

SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

CASE NO. EL05-022

IN THE MATTER OF THE APPLICATION BY OTTER TAIL POWER COMPANY

ON BEHALF OF THE BIG STONE II CO-OWNERS

FOR AN ENERGY CONVERSION FACILITY SITING PERMIT FOR THE

CONSTRUCTION OF THE BIG STONE II PROJECT

PREFILED REBUTTAL TESTIMONY

OF

JOHN T. LEE

VICE PRESIDENT

BARR ENGINEERING COMPANY

JUNE 9, 2006



PREFILED REBUTTAL TESTIMONY OF JOHN T. LEE

TABLE OF CONTENTS

I. INTRODUCTION 2

II. REVISED EXHIBITS TO SECTIONS 4 AND 5 OF THE APPLICATION 2

III. WATER USE AND WATER SOURCES 3

1 **BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION**

2 **PREFILED REBUTTAL TESTIMONY OF JOHN T. LEE**

3 **I. INTRODUCTION**

4 **Q: Please state your name and business address.**

5 A: John T. Lee, 4700 West 77th St., Suite 200, Minneapolis, MN 55435-4803.

6 **Q: By whom are you employed and in what capacity?**

7 A: I am employed as Vice President at Barr Engineering Co. ("Barr").

8 **Q: Did you provide any direct testimony in this proceeding?**

9 A: Yes. My direct testimony is marked as Applicants' Exhibit 18.

10 **Q: What is the purpose of your rebuttal testimony?**

11 A: The purpose of this testimony is to update certain exhibits in Sections 4 and 5 of the
12 Application and to update my Prefiled Direct Testimony with respect to additional analysis of the
13 Project's water use.

14 **II. REVISED EXHIBITS TO SECTIONS 4 AND 5 OF THE APPLICATION**

15 **Q: What exhibits from Sections 4 and 5 of the Application have you revised?**

16 A: Applicants' Exhibits 36 A-L attached to this testimony are intended to replace the
17 following exhibits in the Application:

- Applicants' Exhibit 36-A replaces Exhibit 4-1 in the Application;
- Applicants' Exhibit 36-B replaces Exhibit 4-4 in the Application;
- Applicants' Exhibit 36-C replaces Exhibit 4-5 in the Application;
- Applicants' Exhibit 36-D replaces Exhibit 4-6 in the Application;
- Applicants' Exhibit 36-E replaces Exhibit 4-7 in the Application;
- Applicants' Exhibit 36-F replaces Exhibit 4-8 in the Application;
- Applicants' Exhibit 36-G replaces Exhibit 4-9 in the Application;
- Applicants' Exhibit 36-H replaces Exhibit 4-10 in the Application;
- Applicants' Exhibit 36-I replaces Exhibit 4-11 in the Application;

- Applicants' Exhibit 36-J replaces Exhibit 4-12 in the Application;
- Applicants' Exhibit 36-K replaces Exhibit 5-4 in the Application; and
- Applicants' Exhibit 36-L replaces Exhibit 5-5 in the Application.

1 **Q: Why have the exhibits been revised?**

2 A: Since the Application was filed almost one year ago, there have been minor changes in
 3 the design of the plant and surrounding infrastructure, which are generally described in the
 4 Prefiled Rebuttal Testimony of Mark Rolfes. The specific revisions contained in Applicants'
 5 Exhibits 36 A-L include the location of the water supply pipeline and the expanded area for the
 6 construction lay down.

7 **III. WATER USE AND WATER SOURCES**

8 **Q: Has there been additional analysis done on the Project's water use and water**
 9 **sources?**

10 A: Yes. Barr has completed additional analysis of the Project's potential impact to Big
 11 Stone Lake levels and the Minnesota River flows. This analysis was conducted in conjunction
 12 with preparing the Application for Permit to Appropriate Water within the State of South Dakota
 13 for the Project, submitted to the South Dakota Department of Environment and Natural
 14 Resources in March 2006. The proposed water appropriation is to provide cooling and process
 15 makeup water for the existing Big Stone Unit I and the proposed Big Stone Unit II.

16 **Q: Do these new analyses materially change the conclusions in the Application and in**
 17 **your Prefiled Direct Testimony regarding the Project's potential impacts from the**
 18 **additional water appropriation?**

19 A: No. While some of the details of the most recent analysis are different from the previous
 20 analyses, the recent analysis still shows that incremental impacts to Big Stone Lake levels and

1 Minnesota River flows from the additional water appropriation will be small. Water levels on
 2 Big Stone Lake are modeled to average about 2-1/2 inches lower over the 70-year model period
 3 than they would be without the additional appropriations. The models show that Minnesota
 4 River flows downstream of Big Stone Lake during critical low-flow periods will be significantly
 5 less than the flows that would occur without the additional appropriations only about 1.4 percent
 6 of the time. The limited impact from the additional water appropriation is primarily due to the
 7 fact that the water diversion restrictions currently in place for the Big Stone Plant are tied to Big
 8 Stone Lake water levels, and these restrictions will remain unchanged under the proposed
 9 operating plan for both units.

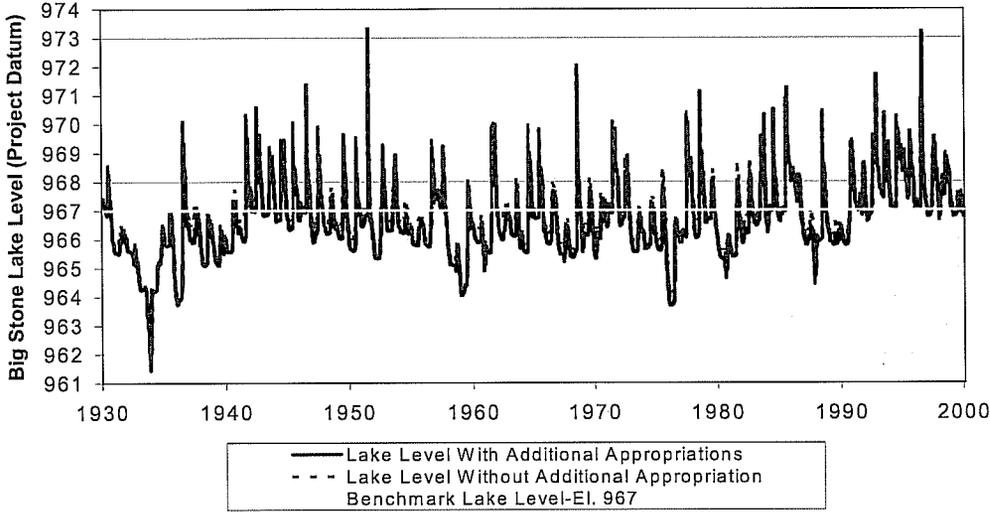
10 **Q: Please describe further the expected impacts to Big Stone Lake water levels.**

11 A: The water use model used for the Project takes 70 years of historical climate and lake
 12 level data (1930 through 1999), superimposes the proposed water appropriation needs of the
 13 combined Big Stone Unit I and Big Stone Unit II, and predicts the Big Stone Lake level over 70
 14 years. The modeled lake levels with and without the additional Big Stone Unit II appropriations
 15 are illustrated in Figure A below.

16
 17
 18
 19
 20
 21
 22
 23

1

Figure A - Modeled Big Stone Lake Water Levels



2

3

Figure B below illustrates the modeled incremental change in lake water levels over the same 70-year model period resulting from the additional Big Stone II water appropriations. As can be seen in Figure B, lake level reductions generally are modeled at less than 6 inches and only a handful of times are lake level reductions modeled to be greater than 12 inches.

7

8

9

10

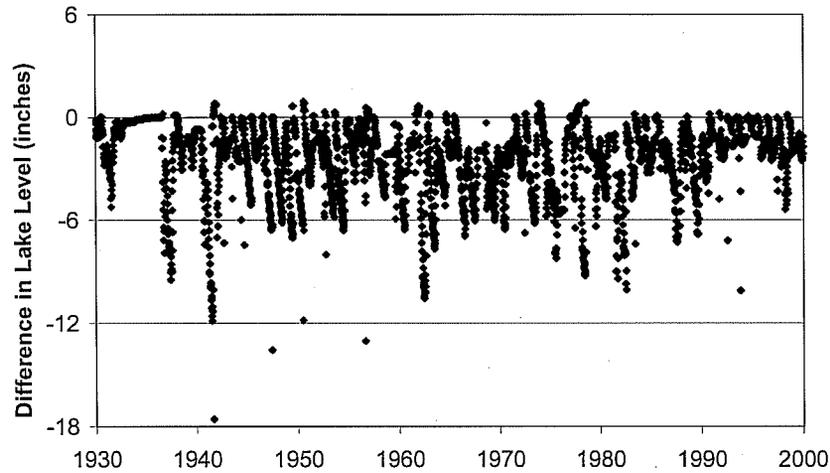
11

12

13

1

Figure B – Modeled Incremental Change in Big Stone Lake Level



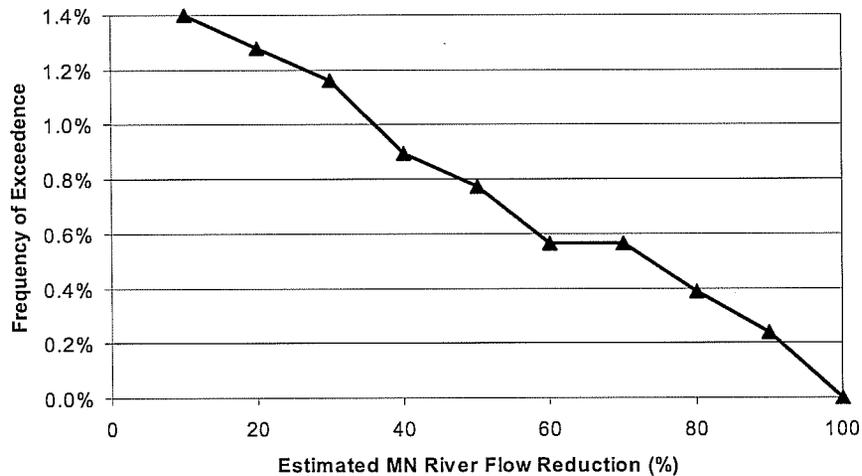
2

3 **Q: Please describe further the expected impacts to Minnesota River flows.**

4 A: The proposed increase in lake water usage from the Project (approximately 7,500 acre-
 5 feet per year) represents less than ten percent of the average annual outflow from Big Stone
 6 Lake. The occurrence of a noticeable flow reduction would depend on the interaction of a
 7 number of variables, including the timing and volume of plant withdrawals, seasonal and shorter-
 8 term runoff conditions, and other influences on lake levels such as temperature and solar
 9 radiation. The overall storage capacity of the Project (18,900 acre-feet) allows some flexibility
 10 in the timing and volume of withdrawals, such that their effects could be minimized. Modeling
 11 indicates that additional lake withdrawals would have little or no effect on an average annual
 12 basis or over most flow intervals. Using 2004 as an example, withdrawals for the existing plant
 13 were made in May, June, July, and November, with most withdrawals made in May. All of these
 14 months, except November, are relatively high flow months on the upper Minnesota River, and
 15 withdrawals are expected to have minimal effect.

1 Examination of flow impacts on the Minnesota River downstream of Big Stone Lake
 2 focus on the periods when flows are relatively low, less than 80 cubic feet per second (cfs).
 3 Historically, these low flows occur about 75 percent of the time. The water use model was used
 4 to predict the frequency of flow reductions during such low flow periods resulting from the
 5 additional Big Stone Unit II appropriations. Those flow reduction impacts are illustrated in
 6 Figure C.

7 **Figure C – Effect on Minnesota River Low Flows**



8
 9 This graph illustrates that Minnesota River flow reductions greater than about 10 percent
 10 during low flow periods are predicted to occur only about 1.4 percent of the time over the 70
 11 years modeled. As another example, Figure C illustrates that Minnesota River flow reductions
 12 greater than about 80 percent during low flow periods are predicted to occur less than 0.4 percent
 13 of the time over the 70 years modeled.

14 **Q: Does this conclude your testimony?**

15 **A:** Yes.

Bar Footer: Date: 6/7/2006 2:32:48 PM, File: I:\Projects\4125\0303\03\Project\Site\img\mxd\img_052205_fm\AcMap_Spice_4_01_Sling_Topography.mxd User: cjk



-  Property Boundary
-  10ft Contours

Project Features

- ID**
-  1 Cooling Tower Blowdown Pond
 -  2 Cooling Tower
 -  3 New Plant
 -  4 Construction Parking
 -  5 Ethanol Plant
 -  6 Construction Laydown
 -  7 Makeup Storage Pond
 -  8 Water Pipelines
 -  Water Pipeline Corridors

Data Source: Contour lines created from USGS Digital Elevation Model

EXHIBIT
APPLICANTS!
EXHIBIT 36A

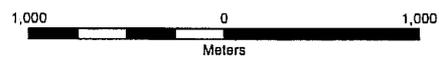


Exhibit 4-1

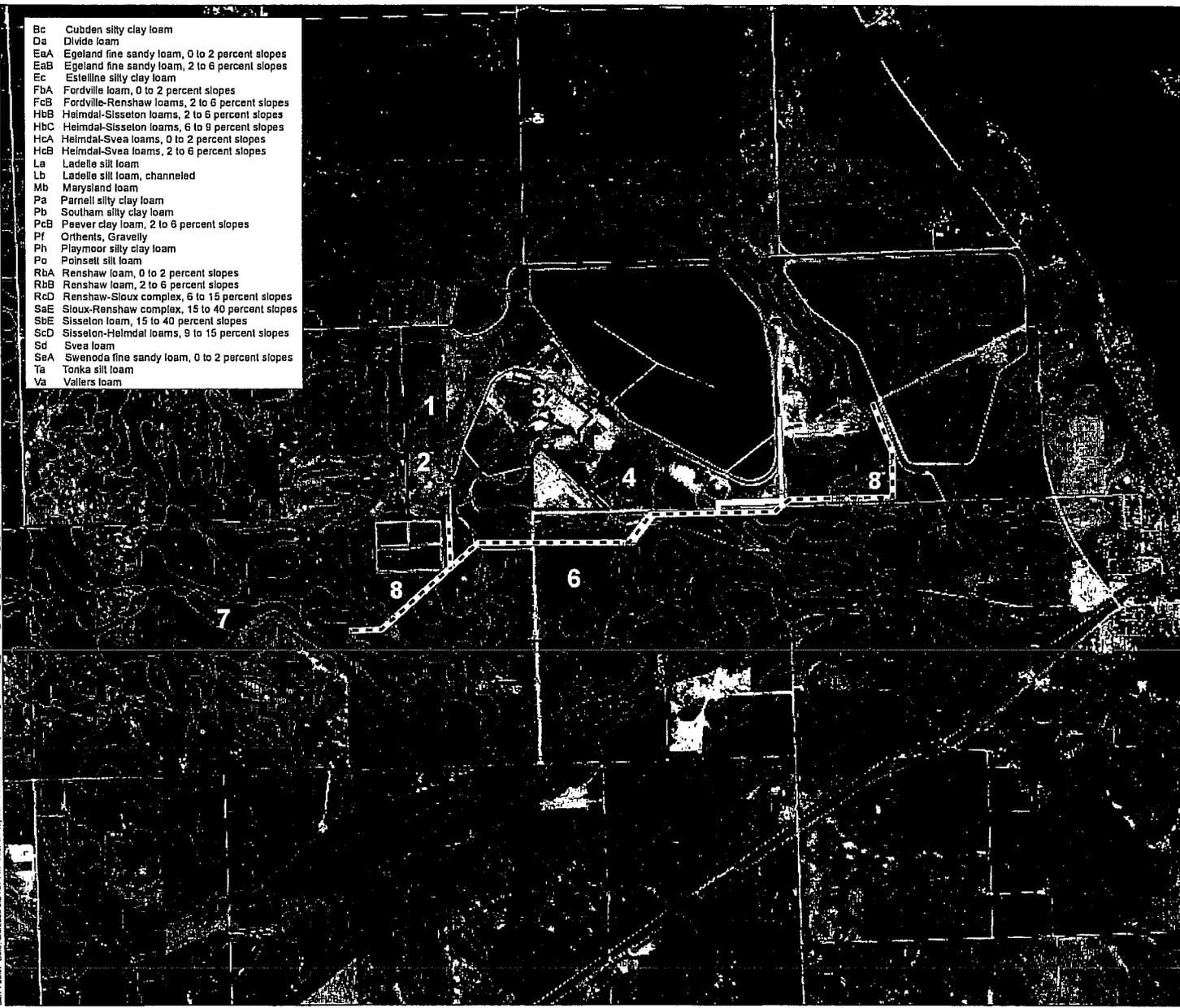
TOPOGRAPHIC MAP OF PROJECT VICINITY
Big Stone II Project
Big Stone II Co-owners

Revised June 2006

3118

Bar Footer Date: 6/6/2006 3:24:51 PM File: I:\Project\41125\0310a\Project\Soils\mst\slimg_02205_fna_ArchMap_fig4E_4_D1_Slimg_Soils.mxd User: nwl

- Bc Cubden silty clay loam
- Da Divide loam
- EaA Egeland fine sandy loam, 0 to 2 percent slopes
- EaB Egeland fine sandy loam, 2 to 6 percent slopes
- Ec Estelline silty clay loam
- FbA Fordville loam, 0 to 2 percent slopes
- FcB Fordville-Renshaw loams, 2 to 6 percent slopes
- HbB Heimdal-Sisseton loams, 2 to 6 percent slopes
- HbC Heimdal-Sisseton loams, 6 to 8 percent slopes
- HcA Heimdal-Svea loams, 0 to 2 percent slopes
- HcB Heimdal-Svea loams, 2 to 6 percent slopes
- La Ladelle silt loam
- Lb Ladelle silt loam, channeled
- Mb Maysland loam
- Pa Parnell silty clay loam
- Pb Southam silty clay loam
- PcB Peever clay loam, 2 to 6 percent slopes
- Pf Orthents, Gravelly
- Ph Playmoor silty clay loam
- Po Poinsett silt loam
- RbA Renshaw loam, 0 to 2 percent slopes
- RbB Renshaw loam, 2 to 6 percent slopes
- RcD Renshaw-Sioux complex, 6 to 15 percent slopes
- SaE Sioux-Renshaw complex, 15 to 40 percent slopes
- SbE Sisseton loam, 15 to 40 percent slopes
- ScD Sisseton-Heimdal loams, 9 to 15 percent slopes
- Sd Svea loam
- SbA Swanoda fine sandy loam, 0 to 2 percent slopes
- Ta Tonka silt loam
- Va Vallery loam



- Property Boundary
- Soils

Project Features

- ID
- 1 Cooling Tower Blowdown Pond
- 2 Cooling Tower
- 3 New Plant
- 4 Construction Parking
- 5 Ethanol Plant
- 6 Construction Laydown
- 7 Makeup Storage Pond
- 8 Water Pipelines
- Water Pipeline Corridors

Data Source: USDA NRCS
Soil Survey Geographic (SSURGO)

EXHIBIT
APPLICANTS'
EXHIBIT 36-B

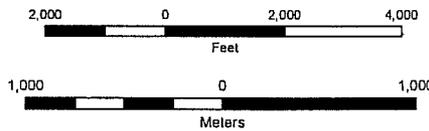
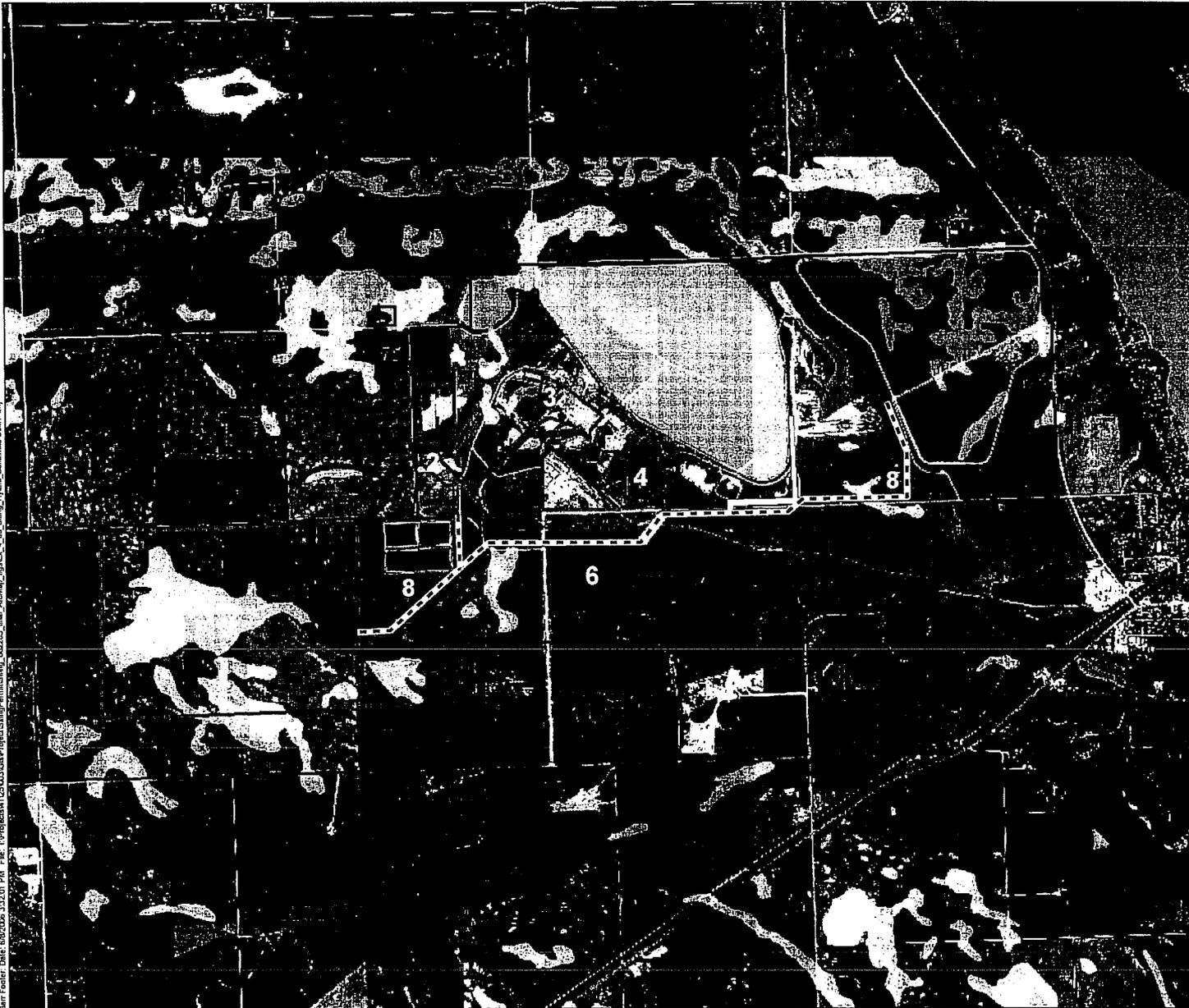


Exhibit 4-4
SOILS
 Big Stone II Project
 Big Stone II Co-owners
 Revised June 2006

3119

Bar Feet: Date: 6/6/2006 3:32:01 PM File: I:\Projects\411250000\GIS\Project\Slings\Permit\Slings_062005_061_AerialMap_1.jpg;EV_4_DS_Sling_Hydric_Soils.mxd User: 66



Property Boundary
Hydric Soils

Project Features

- ID
- 1 Cooling Tower Blowdown Pond
 - 2 Cooling Tower
 - 3 New Plant
 - 4 Construction Parking
 - 5 Ethanol Plant
 - 6 Construction Laydown
 - 7 Makeup Storage Pond
 - 8 Water Pipelines
 - Water Pipeline Corridors

Data Source: USDA NRCS
Soil Survey Geographic (SSURGO)

EXHIBIT
number
APPLICANTS!
EXHIBIT 36-C

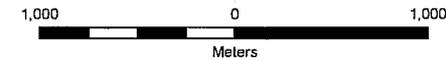


Exhibit 4-5

HYDRIC SOILS
Big Stone II Project
Big Stone II Co-owners

Revised June 2006

3120

Barr Footer: Date: 6/9/2006 3:36:19 PM File: I:\Projects\41125\001\GIS\Project\Streams\mxd\Map_062206_1.mxd ArchMap_11.gxd c:\06_Site\mxd\Network.mxd User: omf



Property Boundary

Project Features

ID

-  1 Cooling Tower Blowdown Pond
-  2 Cooling Tower
-  3 New Plant
-  4 Construction Parking
-  5 Ethanol Plant
-  6 Construction Laydown
-  7 Makeup Storage Pond
-  8 Water Pipelines
-  Water_Pipelines_Buffer2
-  Subwatershed Divides
-  Watershed Boundaries
-  10ft Contours
-  Streams

EXHIBIT
APPLICANTS!
EXHIBIT 36-D

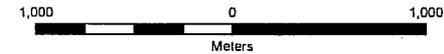


Exhibit 4-6

**STREAM NETWORK &
WATERSHED DIVIDES**
Big Stone II Project
Big Stone II Co-owners

Revised June 2006

3121

Barr Footer Date: 6/8/2006 3:41:08 PM File: I:\Project\411251000\GIS\Project\GIS\Map\Map_Siting_Plant_Communities.mxd User: csk

Plant Communities

-  Cottonwood-reed canary grass depressional wetland
-  Cottonwood-willow floodplain woodland
-  Cottonwood-willow-reed canary grass depressional wetland
-  Disturbed grassland w/ planted trees
-  Disturbed grassland w/ trees
-  Excavated/fill
-  Farmed wetland
-  Impervious surfaces
-  Industrial
-  Mixed deciduous woodland
-  Mixed native/non-native meadow
-  Mixed native/non-native meadow/Northern Great Plains cattail marsh
-  Non-native dominated grasslands
-  Northern bur oak mesic forest
-  Northern bur oak openings
-  Northern cordgrass wet prairie
-  Northern cordgrass wet prairie/Northern Great Plains cattail marsh
-  Northern plains transition bluesiem prairie
-  Northern sedge wet meadow/Northern Great Plains cattail marsh
-  Northern sedge wet meadow/Willow woodland
-  Oak woodland with non-native grasses
-  Open water
-  Perennial crops
-  Planted deciduous trees with non-native grasses
-  Row cropland



 Property Boundary

Project Features

- ID**
-  1 Cooling Tower Blowdown Pond
 -  2 Cooling Tower
 -  3 New Plant
 -  4 Construction Parking
 -  5 Ethanol Plant
 -  6 Construction Laydown
 -  7 Makeup Storage Pond
 -  8 Water Pipelines
 -  Water Pipeline Corridors

Plant community data collection by Barr Engineering Company in September 2004.

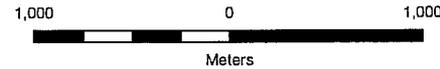
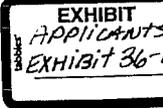


Exhibit 4-7

PLANT COMMUNITIES
Big Stone II Project
Big Stone II Co-owners

Revised June 2006

3122



Barr Footer: Date: 6/6/2006 3:45:12 PM. File: I:\Projects\41125\GIS\Project\GIS\Map\GIS\Map_41125_Siting_Plant_Community.mxd User: dkl



Property Boundary

Project Features

ID

- 1 Cooling Tower Blowdown Pond
- 2 Cooling Tower
- 3 New Plant
- 4 Construction Parking
- 5 Ethanol Plant
- 6 Construction Laydown
- 7 Makeup Storage Pond
- 8 Water Pipelines
- Water Pipeline Corridors

Plant Communities

Quality

- Low
- Medium
- High

Plant community data collection by Barr Engineering Company in September 2004.



EXHIBIT
APPLICANTS'
EXHIBIT 36-F

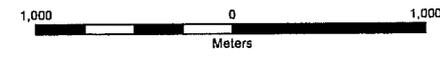
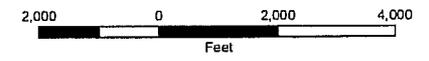


Exhibit 4-8

PLANT COMMUNITY QUALITY
Big Stone II Project
Big Stone II Co-owners

Revised June 2006

3123

Barr Footer Date: 06/20/06 3:47:41 PM File: I:\Projects\411530303\GSP\Project\GSP\Permitting_062006_Aerial_AerialMap_062006_4_09_Siting_Wildlife.mxd User: rnk



-  Property Boundary
-  Extended Study Area

Project Features

- ID
-  1 Cooling Tower Blowdown Pond
 -  2 Cooling Tower
 -  3 New Plant
 -  4 Construction Parking
 -  5 Ethanol Plant
 -  6 Construction Laydown
 -  7 Makeup Storage Pond
 -  8 Water Pipelines
 -  Water Pipeline Corridors
 -  Bald Eagle Nest

Field observations made by Barr Engineering Company. South Dakota Natural Heritage Database query completed on September 24, 2004 by the SD Department of Game, Fish and Parks.

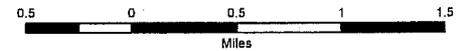


Exhibit 4-9

WILDLIFE
Big Stone II Project
Big Stone II Co-owners

Revised June 2006

3124



- Delineated wetlands
- NWI Wetlands
- Property Boundary
- Watershed Boundaries
- 10ft Contours

Project Features

- ID**
- 1 Cooling Tower Blowdown Pond
 - 2 Cooling Tower
 - 3 New Plant
 - 4 Construction Parking
 - 5 Ethanol Plant
 - 6 Construction Laydown
 - 7 Makeup Storage Pond
 - 8 Water Pipelines
 - Water Pipeline Corridor

Data Sources: USFWS National Wetlands Inventory, Wetlands delineation and data collection within property boundary by Barr Engineering Company.

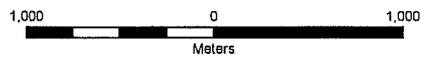
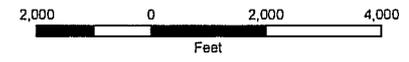
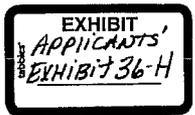


Exhibit 4-10
 DELINEATED WETLANDS
 Big Stone II Project
 Big Stone II Co-owners

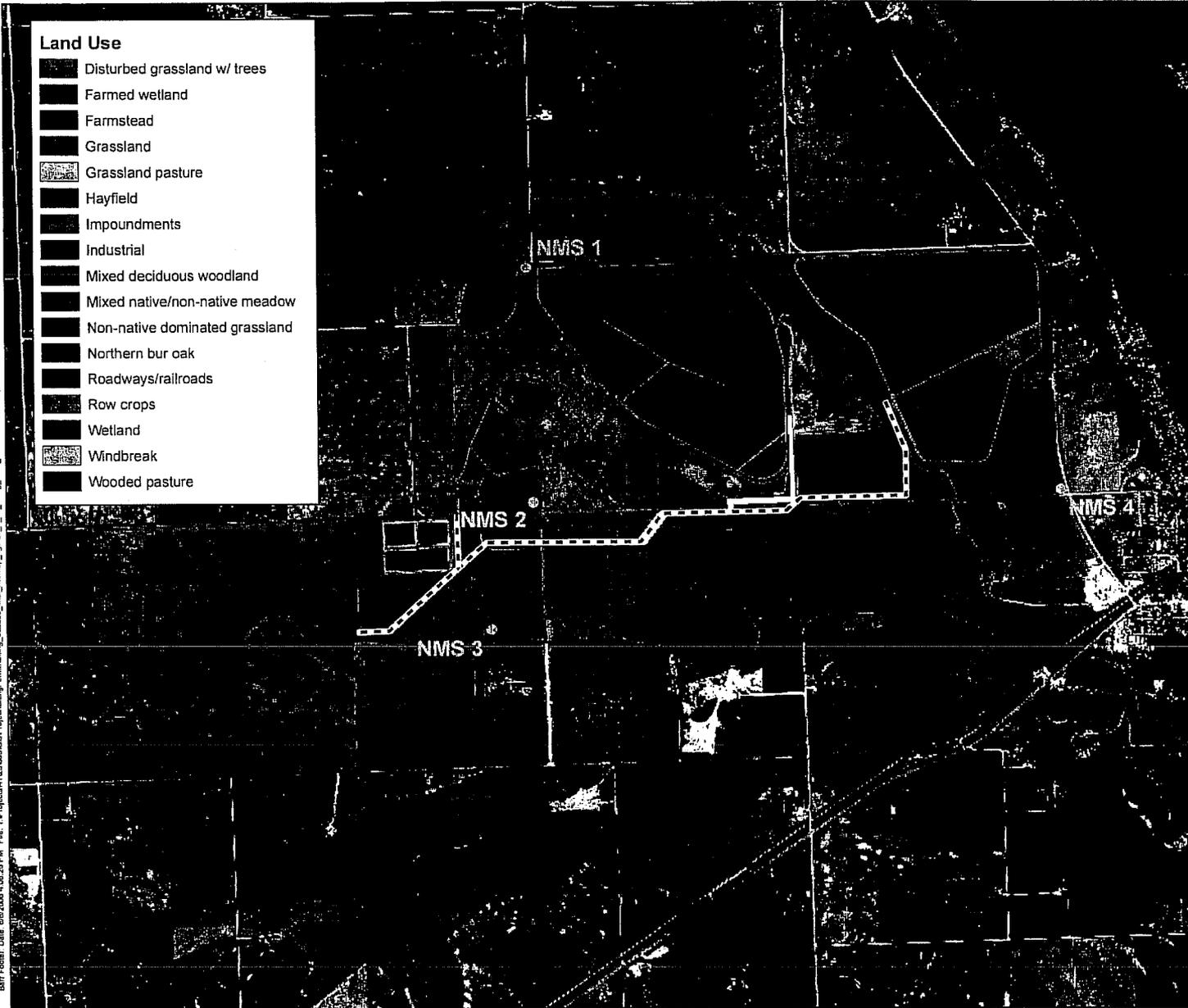
Revised June 2006



3125

Barr Footer: Date: 6/20/06 4:15:39 PM File: I:\Projects\11250303\BigStoneII\Map_Series_4_10_Series_4\Wetlands.mxd User: db

Barr Footer: Date: 6/02/2006 4:08:26 PM; File: I:\Projects\41152\031\GIS\Project\GIS\mxd\LandUse.mxd; User: dm



Land Use

- Disturbed grassland w/ trees
- Farmed wetland
- Farmstead
- Grassland
- Grassland pasture
- Hayfield
- Impoundments
- Industrial
- Mixed deciduous woodland
- Mixed native/non-native meadow
- Non-native dominated grassland
- Northern bur oak
- Roadways/railroads
- Row crops
- Wetland
- Windbreak
- Wooded pasture

Property Boundary

Project Features

ID

- 1 Cooling Tower Blowdown Pond
- 2 Cooling Tower
- 3 New Plant
- 4 Construction Parking
- 5 Ethanol Plant
- 6 Construction Laydown
- 7 Makeup Storage Pond
- 8 Water Pipelines
- Water Pipeline Corridors

Noise Monitoring Site

Plant community data collection by Barr Engineering Company. Simplified version of NCLD created by Barr Engineering Company.

EXHIBIT
APPLICANTS'
EXHIBIT 36-I

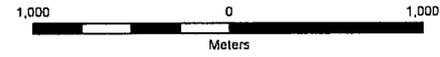
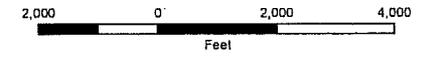


Exhibit 4-11

LAND USE
Big Stone II Project
Big Stone II Co-owners

Revised June 2006

3126



- Property Boundary
- Project Features**
- ID**
- 1 Cooling Tower Blowdown Pond
- 2 Cooling Tower
- 3 New Plant
- 4 Construction Parking
- 5 Ethanol Plant
- 6 Construction Laydown
- 7 Water Storage Pond
- 8 Water Pipelines
- Water Pipeline Corridors
- Zoned Commercial

Data Source: 1st District Watertown GIS
Grant County, SD.

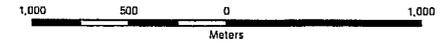


Exhibit 4-12

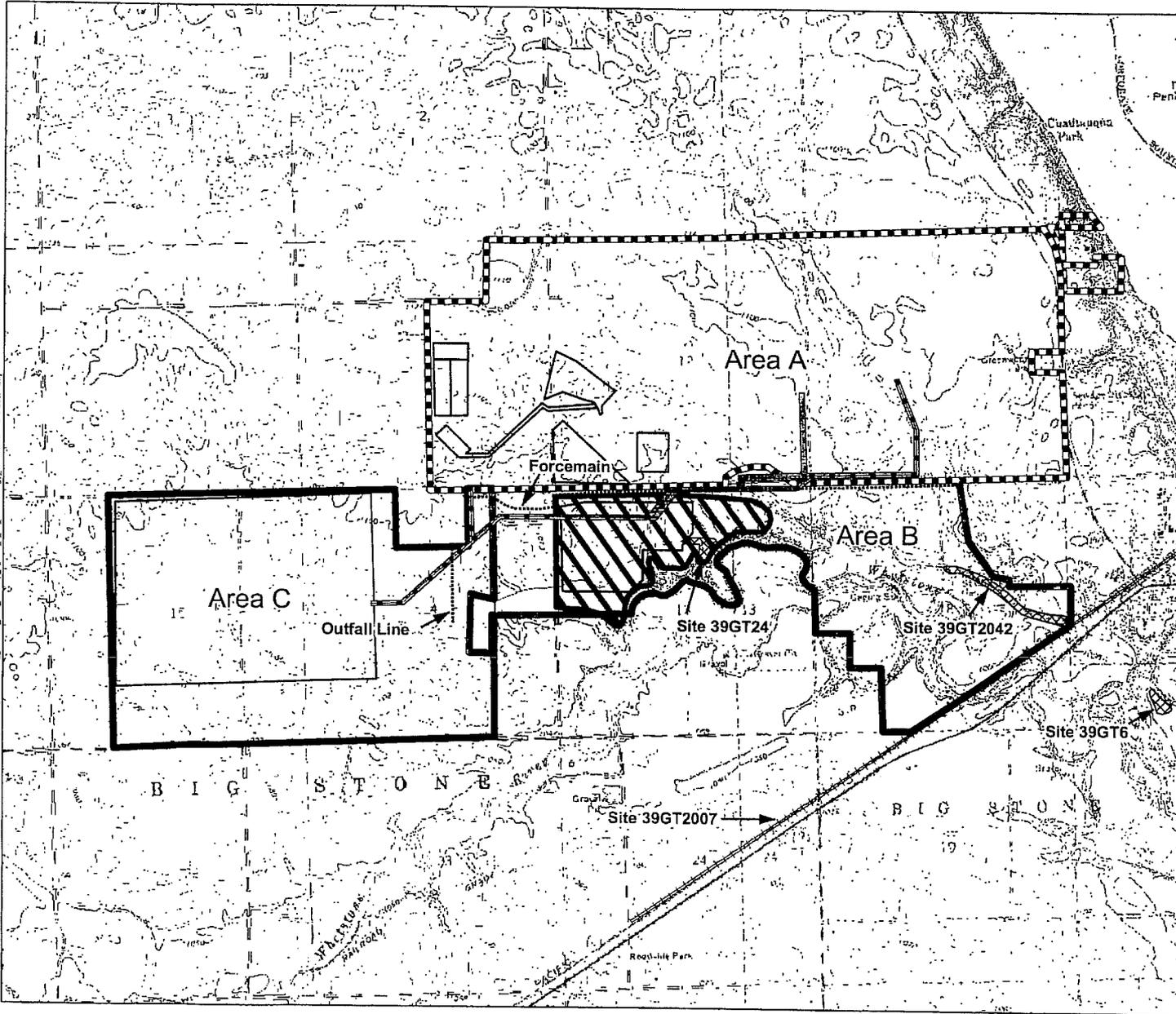
BIG STONE PROPERTY CURRENTLY
ZONED COMMERCIAL
Big Stone II Project
Big Stone II Co-owners

Revised June 2006

3127

EXHIBIT
APPLICANTS'
EXHIBIT 36-1

Bar Footer Date: 6/20/2006 9:32:18 AM File: I:\Projects\12020030\Project\Site\Map\mxd\Sava_062205_Inv_Archaeo_Assessment.mxd User: dhr



Legend

-  Site Boundary
-  Project Features
-  Water Pipeline
-  Water Pipeline Corridors
-  High Potential
-  1994 Survey
-  1996 Survey

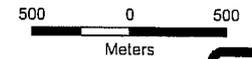


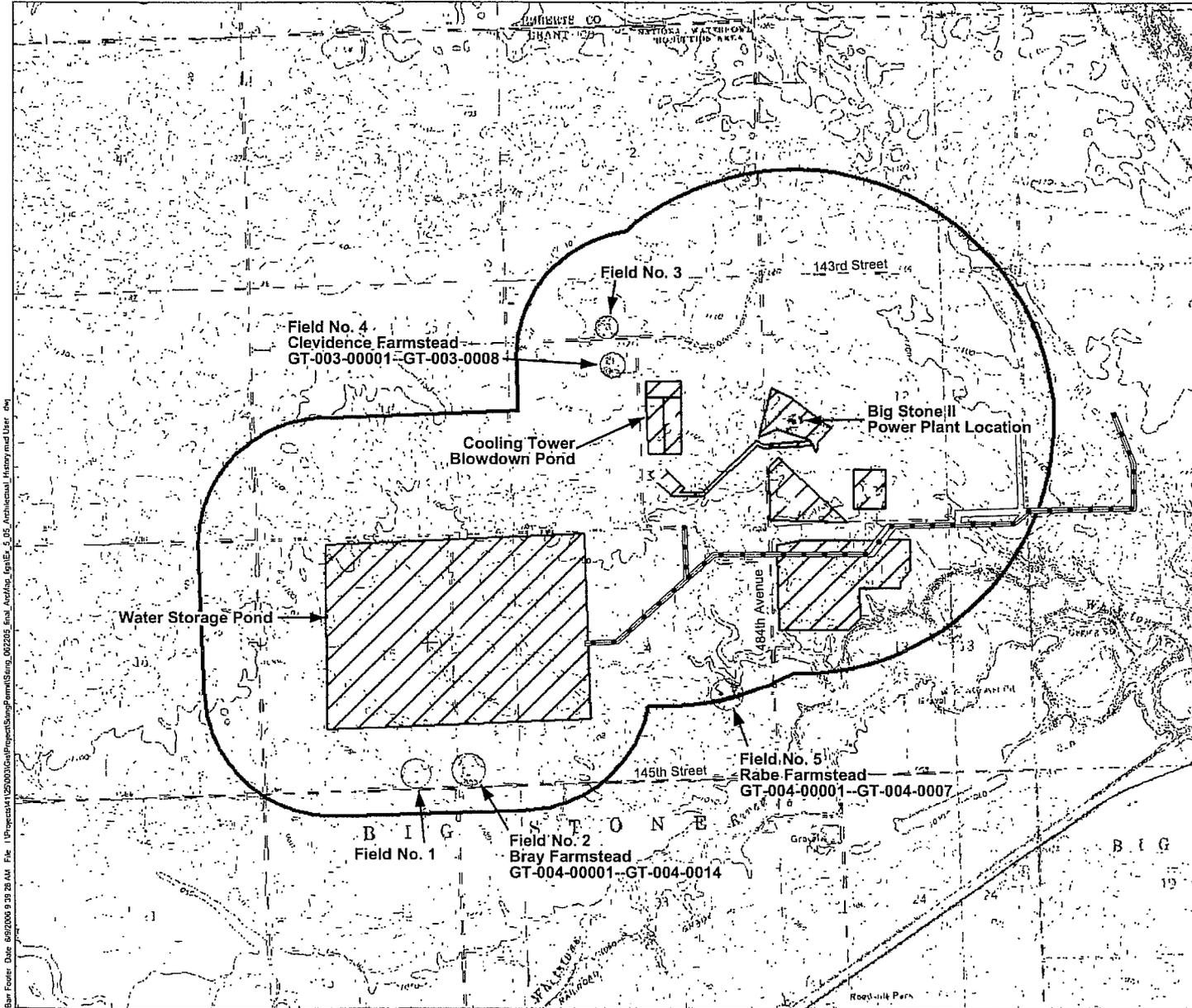
EXHIBIT
APPLICANTS
 NUMBER
EXHIBIT 36-k

Exhibit 5-4

ARCHAEOLOGY ASSESSMENT RESULTS
 Big Stone II Project
 Big Stone II Co-owners

Revised June 2006

3128



Bar Footer Date: 8/27/2006 9:32:28 AM File: I:\Projects\11\250101\11\Project\SurgFarm\Surfing_062206_Ensl_ArchMap_Egn1E_5_05_ArchHistory_History.mxd User: dmw

Legend

-  Architectural History Surveyed Properties
-  Architectural History Area of Potential Effect
-  Project Features
-  Water Pipeline
-  Water Pipeline Corridors

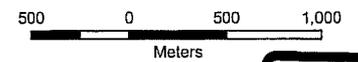
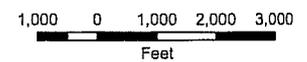


EXHIBIT
 Applicants'
 EXHIBIT 36-L

Exhibit 5-5

ARCHITECTURAL HISTORY
 SURVEY RESULTS
 Big Stone II Project
 Big Stone II Co-owners

Revised June 2006

3129