THE LAKE DE SMET PROJECT

FOR PRESENTATION TO THE
WYOMING WATER DEVELOPMENT COMMISSION

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PART I INTRODUCTION

Lake DeSmet Reservoir is situated in Johnson County in northeastern Wyoming on the sloping plains east of the Big Horn Mountains, about six miles north of Buffalo and 30 miles southeast of Sheridan (Figure 1). Originally a small natural body of water situated within an essentially closed basin, Lake DeSmet was first transformed into an operating reservoir more than 50 years ago by constructing a low dam near its northern end and importing water into it through a canal from Piney Creek, a tributary of Clear Creek which in turn flows into the Powder River. Water impounded in this early reservoir was released during the late summer months to provide supplemental water supplies for the irrigation of lands in the lower valleys of Piney and Clear Creeks. More recently, through the construction of the works described in this Report, the capacity of Lake DeSmet Reservoir has been greatly increased and the water supplies that can be stored therein have been augmented by replacing the earlier works which diverted water from Piney Creek, and by the construction of new facilities for importing water from Clear Creek. With the addition of these new works the potential water yield of the project was increased considerably. Most of the increase in water yield is destined for use in development of the vast coal resources of the area as well as to enhance the dependability of supplies for irrigation and other beneficial purposes.

The project is situated in an area characterized by scant precipitation and wide seasonal variations in temperatures and stream flows. Maximum summer temperatures may approach 100°F in July and August and fall to -20°F to -40°F during the winter. Mean daily temperatures are generally below freezing from December through March. Precipitation in the vicinity of Lake DeSmet averages
about 14 inches per year but increases rapidly with elevation over the Big Horn Mountains to the west, probably exceeding 30 inches annually in the high mountain ranges, most of which occurs as snow during the winter months. In this environment, stream flows in Piney and Clear Creeks and their tributaries are quite low during the winter months, but increase rapidly in April and May as snow begins to melt from the higher portions of the watershed. Peak stream flows generally occur during the latter part of May or forepart of June following which the flow drops rapidly to low levels which are sustained through the winter, largely by the gradual return of water diverted earlier in the summer for irrigation of the valley lands.

All of the base, or dependable, flows of streams in the area are fully appropriated by early direct flow irrigation rights. The only water supplies that are available for storage and subsequent use consist of spring flood flows that are in excess of the requirements of existing irrigation ditches and flows occurring during the winter or non-irrigation season. As those supplies vary so greatly, both in amount and duration, from year to year a relatively large volume of reservoir storage capacity is required to equate them to a reasonable pattern of water use.

The Lake DeSmet Reservoir Project can be readily reached from Buffalo and Sheridan via Interstate Highway 90 which lies about a mile to the west of the reservoir and by Interstate Highway 25 from Casper 116 miles south of Buffalo. Both Sheridan and Casper are served by scheduled airlines, and an airstrip for small planes exists at Buffalo.

The Burlington Northern Railroad extending from the Pacific Northwest to Omaha and Denver passes through Sheridan and down the valley of Clear
Creek. The nearest station to Lake DeSmet is in the valley at Clearmont, approximately 20 miles east of Lake DeSmet Reservoir.

PART II PROJECT FEATURES

The Lake DeSmet Project comprises three separate, but interconnected, units, consisting of:

Lake DeSmet Reservoir,
The Piney Creek Supply System, and
The Clear Creek Supply System

The location of the principal components of each of these features are shown on Figure 2 and briefly described below.

Lake DeSmet Reservoir (Figure 3) -- It is a man-made enlargement of a small natural lake created by constructing an earthfill embankment 90 feet in height at the north end of the lake, a similar embankment 50 feet in height at the south end of the lake, and several small dikes of lesser height along the eastern rim of the reservoir. The enlarged reservoir has an average width of approximately 1 mile and an overall length of approximately 5.5 miles, forming a storage facility with a surface area of nearly 3400 acres and a total capacity of 234,987 acre feet. Of this total capacity, 38,960 acre feet lie below the level of the outlets at the north and south ends of the reservoir. The inverts of the outlets at the north and south ends of the lake are situated at approximately elevation 4545 at which level the surface area of the lake is approximately 1,610 acres. When filled to the level of the crest of the spillway, the water level in the reservoir will be at elevation 4620. Under normal operation, it is unlikely the reservoir would ever be drawn down below about elevation 4555, thus resulting in a maximum fluctuation in water
levels of approximately 65 feet corresponding to an operating storage volume of 179,263 acre feet.

**The Piney Creek Supply System (Figure 11)** -- This system consists of a low concrete diversion dam on Piney Creek, at a point approximately one-quarter mile upstream from the Interstate 90 highway bridge, and a concrete-lined tunnel having an internal diameter of 8.58 feet and a total length of 8316 feet, extending from the diversion dam to Lake DeSmet Reservoir. This tunnel is situated deep in the ground (in order to be within a coal bed), nearly 180 feet below the elevation of the diversion dam and the high water level in Lake DeSmet Reservoir. As such, it functions as an inverted siphon. Water flows from Piney Creek into Lake DeSmet Reservoir by gravity under the elevation differential between the diversion dam and the level of water in the reservoir. When the reservoir is drawn down to its minimum level, the tunnel will convey up to about 900 cubic feet per second from Piney Creek into the reservoir. This capacity progressively decreases as the level of water rises in Lake DeSmet, reaching zero when the reservoir is completely filled to elevation 4620 corresponding to the elevation of the spillway on the Piney Creek diversion dam.

**The Clear Creek Supply System (Figure 14)** -- The system lifts water from Clear Creek and conveys it for a distance of 6.7 miles into Lake DeSmet Reservoir. Water is diverted from Clear Creek at a low concrete diversion dam and conveyed through a short conduit into the Healy Regulatory Reservoir, an off-channel storage facility created by construction of a long earthen dike on the north side of the creek. This reservoir has a surface area of approximately 256 acres and a total storage capacity of 5,140 acre feet. Near the point where water enters the reservoir from Clear Creek, a pumping plant
is provided which draws water from Healy Reservoir through six pumps each having a nominal capacity of 33.3 cubic feet per second. Discharge from the pumps is conveyed through the 66-inch diameter Clear Creek-Lake DeSmet Pipeline to the south end of Lake DeSmet Reservoir. The nominal capacity of this pipeline is 200 cubic feet per second; and when Lake DeSmet Reservoir is nearly full and all pumps are operating, the total pump lift is approximately 340 feet.

Other supplies which reach Lake DeSmet Reservoir consist of the runoff from the approximately 40 square mile drainage area tributary to the Lake, most of which originates in the Shell Creek Basin to the west of the Lake. This runoff also includes the return flow from several small ditches which divert water out of the upper basin of Little Piney Creek for irrigation of lands in the Shell Creek Basin, as well as water imported into that basin by the Lake DeSmet (M&M) Ditch which diverts water out of Rock Creek.

**PART III - FUNCTIONAL OPERATION**

The primary purpose of Lake DeSmet Reservoir and its two water supply systems is to impound storable supplies diverted from the source streams and to regulate those supplies in a fashion such that they can be beneficially used for industrial, irrigation, and other purposes. As noted earlier, during the irrigation season, all of the base flows of Piney and Clear Creeks are allocated to irrigation ditches which have senior direct flow rights and hence the first call on the available stream flow. It is only during the latter part of April, in May, and in part of June in most years when the natural flow of
the streams may exceed the demands of irrigation rights and only flows surplus to such requirements can be diverted into and be impounded in Lake DeSmet Reservoir under its storage rights. The amounts thereof may vary considerably from year to year; and, during years of above-normal runoff, surplus flows in excess of the capacity of the diversion works may occasionally occur for short periods of time. During the winter, or non-irrigation season, all of the flow of Piney and Clear Creeks, except for small amounts that are allowed to pass the diversion structures to maintain a live stream, can be diverted into Lake DeSmet Reservoir. Once impounded, the stored supplies will be drawn upon as required to supply the various uses. Most of the water released to supplement stream flows for irrigation use will be released during the period from about mid-July through the end of the irrigation season. Supplies utilized for industrial operations and domestic use will be withdrawn from the reservoir at a more or less constant rate throughout the entire year. The volume of storage in the reservoir will thus fluctuate with the seasons and from year to year. Within any one year, the reservoir will normally be at its highest level at the end of the flood season near the end of May or in June and reach its lowest level near the end of the irrigation season in October.

Studies that have been made of the operation of the Lake DeSmet Reservoir disclose that apart from the seasonal regulation of supplies, the reservoir may be called upon to supply projected demands during prolonged periods of drought which may be of up to 8 to 10 years in duration. As there is no practical way in which the occurrence of extended drought periods can be predicted in advance, all water that is storable under the Lake DeSmet storage rights will normally be impounded in order to maintain the reservoir at the highest feasible storage level.
PART IV - HISTORY

Originally, Lake DeSmet was a small body of water occupying a natural depression within an essentially closed basin, it being conjectured that this depression originally formed as a result of burning of the underlying coal beds. In its natural state, most of the runoff from the relatively small area tributary to the lake was evaporated from the lake's surface. As a result, at the time the first pioneers entered the area in the 1860's, the lake was a brackish body of water.

More than fifty years ago, the lake was converted into an off-channel reservoir by constructing a low earthen dam near the north end of the basin and an intake canal through which water could be diverted from Piney Creek into the lake. Beginning in 1954, the Reynolds Mining Corporation of Richmond, Virginia became interested in this area because of the availability of water in close proximity to vast coal resources and acquired the reservoir and surrounding lands as well as stock in the Lake DeSmet Reservoir Company which controlled the reservoir storage rights. Soon thereafter it embarked on a program of acquisition of additional lands and an extensive drilling program to explore the extent of the coal resource. In 1958, the dam at the north end of the lake was raised to permit storage of water up to elevation 4573 which provided an operating storage capacity above the level of the outlet in the dam of 55,129 acre feet. Since it was first transformed into an operating reservoir, a portion of the supplies stored therein from Piney Creek have been released during the late summer months to provide supplemental water for irrigation of lands downstream of the reservoir on Piney and Clear Creeks. With the importation of fresh water supplies from Piney Creek, and their subsequent release, the quality of the water in the lake has continually
improved; and for a number of years, has supported rainbow trout and other fresh water fish species.

In the process of acquiring lands, the Reynolds Mining Corporation also acquired, both directly and indirectly, an interest in a great variety of water rights. These comprised, in addition to the storage rights in Lake DeSmet Reservoir, direct flow rights attached to lands that are irrigated with water from various streams in the area, rights to the use of direct flow and storage water by virtue of ownership of shares in ditch and reservoir companies, and a number of water right applications and permits primarily for storage of water in other reservoirs which at the time of their acquisition had not been constructed. From the outset, Reynolds recognized that a dependable water supply would be required in order to develop the coal resources it controlled; and in 1967, it called upon Tipton and Kalmbach, Inc. to, among other things, devise certain improvements to the then existing water supply facilities and to assist it in formulating a long-range plan of water development.

The first stage program, the initial planning for which was undertaken in 1967, embodied rehabilitating the then existing storage and supply facilities. That work included the replacement of the old dam at the north end of the lake (which had developed serious leakage problems) with a new dam across a narrow point in the valley about 2,000 feet to the north of the former site. This new dam accommodated raising the water level in the reservoir from elevation 4573 to 4580 to provide a total operating storage capacity of 72,867 acre feet. The first-stage program also included the construction of a new diversion dam on Piney Creek and the Lake DeSmet Intake Tunnel for conveying water diverted from that creek into the reservoir. When
those works were complete in May of 1971, the old Lake DeSmet Intake (Leiter) Ditch, which had been costly to maintain and difficult to operate during the winter, was abandoned by Reynolds.

During the time the first-stage works were being constructed, a number of alternative plans of developing the other storage filings and permits owned by Reynolds were considered. It was found that the most attractive plan would embody the transfer of a number of undeveloped storage rights (most of which pertained to storage sites on Clear Creek and its tributaries) to an enlarged Lake DeSmet Reservoir and construction of facilities to convey water from Clear Creek into that reservoir. As this scheme, which subsequently became known as the Master Water Plan, involved the transfer in place of storage of a number of individual storage permits, a public hearing on the matter was held by the State Engineer in accord with provisions of Wyoming Water Law, following which the scheme of integrating essentially all of the undeveloped storage permits into Lake DeSmet Reservoir was approved in August of 1970.

The necessary field investigations and preparation of plans for the second-stage development were well underway in December 1973 when Texaco Inc. entered into an agreement to purchase substantially all of the properties, including the water supply facilities and water rights, then owned by Reynolds. Under that agreement, the Reynolds Mining Corporation retained approximately 3,000 acres of land, 200 million tons of coal reserves, and a 15 percent interest in the water supplies that would be available for new uses upon completion of the Master Plan works (In 1988, Reynolds transferred these assets to Texaco and cancelled their contractual call on water in Lake DeSmet Reservoir). Construction of the works embodied in the second-stage program commenced in September 1974 and were substantially completed by the end of
1976. These works included the enlargement of the north dam and construction of new dams and dikes at the south and along the eastern rim of Lake DeSmet Reservoir to accommodate a 40-foot raise in its high water level to elevation 4620; and construction of the Clear Creek Supply System, including a diversion dam on Clear Creek, the Healy regulatory reservoir, a pumping plant, and the Clear Creek-Lake DeSmet Pipeline. Included in the final project was the storage under license of 11,800 acre feet of water for the Lower Clear Creek Reservoir Company (Permit 7292R, priority 2-21-68). The LCCRCO. rehabilitated and now uses the old Lake DeSmet Intake (Leiter) Ditch to transfer water from Piney Creek to fill their permit.

In accord with requirements of State Law, all of the plans and specifications covering the construction of the water supply facilities embodied in the Master Water Plan were submitted to, and approved by, the Office of the State Engineer of Wyoming.

The Corps of Engineers inspected Lake DeSmet Reservoir on May 23, 1978, under the authority of the Dam Inspection Act, Public Law 92-367, to make a general assessment of the structural integrity and operational adequacy of the structures. The COE found the project to be adequately designed and well-constructed and made several recommendations for inspections during initial filling and operation. The COE estimated the reservoir was capable of passing the probable maximum flood event with a freeboard of 5.8 feet.

Bechtel reviewed the design and construction of the Lake DeSmet Project and their report on June 1978 stated "The review of the design and construction of the Lake DeSmet Dam, South Dike and the four smaller dikes on the northeast side of Lake DeSmet reveals no serious or detrimental deviations from the design assumptions."
During initial filling of the reservoir on June 25, 1980, seepage was discovered along the hillside about 1,000 feet from the toe of the North Dam. Filling was stopped and water drained from the reservoir. Maximum seepage was estimated to be 6.68 CFS at a reservoir elevation of 4614.22 feet. Seepage decreased as the elevation dropped and ceased on July 22 when the reservoir elevation reached 4609.74 feet.

Upon initiation of the seepage, Tipton and Kalmbach, Inc. and Woodward-Clyde Consultants were called in to determine the cause and repair the problem. First a sheet steel piling cutoff wall was driven through the dam core into the base material to effect a seal in the area of porous material. Due to difficulties in driving the piles, a second procedure to construct a slurry trench of impervious material was also recommended. Following completion of the repairs, the reservoir was refilled and on June 29, 1983, the seepage rate attained 6.66 CFS, about the same as on June 20, 1980; however, the reservoir level was 5.48 feet higher than three years earlier. It is believed that most of the seepage is going around the cutoff wall and does not pose a threat to the integrity of the north dam.

At present, Texaco measures the flow rate of any seepage and the water level in monitor wells near the north dam. Seepage does not occur when the reservoir is below 4613 feet elevation and the structures are considered to be safe. Additional repair work is not planned.

During the initial filling, a small amount of seepage or boil was observed at the south dike and one of the east dikes. The flow rate was low and was not considered serious; however, when the reservoir level was dropped to repair the leak at the north dam, grouting was pumped into the dikes at the
suspected area of the leaks. This grouting was effective in reducing the leakage.

The south dike design did not include large riprap protection against erosion as did the north dam. Erosion became noticeable in late 1984 and repairs were made during the next three years. Similar work could be required in the future.

In 1988, the State Engineer and the Adjudication officer inspected all of the facilities of the Lake DeSmet Project to assure operational status. All of the facilities were approved and the appurtenant water permits were adjudicated and are being recorded. A schematic showing all the water permits is attached as Figure 21.

PART V OPERATIONAL STATUS

The Lake DeSmet Reservoir Project is fully operational within the limits of all permits. It is presently used to supply up to 13,000 acre feet of water annually under contract for irrigation. Water has also been sold on request for irrigation in Wyoming during dry years when the natural flows of Piney Creek and Clear Creek are below average and some water has been put to use for miscellaneous purposes.

The main intention in constructing the Lake DeSmet Reservoir Project was to supply industrial water for developing the vast coal reserves adjacent to the reservoir. Texaco continues marketing efforts, however, the increased cost of energy and the slowdown in energy demand growth over the past fifteen years has stymied efforts to develop these coal reserves. The Lake DeSmet
Project is presently operating under a five-year extension, Order Record No. 30, Page 471, that will expire April 1, 1992.

Two important public uses are made of the Lake DeSmet Reservoir, harvesting trout eggs in Shell Creek during spawning and maintaining a public recreation area on the southwest side of the reservoir. The Wyoming Game and Fish Department maintains a fish trap on Shell Creek and annually harvest rainbow trout eggs for the State fish hatchery at Story. The trout are raised and stocked at various locations as fingerlings. Lake DeSmet Reservoir is the primary source of trout eggs for the State of Wyoming.

Johnson County maintains a recreation area on the southwest side of the reservoir. Facilities include a boat ramp and picnic facilities. The recreation area is widely used by local people for water sports including fishing. The reservoir is also the site of an annual fishing contest and one leg of an annual triathalon both of which attract participants from several states.

PART VI CONSTRUCTION COST

The total "direct cost" of construction of the water supply works is estimated to be in the order of $37,809,000 in "as spent" dollars. Table 1 indicates a summary of the cost of the water facilities including allocation of some acquisition costs. It does not include the cost to Texaco of engineering services involved in the planning, design and supervision of construction of the works, administrative and engineering costs incurred by Texaco during the time the works were under construction, the cost of land, easements, legal fees, and other similar corollary costs that are allocable to the water supply project. Because of the general increase in costs since the
project was built, the present day replacement cost of the water supply features of the Lake DeSmet Project would be considerably more than the amounts shown.
TABLE 1
LAKE DESMET RESERVOIR PROJECT

Water Facilities Cost

<table>
<thead>
<tr>
<th>Asset (Date)</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Rights</td>
<td>$1,444,728</td>
</tr>
<tr>
<td>Water and Water Facilities</td>
<td>5,781,700</td>
</tr>
<tr>
<td>Incomplete Construction</td>
<td>270,000</td>
</tr>
<tr>
<td>Investment in Subsidiary Companies</td>
<td>1,770,444</td>
</tr>
<tr>
<td>Purchased from Reynolds (12-1-73)</td>
<td>9,266,872</td>
</tr>
</tbody>
</table>

2nd Stage Water Project (1974-1976)

<table>
<thead>
<tr>
<th>Asset</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake DeSmet Reservoir</td>
<td>10,380,908</td>
</tr>
<tr>
<td>Clear Creek Supply System</td>
<td>7,471,128</td>
</tr>
<tr>
<td>Clear Creek-Lake DeSmet Pipeline</td>
<td>6,866,196</td>
</tr>
<tr>
<td><strong>Total 2nd Stage Costs</strong></td>
<td><strong>$24,728,232</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asset</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Dam Repairs (1981)</td>
<td>1,166,490</td>
</tr>
<tr>
<td>South &amp; East Dike Grouting (1982)</td>
<td>160,000</td>
</tr>
<tr>
<td>Water Rights Contract Payments (1974-86)</td>
<td>2,335,000</td>
</tr>
<tr>
<td>Place Riprap on South Dike (1985-87)</td>
<td>152,370</td>
</tr>
</tbody>
</table>

/PR/CRH8
LAKE DES SMET RESERVOIR
NORTH DAM
(AND WEST ABUTMENT CUTOFF)

EMBANKMENT ZONES
1. Selected impervious materials compacted to 6-inch layers.
2. Selected sand and gravel materials compacted to 12-inch layers.
3. Random fill composed predominantly of cinder materials compacted to 12-inch layers.

SECTION A-A
WEST ABUTMENT CUTOFF

PLAN

PROFILE

SECTION B-B
MIN. CLAY BLANKET

SECTION C-C

LAKE DES SMET RESERVOIR
NORTH DAM
(AND WEST ABUTMENT CUTOFF)

EMBANKMENT ZONES
1. Selected impervious materials compacted to 6-inch layers.
2. Selected sand and gravel materials compacted to 12-inch layers.
3. Random fill composed predominantly of cinder materials compacted to 12-inch layers.

SECTION A-A
WEST ABUTMENT CUTOFF

PLAN

PROFILE

SECTION B-B
MIN. CLAY BLANKET

SECTION C-C
SELECTED IMPERVIOUS MATERIALS COMPACTED TO 6-INCH LAYERS.

SELECTED SAND AND GRAVEL MATERIALS COMPACTED TO 12-INCH LAYERS.

RANDOM FILL COMPOSED PREDOMINANTLY OF CLinker MATERIALS COMPACTED TO 12-INCH LAYERS.

HARD CLinker MATERIALS PLACed WITHOUT SPECIAL COMPACTION.

FIGURE 5
LAKE DESMET RESERVOIR
SOUTH DIKE - MAXIMUM SECTION
FIGURE 6
LAKE DESMET RESERVOIR
EAST ABUTMENT CUTOFF
(SLURRY TRENCH)

EMBANKMENT ZONES
1. Selected impervious materials compacted to 6-inch layers.
2. Random fill composed predominantly of clinker materials compacted to 12-inch layers.
3. Hard clinker materials placed without special compaction.

SECTION A-A
STA. 51+00 TO STA. 64+00
SECTION C-C
STA. 74+00 TO STA. 78+00
SECTION B-B
STA. 64+00 TO STA. 74+00
SECTION D-D
STA. 78+00 TO STA. 91+00

PROFILE ON C OF CUTOFF

PLAN

SCALE

400 0 400 800 1200 FEET

P L A N

E A S T  A B U T M E N T  C U T O F F

LAKE DESMET RESERVOIR
RESERVOIR ABUTMENT CUTOFF
(SLURRY TRENCH)
DIKE ZONES

1. Selected impervious materials compacted to 6-inch layers.
2. Selected sand and gravel materials compacted to 12-inch layers.
3. Random fill composed predominantly of clinker materials compacted to 12-inch layers.
4. Hard clinker materials placed without special compaction.

EAST DIKES - TYPICAL SECTIONS

FIGURE 7
LAKE DESMET RESERVOIR
EAST DIKES AND AUXILIARY SPILLWAY
To Piney Creek.

PLAN

SECTION ON E OF SPILLWAY

SECTION D-D

SECTION C-C

SECTION B-B

SECTION A-A

NOTE

See Figure 7 for location of service spillway and description of embankment zones.

FIGURE 8
LAKE DESMET RESERVOIR (AND DIKE)
FIGURE 12
PINEY CREEK SUPPLY SYSTEM
DIVERSION DAM
**CLEAR CREEK PIPELINE**

**PUMPING PLANT E**

**OVERFLOW SECTION EL. 4390**

- Double 36" culverts

- Original E of U.S. Highway 16

- Relocated stream channel

**DIVERSION DAM**

- 24 concrete pipe

**RELOCATED HIGHWAY**

- Original ground surface on dam axis

- Original ground surface at Highway

- Bottom of cutoff trench

**STATES**

**PLAN**

**SCALE**

**SECTION A-A**

**SECTION C-C**

**SECTION B-B**

**EMBANKMENT ZONES**

1. Selected impervious materials compacted to 6-inch layers.
2. Random fill materials composed of sand, gravel, and semi-pervious earth compacted to 12-inch layers.

**HEALY DAM**

(PRELOCALED HIGHWAY)
See Figure 18 for Sections and Table of pumping equipment.

NOTE

PLAN - EL. 4385±

PLAN - EL. 4360±

FIGURE 17
CLEAR CREEK SUPPLY SYSTEM
PUMPING PLANT
(PLANS)
ISOMETRIC VIEW

DETAIL A
H.V. SWITCH OPERATING HANDLE

ELEVATION A-A
(69KV/4160V POWER TRANSFORMER)

ELEVATION B-B
(OUTDOOR SWITCHING CABINET)

FIGURE 19
CLEAR CREEK SUPPLY SYSTEM
PUMPING PLANT
SWITCHYARD