Cotter Corporation (N.S.L.)

CAÑON CITY MILLING FACILITY

Conceptual Evaporation Pond Design Report

December 2011

MWH
3665 JFK Parkway
Suite 206
Fort Collins, CO USA

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1.0 INTRODUCTION

This report presents the conceptual design of a new evaporation pond system for the Cotter Corporation (N.S.L.) (Cotter) Cañon City Milling Facility in Fremont County, Colorado. This report has been prepared for Cotter by MWH Americas Inc. (MWH) to meet the requirements listed in the Remedial Action Plan (RAP) schedule agreed upon by Cotter and the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (CDPHE).

1.1 Site Location

The Cotter Cañon City Milling Facility is located in Fremont County, approximately 2 miles south of Cañon City, and approximately 1.5 miles southwest of Lincoln Park in Section 16, Township 19 South, Range 70 West. The facility is located at the upper end of the Sand Creek basin, which drains to the north through the site area, then drains to the northeast and east through Lincoln Park to its confluence with the Arkansas River (MFG, 2005).

1.2 Design Objectives

The evaporation pond design is based on passive evaporation of groundwater from RAP activities, as well as runoff in the catchment basin draining to the SCS dam. The evaporation pond system is designed to utilize the top surface of the Secondary Impoundment. The evaporation pond design will include a series of three single-lined ponds, located within the outline of the existing liner for the Secondary Impoundment.

The evaporation ponds are being designed to provide storage capacity of 141 acre-ft. The ponds will provide a surface area for evaporative potential of 44 acres. The pond impoundments will be designed to hold the design storm event in accordance with regulatory guidance to maintain the integrity of the existing facilities and protect other structures or populations downstream. The criteria used for evaluation and design of the evaporation pond system are outlined in Section 2.

1.3 Project Background

The mill operated from 1958 to 1979 for recovery of uranium with an alkaline leach process (MFG, 2005). Other custom milling processes including acid leaching for recovery of other metals were also utilized during this time period. The alkaline mill tailings were initially deposited into the Old Ponds Area which consists of a series of ten ponds in the Sand Creek drainage immediately east of the mill site. The alkaline mill was demolished in 1999 (MFG, 2005).

A new tailings impoundment consisting of two cells was constructed from 1977-1979 in preparation of acid-leach mill operations which began in 1979 (MFG, 2005). The cells were designated as the Primary and Secondary Impoundments and were constructed with a composite liner system, consisting of a compacted clay liner overlain by a Hypalon liner and a protective soil cover. Acid leach, alkaline leach tailings, and tailings solids from the Old Ponds area, have been deposited into the Primary and Secondary Impoundments. The Primary Impoundment covers approximately 91 acres. The Secondary Impoundment is approximately 44 acres and was used for disposal of approximately 2 million cubic yards of alkaline tailings excavated from the Old Ponds area between 1981 and 1983 (MFG, 2005 and URS, 2010). The Secondary Impoundment has also served as an evaporative area for collected groundwater and tailings solutions as well as for site solid trash (MFG, 2005). Currently there is an interim cover on the Secondary Impoundment that was completed in 2010.

Currently, additional demolition work is underway and disposal of debris in the Primary Impoundment is ongoing as part of the reclamation of the site.

The evaporation ponds are being designed to evaporate water that is currently within the Primary Impoundment, as well as, direct precipitation and runoff, water removed from dewatering wells and subdrains for the tailings impoundments, and water removed as part of the current and future groundwater remediation activities at the site.

1.4 Scope of Report

This report presents a description of the conceptual design of a new evaporation pond at the site including design criteria, and preliminary facility siting and sizing. Conceptual design drawings are presented in Appendix A and water balance analysis is provided in Appendix B.

1.5 Limitations

MWH's services were performed within the limits prescribed by Cotter and outlined in MWH's contract and proposal for services, with the usual thoroughness and competence of the engineering profession. No other representation, expressed or implied, is included or intended in this report.

2.0 EVAPORATION POND DESIGN

The storage capacity for the evaporation ponds design was based on the volume of remaining process water at the site as well as groundwater collected as part of RAP activities and site experience from the past 30 years. During wet periods, excess runoff, likely to be of good water quality, could be temporarily stored behind the SCS dam (if that water meets appropriate water quality standards). If the runoff collected behind the SCS dam is above prescribed water quality standards, that water will be pumped to the Primary Impoundment for temporary storage. In this manner, water volumes and required evaporative surface area that exceeds those of the ponds on the Secondary Impoundment can be temporarily stored elsewhere (depending on water quality), and then pumped to the Secondary Impoundment when capacity is available for evaporation.

Information on the existing conditions of the site was obtained from the 2005 reclamation plan (MFG, 2005). Criteria for design of the evaporation ponds are summarized below.

2.1 Design Regulations

The design criteria for the evaporation pond design was based on review of regulatory guidance and design regulations prepared by CDPHE, the Nuclear Regulatory Commission (NRC), U.S. Environmental Protection Agency (EPA) (1988), U.S. Army Corps of Engineers (USACE), and the office of the State Engineer of Colorado. Pertinent regulations for the design of the temporary evaporation ponds include CDPHE guidance found in part 265, subpart K (surface impoundments), Regulatory Guide 3.11 for the Design, Construction, and Inspection of Embankment Retention Systems at Uranium Recovery Facilities (NRC, 2008), the USACE manual “Recommended Guidelines for Safety Inspection of Dams (1979)”, the State of Colorado Rules and Regulations for Dam Safety and Dam Construction (2007), and the USACE (2008) Coastal Engineering Manual.

2.2 Project Specific Design Criteria

Design criteria for the evaporation pond design are listed below. The following subsections describe these criteria in more detail.

Geometry:

1. Establish the overall area and capacity of the pond within the perimeter of the existing liner system in the Secondary Impoundment.
2. Provide contingency storage (freeboard) for the design storm event acting over the pond area.
3. Design the ponds with multiple storage areas to allow for phased closure in the future.
4. Provide minimum berm crest width of 15 feet to allow access on all sides of the ponds.
5. Slope pond bottoms to one sump per pond, for pumping and water removal capabilities.

Materials:

1. The ponds will be lined with a single geomembrane liner.
2. Utilize earth fill embankment design, based on available on-site materials.

2.3 Evaporation Pond Site Selection

This section provides a general description of the facility site selection based on the minimum required size of the ponds and the existing site conditions. The conceptual design drawings in Appendix A show the proposed location in plan view.

2.3.1 Facility Sizing

The design area of the evaporation pond system within the lined perimeter of the Secondary Impoundment is approximately 44 acres. The three cells have surface areas of 14.4, 14.7 and 15.0 acres each, respectively from north to south. The pond design was optimized to minimize the amount of import materials needed and minimize the amount of disturbance to the interim soil cover already in-place on the Secondary Impoundment.

The conceptual design of the three cells is based on maximum operating water levels of 5650.5, 5650.0, and 5649.5 feet (north to south) which provide a total storage volume of 141.7 acre-feet. The north cell would provide 44.5 acre-feet, the middle cell would provide 47.6 acre feet, and south cell would provide 49.6 acre-feet of storage volume.

2.3.2 Facility Siting

MWH conducted a review of potential sites for evaporation ponds at the Cotter Facility. Three locations were considered as possible sites: 1) on the Secondary Impoundment, 2) within the Primary Impoundment, and 3) in the Old Ponds Area. Locations on unaffected areas of the Cañon City milling facility were not considered.

Due to the proposed locations of the RAP trenches near the Old Ponds Area and the fact that the existing impoundments provide the benefit of the existing liner systems already in-place beneath the proposed ponds; the most feasible locations for the proposed evaporation ponds are within the footprint of one of the existing impoundments. However, in order for reclamation work on the Primary Impoundment to continue, construction of additional evaporation ponds on the Secondary Impoundment was selected.

In order to site the evaporation ponds within the outline of the existing liner, a low area will be created between the western dike and the existing topography. For the final design, this area will be armored for erosion protection and will divert runoff upstream of the Secondary Impoundment towards the south to the Primary Impoundment.

2.3.3 Site Conditions

As described in Section 1.2, the Secondary Impoundment is constructed with a composite liner system, consisting of a compacted clay liner overlain by a Hypalon liner and a protective soil cover. The subsurface conditions at the Secondary Impoundment site generally consist of alkaline tailings and other materials that were hauled from the Old Ponds Area and deposited within the impoundment. Based on information provided by Cotter, material placed in the Secondary Impoundment was placed in lifts and moisture conditioned during placement.

There is an interim cover presently in place, above the disposed materials. The interim cover was placed by mixing fill with the upper 1-2 feet of sludge in the impoundment and then covering the mixture with 2 feet of soil fill (URS, 2010). The interim cover has been monitored for surficial settlement and the results show minor settlement through interim cover placement, and minimal settlement since interim cover placement.

The Secondary Impoundment was constructed with a crest elevation of 5651.7 feet and 3:1 (H:V) slopes. The Hypalon liner was extended to an elevation of 5646.7 feet in 1988. Cotter disposed of solid waste materials (trash and debris) in the southwest corner of the impoundment and this area was contained by a five foot-tall berm (URS, 2010).

The interim cover soils, on the Secondary Impoundment, were sampled for geotechnical characteristics and in-place density and water content during the 2011 Cover Borrow Investigation. The cover soils tested consist of low plasticity sandy clay with silt and classify as CL material based on the USCS. The laboratory water contents of the samples tested range from about 5 percent to 17 percent. From the nuclear density testing conducted on the interim cover, total in-place densities on the Secondary Impoundment range from about 114 to 133 pcf. One sample was tested for permeability and the remolded permeability was 4.7E-5 cm/sec.

2.4 Liner System Design

Because the evaporation ponds will be constructed on an existing lined impoundment, the ponds are being designed with a single liner. The liner system for the evaporation ponds will consist of:

- 60-mil high density polyethylene (HDPE) geomembrane;
- 6-inches of sand bedding material (if necessary) and;
- Prepared subgrade, (borrow material).

The HDPE geomembrane was selected for its durability and resistance to UV radiation. The use of a black geomembrane will facilitate additional evaporation by absorption of solar radiation on the surface of the liner. The bedding material shall be tested to meet gradation specifications and shall be placed to prevent any sharp or protruding objects from damaging the liner. All geomembrane seams shall be welded in accordance with manufacturer and/or project specifications to create a continuous, watertight barrier. The geomembrane will be securely anchored into the perimeter and interior berms in anchor trenches, as shown on the Drawings.

2.4.1 Sump and Water Removal System

Each pond bottom will be graded at a minimum of 0.5 percent slope to drain to a sump, so that water can be pumped out of each section of the pond separately. The design will include two 10-inch diameter HDPE riser pipes that will extend up the side slope of the ponds from each sump, to the crest of the embankments. Water can be removed from the ponds, or pumped from one cell to the adjacent cell, by installing a submersible pump into the risers.

2.5 Water Balance Modeling

A preliminary site-wide water balance model was developed to assist with estimating the capacity required for the new evaporation pond. The modeling results are summarized in this section and discussed in more detail in Appendix B.

The water balance model was developed as a spreadsheet model using Microsoft Excel® for deterministic variables and monthly time steps. Average site operational and average and extreme climatic conditions were used for the model. Prior to construction of the new evaporation pond, all water inflows into the system report to the Primary Impoundment. After construction of the new evaporation pond, inflows will primarily report to the evaporation pond. The following assumptions were used for the water balance model:

1. Design life of 30 years estimated by Cotter based on current and future RAP groundwater remediation activities.
2. Average and wettest year monthly precipitation conditions estimated from Cañon City climate station (WRCC, 2011a).
3. Average monthly evaporation conditions estimated from Pueblo Reservoir climate station (WRCC, 2011b).
4. Runoff for the Primary and Secondary Impoundment catchment area will be diverted around the evaporation pond and handled at the SCS dam or the Primary Impoundment.
5. Average monthly SCS pumpback values based on measured values from 2001 through 2010 (about 8 gpm annually).
6. Average monthly Well 333 pumping rates based on measured values from 2001 through 2010 (about 7 gpm annually).
7. Average monthly Pond 3 Trench pumping rates based on measured values from 2009 through 2010 (less than 1 gpm annually).
8. Estimate of 30 gpm from Hydrosolutions for inflow due to future RAP groundwater remediation activities including trenches, enhancements to SCS dam and dam to Ditch 006 area, and TCE cleanup.
9. Pond 3 inflows include mill runoff and lab building scrubber discharge and sink waste water. Mill runoff was estimate based on the Pond 3 catchment area and average precipitation conditions. The lab building scrubber discharge and sink waste water was estimated by Cotter as a maximum of 2 gpm for 8 hours/day and 365 days/year (about 1 gpm annually).
10. Average monthly dewatering rates from the Primary and Secondary Impoundment based on measured monthly pumping rates for 2010 (about 8 and 1 gpm annually).
11. Average monthly pumping rates from the tailings impoundment subdrains based on measured values from 2009 through 2010 (less than 1 gpm annually).

The results of the water balance for average and wet- year precipitation conditions are summarized in Table 2-1. The results indicate that the proposed evaporation pond of 44 acres will have the required evaporation area for average precipitation conditions if the upstream runoff is diverted and handled at the SCS dam and/or the Primary Impoundment. For wet-year conditions (evaluated using the wettest year on record), the results indicate an evaporation area of 63 acres is required. For an evaporation pond area of 44 acres, a capacity of 50 ac-ft would be required to store the water not evaporated from the wettest year conditions.

Table 2-1. Water Balance Results

Case	Annual Precipitation (in)	Required Evaporation Area (ac)
Average Precipitation Conditions	12.62	39
Wet-Year Precip. Conditions	23.18	63

For wet-year conditions generating runoff in Sand Creek, additional time for evaporation of water collected at the SCS Dam would be necessary.

2.6 Freeboard

The evaporation pond freeboard between the maximum operating water level and berm crest will be 2.5 feet, based on capacity for extreme storm events and consideration of wave action.

CDPHE (2011) part 265, subpart K (surface impoundments) states that an impoundment “must maintain enough freeboard to prevent any overtopping of the dike by overfilling, wave action, or a storm.” The document also suggests a minimum freeboard of 24 inches. Based on Regulatory Guide 3.11 for the Design, Construction, and Inspection of Embankment Retention Systems at Uranium Recovery Facilities (NRC, 2008), the selection of the design flood needs to be at least compatible with the hazard category guidelines set forth by the USACE (1979). Tables 1 and 2 in that reference indicate that the proposed evaporation ponds would categorize as a small impoundment (less than 1,000 ac-ft of storage) and a significant hazard classification based on “appreciable” economic loss resulting from failure. Based on these classifications, the design storm event should be between the 100-year event and ½ the PMF. Guide 3.11 also recommends including wave action in the freeboard for the impoundment and calculating wave runup in accordance with USACE (2008) Coastal Engineering Manual procedures. In addition, although this impoundment would not meet the States criteria for a jurisdictional dam, the State of Colorado (2007) indicates that freeboard design for jurisdictional dams should include either wave action or the inflow design flood (IDF).

Based on these criteria, the evaporation ponds will be designed with 2.5 feet of freeboard above the maximum operating surface water elevation. This will be sufficient to accommodate either a 1,000-year (24-hour) event over the ponds area and have an additional 2 feet of freeboard or this freeboard will allow for a 100-year (24-hour) event over the ponds area as well as account for wave action.

The 100-year design storm event for the site was estimated based on the NOAA Atlas, Dept. of Commerce (1973). The larger storm event was predicted based on the method described in NOAA Technical Paper No. 40, Dept. of Commerce (1961) in which the more frequent, published storm events are corrected and a log-normal plot is created to extrapolate out to less frequent return periods.

2.7 Closure Design Concepts

The evaporation ponds are being designed so that individual cells can be closed in phases as the storage needs for the site decrease in the future. As pond area and volume is no longer needed, the liner and sump piping can be removed and disposed of in the Primary Impoundment and the embankment fill can be spread over the surface of the interim cover of the Secondary Impoundment, as cover soil.

3.0 CONCEPT CONSIDERATIONS

3.1 Construction Materials

A preliminary pond layout is shown in the drawings in Appendix A. The estimated material quantities for the components of the conceptual pond are listed below.

- Embankment fill material – 58,000 cy
- Pond bottom fill material – 42,000 cy
- Geomembrane bedding material (sand) – 37,000 cy
- HDPE geomembrane liner – 225,000 sy
- HDPE sump riser piping – 60 lf

The evaporation pond embankments would be constructed with mined materials from existing borrow areas on Cotter property and/or from clean fill from the Primary Impoundment embankment. Bedding material for the geomembrane could be mined and screened on-site or purchased and transported to the site. The geomembrane liner would be purchased and delivered from a commercial source in the area.

3.2 Instrumentation and Monitoring

Because of the limited geotechnical information for the dike foundation material, the final design should include a settlement monitoring plan for the dikes and staff gauges, within each pond, to monitor the water levels and maintain the minimum freeboard to prevent overtopping. Additionally, water sampling protocol will be established to evaluate the quality of water if it becomes impounded behind the SCS dam.

3.3 Construction Specifications and QA/QC Plan

The construction of the proposed evaporation ponds will require detailed construction specifications and a QA/QC plan outlining the requirements for construction and testing of materials during construction. The specifications will include, at a minimum, testing requirements for the placement of the embankment fill soils, testing requirements for the geomembrane liner and gradation and placement requirements for the sand bedding material.

3.4 Final Design and Construction Schedule

The final design of the evaporation ponds can be completed by June 2012. Construction of the evaporation ponds can begin late summer 2012 and should be completed by early summer 2013.

3.5 Additional Site Exploration and Design

Once the preliminary design is approved by CDPHE, additional topographic survey information can be collected on the Secondary Impoundment to refine to the final design and grading plans.

4.0 REFERENCES

Brown and Associates, Inc. 1988. "Freeboard Determination and Management in Hazardous Waste Surface Impoundments" prepared for EPA, Cincinatti, OH. August.

Colorado Department of Public Health and Environment (CDPHE), 2011. "Colorado Hazardous Waste Regulations, Part 265, Standards for Owners and Operators of Interim Hazardous Waste Treatment, Storage and Disposal Facilities". September 30.

Colorado, State of, 2007. "Rules and Regulations for Dam Safety and Dam Construction". January 1.

MFG, Inc., 2005, "2005 Update of the Mill Decommissioning and Tailings Reclamation Plan for the Cotter Corporation Cañon City Milling Facility," prepared for Cotter Corporation. August.

URS Corporation, 2010. "2009 Annual Inspection of Tailings Facilities and Water Storage Reservoirs, Cañon City Milling Facility, Cañon City, Colorado", prepared for Cotter Corporation. March.

U.S. Army Corps of Engineers (USACE). 1979. "Recommended Guidelines for Safety Inspection of Dams", ER 1110-2-1273. September.

U.S. Army Corps of Engineers (USACE). 2008. "Coastal Engineering Manual", EM 1110-2-1100. August.

U.S. Army Corps of Engineers (USACE). 1997. "Hydrologic Engineering Requirements for Reservoirs", EM 1110-2-1420. October.

U.S. Army Corps of Engineers (USACE). 1995. "Design of Coastal Revetements, Seawalls, and Bulkheads", EM 1110-2-1614. June.

U.S. Army Corps of Engineers (USACE). 1989. "Water Levels and Wave Heights for Coastal Engineering Design", EM 1110-2-1414. July.

U.S. Army Corps of Engineers (USACE). 1975. "Shore Protection Manual, Vol. 3".

U.S. Department of Commerce, 1961. "Technical Paper No. 40, Rainfall Frequency Atlas of the United States". May. (reprinted 1963).

U.S. Department of Commerce, 1973. "NOAA Atlas No. 2, Precipitation-Frequency Atlas of the Western United States, Volume III Colorado".

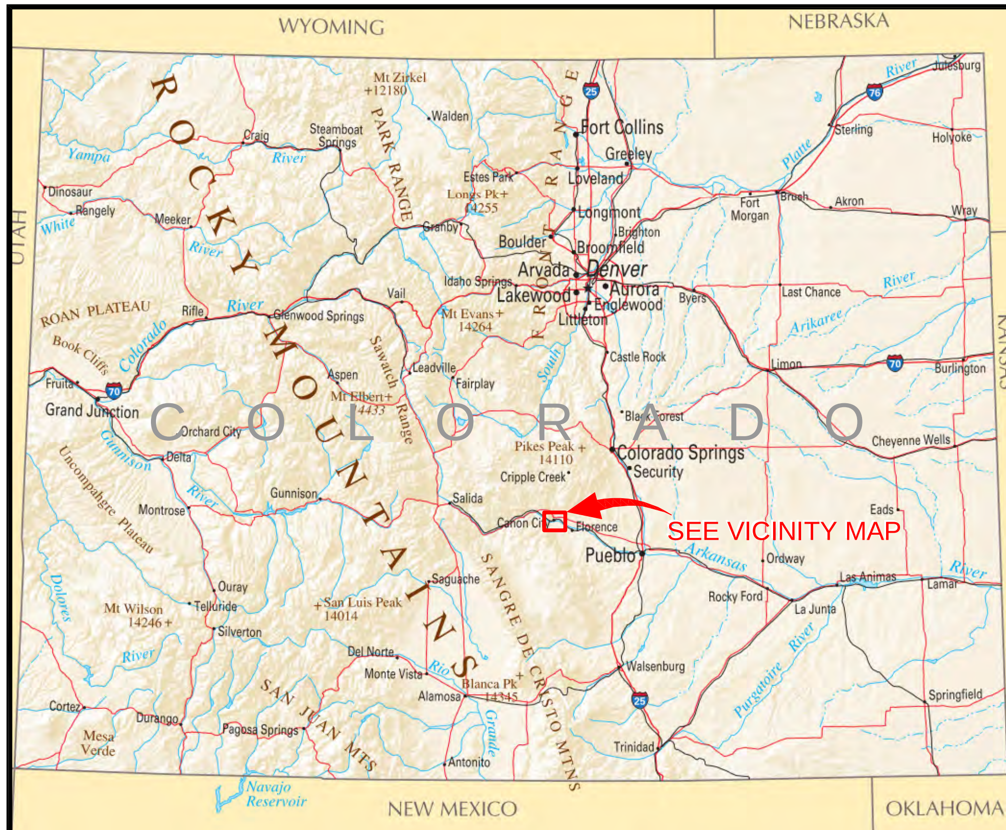
U.S. Nuclear Regulatory Commission (NRC), 2008. "Regulatory Guide 3.11 – Design, Construction, and Inspection of Embankment Retention Systems at Uranium Recovery Facilities". Rev. 3. November.

Western Regional Climate Center (WRCC), 2011a. Monthly Precipitation for Canon City, Colorado Station. http://www.wrcc.dri.edu/cgi-bin/cliMONtpre.pl?co1294 Accessed November 15.

Western Regional Climate Center (WRCC), 2011b. Monthly Evaporation for Pueblo Reservoir, Colorado Station No. 056765. Purchased dataset received via email on November 21.

APPENDIX A

CONCEPTUAL DESIGN DRAWINGS



LOCATION MAP

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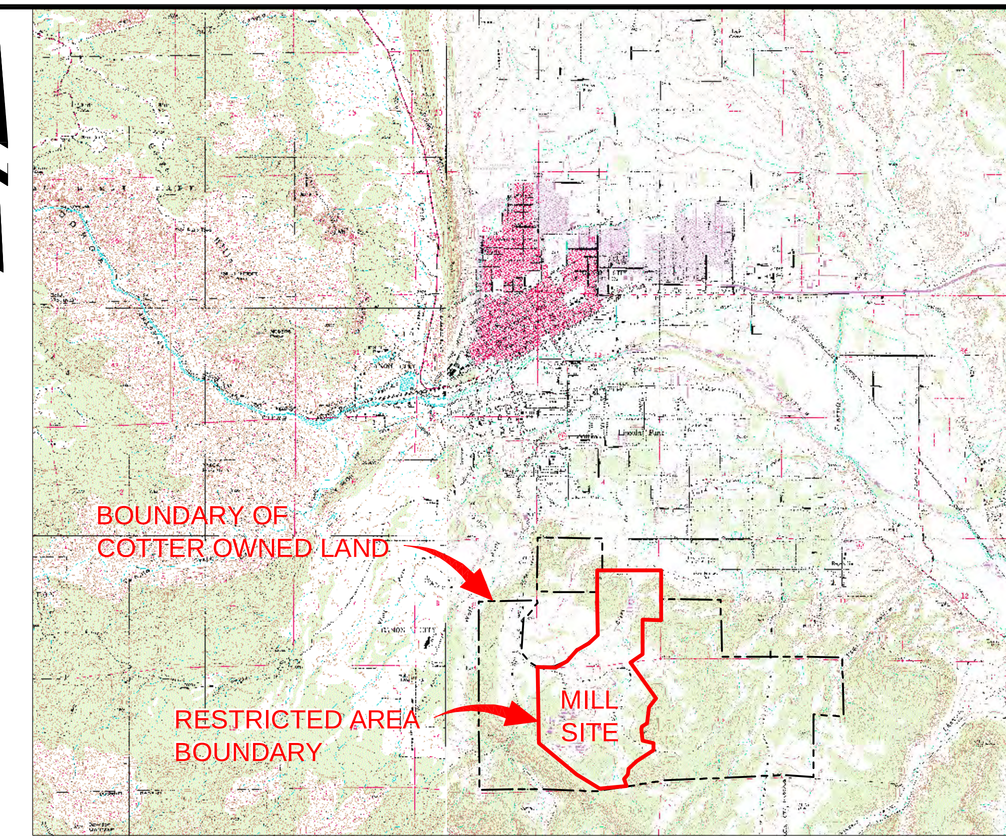

VICINITY MAP

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INDEX OF DRAWINGS		
SHEET	TITLE	REV
1	COVER SHEET	A
2	OVERALL SITE LAYOUT	A
3	GRADING PLAN	A
4	EVAPORATION POND LINER DETAILS	A
5	SUMP SECTION AND DETAILS	A

CONCEPTUAL EVAPORATION POND DESIGN
FOR THE CAÑON CITY MILLING FACILITY

prepared for

COTTER CORPORATION (N.S.L)

FREMONT COUNTY, CO

ISSUE/REV	DESCRIPTION	TECH	ENG	DATE
A	CONCEPTUAL DESIGN	DM	JC	12–11

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DRAWN BY	D. MIRANDA	12–11
CHECKED BY	M. DAVIS	12–11
APPROVED BY	C. STRACHAN	12–11
PROJECT MANAGER		
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

COTTER CORPORATION (N.S.L.)

PROJECT LOCATION: CAÑON CITY, COLORADO

PROJECT: CAÑON CITY MILLING FACILITY

TITLE: COVER SHEET

MWH

SHEET: 1 | REVISION: A

FILE NAME: 1007533D010

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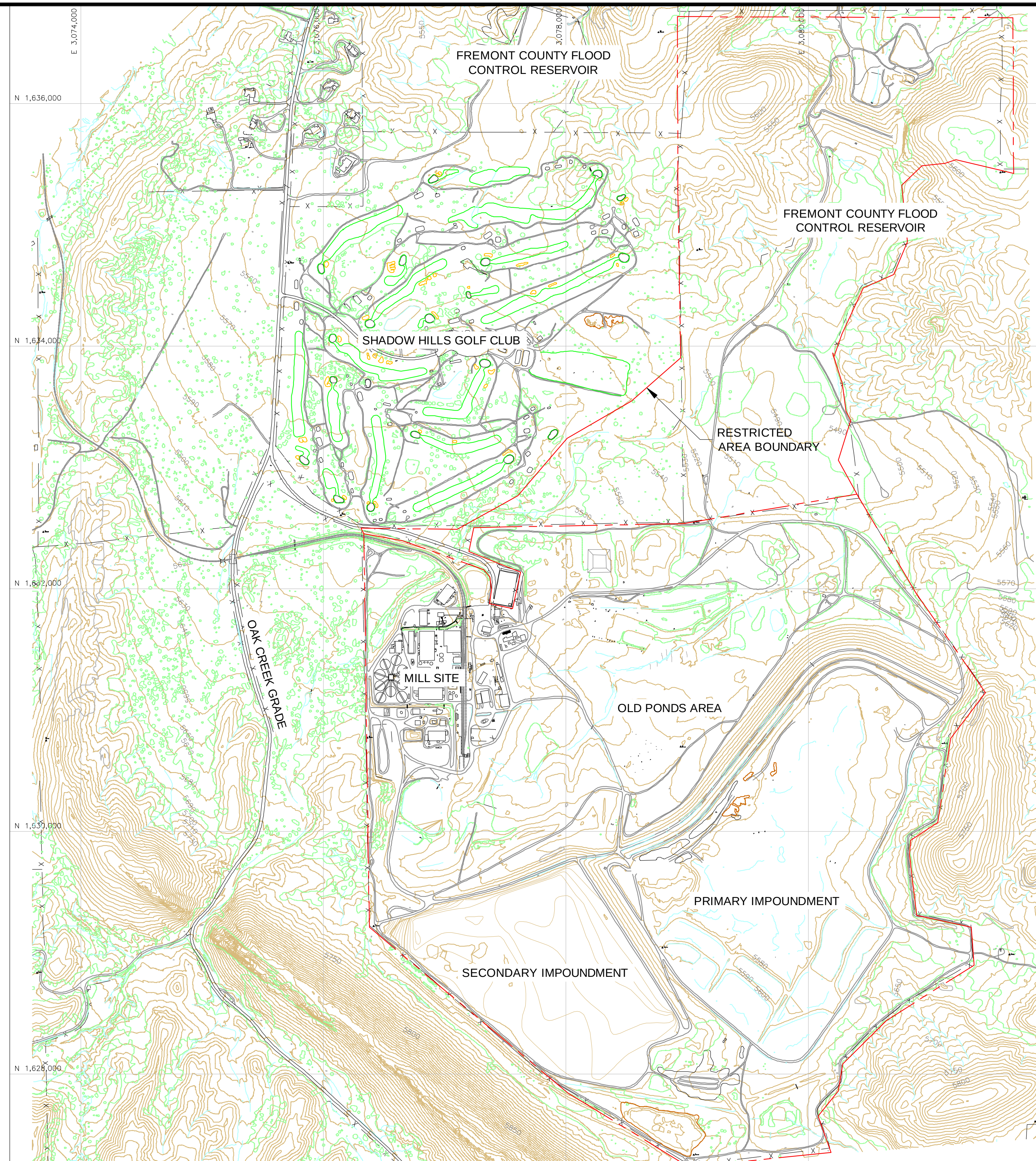

LEGEND:

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	EXISTING ROAD
—x—	EXISTING FENCE

SCALE 500 0 500 1000'

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ISSUE REV	DESCRIPTION	TECH	ENG	DATE
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DRAWING REFERENCE(S):
- TOP SURFACE OF SECONDARY IMPOUNDMENT CONTOURS GENERATED FROM DECEMBER 13, 2010 GPS SURVEY DATA FROM COTTER.
- REMAINDER OF EXISTING TOPOGRAPHY FROM MARCH 9, 2007 AERIAL SURVEY

DESIGNED BY	J. CUMBERS	12-11
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CLIENT APPROVAL		
CLIENT REFERENCE NO.		

COTTER CORPORATION (N.S.L.)

PROJECT LOCATION: CAÑON CITY, COLORADO

PROJECT: CAÑON CITY MILLING FACILITY

TITLE: OVERALL SITE LAYOUT

SHEET: 2 REVISION: A

FILE NAME: 1007533D011

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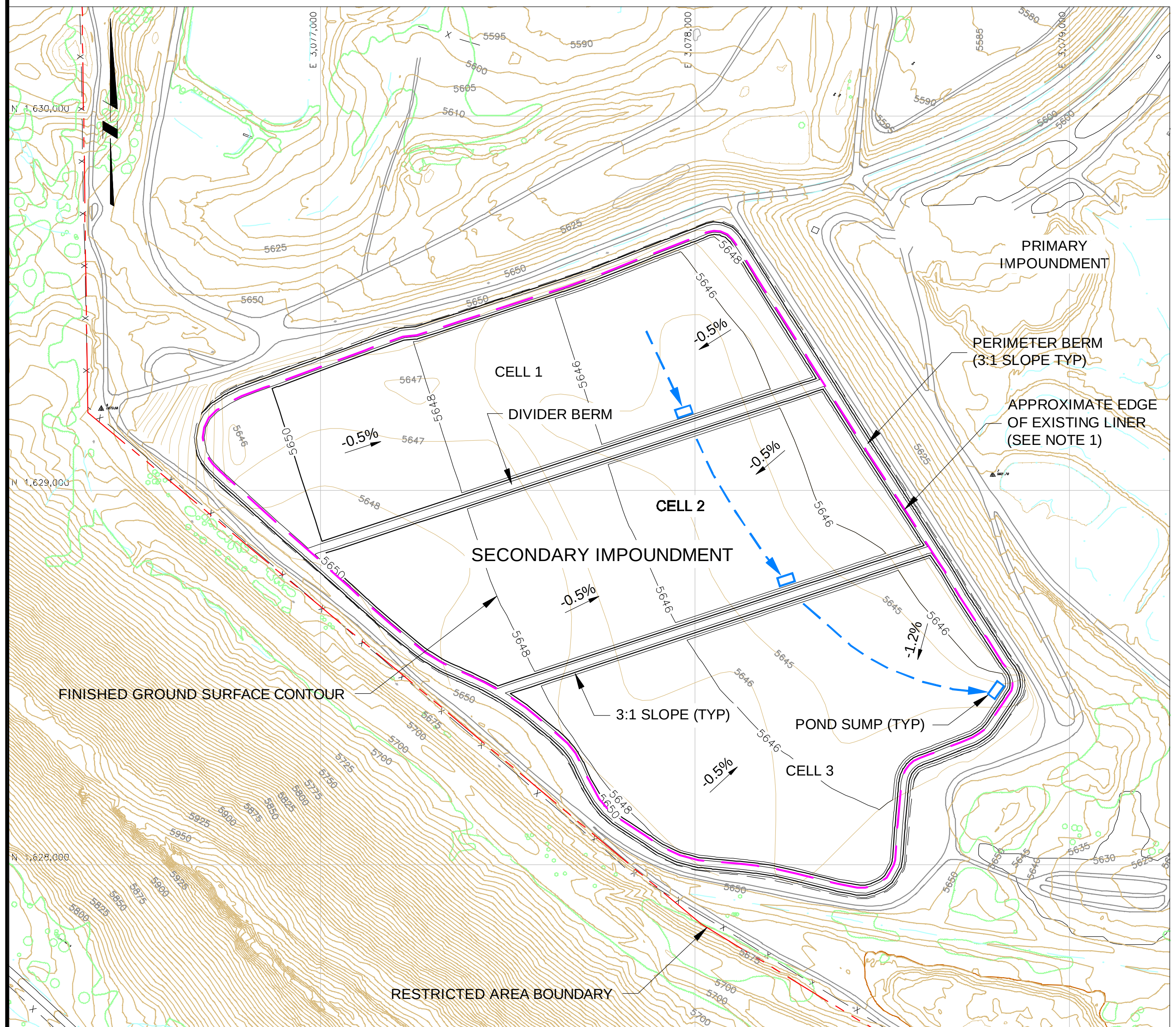
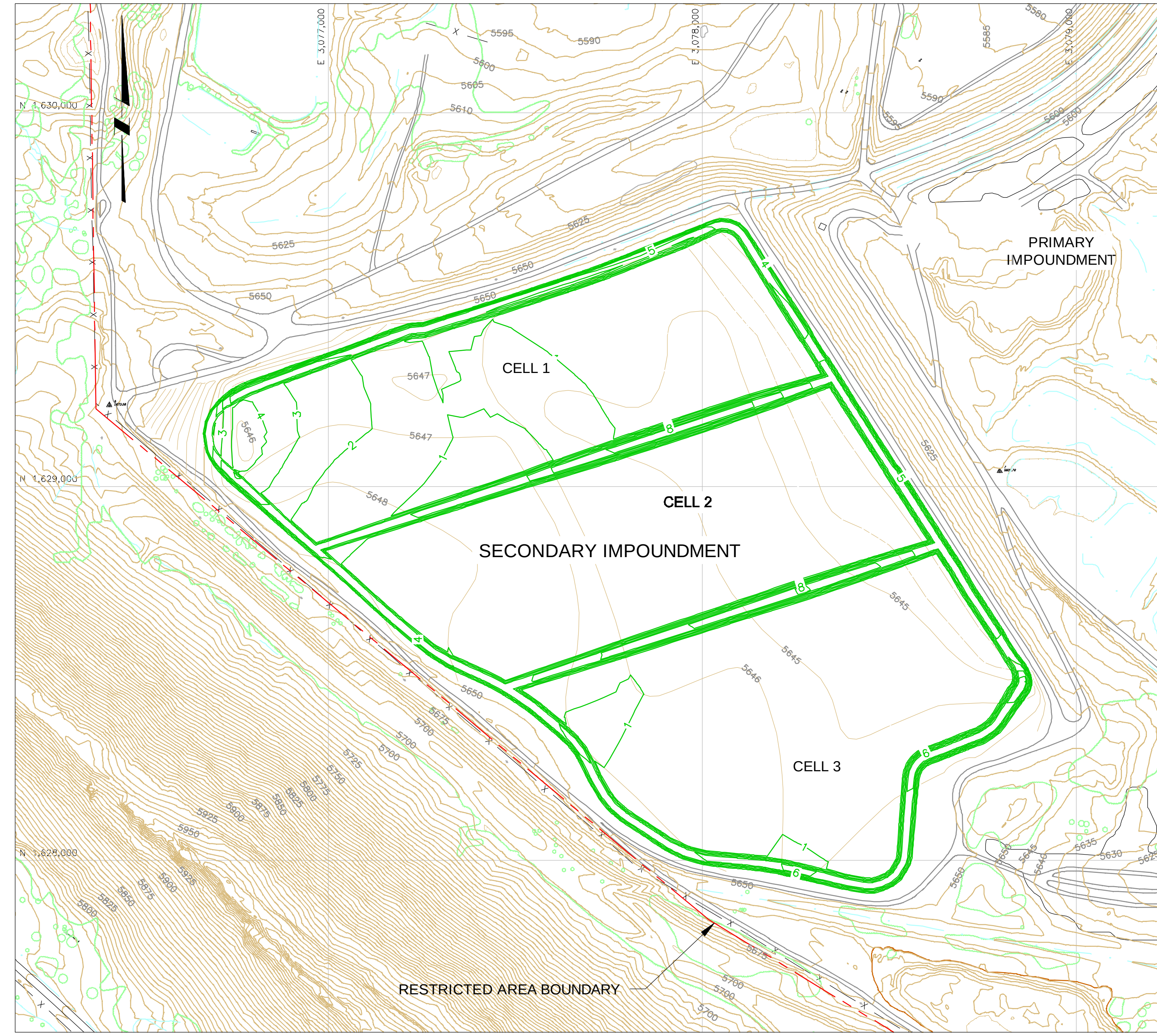


EVAPORATION POND GRADING PLAN



EVAPORATION POND ISOPACH CONTOURS

NOTE:

1. EDGE OF EXISTING SECONDARY IMPOUNDMENT LINER BASED ON LOCATION OF PERIMETER BERM SHOWN ON W.A. WAHLER & ASSOCIATES DRAWING TITLED "RESERVOIR CONTOURS AS-BUILT" AND DATED MAY 1980.

SCALE 200 0 200 400'

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
A	CONCEPTUAL DESIGN	DM	JC	12-11

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DRAWING REFERENCE(S):
- TOP SURFACE OF SECONDARY IMPOUNDMENT CONTOURS GENERATED FROM DECEMBER 13, 2010 GPS SURVEY DATA FROM COTTER.
- REMAINDER OF EXISTING TOPOGRAPHY FROM MARCH 9, 2007 AERIAL SURVEY

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CLIENT REFERENCE NO.		

COTTER CORPORATION (N.S.L.)

PROJECT LOCATION: CAÑON CITY, COLORADO

PROJECT: CAÑON CITY MILLING FACILITY

TITLE: GRADING PLAN

MWH

SHEET 3 | REVISION A

FILE NAME 1007533D012

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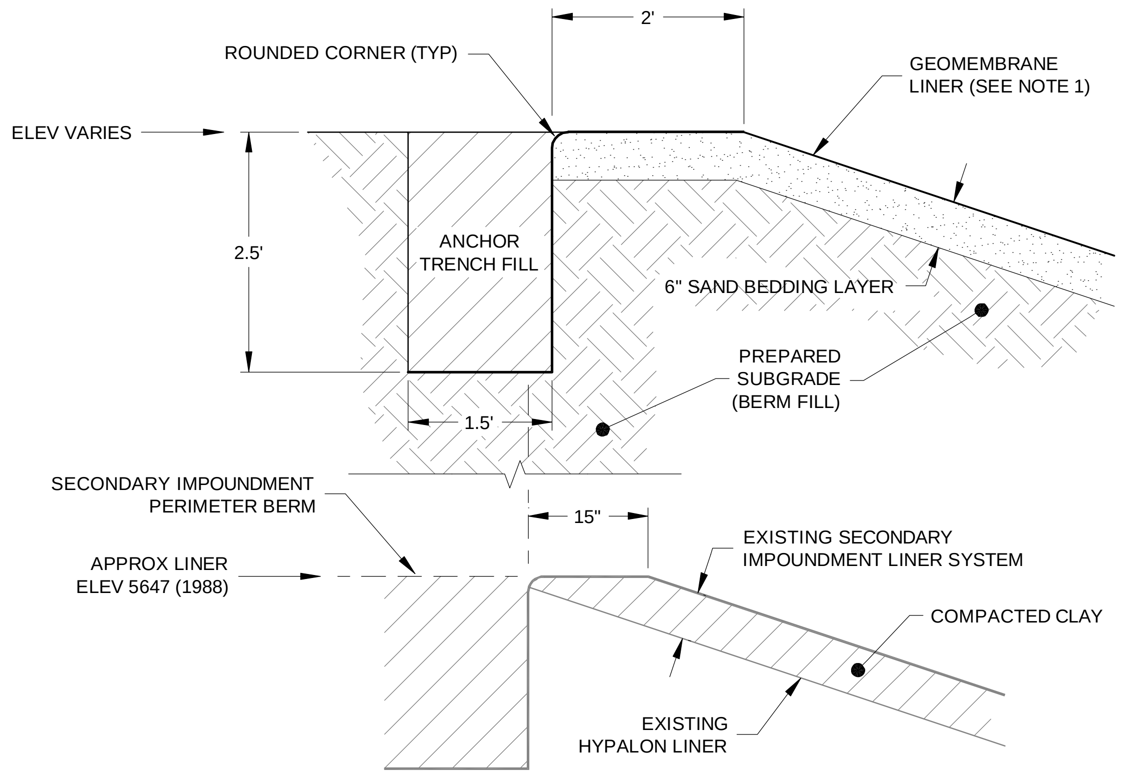

NOTE:

1. EDGE OF EXISTING SECONDARY IMPOUNDMENT LINER BASED ON LOCATION OF PERIMETER BERM SHOWN ON W.A. WAHLER & ASSOCIATES DRAWING TITLED "RESERVOIR CONTOURS AS-BUILT" AND DATED MAY 1980.

1 POND LINER ANCHOR TRENCH DETAIL

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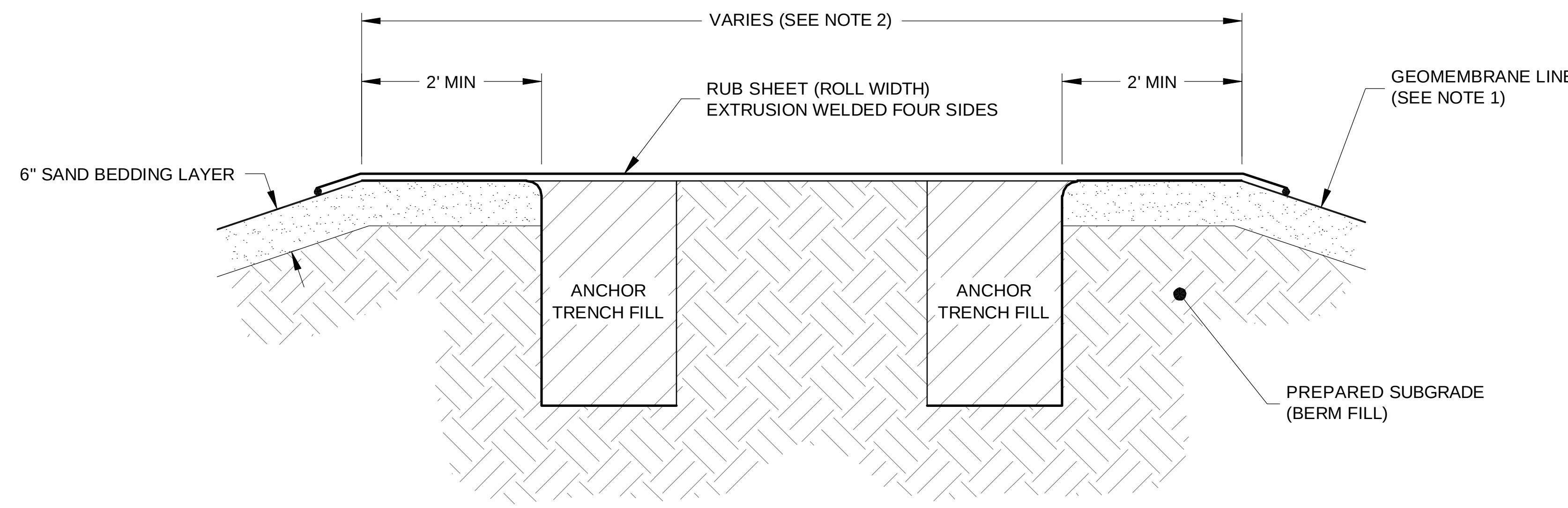
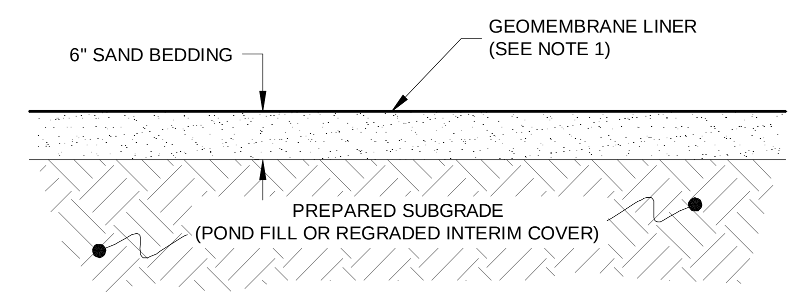


2 DIVIDER BERM DETAIL

SCALE 1' 0 1' 2'



3 POND LINER DETAIL

SCALE 1' 0 1' 2'

NOTES:

1. LINERS SHALL CONSIST OF SMOOTH BLACK HIGH DENSITY POLYETHYLENE GEOMEMBRANE, 60 MIL NOMINAL THICKNESS.
2. DIVIDER BERM SHALL BE CONSTRUCTED WITH A MINIMUM WIDTH OF 15 FT.
3. ANCHOR TRENCH FILL TO BE COMPACTED TO 95% OF THE STANDARD PROCTOR DENSITY.

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ISSUE/REV	DESCRIPTION	TECH	ENG	DATE
A	CONCEPTUAL DESIGN	DM	JC	12-11

DESIGNED BY	J. CUMBERS	12-11
DRAWN BY	D. MIRANDA	12-11
CHECKED BY	M. DAVIS	12-11
APPROVED BY	C. STRACHAN	12-11
PROJECT MANAGER		
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

COTTER CORPORATION (N.S.L.)

PROJECT LOCATION: CAÑON CITY, COLORADO

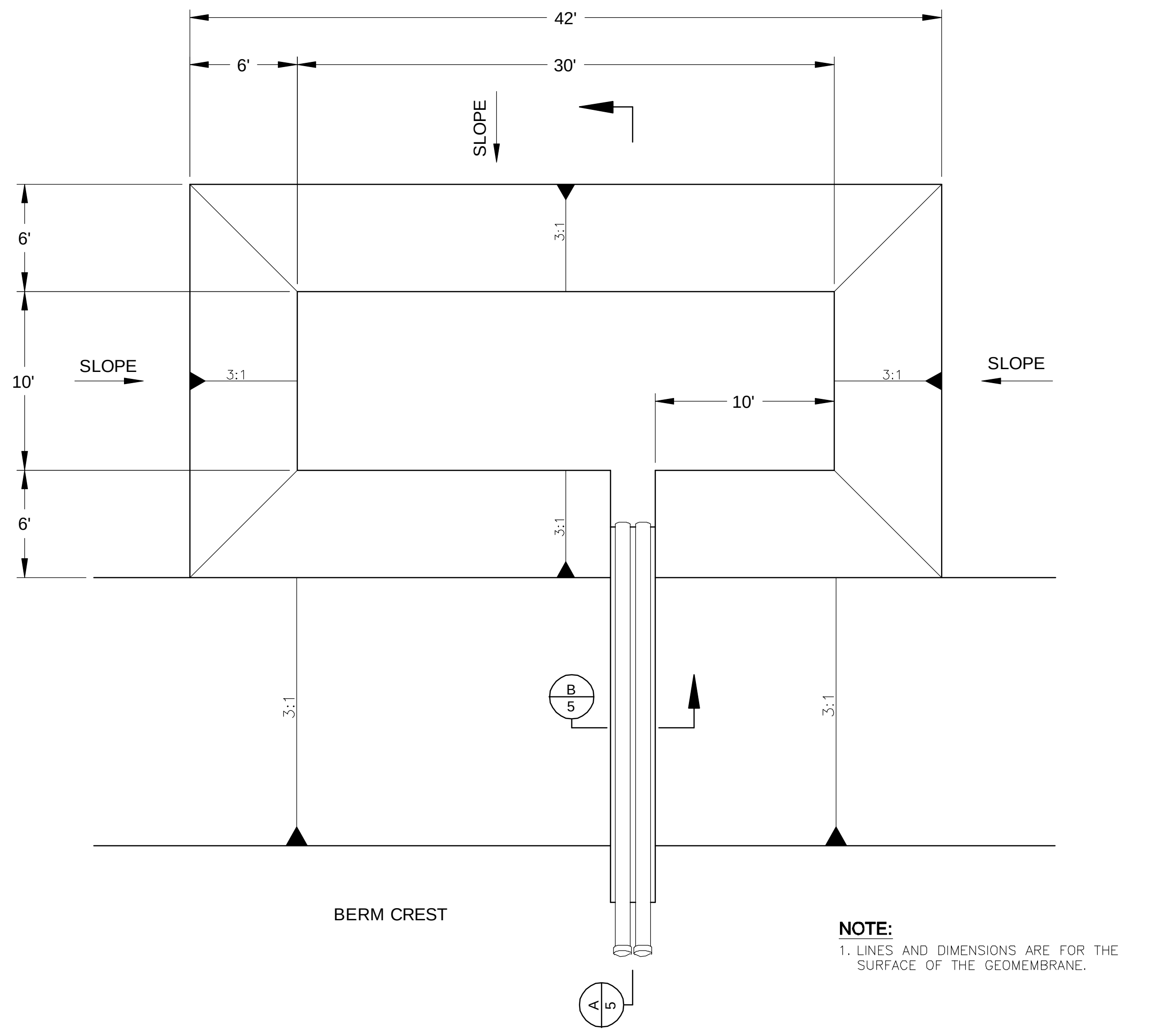
PROJECT: CAÑON CITY MILLING FACILITY

TITLE: EVAPORATION POND LINER DETAILS

MWH

SHEET 4 | REVISION A

FILE NAME 1007533D013



NOTE:
1. LINES AND DIMENSIONS ARE FOR THE SURFACE OF THE GEOMEMBRANE.

1 - SUMP PLAN

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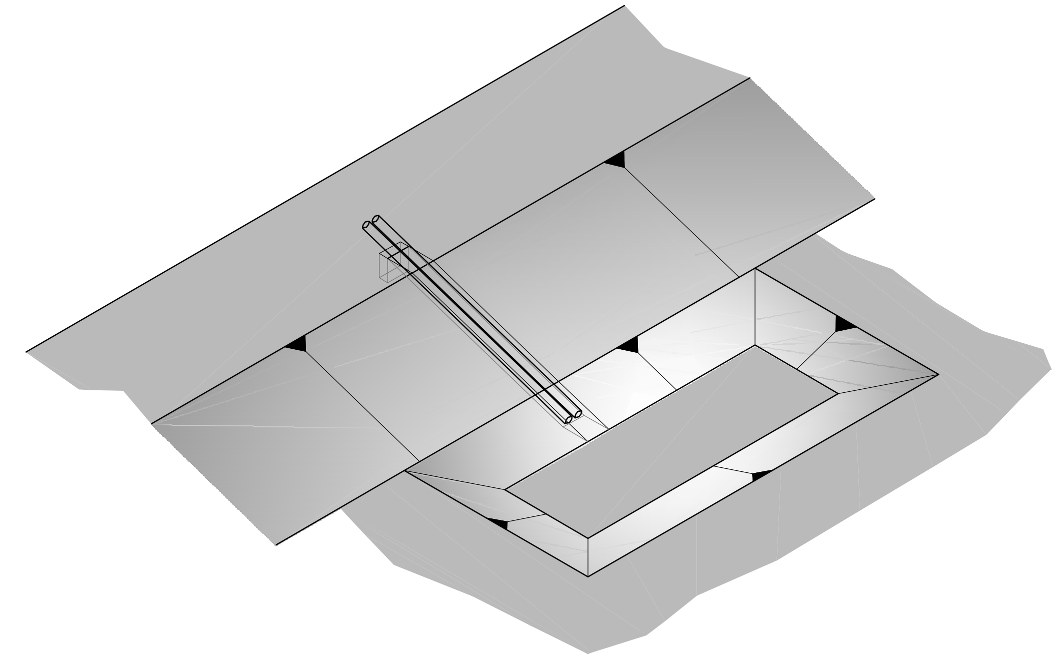
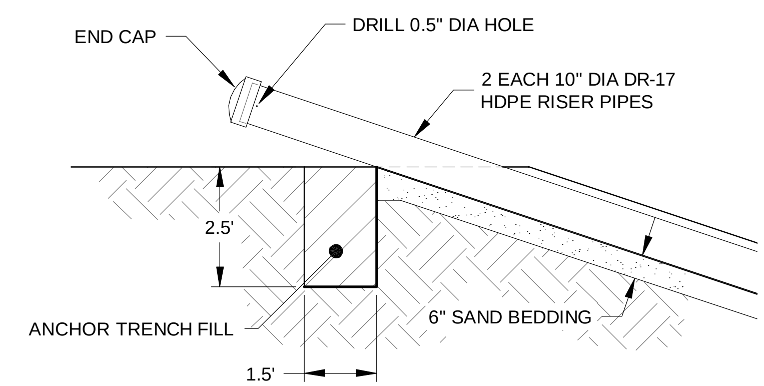


2 - SUMP ISOMETRIC VIEW

NOT TO SCALE

NOTE:
1. MOBILE PUMP TO BE SUPPLIED BY OTHERS.



3 - RISER OUTLET DETAIL

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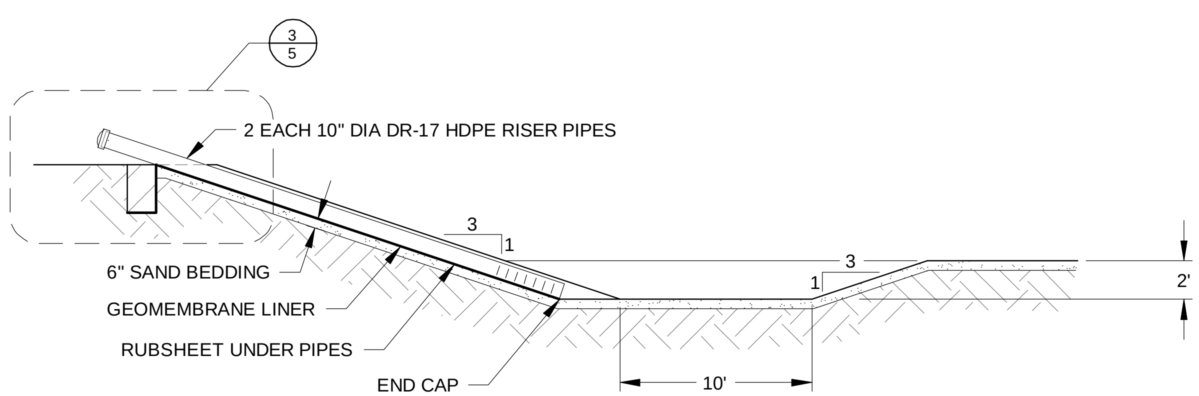
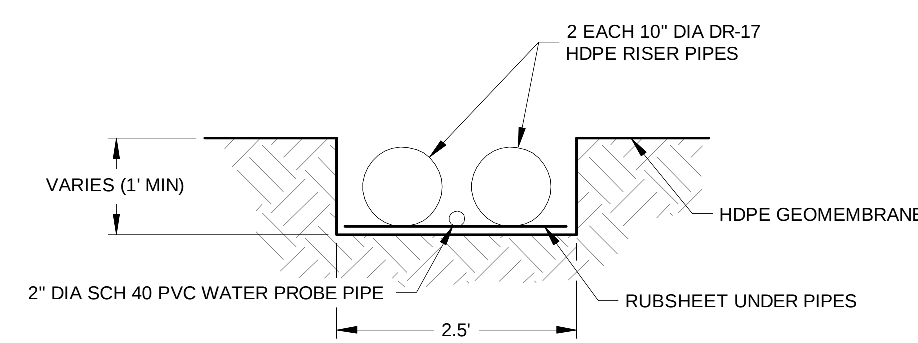


A - SECTION THROUGH RISER PIPE

SCALE 5' 0 5' 10'



B - RISER PIPE SECTION

SCALE 1' 0 1' 2'

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ISSUE / REV	DESCRIPTION	TECH	ENG	DATE
A	CONCEPTUAL DESIGN	DM	JC	12-11

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DESIGNED BY	J. CUMBERS	12-11
DRAWN BY	D. MIRANDA	12-11
CHECKED BY	M. DAVIS	12-11
APPROVED BY	C. STRACHAN	12-11
PROJECT MANAGER		
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

COTTER CORPORATION (N.S.L.)

PROJECT LOCATION: CAÑON CITY, COLORADO

PROJECT: CAÑON CITY MILLING FACILITY

TITLE: SUMP SECTION AND DETAILS

MWH

SHEET: 5
REVISION: A
FILE NAME: 1007533D013

APPENDIX B

WATER BALANCE ANALYSIS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1.0 BACKGROUND

This appendix presents the results of preliminary site-wide water balance modeling for future conditions at the site after construction of a new evaporation pond on the Secondary Impoundment. The modeling results were used to assist with estimating the capacity required for the new evaporation pond. The water balance model will be further refined for the final evaporation pond design and for use as a tool to support Cotter with water management for the site.

2.0 METHODOLOGY

The water balance model was developed as a spreadsheet model using Microsoft Excel. Deterministic variables and monthly time steps were used in the model. Both average and wet-year precipitation conditions were evaluated. The modeled time period was one year. The design life of the evaporation pond is estimated to be 30 years per Cotter based on current and further Remedial Action Plan (RAP) activities.

3.0 MODEL INPUTS AND ASSUMPTIONS

Figure B.2 presents a schematic of the site-wide water balance flows for conditions post evaporation pond construction. In general, the model inflows include precipitation, runoff, inflows from Pond 3, water from dewatering of the Primary and Secondary Impoundment, water collected in the impoundment subdrains, and surface water and groundwater collected as part of the RAP current and future activities. Losses from the site are due to evaporation. These parameters are discussed in more detail in the following sections and the values used for the model are provided in Attachment B.1.

3.1 Model Inflows

3.1.1 Precipitation and Runoff

Model inflows include direct precipitation on the pond and runoff from the upstream catchment area. For future conditions (after construction of the evaporation pond), the upstream runoff is proposed to be diverted around the evaporation pond and handled at the SCS dam and/or the Primary Impoundment. For reference, the total catchment area for the Primary and Secondary Impoundments is shown on Figure B.2.

Both average and extreme precipitation conditions were evaluated and were based on the nearby Cañon City climate station number 51294 (WRCC, 2011a). This station was selected due to its proximity to the site and long period of record (approximately 118 years with measured data from 1893 through 2010). Average precipitation conditions were estimated from the average monthly precipitation and average annual precipitation for the Cañon City climate station. Extreme precipitation conditions were evaluated by using the precipitation for the wettest year on record (1957). A summary of the values used in the model is provided in Table B.1.

Table B.1. Monthly Precipitation Values Used in Model[1]

Month	Average Precip. (inches) [Cañon City station]	Wet-Year Precip. [2] (inches) [Cañon City station]
Jan	0.41	0.51
Feb	0.50	0.36
Mar	0.89	0.39
Apr	1.42	5.61
May	1.61	5.73
Jun	1.16	1.94
Jul	1.81	2.92
Aug	1.91	2.24
Sep	1.01	0.27
Oct	0.81	0.90
Nov	0.60	2.31
Dec	0.49	0.00
Total	**12.62**	**23.18**

Notes:
1. Monthly values used in the model. Annual values provided for reference.
2. Wet-year precipitation conditions based on the wettest year on record for the Cañon City climate station (year 1957).

3.1.2 Pond 3

Pond 3 was constructed in 2008 and collects runoff from the Pond 3 catchment area (includes portions of the mill area), as well as lab building scrubber discharge and sink waste water. The estimated Pond 3 catchment area is shown on Figure B.3. Inflows to Pond 3 are currently pumped to the Water Distribution Pond as needed and then delivered to the Primary Impoundment. After construction of the evaporation pond, it is assumed that the inflows will continue to report to Pond 3 and be delivered to the evaporation pond via the Water Distribution Pond.

The runoff from the Pond 3 catchment area was estimated based on the monthly precipitation values provided in Table B.1, a catchment area of approximately 25.9 acres, and a runoff coefficient of 0.26. The values used in the model are shown in Attachment B.1. The runoff coefficient was estimated based on the volume of water pumped from the Water Distribution Pond in 2009 and 2010 to the Primary Impoundment less the measured flows from the SCS Dam, Well 333, and less the estimated flow of water from the lab building scrubber discharge and sink waste water. The runoff coefficient for the Pond 3 area was then back calculated using this net volume (approximately 640,000 cubic feet), the catchment area, and the measured monthly precipitation values for the Cañon City climate station for 2009 and 2010 (shown in Table B.2).

Table B.2. Monthly Precipitation Values Used to Estimate Runoff Coefficient

Month	2009 Precip. (inches) [Cañon City station]	2010 Precip. (inches) [Cañon City station]
Jan	0.63	0.19
Feb	0.07	0.91
Mar	0.83	2.18
Apr	1.37	0.59
May	1.50	0.51
Jun	1.68	0.36
Jul	3.11	2.13
Aug	1.92	2.61
Sep	1.76	0.23
Oct	1.88	0.27
Nov	0.62	0.03
Dec	0.64	0.22
Total	**16.01**	**10.23**

3.1.3 Tailings Dewatering

A drainage system consisting of a series of finger drains is located above the liner system for both impoundments. The finger drains drain by gravity to a low area of each impoundment. This drainage system provides a means for reduction in porewater pressures and removal of porewater along the base of the tailings in both the Primary and Secondary Impoundments. Pumping from the drainage systems for the Primary and Secondary Impoundments began in 2010 and 2008, respectively. The water removed was sent to the Primary Impoundment. After construction of the evaporation pond, the water collected will be pumped to the evaporation pond. Model inflows to the evaporation pond from tailings dewatering were estimated as the measured monthly pumping rates for both impoundments in 2010. The values used for the model are shown in Attachment B.1 in the water balance model spreadsheet and are approximately 8 and 1 gpm annually for the Primary and Secondary Impoundments, respectively.

3.1.4 Impoundment Subdrains

A subdrain system underlies the liner system for both impoundments. This subdrain system was constructed to intercept springs along the northern half of the impoundment basin and reduce water pressure buildup under the liner (Wahler, 1980). The subdrains drain to a collection sump downstream of the toe of the Primary Impoundment and water collected is currently pumped to the Primary Impoundment. After construction of the evaporation pond, the water collected will be pumped to the evaporation pond. The subdrain pumping rates have been measured since the January 2009. The average monthly pumping rate from the time period of January 2009 through December 2010 was used in the model (less than 1 gpm annually).

3.1.5 RAP Activities

3.1.5.1 Pond 3 Trench
The Pond 3 Trench is located near the toe of the north embankment of the Primary Impoundment and collects groundwater for remediation. Collected water is currently pumped directly to the Primary Impoundment and will be pumped to the evaporation pond after it is constructed. The Pond 3 Trench pumping rates have been measured since the January 2009. The average monthly pumping rate from the time period of January 2009 through December 2010 was used in the model (less than 1 gpm annually).

3.1.5.2 SCS Dam
Groundwater and surface water runoff from the Sand Creek drainage to the north and west of the tailings impoundments is collected at the SCS Dam and currently pumped to the Primary Impoundment. After construction of the evaporation pond, the water collected during average precipitation conditions will be pumped to the evaporation pond. Monthly pumping rates used in the model were estimated as the average monthly pumping rates measured by Cotter from 2001 through 2010. The values used in the model are provided in Attachment B.1 and correspond to about 8 gpm annually. During wet periods, excess runoff, likely to be of good water quality, could be temporarily stored behind the SCS dam (if that water meets appropriate water quality standards). If the runoff collected behind the SCS dam is above prescribed water quality standards, that water will be pumped to the Primary Impoundment for temporary storage.

3.1.5.3 Well 333
Well 333 collects groundwater in the Old Ponds Area which is then pumped to the Primary Impoundment. After construction of the evaporation pond, the water collected will be pumped to the evaporation pond. Monthly pumping rates used in the model were estimated as the average monthly pumping rates measured by Cotter from 2001 through 2010. The values used in the model are provided in Attachment B.1 and correspond to about 7 gpm annually.

3.1.5.4 Future RAP Activities
Future additional RAP activities for groundwater remediation at the site include construction of trenches in the Old Ponds Area, enhancements to the SCS Dam and dam to Ditch 006 area, as well as TCE cleanup measures. Hydrosolutions has preliminarily estimated these additional activities will increase collected surface water and groundwater flows to be remediated by 30 gpm. This flow rate was used in the water balance model. This value may be refined in the future based on groundwater modeling to be conducted by Hydrosolutions.

3.2 Model Outflows
Losses from the evaporation pond consist of evaporation from the pond surface. Average pan evaporation rates were estimated from the Pueblo Reservoir climate station number 056765 (WRCC, 2011b) and adjusted using a pan coefficient of 0.70. This station was selected due to its proximity to the site and period of record. The period of record for this station is approximately 31 years with data measured data from 1975 through 2010. A summary of the values used in the model is provided in Table B.3.

Table B.3. Monthly Evaporation Rates Used in Model[1]

Month	Average Evaporation Rate (inches) [Cañon City station]
Jan	0.00
Feb	0.00
Mar	0.00
Apr	5.05
May	6.48
Jun	7.79
Jul	8.27
Aug	7.00
Sep	5.68
Oct	3.83
Nov	0.00
Dec	0.00
Total	**44.11**

Note:
1. Monthly values used in the model. Annual value provided for reference.

4.0 MODEL RESULTS

The results of the water balance for average and wet-year precipitation conditions are summarized in Table B.4. The results indicate that the proposed evaporation pond of 44 acres will have the required evaporation area for average precipitation conditions if the upstream runoff is diverted and handled at the SCS dam and/or the Primary Impoundment. For wet-year conditions (evaluated using the wettest year on record), the results indicate an evaporation area of 63 acres is required to evaporated the total volume in one year. For an evaporation pond area of 44 acres, a capacity of 50 ac-ft would be required to store the water not evaporated from the wet-year conditions.

Table B.4. Model Results

Case	Annual Precipitation	Required Annual Evaporation Area (ac)	Required Annual Storage Capacity (ac-ft)	Design Evaporation Pond Area (ac)	Design Evaporation Pond Area (ac)
Average Precipitation Conditions	12.62	39	27	44	141
Wet-Year Precipitation Conditions	23.18	63	50	44	141

For wet-year conditions generating runoff in Sand Creek, additional time for evaporation of water collected at the SCS Dam would be necessary.

5.0 REFERENCES

Wahler, W.A. and Associates (Wahler), 1980. "First Stage Construction Report, Cotter Corporation, Uranium-Vanadium Tailings Impoundment," July.

Western Regional Climate Center (WRCC), 2011a. Monthly Precipitation for Cañon City, Colorado Station. http://www.wrcc.dri.edu/cgi-bin/cliMONtpre.pl?co1294 Accessed November.

Western Regional Climate Center (WRCC), 2011b. Monthly Evaporation for Pueblo Reservoir, Colorado Station No. 056765. Purchased dataset received via email on November 21.

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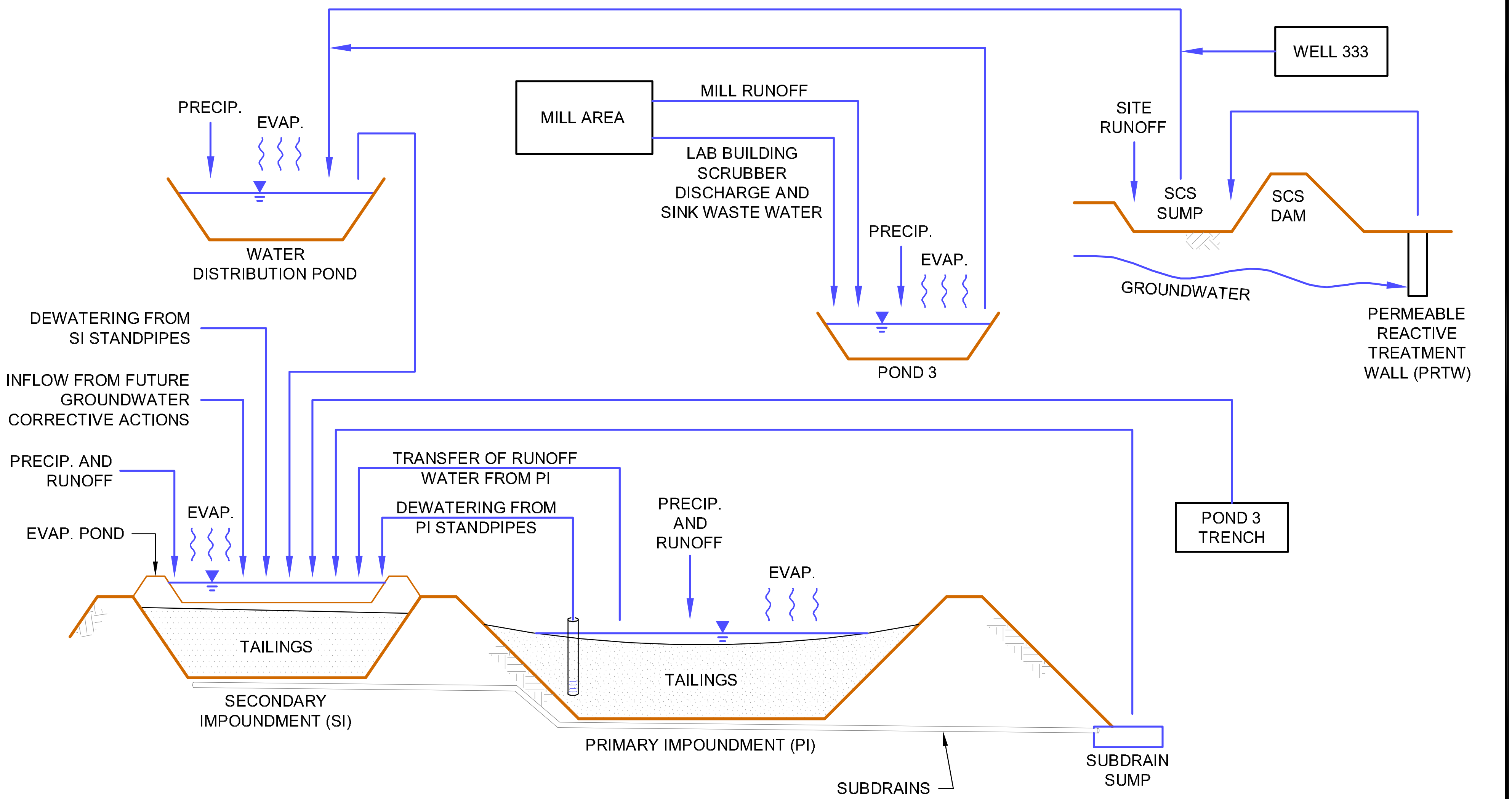

COTTER CORPORATION (N.S.L.)

PROJECT	CAÑÓN CITY MILLING FACILITY
TITLE	SITE-WIDE WATER BALANCE SCHEMATIC POST EVAPORATION POND CONSTRUCTION

MWH

DATE DEC 2011	FIGURE B.1
FILE NAME	1007533D009

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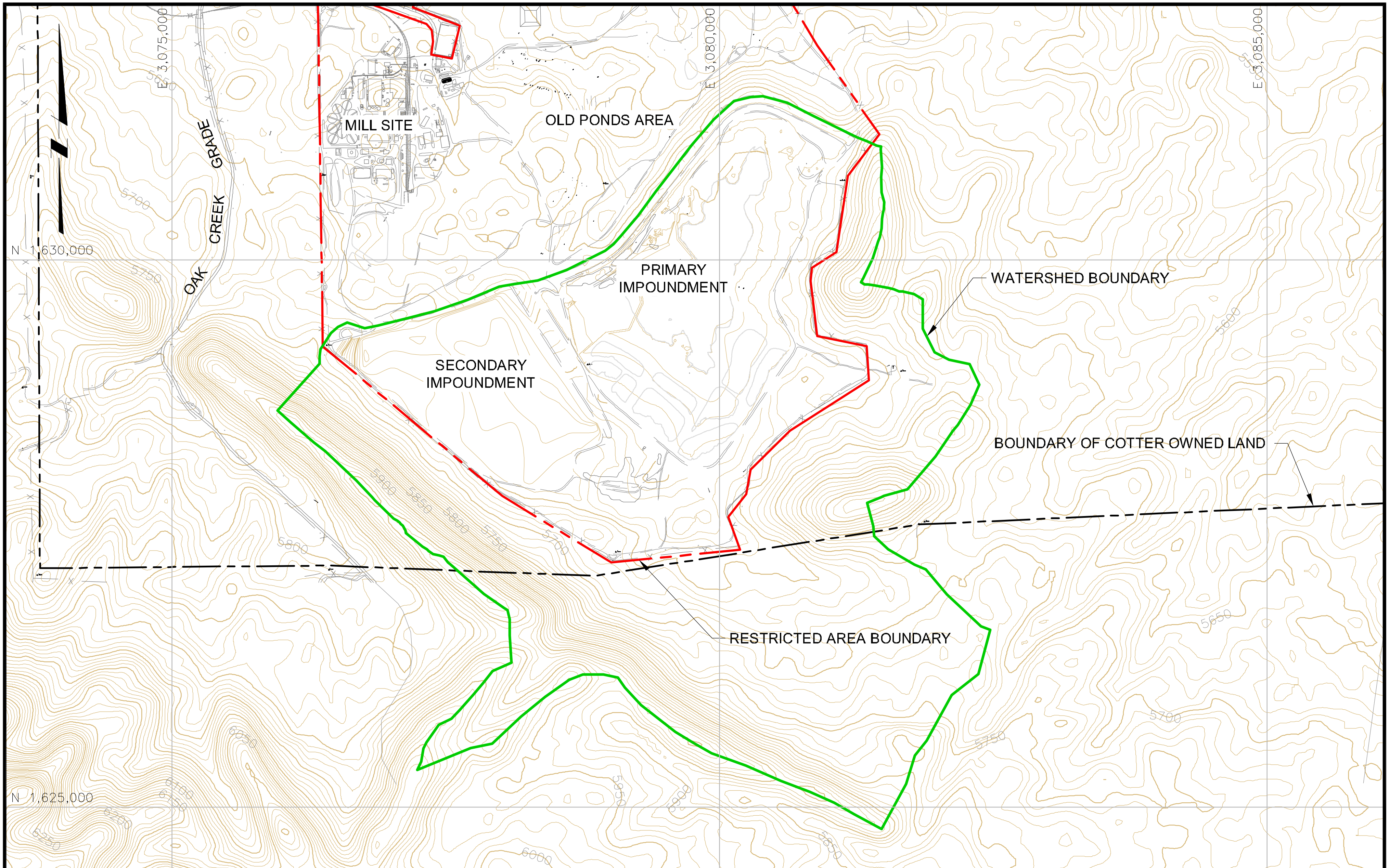

REFERENCE:
- EXISTING GROUND CONTOURS FROM USGS (SEAMLESS.USGS.GOV).
- SITE TOPOGRAPHY FROM COTTER CORPORATION (2007).

SCALE

1200 0 1200 FT

COTTER CORPORATION (N.S.L.)

PROJECT	CAÑON CITY MILLING FACILITY
TITLE	PRIMARY AND SECONDARY IMPOUNDMENT CATCHMENT AREA
DATE	DEC 2011
	FIGURE B.2
FILE NAME	1007533 DB

MWH

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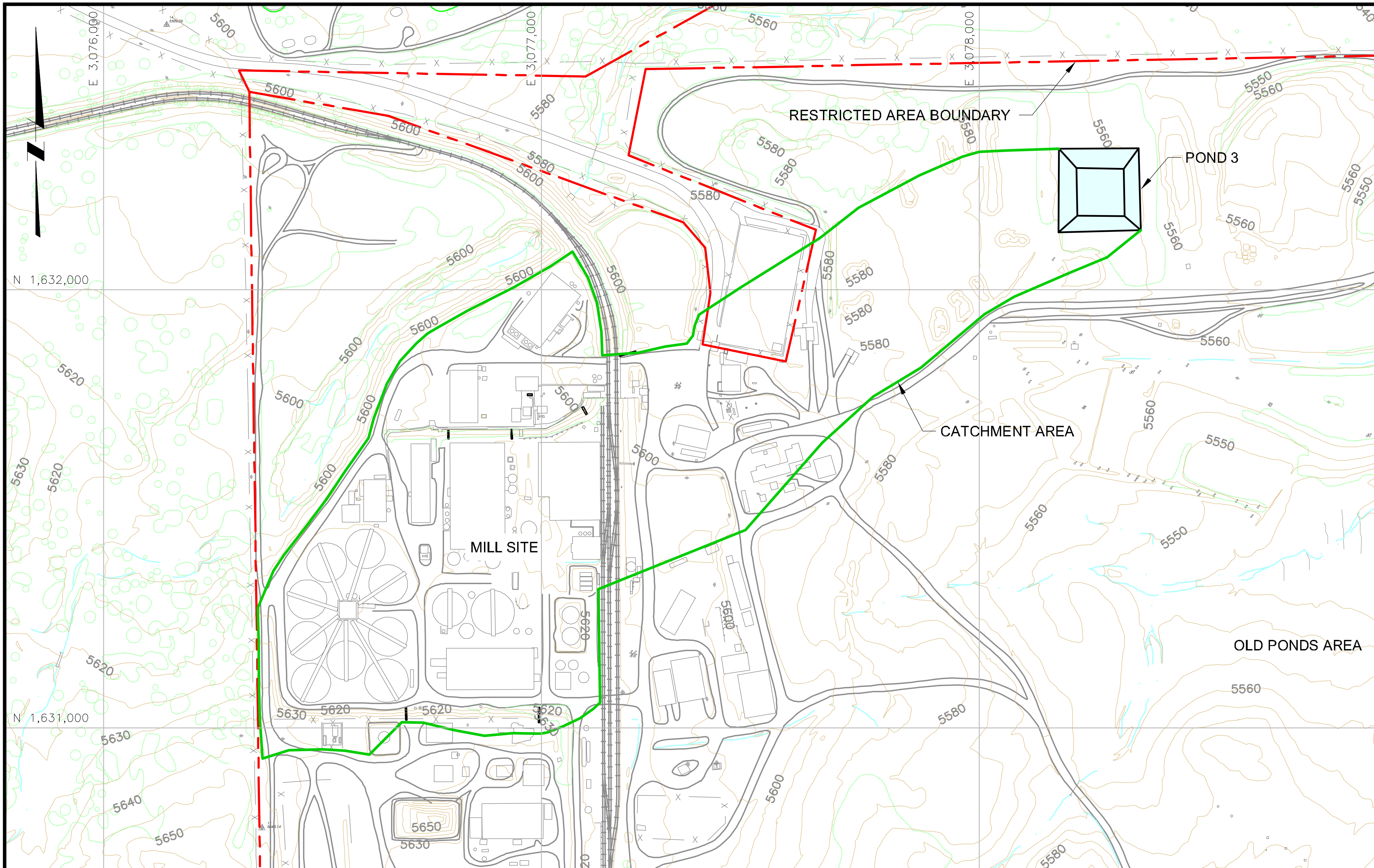

SCALE

300' 0 300'

COTTER CORPORATION (N.S.L.)

PROJECT

CANON CITY MILLING FACILITY

TITLE

POND 3 CATCHMENT AREA

MWH

DATE DEC 2011

FIGURE B.3

FILE NAME 1007533 NP

ATTACHMENT B.1

WATER BALANCE MODEL SPREADSHEET

COTTER CANON CITY FACILTY SITE-WIDE WATER BALANCE

AVERAGE PRECIPTIATION CONDITIONS Average Annual Precipitation (in)= 12.62

YEAR	MONTH	Catchment Area (acres)			INFLOWS (cf)															LOSSES (cf)		REQUIRED STORAGE (cf)
					Direct Precipitation and Runoff						Other Inflows								Total Inflows	Evaporation		
		Total PI and SI Catchment Area	Evap Pond Area	Pond 3 Catchment Area	Precipitation Rate (in)	Mill Area Runoff Coeff.	PI and SI Upstream Catchment Runoff	Evap Pond Precip	Mil Area Runoff to Pond 3	Total Precipitation and Runoff	SCS Barrier Pumpback	Well 333	Inflow to Evap Pond due to future RAP activities	PI Dewatering	SI Dewatering	Lab Bldg. Scrubber Discharge and Sink Waste Water	Pond 3 Trench Water	Subdrain Sump		Evaporation Rate (in)	Evaporation Volume	
1	1	547.1	44	25.9	0.41	0.26	0	65,903	10,099	76,002	32,581	38,417	175,656	0	0	3,903	162	1,693	328,414	0.00	0	328,414
1	2	547.1	44	25.9	0.50	0.26	0	80,369	12,316	92,686	38,426	28,928	175,656	0	0	3,903	162	1,693	341,454	0.00	0	669,869
1	3	547.1	44	25.9	0.89	0.26	0	141,450	21,676	163,127	57,809	36,226	175,656	41,611	15,159	3,903	162	1,693	495,347	0.00	0	1,165,216
1	4	547.1	44	25.9	1.42	0.26	0	226,642	34,732	261,374	54,245	36,050	175,656	65,098	11,286	3,903	162	1,693	609,467	5.05	807,225	967,458
1	5	547.1	44	25.9	1.61	0.26	0	257,182	39,412	296,594	59,679	38,169	175,656	57,734	9,815	3,903	162	1,693	643,405	6.48	1,035,305	575,558
1	6	547.1	44	25.9	1.16	0.26	0	184,850	28,327	213,177	32,495	41,731	175,656	53,592	8,701	3,903	162	1,693	531,110	7.79	1,244,379	0
1	7	547.1	44	25.9	1.81	0.26	0	289,330	44,338	333,668	22,427	39,779	175,656	61,886	8,513	3,903	162	1,693	647,688	8.27	1,320,405	0
1	8	547.1	44	25.9	1.91	0.26	0	305,404	46,801	352,205	147,793	44,598	175,656	60,892	7,497	3,903	162	1,693	794,400	7.00	1,118,040	0
1	9	547.1	44	25.9	1.01	0.26	0	160,739	24,632	185,371	26,465	40,109	175,656	54,859	6,422	3,903	162	1,693	494,640	5.68	907,848	0
1	10	547.1	44	25.9	0.81	0.26	0	128,591	19,706	148,297	21,380	42,267	175,656	53,768	7,910	3,903	162	1,693	455,037	3.83	611,568	0
1	11	547.1	44	25.9	0.60	0.26	0	96,443	14,779	111,223	12,455	35,621	175,656	51,767	6,121	3,903	162	1,693	398,601	0.00	0	398,601
1	12	547.1	44	25.9	0.49	0.26	0	78,762	12,070	90,832	26,672	39,970	175,656	52,626	4,034	3,903	162	1,693	395,548	0.00	0	794,149
				ANNUAL TOTALS (inches or cf)	12.62	--	0	2,015,666	308,890	2,324,556	532,428	461,866	2,107,875	553,833	85,458	46,842	1,940	20,316	6,135,112	44.11	7,044,770	--
				ANNUAL TOTALS (gpm)	--	--	0	28.7	4.4	33.1	7.6	6.6	30.0	7.9	1.2	0.7	0.0	0.3	87.3	--	100.3	--
																					Evaporation Pond Area Required (ac)	38.3
																					Maximum Required Storage (cf)	1,165,216
																					Maximum Required Storage (ac-ft)	26.7
																					Minimum Pond Depth (ft)	0.6

MAXIMUM PRECIPTIATION CONDITIONS Maximum Annual Precipitation (in) = 23.18

YEAR	MONTH	Catchment Area (acres)			INFLOWS (cf)															LOSSES (cf)		REQUIRED STORAGE (cf)
					Direct Precipitation and Runoff						Other Inflows								Total Inflows	Evaporation		
		Total PI and SI Catchment Area	Evap Pond Area	Pond 3 Catchment Area	Precipitation (in)	Mill Area Runoff Coeff.	Upstream Catchment Runoff	Evap Pond Precip	Mil Area Runoff to Pond 3	Total	SCS Barrier Pumpback	Well 333	Inflow to Evap Pond due to future RAP activities	PI Dewatering	SI Dewatering	Lab Bldg. Scrubber Discharge and Sink Waste Water	Pond 3 Trench Water	Subdrain Sump		Rate (in/mo)	Evap	
1	1	547.1	44	25.9	0.51	0.26	0	81,457	12,483	93,940	32,581	86,986	175,656	0	0	3,903	162	1,693	394,921	0.00	0	394,921
1	2	547.1	44	25.9	0.36	0.26	0	57,499	8,811	66,311	38,426	57,810	175,656	0	0	3,903	162	1,693	343,961	0.00	0	738,882
1	3	547.1	44	25.9	0.39	0.26	0	62,291	9,546	71,837	57,809	59,541	175,656	41,611	15,159	3,903	162	1,693	427,372	0.00	0	1,166,254
1	4	547.1	44	25.9	5.61	0.26	0	896,029	137,312	1,033,341	54,245	52,079	175,656	65,098	11,286	3,903	162	1,693	1,397,463	5.05	807,225	1,756,492
1	5	547.1	44	25.9	5.73	0.26	0	915,196	140,249	1,055,444	59,679	61,494	175,656	57,734	9,815	3,903	162	1,693	1,425,581	6.48	1,035,305	2,146,768
1	6	547.1	44	25.9	1.94	0.26	0	309,857	47,484	357,341	32,495	75,436	175,656	53,592	8,701	3,903	162	1,693	708,978	7.79	1,244,379	1,611,368
1	7	547.1	44	25.9	2.92	0.26	0	466,382	71,471	537,853	22,427	80,890	175,656	61,886	8,513	3,903	162	1,693	892,984	8.27	1,320,405	1,183,947
1	8	547.1	44	25.9	2.24	0.26	0	357,773	54,827	412,599	147,793	80,155	175,656	60,892	7,497	3,903	162	1,693	890,351	7.00	1,118,040	956,258
1	9	547.1	44	25.9	0.27	0.26	0	43,124	6,609	49,733	26,465	77,521	175,656	54,859	6,422	3,903	162	1,693	396,414	5.68	907,848	444,823
1	10	547.1	44	25.9	0.90	0.26	0	143,748	22,029	165,777	21,380	79,674	175,656	53,768	7,910	3,903	162	1,693	509,923	3.83	611,568	343,178
1	11	547.1	44	25.9	2.31	0.26	0	368,953	56,540	425,493	12,455	76,492	175,656	51,767	6,121	3,903	162	1,693	753,742	0.00	0	1,096,921
1	12	547.1	44	25.9	0.00	0.26	0	0	0	0	26,672	75,023	175,656	52,626	4,034	3,903	162	1,693	339,769	0.00	0	1,436,690
				ANNUAL TOTALS (inches or cf)	23.18	--	0	3,702,310	567,358	4,269,668	532,428	863,102	2,107,875	553,833	85,458	46,842	1,940	20,316	8,481,460	44.11	7,044,770	--
				ANNUAL TOTALS (gpm)	--	--	0.0	52.7	8.1	60.8	7.6	12.3	30.0	7.9	1.2	0.7	0.0	0.3	120.7	--	100.3	--
																					Evaporation Pond Area Required (ac)	63.0
																					Maximum Required Storage (cf)	2,146,768
																					Maximum Required Storage (ac-ft)	49.3
																					Minimum Pond Depth (ft)	1.1