

# ENGINEERING REPORT

FOR

## COAL CUMBUSTION RESIDUAL SURFACE IMPOUNDMENT EMERY POND

OCTOBER 17, 2016

PREPARED FOR

SOUTHERN ILLINOIS POWER COOPERATIVE

PREPARED BY

CLARIDA & ZIEGLER ENGINEERING CO.  
410 NORTH COURT STREET  
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PROJECT 16136



*W. Ziegler*  
*10/12/16*  
*EXP. 11/3-17*

**ENGINEERING REPORT  
FOR  
SOUTHERN ILLNOIS POWER COOPERATIVE**

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## **1. BACKGROUND**

The Emery Pond is approximately 30-35 years old and is located on the south side of the power plant facility. It is possible that the pond could be classified as an incised CCR surface impoundment, exempting it from the requirements of section 257.73 of the Federal Register, Vol. 80, No. 74. However, the Southern Illinois Power Cooperative has decided not to interpret the Emery Pond as an incised CCR unit. Therefore, the pond is subject to the requirements put forth in section 257.73. The pond contains some ash from boiler wash downs and wash downs of other equipment in the event of outages. One primary electric pump and one back up diesel pump are used to pump the contents of the Emery Pond to the plant's south fly ash pond.

## **2. DESIGN CRITERIA**

### **A. LINER DESIGN CRITERIA**

The Emery Pond is an existing unlined CCR surface impoundment.

### **B. HISTORY OF CONSTRUCTION**

N/A. Emery Pond is too small to meet the application.

### **C. HAZARD POTENTIAL CLASSIFICATION**

The initial hazard potential classification assessment has found the Emery Pond to be of significant hazard potential because of the possible damage to Lake of Egypt in the event of failure or misoperation. Periodic hazard potential assessments shall be conducted every 5 years.

### **D. STRUCTURAL STABILITY ASSESSMENTS**

N/A. Emery Pond is too small to meet the application.

### **E. SAFETY FACTOR ASSESSMENTS**

N/A. Emery Pond is too small to meet the application.

## **3. OPERATING CRITERIA**

### **A. HYDROLOGIC AND HYDRAULIC CAPACITY REQUIREMENTS**

The inflow design flood for a significant hazard potential CCR surface impoundment, such as the Emery Pond, is the 1,000-year flood event. The inflow design flood control system plan is to utilize the approximate seven or more feet of freeboard of the Emery Pond to store the required detention volume for a 1,000-year flood event. Using the 1,000-year flood information from the National Oceanic and Atmospheric Administration Atlas 14, Volume 2, Version 3 and existing topographic surveys, it was calculated that the freeboard of the Emery Pond created enough available storage volume, approximately 290,000 cubic feet, to accommodate a 1,000-year flood event continuously lasting in excess of 60 days. This

exceeds any design criteria for dam construction. Please see the attached exhibits for the information used in calculations.

#### **4. CLOSURE & POST CLOSURE CARE**

##### **A. CLOSURE REQUIREMENTS**

Written Closure Plan as detailed in section 257.102 (b)(1)(i) through (vi).

- (i) Future closure of the Emery Pond, will consist of the removal of all CCR and decontamination of the CCR unit.
- (ii) Procedures for the removal of CCR and decontamination of the CCR unit shall be done in a manner that satisfies the requirements put forth in section 257.102 (c).
- (iii) N/A
- (iv) The maximum CCR that could ever be present in the Emery Pond, would occur during a 1,000-year flood event at a time when the pumps were disabled. This could result in roughly 290,000 cubic feet of CCR waste streams being present in the Emery Pond.
- (v) N/A
- (vi) There is no intention at this time to close Emery Pond.

##### **B. POST-CLOSURE CARE PLAN**

N/A. Closure of the Emery Pond will result in the removal of CCR in accordance with section 257.102.

# Cut/Fill Report

**Generated:** 2016-10-12 15:58:03

**By user:** Greg

**Drawing:** P:\16136 - SIPC CCR Assessments\Drawings - Plans\Old Drawings\P:\16136 - SIPC CCR Assessments\Drawings - Plans\Old Drawings\08049 Topo - Points Converted.dwg

Volume Summary							
Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Rough Available Detention Volume	full	1.000	1.000	42730.29	0.00	10690.20	10690.20<Fill>

Totals						
			2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total			42730.29	0.00	10690.20	10690.20<Fill>

\* Value adjusted by cut or fill factor other than 1.0

SIPC Emery Pond  
 Project 16136  
 Detention Sizing

Guebert  
 6-Oct-16

Post-development C = 0.65  
 Development Area = 2.60 acres  
 Pre-Developed Q = 0 cfs  
 Storm Frequency = 1000 years

Durations (minutes)	Intensity (in/hr) from chart	Max Q (cfs)	Detained Q (cfs)	Required Detention (cf)
5	13.2	22.31	22.31	6692
10	9.7	16.33	16.33	9795
15	8.0	13.59	13.59	12229
30	6.0	10.17	10.17	18313
60	4.2	7.15	7.15	25735
120	2.7	4.51	4.51	32489
180	2.0	3.35	3.35	36139
360	1.2	1.96	1.96	42345
720	0.7	1.10	1.10	47455
1440	0.4	0.61	0.61	52566
2880	0.2	0.34	0.34	58406
4320	0.1	0.24	0.24	61327
5760	0.11	0.19	0.19	64247
10080	0.07	0.12	0.12	71548
14400	0.05	0.08	0.08	73008
28800	0.03	0.05	0.05	87610
43200	0.03	0.05	0.05	131414
64800	0.02	0.03	0.03	131414
86400	0.02	0.03	0.03	175219

### PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup>

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	<b>0.401</b> (0.367-0.442)	<b>0.478</b> (0.437-0.526)	<b>0.569</b> (0.521-0.627)	<b>0.641</b> (0.585-0.705)	<b>0.732</b> (0.664-0.802)	<b>0.802</b> (0.726-0.879)	<b>0.870</b> (0.784-0.952)	<b>0.940</b> (0.843-1.03)	<b>1.03</b> (0.920-1.13)	<b>1.10</b> (0.977-1.21)
10-min	<b>0.624</b> (0.571-0.687)	<b>0.746</b> (0.682-0.821)	<b>0.885</b> (0.810-0.975)	<b>0.990</b> (0.903-1.09)	<b>1.12</b> (1.02-1.23)	<b>1.22</b> (1.10-1.33)	<b>1.31</b> (1.18-1.43)	<b>1.40</b> (1.26-1.54)	<b>1.52</b> (1.35-1.66)	<b>1.61</b> (1.42-1.76)
15-min	<b>0.764</b> (0.699-0.842)	<b>0.912</b> (0.834-1.00)	<b>1.09</b> (0.995-1.20)	<b>1.22</b> (1.11-1.34)	<b>1.38</b> (1.25-1.51)	<b>1.50</b> (1.36-1.65)	<b>1.63</b> (1.47-1.78)	<b>1.75</b> (1.57-1.91)	<b>1.90</b> (1.69-2.08)	<b>2.01</b> (1.78-2.20)
30-min	<b>1.01</b> (0.925-1.11)	<b>1.22</b> (1.12-1.34)	<b>1.49</b> (1.36-1.64)	<b>1.69</b> (1.54-1.86)	<b>1.95</b> (1.77-2.14)	<b>2.15</b> (1.95-2.36)	<b>2.35</b> (2.12-2.57)	<b>2.55</b> (2.29-2.79)	<b>2.81</b> (2.50-3.08)	<b>3.01</b> (2.67-3.30)
60-min	<b>1.24</b> (1.13-1.36)	<b>1.50</b> (1.37-1.65)	<b>1.87</b> (1.71-2.06)	<b>2.15</b> (1.96-2.37)	<b>2.53</b> (2.30-2.77)	<b>2.83</b> (2.56-3.11)	<b>3.14</b> (2.83-3.44)	<b>3.46</b> (3.10-3.79)	<b>3.89</b> (3.46-4.26)	<b>4.23</b> (3.74-4.63)
2-hr	<b>1.46</b> (1.33-1.61)	<b>1.77</b> (1.62-1.95)	<b>2.22</b> (2.02-2.44)	<b>2.57</b> (2.34-2.82)	<b>3.05</b> (2.77-3.34)	<b>3.43</b> (3.11-3.76)	<b>3.83</b> (3.45-4.19)	<b>4.26</b> (3.81-4.66)	<b>4.86</b> (4.31-5.31)	<b>5.34</b> (4.71-5.85)
3-hr	<b>1.55</b> (1.42-1.71)	<b>1.88</b> (1.72-2.07)	<b>2.36</b> (2.15-2.60)	<b>2.74</b> (2.49-3.01)	<b>3.28</b> (2.96-3.59)	<b>3.71</b> (3.34-4.06)	<b>4.17</b> (3.73-4.56)	<b>4.66</b> (4.14-5.09)	<b>5.35</b> (4.72-5.86)	<b>5.93</b> (5.18-6.50)
6-hr	<b>1.83</b> (1.67-2.01)	<b>2.20</b> (2.02-2.42)	<b>2.76</b> (2.52-3.03)	<b>3.21</b> (2.93-3.52)	<b>3.83</b> (3.48-4.19)	<b>4.34</b> (3.92-4.74)	<b>4.88</b> (4.39-5.33)	<b>5.46</b> (4.87-5.96)	<b>6.28</b> (5.55-6.85)	<b>6.97</b> (6.11-7.60)
12-hr	<b>2.12</b> (1.96-2.32)	<b>2.56</b> (2.36-2.80)	<b>3.19</b> (2.93-3.48)	<b>3.69</b> (3.39-4.02)	<b>4.38</b> (4.01-4.77)	<b>4.95</b> (4.51-5.38)	<b>5.54</b> (5.02-6.01)	<b>6.17</b> (5.56-6.70)	<b>7.07</b> (6.30-7.67)	<b>7.80</b> (6.90-8.47)
24-hr	<b>2.47</b> (2.28-2.67)	<b>2.98</b> (2.77-3.22)	<b>3.72</b> (3.45-4.03)	<b>4.30</b> (3.99-4.64)	<b>5.09</b> (4.70-5.49)	<b>5.71</b> (5.27-6.16)	<b>6.35</b> (5.84-6.84)	<b>7.01</b> (6.44-7.56)	<b>7.93</b> (7.25-8.56)	<b>8.66</b> (7.90-9.35)
2-day	<b>2.86</b> (2.65-3.10)	<b>3.46</b> (3.21-3.74)	<b>4.29</b> (3.98-4.64)	<b>4.93</b> (4.57-5.33)	<b>5.81</b> (5.36-6.27)	<b>6.49</b> (5.99-7.01)	<b>7.20</b> (6.62-7.77)	<b>7.92</b> (7.26-8.56)	<b>8.91</b> (8.14-9.64)	<b>9.70</b> (8.83-10.5)
3-day	<b>3.05</b> (2.84-3.28)	<b>3.68</b> (3.43-3.96)	<b>4.56</b> (4.25-4.91)	<b>5.25</b> (4.88-5.64)	<b>6.17</b> (5.71-6.63)	<b>6.89</b> (6.37-7.41)	<b>7.63</b> (7.04-8.20)	<b>8.38</b> (7.72-9.03)	<b>9.42</b> (8.64-10.2)	<b>10.2</b> (9.37-11.1)
4-day	<b>3.24</b> (3.03-3.47)	<b>3.90</b> (3.65-4.19)	<b>4.84</b> (4.52-5.19)	<b>5.56</b> (5.18-5.96)	<b>6.52</b> (6.07-6.99)	<b>7.28</b> (6.76-7.80)	<b>8.06</b> (7.46-8.64)	<b>8.85</b> (8.17-9.49)	<b>9.93</b> (9.14-10.7)	<b>10.8</b> (9.90-11.6)
7-day	<b>3.80</b> (3.56-4.06)	<b>4.57</b> (4.28-4.87)	<b>5.58</b> (5.23-5.95)	<b>6.34</b> (5.94-6.76)	<b>7.35</b> (6.86-7.83)	<b>8.12</b> (7.57-8.65)	<b>8.90</b> (8.28-9.48)	<b>9.69</b> (9.00-10.3)	<b>10.7</b> (9.95-11.5)	<b>11.6</b> (10.7-12.4)
10-day	<b>4.32</b> (4.06-4.59)	<b>5.17</b> (4.86-5.51)	<b>6.28</b> (5.90-6.69)	<b>7.12</b> (6.67-7.56)	<b>8.21</b> (7.68-8.72)	<b>9.04</b> (8.46-9.62)	<b>9.88</b> (9.22-10.5)	<b>10.7</b> (9.98-11.4)	<b>11.8</b> (11.0-12.6)	<b>12.7</b> (11.8-13.6)
20-day	<b>5.84</b> (5.52-6.19)	<b>6.98</b> (6.59-7.41)	<b>8.39</b> (7.91-8.89)	<b>9.41</b> (8.86-9.97)	<b>10.7</b> (10.1-11.4)	<b>11.8</b> (11.0-12.4)	<b>12.7</b> (11.9-13.5)	<b>13.7</b> (12.8-14.6)	<b>15.1</b> (14.0-16.0)	<b>16.0</b> (14.9-17.0)
30-day	<b>7.24</b> (6.86-7.65)	<b>8.64</b> (8.17-9.13)	<b>10.3</b> (9.72-10.9)	<b>11.5</b> (10.8-12.1)	<b>13.0</b> (12.2-13.7)	<b>14.1</b> (13.3-14.9)	<b>15.2</b> (14.3-16.1)	<b>16.3</b> (15.3-17.2)	<b>17.7</b> (16.6-18.8)	<b>18.8</b> (17.6-20.0)
45-day	<b>9.09</b> (8.63-9.56)	<b>10.8</b> (10.3-11.4)	<b>12.7</b> (12.1-13.4)	<b>14.1</b> (13.4-14.9)	<b>15.9</b> (15.0-16.7)	<b>17.1</b> (16.2-18.1)	<b>18.4</b> (17.4-19.4)	<b>19.6</b> (18.5-20.7)	<b>21.2</b> (20.0-22.4)	<b>22.4</b> (21.1-23.7)
60-day	<b>10.7</b> (10.2-11.3)	<b>12.8</b> (12.1-13.4)	<b>15.0</b> (14.2-15.7)	<b>16.5</b> (15.7-17.4)	<b>18.5</b> (17.5-19.5)	<b>20.0</b> (18.9-21.0)	<b>21.4</b> (20.2-22.5)	<b>22.8</b> (21.5-24.0)	<b>24.6</b> (23.1-25.9)	<b>25.9</b> (24.3-27.3)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

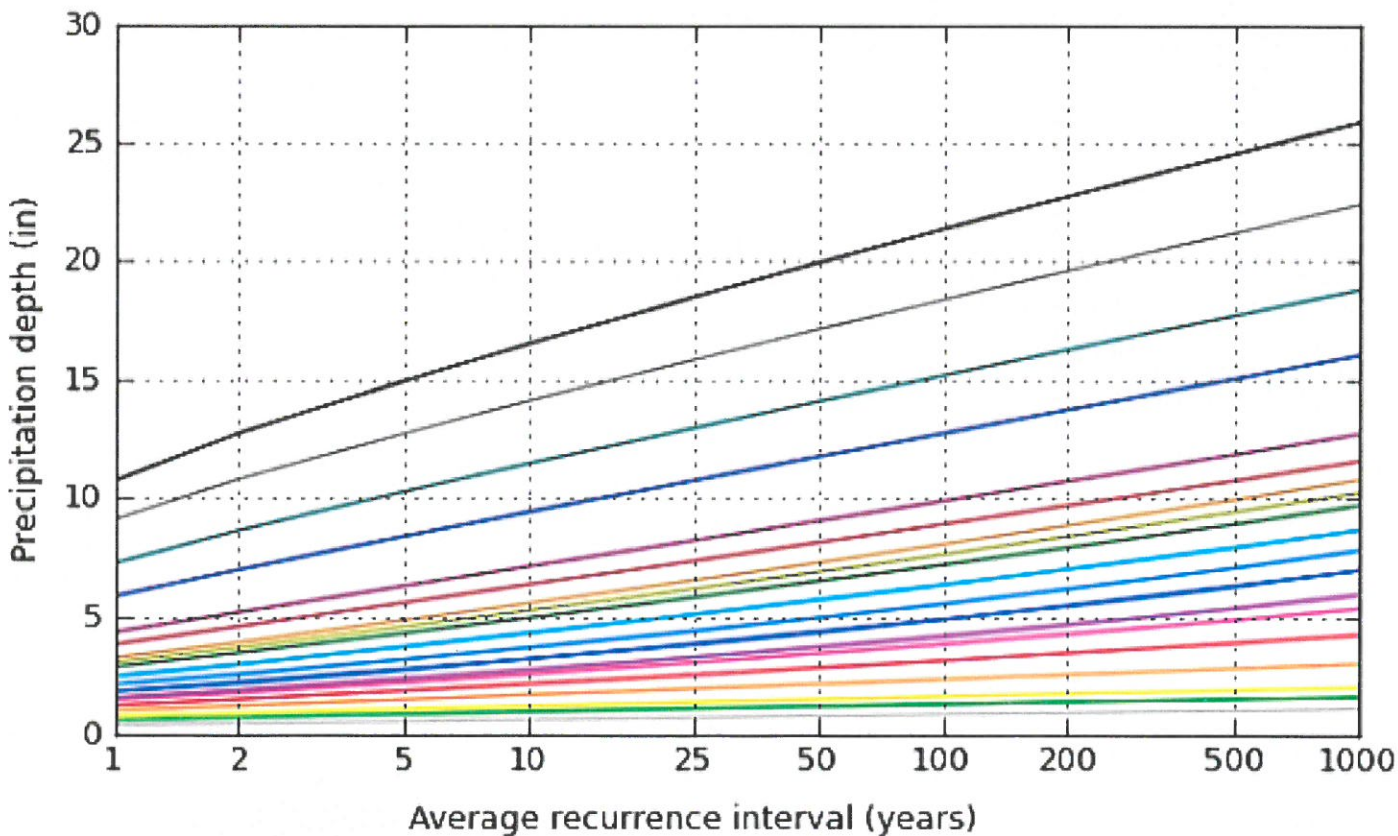
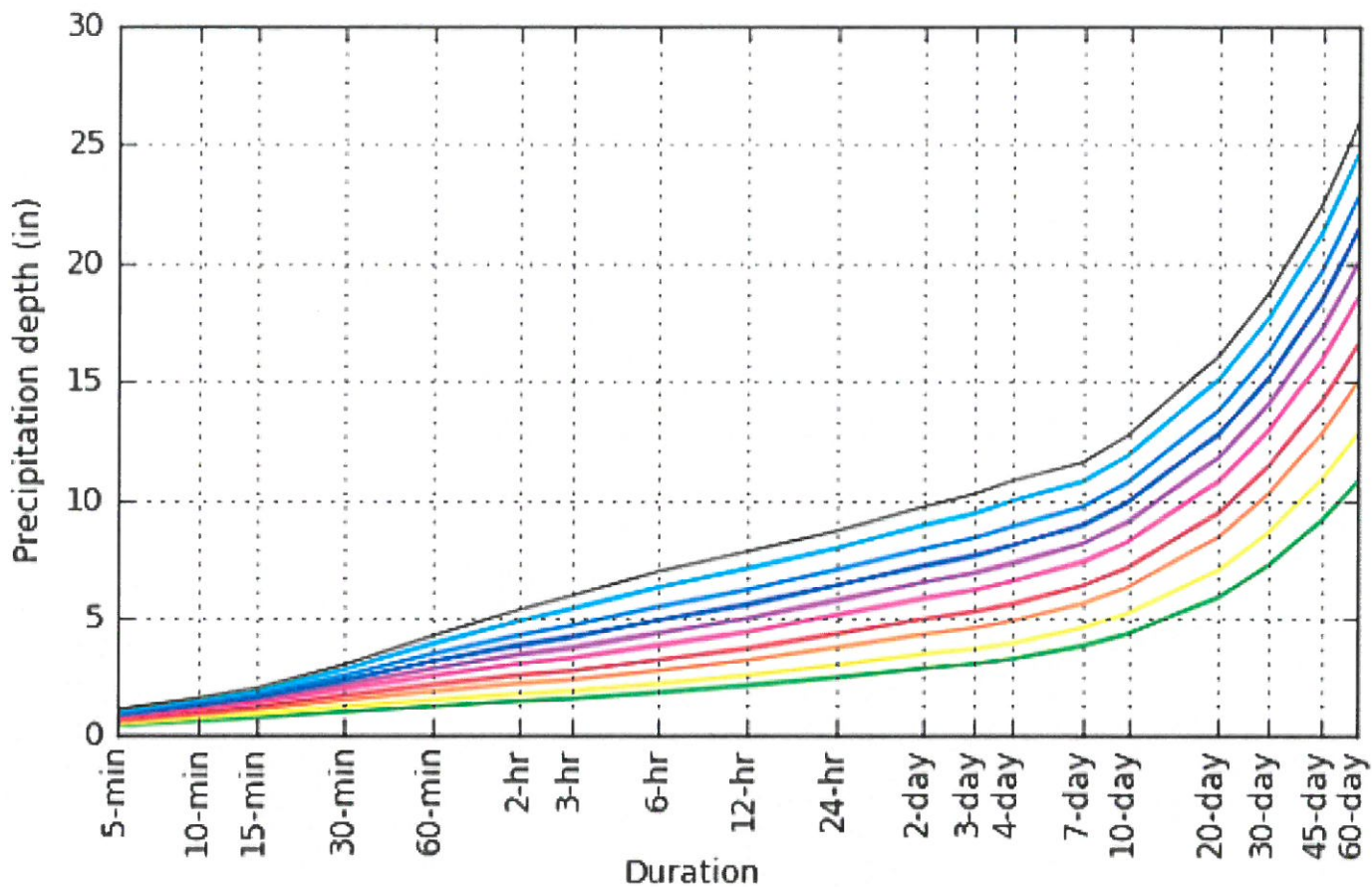
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

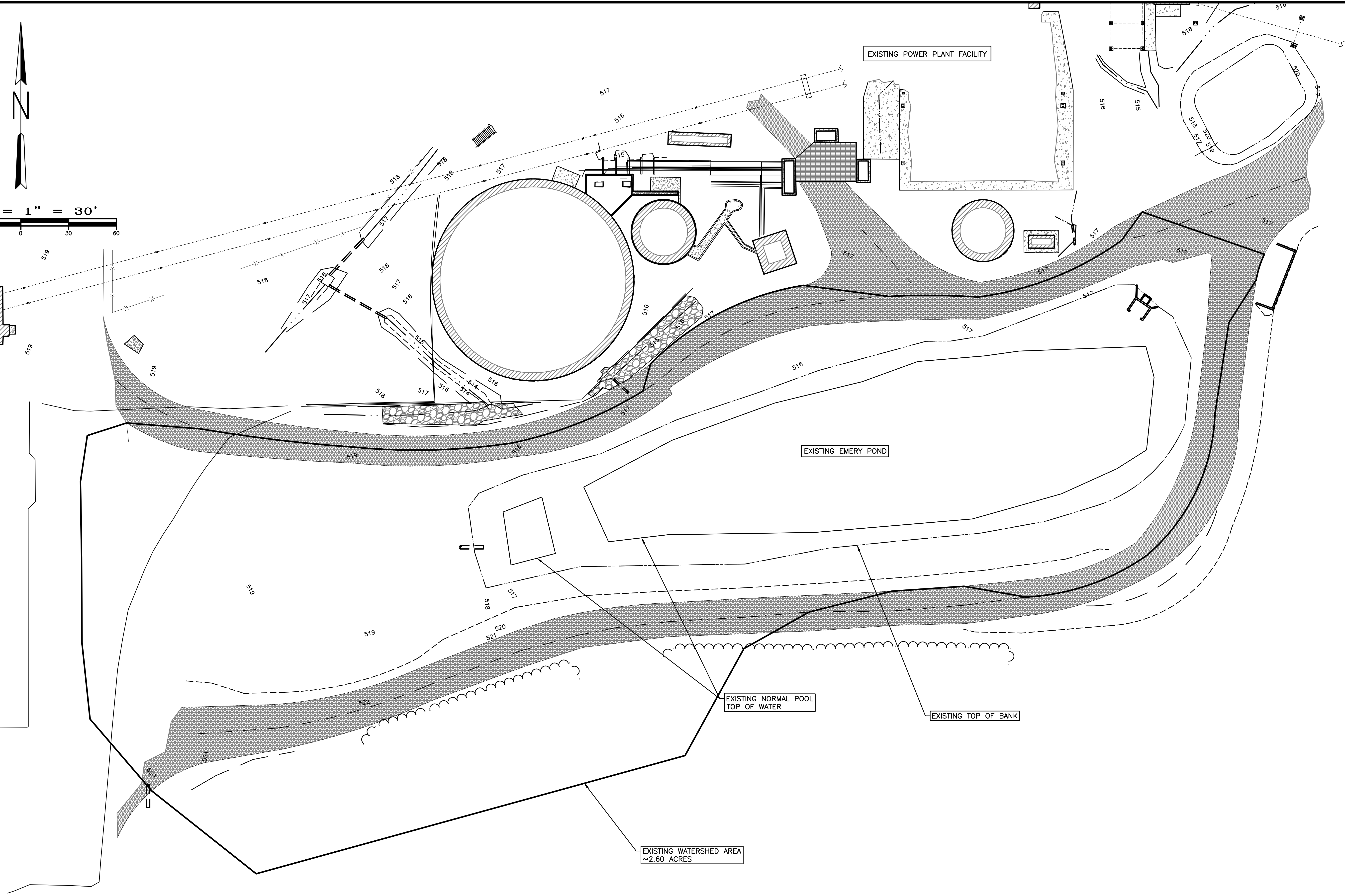
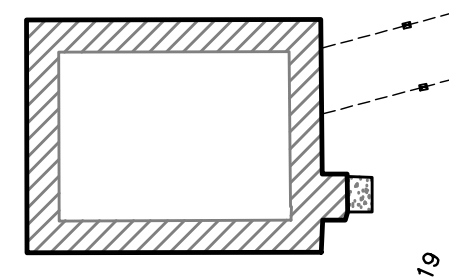
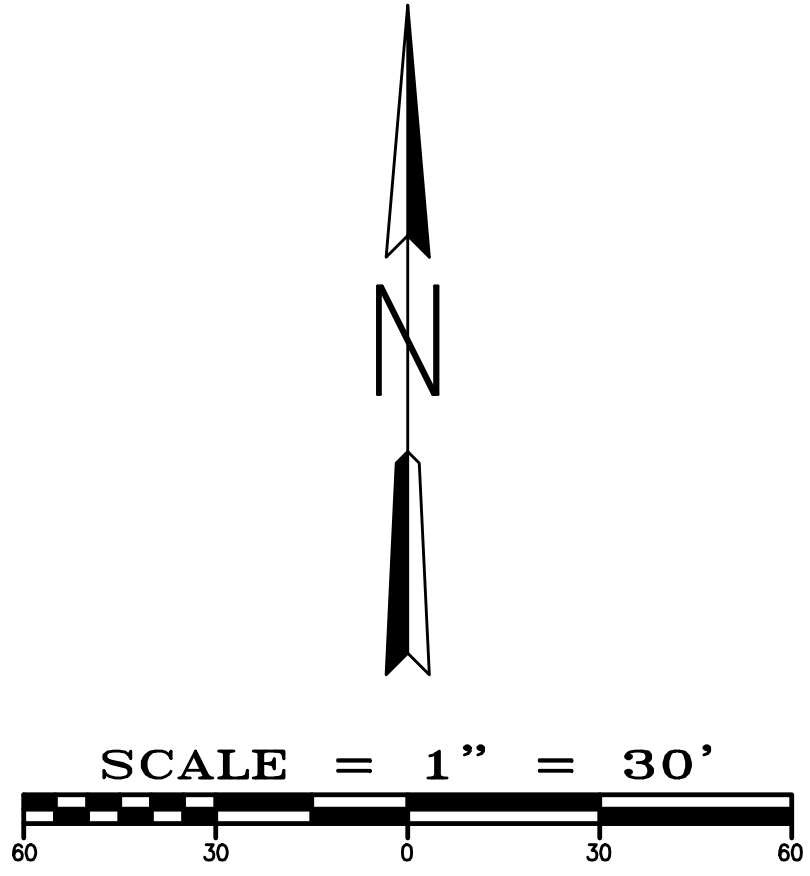


### PDS-based depth-duration-frequency (DDF) curves

Latitude: 39.9000°, Longitude: -89.4000°







P:\16136 - SIFC CCR Assessments\Drawings - Plans\Old Drawings\08049 Topo - Points Converted.dwg 10-13-16 08:59:01 AM Greg

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<b>SITE EXHIBIT</b> <b>CCR REQUIREMENTS</b> <b>SOUTHERN ILLINOIS POWER COOPERATIVE</b>	
Date	OCTOBER 2016
DR. By	G.E.G.
Ck'D By	W.B.Z.
Scale	1"=30'
Job No.	16136
Sheet No.	1 of 1