

Appendix N

Electrical Engineering

Draft Feasibility Report with Integrated Environmental Assessment
OBGTR HREP

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1 EXISTING CONDITIONS

1.1 Project Location and History

The Oakwood Bottoms Green Tree Reservoir is part of the USFS national forest portfolio in the Shawnee National Forest, which includes approximately 280,000 acres of upland and bottomland forest in southern Illinois. The Oakwood Bottoms, consisting of approximately 13,500 acres bottomland forest and wetlands, is located within the Shawnee National Forest in the Mississippi River floodplain on the left descending bank of the Mississippi River between River Miles (RM) 73-84 in Jackson County, Illinois. The Oakwood Bottoms HREP focuses on the 3,700-acre Greentree Reservoir portion of Oakwood Bottoms (Oakwood Bottoms Greentree Reservoir, or OBGTR).

The electrical power utility company in the area is Ameren Illinois. Ameren currently provides electrical power to existing well pump motors within the Oakwood Bottoms area. Ameren will be the power company to provide power to the new site features including a pump station and additional well pumps.



AMEREN ILLINOIS

Construction and Engineering Services

888.659.4540

Coordination with Ameren Illinois will be required during design to ensure Ameren Illinois' standards, as well as all local codes, ordinances and inspection authority requirements, or the latest National Electric Code, whichever is applicable are met and power needs of the new site features can be provided by the utility company. A non-residential service request (shown in Figure 1) will be submitted to Ameren to initiate the process of obtaining electrical power.

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**Non-Residential Service Request / Alteration Form**

Submitted By: _____

Return To: _____

Address: _____

Phone: () _____ - _____

Fax: () _____ - _____

Visit website at <http://www.ameren.com>**Billing Information for Permanent Service:**

Service Name: _____

Mailing Name: _____

Service Address: _____

Mailing Address: _____

Temporary service request (attach billing info if different from above):
☐ None ☐ Underground ☐ Overhead ☐ Temp. off of permanent transformer
 When ? ____/____/____ Voltage _____ Phase _____ # of Wires _____ Panel Size _____ Amps
Project Information:

Type of Project _____ Project / Building Sq. Ft. _____

☐ New Construction ☐ Building Addition ☐ Service Upgrade ☐ Other _____

Expected date of permanent connection to Ameren system ____/____/____

Number of hours/week that facility will operate when completed _____ Number of shifts per day at facility _____

Contacts:	Company	Contact	Phone	Fax
Customer				
Architect				
General Cont.				
Electrical Cont.				

Electrical Characteristics:

New Connected Load _____ Kw Future Load _____ Kw Date of Future Load: ____/____/____

Lighting Interior _____ Kw _____ Kw

Exterior _____ Kw _____ Kw

Water Heating _____ Kw _____ Kw

Cooking _____ Kw _____ Kw

HVAC Cooling (Total Tons) _____ Kw _____ Kw

Cooling: Largest Unit (Tons) _____

Electric Heating Total: _____ Kw _____ Kw

Heating Type: ☐ Resistance ☐ Heat Pump ☐ Gas ☐ Other _____**Motor Load (excluding HVAC)**

Total: _____ Hp _____ Hp

Receptacle Load _____ Kw _____ Kw

Other Loads or Process Loads (specify) – add additional sheet, if necessary.

_____ Kw _____ Kw

_____ Kw _____ Kw

Total Connected Load

Information on Largest Motor _____ Kw _____ Kw

Voltage _____ Horsepower _____ LRA _____ FLA _____ Starting PF 0.00% %

NEMA Code Type _____ Number of motor starts per hour _____ Running PF 0.00% %

Start-Up Method: ☐ Across-the-Line ☐ Reduced Load Starting ☐ Other _____**Type of Service Requested**

Voltage _____ # of Phases _____ # of Wires _____ Panel Size _____ Amps

Secondary Conductor _____ # of Sets _____ ☐ Underground ☐ Overhead

Please include a set of construction drawings (i.e. site/grading plan & utilities) in AutoCAD format. Contact your Ameren representative for additional formation (i.e. e-mail address for drawings). Submit one Non-Residential Service Request / Alteration Form for each metered service.

Figure 1 – Ameren Non-Residential Service Request

1.2 Existing Features

Various well pumps consisting of 3-phase pump motor, combination starter/controller, and transformer are currently present in the Oakwood Bottoms area. These existing well pumps pump ground water from 75 – 110ft down into desired ponding areas. Electrical power to the existing well pumps are provided by underground primary feeders from an aerial drop just inside the Oakwood Bottoms area.

1.2.1 Well Pump

A typical existing well pump consists of a 30-60HP, 3-phase vertical hollow shaft motor. Each motor is powered by a local combination motor starter and transformer. There are newer well pumps that have been installed by Ducks Unlimited which include modern controls and pump protection devices. It was stated during a site visit that the pump protection devices can cause nuisance outages which is likely due to poor power quality at the motor. This concern will be considered during design of new well pumps.



Figure 2 – Existing Well Pump

1.2.2 Utility Power

The existing utility power is provided by Ameren Illinois. Primary power is routed to existing well pumps in the Oakwood Bottoms area underground from an aerial drop (utility pole). Local transformers are located at existing well pumps to step down the distribution voltage to 480V, 3-phase. During a site visit it was observed that primary distribution power is available at an existing well pump transformer along the main diagonal drainage channel and near the intersection of Howerdton Road and the Railroad. Utility power will likely come from these locations as needed for new site features including pump station and well pumps.



Figure 3 – Power Lines Howardton Road. & Railroad

Coordination with Ameren Illinois will be required during design to evaluate existing primary grid including ratings and capacity which could not be evaluated at the time of the site visit. Upgrade of utility equipment could be necessary for the additional electrical loads of a new pump station and new well pumps.

2 MEASURES

2.1 General Design Information

All feature designs including new pump station and new well pumps will be in accordance with NFPA 70 NATIONAL ELECTRICAL CODE and all local utility codes.

All features of the project will be designed according to the applicable USACE Engineering Manuals and standard engineering practice. Lessons learned from prior UMRR projects will be incorporated.

For proposed locations of the new pump station and new well pumps, see civil maps.

2.2 Pump Station

Pump station electrical design will be based on the mechanical pumping capacity needs and the customer's electrical needs at the station for operation and maintenance. Considerations will be given to customer's needs for specific control features while maintaining a simple approach of design to ensure reliability and functionality. Standardization of components and readily available parts will be utilized. Motor branch circuit devices will be selected for greatest power efficiency while meeting the needs of the customer and withstanding the demands of the environment.

An arc-flash hazard analysis and power coordination study will be part of the design requirements.

2.3 Well Pumps

Well Pump design will be based on the existing well pumps while utilizing modern components. Consideration will be given greatly to the harsh outdoor environment the electrical equipment will be subject to. It was discussed during the site visit that control features such as electronic power meters including the following would be useful for the customer:

- Power Usage
- Voltage (volts)
- Current (amps)
- Elapsed Time
- Alarms

These features will be considered during design including the ability for the customer to pull this data from each well pump without exposing personnel to electrical hazards.

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REFERENCES

US Army Corps of Engineers. (1994, March/1999, November update 2). Engineer Manual EM_1110-2-3105 *Mech and Elec Design of Pump Stations*