Final Report

for the

Big Goose Creek Diversion
(Sheridan Raw Water Intake Facilities)

Level II

November 1999

Prepared for:

Wyoming Water Development Commission

Prepared by:

MSE-HKM, Inc.
Sheridan, Wyoming
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for the
Big Goose Creek Diversion
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Prepared for:
Wyoming Water Development Commission
Herschler Building, 4th Floor-West
122 W. 25th Street
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Sheridan, Wyoming
# TABLE OF CONTENTS

1.0 INTRODUCTION
   1.1 Purpose of Study ................................................................. 01
   1.2 Authorization ........................................................................ 01
   1.3 Project Location .................................................................... 01
   1.4 Consultant Team ................................................................... 03
   1.5 Facilities ............................................................................... 03
   1.6 Site History ........................................................................... 03
   1.7 Historical Water Usage and Design Flows .............................. 07
   1.8 Water Rights ......................................................................... 09

2.0 EXISTING FACILITIES
   2.1 Review Existing Facilities ..................................................... 11
   2.2 Condition of Existing Facilities ............................................. 14
   2.3 Water Quality Issues ............................................................. 18
   2.4 Sediment Samples ................................................................. 21
   2.5 Hydraulic Analysis ................................................................. 25
   2.6 PRVS on the 30-inch RWTM .................................................. 30
   2.7 Discharge Permit Issues ......................................................... 32

3.0 GEOTECHNICAL/PERMITTING/EASEMENTS
   3.1 Geotechnical ......................................................................... 34
   3.2 Construction Permitting ......................................................... 34
   3.3 Easements ............................................................................. 36

4.0 PROPOSED IMPROVEMENTS
   4.1 Modifications to Existing Facilities ...................................... 37
   4.2 Capacity ................................................................................ 38
   4.3 New Facilities ........................................................................ 38
   4.4 Summary of Recommendations ............................................. 47

5.0 ECONOMIC ANALYSIS
   5.1 Introduction ........................................................................... 49
   5.2 Cost Estimates ....................................................................... 49
   5.3 Funding Plan/Ability to Pay ................................................... 49
   5.4 Operation and Maintenance .................................................. 51
TABLE OF CONTENTS

LIST OF TABLES

<table>
<thead>
<tr>
<th>Table No.</th>
<th>Table Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Peak Day Diversions at Big Goose Creek</td>
<td>08</td>
</tr>
<tr>
<td>2</td>
<td>1998 Big Goose Creek Raw Water Diversion</td>
<td>08</td>
</tr>
<tr>
<td>3</td>
<td>Peak Day Flow to Four Facilities</td>
<td>08</td>
</tr>
<tr>
<td>4</td>
<td>Design Peak Day Requirements for the Sheridan Water System</td>
<td>09</td>
</tr>
<tr>
<td>5</td>
<td>Summary of Water Quality Monitoring</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td>Particle Size Analysis</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>Summary of TOC Monitoring</td>
<td>21</td>
</tr>
<tr>
<td>8</td>
<td>Intake Rating Curve</td>
<td>28</td>
</tr>
<tr>
<td>9</td>
<td>Summary of NPDES Discharge Monitoring Reports</td>
<td>33</td>
</tr>
<tr>
<td>10</td>
<td>Cost Estimate Summary</td>
<td>49</td>
</tr>
<tr>
<td>11</td>
<td>Cost Estimate Allocation</td>
<td>51</td>
</tr>
</tbody>
</table>

LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Figure Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Location of Relating Facilities</td>
<td>02</td>
</tr>
<tr>
<td>2</td>
<td>Site Map</td>
<td>04</td>
</tr>
<tr>
<td>3</td>
<td>Existing Facilities</td>
<td>05</td>
</tr>
<tr>
<td>4</td>
<td>Reconstructed Sand Trap Channel</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>New 30&quot; Pipeline and Road Reconstruction</td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td>Grain Size Distribution – Sand Trap Channel</td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>Grain Size Distribution – Microstrainer Basin</td>
<td>22</td>
</tr>
<tr>
<td>8</td>
<td>Grain Size Distribution – Presedimentation Basin</td>
<td>24</td>
</tr>
<tr>
<td>9</td>
<td>Grain Size Distribution – Big Goose Creek</td>
<td>24</td>
</tr>
<tr>
<td>10</td>
<td>Hydraulic Profiles</td>
<td>29</td>
</tr>
<tr>
<td>11</td>
<td>Beckton Vault Piping Plan</td>
<td>31</td>
</tr>
<tr>
<td>12A</td>
<td>Proposed Improvements – Alternate A</td>
<td>40</td>
</tr>
<tr>
<td>12B</td>
<td>Proposed Improvements – Alternate B</td>
<td>41</td>
</tr>
<tr>
<td>12C</td>
<td>Proposed Improvements – Alternate C</td>
<td>42</td>
</tr>
<tr>
<td>13</td>
<td>Vortex Grit Unit</td>
<td>43</td>
</tr>
<tr>
<td>14</td>
<td>Grain Size Distribution – Loading and Removal on Grit Unit</td>
<td>44</td>
</tr>
<tr>
<td>15</td>
<td>Rectangular Presedimentation Basin</td>
<td>46</td>
</tr>
</tbody>
</table>

APPENDICES

APPENDIX A – Pictures of Existing Facilities
APPENDIX B – Water Quality Analyses Results
APPENDIX C – Hydraulic Analyses
APPENDIX D – Discharge Permit
APPENDIX E – Geotechnical Information
APPENDIX F – Permitting Requirements
APPENDIX G – Grain Size of Sediment Samples
1.0

INTRODUCTION
1.0 Introduction

1.1 PURPOSE OF STUDY

The existing City of Sheridan's Big Goose Creek Diversion Facilities are unable to meet peak demand requirements. The purpose of this study is to perform a Level II investigation to determine expansion needs at these facilities. This study will:

1. Determine diversion requirements to meet the water supply needs of the Sheridan Area Water Supply Joint Powers Board Big Goose Water Treatment Plant and the other facilities served by this site,
2. Inventory and assess existing water rights held by the City and Joint Powers Board,
3. Evaluate water quality, water yield and the condition of the existing City of Sheridan Big Goose Creek diversion facilities,
4. Evaluate diversion facility expansion alternatives,
5. Prepare conceptual level designs and cost estimates for the proposed expansion,
6. Complete an economic study and ability to pay analysis, and
7. Determine permitting and environmental constraints.

This report provides the results of this investigation. These results include not only recommended new facilities needed to address the above items, but modifications to existing facilities which will be beneficial to long-term operation of this site. Improvements are required to increase the capacity of the existing facilities to meet 25-year diversion estimates, including supplying the recently constructed Big Goose Water Treatment Plant (BGWTP) and expanded Sheridan Water Treatment Plant (SWTP).

This report also provides recommendations for the implementation of the proposed improvement plan, as well as background information used to develop these recommendations. Cost estimates and an economic study are included. It is intended that this report be used to allow this project to proceed into Level III in the year 2000. Construction will not occur until 2001 at the earliest.

1.2 AUTHORIZATION

The Sheridan Big Goose Creek Diversion Level II Study was authorized by the Wyoming Water Development Commission in a contract with MSE-HKM, Inc. of Sheridan, Wyoming dated June 4, 1998. The contract authorizes and identifies two study phases for this (Phase I-Analysis of Alternatives and Phase II-Conceptual Design and Cost Estimates). The study is to be completed by November 1, 1999.

1.3 PROJECT LOCATION

The existing intake facilities are located approximately 12 miles southwest of Sheridan on Big Goose Creek at the edge of the Big Horn Mountains. This site is near the center of Section 35, T55N, R86W (see Figure 1).
1.4 CONSULTANT TEAM

MSE-HKM of Sheridan, Wyoming performed this Level II Study. CH2MHiII of Denver, Colorado assisted with evaluation of alternatives for upgrading the capacity of this site.

1.5 FACILITIES

The existing facilities at this diversion site are shown in Figure 2 and Figure 3. Figure 2 shows the diversion dam, pipeline route, and debris removal facilities, while Figure 3 illustrates the debris removal facilities and their appurtenances in greater detail.

The existing facilities include the following:

- Diversion Dam
- Bar screen and inlet baffle
- Sand trap channel
- Two 24-inch pipelines from the intake to the debris removal facilities
- Three flow paths for debris removal
  - the travelling screen and presedimentation basin (primary path)
  - microstrainer (secondary path)
  - manual screening facility (emergency path)
- Supervisory Control and Data Acquisition (SCADA) monitoring of flows, turbidity and certain water levels
- Electrically operated throttling valves connected to the SCADA system
- Metering of flows
- 70 kW emergency power generator
- Original diversion dam, presedimentation basin and 12-inch site piping
- Waste flow facilities from basins (returned to creek)
- Isolation valves
- Support buildings including house (office), garage and storage building (generator building)

These facilities are discussed in more detail in Section 2.1. Also refer to Appendix A for pictures of the site and these facilities.

This site diverts raw water from Big Goose Creek, provides some debris removal of naturally occurring debris such as twigs, pine cones, leaves, sand and sediment, and delivers the water to three raw water transmission mains (RWTMs) which take the water to four usage points. These points are:

- Big Goose Water Treatment Plant (capacity 4.5 million gallons per day (MGD))
- Sheridan Water Treatment Plant (capacity 14.0 MGD)
- Veterans Affairs Medical Center (VAMC) Water Treatment Plant and irrigation system (capacity 1.9 MGD)
- Kendrick Golf Course for irrigation and fire flows (capacity 2.5 MGD)

These four usage points and the RWTMs are shown in Figure 1.

1.6 SITE HISTORY

The development of this diversion site by the City of Sheridan commenced shortly after 1900. In 1904, the City of Sheridan allowed Fort McKenzie (VAMC) to use 3 cubic feet per second (cfs) of their 1882 Territorial Water Rights Appropriation to be diverted at this site for use at Fort McKenzie. A diversion facility and pipeline to Fort McKenzie was constructed for this purpose.
The State Board of Control granted a petition on April 16, 1909 allowing the City of Sheridan to change the location of its intake to this location at the edge of the mountains. This then became the primary point of diversion for the City of Sheridan's water supply. In 1909, a 10-inch cast iron pipeline was constructed from this site to the City of Sheridan.

In 1936, a slow sand filtration treatment plant was constructed at this site. Also constructed at that time was a second diversion dam approximately 400 feet below the original diversion dam. The treatment facilities consisted of a presedimentation basin, 3 uncovered, slow sand filters and chlorination facilities. A 178,000-gallon clearwell provided gravity flow to the valley. Also constructed in 1936 was a 16-inch steel pipeline which delivered treated water to the city. This facility remained in service until 1966 when a water treatment plant was constructed on the west edge of Sheridan. This treatment plant is still in use today and was expanded to 14.0 MGD in 1993. Constructed in 1968 was a 20-inch ductile iron pipeline which delivered water from the diversion facilities to the SWTP.

A travelling screen, covered presedimentation basin, and chlorination facilities were constructed at this diversion site in 1971. The travelling screen and presedimentation basin continue in use today and are the primary flow path through the facilities. The practice of chlorination ceased in late 1993 when the BGWTP was brought on-line. The BGWTP now provides treated water to users in the Big Goose Valley which had previously been receiving untreated but chlorinated water from the diversion facilities.

The manual screening facilities, constructed in 1936, remained in service as a back-up flow path to the travelling screen/presedimentation basin. Today these facilities are periodically used in an emergency. Most other facilities constructed in 1936 have been abandoned and removed.

Also constructed in 1971 was a second 24-inch steel pipeline from the diversion dam to the debris removal facilities. Because of the narrow route and rock along the south side of Big Goose Creek, this new pipeline had to be set on concrete piers and fill placed to provide cover for this pipeline.

Due to the limited capacity of the travelling screen/presedimentation basin flow path (approximately 8 MGD), additional capacity was required. This led to a two-phase project. The 1986 Phase I project primarily consisted of raising the diversion dam and the construction of improved diversion facilities. The Phase II project in 1987 included installation of a microstrainer installed in a 24-inch ductile iron pipe (DIP) which connected to a 36-DIP, as a parallel flow path to the travelling screen/presedimentation basins. This microstrainer, with a design flow of 10 MGD, was a used unit obtained from the Denver Water Company.

With the completion of the 1987 project, it was believed this site had a capacity of approximately 18 MGD.

In 1985, the Wyoming Water Development Commission drilled a 2,538-foot deep well at this location into the Madison Formation. This well was drilled to explore the possibility of ground water development to serve the proposed Sheridan Area Regional Water System. It was determined this well did not have sufficient water to support a regional water system, however it was put in use in 1996 to serve the Niedringhaus Ranch which is located between this diversion site and the BGWTP. Since the Niedringhaus Ranch was at a higher elevation than the BGWTP, it was not practical to serve it with treated water. Being under artesian pressure (220 psi shut in pressure), this well provides water to this ranch with minimal operation and maintenance.
In 1995, high water eroded the creek bank adjacent to the two 24-inch steel pipelines from the diversion dam. This erosion was repaired with grouted riprap. No further problems from erosion or high water have occurred with any of these facilities since that time.

In 1996, the 30-inch RWTM was completed. This pipeline provided a raw water supply from the diversion site to all four usage points (BGWTP, SWTP, VAWTP and Kendrick Golf Course). The completion of this pipeline led to the abandonment of the City of Sheridan 10-inch RWTM and the VAMC 8-inch RWTM. The 16-inch RWTM remains in service from the diversion site to supply the BGWTP. The 20-inch RWTM remains in service all the way to the SWTP, however due to its poor condition, the pipeline capacity relies on the 30-inch RWTM.

The piping manifold on the east end of the diversion site was modified with the 30-inch RWTM project. Propeller meters were also installed at that time (see Figure 3). These meters were brought into the SCADA system, which transmits data to the control center at the SWTP.

Currently (1999), the SCADA system and controls at the SWTP are being upgraded. This upgrade includes a new computer at the diversion site, which will be fully integrated into the SCADA system for the regional water system.

It is believed remnants of concrete walls and foundations from the abandoned slow sand filters and other facilities previously constructed at this site and no longer in use, will be found as excavation for new facilities takes place. While space for improvements is limited, a potential expansion area does exist south of the existing travelling screen/presedimentation basin (see Figure 3).

1.7 HISTORICAL WATER USAGE AND DESIGN FLOWS

This study has a 25-year planning period. Since these facilities must pass a peak day demand for the entire water system, the design day is the peak day for this 25-year period. From the 1998 City of Sheridan Utilities Master Plan, 1998 population and projected population growth were obtained. Also from the Utilities Master Plan, which considered design criteria for the Sheridan Area Water Project and actual water usage records, design criteria for peak day per capita flows were obtained. These were 690 gallons per capita per day (gpcd) for the city plus 100 gpcd for the rural areas served by this system.

Water diversion records at the intake and inflows to the four facilities receiving water from this diversion were reviewed for the period of 1994 through 1999. 1994 was the first year where the rural water system was in service (BGWTP and expanded SWTP were operating). Summaries of these records are included in the following tables. Table 1 provides a listing of the peak diversions for each year. Table 2 provides monthly diversions for 1998, which was the peak year over this period. Table 3 lists the peak daily demand required by the four facilities that receive raw water from this diversion during the period from 1995 through 1999.
Table 1
Peak Day Diversions at Big Goose Creek

<table>
<thead>
<tr>
<th>Year</th>
<th>Peak Day for Year</th>
<th>Avg. Day in Peak Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>-----</td>
<td>9.5 MGD</td>
</tr>
<tr>
<td>1995</td>
<td>11.2 MGD</td>
<td>10.5 MGD</td>
</tr>
<tr>
<td>1996</td>
<td>12.4 MGD</td>
<td>11.2 MGD</td>
</tr>
<tr>
<td>1997</td>
<td>10.2 MGD</td>
<td>7.9 MGD</td>
</tr>
<tr>
<td>1998</td>
<td>13.5 MGD</td>
<td>11.6 MGD</td>
</tr>
<tr>
<td>1999</td>
<td>12.6 MGD</td>
<td>10.8 MGD</td>
</tr>
<tr>
<td>Average</td>
<td>12.0 MGD</td>
<td>10.3 MGD</td>
</tr>
</tbody>
</table>

Table 2
1998 Big Goose Creek Raw Water Diversion (Flows in MGD)

<table>
<thead>
<tr>
<th>Month</th>
<th>16&quot;</th>
<th>20&quot;</th>
<th>30&quot;</th>
<th>Total</th>
<th>BGWTP</th>
<th>SWTP</th>
<th>Golf Course</th>
<th>VAWTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>39.270</td>
<td>13.330</td>
<td>51.179</td>
<td>103.779</td>
<td>36.559</td>
<td>64.743</td>
<td>0</td>
<td>5.581</td>
</tr>
<tr>
<td>February</td>
<td>37.053</td>
<td>16.611</td>
<td>43.689</td>
<td>97.353</td>
<td>34.339</td>
<td>60.258</td>
<td>0</td>
<td>3.287</td>
</tr>
<tr>
<td>March</td>
<td>40.492</td>
<td>33.206</td>
<td>25.166</td>
<td>98.864</td>
<td>37.955</td>
<td>64.478</td>
<td>0</td>
<td>2.355</td>
</tr>
<tr>
<td>April</td>
<td>38.179</td>
<td>15.153</td>
<td>43.452</td>
<td>96.784</td>
<td>36.094</td>
<td>61.516</td>
<td>0</td>
<td>0.151</td>
</tr>
<tr>
<td>May</td>
<td>41.807</td>
<td>35.455</td>
<td>163.340</td>
<td>240.602</td>
<td>41.807</td>
<td>177.699</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>June</td>
<td>47.927</td>
<td>54.124</td>
<td>153.494</td>
<td>255.545</td>
<td>48.043</td>
<td>137.503</td>
<td>0</td>
<td>0</td>
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<tr>
<td>July</td>
<td>54.824</td>
<td>73.918</td>
<td>229.776</td>
<td>358.518</td>
<td>53.393</td>
<td>224.885</td>
<td>38.854</td>
<td>22.622</td>
</tr>
<tr>
<td>August</td>
<td>49.069</td>
<td>87.884</td>
<td>157.649</td>
<td>294.602</td>
<td>46.613</td>
<td>170.143</td>
<td>26.384</td>
<td>20.822</td>
</tr>
<tr>
<td>September</td>
<td>37.580</td>
<td>83.524</td>
<td>146.971</td>
<td>268.075</td>
<td>34.929</td>
<td>150.560</td>
<td>28.818</td>
<td>11.314</td>
</tr>
<tr>
<td>October</td>
<td>30.070</td>
<td>76.184</td>
<td>91.770</td>
<td>198.024</td>
<td>28.050</td>
<td>95.514</td>
<td>36.385</td>
<td>2.658</td>
</tr>
<tr>
<td>November</td>
<td>26.915</td>
<td>73.272</td>
<td>81.933</td>
<td>182.120</td>
<td>25.386</td>
<td>75.622</td>
<td>42.916</td>
<td>4.296</td>
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<tr>
<td>December</td>
<td>29.843</td>
<td>76.495</td>
<td>82.592</td>
<td>188.930</td>
<td>27.645</td>
<td>72.813</td>
<td>43.095</td>
<td>3.730</td>
</tr>
<tr>
<td>Total</td>
<td>473.029</td>
<td>639.156</td>
<td>1271.011</td>
<td>2383.196</td>
<td>450.813</td>
<td>1355.734</td>
<td>216.452</td>
<td>76.816</td>
</tr>
</tbody>
</table>

Table 3
Peak Day Flow to Four Facilities That Receive Raw Water From the Diversion (Million Gallons per Day)

<table>
<thead>
<tr>
<th>Year</th>
<th>BGWTP</th>
<th>SWTP</th>
<th>VAWTP</th>
<th>Kendrick</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>1.2</td>
<td>9.4</td>
<td>-----</td>
<td>-----</td>
<td>10.6</td>
</tr>
<tr>
<td>1996</td>
<td>1.4</td>
<td>8.8</td>
<td>1.7</td>
<td>-----</td>
<td>11.9</td>
</tr>
<tr>
<td>1997</td>
<td>1.3</td>
<td>7.8</td>
<td>1.6</td>
<td>1.2</td>
<td>11.9</td>
</tr>
<tr>
<td>1998</td>
<td>1.9</td>
<td>9.1</td>
<td>1.2</td>
<td>1.4</td>
<td>13.5</td>
</tr>
<tr>
<td>1999</td>
<td>2.2</td>
<td>9.0</td>
<td>1.1</td>
<td>1.2</td>
<td>13.5</td>
</tr>
<tr>
<td>Average</td>
<td>1.6</td>
<td>8.8</td>
<td>1.4</td>
<td>1.3</td>
<td>13.0</td>
</tr>
</tbody>
</table>

Based on the above, Table 4 lists the design, peak day requirements for this diversion facility as determined by this study. The 25-year peak day estimated demand will be used to develop the design flow for the expanded facilities.
Table 4
Design Peak Day Requirements for the Sheridan Water System

<table>
<thead>
<tr>
<th>Item</th>
<th>City of Sheridan</th>
<th>Rural Areas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998 population</td>
<td>15,325</td>
<td>3,175</td>
<td>18,500</td>
</tr>
<tr>
<td>2025 population</td>
<td>26,158</td>
<td>5,419</td>
<td>31,577</td>
</tr>
<tr>
<td>Per capita demand</td>
<td>690 gpcd</td>
<td>100 gpcd</td>
<td>590 gpcd (average)</td>
</tr>
<tr>
<td>Total design flow</td>
<td>18.1 MGD</td>
<td>0.5 MGD</td>
<td>18.6 MGD</td>
</tr>
</tbody>
</table>

The water right for the VAMC is 3 cfs or 1.9 MGD. According to the VAMC, their needs will not increase. Their peak day over the last four years is 1.7 MGD, therefore the design flow to be used for this study will remain at 1.9 MGD.

The peak irrigation demand for Kendrick Golf Course over the past three years was 1.4 MGD. Allowing for a limited growth and fire flows which may occur at times when irrigation is also taking place, the design flow for Kendrick Golf Course will be 2.0 MGD.

The Corps of Engineers, in the 404 Construction Permit for the Twin Lakes Project, required the Sheridan Area Water System to reduce the average water used per account by 12% by the year 2020. The city is tracking water used per account. Variations are occurring because of weather, rainfall, and other factors, therefore it is too early to determine if reductions in water use are taking place. It is recommended any reduction in usage due to conservation not be included in the design flow calculations.

Because of physically constraints of this site it is critical this expansion project not be under designed. Construction costs at this location are above average because of its limited size, rock and distance from town. With the completion of this project almost all of the available space for additional facilities will be used.

The design flow for the four facilities presented above totals approximately 22.5 MGD. Because of the concerns expressed in the previous paragraph, a design flow of 25 MGD (17,000 gpm or 39 cfs) will be used for this study.

1.8 WATER RIGHTS

City of Sheridan water rights at this location date back to 1904 when a portion of their 1882 territorial rights were transferred to this site for supplying Fort McKenzie. Water rights for the city’s use were transferred to this location of these diversion facilities by a petition granted by the Board of Control in 1909. The most significant water rights issue since 1909 occurred in 1995 when three agricultural irrigators filed a petition seeking to abandon 4.5 cfs of the city’s territorial water right.

The State Board of Control issued an order in February 1997 following the completion of hearings on this abandonment petition and an agreement with these irrigators (Docket #11-96-1-2, Minute Book 21, page 294, Order #48, page 43). This order clarified the city’s diversions directly from Big Goose Creek at this location. This order stated:

➢ The city may divert their entire 16.0 cfs Territorial Appropriation at this location during the period of October 1 to April 30 each year.

➢ During the period of May 1 to September 30 each year when Big Goose Creek is under non-surplus conditions, and a call for regulation has been placed on the stream, the city (together with the Veteran’s Administration) may not take more than a combined 13.0 cfs at
this location. The remaining 3.0 cfs can be taken by the city at alternative diversion points that were identified downstream.

- The city is allowed to use any portion of the 3.0 cfs designated for the Veteran’s Administration in 1904, and not being used by the Veteran’s Administration.

Water supply requirements needed to meet system demand in excess of these direct flow rights, are met by releasing stored water from the recently constructed Twin Lakes reservoir (3380 acre feet of storage), or one of the reservoirs where the Sheridan Area Water Supply Joint Powers Board holds a stored right (Park, Dome, and Sawmill Reservoirs). Therefore the city of Sheridan has adequate water rights to support the proposed improvements at this site, including the expanded capacity.

The history of Sheridan’s water rights is discussed in the Utilities Master Plan prepared by MSE-HKM dated June 1998. This document also discusses water rights associated with the Sheridan Area Water Supply Joint Powers Board. Refer to this document for additional information on Sheridan’s water rights.

It is understood there is no in-stream flow requirement at this location, therefore if the city is diverting within its direct diversion right plus any stored releases, the city does not have the responsibility to maintain any minimum flow over the diversion dam.

Another water rights issue relates to the First, Second and Third Enlargements (permit numbers 7021, 7022, and 7023 on file with the State Engineer’s office) to expand the use area for these water rights. These enlargements list cumulative pipeline capacities of 60.53 cfs (39 MGD). This 60 cfs is basically a “junior” direct flow water right. Once this expansion project is completed, the maximum diversion should be made under a “high” creek condition. The “high” creek condition allows a greater diversion because of the available hydraulic head, and available water for this junior right. The city may desire to amend this quantity to the water that can actually be diverted and proven as being put to beneficial use. This quantity should then be diverted on an annual basis.
2.0

EXISTING FACILITIES
2.0 EXISTING FACILITIES

The following paragraphs provide a brief review of the existing facilities at this diversion site.

2.1 REVIEW OF EXISTING FACILITIES

Original Diversion Dam

The original diversion dam was constructed in 1909. This dam diverts water to a small presedimentation basin facility (approximately 16'x50') constructed at that time. This facility connects to a 12-inch cast iron pipe, which follows the southern and eastern edges of the site. This diversion, presedimentation basin and pipeline are used today to provide water to the site for lawn irrigation and bathroom use. With its higher elevation, these original facilities provide pressure not available from the primary diversion facilities.

These original facilities also are used periodically when the primary diversion is out of service for cleaning or other maintenance. During a recent cleaning event with the original system in operation, it was noted the original presedimentation basin was overflowing, yet the water level in the presedimentation basin was dropping. Therefore it appears the limiting capacity is in the 12-inch line leaving the original presedimentation basin, rather than the diversion and piping which supply it.

Primary Diversion Dam

This diversion dam was originally constructed in 1936 and raised in the 1986 project. It is located approximately 600 feet upstream from the debris removal facilities, and approximately 500 feet downstream from the original diversion dam. It is a concrete structure keyed into the limestone bedrock. The dam crest is at an elevation of approximately 4616.2'. This dam creates a pool with a depth of approximately 3 to 4 feet. The entire flow of Big Goose Creek tops this diversion dam. A 3-foot wide fish ladder with a crest 0.5 feet below the top of the dam is located on the south end of the dam. Slots are available in the concrete to place a board in the fish ladder lower crest area, to maintain the water level feeding the sand trap channel at the elevation of the diversion dam. This structure appears to be in good condition.

Baffle and Bar Screen

An aluminum baffle is located on the south side of the creek above the diversion dam to keep floating branches out of the diversion. Water then passes through a bar screen with seven 2-foot wide sections. The bars have a 2-inch spacing. This bar screen also helps keep larger floating debris such as branches out of the system. The bar screen is periodically manually cleaned. The bottom of the bar screen is at an elevation approximately 4 feet below the dam crest and 33" below the bottom of the baffle. An aluminum slide gate may be opened periodically to flush the area in front of the bar screen to remove accumulated sand. A second aluminum slide gate controls water that passes through the bar screen. This water then enters the sand trap channel. The concrete in the bar screen structure appears to be in good condition.

Sand Trap Channel

The sand trap delivers water from the bar screen to the two 24-inch pipelines. This channel is designed to remove course sand carried along the bed of the creek, prior to its entering the
pipelines. However, it does not appear to be very effective. It is 48 feet long and 4 feet wide and has two concrete baffle walls along the bottom. Four-inch valves are located immediately ahead of these baffles which can be opened to remove sand. In addition, a gate is located at the downstream end of the channel prior to the water entering the pipelines. This gate is generally kept partially open to allow some sand to flush back into the creek. There is also an overflow weir at the east end of the channel to allow excess water to flow back to the creek.

The north wall of this channel exposed to the creek is in very poor condition (cracking and spalling) apparently due to freeze/thaw conditions. The wall next to the bank (south wall) is in good condition.

24-inch Pipelines

Two 24-inch steel pipelines deliver the water from the sand trap channel to the debris removal facilities. Sliding gates are located at the entrance to the two pipelines at the east end of the sand trap channel. These pipelines were installed in 1936 and 1971. The 1971 pipeline started out as the south pipeline, but then became the north pipeline as a transition is made approximately 80 feet east of the sand trap channel. From measurements taken at the entrance into the pipelines at the sand trap channel, it appears 24 inches is an internal diameter for the original pipeline, and an outside diameter for the 1971 line. These lines appear to have very minimal cover, with the pipe visible at the ground surface in at least one location. At the east end of these pipelines where they connect into the manifold, the pipe has approximately 3.5 feet of cover.

The entrance to the north pipeline is a 36-inch diameter opening, which tapers into the 24-inch pipeline. The entrance to the south line is 24-inch diameter. The pipeline then immediately turns a 90-degree bend. Therefore the hydraulic entrance losses into the south line are greater than into the north pipeline.

The pipelines are believed to be in good condition, however an inspection of the inlet end of the pipes shows a significant number of cadyss fly larvae hatch sites. These are attached to the inside of the pipe and create a roughness, which significantly reduces the capacity of the pipelines.

Site Piping and Valves

Site piping consists of primarily cast iron and ductile iron pipe installed in conjunction with many projects over the past 90 years. The piping manifold on the west end of the site allows flow to be diverted to any of the three primary flow paths, while the manifold on the east end of the site allows water to enter any of the three RWTMs. Isolation valves, which are primarily butterfly valves, are present throughout the site to provide isolation of facilities and diversion of water as necessary for proper operation. Generally, these lines and valves are believed to be in good condition and are not proposed for replacement other than as necessary in conjunction with the construction of new facilities.

Three electrically operated butterfly valves are connected to the SCADA system for monitoring of their position and adjustment as necessary to control flows. Two of these valves are located on the inlet pipes to the travelling screen/presedimentation basin flow path and the microstrainer. These two valves can be adjusted to divert the proper amount of flow through these two flow paths. They will also adjust automatically to maintain the desired level in the presedimentation basin. The third valve is located on the discharge side of the presedimentation basin. It can be throttled to adjust the hydraulic gradeline (HGL) from this path to match the microstrainer. The microstrainer is set at an elevation approximately 4 feet
below the travelling screen, therefore a balance in flow between the two facilities is needed. See Figure 3 for the location of the primary piping through the facility.

**Travelling Screen**

The travelling screen is located in the brick building, which also previously housed the chlorination facilities. The travelling screen is a Rex Chainbelt brand and was installed in 1971. U.S. Filter now services Rex Chainbelt equipment and has information on this particular unit. They can be contacted for spare parts and service as necessary (414-547-0141).

This screen uses a 3/8-inch mesh and is intended to remove larger floating debris such as pine cones, twigs, bark, and leaves. The pump is located in the basement of this building, which provides surface wash to remove debris off of the screen. This wash water enters a pipeline with other waste streams and is returned to Big Goose Creek. A 12-foot long weir at the inlet end to this basin provides overflow back to the creek, should flows entering this point be greater than needed or that can pass through the presedimentation basin.

The travelling screen was inspected and found to be in good condition and reportedly operates very well. Some wearing of the foot and head sprockets was noted. Considering its age and use, U.S. Filter was contacted for recommendations on replacement parts. Their recommendations are included in the recommended upgrade project, and it is proposed these replacement parts be installed once the new primary flow path is in service. Minimal corrosion was observed during a recent inspection.

This building also houses a Hach turbidimeter which continuously monitors and reports turbidity of this raw water supply.

**Presedimentation Basin**

The presedimentation basin is a circular concrete basin with a diameter of 65 feet and water depth of 11 feet (at the wall). The distance from the top of the basin wall to the bottom of the sump is approximately 20.5 feet. The basin is covered with an insulated dome.

The purpose of this basin is to remove settable solids such as sand and sediment. Water enters the basin at the center, and flows out radially to collection piping mounted on the perimeter of the basin. This collection piping consists of submerged 24-inch piping with one hundred forty-four 2-inch holes located in the piping. Water enters this collection piping which leads to a manhole which connects into a 20-inch pipeline. Water then flows through this 20-inch piping to the RWTMs at the east end of the site.

Two scraper arms continuously travel around the bottom of the sloping concrete floor to bring the sediment to a hopper in the center. Continuous flushing is used to remove this accumulated sediment and return it to the creek. The basin is normally drained, cleaned and inspected each fall.

During a recent inspection, the facilities were found to be in generally good condition. Some tuberculation on metal surfaces was observed. Tuberculation typically begins at a flaw in the metal coating, which leads to the development of an iron oxide growth. While this is corrosion, it did not appear to be excessive. Attaching anodes to the metal components would basically maintain current conditions. It is believed this facility can remain serviceable through the planning period of this study. Any maintenance required on the presedimentation basin can be performed when the new flow path is in place, allowing this unit to be removed from service.
While the design flow for this basin was rated as 12 MGD in a 1970 design memorandum based on a 30-minute detention time, the city has determined it operates closer to an 8-MGD peak flow.

Microstrainer

The microstrainer was installed in 1987 as a parallel flow path to the travelling screen/presedimentation basin. This was a Glenfield model which was purchased used from the Denver Water Company. It is cylindrically shaped with water flowing from the inside out. It is 10 feet long and has a 10-foot diameter. The 100-mesh fabric on the screen was removed in 1998, therefore the window screen size mesh now is used.

The microstrainer is typically used each summer to meet peak demands. It has proven to be maintenance intensive and unreliable. As a pressure differential develops across the screen, panels in the screen frequently blowout, causing unscreened water to enter the pipelines.

Because of its high level of maintenance and insufficient level of debris removal, it is proposed this unit be abandoned and new facilities be constructed.

Manual Screening Facility

A manual screening facility, constructed in 1936, is located on a 24-inch pipeline on the north side of the site, which bypasses the other two flow paths. Screens are located in a concrete channel which must be removed and manually cleaned. Two screens are used to allow one to remain in place during cleaning. This process is also labor intensive and must be monitored closely. It is proposed this unit remain in service however, as an emergency backup. The 24-inch pipeline provides considerable hydraulic capacity, and its availability should be of value for periodic emergencies in the future. No benefit is seen in the demolition of this facility.

Auxiliary Generator

An auxiliary power generator is located in the garage/storage shed adjacent to the manual screening facility. The unit is a 70 kW generator powered by propane which is stored at the site. The generator will automatically start itself in the event of a power outage and provides necessary power for controls, pumps and other electrical facilities at the site. There are no reported problems associated with this generating system.

Power to the site is 3 phase, 240-volt.

Metering

Metering at the site consists of three propeller meters which were installed in 1996 with the 30-inch RWTM project. These meters are connected to the SCADA system to automatically record flows. These meters are located in manholes at the east end of the site. These meter readings are also used to document diversions for water rights.

2.2 CONDITION OF EXISTING FACILITIES

This section reviews existing facilities and where rehabilitation is required because of their condition. Pictures in Appendix A illustrate many of the issues outlined below. Most facilities will remain in service following completion of the reconstruction project while others will be renovated or abandoned.
Sand Trap Channel. The north wall of the sand trap channel (wall next to the creek) is deteriorating and requires reconstruction. The existing baffle walls in the bottom of the channel are not providing the intended benefits (see Figure 4). The overflow weir at the downstream end of the channel is not adjustable. The operators desire the flexibility of being able to adjust this weir. The proposed new configuration of the sand trap channel is shown in Figure 4.

South 24-inch Pipeline. The 24-inch pipelines from the diversion to the debris removal facilities cannot supply design flow. The south pipe was chosen to be replaced rather than the north pipe because the north pipe sits on concrete piers (because of the rock and steep slope of the creek bank), and because most of the south pipe is older than the north pipe. Also, the south pipe has poor inlet conditions at the sand trap channel. These will be improved as part of the installation of the new pipe and the reconstruction of the sand trap channel. A new gate will also need to be installed at the sand trap channel at the inlet for this pipe.

Because of the rocky conditions of the pipeline route, the existing south 24-inch pipeline will need to be removed prior to placement of the new pipeline. The inverts of the two lines will be approximately the same. Because of the shallow bury, the roadbed will need to be raised. Gabions placed along the north edge of the road will be used to help anchor the additional fill placed on the road, because of the steep north side slope going down into the creek (see Figure 5).

Travelling Screen. The 30-year old Rex Chainbelt (now U.S. Filter), travelling screen appears to be in generally good condition. Some worn parts should be replaced, and then, it is believed this screen can continue in service for many years. Once a new flow path is constructed, this travelling screen will be on the backup flow path, therefore its usage will decrease. A maintenance technician for U.S. Filter has provided a recommended list of typical replacement parts for a screen of this age and work history.

Presedimentation Basin. The presedimentation basin was in generally good condition. The metal components appeared to be coated with a material that has generally lasted well over its 30 years in use. Some pitting in the coating has been occurring however, as tuberculation was evident on many metal surfaces. This did not appear to be excessive and did not appear to be compromising the integrity of the steel structure at this time (see Appendix A). It is proposed to attach ribbon anodes to the metal surfaces such as the scraper arms, influent pipe, collector pipe, and structure supporting the interior baffle wall. These anodes should maintain current conditions by inhibiting further corrosion.

Microstrainer. The screen on the microstrainer has been repaired many times and cracks are seen in the housings connected to the main shaft. The microstrainer has also been very maintenance intensive over the years, therefore it is proposed to be abandoned as part of this project. It is also proposed to complete the 24-inch piping through this basin, so this flow path can be used if required.

Other Facilities. The other facilities are primarily in good to acceptable condition and are recommended to remain as is.

Some facilities such as the north 24-inch bypass piping are over 60 years old, however it is believed to be in satisfactory condition for a future role as an emergency flow path. An investigation into upgrading this piping is not warranted.
Facilities to remain in their current condition include:

- Original diversion dam, presedimentation basin, and 12-inch pipeline
- Diversion dam and bar screen
- North 24-inch pipeline from the diversion
- Manual screen facility and connecting piping
- Piping for travelling screen and presedimentation basin flow path
- Metering
- Manifold and piping leaving the site
- Emergency generator
- Discharge points for return flows to the creek
- Turbidity and any other measurements of water quality
- SCADA hardware and software after the completion of the current instrumentation project
- Isolation valves
- House, garage and red storage shed
- Madison well

2.3 WATER QUALITY ISSUES

Physical water quality is very important for the design of new facilities. Sampling of the water quality for temperature, pH, turbidity and total suspended solids (TSS) was performed over a 1-year period. The results of this sampling are shown in Table 5. During much of the year, the turbidity in Big Goose Creek is less than 6 NTUs (nephalometric turbidity units), and during the winter it frequently runs under 1 NTU.
Heavy rainstorms can occur anytime from spring to fall, however even a heavy rainstorm does not necessarily mean the turbidity and TSS levels will increase significantly. This is evidenced by the August 3, 1998 sampling event. During spring rains and snowmelt, turbidity and TSS levels can increase significantly, at times. While levels may be elevated for several weeks, peak spikes such as the April 27th, April 29th, and May 4th 1999 samples, typically are short-lived. These events occur on a regular basis however, and facilities must be in place to remove the debris. Other debris concerns include organic material such as leaves (particularly in the fall), twigs, pine cones, and the inorganic bedload of the creek, which consists of sand and sediment. The inorganic loading is always present, but does increase with higher flows and increased runoff. The design of the existing intake and new sand trap channel will help reduce the amount of this bedload which reaches the debris removal facilities, however grit removal

### Table 5
**Summary of Water Quality Monitoring**

<table>
<thead>
<tr>
<th>Date</th>
<th>Temperature (°C)</th>
<th>pH (S.U.)</th>
<th>Turbidity* (NTU)</th>
<th>Total Suspended Solids* (mg/L)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1    2    3    4    5</td>
<td>1     2     3     4     5</td>
<td></td>
</tr>
<tr>
<td>14-Jul-98</td>
<td>15.3</td>
<td>7.9</td>
<td>2.7  2.9  2.6  2.6  2.4</td>
<td>2.0  2.0  2.0  2.0  2.0</td>
<td></td>
</tr>
<tr>
<td>3-Aug-98</td>
<td>13.5</td>
<td>7.8</td>
<td>6.3  6.6  8.0  6.3  NIS</td>
<td>4.0  10  14  16  NIS</td>
<td>Heavy rain storms on mountain.</td>
</tr>
<tr>
<td>25-Aug-98</td>
<td>11.0</td>
<td>7.7</td>
<td>3.8  6.6  5.5  1.9  4.3</td>
<td>4.0  4.0  2.0  4.0  2.0</td>
<td></td>
</tr>
<tr>
<td>01-Sep-98</td>
<td>12.0</td>
<td>7.7</td>
<td>2.1  3.7  2.7  4.1  5.3</td>
<td>4.0  4.0  6.0  4.0  8.0</td>
<td></td>
</tr>
<tr>
<td>15-Sep-98</td>
<td>11.5</td>
<td>7.9</td>
<td>4.1  3.1  3.6  3.7  7.0</td>
<td>4.0  4.0  2.0  6.0  6.0</td>
<td></td>
</tr>
<tr>
<td>01-Oct-98</td>
<td>7.0</td>
<td>7.9</td>
<td>4.6  4.3  3.8  4.4  NIS</td>
<td>4.0  2.0  4.0  2.0  NIS</td>
<td></td>
</tr>
<tr>
<td>19-Oct-98</td>
<td>3.2</td>
<td>6.7</td>
<td>1.4  1.2  1.2  1.4  NIS</td>
<td>2.0  2.0  2.0  0.0  NIS</td>
<td></td>
</tr>
<tr>
<td>02-Nov-99</td>
<td>2.6</td>
<td>7.4</td>
<td>1.9  1.7  1.7  1.8  NIS</td>
<td>4.0  4.0  2.0  2.0  NIS</td>
<td>Microstrainer filter fabric removed prior to sampling.</td>
</tr>
<tr>
<td>18-Nov-98</td>
<td>1.5</td>
<td>7.6</td>
<td>1.1  1.4  1.3  1.3  NIS</td>
<td>4.0  4.0  0.0  6.0  NIS</td>
<td></td>
</tr>
<tr>
<td>03-Dec-98</td>
<td>2.2</td>
<td>7.0</td>
<td>1.2  1.1  1.1  1.3  NIS</td>
<td>2.0  4.0  6.0  0.0  NIS</td>
<td></td>
</tr>
<tr>
<td>05-Jan-99</td>
<td>1.5</td>
<td>6.8</td>
<td>1.0  1.1  1.6  1.1  NIS</td>
<td>2.0  2.0  2.0  2.0  NIS</td>
<td></td>
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<tr>
<td>19-Jan-99</td>
<td>1.0</td>
<td>7.7</td>
<td>0.8  1.1  0.9  0.9  NIS</td>
<td>2.0  2.0  4.0  4.0  NIS</td>
<td></td>
</tr>
<tr>
<td>02-Feb-99</td>
<td>0.5</td>
<td>8.1</td>
<td>0.8  0.9  0.9  1.0  NIS</td>
<td>2.0  2.0  4.0  2.0  NIS</td>
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<tr>
<td>16-Feb-99</td>
<td>1.2</td>
<td>7.5</td>
<td>0.6  0.8  0.8  0.7  NIS</td>
<td>2.0  2.0  2.0  2.0  NIS</td>
<td></td>
</tr>
<tr>
<td>02-Mar-99</td>
<td>0.9</td>
<td>7.2</td>
<td>0.8  1.0  0.8  0.8  NIS</td>
<td>2.0  2.0  4.0  0.0  NIS</td>
<td></td>
</tr>
<tr>
<td>16-Mar-99</td>
<td>2.4</td>
<td>7.2</td>
<td>1.0  0.9  0.9  1.2  NIS</td>
<td>2.0  2.0  4.0  2.0  NIS</td>
<td></td>
</tr>
<tr>
<td>06-Apr-99</td>
<td>0.3</td>
<td>6.9</td>
<td>0.9  0.8  0.9  1.0  NIS</td>
<td>2.0  0.0  4.0  1.5  NIS</td>
<td></td>
</tr>
<tr>
<td>13-Apr-99</td>
<td>2.0</td>
<td>7.2</td>
<td>1.1  1.4  1.3  1.2  NIS</td>
<td>2.0  0.0  4.0  2.0  NIS</td>
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</tr>
<tr>
<td>23-Apr-99</td>
<td>1.8</td>
<td>7.1</td>
<td>4.2  4.2  4.6  3.7  NIS</td>
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<td></td>
</tr>
<tr>
<td>27-Apr-99</td>
<td>1.8</td>
<td>7.9</td>
<td>204 165 177 211 NIS</td>
<td>140 150 160 184 NIS</td>
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</tr>
<tr>
<td>29-Apr-99</td>
<td>4.5</td>
<td>7.5</td>
<td>119 117 120 123 NIS</td>
<td>120 120 180 110 NIS</td>
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</tr>
<tr>
<td>04-May-99</td>
<td>2.0</td>
<td>7.8</td>
<td>771 762 439 155 NIS</td>
<td>540 500 160 130 NIS</td>
<td>Max. Daily Turb. = 1330 NTU MudSlide in Canyon.</td>
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<td>12-May-99</td>
<td>3.3</td>
<td>7.5</td>
<td>5.6  6.1  5.8  5.0  NIS</td>
<td>8.0  10  8.0  2.0  NIS</td>
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<td>19-May-99</td>
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<td>7.5</td>
<td>6.4  6.6  6.7  7.2  NIS</td>
<td>8.0  8.0  8.0  10 NIS</td>
<td></td>
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<td>7.7</td>
<td>7.1  6.9  6.6  7.2  6.6</td>
<td>4.0  4.0  8.0  4.0  12</td>
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<td>02-Jun-99</td>
<td>7.6</td>
<td>7.6</td>
<td>5.1  5.6  6.9  6.3  NIS</td>
<td>10 12 10 10 6.0</td>
<td></td>
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<tr>
<td>09-Jun-99</td>
<td>6.9</td>
<td>7.2</td>
<td>16 18 20 21 19</td>
<td>20 25 35 25 25</td>
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<tr>
<td>18-Jun-99</td>
<td>7.1</td>
<td>7.2</td>
<td>6.6  6.3  6.9  7.1  6.8</td>
<td>15 25 20 30 20</td>
<td></td>
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<tr>
<td>22-Jun-99</td>
<td>8.1</td>
<td>7.4</td>
<td>5.1  5.2  4.7  5.1  5.2</td>
<td>15 10 10 15 20</td>
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<td>30-Jun-99</td>
<td>9.8</td>
<td>6.7</td>
<td>2.6  2.3  1.8  1.7  2.2</td>
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<td></td>
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<tr>
<td>14-Jul-99</td>
<td>13.7</td>
<td>7.5</td>
<td>1.9  1.8  2.0  1.7  1.6</td>
<td>2.0  2.0  4.0  4.0  2.0</td>
<td></td>
</tr>
</tbody>
</table>

*Key to sampling locations: NIS – Not In Service
1 - Creek at Bar Screen
2 - Following Sand Trap Channel
3 - Following Travelling Screen
4 - Presed Basin Effluent
5 - Microstrainer Effluent
and sedimentation will remain critical processes. These steps are needed to prevent unacceptable amounts of debris from entering the pipelines.

Table 5 also shows the turbidity and TSS levels at five different locations. This shows how these concentrations change throughout the existing facilities. At low concentrations little reduction is noticed, however again, it is important to remove the heavier material and the organic material which may not be reflected in these numbers. Removals at peak turbidity periods (as occurred on May 4th when a peak turbidity of 1330 NTUs was observed) is critical.

The pH measurements reflect the high quality and neutral condition of this water. With very low total dissolved solids and alkalinity levels, the pH readings (which typically fall between 7.0 and 7.9), indicate there is no problem with the pH of the raw water supply. These levels should not result in corrosion concerns in the raw water supply due to water quality. Past experiences at this site verify corrosion due to water quality does not seem to be a problem. The pH is of very great concern in the water treatment process, as the low alkalinity will allow the pH to reduce significantly when certain chemicals (such as alum) are added.

The temperature readings in conjunction with the size of the particles found in this stream, provide information on the settling characteristics of this water. In colder water, small particles will settle slower due to the increased density (viscosity). These readings show that between mid-October and mid-May, the temperature is typically less than 4 degrees C. It also shows the higher TSS levels seen in spring conditions occur when the water is very cold. Temperatures during May and into June are influenced considerably by snowmelt.

Four samples were collected during spring runoff and analyzed for particle size by Malvern Instruments Laboratory in Southboro, Massachusetts. The aqueous liquid laser defraction method was used for this analysis. The results of these analyses are shown in Table 6. Laboratory reports are included in Appendix B. These particle size results can be compared to the size of settled material collected from the existing presedimentation basin. They also provide information on settling time requirements for the new presedimentation basin.

<table>
<thead>
<tr>
<th>Date</th>
<th>Turbidity (NTU)</th>
<th>TSS (mg/L)</th>
<th>Range Reported</th>
<th>95% of Particles*</th>
<th>60% of Particles*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26-Apr-99</td>
<td>204</td>
<td>140</td>
<td>0.020 um - 2000 um</td>
<td>0.893 um - 141.589 um</td>
<td>3.99 um - 28.251 um</td>
</tr>
<tr>
<td>29-Apr-99</td>
<td>132</td>
<td>120</td>
<td>0.020 um - 2000 um</td>
<td>1.125 um - 316.979 um</td>
<td>7.962 um - 79.62 um</td>
</tr>
<tr>
<td>04-May-99</td>
<td>770</td>
<td>540</td>
<td>0.020 um - 2000 um</td>
<td>2.244 um - 1124.683 um</td>
<td>22.44 um - 632.465 um</td>
</tr>
<tr>
<td>09-Jun-99</td>
<td>16</td>
<td>20</td>
<td>0.020 um - 2000 um</td>
<td>1.002 um - 39.905 um</td>
<td>2.518 um - 14.159 um</td>
</tr>
</tbody>
</table>

*Range of particle size accounting for percent of total volume.

Four samples for total organic carbon (TOC) analysis were also collected during the spring runoff. These results are listed in Table 7. The analyses for TOC was conducted by Columbia Analytical Services a laboratory in Kelso, Washington. In addition, the city collected four additional samples for TOC which were analyzed by Intermountain Laboratories of Sheridan. These results are also shown in Table 7. While TOC levels do not affect the design of debris removal facilities, they do provide important data on the quality of this raw water source. TOC levels will become an important parameter as the Disinfection/Disinfection Byproducts Rule is fully implemented. This will occur over the next several years. TOC levels above 2.0 mg/L may require changes in the treatment process as "enhanced coagulation" may need to be practiced. Enhanced coagulation lowers the pH further than the treatment process currently does.
TOC data provide good background on expected levels relating to these regulations. TOC monitoring of both the source and treated water will probably be required.

Table 7
Summary of TOC Monitoring

<table>
<thead>
<tr>
<th>Date</th>
<th>Laboratory</th>
<th>TOC (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-Jun-98</td>
<td>Intermountain</td>
<td>5.3</td>
</tr>
<tr>
<td>27-Apr-99</td>
<td>Intermountain</td>
<td>2.0</td>
</tr>
<tr>
<td>17-Jun-99</td>
<td>Intermountain</td>
<td>4.0</td>
</tr>
<tr>
<td>07-Jul-99</td>
<td>Intermountain</td>
<td>8.0</td>
</tr>
<tr>
<td>26-Apr-99</td>
<td>Columbia</td>
<td>ND</td>
</tr>
<tr>
<td>29-Apr-99</td>
<td>Columbia</td>
<td>1.9</td>
</tr>
<tr>
<td>09-Jun-99</td>
<td>Columbia</td>
<td>5.5</td>
</tr>
<tr>
<td>12-Jul-99</td>
<td>Columbia</td>
<td>2.6</td>
</tr>
</tbody>
</table>

The results of the water sampling for monitoring required by the discharge permit are summarized in Section 2.7.

### 2.4 SEDIMENT SAMPLES

Sediment samples were collected at several locations throughout the facilities during the fall 1998 cleaning. The samples were collected from the basins where settled sand and sediment were found. These results are included in Appendix G. Sample sites included:

- Bar screen at creek
- Middle of sand trap channel
- East end of sand trap channel
- Entrance into microstrainer basin
- Effluent end of microstrainer basin
- Travelling screen basin
- Center of presedimentation basin (where influent water enters)
- Middle of presedimentation basin beneath the scraper arm
- Base of the wall of the presedimentation basin
- On the effluent pipe supports within the presedimentation basin (this would be at the point where the water is leaving the presedimentation basin)

**Sand Trap Sediment Capture Efficiency**

Figure 6 illustrates the sediment distribution of the deposited material in the creek, upstream from the intake (adjacent to the bar screen), as well as in the middle and downstream (east) ends of the sand trap channel. It is seen there is only a slight decrease in the distribution of material as flows move from the creek into the sand trap channel, with no significant reduction in sediment distribution along the length of the sand trap. This indicates there is nominal capture of the coarse infractions of sand along the lengths of the sand trap, and once the coarser materials enter the west end of this channel, they are eventually conveyed through the sand trap and into the two pipelines.

Unless this coarse material is intercepted and returned to the creek at this location, it will be conveyed downstream to the screening buildings.
Microstrainer Sediment Capture Efficiency

The gradation of these samples from the inflow and outflow sides of the microstrainer provides a very interesting analysis of the particle sizes which are carried through the pipelines to the debris removal facilities. This is because the cross-section of the flow path increases considerably in the microstrainer basin and much more so than it does in the travelling screen basin. This increase in the cross-section slows down the velocity, resulting in the deposition of the heavier particles. This deposition is illustrated in Appendix A. The analysis of these particles demonstrates that what is passing through the sand trap channel and being carried through the pipelines will reach the new debris removal facilities, if this matter is not addressed. Figure 7 illustrates the grain size distribution on the upstream and downstream sides of the microstrainer, as well as the downstream side of the travelling screen basin.

The new facilities should be designed so deposition in the screening unit is minimal, and sand and sediment is carried on through to the grit unit and/or presedimentation basin.

Presedimentation Basin Sediment Capture Efficiency

Figure 8 illustrates the sediment distribution for material deposited at various locations within the presedimentation basin. The locations vary from the influent at the center of the basin, across the bottom, and then to settled material collected on a support for the effluent pipe. This final location would represent material which passes through the basin. This figure shows how coarse material is found near the center of the basin and fine material does not settle out within this particular basin. This knowledge is helpful in designing the new basin.

The difference in the area under the sediment curves represents the capture efficiency of the presedimentation basin. Any raw water containing sediments that would plot to the right of the curve for the “presedimentation basin support for effluent pipe” will not be captured by this facility, and will be seen as solids loading the treatment process at the water treatment plant.

Suspended Solids Distribution

Figure 9 is a plot of the particle size of the four samples collected during runoff 1999. These samples were collected from the upper portion of the water column in Big Goose Creek. Therefore they represent the finer portions of the sediment being carried by the creek. The bedload in the creek, which also enters the bar screen near the bottom of the water column, is not represented in the samples. Conventional sedimentation will have little effect on the removal of the finer particles carried in the upper portion of the water column in the creek, as illustrated by the samples results shown in Figure 9. As flows in the creek rise, larger amounts of coarse material will be entrained in the creek's water column, which will provide a greater relative efficiency of the presedimentation basin than at lower flows. Under the higher flow conditions, it is only the fine material that will pass through the presedimentation basin.

Comparison of Field Data Results

Under all observed flow conditions, the sand trap channel only captured the coarse material ($D_{50} = 0.6-0.8$ mm), with the microstrainer building capturing material down to the $D_{50}$ size of 0.5 mm. The presedimentation basin appears to be capable of capturing material down to the $D_{50}$ size of 0.03 mm. $D_{50}$ means that 50% of the particles are smaller than this diameter.
FIGURE 8
GRAIN SIZE DISTRIBUTION - PRESEDIMENTATION BASIN

FIGURE 9
GRAIN SIZE DISTRIBUTION - BIG GOOSE CREEK
Under the low flow conditions observed during 1999 and historic deposition rates in the existing intake facilities, the capture efficiency of 0.03 mm particles by these facilities appears to be around 50%. The remainder of the fine grain material passes through the presedimentation basin to the water treatment plants, where it can be effectively removed.

Using the American Society of Civil Engineers Manual No. 44 *Sedimentation Engineering*, Figure 2.2 (Fall Velocity of Quartz Spheres in Air and Water), and a nominal depth of 15-feet, the effective capture of particles will be 0.038 mm. This corresponds to the 50% finer value on the distribution curve of sampled materials at the effluent location in the presedimentation basin.

### 2.5 HYDRAULIC ANALYSIS

**Flow Tests**

Hydraulic analysis of the existing facilities was a major part of this study. Three flow tests of the existing facilities were conducted under different creek level conditions. In addition, two flow tests were completed to better evaluate the two 24-inch pipelines from the diversion dam. The dates and conditions of these flow tests are as follows:

- June 18, 1998 under a mid-creek level condition.
- October 24, 1998 under a low creek level condition.
- May 25, 1999 under a high creek level condition.
- March 31, 1999 flow test of the two 24-inch pipelines.
- April 20, 1999 flushing and flow testing of the two 24-inch pipelines.

During the various flow tests, the three flow paths through the site (travelling screen/presedimentation basin, microstrainer, manual screening facility) were tested individually and in various combinations. They were also tested at various rates. These tests were conducted to gain a better understanding of the complex hydraulic nature of this site. Headlosses through the various facilities could also be determined. Headloss was difficult to estimate because of the complexity of some of these flow paths, and since these facilities have been constructed under so many projects over the past ninety years. A summary of the results of these flow tests is included in this section. The data gathered is provided in Appendix C.

**Flow Constraints**

Data were gathered by taking measurements and pressures at many various sites throughout the facilities and recording readings off of the SCADA system. The locations and elevations of these points are also shown in Appendix C. Increased flow was accomplished by opening one or two blowoffs in the 30-inch raw water transmission main.

The flow through these facilities and any given flow path depends on several factors, one of which is the allowable headloss through the pipelines and facilities. Items to consider and criteria used to evaluate flow capacity include:

- Generally the water level at the diversion dam will be assumed to be at the elevation of the diversion dam. It can be higher under many circumstances.
- The primary flow path is the travelling screen/presedimentation basin. More water can be brought to the travelling screen than can pass through this entire flow path. The city indicates the basin should be operated at a depth of 4.6 feet on the SCADA system, to operate at full basin capacity. A lower depth could be achieved at a higher flow rate, however 4.6 feet was used as the operating criteria.
The electrically controlled throttling valves located ahead of the two primary flow paths were throttled under many of the flow scenarios. If these valves were fully opened, flow rates would increase considerably. To balance the flow required, throttling was required which increases headloss and reduces the total flow through the facilities.

The capacity of the existing twin 24-inch pipes from the diversion and the design capacity of the replacement 36-inch pipe, in conjunction with the existing north 24-inch pipe, is a key to this evaluation. Based on experience, Hazen-Williams “C” values of 85 for the existing north pipe and 110 for the new pipe were assumed. An allowable headloss of 1.9 feet is generally used in these calculations. This headloss was used from run #5 on May 25, 1999, which was taken as the run which best reflects the system’s capacity. The elevation difference between the top of the diversion dam and the pressure measured at the east end of the pipelines, while allowing for velocity head, was 1.9 feet.

Water being used from storage must be considered. To be a sustainable flow rate, water levels in the pool at the diversion dam and the presedimentation basin(s) must be maintained. Water levels cannot not be increasing or decreasing.

The amount of weir overflows that are occurring must also be considered. For example, more water could be brought to the travelling screen or manual screening facility than is leaving the site because a weir overflow back to the creek can occur at those points.

**Peak Flows**

Following an evaluation of the many hydraulic evaluations made over the course of this study, the following are presented as the approximate peak flows through the facilities:

- Travelling screen and presedimentation basin: 8 MGD. This rate can be increased if the presedimentation basin is allowed to drop below the 4.7-foot level discussed above.
- Microstrainer: 10 MGD. If the microstrainer is working in conjunction with the travelling screen/presedimentation basin, which it virtually always does (as it is brought online to accommodate peak flows), the peak flow through the microstrainer is more in the 5 to 6 MGD range, primarily because of the difference in the elevation of the walls of these two basins.
- Manual screening facility: 10 MGD
- All three flow paths: approximately 17 MGD, with consideration to the positioning of throttling valves to allow the facilities to operate together, and the creek level.

**“C” Values of 24-inch pipelines**

The Hazen-Williams “C” values (friction factor) of the twin 24-inch pipelines is very important to hydraulic considerations. A “C” value of 140 is typically taken for a new pipe, with about 125 used for a 20-year old pipelines. Many values were calculated for the two 24-inch lines under the various flow conditions. For the March 31 and April 20, 1999 flow tests, the pipelines were operated separately, to better calculate their individual friction factors. Variation in the calculated “C” factor can occur due to the small magnitude of head being measured, and therefore, the influences from the measurement method. Calculated “C” values were plotted with a regression equation to determine the best fit of these points. It is estimated that the “C” factor for these two pipelines is approximately 85 for the north pipeline and 95 for the south pipeline. Since the “C” factor is directly related to flow rate, a 30% reduction in a “C” factor from 120 to 125 to the 85 estimate, results in a 30% reduction in flow capacity.

Flushing of the pipelines was accomplished on April 20, 1999. The manual screening facility bypass was used to maximize flow through the pipelines. A flushing flow of approximately 8000 gpm was used. Following this flushing flow, no change in the “C” value was measured.
Therefore there did not appear to be sand or sediment settled out in the pipeline which was contributing to the headloss.

The lower than expected “C” factor appears to be largely due to the remaining shells for cadyss fly larvae, which were seen attached to the inside of the pipes during the September 30, 1998 and October 13, 1999 cleaning of the facilities. With a mid-summer hatch of these eggs, these shells will be present during the peak usage summer months and will influence the flow capacity of the system.

Considering these “C” factors and the criteria of maintaining the desired operational level in the presedimentation basin, while assuming the water level in the creek is at the top of the diversion dam, the maximum flow through the two existing pipelines is almost 20 MGD.

An option to enlarging one of the pipelines is to raise the diversion dam to increase the head available for the pipelines. The required head increase is in the 3.5-foot range, depending on “C” factor and design constraints. This is not seen as practical, and will not be examined further. The cost for this work including reconstructing the bar screen inlet into the sand trap channel, and permitting, is estimated to be much more than the pipeline costs.

Intake Rating Curve

It is necessary to understand the hydraulics of the diversion dam and intake in order to develop a plan for increasing the system capacity to 25 MGD. The data from the flow tests illustrates that for a given stream flow in Big Goose Creek, the amount of water entering the intake varies depending on the creek level, among other factors. Under some circumstances, the city might have the capability of diverting 25 MGD with no water passing over the diversion dam. While it is uncommon to dry up the creek at the diversion dam, a worst case scenario would occur if natural runoff into Big Goose Creek upstream of the diversion dam does not exceed the city’s direct diversion water right, or the limited flow in the stream is being supplemented by released water from the city’s upstream storage.

From the evaluation of the flow test results and hydraulic modeling of the proposed 36-inch pipeline, an intake rating curve was developed based on the water elevation at the diversion dam. This rating data is shown in Table 8. These data points are based on a headloss of 1.9 feet from the sand trap channel to the east end of the pipelines. Flow tests show this headloss most closely approximates the capacity of the system. If this loss could increase, a greater flow will of course occur. This headloss brings the HGL down to 4614.0 at the east end of the pipelines. With the overflow weir in the travelling screen basin at 4611.0, an additional three feet of headloss is available to reach that point. The amount of throttling by the electrically operated valve ahead of the travelling screen significantly effects the headloss that occurs in reaching the travelling screen basin. At peak flow this valve will need to be fully open.

Another factor is the pipeline design and minor losses. Equivalent lengths of pipe for the existing north pipe and new south pipe were 685 and 765 respectively. An internal diameter of 23.5 inches is used for the north pipe.

The assumed “C” value will also effect the calculated peak flow through the facility. A “C” value of 85 is used for the existing north 24-inch pipe, while a value of 110 is assumed for the new 36-inch pipe. If in the future the fly larvae bring the “C” value below these levels, “pigs” may need to be used to increase the flow capacity. A “pig catcher” would need to be constructed at the east end of the pipelines if pigging is to be used.
Table 8
Intake Rating Curve
(Flows in MGD)

<table>
<thead>
<tr>
<th>Water Elevation Above Dam</th>
<th>Headloss Available (ft)</th>
<th>North Pipe</th>
<th>New 36&quot; Pipe</th>
<th>Total Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.3 (ft.)</td>
<td>1.6</td>
<td>85</td>
<td>110</td>
<td>19.8</td>
</tr>
<tr>
<td>0.0 (ft.)</td>
<td>1.9</td>
<td>85</td>
<td>110</td>
<td>21.7</td>
</tr>
<tr>
<td>0.5 (ft.)</td>
<td>2.4</td>
<td>85</td>
<td>110</td>
<td>24/7</td>
</tr>
<tr>
<td>0.8 (ft.)</td>
<td>2.7</td>
<td>85</td>
<td>110</td>
<td>26.2</td>
</tr>
</tbody>
</table>

Capacity of Bar Screen and Sand Trap Channel

Based on the rating curve, an analysis of these facilities and the velocity through these facilities at the higher flows shown in Table 8, it is estimated the inlet facilities into the pipelines (bar screen and sand trap channel) have a capacity greater than the pipelines, even with the new 36-inch line. This capacity is more than sufficient to supply the new pipeline with the 25 MGD design flow.

Hydraulic Gradeline

Figure 10 illustrates hydraulic gradelines (HGLs) through the existing and proposed facilities at the capacities provided. Again, several variables come into play such as the level of the creek, and the amount of throttling of the electrically controlled valves.

Maximum Capacity

The maximum flow rate through the facility measured on any of the hydraulic model runs conducted under this study was approximately 18.7 MGD or 13,000 gpm on May 25, 1999, which was a "high creek" condition. The run that most closely reflects the system capacity and still meets the design operating criteria is run 7 on May 25, 1999. The SCADA presedimentation level of 4.3 is close to the desired level of 4.7. The flow rate under this condition was approximately 15 MGD.

The HGL elevation at the diversion dam on May 25 varied little despite the large range in flows into the intake system (7300 to 13,000 gpm). This is because the flow entering the intake is small, relative to the flow over the diversion dam. Increasing the intake system capacity from 16 to 25 MGD would require either raising the crest of the diversion dam or enlarging one of the existing 24-inch pipelines.

Flow Controls

Flow control at the diversion facilities is accomplished primarily by the settings on the electrically operated throttling valves ahead of the two primary flow paths. Once flow leaves the site via the RWTRYMs, the flow enters one of three water treatment plants or a storage pond at Kendrick Golf Course. Control valves are used to maintain the desired flow into the water treatment plants. Flow into the Kendrick Golf Course pond is accomplished manually, based on the need for water in the pond.

Excess flow into the debris removal facilities at the diversion, is returned to the creek via overflow weirs at the travelling screen or manual screening basins.
Recommendations

Based on these flow analyses, the following recommendations are made relating to hydraulics:

1. Increase the size of the south 24-inch pipeline to 36 inches.
2. Raise the weir elevation in the travelling screen basin by 0.3 feet. This should increase the capacity in this flow path to 12 MGD (10 MGD used in estimates).
3. Size the piping and facilities in the new primary flow path for a capacity of 15 to 16 MGD.

2.6 PRVS ON THE 30-INCH RWTM

This study also evaluated the pressure reducing valves (PRVs) on the 30-inch RWTM. These valves are housed in two vaults, the Beckton vault and the SWTP (Sheridan water treatment plant) vault. Each vault consists of three Roll Seal PRVs, with room for a fourth valve. Two of the valves are normally used for the 30-inch RWTM, while the third valve is normally used for the older 20-inch RWTM (see Figure 11). These diaphragm actuated valves are preceded by cone screens to keep debris out of the valve. The cone screens periodically require backflushing to remove accumulated debris. The frequency of the backflushing depends on the debris in the creek, the rate of flow through the pipeline, and the facilities being used at the intake site to remove debris.

Since these valves are influenced by processes at the intake site, they were evaluated to determine if improvements should be made at these two vaults.

These valves and their maintenance were discussed with Pete Husman, foreman of the city maintenance crew, on several occasions over the past year. Comments from those discussions are as follows:

- The Roll Seal valves are good PRVs. They respond very well to pressure fluctuations and maintain a steady downstream pressure.
- Backwashing procedures are currently working fairly smoothly, taking less than 1 hour to complete the backwashing.
- This past year, the valves were backwashed about once per month except more frequently at runoff and higher flow times.
- The increased system flows in June do more to increase the frequency of backwashing than does the increase in creek turbidity (this appears to mean the pipeline allows debris to settle out during much of the year, and then this material is resuspended when flows increase).
- The frequency of backwashing during the higher flow and runoff times varies from every day to about twice per week.
- The pilot systems also require occasional backwashing, but this is not significant and modifications to the pilot system are probably not warranted.
- Backflushing the screens at the SWTP vault is not needed as often as at the Beckton vault, but when it is, it is more difficult because of the lower back-pressure. Generally multiple flushings are required to clean the screens.
- The isolation gate valves in the Beckton vault do not operate smoothly.
- A remote transmitting unit (RTU) at the Beckton vault would be desirable, to check pressure loss across the screen without visiting the site.
Alternatives to the Roll Seal valves were considered. These alternatives and pertinent considerations to these valves are as follows:

- Other types of diaphragm actuated valves – similar operational issues would exist with these valves.
- Piston actuated PRVs – The City of Sheridan has not had good experience with piston actuated valves, so these will not be considered. They would also have plugging problems with raw water.
- Sleeve valves – These valves use many small holes to reduce pressure, so plugging problems would probably be worse.
- Throttling isolation-type valves – Throttling of gate, butterfly, ball or plug valves was considered. The potential advantage of these valves is they may not require screens in front of them. Throttling with these valves would be difficult because of the pressure reduction at the Beckton vault (265 psi down to 90 psi). This pressure reduction will be very hard on these valves, particularly at lower flows, resulting in erosion of the interior valve surfaces. Only the v-port ball valve had the potential of operating in this application. A supplier of these valves was contacted concerning this possible application. Concerns remained because of the high pressure reduction and periodic low flows. Under these conditions, the opening in the valve is very small, resulting in very high velocities through the valves. These valves would not be as fast to respond to pressure fluctuations, and if debris did temporarily block the opening and then broke through, a pressure spike could result. Pressure spikes at these pressures could be a significant problem. Considering the above, these valves did not appear to be a viable solution.

Based on the above, the following recommendations are made regarding the pressure reducing valves:

- Continue to use the existing Roll Seal valves and pilot system
- Replace the four 12-inch gate valves at the Beckton vault with plug valves.
- Install a pump in the SWTP vault to increase the backpressure available to backwash these cone screens.
- Install an RTU at the Beckton vault with pressure transducers to monitor pressure losses and pressure reduction.

2.7 DISCHARGE PERMIT ISSUES

The city has a discharge permit for this site which was recently reissued by the state Department of Environmental Quality (DEQ) (current permit is good through January 31, 2004). This permit and potentially more stringent future regulations were discussed with Leah Kraft, permits coordinator for DEQ. The current permit only addresses suspended solids. The monthly average for total suspended solids (TSS) is 30 mg/L. It also allows a weekly average of 45 mg/L and a daily maximum of 90 mg/L. The permit states there can be no discharge of floating solids, sheen, or water containing a chlorine residual. The discharge also cannot cause formation of visible deposits on the bottom of the creek.

Big Goose Creek is a Class 2 stream, a classification unlikely to change according to Ms. Kraft. If it did change to Class 1, existing permits would be grandfathered, based on current Class 2 loading calculations. Total maximum daily load (TMDL) issues were reportedly not a factor in possible future changes to the permit. Volume is also not a factor, should the facilities expand and the quantity of discharge back to the creek increase. The only issue is concentration of TSS in the discharge. If the type of discharge changed with new facilities, all parameters may need to be addressed.
The TSS effluent limit was set based on "best professional judgement" according to the Statement of Basis for the permit. A specific standard or calculation was not used. The Statement of Basis also says the backwash water from screens and strainers (outfall 002) does not have any effluent limits or monitoring requirements, provided the waste stream only consists of floating and suspended solids backwashed from the screens and strainers.

Therefore if the type of discharge remains the same, DEQ does not expect changes in the permit. Limits would also remain where they are. From 20 quarterly self-monitoring discharge reports that were examined, only one sample (second quarter 1995), exceeded the 30 mg/L standard (see Table 9).

At this time, it is believed the debris removal processes used at this site will remain basically as is. Additional basins and screening units could be added at a future date, but would be similar to the existing processes. Control of the waste streams should be able to be operated similar to the way they are now, with the quantity of flow increased as needed to keep concentrations within permit limits.

Discussions with city staff indicate they would much prefer not to construct any solids removal facilities (such as settling ponds) at this site to receive waste streams from the various processes. Site size and topography constraints make the locating of any ponds difficult. Based on this preference by the city and comments from DEQ on the likelihood that the discharge permit will not become more stringent in the future, it is recommended waste stream treatment facilities not be constructed as part of this project. This decision does not effect the type of debris removal processes proposed to be constructed. If it is determined at a future date that treatment of the waste streams is required, it can be added at that time.

### Table 9
Summary of NPDES Discharge Monitoring Reports

<table>
<thead>
<tr>
<th>Period Covered</th>
<th>Flow</th>
<th>Total Suspended Solids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average (mg/L)</td>
</tr>
<tr>
<td>Feb 1994 - Mar 1994</td>
<td>0.5 MGD</td>
<td>15.0</td>
</tr>
<tr>
<td>Apr 1994 - Jun 1994</td>
<td>0.5 MGD</td>
<td>13.5</td>
</tr>
<tr>
<td>Jul 1994 - Sept 1994</td>
<td>0.5 MGD</td>
<td>4.1</td>
</tr>
<tr>
<td>Oct 1994 - Dec 1994</td>
<td>0.5 MGD</td>
<td>2.4</td>
</tr>
<tr>
<td>Jan 1995 - Mar 1995</td>
<td>0.5 MGD</td>
<td>27.2</td>
</tr>
<tr>
<td>Apr 1995 - Jun 1995</td>
<td>0.5 MGD</td>
<td>353.8</td>
</tr>
<tr>
<td>Jul 1995 - Sept 1995</td>
<td>0.5 MGD</td>
<td>14.6</td>
</tr>
<tr>
<td>Oct 1995 - Dec 1995</td>
<td>0.5 MGD</td>
<td>30.0</td>
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GEOTECHNICAL/
PERMITTING/
EASEMENTS
3.0 GEOTECHNICAL/PERMITTING/EASEMENTS

3.1 GEOTECHNICAL

Two existing drill holes were available to examine the soils at this site. A boring done for the 30-inch raw water transmission main in 1993 was completed near the existing meter manholes. This boring was to a depth of 10.8 feet. The entire depth was classified as lean clay. At 9.5-feet, the soil was called very moist to wet.

The log of the Madison well was taken from the *Report of Drilling and Testing* prepared by Anderson and Kelly in November 1985, as part of a WWDC investigation of the ground water potential in this area. This log shows the upper 26 feet to be silt and sand, followed by 9 feet of cobbles, and then silt and clay. Bedrock was not encountered until approximately 70 feet. Bedrock is the Chugwater formation, which has the very noticeable characteristic red color. Information on the soils encountered in the drilling of this well is included in Appendix E.

One boring was conducted as part of this study. This bore hole is located toward the west end of the area designated to construct the improvements (see Figure 3). The results of this boring can be compared to the Madison Well log to provide information on the depth to bedrock and other soil types at this site. It was believed bedrock would be closer to the surface near the 1999 bore hole when compared to the Madison Well, because of the topography. This assumption proved correct, however the depth to bedrock appears to be great enough to allow the proposed basins to be constructed. The log of this bore hole is also included in Appendix E.

Significant large rocks (boulders) are expected to be encountered during excavation for the basins and pipelines. This will increase the cost of excavation. These boulders will need to be hauled from the site as they will not be suitable for backfill.

While the removal of boulders will increase excavation costs above a site which does not contain boulders, geotechnical issues do not appear to influence the design of improvements.

3.2 CONSTRUCTION PERMITTING

This section addresses permitting issues related to the construction of improvements. Permitting associated with discharges from the operating facility are reviewed in Section 2.7.

Permitting issues should not have a significant impact on this project. Big Goose Creek at this location is a Class 2 stream. It is considered a very good trout stream and high quality water. Work in the creek will be minimal however. The impact on the creek can be controlled by the time of the year the work is done, and pollution control measures.

The work in the creek will primarily involve the reconstruction of the wall at the sand trap channel. This will be accomplished along the edge of the creek, and it is believed construction requirements will separate the construction activity from the stream flow. Other improvements such as the pipeline and the debris removal facilities, will be away from the creek as shown in Figures 2 and 12B.

The U.S. Army Corps of Engineers (COE) was contacted concerning this project. They indicated that Nationwide Permit #3 would be most applicable to this work. This addresses maintenance of existing facilities. Permit #3 along with Nationwide Permit #33 (Temporary
Construction, Access and Dewatering) are included in Appendix F. Primary requirements of Permit #3 include:

- Uses for the reconstructed facility must not be different from those in the original permit.
- Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil must be permanently stabilized at the earliest practical date.
- No activity may substantially disrupt the movement of aquatic species.
- Activities must comply with Section 401 of the Clean Water Act.
- As much as possible operations should be conducted during low water times.
- Care must be taken to minimize disturbances. Stream bank vegetation should be protected to the maximum extent possible.
- No debris may be disposed of within the stream channel. Care must be taken to prevent any petroleum products, chemicals, or other deleterious materials from entering the water.
- Equipment operation within the stream should be minimized.

The COE permitted the grouted riprap fill to protect the 24-inch steel pipeline which was exposed by the high water in 1995. That work was authorized by Nationwide Permits #13 and #33.

The Cheyenne COE office has indicated the Nationwide Permits are scheduled for revision. Therefore at the time of final design they must be recontacted to determine if any changes have been made in the Nationwide Permits applicable to this particular project.

The Wyoming DEQ has regulations pertaining to both a pollution prevention plan and the discharge of waters into a state water. A Pollution Prevention Plan is applicable when a site adjacent to a stream exceeds one acre. A Pollution Prevention Plan will be required for this project. This plan will be incorporated into the contractor’s requirements. The contractor will need to install and maintain suitable pollution prevention facilities such as silt fences and runoff control ditches and berms.

Chapter 2 of DEQ’s Water Quality Division Rules and Regulation states any owner or operator of a point source within the State of Wyoming who proposes to commence discharging into water of the state, must obtain an appropriate discharge permit. Discharges from this project are only associated with the construction phase (other than discharges from the debris removal facilities which are ongoing under the current discharge permit).

Discharge of construction dewatering is regulated by turbidity standards. The turbidity cannot increase more than 10 units when compared to the upstream water quality after an appropriate mixing zone. The discharge of construction dewatering falls under the general permit for temporary construction sites. A specific permit for this project is not required. A Notice of Intent for a temporary discharge is required however. DEQ requirements for such permits are included in Appendix F.

It is possible the contractor may be able to avoid discharge and turbidity issues if any discharge water from the construction site is pumped onto the land between the existing facilities and the creek, allowing water to infiltrate back into the soil rather than to return to the creek itself. Again, the contractor will be responsible for obtaining and complying with a construction discharge permit. These requirements will be detailed in the Contract Documents.

The Wyoming Game and Fish Department is concerned about construction activities in a high quality trout stream such as this location. Their recommendations to minimize negative impact to the fishery include the following practices:
The use of angular rock for bank stabilization.

- Fill materials should be from a non-streambed source and free of fines.
- Deposition of fill and related activities must comply with DEQ regulations.
- Instream construction activities should be minimized to the greatest extent possible to minimize sedimentation impacts to trout eggs.
- A coffer dam should be used to minimize sediment entering the stream while work on the stream bank is being undertaken.

These concerns should be able to be addressed for the reconstruction of the sand trap channel wall.

Permitting agencies are primarily the US Army Corps of Engineers (COE) and the Wyoming Department of Environmental (DEQ).

3.3 EASEMENTS

No easements are anticipated to be required to construct this project. The City of Sheridan owns just over 9 acres at this site, and all of the proposed work will be within these nine acres. The site will be very “tight” during construction, particularly as staging areas are required for material storage, office trailers, equipment and other contractor activities. However it is believed a well-planned operation should be able to work within the area available. Also, obtaining a construction easement on the neighboring property is anticipated to be difficult. The area owned by the City of Sheridan at this site is shown in Figure 3.

While the City of Sheridan has access rights through the Neidringhaus Ranch to reach the intake site, this is a sensitive issue since the access road passes through the ranch house complex area. Significant traffic will occur during the construction phase, including heavy truck traffic bringing concrete, building materials, aggregate and the like, as well as the construction workers. Some mitigation measures may be required. These will include watering for dust suppression, speed limits, “sweetening” of the existing aggregate surfaced roads, and consideration to the residents of the ranch. An allowance of $10,000 was established in the proposed project budget to help address possible mitigation issues.
4.0 PROPOSED IMPROVEMENTS
4.0 PROPOSED IMPROVEMENTS

4.1 MODIFICATIONS TO EXISTING FACILITIES

The existing facilities and their condition is presented in Sections 2.1 and 2.2. A summary of the modifications to the existing facilities is as follows:

1. Reconstruct sand trap channel, new pipe inlet and adjustable overflow weir. This reconstruction will consist of replacing the existing deteriorated north wall (next to the creek) and installing angled baffle walls which will direct the bed load sand toward the flushing gate at the east end. Also, a new inlet will be constructed for the new pipeline which will carry water to the debris removal facilities. This inlet will have improved hydraulic features over the current inlet. Another improvement is the proposed addition of an adjustable weir overflow. This will allow the overflow water to remove floating debris during times when the creek level is below the level of the current fixed weir (see Figure 4).

2. New Pipeline. The south 24-inch pipeline will be removed and replaced with a 36-inch line. This additional size will provide the design capacity for the new facilities. The south pipe was chosen because it will be easier to replace than the north pipe, which is set on concrete piers. Also, much of the south pipe is older than the north pipe. The existing 24-inch pipe will need to be removed with the new pipe laid in its place. It is anticipated bedrock will prohibit lowering the pipe below its current depth. Therefore, the road grade will need to be raised to accommodate the larger diameter pipeline (see Figure 5).

Because of the steep slope and narrowness of the existing road, gabions are proposed on the north side of the existing road. Crushed base course material will be used to fill in the remaining width to create a road grade 15 to 18-inches higher than the existing road. This road is used only occasionally when a truck needs access to the sand trap channel. The existing width has been adequate and that width will be maintained.

Steel pipeline material is proposed. Thirty-six inch steel pipe is generally more competitively priced than ductile iron. Other materials are not suitable because of installation difficulties, shallow bury, type of water carried, and design life considerations. Steel is also the most easily coated with the desired coating and lining. The proposed coating material is polyurethane. Forty mil coating and lining thickness is recommended. This is thicker than normal. A heavier inside lining will help resist erosion from sand particles, and the heavier outer coating will better protect the pipe against the rocky environment. The polyurethane lining is recommended over cement-mortar because of its better abrasion resistance and slicker surface. This slicker surface is expected to be more resistant to the Cadyss flies being able to attach their eggs. Polyurethane also has a very high initial "C" factor and if less fly hatch sites are present in the pipeline, it will maintain a higher carrying capacity over the years. While polyurethane is more expensive than conventional cement-mortar lining and tape coating, the additional costs are not significant considering this relatively short distance.

3. Travelling Screen: New parts will be installed on the existing 30-year old travelling screen to replace worn parts. The replacement parts are as recommended by U.S. Filter. These parts include the head and foot sprockets and a chain. The total cost for the replacement parts (materials only) is approximately $14,000. In addition, the overflow weir will be raised 0.3 feet to increase flow through this flow path.
4. Presedimentation Basin. Ribbon anodes will be attached to the scraper, structural supports, piping, and other metal components of the basin to reduce future corrosion. The valve on the drain line from the sump is also proposed for replacement, since it operates with difficulty. This valve will need to be a gate or plug valve, providing a full-port opening.

5. Pressure Reducing Valves. It is proposed to replace the four existing gate valves which isolate the two PRVs in the Beckton vault, with 12-inch plug valves. It is also proposed to install a pump in the Sheridan WTP vault to increase pressures for backflushing the cone screens. Piping, connections, and valving to the three cone screens will be required.

Another proposed improvement to the Beckton vault is to install a remote transmitting unit. Pressure sensors will be installed in the upstream and downstream manifolds as well as downstream of the three cone screens. This will allow an operator to read the incoming and outgoing pressures as well as the pressure loss across the cone screens from a remote location. Currently operators must visit the vault on a regular basis to check on pressure loss across the cone screens and to verify the PRVs are producing the correct downstream pressure.

4.2 CAPACITY

The design capacity of the new facilities will be 25 MGD. The new flow path as discussed in Section 4.3 will have a design capacity of 15 to 16 MGD, while the existing travelling screen/presedimentation will become the backup flow path with a design capacity of 10 MGD.

Capacity to supply water from the creek to the debris removal facilities depends on the creek level, the assumed "C" value for the new pipeline, and other factors. With a "C" factor of 110 for the new pipeline and with water at the top of the diversion dam, a capacity of 27 MGD can be supplied. Using a "C" factor of 120, almost 30 MGD can be supplied to these facilities (again with the water level at the top of the diversion dam). Therefore the facilities should be able to be operated at a capacity somewhat above the 25 MGD design rate under some circumstances.

The existing 24-inch bypass line on the north through the manual screen facilities will remain as an emergency backup and is not included in calculations relating to capacity or standard operations.

4.3 NEW FACILITIES

The proposed new facilities will primarily consist of a new flow path to parallel the existing travelling screen/presedimentation basin. The microstrainer will be eliminated.

Based on the analysis of the particles in this raw water source, past history of operating the travelling screen, presedimentation basin and microstrainer, an evaluation of current technologies, and discussion with city staff, the following units are proposed as the debris removal facilities in the new primary flow path. These are:

- Dual travelling screens
- Vortex grit unit
- Two rectangular presedimentation basins

The travelling screens will remove organic debris as does the existing travelling screen. This debris primarily consists of leaves, pine cones, twigs, and the like. Two travelling screens are recommended for increased flexibility in the operation. One building will be constructed with dual basins. Valving will allow both travelling screens to normally operate simultaneously,
however either side can be isolated if necessary. The isolation valves ahead of each unit will
be manual, while the electrically operated throttling valve will be a single upstream valve. Options
for the new primary flowpath are shown in Figures 12A, 12B and 12C.

Also included in the travelling screen design is an overflow weir to allow excess water to return
to the creek via the drainage system and a spray wash system which will carry debris removed
on the screen to the drainage line. The bottom elevation in the basin will be such that it can be
drained by gravity into the drainage system.

**Vortex Grit Units**

A vortex grit unit is proposed as the second debris removal step. The Smith and Loveless Pista
Grit Chamber is used as an example. A single model 20 unit, rated at 20 MGD was selected.
This unit is located on the side of the flow channel, with the flow directed into the circular grit
unit which uses a centrifugal force to remove the heavier sand and sediment. Water passes
around the unit once, and then proceeds down the discharge flow channel which is on the same
line as the inlet flow channel (see Figure 13).

During the fall 1998 cleaning, a considerable amount of larger sand particles were found in the
microstrainer basin. This demonstrates these particles are not being removed in the sand trap
channel and settle out when the flow cross section increases, reducing the velocity. It is these
particles that are targeted for removal in the vortex grit unit. This sand accumulation is shown in
a picture of the microstrainer basin in Appendix A.

Grit accumulates in the hopper below the main basin in the grit unit. A propeller blade forces
the grit to the bottom of this hopper. An effluent line then carries the waste flow into the existing
drainage system on the north side of the existing travelling screen building. With the elevations
available, gravity flow is available for this waste stream. No pumping is necessary. The only
power required for this unit is a 1½-HP motor to drive the propeller.

Bypass piping to the presedimentation basins will be provided, should this unit need to be taken
out of service. Because of its simple design, this should not be a frequent occurrence.

During parts of the year, the grit unit may not be required, however any bedload of heavier sand
which can always be present in the creek, is better removed in this grit unit than in the
presedimentation basin. The sludge removal system in the presedimentation basin is not as
effective in removing heavier sand particles. This grit unit is designed to remove particles down
to 0.15 mm in size (100 mesh) (see Figure 14). This unit has a headloss of less than ½-inch.
This low headloss results in little change in the hydraulic gradeline.

It is important to maintain a relatively high velocity rate (probably around 6 feet per second)
through the drainline, in order to maintain sand particles in suspension. Provisions will be made
to adjust the water flow which carries the grit. Like all waste lines at this facility which can
receive sand that is relatively heavy and difficult to move in a gravity flow stream, these lines will
require periodic cleaning with a pressure hose and vacuum truck. Access to these drain lines
through manholes will be required.

**Presedimentation Basins**

Both circular and rectangular presedimentation basins were considered. The city has had
excellent experience with their circular presedimentation basin at the site over the last 30 years.
Both designs have their hydraulic advantages. In circular basins the water slows as it moves
out from the center because of the increasing diameter. This allows particles to settle.
PRESEDIMENTATION BASIN

WATER UNTO
NIEDRINGHAUS
RANCH

MANUAL
SCREENING
BUILDING

PRESEDIMENTATION BASIN

OUTFALL LINE TO CREEK

SHAD

BYPASS LINE

NEW 36" PIPELINE

TRAVELING SCREEN

DRAIN LINE

DUAL TRAVELING SCREENS

(1) 20" Vortex ORT UNIT

65" DIA.
PRESED. BASIN
1ST STAGE

65" DIA.
PRESED. BASIN
2ND STAGE

WATER LINE TO
NIEDRINGHAUS RANCH

METER MANHOLE

20"

25'

30'

4500

4600

4610

4620

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Sheet No.

PERIOD TO
MADISON WELL
(TOP NUT=4814. AK)
VORTEX GRIT UNIT

INFLUENT LOADING TO EXISTING PRESEDIMENTATION BASIN WITH MICROSTRAINER

PERCENT FINER

GRAIN SIZE - mm
rectangular basins are superior for plug flow, which maximizes the use of the basin length and minimizes short-circuiting. Rectangular clarifiers are generally less expensive to construct. This is especially true when dual units are proposed. Side by side rectangular basins can share a common wall. Construction of roofing over rectangular structures is much more efficient than over two circular structures.

Sludge removal is also more easily accomplished in a rectangular basin if a vacuum sludge removal system can be used. Circular basins effectively use round scrapers which bring sludge to a sump in the center. With the use of vortex grit units that remove the bulk of the heavier particles, a vacuum sludge removal system is expected to be effective at this site. Vacuum removal has another advantage in that the basins do not have to be so deep to accommodate sumps and steeply sloped floors. This shallower depth is an advantage for construction in this rocky soil.

The City of Sheridan is familiar with the vacuum sludge removal system with Trac Vac units at the existing treatment plants. Trac Vacs are designed to remove light alum sludge, while a heavier sediment will be present at the intake site. Vacuum removal systems were evaluated, and the Meurer Research Inc. (MRI) design was selected for this particular application. MRI recommends a maximum collector width of 15 feet, therefore 30-foot wide basins are proposed with two collectors per basin. A sludge pump is required for sludge removal. The system should be operated in a continuous mode during higher turbidity events. Under cleaner creek conditions, experience will help dictate the level of operation required. Water collected through the vacuum system will be brought into the drain pipeline from the grit units and the travelling screen, which again leads to the existing drain line from the existing travelling screen and presedimentation basin. Pressure relief valves should be installed in the bottom of the basins to provide ground water relief when the basins are drained.

The proposed presedimentation basins with the vacuum sludge system are shown in Figure 15. The two 30-foot wide basins are proposed to be 115-feet long with a 15-foot depth.

**Design Criteria**

The design criteria for the new facilities (travelling screen, grit unit, and presedimentation basins) will be as follows:

- **Design flow rate**: 16 MGD
- **Presedimentation Basin retention time**: 70 minutes
- **Effective capture diameter ($D_{50}$)**: 0.035 millimeters (@ 10° C)

**Abandon Microstrainer**

It is proposed that the microstrainer be abandoned as part of this project, and that the microstrainer itself be removed from this building. This study did not identify any effective use for the existing building. It is proposed that the 24-inch ductile iron pipeline, which leads to and from this building, be connected in the basin, for availability as an emergency conduit.

**SCADA System and Electrical**

The existing SCADA system is currently being upgraded as part of an overall instrumentation upgrade at the water treatment plants. This will result in a new computer being located at the
TO DISCHARGE

FIXED SLUDGE DISCHARGE PIPING

PNEUMATIC SLUDGE VALVE (TYP.)

TO DISCHARGE

FROM GRIT UNITS

FROM GRIT UNITS

FROM GRIT UNITS

MAIN CONTROL PANEL

3" DIA. COLLECTOR PIPE

VACUUM SLUDGE COLLECTOR ON TRACKS

EACH BASIN 30' W. X 115' L. X 15' D.

FROM GRIT UNITS

EACH BASIN 30' W. X 115' L. X 15' D.

MSE-HKM, Inc.
1842 Sugarland Drive
P.O. Box 7010
Sheridan, WY 82801-7010
(307) 672-9006
FAX (307) 672-5214
Intake site. The existing readings of water levels, flow through the three meters on the east end of the site, turbidity, and the settings and control of the electrically operated throttling valves will continue as they currently exist. The SCADA system will be expanded to include the new facilities. These additions include an electrically operated throttling valve on this flow path, and water level measurements in the travelling screen and presedimentation basins. The programmable logic controller (PLC) may need expansion, and there will be reprogramming and operator training required. Also, the site electrical system will need to be extended to the new travelling screen building, grit unit, and presedimentation basin.

Piping

Considerable piping improvements are required throughout the site. The primary new piping is the 36-inch transmission main as discussed above. Also included is piping through the microstrainer building to make that flow path continuous. Additional piping includes that associated with the new primary flow path. This includes piping to the travelling screen building and splitting flow into the two basins at this building, to the vortex grit unit and bypassing this unit, and piping to the two presedimentation basins. Effluent piping from the two basins continues to the east end of the site, where it connects into existing piping near the existing manifold (see Figure 12B). The west manifold will be reconstructed to allow flow from the new 36-inch pipe into the new flow path.

Drain piping is another important component of the piping improvements. Drain piping leads from the travelling screen building, grit unit and two presedimentation basins. It is proposed to route this drain piping around the west side of the existing travelling screen building, and connect into the existing drain piping in a manhole at that location.

4.4 SUMMARY OF RECOMMENDATIONS

This section briefly summarizes the recommendations discussed in this Level II Study. These recommendations were developed following completion of the assessment of the existing facilities and capacity, and a review of alternatives to best provide the design capacity and needs for this water system over the 25-year planning period. These recommendations were also reviewed with WWDC and City of Sheridan staff at a September 24, 1999 meeting.

The recommendations include:

1. Reconstruct the sand trap channel.
2. Install a 36-inch pipe from the sand trap channel to the debris removal facilities and reconstruct this road.
3. Provide a new primary flow path consisting of dual travelling screens, a vortex grit unit, and dual rectangular presedimentation basins (see Figure 12B).
4. Upgrade the SCADA system to include features associated with these new facilities.
5. Remove the microstrainer and install piping through this basin for emergency use.
6. Upgrade the existing travelling screen by replacing worn parts and raising the overflow baffle.
7. Attach ribbon anodes to the metal in the existing presedimentation basin, and replace the drain valve in this facility.
8. Provide piping improvements throughout the site to carry the water as required, and provide operating flexibility.
9. Expand the drainage system to incorporate flow from all new facilities. Connect this piping into the existing drainage system, utilizing the existing point of discharge.
10. Upgrade the Beckton Hall PRV vault by replacing the existing plug valves and installing an RTU to relay pressures to the SCADA system.
11. Install a pump in the Sheridan WTP PRV vault to increase the pressure for backflushing of the cone screens.

12. Utilizing the existing discharge permit, maintain similar practices for discharge of waste streams, overflows, and drainage water from the facilities. Adjust flow quantities as necessary to meet the suspended solids limit in the discharge permit.

13. Maintain the original diversion dam, presedimentation basin, and 12-inch piping around the site for use when the primary diversion dam may be out of service.

14. Maintain the north 24-inch piping through the manual screening facility for emergency use.

15. No improvements are planned to the diversion dam and bar screen, north 24-inch transmission main, metering system, east manifold connecting into the RWTMs, emergency generator, discharge points to the creek, turbidity or any other water quality measurement, existing isolation valves, and the existing buildings.
5.0
ECONOMIC ANALYSIS
5.0 ECONOMIC ANALYSIS

5.1 INTRODUCTION

This section provides the project cost estimates, funding plan, budgets, and evaluates economic and ability to pay issues. Construction costs estimates presented are the engineer's opinion, based on the work completed under the Level I Study. As this project moves into final design, these estimates should be reviewed with adjustments made as appropriate. Cost estimates assume 2001 construction.

5.2 COST ESTIMATES

Table 10 presents the summary of the cost estimate on this project. This table follows the standard WWDC format.

<table>
<thead>
<tr>
<th>TABLE 10</th>
<th>COST ESTIMATE SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preparation of Final Design and Specifications</strong></td>
<td>$191,000</td>
</tr>
<tr>
<td><strong>Permitting and Mitigation</strong></td>
<td>$25,000</td>
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<tr>
<td><strong>Legal Fees</strong></td>
<td>$3,000</td>
</tr>
<tr>
<td><strong>Acquisition of Access and Rights-of-Way</strong></td>
<td>$10,000</td>
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<tr>
<td><strong>Cost of Project Components</strong></td>
<td></td>
</tr>
<tr>
<td>Reconstruction of Sand Trap Channel</td>
<td>$72,000</td>
</tr>
<tr>
<td>New 36&quot; Pipeline</td>
<td>$106,000</td>
</tr>
<tr>
<td>New Traveling Screens</td>
<td>$420,000</td>
</tr>
<tr>
<td>New Grit Unit</td>
<td>$200,000</td>
</tr>
<tr>
<td>New Presedimentation Basins</td>
<td>$780,000</td>
</tr>
<tr>
<td>Modifications to existing traveling screen and presedimentation basin</td>
<td>$44,000</td>
</tr>
<tr>
<td>Removal of microstrainer</td>
<td>$20,000</td>
</tr>
<tr>
<td>Piping improvements</td>
<td>$95,000</td>
</tr>
<tr>
<td>SCADA system expansion &amp; electrical</td>
<td>$50,000</td>
</tr>
<tr>
<td>Replace four 12-inch plug valves</td>
<td>$60,000</td>
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<tr>
<td>Pump in SWTP PRV vault</td>
<td>$18,000</td>
</tr>
<tr>
<td>RTU at Beckton PRV vault</td>
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<td><strong>Construction Cost Subtotal #1</strong></td>
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</tr>
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<td><strong>Engineering Costs = CCS#1 x 10%</strong></td>
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<tr>
<td><strong>Subtotal #2</strong></td>
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<tr>
<td><strong>Contingency – Subtotal #2 x 15%</strong></td>
<td>$315,000</td>
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<tr>
<td><strong>Construction Total</strong></td>
<td>$2,416,000</td>
</tr>
<tr>
<td><strong>Project Cost Total</strong></td>
<td>$2,645,000</td>
</tr>
</tbody>
</table>

5.3 FUNDING PLAN/ABILITY TO PAY

This project is proposed to be funded by the City of Sheridan and the WWDC. No other grant funding sources are proposed at this time, as they are not believed to be appropriate. All funding options should be routinely evaluated. If another other program appears to be a source of grant funds, an application should be made. The State Loan and Investment Board (SLIB) and Abandoned Mine Lands (AML) Program are options, however due to recent directions of
these programs and other priorities within the city budget which have demands on these programs, it is not proposed to submit applications for this project.

WWDC funding is anticipated to be at a 60% grant level for all project costs. The remaining 40% will come from the City of Sheridan.

The City of Sheridan has been evaluating water rates over the last couple of years. They have completed a detailed Cost of Services study, and have incorporated a Capital Improvements Plan into a comprehensive citywide water enterprise fund financial plan. Final calculations are currently underway for water rate adjustments. These calculations will include the updated financial estimates in this Level II Study, and incorporate the city's share of these costs into their Capital Improvements Plan. Therefore the City of Sheridan is taking steps to have the funds available to construct these improvements. Rate adjustments necessary to carry this out are in the final planning stage and will be presented to the City Council in the near future. A rate increase of approximately 10% is anticipated at this time. This increase includes this project, but also includes other items in the current Capital Improvements Plan.

In their Capital Improvements Planning process, the city established the upgrading of these raw water diversion facilities as Priority No. 2, second only to an instrumentation upgrade at the Sheridan Water Treatment Plant. That instrumentation upgrade will be completed by the end of 1999. Therefore this project will become No. 1 on the priority list. Every effort will be made by the city to secure the necessary local match for this project. Matching funds are proposed to come from the water enterprise fund.

The city desires to move this project into Level III as quickly as possible. It is requested this be included in the WWDC funding request to the 2000 Legislature. With a positive recommendation from the Commission and the Legislature, this project can proceed to final design in 2000, with construction during 2001. The schedule appears realistic for securing the necessary local match to the WWDC funds. A resolution is being prepared to present to the Sheridan City Council at their November 15, 1999 meeting to request the WWDC include this project in their Level III funding package being presented to the upcoming legislature.

A breakout of the project costs from Table 10 to the WWDC and city is shown in Table 11.
5.4 OPERATION AND MAINTENANCE

Operation and maintenance of the proposed facilities is very similar to the existing facilities. Therefore little change in operation and maintenance (O&M) should occur. Improvements in the amount of O&M will come with removal of the microstrainer and the enhanced operation of existing facilities. The improvements to the PRV vault at Beckton Road and the Sheridan WTP will ease the process of backflushing the cone screens. An RTU at the Beckton vault will reduce the number of trips to check on pressures.

Increased O&M costs will only come with growth in the water system, and increased flows through these facilities. The new debris removal facilities (travelling screen, vortex grit unit, and presedimentation basin) should not increase operation and maintenance efforts and costs by themselves. Therefore estimates are not included for O&M, as again, the changes are occurring due to growth in the system.
APPENDIX A

PICTURES OF EXISTING FACILITIES
AERIAL VIEW OF SITE

AREA AVAILABLE FOR EXPANSION
SAND TRAP CHANNEL - EXTERIOR WALL
SAND TRAP CHANNEL - INTERIOR
PIPELINES LEAVING SAND TRAP CHANNEL
ORIGINAL DIVERSION DAM AND PRESEDIMENTATION BASIN
ROUTE OF TWO 24-INCH PIPELINES

NORTH 24" STEEL PIPE EXPOSED BY HIGH WATER IN 1995. NOTE ROCK AND MINIMUM COVER.
MICROSTRAINER

SAND ACCUMULATED IN MICROSTRAINER
TRAVELING SCREEN AND DRAIN VALVE IN TRAVELING SCREEN BASIN

PIPE ENTERING TRAVELING SCREEN BASIN
AREA NEAR BIG GOOSE CREEK
SILVER VALVES ARE PRESSURE REDUCING VALVES. CONE SCREENS ARE SET IN THE PIPE JUST UPSTREAM OF THE PRV’S. PRESSURE GAUGES MEASURE PRESSURE LOSS ACROSS CONE SCREENS AND PRV’S.
APPENDIX B

WATER QUALITY ANALYSES RESULTS
Sample Name: Sample #1
Sample Source & type: Dayton...
Sample bulk lot ref: 2

SOP Name: Measured by: Jim
Measured: 10 May 1999 11:31:54
Analysed: 10 May 1999 11:43:37

Result Analysis Report

Particle Name: Sample 1.72, 0.1
Accessory Name: Hydro 2000S (A)
Particle R: 1.720
Absorption: 0.1
Analysis model: General purpose
Dispersant Name: Water
Size range: 0.020 to 2000.000 um
Dispersant R: 1.330

Concentration: 0.0125 %Vol
Vol. Weighted Mean D[4,3]: 36.836 um
Specific Surface Area: 1.13233 m²/g
Span (10% - 90%): 4.703
Uniformity: 3.29583
Surface Weighted Mean D[3,2]: 5.299 um

Result units:

Operator notes: Sheridan Intake Study
Raw Water Supply

Malvern Instruments Ltd.
Malvern, UK
Tel: +[44] (0) 1684-892456 Fax +[44] (0) 1684-892789

Mastersizer 2000 Ver. 1.00
Serial Number: 34027-14
10 May 1999 11:48:08
**Result Analysis Report**

**Sample Name:** Sample #2  
**Sample Source & type:** Dayton...  
**Sample bulk lot ref:** 2  
**SOP Name:**  
**Measured by:** Jim  
**Analysed:** 10 May 1999 12:11:43  
**Result Source:** Measurement

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<tr>
<th>Particle Name</th>
<th>Accessory Name</th>
<th>Obscuration</th>
<th>Particle RI</th>
<th>Vol. Wt. Mean D[4,3]</th>
<th>Specific Surface Area</th>
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<tr>
<td>Sample 1.72, 0.1</td>
<td>Hydro 2000S (A)</td>
<td>7.86%</td>
<td>1.720</td>
<td>69.565 um</td>
<td>0.605236 m²/g</td>
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<td>Absorption: 0.1</td>
<td>Analysis model: General purpose</td>
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<tr>
<td>Dispersant Name: Water</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispersant RI: 1.330</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentration: 0.0100 %Vol</td>
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<td></td>
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<td></td>
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<tr>
<td>Silt (10% - 90%): 5.135</td>
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</table>

**Result units:** Volume  

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<thead>
<tr>
<th>d(0.1):</th>
<th>d(0.5):</th>
<th>d(0.9):</th>
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</thead>
<tbody>
<tr>
<td>4.188 um</td>
<td>25.094 um</td>
<td>133.029 um</td>
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**Operator notes:** Sheridan Intake Study  
**Raw Water Supply**

---

**Particle Size Distribution**

**Sample #2, 10 May 1999 12:11:41**

---

**Size (µm) Volume in %**

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<th>Size (µm)</th>
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</tbody>
</table>

---

**Malvern Instruments Ltd.**

Malvern, UK

Tel.: +44 (0) 1684-892456  Fax: +44 (0) 1684-892789

Mastersizer 2000 Ver. 1.00

Serial Number: 34027-14

10 May 1999 12:11:09
Sample Name: Sample #3

Sample Source & type: MSE-HKM

Sample bulk lot ref: 6

Particle Name: Sample 1.72, 0.1

Absorption: 1.720

Dispersant Name: Water

Dispersant Ref: 1.330

Accessory Name: Hydro 2000S (A)

Analysis model: General purpose

Size range: 0.020 to 2000.000 μm

Weighted Residual: 0.606 %

Concentration: 0.0120 % Vol

Vol. Weighted Mean D(4,3): 215.085 μm

Specific Surface Area: 0.371511 m²/g

Span (10% - 90%): 8.910

Uniformity: 2.6588

Surface Weighted Mean D(3,2): 16.150 μm

Result units: Volume

d(0.1): 7.064 μm

d(0.5): 72.302 μm

d(0.9): 651.305 μm

Concentration: 0.0120 % Vol

Vol. Weighted Mean D(4,3): 215.085 μm

Specific Surface Area: 0.371511 m²/g

Span (10% - 90%): 8.910

Uniformity: 2.6588

Surface Weighted Mean D(3,2): 16.150 μm

Result units: Volume

d(0.1): 7.064 μm

d(0.5): 72.302 μm

d(0.9): 651.305 μm

Particle Size Distribution

Sample #3, 17 Jun 1999 13:37:32

Operator notes: Sheridan Intake - Level II Study

Raw Water Supply #3

Malvern Instruments Ltd.
Malvern, UK
Tel: +44 (0) 1684-892458 Fax: +44 (0) 1684-892790

Mastersizer 2000 Ver. 1.00
Serial Number: 34027-14

17 Jun 1999 13:39:43
Result Analysis Report

Sample Name: Sample # 4
Sample Source & type: MSE-HKM
Sample bulk lot ref: 1

Particle Name: Sample 1.72, 0.1
Particle Rf: 1.720
Absorption: 0.1
Dispersant Name: Water
Dispersant Rf: 1.330

Concentration: 0.0109 %Vol
Vol. Weighted Mean D[4,3]: 9.813 um
Uniformity: 1.00171
Surface Weighted Mean D[3,2]: 4.002 um

Specific Surface Area: 1.49914 m²/g
Span (10% - 90%): 3.212

Result Source: Measurement

Patient OyIDur.
Sample 1.72,0.1
A=--*-Yw*

Ydrom(A) Orwcwltn: 20.34 %
Partick W.

Akorgtkrr: 0.1
Andy8Lmod.l: Gensralm

Xnt~ Wder
Ske range: 0.020 to 2000.000 um
Weightnd
Residual: 0.924 %
DbpmW:
ConcmwWon:
0.0109 %Vd
Vol. Weighted
Mean
0.14.31:
9.81 3

Specific Surface Area: 1.49914 m²/g
Spmn
(10% - 90%): 3.212
Unlfmw:
Surface Weighted Mean W,q:
4.002 m
R+rult
unlb:
Vdume
d(0.1):
1.793 um
d(0.5):
6.433 um
d(0.9): 22.459 um

Operator notes: Sherdon Intake- Level II Study
Raw Water Supply #4

Mastersizer 2000 Ver. 1.00
Serial Number: 34027-14

17 Jun 1999 13:51:02
APPENDIX C

HYDRAULIC ANALYSES
MEASURING POINTS FOR HYDRAULIC ANALYSIS

A - CONCRETE AT TOP OF BAR SCREEN
B - TOP WEST END OF SAND TRAP CHANNEL
C - TOP EAST END OF SAND TRAP CHANNEL
D - OVERFLOW WEIR SAND TRAP CHANNEL
E - PRESSURE GAUGE ON PIPE
F - FLOOR INLET SIDE MICROSTRAINER
G - FLOOR OUTLET SIDE MICROSTRAINER
H - FLOOR INLET SIDE TRAVELING SCREEN
I - FLOOR OUTLET SIDE TRAVELING SCREEN
J - RIM IN INFLENT SECTION OF PRESEDIMENTATION BASIN
K - OUTLET MANHOLE RIM FOR PRESEDIMENTATION BASIN
L - MANHOLE RIM FOR 30" AIR/VAC VALVE
M - OVERFLOW WEIR AT BYPASS

INTAKE/BAR SCREEN
MAIN DIVERSION DAM
(SAND TRAP CHANNEL)
G (4609.96)
F (4609.96)
VA INTAKE
(ABANDONED)

BYPASS LINE
PRESEDIMENTATION BASIN
M (4609.16)
OLD SCREENING BUILDING

ORIGINAL PRESEDIMENTATION BASIN
A (4619.24)
B (4617.37)
C (4617.36)
D (4616.50)
E (4607.06)

CONCRETE BASE ON LIGHT POLE (4610.06)

METER MANHOLES
L (4605.82)
K (4612.49)

TRAVELING SCREEN
J (4613.94)

MADISON WELL
(TOP NUT=4614.48)
### Flow Test Data

**Sheridan Intake Facilities**

**June 18, 1998**

**Data from Measuring Points A thru M**

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<thead>
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<th>Run</th>
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<th>Item</th>
<th>Flow Test Data</th>
<th>4.79 Wide</th>
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<tr>
<th>Bar Screen</th>
<th>West End of Sand Trap</th>
<th>East End of Sand Trap</th>
<th>Sand Trap Weir</th>
<th>24&quot; Gauge (psi)</th>
<th>Microstrainer In</th>
<th>Microstrainer Out</th>
<th>Traveling Screen In</th>
<th>Traveling Screen Out</th>
<th>Presed Basin In</th>
<th>Presed Manhole</th>
<th>Manhole (start of 30° line)</th>
<th>Bypass Weir</th>
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<td>Run</td>
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<td>Item</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
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<tr>
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All readings are in feet unless otherwise noted.

**Runs**

1. Facilities as is. Presed basin and microstrainer.
2. Presed basin and microstrainer at higher flow rate.
3. All three paths at higher flow rate, probably close to peak flow.
4. Presed basin and bypass (no microstrainer).
5. Bypass alone.
6. Presed basin flow path alone.
### Flow Test Data

**Sheridan Intake Facilities**

**June 18, 1998**

#### Flow and SCADA Data

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# Flow Test Data

**Sheridan Intake Facilities**

**October 14, 1998**

**Data from Measuring Points A thru M**

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</table>

All readings are in feet unless otherwise noted.

**Runs**

Both valves on sand trap were open throughout all 5 flow tests.
1. Presed only. Water just flowing over crest of dam about 0.05'.
2. Presed only at higher rate. Water flowing only over spillway at diversion dam.
3. Presed with microstrainer. No flow over dam or spillway. Valve on micro was set to 55.7%, then automatically shut to 35% because level was "high".
4. Presed with micro at higher rate. No flow over dam or spillway. Open flow from sand trap channel into pipes. Water level at dam was lowered 2.25' - inadequate flow in creek to keep up with diversion.
5. Microstrainer only. No flow over dam or spillway. Open flow from sand trap channel into pipes. Water level at dam was lowered 2.25' - inadequate flow in creek to keep up with diversion.
Flow Test Data

Sheridan Intake Facilities

October 14, 1998

Flow and SCADA Data

<table>
<thead>
<tr>
<th>Run</th>
<th>Time</th>
<th>Diversion Elevation</th>
<th>Dam Head</th>
<th>Influent</th>
<th>Effluent</th>
<th>Presed Level</th>
<th>Microstrainer</th>
<th>Traveling Screen</th>
<th>SCADA Meter Readings (MGD)*</th>
<th>Direct Meter Readings (gpm)</th>
<th>Total Flow (gpm)</th>
</tr>
</thead>
<tbody>
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* SCADA meter readings seem to read about 94% of direct meter readings. It is assumed the direct meter readings are correct. Therefore, the total is based on the direct readings, or the adjusted SCADA readings.
## Flow Test Data

### Sheridan Intake Facilities

**March 31, 1999 - Flow Testing Two 24-inch Pipelines**

### Flow and SCADA Data

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<th>Effluent</th>
<th>Presed Level</th>
<th>Microstrainer</th>
<th>SCADA Meter Readings (MGD)**</th>
<th>Total (MGD)</th>
<th>Total (GPM)</th>
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<td>4.7</td>
<td>38.3</td>
<td>2.440</td>
</tr>
</tbody>
</table>

* Height of water column above MH rim for manometer at 30° Air/Vac MH at east end of site.

** SCADA meter readings seem to read about 94% of direct meter readings. It is assumed the direct meter readings are correct. Therefore, the total is based on the direct readings, or the adjusted SCADA readings.

### Runs

- All flow through traveling screen/presed basin.
- Facilities as is - both pipes open.
- Only north 24" pipe flowing.
- Only south 24" pipe flowing.
SCADA meter readings seem to read about 94% of direct meter readings. It is assumed the direct meter readings are correct. Therefore, the total is based on the direct readings, or the adjusted SCADA readings.

### Flow Test Data

**Sheridan Intake Facilities**

April 20, 1999 - Flushing and Flow Testing Two 24-inch Pipelines

<table>
<thead>
<tr>
<th>Flow and SCADA Data</th>
</tr>
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<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Flow and SCADA Data

#### Runs

1. Both 24" pipes flowing.
2. North pipe only - flushing.
3. South pipe only - flushing.
4. South pipe only - flow test
5. North pipe only - flow test

#### Weirs

- Bypass: Elevation = 4609.16, Width = 9'. Traveling Screen: Width = 12'.
- Weir Flow = 3.1 L/H/2

---

<table>
<thead>
<tr>
<th>Run</th>
<th>Time</th>
<th>Diversion Elevation</th>
<th>Microstrainer</th>
<th>Influent</th>
<th>Effluent</th>
<th>Presed Level</th>
<th>Microstrainer</th>
<th>Traveling Screen</th>
<th>SCADA Meter Readings (MGD)</th>
<th>Total (GPM)</th>
<th>Depth of Flow over Weir at Bypass</th>
<th>Weir Flow (GPM)</th>
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* SCADA meter readings seem to read about 94% of direct meter readings. It is assumed the direct meter readings are correct. Therefore, the total is based on the direct readings, or the adjusted SCADA readings.
## Flow Test Data

**Sheridan Intake Facilities**  
**May 25, 1999 - High Creek Condition**  
**Data from Measuring Points A thru M**

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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
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# Flow Test Data

**Sheridan Intake Facilities**  
**May 25, 1999 - "High Creek" Condition**

**Data from Measuring Points A thru M**

<table>
<thead>
<tr>
<th>Run</th>
<th>Time</th>
<th>Item</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>Weir Overflow</th>
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<td>-</td>
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</tbody>
</table>

All readings are in feet unless otherwise noted.

**Heirs:** Bypass: Elev = 4609.16, Width = 9'. Traveling Screen: Width = 12'.

**Weir Flow:** = 3.1 LH32/2

**Runs**
1. Facilities as is, Presed Basin flow path only
2. Presed & microstrainer flow paths, at higher rate of flow
3. Microstrainer only
4. Microstrainer only, at higher flow rate
5. Microstrainer and Presed at higher flow path.
6. Microstrainer, Presed, Bypass (all 3 flow paths)
7. All 3 flow paths at higher flow.
8. Presed and microstrainer, w/ north 24" pipe from diversion dam only.

---

**may25flow.XLS**

2 of 3
## Flow Test Data

### Sheridan Intake Facilities

**May 25, 1999 - "High Creek" Condition**

### Flow and SCADA Data

<table>
<thead>
<tr>
<th>Run</th>
<th>Time</th>
<th>Diversion Elevation</th>
<th>Dam Head</th>
<th>Influent</th>
<th>Effluent</th>
<th>Presed Level</th>
<th>Microstrainer</th>
<th>Traveling Screen</th>
<th>SCADA Meter Readings (MGD)</th>
<th>Direct Meter Readings (gpm)</th>
<th>16&quot;</th>
<th>20&quot;</th>
<th>30&quot; **</th>
<th>Total Meters</th>
<th>Weir Flow</th>
<th>Total</th>
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<td>0.970</td>
<td>8.010</td>
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<td>7300</td>
<td></td>
<td></td>
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<td>3</td>
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<td>3.46</td>
<td>0.30</td>
<td>5.7</td>
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<td>3.46</td>
<td>0.30</td>
<td>3.82</td>
<td>3.78</td>
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<td>0.970</td>
<td>1.040</td>
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<td>9680</td>
<td>1480</td>
<td>11,160</td>
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</tr>
<tr>
<td>6</td>
<td>1:30</td>
<td>3.45</td>
<td>0.29</td>
<td>4.40</td>
<td>4.29</td>
<td>4.10</td>
<td>36.3</td>
<td>100</td>
<td>0.970</td>
<td>1.020</td>
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<td>10,790</td>
<td>2060</td>
<td>12,850</td>
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<td>7</td>
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<td>3.43</td>
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<td>1.04</td>
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<td>3.70</td>
<td>36.2</td>
<td>100</td>
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<td>1.08</td>
<td>10</td>
<td>9210</td>
<td></td>
<td>9210</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Direct Meter Reading
** SCADA meter readings are about 94% of actual meter readings, so these readings are increased by dividing by 0.94 in the "Total Meters" column.
APPENDIX D

DISCHARGE PERMIT
STATEMENT OF BASIS

Renewal

APPLICANT NAME: The City of Sheridan, Wyoming

MAILING ADDRESS: Water Treatment Division
6 Soldier Creek Road
Sheridan, WY 82801

FACILITY LOCATION: Sheridan County

PERMIT NUMBER: WY0035661

The City of Sheridan, Wyoming collects potable water from the Big Goose Creek at a location approximately 13 miles above the City. The intake facilities include screens, microstrainers, and a presedimentation basin. This pretreated water is then delivered to the City's water treatment plant which is located near the City.

There are two waste streams from the intake facility. Both streams discharge to the Big Goose River (Class 2 water).

Outfall 001 is the discharge from the presedimentation basin. Potential pollutants from the basin typically consist of settle sediment and solids.

Outfall 002 is the backwash water from the plant screens and strainers. Potential pollutants from the screens and strainers consists of sticks, leaves, and other natural floating material.

The permit requires compliance with Wyoming Water Quality Standards. The permit establishes a total suspended solids effluent limit that is based upon Best Professional Judgement. The permit does not establish effluent limits or monitoring requirements for outfall 002 provided the waste stream consists only of floating and suspended solids backwashed from the screens and strainers.

Other Considerations

The discharge of wastewater and the effluent limits that are established in this permit have been reviewed to ensure that the levels of water quality necessary to protect the designated uses of the receiving waters are maintained and protected. An antidegradation review has been conducted and verifies that the permit conditions, including the effluent limitations established, provide a level of protection to the receiving water consistent with the antidegradation provisions of Wyoming surface water quality standards.
Self monitoring of effluent quality and quantity at outfall 001 is required with reporting of results quarterly. The permit is scheduled to expire January 31, 2004.

Leah Krafft
Water Quality Division
Department of Environmental Quality
December 15, 1998
In compliance with the provisions of the Federal Water Pollution Control Act, (hereinafter referred to as "the Act"), and the Wyoming Environmental Quality Act, The Town of Sheridan, Wyoming is authorized to discharge from the city's raw water intake facilities located in Sheridan County to receiving waters named Big Goose Creek (Class 2 water) in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II and III hereof.

This permit shall become effective on February 1, 1999.

This permit and the authorization to discharge shall expire at midnight, January 31, 2004.

Gary Beach
Administrator - Water Quality

Dennis Hemmer
Director - Department of Environmental Quality
PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning immediately and lasting through January 31, 2004, the permittee is authorized to discharge from outfall(s) serial number(s) 001.

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

<table>
<thead>
<tr>
<th>Effluent Characteristic</th>
<th>Discharge Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monthly Average</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>30 mg/l</td>
</tr>
</tbody>
</table>

There shall be no discharge of floating solids or foam in other than trace amounts. Nor shall the discharge have a visible sheen or cause formation of a visible sheen or visible deposits on the bottom or shoreline of the receiving water.

Monitoring Requirements

<table>
<thead>
<tr>
<th>Effluent Characteristic</th>
<th>Measurement Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow - MGD</td>
<td>Weekly</td>
<td>Instantaneous</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
</tbody>
</table>

Samples taken in compliance with the monitoring requirements specified above shall be taken at the outfall from the final treatment unit and prior to admixture with diluent water or the receiving stream.

2. The discharge from Outfall 002 shall consist of the backwash of floating solids captured in the intake screens and strainers only.
B. MONITORING AND REPORTING

1. Representative Sampling

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

2. Reporting

Effluent monitoring results obtained during the previous three (3) month(s) shall be summarized and reported on a Discharge Monitoring Report Form. Whole effluent toxicity (biomonitoring) results must be reported on the most recent version of EPA Region VIII'S Guidance for Whole Effluent Reporting. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the Signatory Requirements (see Part II.A.11.), and submitted to the Director, Water Management Division and the state water pollution control agency at the following addresses postmarked no later than the 28th day of the month following the completed reporting period. The first report is due April 28, 1999.

Wyoming Department of Environmental Quality/Water Quality Division
Herschler Building, 4 West
122 West 25th Street
Cheyenne, WY 82002
Telephone: (307) 777-7781

If no discharge occurs during the reporting period, "no discharge" shall be reported. If discharge is intermittent during the reporting period, sampling shall be done while the facility is discharging.

3. Definitions

Concentration Values

a. Daily Maximum (mg/l) - The highest single reading from any grab or composite sample collected during the reporting period.

b. Monthly Average (mg/l) - The arithmetic mean (geometric mean in the case of fecal coliform) of all composite and/or grab samples collected during a calendar month.

c. Weekly Average (mg/l) - The arithmetic mean (geometric mean in the case of fecal coliform) of all composite and/or grab
samples collected during any week. A week begins at 12:01 am Sunday morning and ends at 12:00 midnight Saturday evening.

Quantity Values

d. Daily Maximum - The highest single daily quantity reading (See Calculations below) recorded during the reporting period.

e. Monthly Average - The arithmetic mean (geometric mean in the case of fecal coliform bacteria) of all the daily quantity readings (See Calculations below) recorded during a calendar month.

f. Weekly Average - The arithmetic mean (geometric mean in the case of fecal coliform bacteria) of all the daily quantity readings (See Calculations below) recorded during a week. A week begins at 12:01 am Sunday morning and ends at 12:00 midnight Saturday evening.

Flow Values

g. Daily Flow - The flow volume recorded on any single day. The daily flow volume may be determined by using an instantaneous reading (if authorized by this permit) or a continuous recorder.

h. Daily Maximum Flow - The highest single daily flow reading recorded during a reporting period.

i. Monthly Average Flow - The arithmetic mean of all daily flow values recorded during a calendar month.

j. Weekly Average Flow - The arithmetic mean of all daily flow values recorded during a week. A week begins at 12:01 am on Sunday morning and ends at 12:00 midnight Saturday evening.

Calculations

k. Daily Quantity (kg/day) - The quantity, in kilograms per day, of pollutant discharged on a single day. The Daily quantity shall be calculated by multiplying the composite or grab sample concentration value for that day in milligrams/liter (mg/l) times the flow volume (in millions of gallons per day - MGD) for that day times 3.78. If a flow volume reading for the day the sample is collected is not available, the average flow volume reading for the entire reporting period shall be used.

l. Daily Quantity (#/day) - The quantity, in number per day, of bacteria or other pollutants discharged on a single day. The
number per day shall be calculated by multiplying the composite
or grab sample result for that day, in number per 100
milliliters (#/100 ml), times the flow volume (in millions of
gallons per day - MGD) times $3.78 \times 10^3$. If a flow volume
reading for the day the sample is collected is not available,
the average flow volume reading for the entire reporting
period shall be used.

m. Geometric Mean - Calculated in accordance with the procedure
described in the most recent edition of "Standard Methods for
the Examination of Water and Wastewater".

Miscellaneous

n. A "composite" sample, for monitoring requirements, is defined
as a minimum of four (4) grab samples collected at equally
spaced two (2) hour intervals and proportioned according to
flow.

o. An "instantaneous" measurement for monitoring requirements is
defined as a single reading, measurement, or observation.

p. "MGD", for monitoring requirements, is defined as million
gallons per day.

q. "Net" value, if noted under Effluent Characteristics, is
calculated on the basis of the net increase of the individual
parameter over the quantity of that same parameter present in
the intake water measured prior to any contamination or use in
the process of this facility. Any contaminants contained in
any intake water obtained from underground wells shall not be
adjusted for as described above and, therefore, shall be
considered as process input to the final effluent. Limitations
in which "net" is not noted are calculated on the basis of
gross measurements of each parameter in the discharge,
irrespective of the quantity of those parameters in the intake
waters.

4. Test Procedures

Test procedures for the analysis of pollutants, collection of
samples, sample containers, sample preservation, and holding times,
shall conform to regulations published pursuant to 40 CFR, Part 136,
unless other test procedures have been specified in this permit.
5. **Recording of Results**

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

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

b. The dates and times the analyses were performed;

c. The person(s) who performed the analyses and collected the samples;

d. The analytical techniques or methods used; and

e. The results of all required analyses including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine the results.

6. **Additional Monitoring by Permittee**

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form. Such increased frequency shall also be indicated.

7. **Records Retention**

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Administrator at any time. Data collected on site, copies of Discharge Monitoring Reports and a copy of this NPDES permit must be maintained on site during the duration of activity at the permitted location.

8. **Penalties for Tampering**

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

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than fourteen (14) days following each schedule date.
PART II

A. MANAGEMENT REQUIREMENTS

1. Changes

The permittee shall give notice to the Administrator of the Water Quality Division as soon as possible of any physical alterations or additions to the permitted facility. Notice is required when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR 122.29(b); or

b. The alteration or addition could change the nature or increase the quantity of pollutants discharged.

2. Noncompliance Notification

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

b. The permittee shall report any unanticipated noncompliance which may endanger health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Quality Division, Wyoming Department of Environmental Quality at (307) 777-7781.

c. The following occurrences of unanticipated noncompliance shall be reported by telephone to the Water Quality Division, Technical Support Section, (307) 777-7781 by the first workday following the day the permittee became aware of the circumstances.

(1) Any unanticipated bypass which exceeds any effluent limitation in the permit;

(2) Any upset which exceeds any effluent limitation in the permit; or

(3) Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit.

d. A written submission shall be provided within five days of the time that the permittee becomes aware of a noncompliance circumstance as described in item "c" above.
The written submission shall contain:

1. A description of the noncompliance and its cause;

2. The period of noncompliance, including exact dates and times;

3. The estimated time noncompliance is expected to continue if it has not been corrected; and

4. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance.

e. The Administrator of the Water Quality Division may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Quality Division, Technical Support Section, (307) 777-7781.

f. Reports shall be submitted to the addresses in Part I under Reporting.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.

4. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to waters of the state resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. Bypass of Treatment Facilities

a. Bypass means the intentional diversion of waste streams from any portion of a treatment facility.
b. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs c and d of this section. Return of removed substances to the discharge stream shall not be considered a bypass under the provisions of this paragraph.

c. Notice:

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice at least 60 days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.A.2.

d. Prohibition of bypass.

(1) Bypass is prohibited and the Administrator of the Water Quality Division may take enforcement action against a permittee for a bypass, unless:

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

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

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

e. The Administrator of the Water Quality Division may approve an anticipated bypass, after considering its adverse effects, if the Administrator determines that it will meet the three conditions listed above in paragraph d.(1) of this section.
6. **Upset Conditions**

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

   b. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph c of this section are met.

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

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

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

      (3) The permittee submitted notice of the upset as required under Part II.A.2; and

      (4) The permittee complied with any remedial measures required under Part II.A.4.

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

7. **Removed Substances**

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

8. **Power Failures**

   In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

   a. In accordance with a schedule of compliance contained in Part I, provide an alternative power source sufficient to operate
the wastewater control facilities; or

b. If such alternative power source as described in paragraph a above is not in existence and no date for its implementation appears in Part I, take such precautions as are necessary to maintain and operate the facility under its control in a manner that will minimize upsets and insure stable operation until power is restored.

9. **Duty to Comply**

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the federal act and the Wyoming Environmental Quality Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Administrator of the Water Quality Division advance notice of any planned changes at the permitted facility or of any activity which may result in permit noncompliance.

10. **Duty to Mitigate**

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

11. **Signatory Requirements**

All applications, reports or information submitted to the Administrator of the Water Quality Division shall be signed and certified.

a. All permit applications shall be signed as follows:

(1) For a corporation: by a responsible corporate officer;

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

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

b. All reports required by the permit and other information requested by the Administrator of the Water Quality Division shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
(1) The authorization is made in writing by a person described above and submitted to the Administrator of the Water Quality Division; and

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

c. If an authorization under paragraph II.A.11.b. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph II.A.11.b must be submitted to the Administrator of the Water Quality Division prior to or together with any reports, information or applications to be signed by an authorized representative.

d. Any person signing a document under this section shall make the following certification:

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

B. RESPONSIBILITIES

1. Inspection and Entry

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

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;
b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

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

d. Sample or monitor, at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the federal act, any substances or parameters at any location.

2. **Transfer of Ownership or Control**

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator of the Environmental Protection Agency and the Administrator of the Water Quality Division. The Administrator of the Water Quality Division shall then provide written notification to the new owner or controller of the date in which they assume legal responsibility of the permit.

3. **Availability of Reports**

Except for data determined to be confidential under Section 308 of the federal act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Wyoming Department of Environmental Quality and the Regional Administrator of the Environmental Protection Agency. As required by the federal act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the federal act.

4. **Toxic Pollutants**

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

5. **Changes in Discharge of Toxic Substances**

Notification shall be provided to the Administrator of the Water Quality Division as soon as the permittee knows of, or has reason to believe:

a. That any activity has occurred or will occur which would result
in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) One hundred micrograms per liter (100 ug/l);

(2) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the director of the Environmental Protection Agency in accordance with 40 CFR 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 ug/l);

(2) One milligram per liter (1 mg/l) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Director of the Environmental Protection Agency in accordance with 40 CFR 122.44(f).

6. Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. As long as the conditions related to the provisions of "Bypass of Treatment Facilities" (Part II.A.5), "Upset Conditions" (Part II.A.6), and "Power Failures" (Part II.A.8) are satisfied then they shall not be considered as noncompliance.
7. **Need to Halt or Reduce Activity not a Defense**

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

8. **Oil and Hazardous Substance Liability**

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

9. **State Laws**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties established pursuant to any applicable state or federal law or regulation.

10. **Property Rights**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights nor any infringement of federal, state or local laws or regulations.

11. **Duty to Reapply**

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

12. **Duty to Provide Information**

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

When the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or any report to the Administrator of the Water Quality Division, it shall promptly submit such facts or information.
PART III

A. OTHER REQUIREMENTS

1. Flow Measurement

At the request of the Administrator of the Water Quality Division, the permittee must be able to show proof of the accuracy of any flow measuring device used in obtaining data submitted in the monitoring report. The flow measuring device must indicate values of within plus or minus ten (10) percent of the actual flow being measured.

2. 208(b) Plans

This permit may be modified, suspended or revoked to comply with the provisions of any 208(b) plan certified by the Governor of the State of Wyoming.

3. Reopener Provision

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary) or other appropriate requirements if one or more of the following events occurs:

a. The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit;

b. A wasteload allocation is developed and approved by the state and/or the Environmental Protection Agency for incorporation in this permit;

c. A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit;

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended or revoked in whole or in part during its term for cause including, but not limited to, the following:
a. Violation of any terms or conditions of this permit;

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

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

d. If necessary to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2) and 307(a)(2) of the federal act, if the effluent standard or limitation so issued or approved:

(1) Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

(2) Controls any pollutant not limited in the permit.

5. **Toxicity Limitation - Reopener Provision**

This permit may be reopened and modified (following proper administrative procedures) to include a new compliance date, additional or modified numerical limitations, a new or different compliance schedule, a change in the whole effluent protocol or any other conditions related to the control of toxicants if one or more of the following events occur:

a. Toxicity was detected late in the life of the permit near or past the deadline for compliance;

b. The TRE results indicate that compliance with the toxic limits will require an implementation schedule past the date for compliance and the permit issuing authority agrees with the conclusion;

c. The TRE results indicate that the toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits and the permit issuing authority agrees that numerical controls are the most appropriate course of action;

d. Following the implementation of numerical controls on toxicants, the permit issuing authority agrees that a modified whole effluent protocol is necessary to compensate for those toxicants that are controlled numerically;

e. The TRE reveals other unique conditions or characteristics which, in the opinion of the permit issuing authority, justify the incorporation of unanticipated special conditions in the permit.
6. **Severability**

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

7. **Penalties for Falsification of Reports**

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

GEOTECHNICAL INFORMATION
The Big Goose Well

The Big Goose Well is located beside Big Goose Creek in the SW 1/4, SW 1/4, NE 1/4, Section 35, T55N R86W. This was the first well drilled on the project; mobilization began May 30, 1985. The well was drilled using standard, direct-circulation, rotary methods. Thirteen and three-eighths-inch surface casing was set to 66 feet. A light mud was used as a drilling fluid to a depth of 855 feet (just into the Madison Limestone), at which point a string of 9-5/8" diameter casing was pressure cemented in place from the bottom to near ground surface. (While the exact location of the top of the annular cement is not known [only cement-cut mud was circulated to the surface], it is clear that the well is completely sealed, despite the 230 psi shut-in pressure.) Water flow increasing to 20 gallons per minute (gpm) was encountered during the drilling of this upper part of the hole; production is believed to be primarily from the Tensleep Sandstone.

The lower portion of the Big Goose Well was drilled using only fresh-water circulation. Flow was encountered at a depth of 1054 feet and increased intermittently to 43 gpm over the remainder of the hole. Water production is believed to come predominantly from the Gallatin Formation. Drilling was completed July 2, 1985. The well was subsequently air-developed for 12 hours on July 11 without appreciable increase in water production.
TABLE 2-1: BIG GOOSE WELL SUMMARY

Owner: State of Wyoming - City of Sheridan

Wyoming Permit Number: UW 70179

Location: SW 1/4, SW 1/4, NE 1/4, Section 35, T55N, R86W

Elevation: 4630 feet

Total Depth: 2538 feet

Formation Tops: Artificial fill & Quaternary alluvium - surface; Chugwater Formation - 43 ft; Goose Egg Formation - 119 ft; Tensleep Sandstone - 346 ft; Amsden Formation - 719 ft; Madison Limestone - 844 ft; Devonian unnamed - 1789 ft; Bighorn Dolomite - 1920 ft; Gallatin Formation - 2355 ft; Gros Ventre Formation - 2510 ft.

Hole Diameter: Surface to 66 feet - 18-1/2", 66 feet to 855 feet - 12-1/4", 855 feet to 2538 feet - 7-7/8".


Drilling Dates: 6/1/85 to 7/2/85

Testing Dates: 7/17/85 to 7/18/85; 8/16/85 to 8/17/85

Engineering and Geology: Anderson & Kelly, Laramie, Wyoming
Project Supervision and Well Design: Larry Wester
Geologic Logging: Mark Hillenbrand
Testing Supervision: Larry Wester and Todd Jarvis

Drilling Contractor: Materi Exploration, Inc., Upton, Wyoming
Drilling Equipment: Failing 2500 CF drill rig with 5 x 10 duplex mud pump

Cementing Contractor: Sun Cementing of Wyoming, Inc.,

Geophysical Logging: Strata Data, Inc., Casper, Wyoming
STRATIGRAPHIC COLUMN AND AS-BUILT DIAGRAM
BIG GOOSE WELL

Quaternary Alluvium

Chugwater Formation

Goose Egg Formation

Tensleep Sandstone

Amsden Formation

Madison Limestone

Devonian unnamed

Bighorn Dolomite

Gallatin Formation

Gros Ventre Formation

---

18-1/2" dia. hole
ready-mix concrete
13-3/8" dia. steel casing

Lite cement

12-1/4" dia. hole

9-5/8" dia. steel casing

Class G cement

7-7/8" dia. hole

Figure 2-2
# APPENDIX B1

## LITHOLOGIC DESCRIPTIONS

### Big Goose Well

<table>
<thead>
<tr>
<th>Footage (KB)</th>
<th>Principal Lithology</th>
<th>Description</th>
<th>Drilling Character</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Quaternary Alluvium &amp; artificial fill - surface</td>
<td></td>
</tr>
<tr>
<td>0-26</td>
<td>silt &amp; sand</td>
<td>red silt &amp; fine sand; scattered pebbles &amp; cobbles</td>
<td>rough on rocks, smooth in between</td>
</tr>
<tr>
<td>26-34</td>
<td>cobbles</td>
<td>cream, gray, brown, maroon muds &amp; white, buff, gray fine sandy silt cobbles; red, soft, very fine-grained, silt</td>
<td>very rough, uneven</td>
</tr>
<tr>
<td>34-48</td>
<td>silt &amp; clay</td>
<td>red, silt, calc, fine sandy silt &amp; clay; some red, soft, calc, silt, very fine-grained silt; minor muds &amp; sandstone cobbles; minor red, medium-indurated, calc, homogenous silt below 40 ft</td>
<td>consistent, silt rough</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chugwater Formation - 43 ft</td>
<td></td>
</tr>
<tr>
<td>48-63</td>
<td>mudstone</td>
<td>red, soft, calc, silt, fine silt, mudstone</td>
<td>smooth, steady</td>
</tr>
<tr>
<td>63-70</td>
<td>mudstone &amp; sandstone</td>
<td>mudstone, soft-medium indurated, gradationally into: red, soft, calc, silt, very fine-grained silt with finely disseminated gypsum crystals</td>
<td>increasing roughness</td>
</tr>
<tr>
<td>70-85</td>
<td>sandstone</td>
<td>red, soft, silt, calc, silt, very fine-grained silt with fine gypsum crystals, locally with black stained blotches on parting surfaces; small calcite inclusions noted at 80 ft</td>
<td>smooth, steady</td>
</tr>
</tbody>
</table>
November 1, 1999

MSE-HKM
Attn. Dayton Alsaker
P.O. Box 7010
Sheridan, Wyoming 82801

Subject: City of Sheridan Intake Drilling.

Dear Dayton:

On October 26, 1999 an exploratory boring was drilled at the above subject site. The subsurface conditions encountered within the boring are summarized below.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5'</td>
<td>Sand, slightly clayey, silty and gravelly with occasional cobbles, dry, light red. Cobbles from 3-5' made drilling hard.</td>
</tr>
<tr>
<td>5'-7'</td>
<td>Gravel, slightly clayey, silty and sandy, slightly moist, light red. Drilling fairly easy in this area.</td>
</tr>
<tr>
<td>7-8'</td>
<td>Clay, silty, very moist, red. Easy drilling.</td>
</tr>
<tr>
<td>8-9'</td>
<td>Gravel, slightly clayey, silty and sandy, slightly moist, light red. Drilling easy in this area.</td>
</tr>
<tr>
<td>9-15'</td>
<td>Boulders, granitic, dry, very light red to white. Extremely hard drilling. Based on the boulders seen near the river, boulders can be 4-10 relative diameter.</td>
</tr>
<tr>
<td>15-21'</td>
<td>Gravel, slightly silty, sandy, cobbles to small boulders, slightly moist, light red. Hard drilling.</td>
</tr>
<tr>
<td>21-25'</td>
<td>Sand/Gravel, Sand, silt and clay content increases with depth, moisture increases with depth, light to dark red. Fairly easy drilling.</td>
</tr>
<tr>
<td>25-31'</td>
<td>Silt/Clay (Chugwater Formation), occasional very sandy lenses, moist to wet, dark red. Easy drilling.</td>
</tr>
</tbody>
</table>
The above subsurface conditions are very similar to the WWDC Big Goose Well log. The Big Goose well encountered cobbles, what I referred to as boulders, approximately 17' deeper than at this exploratory boring location. This depth difference is probably due to the gradient away from the mountain.

If you have any questions, please call.

Sincerely,

Thomas J. Pilch, P.E., P.G.
APPENDIX F

PERMITTING REQUIREMENTS
Discharges of dredged or fill material associated with repair, rehabilitation, or replacement of any previously authorized (including those in place prior to July 19, 1977 and authorized by 33 CFR 330.3), currently serviceable, structure or fill, are authorized provided the structure or fill is not to be put to uses differing from those uses specified in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area including those due to changes in materials, construction techniques, current construction codes or safety standards which are necessary to make repair, rehabilitation, or replacement are authorized, provided the environmental effects resulting from such repair, rehabilitation, or replacement are minimal. Currently serviceable means useable as is with some maintenance but not so degraded as to essentially require reconstruction. This permit authorizes the repair, rehabilitation, or replacement of structures destroyed by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced or under contract to commence within 2 years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this 2 year limit may be waived by the U.S. Army Corps of Engineers (Corps), provided the permittee can demonstrate funding, contract, or other similar delays. Maintenance dredging and beach restoration are not authorized by this permit.

Authorized activities must also comply with all General Conditions listed on the attached pages.

Notification Requirements: Notification of the Corps is not required for activities that comply with all of the above criteria.

This permit satisfies the requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act.

Contents adapted from Part VII of the Federal Register (Vol 61, No. 241) published on December 13, 1996. Copies available upon request.
Nationwide Permits

General Conditions

Activities authorized under Nationwide Permits must comply with all of the following conditions:

1. Navigation: No activity may cause more than a minimal adverse effect on navigation.

2. Proper Maintenance: Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.

3. Erosion and Siltation Controls: Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.

4. Aquatic Life Movements: No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water.

5. Equipment: Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance.

6. Regional and Case-by-Case Conditions: The activity must comply with any regional conditions and case-by-case conditions added by the Division Engineer under 33 CFR Part 330.4(e). The following regional conditions have been adopted for all authorized activities in the State of Wyoming:
   a. The permittee must ensure that native vegetation, including woody species if present, are established within 1 year after project completion in wetland areas where land clearing is necessary for construction access.
   b. No activity is authorized within 100 feet of the source in natural spring areas. For purposes of this condition, a spring source is defined as any location where there is natural artesian flow emanating from a distinct point at any time during the growing season. Springs do not include seeps and other groundwater discharge areas where there is no distinct point source.
   c. The permittee must ensure that effluent from outfall structures does not increase erosion downstream due to the concentration of flow.
   d. The permittee must ensure that pipeline projects have been designed to prevent the trench and bedding material from acting as a sub-surface drain in wetlands. It may be necessary to install cutoff collars to prevent piping.

7. Wild and Scenic Rivers: No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status; unless the appropriate federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely effect the Wild and Scenic River designation, or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service.)
8. **Tribal Rights:** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

9. **Water Quality Certification:** Authorized activities must comply with all conditions issued in accordance with water quality certifications under Section 401 of the Clean Water Act (see 33 CFR Part 330.4(c)). The Wyoming Department of Environmental Quality (WDEQ) issued the following conditions with its water quality certifications for all activities in the State of Wyoming outside the boundaries of the Wind River Indian Reservation:
   a. As much as possible, operations in stream channels should be conducted “in the dry” either by temporarily diverting water around the work area or restricting equipment operation to areas of the stream channel that are above the existing water surface. Work below the water which is essential for preparation of culvert bedding or footing installations is acceptable to the extent that the activity does not create turbidity in excess of the Chapter 1 surface water standards or unnecessary stream channel disturbance.
   b. Fording the stream at one location is acceptable, however, vehicles and other equipment should not push or pull material along the streambed below the existing water level. Frequent fording should not occur in areas where extensive turbidity will be created.
   c. Any temporary structures such as road crossings, bridge supports, cofferdams, or other temporary structures that will be needed during the period of construction should be designed to withstand high flows that could be anticipated during the construction period. All temporary structures must be completely removed from the stream channel at the conclusion of construction and the area restored to a natural appearance.
   d. Care must be taken to cause only minimum necessary disturbance. Streambank vegetation should be protected except where its removal is absolutely necessary for completion of the project. Any vegetation, debris, or other material removed during construction must be disposed of outside the stream channel or adjacent wetland areas where it cannot reenter the channel during high stream flow or runoff events. All cut and fill slopes not protected with riprap should be revegetated with appropriate species or otherwise stabilized to prevent erosion.
   e. Care must be taken to prevent any petroleum products, chemicals, or other deleterious materials from entering the water. All equipment which will be operated within any stream channel, pond, or wetland should be clean and free from fuel and oil leaks. A spill contingency plan should be developed for all projects where a large amount of petroleum products or solvents will be stored on the project site. A plan must be prepared when storage of these materials exceeds the federal limits set forth at 40 CFR Part 112.

The WDEQ has either waived or issued water quality certification for the following Nationwide Permits: 1, 2, 4, 8, 9, 10, 11, 15, 19, 20, 21, 22, 24, 28, 34, 35, and 38.

The WDEQ has issued water quality certification for the following Nationwide Permits in all waters except Class 1 waters as listed on the following page. The following permits cannot be used in Class 1 waters without separate written approval from the WDEQ: 3, 5, 6, 7, 12, 13, 14, 18, 25, 26, 29, 30, 32, 33, 36, & 37.

The WDEQ has denied water quality certification for the following Nationwide Permits in all waters. The following permits cannot be used without separate written approval from the WDEQ: 16, 17, 23, 27, 31, & 40.
General Conditions (Continued)

9. Water Quality Certification (continued):

Wyoming Department of Environmental Quality
Class 1 Waters

a. All surface waters located within the boundaries of national parks and congressionally designated wilderness areas;
b. The main stem of the Snake River through its entire length above the U.S. Highway 22 Bridge (Wilson Bridge);
c. The main stem of the Green River, including Green River Lakes, from the mouth of the New Fork River upstream to the wilderness boundary;
d. The main stem of the Wind River from the boundary of the Wind River Indian Reservation upstream to Boyes Dam;
e. The main stem of the North Platte River from the Mouth of Sage Creek (approximately 15 miles below Saratoga, Wyoming) upstream to the Colorado state line;
f. The main stem of the North Platte River from the headwaters of Pathfinder Reservoir upstream to Kortes Dam;
g. The main stem of the North Platte River from the Natrona County Road 309 bridge (Goose Egg Bridge) upstream to Alcova Reservoir;
h. The main stem of Sand Creek above the U.S. Highway 14 bridge;
i. The main stem of the Middle Fork of the Powder River through its entire length above the mouth of Buffalo Creek;
j. The main stem of the Tongue River, the main stem of the North Fork of the Tongue River, and the main stem of the South Fork of the Tongue River above the U.S. Forest Service boundary;
k. The main stem of the Sweetwater River above the mouth of Alkali Creek;
l. The main stem of the Encampment River from the U.S. Forest Service boundary upstream to the Colorado state line;
m. The main stem of the Clarks Fork River from the U.S. Forest Service boundary upstream to the Montana state line;
n. All waters within the Fish Creek (near Wilson, Wyoming) drainage;
o. The main stem of Granite Creek (tributary of the Hoback River) through its entire length;
p. Fremont Lake;
q. All streams that are tributary to the above listed waters and are otherwise unlisted in Chapter 1, Appendix A of the Wyoming Water Quality Rules and Regulations; and
r. Wetlands adjacent to Class 1 waters are also treated as Class 1.

The U.S. Environmental Protection Agency (EPA) has waived water quality certification for the following Nationwide Permits for activities within the boundaries of the Wind River Indian Reservation: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 14, 15, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 32, 34, 35, 36, 37, 38 & 40.

The EPA has denied water quality certification for the following Nationwide Permits for activities within the boundaries of the Wind River Indian Reservation. The following permits cannot be used without separate written approval from the EPA: 7, 12, 13, 16, 17, 18, 26, 31, and 33.
General Conditions (Continued)


11. Endangered Species: No activity is authorized which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which is likely to destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the Corps if any listed species or critical habitat might be affected or is in the vicinity of the project, and shall not begin work on the activity until notified by the Corps that the requirements of the ESA have been satisfied and that the activity is authorized. Authorization of an activity by a nationwide permit does not authorize the "take" of a threatened or endangered species. In the absence of separate authorization (e.g., an ESA Section 10 permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. Fish and Wildlife Service, both lethal and non-lethal "takes" of protected species are in violation of the ESA. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. Fish and Wildlife Service on their world wide web page at http://www.fws.gov/r9endsp/endsp.html or by calling the Wyoming State Office at (307)772-2374. In addition, the following regional conditions have been adopted to further protect threatened and endangered species in the State of Wyoming:

a. The permittee must contact the Wyoming State Office of the FWS prior to undertaking any activities under Nationwide Permits 3, 6, 23, 25, 26, 36, and 40 in the following areas:
   1. Niobrara River basin in Niobrara County
   2. Antelope Creek basin in Converse County
   3. Bear Creek basin in Goshen County
   4. Within 0.5 miles of and including the Hutton Lake and Mortenson Lake National Wildlife Refuges and all sections in Township 15 North, Range 65 West, Albany County
   5. Within 0.5 miles of any raptor nest (raptors include all eagles, hawks, ospreys, falcons, and owls) during the nesting season (February 1 through July 15) in all areas.

12. Historic Properties: No activity is authorized which may affect historic properties listed, or eligible for listing, in the National Register of Historic Places, until the Corps has complied with the provisions of 33 CFR Part 325, Appendix C. Non-federal permittees must notify the Corps if the authorized activity may affect any historic properties listed, determined to be eligible, or which the permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the Corps that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places.
General Conditions (Continued)

13. Notification: When required by the terms of a nationwide permit, the landowner (permittee) or a designated agent for the permittee must notify the U.S. Army Corps of Engineers (Corps) with a Pre-Construction Notification (PCN) in accordance with the Notification Procedure prior to initiating any activities subject to regulation under Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act. The permittee shall not begin any such activities until the Corps provides confirmation, either verbally or in writing, that the activity may proceed under a nationwide permit. However, the permittee may proceed after 30 days (45 days for Nationwide Permit 26 only) have passed since the Corps receipt of a complete PCN if the permittee has not received a response from the Corps. Subsequently, the permittee’s right to proceed under a nationwide permit may be modified, suspended, or revoked in accordance with the procedure set forth in 33 CFR 330.5(d)(2). The permittee is not authorized to proceed under a nationwide permit if properly notified by the Corps that the activity does not qualify and that an individual Department of the Army permit is required instead.

14. Compliance Certification: Permittees who receive a permit verification from the Corps must submit a signed certification after project completion. The certification will be provided by the Corps with the verification letter and will include:
   a. A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions;
   b. A statement that any required mitigation was completed in accordance with the permit conditions.

15. Multiple Use of Permits (Single and Complete Project): Single and complete project means the total project proposed or accomplished by one owner, developer, partnership or other association. The term "real estate subdivision" shall be interpreted to include circumstances where a landowner or developer divides a tract of land into smaller parcels for the purpose of selling, conveying, transferring, leasing, or developing said parcels. This would include the entire area of a residential, commercial or other real estate subdivision, including all parcels and parts thereof. For linear projects such as utility lines and roads, each crossing of a waterbody is considered to be a single and complete project. However, the Corps retains the authority to combine several crossings as a single project such as when a road crosses the same waterbody at several locations. For bank stabilization projects, all of the areas on the same waterbody that are stabilized by one owner are combined to define a single and complete project. Individual channels in a braided stream or individual arms of an irregularly shaped wetland are considered to be part of the same waterbody. As provided at 33 CFR 330.6(c) two or more permits can be combined to authorize a single and complete project. However, permits cannot be combined for the purpose of increasing the filled area limitation. Furthermore, the same permit cannot be used more than once for a single project. In any case where permits 12 through 40 are to be used in combination, the permittee must notify the Corps in accordance with the Notification Procedure. Permits 1 through 11 may be combined without notification to the Corps, unless notification is otherwise required by the terms of the permit.
Nationwide Permits

Section 404 Only Conditions

Activities authorized under any nationwide permit relative to Section 404 must comply with all of the following conditions:

1. Water Supply Intakes: No discharge may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or for adjacent bank stabilization.

2. Shellfish Production: No discharge may occur in areas of concentrated shellfish production, unless the discharge is directly related to a shellfish harvesting activity authorized by Nationwide Permit No 4.

3. Suitable Material: No discharge may consist of unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.) and material discharged must be free from toxic pollutants in toxic amounts as required by Section 307 of the Clean Water Act. In Wyoming, the Corps issued a prohibition against the use of certain materials as fill in a Public Notice issued on March 21, 1994.

4. Mitigation: Discharges must be minimized or avoided to the maximum extent practicable at the project site, unless the Corps approves a compensation plan that is determined to be more beneficial to the environment than on-site minimization or avoidance measures. Mitigation cannot be used in an attempt to offset the acreage of wetland losses that would occur in order to comply with the acreage limitation of a nationwide permit. To be practicable, mitigation must be capable of being done considering costs, existing technology, and logistics in light of the overall project purpose. Furthermore, mitigation must address wetland functional impacts. Examples of mitigation that may be appropriate and practicable include, but are not limited to:
   a. establishing wetland or upland buffer zones to protect aquatic resource functions; and
   b. replacing the loss of aquatic resource functions by creating or restoring similar functions.

To the extent appropriate, permittees should consider mitigation banking and other forms of mitigation including contributions to wetland trust funds or "in lieu fees" to organizations such as The Nature Conservancy, state or county natural resource management agencies, where such fees contribute to the restoration, creation, replacement, or preservation of wetlands.

5. Spawning Areas: Discharges in spawning areas during the spawning season of aquatic life indigenous to the waterbody must be avoided to the maximum extent practicable. Spawning seasons for fish species of concern to the Wyoming Game and Fish Department (WGFD) are listed below:
   Rainbow and Cutthroat Trout - March 15 thru July 31
   Brown and Brook Trout - September 15 thru November 30

Site specific information on spawning seasons may be obtained from Fisheries Supervisors in WGFD Regional Offices.

6. Obstruction of High Flows: Discharges must not permanently restrict or impede the passage of normal or expected high flows to the maximum extent practicable (unless the primary purpose of the fill is to impound waters).
Section 404 Only Conditions (Continued)

7. Adverse Effects From Impoundments: If the discharge creates an impoundment of water, adverse effects on the aquatic system caused by the accelerated passage of water and/or the restriction of flow shall be minimized to the maximum extent practicable.

8. Waterfowl Breeding Areas: Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

9. Removal of Temporary Fills: All temporary fills must be removed in their entirety and the affected areas returned to their preexisting contours.
Discharges of dredged or fill material associated with construction of temporary structures, including cofferdams or other structures necessary for dewatering of construction sites and access roads are authorized provided that the associated construction activity is authorized by the U.S. Army Corps of Engineers (Corps), or for construction activities not subject to regulation by the Corps. Authorized activities must comply with all of the following criteria:

a. Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding;

b. Activities cannot dewater wetlands in a way that would change its functions.

c. Fill material must be placed in a manner that will not be eroded by expected high flows. The use of dredged material may be used as fill if the Corps determines that it will not cause more than minimal adverse effects on aquatic resources;

d. Temporary fill must be entirely removed, or dredged material must be returned to its original location, following completion of the construction activity; and

e. All disturbed areas must be restored to their original contours.

Structures left in place after cofferdams are removed require a Section 10 permit if located in navigable waters of the United States (See 33 CFR Part 322).

Authorized activities must also comply with all General Conditions listed on the attached pages.

**Notification Requirements:** The applicant is required to notify the Corps in accordance with the Notification Procedure prior to initiating any temporary construction access or dewatering activities. In addition, the notification must include the following information:

a. A restoration plan of reasonable measures to minimize adverse effects on aquatic resources.

Activities that require notification are not authorized until written verification is received from the Corps unless the Corps waives verification by failing to respond, either verbally or in written form, within 30 days after receipt of a complete notification. The Corps may add special conditions to the authorization, where necessary, to ensure that adverse environmental effects are minimal. Such conditions may include:

a. Requiring seasonal restrictions;

b. Modifying the restoration plan; and

c. Requiring alternative construction methods such as construction mats in wetlands.

This permit satisfies the requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act.

Contents adapted from Part VII of the Federal Register (Vol 61, No. 241) published on December 13, 1996. Copies available upon request.
Nationwide Permits

General Conditions

Activities authorized under Nationwide Permits must comply with all of the following conditions:

1. **Navigation:** No activity may cause more than a minimal adverse effect on navigation.

2. **Proper Maintenance:** Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.

3. **Erosion and Siltation Controls:** Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.

4. **Aquatic Life Movements:** No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate through the area, unless the activity’s primary purpose is to impound water.

5. **Equipment:** Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance.

6. **Regional and Case-by-Case Conditions:** The activity must comply with any regional conditions and case-by-case conditions added by the Division Engineer under 33 CFR Part 330.4(e). The following regional conditions have been adopted for all authorized activities in the State of Wyoming:
   a. The permittee must ensure that native vegetation, including woody species if present, are established within 1 year after project completion in wetland areas where land clearing is necessary for construction access.
   b. No activity is authorized within 100 feet of the source in natural spring areas. For purposes of this condition, a spring source is defined as any location where there is natural artesian flow emanating from a distinct point at any time during the growing season. Springs do not include seeps and other groundwater discharge areas where there is no distinct point source.
   c. The permittee must ensure that effluent from outfall structures does not increase erosion downstream due to the concentration of flow.
   d. The permittee must ensure that pipeline projects have been designed to prevent the trench and bedding material from acting as a sub-surface drain in wetlands. It may be necessary to install cutoff collars to prevent piping.

7. **Wild and Scenic Rivers:** No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status; unless the appropriate federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely effect the Wild and Scenic River designation, or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service.)
8. Tribal Rights: No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

9. Water Quality Certification: Authorized activities must comply with all conditions issued in accordance with water quality certifications under Section 401 of the Clean Water Act (see 33 CFR Part 330.4(c)). The Wyoming Department of Environmental Quality (WDEQ) issued the following conditions with its water quality certifications for all activities in the State of Wyoming outside the boundaries of the Wind River Indian Reservation:
   a. As much as possible, operations in stream channels should be conducted "in the dry" either by temporarily diverting water around the work area or restricting equipment operation to areas of the stream channel that are above the existing water surface. Work below the water which is essential for preparation of culvert bedding or footing installations is acceptable to the extent that the activity does not create turbidity in excess of the Chapter 1 surface water standards or unnecessary stream channel disturbance.
   b. Fording the stream at one location is acceptable, however, vehicles and other equipment should not push or pull material along the streambed below the existing water level. Frequent fording should not occur in areas where extensive turbidity will be created.
   c. Any temporary structures such as road crossings, bridge supports, cofferdams, or other temporary structures that will be needed during the period of construction should be designed to withstand high flows that could be anticipated during the construction period. All temporary structures must be completely removed from the stream channel at the conclusion of construction and the area restored to a natural appearance.
   d. Care must be taken to cause only minimum necessary disturbance. Streambank vegetation should be protected except where its removal is absolutely necessary for completion of the project. Any vegetation, debris, or other material removed during construction must be disposed of outside the stream channel or adjacent wetland areas where it cannot reenter the channel during high stream flow or runoff events. All cut and fill slopes not protected with riprap should be revegetated with appropriate species or otherwise stabilized to prevent erosion.
   e. Care must be taken to prevent any petroleum products, chemicals, or other deleterious materials from entering the water. All equipment which will be operated within any stream channel, pond, or wetland should be clean and free from fuel and oil leaks. A spill contingency plan should be developed for all projects where a large amount of petroleum products or solvents will be stored on the project site. A plan must be prepared when storage of these materials exceeds the federal limits set forth at 40 CFR Part 112.

The WDEQ has either waived or issued water quality certification for the following Nationwide Permits: 1, 2, 4, 8, 9, 10, 11, 15, 19, 20, 21, 22, 24, 28, 34, 35, and 38.

The WDEQ has issued water quality certification for the following Nationwide Permits in all waters except Class 1 waters as listed on the following page. The following permits cannot be used in Class 1 waters without separate written approval from the WDEQ: 3, 5, 6, 7, 12, 13, 14, 18, 25, 26, 29, 30, 32, 33, 36, & 37.

The WDEQ has denied water quality certification for the following Nationwide Permits in all waters. The following permits cannot be used without separate written approval from the WDEQ: 16, 17, 23, 27, 31, & 40.
General Conditions (Continued)

9. Water Quality Certification (continued):

Wyoming Department of Environmental Quality
Class 1 Waters

a. All surface waters located within the boundaries of national parks and congressionally designated wilderness areas;
b. The main stem of the Snake River through its entire length above the U.S. Highway 22 Bridge (Wilson Bridge);
c. The main stem of the Green River, including Green River Lakes, from the mouth of the New Fork River upstream to the wilderness boundary;
d. The main stem of the Wind River from the boundary of the Wind River Indian Reservation upstream to Boysen Dam;
e. The main stem of the North Platte River from the Mouth of Sage Creek (approximately 15 miles below Saratoga, Wyoming) upstream to the Colorado state line;
f. The main stem of the North Platte River from the headwaters of Pathfinder Reservoir upstream to Kortes Dam;
g. The main stem of the North Platte River from the Natrona County Road 309 bridge (Goose Egg Bridge) upstream to Alcova Reservoir;
h. The main stem of Sand Creek above the U.S. Highway 14 bridge;
i. The main stem of the Middle Fork of the Powder River through its entire length above the mouth of Buffalo Creek;
j. The main stem of the Tongue River, the main stem of the North Fork of the Tongue River, and the main stem of the South Fork of the Tongue River above the U.S. Forest Service boundary;
k. The main stem of the Sweetwater River above the mouth of Alkali Creek;
l. The main stem of the Encampment River from the U.S. Forest Service boundary upstream to the Colorado state line;
m. The main stem of the Clarks Fork River from the U.S. Forest Service boundary upstream to the Montana state line;
n. All waters within the Fish Creek (near Wilson, Wyoming) drainage;
o. The main stem of Granite Creek (tributary of the Hoback River) through its entire length;
p. Fremont Lake;
q. All streams that are tributary to the above listed waters and are otherwise unlisted in Chapter 1, Appendix A of the Wyoming Water Quality Rules and Regulations; and
r. Wetlands adjacent to Class 1 waters are also treated as Class 1.

The U.S. Environmental Protection Agency (EPA) has waived water quality certification for the following Nationwide Permits for activities within the boundaries of the Wind River Indian Reservation: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 14, 15, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 32, 34, 35, 36, 37, 38 & 40.

The EPA has denied water quality certification for the following Nationwide Permits for activities within the boundaries of the Wind River Indian Reservation. The following permits cannot be used without separate written approval from the EPA: 7, 12, 13, 16, 17, 18, 26, 31, and 33.
General Conditions (Continued)


11. Endangered Species: No activity is authorized which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which is likely to destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the Corps if any listed species or critical habitat might be affected or is in the vicinity of the project, and shall not begin work on the activity until notified by the Corps that the requirements of the ESA have been satisfied and that the activity is authorized. Authorization of an activity by a nationwide permit does not authorize the "take" of a threatened or endangered species. In the absence of separate authorization (e.g., an ESA Section 10 permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. Fish and Wildlife Service, both lethal and non-lethal "takes" of protected species are in violation of the ESA. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. Fish and Wildlife Service on their worldwide web page at http://www.fws.gov/-r9end spp/end spp.html or by calling the Wyoming State Office at (307)772-2374. In addition, the following regional conditions have been adopted to further protect threatened and endangered species in the State of Wyoming:

   a. The permittee must contact the Wyoming State Office of the FWS prior to undertaking any activities under Nationwide Permits 3, 6, 23, 25, 26, 36, and 40 in the following areas:
      1. Niobrara River basin in Niobrara County
      2. Antelope Creek basin in Converse County
      3. Bear Creek basin in Goshen County
      4. Within 0.5 miles of and including the Hutton Lake and Mortenson Lake National Wildlife Refuges and all sections in Township 15 North, Range 65 West, Albany County
      5. Within 0.5 miles of any raptor nest (raptors include all eagles, hawks, ospreys, falcons, and owls) during the nesting season (February 1 through July 15) in all areas.

12. Historic Properties: No activity is authorized which may affect historic properties listed, or eligible for listing, in the National Register of Historic Places, until the Corps has complied with the provisions of 33 CFR Part 325, Appendix C. Non-federal permittees must notify the Corps if the authorized activity may affect any historic properties listed, determined to be eligible, or which the permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the Corps that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places.
General Conditions (Continued)

13. Notification: When required by the terms of a nationwide permit, the landowner (permittee) or a designated agent for the permittee must notify the U.S. Army Corps of Engineers (Corps) with a Pre-Construction Notification (PCN) in accordance with the Notification Procedure prior to initiating any activities subject to regulation under Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act. The permittee shall not begin any such activities until the Corps provides confirmation, either verbally or in writing, that the activity may proceed under a nationwide permit. However, the permittee may proceed after 30 days (45 days for Nationwide Permit 26 only) have passed since the Corps receipt of a complete PCN if the permittee has not received a response from the Corps. Subsequently, the permittee’s right to proceed under a nationwide permit may be modified, suspended, or revoked in accordance with the procedure set forth in 33 CFR 330.5(d)(2). The permittee is not authorized to proceed under a nationwide permit if properly notified by the Corps that the activity does not qualify and that an individual Department of the Army permit is required instead.

14. Compliance Certification: Permittees who receive a permit verification from the Corps must submit a signed certification after project completion. The certification will be provided by the Corps with the verification letter and will include:
   a. A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions;
   b. A statement that any required mitigation was completed in accordance with the permit conditions.

15. Multiple Use of Permits (Single and Complete Project): Single and complete project means the total project proposed or accomplished by one owner, developer, partnership or other association. The term "real estate subdivision" shall be interpreted to include circumstances where a landowner or developer divides a tract of land into smaller parcels for the purpose of selling, conveying, transferring, leasing, or developing said parcels. This would include the entire area of a residential, commercial or other real estate subdivision, including all parcels and parts thereof. For linear projects such as utility lines and roads, each crossing of a waterbody is considered to be a single and complete project. However, the Corps retains the authority to combine several crossings as a single project such as when a road crosses the same waterbody at several locations. For bank stabilization projects, all of the areas on the same waterbody that are stabilized by one owner are combined to define a single and complete project. Individual channels in a braided stream or individual arms of an irregularly shaped wetland are considered to be part of the same waterbody. As provided at 33 CFR 330.6(c) two or more permits can be combined to authorize a single and complete project. However, permits cannot be combined for the purpose of increasing the filled area limitation. Furthermore, the same permit cannot be used more than once for a single project. In any case where permits 12 through 40 are to be used in combination, the permittee must notify the Corps in accordance with the Notification Procedure. Permits 1 through 11 may be combined without notification to the Corps, unless notification is otherwise required by the terms of the permit.

Contents adapted from Part VII of the Federal Register (Vol 61, No. 241) published on December 13, 1996. Copies available upon request.
Nationwide Permits

Section 404 Only Conditions

Activities authorized under any nationwide permit relative to Section 404 must comply with all of the following conditions:

1. Water Supply Intakes: No discharge may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or for adjacent bank stabilization.

2. Shellfish Production: No discharge may occur in areas of concentrated shellfish production, unless the discharge is directly related to a shellfish harvesting activity authorized by Nationwide Permit No 4.

3. Suitable Material: No discharge may consist of unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.) and material discharged must be free from toxic pollutants in toxic amounts as required by Section 307 of the Clean Water Act. In Wyoming, the Corps issued a prohibition against the use of certain materials as fill in a Public Notice issued on March 21, 1994.

4. Mitigation: Discharges must be minimized or avoided to the maximum extent practicable at the project site, unless the Corps approves a compensation plan that is determined to be more beneficial to the environment than on-site minimization or avoidance measures. Mitigation cannot be used in an attempt to offset the acreage of wetland losses that would occur in order to comply with the acreage limitation of a nationwide permit. To be practicable, mitigation must be capable of being done considering costs, existing technology, and logistics in light of the overall project purpose. Furthermore, mitigation must address wetland functional impacts. Examples of mitigation that may be appropriate and practicable include, but are not limited to:
   a. establishing wetland or upland buffer zones to protect aquatic resource functions; and
   b. replacing the loss of aquatic resource functions by creating or restoring similar functions.

To the extent appropriate, permittees should consider mitigation banking and other forms of mitigation including contributions to wetland trust funds or "in lieu fees" to organizations such as The Nature Conservancy, state or county natural resource management agencies, where such fees contribute to the restoration, creation, replacement, or preservation of wetlands.

5. Spawning Areas: Discharges in spawning areas during the spawning season of aquatic life indigenous to the waterbody must be avoided to the maximum extent practicable. Spawning seasons for fish species of concern to the Wyoming Game and Fish Department (WGFD) are listed below:
   Rainbow and Cutthroat Trout - March 15 thru July 31
   Brown and Brook Trout - September 15 thru November 30

Site specific information on spawning seasons may be obtained from Fisheries Supervisors in WGFD Regional Offices.

6. Obstruction of High Flows: Discharges must not permanently restrict or impede the passage of normal or expected high flows to the maximum extent practicable (unless the primary purpose of the fill is to impound waters).
Section 404 Only Conditions (Continued)

7. Adverse Effects From Impoundments: If the discharge creates an impoundment of water, adverse effects on the aquatic system caused by the accelerated passage of water and/or the restriction of flow shall be minimized to the maximum extent practicable.

8. Waterfowl Breeding Areas: Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

9. Removal of Temporary Fills: All temporary fills must be removed in their entirety and the affected areas returned to their preexisting contours.

Contents adapted from Part VII of the Federal Register (Vol 61, No. 241) published on December 13, 1996. Copies available upon request.
Nationwide Permits

Notification Procedure

When required by the terms of a nationwide permit, the landowner (applicant) or a designated agent for the applicant must notify the U.S. Army Corps of Engineers (Corps) with a Pre-Construction Notification (PCN) as early as possible and prior to initiating any activities subject to regulation under Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act. All PCN’s must be in writing and must include project specific information. The standard permit application form (Form ENG 4345) may be used for the notification, but must clearly indicate that it is a PCN. All PCN’s must include the information required in items 1-5 below:

1. Full name, mailing address, and telephone number(s) of the applicant;
2. Identification of nationwide permit(s) for which the applicant is seeking authorization;
3. Copy of the appropriate portion of a U.S. Geological Survey map with the location of the proposed project labeled;
4. Any other information necessary to determine whether the criteria of the requested nationwide permit(s) will be satisfied, including but not limited to the following:
   a. statement on project purpose and need;
   b. brief project description;
   c. project drawings with appropriate dimensions including lengths, areas, and volumes;
   d. statement of potential environmental effects the project may cause; and
   e. photographs of the project area (recommended but not required).
5. For Nationwide Permits 14, 18, 21, 26, 29, 31, 34, and 38, the PCN must also include a delineation of affected special aquatic sites, including wetlands. Delineations must be prepared in accordance with Corps Wetland Delineation Manual dated January 1987. The applicant may request the Corps to perform a delineation. However, there may be some delay if the Corps does the delineation. Furthermore, a PCN is not considered to be complete until a wetland delineation has been completed and submitted to the Corps. In order to avoid delays, the applicant may hire a qualified consultant to complete a delineation. A list of consultants with the ability to complete delineations is available.

All Pre-Construction Notification’s for activities in the State of Wyoming must be sent to:

Mr. Matthew A. Bilodeau
U.S. Army Corps of Engineers
Wyoming Regulatory Office
2232 Dell Range Boulevard, Suite 210
Cheyenne, Wyoming 82009-4942

Questions concerning PCN procedure should be directed to Mr. Bilodeau, Mr. Thomas Johnson, or Mr. Chandler Peter in the Wyoming Regulatory Office at the above address or by phone at (307) 772-2300.
COMPLIANCE CERTIFICATION

The purpose of this form is to document the completion of activities authorized under a Department of the Army Permit. Upon completion of the authorized activities and any mitigation required as a condition of the authorization, the permittee must complete and sign this form and return it to the following address within 30 days as required by General Condition 14:

U.S. Army Corps of Engineers
Wyoming Regulatory Office
2232 Dell Range Boulevard, Suite 210
Cheyenne, Wyoming 82009-4942

Please complete the following information:

1. Name of Permittee:
2. County:
3. Application Number:
4. Date of Issuance:
5. Description of Authorized Activities:

6. Date Construction Began:
7. Name, address, and phone number of Contractor (if applicable):

8. Date Construction Completed:
9. Was Mitigation Required (yes or no):
   If yes, Date Mitigation was Completed:
10. OPTIONAL - Are photographs of the project area enclosed (yes or no):

Please note that authorized activities are subject to inspection by a U.S. Army Corps of Engineers representative. Failure to comply with the terms and conditions of the permit could result in permit suspension, modification, or revocation.

I hereby certify that the activities authorized by the permit referenced above have been completed in accordance with the terms and conditions of the referenced permit and that all mitigation required as a condition of the permit was completed in accordance with the mitigation guidelines provided.

Signature of Permittee
Statement of Basis

New

In 1972, the federal Clean Water Act (CWA) was amended to provide that the discharge of any pollutants from a point source into surface waters of the United States had to be regulated through the issuance of a National Pollutant Discharge Elimination System (NPDES) permit. Under the CWA, states were given the authority to assume "primacy" to administer the NPDES program and issue such permits. The State of Wyoming obtained primacy in 1974.

Chapter 2 of the Wyoming Department of Environmental Quality, Water Quality Division Rules and Regulations states that owners or operators of any point source within the State of Wyoming who proposes to commence discharging wastes into the waters of the state must file an NPDES permit application and obtain an NPDES permit. Surface waters of the state have been broadly defined as all permanent and intermittent defined drainages and lakes, reservoirs, and wetlands which are not manmade retention ponds used for the treatment of municipal, agricultural, or industrial waste; and all other bodies of surface water, either public or private, which are wholly or partially within the boundaries of the state. Discharging pollutants to areas, such as fields or roads, which do not satisfy the definition of a surface water of the state are not regulated under the NPDES program but may fall under the jurisdiction of another program.

It has been determined that several types of short-term activities require coverage under an NPDES permit. In order to permit these temporary discharges in a timely manner, the Wyoming Department of Environmental Quality (DEQ) has issued a general permit for temporary discharges. The general permit is an administrative "tool" which can be used to issue a large number of permits with a relatively small administrative burden. Under the general permitting approach, a single generic permit is issued to cover a large number of facilities conducting similar activities within a common geographic area.

This general permit for temporary discharges authorizes the discharge of wastewaters to surface waters of the state associated with: hydrostatic testing of pipes, tanks or other similar vessels, disinfection of potable water lines, pump tests of water wells, construction dewatering, treatment of gasoline or diesel contaminated ground water and the discharge of wastewater from swimming pools.

The general permit does not cover activities such as discharges of sanitary wastewater, acids, toxic pollutants, hazardous substances, de-icing chemicals, and wastewater associated with washing of mixing drums or chutes on concrete or asphalt trucks. In addition, flushing, testing, and dewatering of water mains...
do not require coverage under this permit provided the water is not superchlorinated or no additional chemicals are added. However, the DEQ strongly suggests that Best Management Practices (BMPs) be implemented when flushing the water mains to lower potential chlorine concentrations in the wastewater. Suggested BMPs include detaining or aerating the wastewater prior to discharge to the surface. Part I.A.1 and Part I.A.5 of the general permit clearly state the activities that are and are not covered under the general permit.

In order to request coverage under the general permit for temporary discharges, the applicant must complete and submit a "Notice of Intent" (NOI) to the DEQ. The DEQ will review the NOI and determine if the proposed activity is eligible for coverage under this permit or if the activity must be covered under an individual permit. If the proposed activity is eligible for coverage under the general permit, the DEQ will send the operator notification, through a written facility certification form, that coverage has been granted. The facility certification form will also establish effluent limitations and monitoring requirements.

Depending upon the type of wastewater discharged, the quality of the effluent discharged shall, at a minimum, meet the limitations listed below. For a complete listing of the effluent limitations, refer to Part I.B.1 of the general permit. It may be determined that more stringent effluent limitations must be imposed in order to protect the beneficial uses of the stream. This will be determined on a case by case basis and will be established in the facility certification form.

**Effluent associated with disinfection of potable water lines.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>The concentration shall not exceed a monthly average of 30 mg/l, a weekly average of 45 mg/l or a daily maximum of 90 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L</td>
<td>The concentration shall be determined on a case by case basis but will not exceed 1.0 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
</tbody>
</table>
### Effluent associated with pump testing of water wells.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>The concentration shall not exceed a monthly average of 30 mg/l, a weekly average of 45 mg/l or a daily maximum of 90 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Dissolved Solids, mg/L</td>
<td>The concentration shall not exceed 5000 mg/l unless the discharge is to the Colorado River Basin. In that case, the salt load may not exceed one ton per day or 350 tons per year.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

### Effluent associated with construction dewatering.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>The concentration shall not exceed a monthly average of 30 mg/l, a weekly average of 45 mg/l or a daily maximum of 90 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease <em>2</em></td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>Turbidity</td>
<td>A discharge to Class 2 water shall not result in a turbidity net increase of 10 nephelometric turbidity units (NTUs). A discharge to Class 2ww or Class 3 waters shall not result in a turbidity net increase of 15 NTUs.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>
Wastewater produced from the draining, cleaning and filter backwash of swimming pools, spas, hot tubs, and similar structures including water slides and water theme amusement parks.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L</td>
<td>The concentration shall be determined on a case by case basis but will not exceed 1.0 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Turbidity</td>
<td>A discharge to Class 2 water shall not result in a turbidity net increase of 10 NTUs. A discharge to Class 2ww or Class 3 waters shall not result in a turbidity net increase of 15 NTUs.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

Wastewater produced from the treatment of gasoline or diesel contaminated ground or surface water from LAUST remediation activities.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Monthly</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Benzene, ug/L</td>
<td>For direct discharges, the concentration shall not exceed 5 ug/l. For discharges to storm sewers, the concentration shall not exceed 50 ug/l.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total BETX, ug/L (3)</td>
<td>For direct discharges, the concentration shall not exceed 100 ug/l. For discharges to storm sewers, the concentration shall not exceed 750 ug/l.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Parameter</td>
<td>Effluent Limitation</td>
<td>Frequency</td>
<td>Sample Type</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Oil and Grease ( (2) )</td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Monthly</td>
<td>Visual</td>
</tr>
<tr>
<td>Specific Conductance</td>
<td>The concentration shall not exceed 7500 mg/l.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons ( (4) )</td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
</tbody>
</table>

**Hydrostatic test water from testing of pipes, tanks or other vessels.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>The concentration shall not exceed a monthly average of 30 mg/l, a weekly average of 45 mg/l or a daily maximum of 90 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Dissolved Solids, mg/L</td>
<td>The concentration shall not exceed 5000 mg/l unless the discharge is to the Colorado River Basin. In that case, the salt load may not exceed one ton per day or 350 tons per year.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Benzene, ug/L ( (1) )</td>
<td>For direct discharges, the concentration shall not exceed 5 ug/l. For discharges to storm sewers, the concentration shall not exceed 50 ug/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total BETX, ug/L ( (1)(3) )</td>
<td>For direct discharges, the concentration shall not exceed 100 ug/l. For discharges to storm sewers, the concentration shall not exceed 750 ug/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease ( (2) )</td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>Parameter</td>
<td>Effluent Limitation</td>
<td>Frequency</td>
<td>Sample Type</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L ((5))</td>
<td>The concentration shall be determined on a case by case basis but will not exceed 1.0 mg/L.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons ((1)(4))</td>
<td>The concentration shall not exceed 10 mg/L.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
</tbody>
</table>

**FOOTNOTES:**

1. This parameter shall be analyzed if the discharge is from hydrostatic test water from the testing of used pipes, tanks, or other similar vessels which have or may have contained petroleum products.

2. In the event that an oil sheen or floating oil is observed in the discharge, a grab sample shall be immediately taken, analyzed and reported. The sample shall not exceed 10 mg/L.

3. BETX shall be measured as the sum of benzene, ethyl benzene, toluene, and xylene. EPA methods 602, 624, or 1624 shall be used for the measurement of benzene, ethyl benzene, and toluene. EPA method 8260 or an equivalent method shall be used for the measurement of xylene including ortho-, meta-, and para-xylene. (Note: Depending on Regional/State policy, EPA method 8260 may be used as a substitute or equivalent for the CWA methods 602, 624, or 1624 required under the CWA in 40 CFR Part 136.)

4. EPA method 8015 shall be used for the measurement of total petroleum hydrocarbons.

5. Total residual chlorine shall be analyzed if chlorinated water is used during the hydrostatic test.

Once the temporary discharge has ceased, a Notice of Termination must be submitted to the DEQ.

Water Quality Division  
Department of Environmental Quality  
April 24, 1997  
Modified October 21, 1997
AUTHORIZATION FOR TEMPORARY DISCHARGES UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, (hereinafter referred to as "the Act"), and the Wyoming Environmental Quality Act, facilities located within the State of Wyoming which are or may discharge wastewater from temporary discharges associated with hydrostatic testing, disinfection of potable water lines, pump testing of water wells, construction dewatering, wastewater associated with swimming pools and wastewater associated with LAUST remediation projects, are hereby authorized to discharge to surface waters of the State of Wyoming in accordance with the requirements of this permit.

This general NPDES permit is issued under the provisions of Wyoming Water Quality Rules and Regulations Chapters 1, 2, and 18.

This permit becomes effective on the date of issuance.

This permit shall expire November 2, 2002.

Administrator - Water Quality Division

Date

Director - Department of Environmental Quality

Date
# Table of Contents

## PART I

### A. AUTHORIZATION TO DISCHARGE

1. Coverage Under This Permit ........................................... 1
2. Request for Authorization ........................................... 2
3. Criteria for Coverage Under General Permit ......................... 3
4. Definitions .................................................................. 4
5. Terms, Conditions and Specific Limitations ......................... 7

### B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Effluent Limitations .................................................. 9
2. Self-Monitoring Requirements ....................................... 10
3. Daily Logs ................................................................ 13
4. Reporting ................................................................... 13
5. Representative Sampling .............................................. 14
6. Test Procedures ........................................................ 14
7. Recording of Results .................................................. 14
8. Additional Monitoring by Permittee ................................. 15
9. Records Retention ..................................................... 15
10. Penalties for Tampering .............................................. 15

## PART II

### A. MANAGEMENT REQUIREMENTS

1. Changes .................................................................. 16
2. Noncompliance Notification .......................................... 16
3. Facilities Operation ................................................... 17
4. Adverse Impact ......................................................... 17
5. Bypass of Treatment Facilities ...................................... 17
6. Upset Conditions ........................................................ 18
7. Removed Substances .................................................. 19
8. Power Failures ........................................................ 19
9. Duty to Comply ........................................................ 19
10. Duty to Mitigate ....................................................... 19
11. Signatory Requirements ............................................. 19

### B. RESPONSIBILITIES

1. Inspection and Entry ................................................... 20
2. Transfer of Ownership or Control ................................... 21
3. Availability of Reports ................................................. 21
4. Toxic Pollutants ........................................................ 21
5. Changes in Discharge of Toxic Substances ....................... 21
6. Civil and Criminal Liability ........................................... 22
7. Need to Halt or Reduce Activity not a Defense ................ 22
8. Oil and Hazardous Substance Liability ............................ 22
9. State Laws .............................................................. 22
Table of Contents (continued)

10. Property Rights .................................................. 23
11. Duty to Reapply .................................................. 23
12. Duty to Provide Information .................................... 23
13. Other Information ................................................ 23

PART III ........................................................................ 24
A. OTHER REQUIREMENTS .............................................. 24
   1. Flow Measurement ................................................ 24
   2. 208(b) Plans ....................................................... 24
   3. Reopener Provision ............................................... 24
   4. Permit Modification ............................................. 24
   5. Toxicity Limitation - Reopener Provision ................. 25
   6. Severability ....................................................... 25
   7. Penalties for Falsification of Reports ...................... 25

APPENDIX A
NOTICE OF INTENT .................................................. 27

APPENDIX B
TERMINATION NOTICE ............................................. 33
PART I

A. AUTHORIZATION TO DISCHARGE

1. Coverage Under This Permit

a. Permit Area

This permit covers all areas within the State of Wyoming except areas within the Wind River Indian Reservation where the state does not have jurisdiction.

b. Activities Covered Under This Permit

Under this general permit, facilities may be granted authorization to discharge process generated wastewaters, as defined in Part I.A.1.b.(1) through (7), into surface waters of the State of Wyoming. The water discharged from any of these activities must be relatively uncontaminated and must not have the potential to contribute non-conventional or toxic pollutant loadings to the receiving stream. The discharge must be of short duration, lasting no longer than one year, except for Part I.A.1.b.(6) which is authorized for the duration of the remediation activities or until this general permit expires.

(1) Discharge of hydrostatic test water from the testing of new or used pipes, tanks, or other similar vessels, subject to the conditions of this permit.

(2) Discharge of effluent associated with disinfection of potable water lines, subject to the conditions of this permit.

(3) Discharge of effluent associated with pump testing of water wells, subject to the conditions of this permit.

(4) Discharge of effluent associated with construction dewatering, subject to the conditions of this permit.

(5) Wastewater produced from the draining, cleaning and filter backwash of swimming pools, spas, hot tubs, and similar structures including water slides and water theme amusement parks, subject to the conditions of this permit.

(6) Wastewater produced from the treatment of gasoline or diesel contaminated ground or surface water from leaking aboveground and underground storage tanks, provided no other contaminants are present, subject to the conditions of this permit.
(7) Discharge of wastewaters, other than the types listed above, when negligible pollution concerns are present, subject to the discretion of the Administrator and subject to the conditions of this permit.

2. Request for Authorization

a. Notice of Intent

In order to be considered eligible for authorization to discharge wastewater under the terms and conditions of this permit, the owner, operator, and/or authorized agent of any facility desiring to discharge wastewater must submit a Notice of Intent (NOI) to the Administrator on a form provided by the Administrator (See Appendix A). The NOI must be submitted at least 30 days prior to the first anticipated date of discharge and at a minimum must contain the following information:

(1) Name, address, and descriptive location of the facility, including quarter section, township and range, or latitude and longitude;

(2) Name, address and phone number of principal in charge of operation of the facility and the owner;

(3) Names of the drainage and water body receiving or potentially receiving the discharge (including irrigation ditches, intermittent streams and dry drainages);

(4) Distance the effluent must travel before reaching the live waters (live water is any stream, lake or other water body which contains water year-around);

(5) A brief description of the type of activity resulting in the discharge, including the anticipated date for commencement of the discharge, expected duration of the discharge, expected termination date of the discharge, average and maximum flow rate of the discharge, the source of water which is to be discharged and the total expected volume of the discharge;

(6) A brief description of the type of water treatment process to be employed (including recycling or reuse);

(7) A map and/or schematic diagram showing the area of the activity, location of the discharge, and the location of any treatment system employed;

(8) A list of all potential pollutants and the expected concentrations in the wastewater to be discharged;

(9) If the discharge is to a storm sewer system, ditch, or other man made conveyance, approval from the owner of the system must be obtained, and attached to the NOI.
(10) A description of the erosion control measures that will be implemented to prevent significant damage to or erosion of the receiving water channel.

In addition, for Hydrostatic Testing Related Discharges, the following must be included:

(11) The type of vessel being tested (e.g., pipe, tank, etc.);
(12) The type of material from which the vessel is constructed;
(13) Whether the vessel has been previously used or is of virgin material; and,
(14) If used, a description of the fluid material normally contained and/or transported through the vessel.

The NOI and any supplemental information shall be submitted to:

Wyoming Department of Environmental Quality
Water Quality Division - NPDES Program
122 West 25th Street (4th Floor)
Cheyenne, Wyoming 82002

The Administrator shall provide the applicant written confirmation of approval or disapproval for coverage under this permit. In the case of disapproval, the Administrator shall specify in writing the reason(s) for the disapproval and action(s) that the applicant must take to gain approval.

An NOI must be filed and coverage must be granted under this permit prior to the start of the discharge.

3. Criteria for Coverage Under General Permit

a. Evaluation of whether or not an individual permit may be required instead of a general permit, or whether stricter and/or additional effluent limits and/or monitoring are required is subject to one or more of the following criteria:

(1) Will the discharge result in exceedence of the Total Maximum Daily Load (TMDL) established for any pollutant in the receiving water;
(2) Is the receiving water listed as an impaired waterbody in need of TMDL development on the most recent 303(d) list;
(3) Beneficial uses of the receiving water may be adversely impacted;
(4) The need to preserve high quality waters;
(5) Addition of chemicals (such as chlorine or flocculent) to water prior to discharge;
(6) Failure of the effluent to pass a Whole Effluent Toxicity (WET) test, when required;
(7) Potential for the effluent to cause a violation(s) of water quality standards in the receiving water(s);
(8) Differences in ambient water quality, including temperature and flow, between the effluent and receiving waters;
(9) An anti-degradation review showing that the discharge would cause unacceptable degradation of the receiving waters;
(10) Total anticipated volume of the discharge;
(11) Surface water classification (discharges to Class 1 surface waters are not authorized under this permit); and/or
(12) Coverage under a more specific permit (those facilities already covered under a more specific general permit and/or an individual permit will not be granted coverage under this permit).

4. **Definitions**

**Concentration Values**

a. "Daily Maximum (mg/l)" - The highest single reading from any grab or composite sample collected during the reporting period.

b. "Monthly Average (mg/l)" - The arithmetic mean of all composite and/or grab samples collected during a calendar month.

c. "Weekly Average (mg/l)" - The arithmetic mean of all composite and/or grab samples collected during any week. A week begins at 12:01 a.m. Sunday morning and ends at 12:00 midnight Saturday evening.

**Quantity Values**

d. "Daily Maximum" - The highest single daily quantity reading (See Calculations below) recorded during the reporting period.

e. "Monthly Average" - The arithmetic mean of all the daily quantity readings (See Calculations below) recorded during a calendar month.
f. “Weekly Average” - The arithmetic mean of all the daily quantity readings (See Calculations below) recorded during a week. A week begins at 12:01 a.m. Sunday morning and ends at 12:00 midnight Saturday evening.

Flow Values

g. “Daily Flow” - The flow volume recorded on any single day. The daily flow volume may be determined by using an instantaneous reading (if authorized by this permit) or a continuous recorder.

h. “Daily Maximum Flow” - The highest single daily flow reading recorded during a reporting period.

i. “Monthly Average Flow” - The arithmetic mean of all daily flow values recorded during a calendar month.

j. “Weekly Average Flow” - The arithmetic mean of all daily flow values recorded during a week. A week begins at 12:01 a.m. on Sunday morning and ends at 12:00 midnight Saturday evening.

Calculations

k. “Daily Quantity (kg/day)” - The quantity, in kilograms per day, of pollutant discharged on a single day. The daily quantity shall be calculated by multiplying the composite or grab sample concentration value for that day in milligrams/liter (mg/l) times the flow volume (in millions of gallons per day - MGD) for that day times 3.78. If a flow volume reading for the day the sample is collected is not available, the average flow volume reading for the entire reporting period shall be used.

l. “Daily Quantity (#/day)” - The quantity, in number per day, of bacteria or other pollutants discharged on a single day. The number per day shall be calculated by multiplying the composite or grab sample result for that day, in number per 100 milliliters (#/100 ml), times the flow volume (in millions of gallons per day - MGD) times 3.78 X 10^7. If a flow volume reading for the day the sample is collected is not available, the average flow volume reading for the entire reporting period shall be used.

Miscellaneous

m. “Administrator” means the Administrator of the Water Quality Division (WQD), Wyoming Department of Environmental Quality or his or her authorized agent.

n. “Best Management Practices” (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the state. BMPs also include treatment requirements,
operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

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

p. A "composite" sample, for monitoring requirements, is defined as a minimum of four grab samples collected at equally spaced two hour intervals and proportioned according to flow.

q. "CWA" means the federal Clean Water Act or the Federal Water Pollution Control Act.

r. "Ephemeral Stream" means a stream which flows only in direct response to precipitation in the immediate watershed or in response to snow melt, and which has a channel bottom that is always above the prevailing water table.

s. "GPM," for monitoring requirements, is defined as gallons per minute.

t. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

u. "Hazardous Constituents" is defined as those constituents listed in Chapter 2, Appendix H of the Wyoming Department of Environmental Quality Hazardous Waste Rules and Regulations or any approved subset thereof.

v. "Hazardous Substance" is defined as any substance, other than oil, which, when discharged in any quantities into waters of the U.S., presents an imminent and substantial danger to the public health or welfare, including but not limited to fish, shellfish, wildlife, shorelines and beaches (Section 311 of the CWA); identified by EPA as the pollutants listed under 40 CFR Part 116.

w. An "impaired waterbody" is defined as a waterbody in which the beneficial uses are not fully attained.

x. An "instantaneous" measurement for monitoring requirements is defined as a single reading, measurement, or observation.

y. An "intermittent stream" means a stream or part of a stream that is below the local water table for some part of the year, but is not a perennial stream.

z. "MGD," for monitoring requirements, is defined as million gallons per day.

aa. "Net" value, if noted under Effluent Characteristics, is calculated on the basis of the net increase of the individual parameter over the quantity of that same parameter present in the intake water measured prior to any contamination or use in the process of this fa-
ility. Any contaminants contained in any intake water obtained from underground wells shall not be adjusted for as described above and, therefore, shall be considered as process input to the final effluent. Limitations in which "net" is not noted are calculated on the basis of gross measurements of each parameter in the discharge, irrespective of the quantity of those parameters in the intake waters.

bb. "Non-conventional Pollutants” are all pollutants that are not included in the list of conventional or toxic pollutants as described in 40 CFR Part 401.

cc. “Surface Waters of the State of Wyoming” is defined as all permanent and intermittent defined drainages and lakes, reservoirs, and wetlands which are not manmade retention ponds used for the treatment of municipal, agricultural, or industrial waste; and all other bodies of surface water, either public or private, which are wholly or partially within the boundaries of the state. Nothing in this definition is intended to expand the scope of the Environmental Quality Act as limited in W.S. 35-11-1104.

dd. “Toxic Pollutant” is defined as pollutants or combination of pollutants, including disease-causing agents, which after discharged and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will, on the basis of information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring. Toxic pollutants also include those pollutants listed by the Administrator under CWA Section 307 (a)(1) or any pollutant listed under Section 405(d) which related to sludge management.

e. "Total Maximum Daily Load (TMDL)" is defined as the amount of pollutant, or property of a pollutant, from point, nonpoint, and natural background sources, that may be discharged to a water quality-limited receiving water. Any pollutant loading above the TMDL results in violation of applicable water quality standards.

5. **Terms, Conditions and Specific Limitations**

a. **General Limitations**

(1) Discharges are not allowed that include soaps, degreasers, detergents, surfactants, antifreeze, deicers, or any hazardous constituents and hazardous substances under this permit unless the permit establishes an effluent limit for that constituent.

(2) No chemicals are to be added to the discharge unless permission for the use of a specific chemical is granted by DEQ/WQD. It is the responsibility of the applicant to provide this information. Additional limitations and monitoring may be imposed in these cases.
(3) Discharges are not allowed that include solvents, acids, caustics, halogenated hydrocarbons, biocides, or chemicals which are not readily biodegradable and which could adversely affect water quality or aquatic life.

(4) Discharges from permanent dairy operations, livestock or poultry production operations, animal feeding operations, permanent or long term stable or kennel facilities, or animal waste storage or handling facilities are not covered under this permit.

(5) Discharges are not allowed which contain wastewater from washing of the interior of bulk tanker trucks, areas in which aircraft de-icing chemicals are used, in-stream boat washing, washing the mixing drums or chutes on concrete or asphalt trucks, or hydro blasting (the use of abrasive slurries for cleaning purposes or the removal of paint).

(6) There shall be no discharge of sanitary wastewater from toilets, septic tanks, or related facilities.

(7) There shall be no discharge of solid animal waste, food waste or vegetative wastes (grass, leaves, manure, garbage, etc.).

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

(9) Bulk storage structures for fuels and other chemicals shall have adequate protections so as to contain all spills and prevent any spilled material from entering the effluent stream or waters of the State.

(10) This permit does not constitute authorization under 33 U.S.C. 1344 (Section 404 of the Clean Water Act) of any stream dredging or filling operations.

(11) All waters shall be discharged in a manner to prevent erosion, scouring, or damage to stream banks, stream beds, or ditches.

(12) In the case of a hydrostatic discharge, the permittee shall provide telephone notification to DEQ/WQD at (307) 777-7093 at least 24 hours prior to any testing discharge.

(13) This permit does not authorize discharges associated with dewatering activities that contain toxic pollutants or hazardous substances.

(14) The discharge of chlorinated water (including potable tap water) shall not be allowed unless it can be demonstrated that the chlorine substantially dissipates prior to discharge and/or possesses no potential for toxic impacts to live waters.
(15) The permittee must notify the permitting authority of the termination of the discharge by submitting a Notice of Termination (Appendix B).

(16) The permitting authority may, if conditions warrant it, place stricter and/or additional limits and/or monitoring requirements in an individual discharger’s authorization to discharge under this general permit to assure appropriate protection of the receiving waters.

(17) There shall be no further water quality degradation by point source discharges, other than from dams, to Class 1 waters.

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Effective immediately the quality of effluent discharged by the facility shall, at a minimum, meet the limitations as set forth below. The Administrator may impose additional or more stringent effluent limitations as decided on a case by case basis.

1. Effluent Limitations

   a. The concentration of total suspended solids (TSS) shall not exceed a monthly average of 30 mg/L, a weekly average of 45 mg/L, or a daily maximum of 90 mg/L.

   b. The pH of the discharged waters shall not be less than 6.5 nor more than 9.0 standard units.

   c. The concentration of oil and grease in any single sample shall not exceed 10 mg/L nor shall there be a visible sheen in the discharge.

   d. The concentration of total petroleum hydrocarbons in any single sample shall not exceed 10 mg/L.

   e. For direct discharges to surface waters of the State of Wyoming, the concentration of benzene and total BTEX (benzene, toluene, ethyl benzene, and xylene) in any single sample shall not exceed 5 ug/L and 100 ug/L respectively.

   f. For discharges to a storm sewer system which will not result in an in-stream concentration of benzene, toluene or ethyl benzene in excess of 1.2 ug/L, 6.8 mg/L and 3.1 mg/L respectively, the concentration of benzene and BTEX in any single sample shall not exceed 50 ug/L and 750 ug/L respectively.

   g. For discharges to Class 2 waters the discharge shall not result in a turbidity increase of more than 10 nephelometric turbidity units (NTUs).

   h. For discharges to Class 2 WW and all Class 3 waters the discharge shall not result in a turbidity increase of more than 15 NTUs.
I. The concentration of total dissolved solids (TDS) shall not exceed 5000 mg/L unless the discharge is to the Colorado River Basin. In that case, the salt load may not exceed one ton per day or 350 tons per year.

j. For discharges to all streams, except dry draws, intermittent streams, and ephemeral streams that do not contain water, the chlorine concentration shall be evaluated and established by the DEQ but will never exceed 1.0 mg/l. The effluent limitation for total residual chlorine will be established based upon information that is submitted by the applicant and reported on the NOI, data provided by the U.S. Geological Survey, Chapter 1 of the Wyoming Department of Environmental Quality Rules and Regulations, and other pertinent information. The effluent limit for total residual chlorine shall be specified in the written facility certification from the DEQ.

k. The concentration of specific conductance in any grab sample shall not exceed 7500 micromhos/cm.

2. Self-Monitoring Requirements

Samples shall be taken as often as necessary to provide representative information as to the nature and volume of the discharge(s). At a minimum, the following constituents shall be monitored at the frequency indicated for each type of discharge. For discharges of shorter duration than the listed sampling frequency, a minimum of one sample of each constituent must be collected during the discharge. The Administrator may impose additional monitoring requirements as decided on a case by case basis. The self monitoring requirements will be specified in the facility certification.

Samples taken in compliance with monitoring requirements shall be taken following the final treatment unit and prior to admixture of the effluent with any other waste stream, body of water, or substance.

a. Hydrostatic test water from the testing of pipes, tanks, or other similar vessels.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Dissolved Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s. u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Benzene, ug/L (1)</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total BETX, ug/L (1x3)</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease (2)</td>
<td>Daily</td>
<td>Visual</td>
</tr>
</tbody>
</table>
b. Effluent associated with disinfection of potable water lines.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

c. Effluent associated with pump testing of water wells.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Dissolved Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

d. Effluent associated with construction dewatering.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Daily</td>
<td>Visual</td>
</tr>
</tbody>
</table>
e. Wastewater produced from the draining, cleaning and filter backwash of swimming pools, spas, hot tubs, and similar structures including water slides and water theme amusement parks.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

f. Wastewater produced from the treatment of gasoline or diesel contaminated ground or surface water from LAUST remediation activities.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, MGD</td>
<td>Monthly</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Benzene, ug/L</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total BETX, ug/L (3)</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons (4)</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Specific Conductance</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease (2)</td>
<td>Monthly</td>
<td>Visual</td>
</tr>
</tbody>
</table>

FOOTNOTES:

(1) This parameter shall be analyzed if the discharge is from hydrostatic test water from the testing of used pipes, tanks, or other similar vessels which have or may have contained petroleum products.

(2) In the event that an oil sheen or floating oil is observed in the discharge, a grab sample shall be immediately taken, analyzed and reported. The sample shall not exceed 10 mg/L.

(3) BETX shall be measured as the sum of benzene, ethyl benzene, toluene, and xylene. EPA methods 602, 624, or 1624 shall be used for the measurement of benzene, ethyl benzene, and toluene. EPA method 8260 or an equivalent method
shall be used for the measurement of xylene including ortho-, meta-, and para-xylene. (Note: Depending on Regional/State policy, EPA method 8260 may be used as a substitute or equivalent for the CWA methods 602, 624, or 1624 required under the CWA in 40 CFR Part 136.)

(4) EPA method 8015 shall be used for the measurement of total petroleum hydrocarbons.

(5) Total residual chlorine shall be analyzed if chlorinated water is used during the hydrostatic test.

3. **Daily Logs**

For all activities covered under this permit, with the exception of the activity listed in Part I.A.1.b.(6), the permittee shall maintain a daily log relating to the authorized discharge(s). The log shall contain:

a. Flow information and data;

b. Sample results;

c. Records of visual observations;

d. Notations on any problems relating to treatment of the discharge; and

e. A brief description of any actions taken with regard to problems identified.

The permittee shall maintain the log in accordance with proper record retention procedures that are described in Part I.B.9 and shall make the log available for inspection, upon request, by authorized representatives of the Wyoming Department of Environmental Quality, Water Quality Division.

4. **Reporting**

For all activities listed in Part I.A.1.b (1) through (7), except Part I.A.1.b (6), copies of all effluent monitoring results obtained during the discharge shall be submitted to the Wyoming Department of Environmental Quality after the completion of the discharge.

For activities listed in Part I.A.1.b (6) only, effluent monitoring results obtained during the previous three months shall be summarized and reported on a Discharge Monitoring Report Form and submitted to the Wyoming Department of Environmental Quality.

Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the Signatory Requirements (see Part II.A.11), and submitted to:
If no discharge occurs during the reporting period, “no discharge” shall be reported. If the discharge is intermittent during the reporting period, sampling shall be done while the facility is discharging.

Nothing in this permit in any way relieves the permittee from complying with water quality standards as defined in Wyoming Department of Environmental Quality Rules and Regulations and/or the Environmental Quality Act or any other local, state, or federal regulations.

5. **Representative Sampling**

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

6. **Test Procedures**

Test procedures for the analysis of pollutants, collection of samples, sample containers, sample preservation, and holding times, shall conform to regulations published pursuant to 40 CFR, Part 136, unless other test procedures have been specified in this permit.

7. **Recording of Results**

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

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

b. The dates and times the analyses were performed;

c. The person(s) who performed the analyses and collected the samples;

d. The analytical techniques or methods used; and

e. The results of all required analyses including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine the results.
8. **Additional Monitoring by Permittee**

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Daily Logs and/or the Discharge Monitoring Report Form. Such increased frequency shall also be indicated.

9. **Records Retention**

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Administrator at any time. Data collected on site, copies of Discharge Monitoring Reports and/or Daily Log and a copy of this NPDES permit must be maintained on site during the duration of activity at the permitted location.

10. **Penalties for Tampering**

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

A. MANAGEMENT REQUIREMENTS

1. Changes

The permittee shall give notice to the Administrator as soon as possible of any physical alterations or additions to the permitted facility. Notice is required when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR 122.29(b); or

b. The alteration or addition could change the nature or increase the quantity of pollutants discharged.

2. Noncompliance Notification

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

b. The permittee shall report any unanticipated noncompliance which may seriously endanger health or the environment as soon as possible, but no later than 24 hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Quality Division, Wyoming Department of Environmental Quality at (307) 777-7781.

c. The following occurrences of unanticipated noncompliance shall be reported by telephone to the Water Quality Division, NPDES Section, (307) 777-7781 by the first workday following the day the permittee became aware of the circumstances.

(1) Any unanticipated bypass which exceeds any effluent limitation in the permit;

(2) Any upset which exceeds any effluent limitation in the permit; or

(3) Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit.

d. A written submission shall be provided within five days of the time that the permittee becomes aware of a noncompliance circumstance as described in item c. above.

The written submission shall contain:

(1) A description of the noncompliance and its cause;
(2) The period of noncompliance, including exact dates and times;

(3) The estimated time noncompliance is expected to continue if it has not been corrected, and

(4) Steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance.

e. The Administrator may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Quality Division, NPDES Section, (307) 777-7781.

f. Reports shall be submitted to the addresses in Part I under Reporting.

3. **Facilities Operation**

The permittee shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.

4. **Adverse Impact**

The permittee shall take all reasonable steps to minimize any adverse impact to waters of the state resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. **Bypass of Treatment Facilities**

a. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs b. and c. of this section. Return of removed substances to the discharge stream shall not be considered a bypass under the provisions of this paragraph.

b. Notice:

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice at least 60 days before the date of the bypass.
(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.A.2.

c. Prohibition of bypass.

Bypass is prohibited and the Administrator may take enforcement action against a permittee for a bypass, unless:

(1) The bypass was unavoidable to prevent loss of life, personal injury or severe property damage;

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

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

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

6. Upset Conditions

a. An upset constitutes an affirmative defense to an action brought for noncompliance with technology-based permit effluent limitations if the requirements of paragraph b. of this section are met.

b. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that:

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

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

(3) The permittee submitted notice of the upset as required under Part II.A.2; and

(4) The permittee complied with any remedial measures required under Part II.A.4.

c. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.
7. **Removed Substances**

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

8. **Power Failures**

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall take such precautions as are necessary to maintain and operate the facility under its control in a manner that will minimize upsets and ensure stable operation until power is restored.

9. **Duty to Comply**

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the federal act and the Wyoming Environmental Quality Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Administrator advance notice of any planned changes at the permitted facility or of any activity which may result in permit noncompliance.

10. **Duty to Mitigate**

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

11. **Signatory Requirements**

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

a. All permit applications shall be signed as follows:

   (1) For a corporation: by a responsible corporate officer;

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

   (3) For a municipality, state, federal or other public agency: by either a principal executive officer or ranking elected official.
b. All reports required by the permit and other information requested by the Administrator shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described above and submitted to the Administrator; and

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

c. If an authorization under paragraph II.A.11.b. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph II.A.11.b. must be submitted to the Administrator prior to or together with any reports, information or applications to be signed by an authorized representative.

d. Any person signing a document under this section shall make the following certification:

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

B. RESPONSIBILITIES

1. Inspection and Entry

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

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

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
c. Inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit, and

d. Sample or monitor, at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the federal act, any substances or parameters at any location.

2. **Transfer of Ownership or Control**

   In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Administrator.

3. **Availability of Reports**

   Except for data determined to be confidential under Section 308 of the federal act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Wyoming Department of Environmental Quality and the Regional Administrator of the Environmental Protection Agency. As required by the federal act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the federal act.

4. **Toxic Pollutants**

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

5. **Changes in Discharge of Toxic Substances**

   Notification shall be provided to the Administrator as soon as the permittee knows of, or has reason to believe:

   a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   (1) One hundred micrograms per liter (100 ug/l),

   (2) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2, 4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
(3) Five times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the director of the Environmental Protection Agency in accordance with 40 CFR 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 μg/l);

(2) One milligram per liter (1 mg/l) for antimony.

(3) Ten times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Director of the Environmental Protection Agency in accordance with 40 CFR 122.44(f).

6. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" (Part II.A.5) and "Power Failures" (Part II.A.8), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

8. Oil and Hazardous Substance Liability

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

9. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties established pursuant to any applicable state or federal law or regulation.
10. **Property Rights**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights nor any infringement of federal, state or local laws or regulations.

11. **Duty to Reapply**

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

12. **Duty to Provide Information**

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

13. **Other Information**

When the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or any report to the Administrator, it shall promptly submit such facts or information.
PART III

A. OTHER REQUIREMENTS

1. Flow Measurement

At the request of the Administrator, the permittee must be able to show proof of the accuracy of any flow measuring device used in obtaining data submitted in the monitoring report. The flow measuring device must indicate values of within plus or minus ten percent of the actual flow being measured.

2. 208(b) Plans

This permit may be modified, suspended or revoked to comply with the provisions of any 208(b) plan certified by the Governor of the State of Wyoming.

3. Reopener Provision

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary) or other appropriate requirements if one or more of the following events occur:

a. The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit;

b. A wasteload allocation is developed and approved by the state and/or the Environmental Protection Agency for incorporation in this permit;

c. A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit;

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended or revoked in whole or in part during its term for cause including, but not limited to, the following:

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

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

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge; or
d. If necessary to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2) and 307(a)(2) of the federal act, if the effluent standard or limitation so issued or approved:

(1) Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

(2) Controls any pollutant not limited in the permit.

5. **Toxicity Limitation - Reopener Provision**

This permit may be reopened and modified (following proper administrative procedures) to include a new compliance date, additional or modified numerical limitations, a new or different compliance schedule, a change in the whole effluent protocol or any other conditions related to the control of toxicants if one or more of the following events occur:

a. Toxicity was detected late in the life of the permit near or past the deadline for compliance;

b. The Toxicity Reduction Evaluation (TRE) results indicate that compliance with the toxic limits will require an implementation schedule past the date for compliance and the permit issuing authority agrees with the conclusion;

c. The TRE results indicate that the toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits and the permit issuing authority agrees that numerical controls are the most appropriate course of action;

d. Following the implementation of numerical controls on toxicants, the permit issuing authority agrees that a modified whole effluent protocol is necessary to compensate for those toxicants that are controlled numerically;

e. The TRE reveals other unique conditions or characteristics which, in the opinion of the permit issuing authority, justify the incorporation of unanticipated special conditions in the permit.

6. **Severability**

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

7. **Penalties for Falsification of Reports**

The federal act provides that any person who knowingly makes any false statement, representation or certification in any record or other document submitted or required to be
maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation or by imprisonment for not more than two years per violation or both.
APPENDIX A
NOTICE OF INTENT
FOR
TEMPORARY DISCHARGES

1. This Notice of Intent is being filed for:
   □ A temporary discharge which does not currently have coverage under a general permit for temporary discharges, or
   □ A temporary discharge which currently does have coverage under general for temporary discharges. Permit Number WYG________.

2. Name, address, and telephone number of the company, individual, or organization which will have responsibility for the temporary discharge and which will be the permit holder.
   Name: ____________________________________________
   Address: __________________________________________
   Telephone: _________________________________________

3. Name, address, and telephone number of the owner of the property in which the wastewater is to be discharged.
   Name: ____________________________________________
   Address: __________________________________________
   Telephone: _________________________________________

4. Name, address, county, legal description or latitude and longitude of the temporary discharge for which this notice is being filed.
   Project Name: ______________________________________
   Address: __________________________________________
   Quarter:____  Section:____  Township:____  Range:____  County:________________________
5. Briefly describe the type of activity resulting in the discharge.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6. The anticipated date for commencement of the discharge, expected duration of the discharge and expected termination date of the discharge.

Commencement Date: ______________________________________________________________________

Duration of Discharge: ______________________________________________________________________

Termination Date: ______________________________________________________________________

7. The average and maximum flow rate of the discharge, the total expected volume of the discharge and the source of water which is to be discharged.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

8. Description of the type of water treatment process to be employed (i.e. recycling, reuse, and detention).

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

9. List all potential pollutants and the expected concentrations in the wastewater to be discharged.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
10. Description of the erosion control measures that will be implemented to prevent significant damage to or erosion of the receiving water channel.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

11. What is/are the name(s) of the nearest defined drainage(s) or water body receiving or potentially receiving the temporary discharge and the distance the water must travel before reaching live water?

Name:________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Distance:____________________________________________________________________
________________________________________________________________________
________________________________________________________________________

12. A map and/or schematic diagram showing the area of the activity, location of the discharge, location of any treatment units, and the location of all receiving waters must be attached.

13. If the discharge is to a storm sewer system, ditch, or other man made conveyance, approval from the owner of the system must be obtained and attached to the NOI.

Discharges Associated With Hydrostatic Testing

14. Type of vessel being tested.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
15. Type of material from which the vessel is constructed.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

16. Has the vessel been previously used or is it of virgin material?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

17. If the vessel is used, provide a description of fluid material normally contain and/or transported through the vessel.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Discharges Associated With LAUST Remediation Projects

18. Detailed description of the type of remediation system.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

19. List the source of contamination.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
20. I certify under penalty of law that this document and all attachments were prepared under my
direction or supervision in accordance with a system designed to assure that qualified personnel
properly gather and evaluate the information submitted. Based on my inquiry of the person or
persons who manage the system, or those persons directly responsible for gathering the information,
the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I
am aware that there are significant penalties for submitting false information, including the possibil-
ity of fine and imprisonment for knowing violations.

Printed Name of Person Signing

Title

Signature of Applicant

Date

Telephone

Section 35-11-901 of Wyoming Statutes provides that:

"Any person who knowingly makes any false statement, representation, or certification in any
application ... shall, upon conviction, be fined not more than $10,000 per day for each violation or
imprisoned for not more than one (1) year, or both."

Mail this application to:

NPDES Permits Section
DEQ/WQD
Herschler Building - 4 W
122 West 25th Street
Cheyenne, WY 82002

FOR AGENCY USE ONLY

Certification Number

W Y G

Date Received

MM DD YY
APPENDIX B
TERMINATION NOTICE

1. Name, address, and telephone number of the company, individual, or organization which received authorization for a temporary discharge under the attached general permit.

   Name: ____________________________________________________________

   Address: __________________________________________________________

   _________________________________________________________________

   _________________________________________________________________

   Telephone: ________________________________________________________

2. Identification number assigned to this temporary discharge: WYG______________

3. Project Name: ______________________________________________________

4. Certification:

   I certify under penalty of law that the temporary discharge identified above has been completed and that the discharge locations have been returned to approximate pretest conditions. I understand that by submitting this notice I am terminating coverage under Wyoming's general NPDES permit for temporary discharges. I also understand that if, at a later date, it is determined that the site was inadequately reclaimed and pollutant discharge results, I may be liable for discharging pollutants without a permit.

   Printed Name of Person Signing

   ________________________________  ________________________________

   Signature                        Date

Section 35-11-901 of Wyoming Statutes provides that:

"Any person who knowingly makes any false statement, representation, or certification in any application ... shall, upon conviction, be fined not more than $10,000 per day for each violation or imprisoned for not more than one (1) year or both."

Upon completion, remove this notice from the permit and mail to:

NPDES Permits Section
DEQ/WQD
Herschler Building - 4 W
122 West 25th Street
Cheyenne, WY 82002
APPENDIX G

GRAIN SIZE OF SEDIMENT SAMPLES
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 13, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Traveling screen downstream side
Sample Description: Well graded sand
USCS Class: SW
AASHTO Class: --
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 9-30
Testing completed by K. Hager 10-9-98
Fig. No.: 1

Mechanical Analysis Data

<table>
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<th>Size, mm</th>
<th>Percent finer</th>
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</thead>
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<td>2.000</td>
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</tr>
<tr>
<td># 40</td>
<td>0.425</td>
<td>30.0</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Hydromenter Analysis Data

<table>
<thead>
<tr>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0300</td>
<td>3.3</td>
</tr>
<tr>
<td>0.0200</td>
<td>1.1</td>
</tr>
<tr>
<td>0.0140</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
\% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 96.2
\% FINES = 3.8

D85 = 1.72  D60 = 0.931  D50 = 0.723
D30 = 0.4207 D15 = 0.15631 D10 = 0.11194
Cc = 1.6982  Cu = 8.3176
# Grain Size Distribution Test Report

## Material Description

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt</th>
<th>% Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>96.2</td>
<td></td>
<td>3.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D_85</th>
<th>D_60</th>
<th>D_50</th>
<th>D_30</th>
<th>D_15</th>
<th>D_10</th>
<th>C_c</th>
<th>C_u</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td>1.72</td>
<td>0.931</td>
<td>0.723</td>
<td>0.421</td>
<td>0.156</td>
<td>0.112</td>
<td>1.70</td>
<td>8.3</td>
</tr>
</tbody>
</table>

## Project Information
- **Project No.:** 10M183.137
- **Project:** WWDC Level II Intake
- **Location:** Traveling screen downstream side

**Date:** October 13, 1998

**Remarks:**
- Sampled and submitted by Hines and Alsaker 9-30
- Testing completed by K. Hager 10-9-98

**Figure No. 1**
GRAIN SIZE DISTRIBUTION TEST DATA

Site: October 13, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Presedimentation basin sand on support for effluent pipe
Sample Description: Silt
SCS Class: ML
AASHTO Class: --
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 9-30
Testing completed by K. Hager 10-9-98

rig. No.: 2

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2.000</td>
<td>100.0</td>
</tr>
<tr>
<td>40</td>
<td>0.425</td>
<td>95.0</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
<td>66.0</td>
</tr>
</tbody>
</table>

Hydrometer Analysis Data

<table>
<thead>
<tr>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0300</td>
<td>45.0</td>
</tr>
<tr>
<td>0.0200</td>
<td>41.0</td>
</tr>
<tr>
<td>0.0100</td>
<td>30.0</td>
</tr>
<tr>
<td>0.0010</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve

\[ \begin{align*}
+ 3 \text{ in.} &= 0.0 & \% \text{ GRAVEL} &= 0.0 & \% \text{ SAND} &= 34.0 \\
\text{SILT} &= 45.7 & \% \text{ CLAY} &= 20.3 & (\% \text{ CLAY COLLOIDS} &= 7.1)
\end{align*} \]

\[ \begin{align*}
\phi &= 0.19 & D_{60} &= 0.060 & D_{50} &= 0.040 \\
\phi &= 0.0100 & D_{15} &= 0.00295 & D_{10} &= 0.00155 \\
\phi &= 1.0827 & Cu &= 38.5035
\end{align*} \]
### GRAIN SIZE DISTRIBUTION TEST REPORT

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D₈₅</th>
<th>D₆₀</th>
<th>D₅₀</th>
<th>D₃₀</th>
<th>D₁₅</th>
<th>D₁₀</th>
<th>Cₛ</th>
<th>Cᵤ</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td>0.186</td>
<td>0.0398</td>
<td>0.0100</td>
<td>0.0029</td>
<td>0.0015</td>
<td>1.08</td>
<td>38.5</td>
<td></td>
</tr>
</tbody>
</table>

### MATERIAL DESCRIPTION

- **USCS**: ML
- **AASHTO**: --

#### Remarks:
- Sampled and submitted by Hines and Alsaker 9-30
- Testing completed by K. Hager 10-9-98

**Project No.: 10M183.137**

Project: WWDC Level II Intake
- Location: Presedimentation basin sand on support for effluent pipe

**Date:** October 13, 1998

---

**GRAIN SIZE DISTRIBUTION TEST REPORT**

**MSE-HKM, INC.**

---

**Figure No. 2**
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 6, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Presedementation basin by center column inside path of scaper
Sample Description: Well graded sand with silt
USCS Class: SW-SM
AASHTO Class: --
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 9-30
Testing completed by K. Hager 10-6-98

Fig. No.: 3

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>2.360</td>
<td>100.0</td>
</tr>
<tr>
<td>16</td>
<td>1.180</td>
<td>98.0</td>
</tr>
<tr>
<td># 30</td>
<td>0.600</td>
<td>80.0</td>
</tr>
<tr>
<td>&quot; 50</td>
<td>0.300</td>
<td>57.0</td>
</tr>
<tr>
<td>100</td>
<td>0.150</td>
<td>38.0</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
<td>17.0</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
and/Fines based on #200 sieve
+ 3 in. = 0.0  % GRAVEL = 0.0  % SAND = 83.0
% FINES = 17.0

\( D_{85} = 0.71 \quad D_{60} = 0.330 \quad D_{50} = 0.233 \)
\( D_{30} = 0.1139 \)
**GRAIN SIZE DISTRIBUTION TEST REPORT**

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>83.0</td>
<td>17.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D_85</th>
<th>D_60</th>
<th>D_50</th>
<th>D_30</th>
<th>D_15</th>
<th>D_10</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td>0.713</td>
<td>0.330</td>
<td>0.233</td>
<td>0.114</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

- Well graded sand with silt

**USCS** | **AASHTO**
--- | ---
SW-SM | --

Project No.: 10M183.137
Project: WWDC Level II Intake
Location: Presedimentation basin by center column inside path of scraper

Date: October 6, 1998

Remarks:
- Sampled and submitted by Mines and Alsaker 9-30
- Testing completed by K. Hager 10-6-98

Figure No. 3
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 13, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Presedimentation basin floor below path of scrapper
Sample Description: Silty Sand
USCS Class: SM
AASHTO Class: --
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 9-30
Testing completed by K. Hager 10-9-98

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2.000</td>
<td>100.0</td>
</tr>
<tr>
<td>40</td>
<td>0.425</td>
<td>96.0</td>
</tr>
<tr>
<td>#200</td>
<td>0.075</td>
<td>27.0</td>
</tr>
</tbody>
</table>

Hydrometer Analysis Data

<table>
<thead>
<tr>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0300</td>
<td>13.0</td>
</tr>
<tr>
<td>0.0200</td>
<td>9.3</td>
</tr>
<tr>
<td>0.0100</td>
<td>7.1</td>
</tr>
<tr>
<td>0.0010</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve

+ 3 in. = 0.0  % GRAVEL = 0.0  % SAND = 73.0
SILT = 21.0  % CLAY = 6.0  (% CLAY COLLOIDS = 2.9)

85= 0.34  D60= 0.202  D50= 0.160
30= 0.0871 D15= 0.03673 D10= 0.02188
Cc = 1.7179  Cu = 9.2257
### GRAIN SIZE DISTRIBUTION TEST REPORT

**Project No.:** 10M183.137  
**Project:** WWDC Level II Intake  
**Location:** Presedimentation basin floor below path of scrapper  
**Date:** October 13, 1998

#### Remarks:
- Sampled and submitted by Hines and Alsaker 9-30
- Testing completed by K. Hager 10-9-98

#### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>Material Description</th>
<th>USCS</th>
<th>AASHTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silty Sand</td>
<td>SM</td>
<td>--</td>
</tr>
</tbody>
</table>

#### GRAVITY TABLE

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D85</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>D10</th>
<th>c_e</th>
<th>c_u</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td>0.339</td>
<td>0.202</td>
<td>0.160</td>
<td>0.0871</td>
<td>0.0357</td>
<td>0.0219</td>
<td>1.72</td>
</tr>
</tbody>
</table>

#### GRAIN SIZE DISTRIBUTION TEST REPORT MSE-HKM, INC.
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 13, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Presedimentaion basin by wall outside of path of scrapper
Sample Description: Silt
SCS Class: ML Liquid limit: --
AASHTO Class: -- Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 9-30
Testing completed by K. Hager 10-9-98
Fig. No.: 5

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>0.600</td>
<td>100.0</td>
</tr>
<tr>
<td>50</td>
<td>0.300</td>
<td>99.0</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
<td>85.0</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
and/Fines based on #200 sieve
+ 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 15.0
% FINES = 85.0
## GRAIN SIZE DISTRIBUTION TEST REPORT

### Graph

The graph shows the grain size distribution with percent finer on the y-axis and grain size in mm on the x-axis. The data points indicate the following:

- % +3": 0.0
- % Gravel: 0.0
- % Sand: 15.0
- % Silt: 85.0

### Table

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D85</th>
<th>D60</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>D10</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Material Description
- Silt

### Project Information
- Project No.: 10M183.137
- Project: WWDC Level II Intake
- Location: Presedimentation basin by wall outside of path of scraper

### Date
- October 13, 1998

### Remarks
- Sampled and submitted by Hines and Alsaker 9-30
- Testing completed by K. Hager 10-9-98

---

**MSE-HKM, INC.**
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 6, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Microstrainer downstream side
Sample Description: Well graded sand with silt
USCS Class: SW-SM Liquid limit: --
AASHTO Class: -- Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 10-1
Testing completed by K. Hager 10-6-98
Fig. No.: 6

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td># 4</td>
<td>4.750</td>
<td>100.0</td>
</tr>
<tr>
<td># 8</td>
<td>2.360</td>
<td>99.0</td>
</tr>
<tr>
<td># 16</td>
<td>1.180</td>
<td>87.0</td>
</tr>
<tr>
<td># 30</td>
<td>0.600</td>
<td>56.0</td>
</tr>
<tr>
<td># 50</td>
<td>0.300</td>
<td>29.0</td>
</tr>
<tr>
<td># 100</td>
<td>0.150</td>
<td>16.0</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 92.1
% FINES = 7.9

D85 = 1.12  D60 = 0.649  D50 = 0.527
D30 = 0.3105 D15 = 0.13868 D10 = 0.09057
Cc = 1.6387  Cu = 7.1697
**GRAIN SIZE DISTRIBUTION TEST REPORT**

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>92.1</td>
<td>7.9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D_85</th>
<th>D_50</th>
<th>D_30</th>
<th>D_15</th>
<th>D_10</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td>1.12</td>
<td>0.649</td>
<td>0.527</td>
<td>0.310</td>
<td>0.139</td>
<td>0.0906</td>
<td>1.64</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**
- Well graded sand with silt

**USCS**
- SW-SM

**AASHTO**
- --

**Remarks:**
- Sampled and submitted by Hines and Alsaker 10-1
- Testing completed by K. Hager 10-6-98

**Date:** October 6, 1998

**Figure No. 6**
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 6, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Microstrainer upstream side
Sample Description: Poorly graded sand
JSCS Class: SP
AASHTO Class: --
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 10-1
Testing completed by K. Hager 10-6-98

Fig. No.: 7

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.53</td>
<td>100.0</td>
</tr>
<tr>
<td>4.750</td>
<td>96.0</td>
</tr>
<tr>
<td>2.360</td>
<td>71.0</td>
</tr>
<tr>
<td>1.180</td>
<td>24.0</td>
</tr>
<tr>
<td>0.600</td>
<td>6.0</td>
</tr>
<tr>
<td>0.300</td>
<td>2.0</td>
</tr>
<tr>
<td>0.150</td>
<td>0.7</td>
</tr>
<tr>
<td>0.075</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve

% + 3 in. = 0.0  % GRAVEL = 4.0  % SAND = 95.6
% FINES = 0.4

D85 = 3.13  D60 = 1.995  D50 = 1.738
D30 = 1.3077  D15 = 0.95389  D10 = 0.78433
Cc = 1.0927  Cu = 2.5439
**GRAIN SIZE DISTRIBUTION TEST REPORT**

### Particle Size Distribution

<table>
<thead>
<tr>
<th>Percent Finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
</tr>
<tr>
<td>200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grain Size - mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0 in.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>4.0</td>
<td>95.6</td>
<td></td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D85</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>D10</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td>3.13</td>
<td>2.00</td>
<td>1.74</td>
<td>1.31</td>
<td>0.954</td>
<td>0.784</td>
<td>1.09</td>
</tr>
</tbody>
</table>

### Material Description

- Poorly graded sand

---

**Project No.: 10M183.137**

- Project: WWDC Level II Intake
- Location: Microstrainer upstream side

**Date:** October 6, 1998

**Remarks:**
- Sampled and submitted by Hines and Alsaker 10-1
- Testing completed by K. Hager 10-6-98

**Figure No. 7**

**GRAN SIZE DISTRIBUTION TEST REPORT**

**MSE-HKM, INC.**
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 6, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Creek ahead of bar screen
Sample Description: Poorly graded sand
USCS Class: SP
AASHTO Class: --
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 10-1
Testing completed by K. Hager 10-6-98
Fig. No.: 8

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 inches</td>
<td>12.70</td>
<td>100.0</td>
</tr>
<tr>
<td>0.375 inches</td>
<td>9.53</td>
<td>99.0</td>
</tr>
<tr>
<td># 4</td>
<td>4.750</td>
<td>98.0</td>
</tr>
<tr>
<td>% 8</td>
<td>2.360</td>
<td>91.0</td>
</tr>
<tr>
<td>% 16</td>
<td>1.180</td>
<td>51.0</td>
</tr>
<tr>
<td># 30</td>
<td>0.600</td>
<td>11.0</td>
</tr>
<tr>
<td># 50</td>
<td>0.300</td>
<td>1.0</td>
</tr>
<tr>
<td># 100</td>
<td>0.150</td>
<td>0.4</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
\( D_{85} = 2.13 \) \( D_{60} = 1.377 \) \( D_{50} = 1.163 \)
\( D_{30} = 0.8650 \) \( D_{15} = 0.65993 \) \( D_{10} = 0.58143 \)
\( Cc = 0.9343 \) \( Cu = 2.3686 \)
GRAIN SIZE DISTRIBUTION TEST REPORT

% +3" | % GRAVEL | % SAND | % SILT | % CLAY
---|---|---|---|---
0.0 | 2.0 | 97.7 | 0.3 |

LL | PI | D85 | D60 | D50 | D30 | D10 | Cc | Cu
---|---|---|---|---|---|---|---|---
-- | -- | 2.13 | 1.38 | 1.16 | 0.865 | 0.660 | 0.581 | 0.93 | 2.4 |

MATERIAL DESCRIPTION
- Poorly graded sand

USCS | AASHTO
---|---
SP | --

Remarks:
- Sampled and submitted by Hines and Alsaker 10-1
- Testing completed by K. Hager 10-6-98

Date: October 6, 1998

GRAIN SIZE DISTRIBUTION TEST REPORT
MSE-HKM, INC.
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 6, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Middle of sand channel
Sample Description: Poorly graded sand
USCS Class: SP
ASHTO Class: --
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 10-1
Testing completed by K. Hager 10-6-98

Fig. No.: 9

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>2.360</td>
<td>100.0</td>
</tr>
<tr>
<td># 16</td>
<td>1.180</td>
<td>83.0</td>
</tr>
<tr>
<td># 30</td>
<td>0.600</td>
<td>38.0</td>
</tr>
<tr>
<td>50</td>
<td>0.300</td>
<td>12.0</td>
</tr>
<tr>
<td>&quot; 100</td>
<td>0.150</td>
<td>3.0</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve and/Fines based on #200 sieve
8 + 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 98.7 % FINES = 1.3

85 = 1.23 D60 = 0.826 D50 = 0.719
D30 = 0.5176 D15 = 0.34119 D10 = 0.27102
c = 1.1967 Cu = 3.0479
GRAIN SIZE DISTRIBUTION TEST REPORT

PERCENT FINER

200 100 10.0 1.0 0.1 0.01 0.001

GRAIN SIZE - mm

% +3" % GRAVEL % SAND % SILT % CLAY

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>98.7</td>
<td>1.3</td>
<td></td>
</tr>
</tbody>
</table>

LL PI D85 D60 D50 D30 D15 D10 Cc Cu

|   |   | 1.23 | 0.826 | 0.719 | 0.518 | 0.341 | 0.271 | 1.20 | 3.0 |

MATERIAL DESCRIPTION

Poorly graded sand

USCS AASHTO

SP --

Remarks:

Sampled and submitted by Hines and Alsaker 10-1
Testing completed by K. Hager 10-6-98

Date: October 6, 1998

GRAIN SIZE DISTRIBUTION TEST REPORT

MSE-HKM, INC.
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 6, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: Middle of sand channel
Sample Description: Poorly graded sand
USCS Class: SP
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 10-1
Testing completed by K. Hager 10-6-98
Fig. No.: 10

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.70</td>
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</tr>
<tr>
<td>9.50</td>
<td>99.0</td>
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<td>31.0</td>
</tr>
<tr>
<td>0.300</td>
<td>10.0</td>
</tr>
<tr>
<td>0.150</td>
<td>2.0</td>
</tr>
<tr>
<td>0.075</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve

% GRAVEL = 2.5 % SAND = 96.6
FINES = 0.9

D85= 1.58 D60= 0.952 D50= 0.819
D30= 0.5868 D15= 0.37888 D10= 0.29751
Cc = 1.2162 Cu = 3.1989
GRAIN SIZE DISTRIBUTION TEST REPORT

**Per Cent Finer**

<table>
<thead>
<tr>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>2.5</td>
<td>96.6</td>
<td>0.9</td>
<td>0.9</td>
</tr>
</tbody>
</table>

**LL PI D85 D60 D50 D30 D15 D10 Cc Cu**

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D85</th>
<th>D60</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>D10</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
<td>1.58</td>
<td>0.952</td>
<td>0.819</td>
<td>0.587</td>
<td>0.379</td>
<td>0.298</td>
<td>1.22</td>
<td>3.2</td>
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</tbody>
</table>

**MATERIAL DESCRIPTION USCS AASHTO**

- Poorly graded sand

**Project No.: 10M183.13?**
- Project: WWDC Level II Intake
- Location: Middle of sand channel

**Date: October 6, 1998**

**Remarks:**
- Sampled and submitted by Hines and Alsaker 10-1
- Testing completed by K. Hager 10-6-98

**MSE-HKM, INC.**

**Figure No. 10**
GRAIN SIZE DISTRIBUTION TEST DATA

Date: October 6, 1998
Project No.: 10M183.137
Project: WWDC Level II Intake

Sample Data

Location of Sample: E. end of sand channel under barrock
Sample Description: Poorly graded sand
USCS Class: SP
AASHTO Class: --
Liquid limit: --
Plasticity index: --

Notes

Remarks: Sampled and submitted by Hines and Alsaker 10-1
Testing completed by K. Hager 10-6-98
Fig. No.: 11

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>2.360</td>
<td>100.0</td>
</tr>
<tr>
<td>16</td>
<td>1.180</td>
<td>87.0</td>
</tr>
<tr>
<td># 30</td>
<td>0.600</td>
<td>42.0</td>
</tr>
<tr>
<td># 50</td>
<td>0.300</td>
<td>13.0</td>
</tr>
<tr>
<td>100</td>
<td>0.150</td>
<td>3.0</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
and/Fines based on #200 sieve
+ 3 in. = 0.0  % GRAVEL = 0.0  % SAND = 98.6
% FINES = 1.4

85 = 1.13  D60 = 0.774  D50 = 0.675
D30 = 0.4831  D15 = 0.32285  D10 = 0.26242
Cc = 1.1482  Cu = 2.9512
GRAIN SIZE DISTRIBUTION TEST REPORT

% +3"  % GRAVEL  % SAND  % SILT  % CLAY
---  ---  ---  ---  ---
0.0  0.0  98.6  1.4  

LL  PI  D85  D50  D30  D15  D10  Cc  Cu
---  ---  ---  ---  ---  ---  ---  ---  ---
1.13  0.774  0.675  0.483  0.323  0.262  1.15  3.0  

MATERIAL DESCRIPTION

- Poorly graded sand

USCS  AASHTO
---  ---
SP  --

Project No.: 10M183.137
Project: WWDC Level II Intake
- Location: E. end of sand channel under barrock

Date: October 6, 1998

Remarks:
Sampled and submitted by Hines and Alsaker 10-1
Testing completed by K. Hager 10-6-98