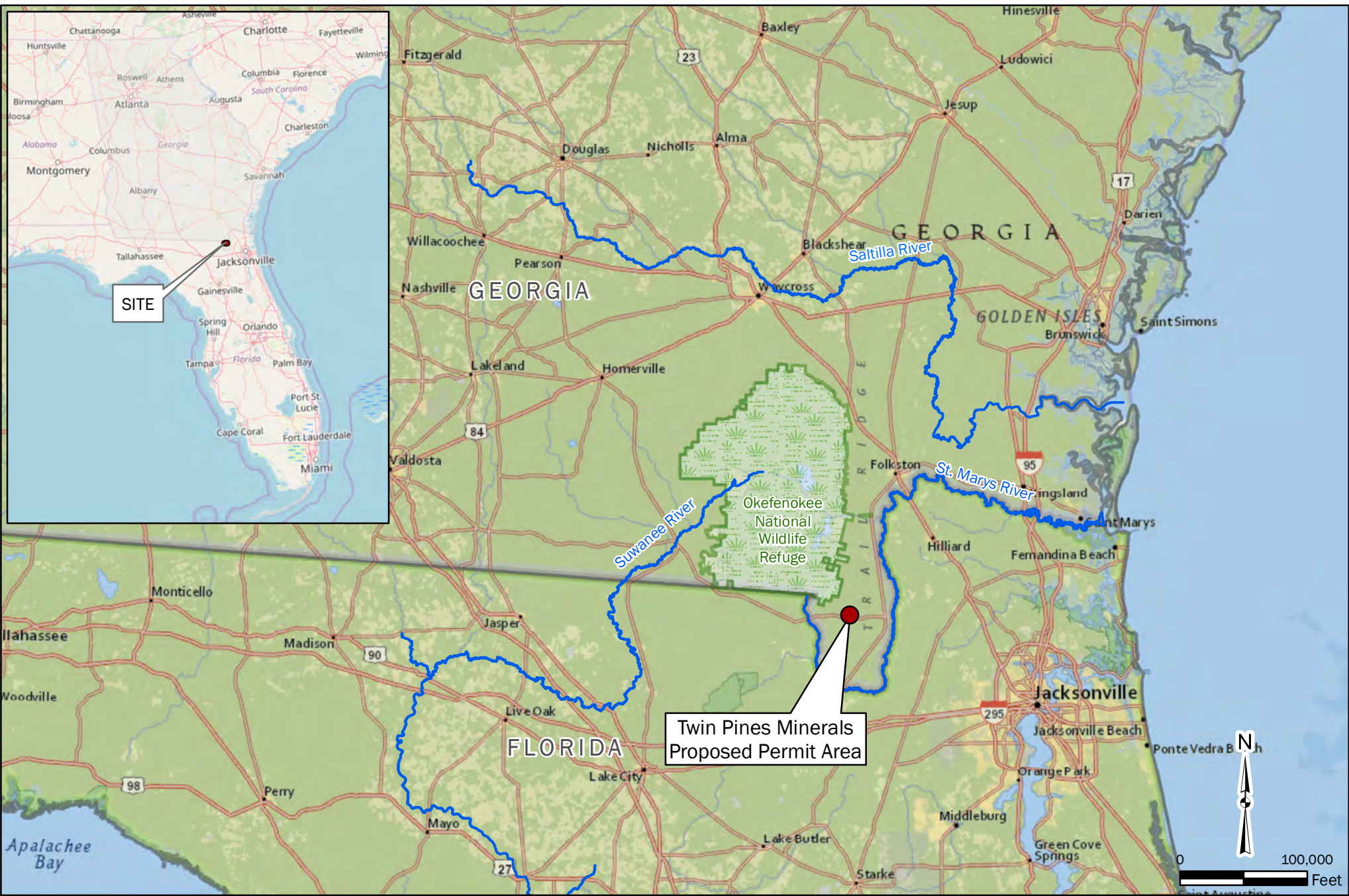


# FIGURES



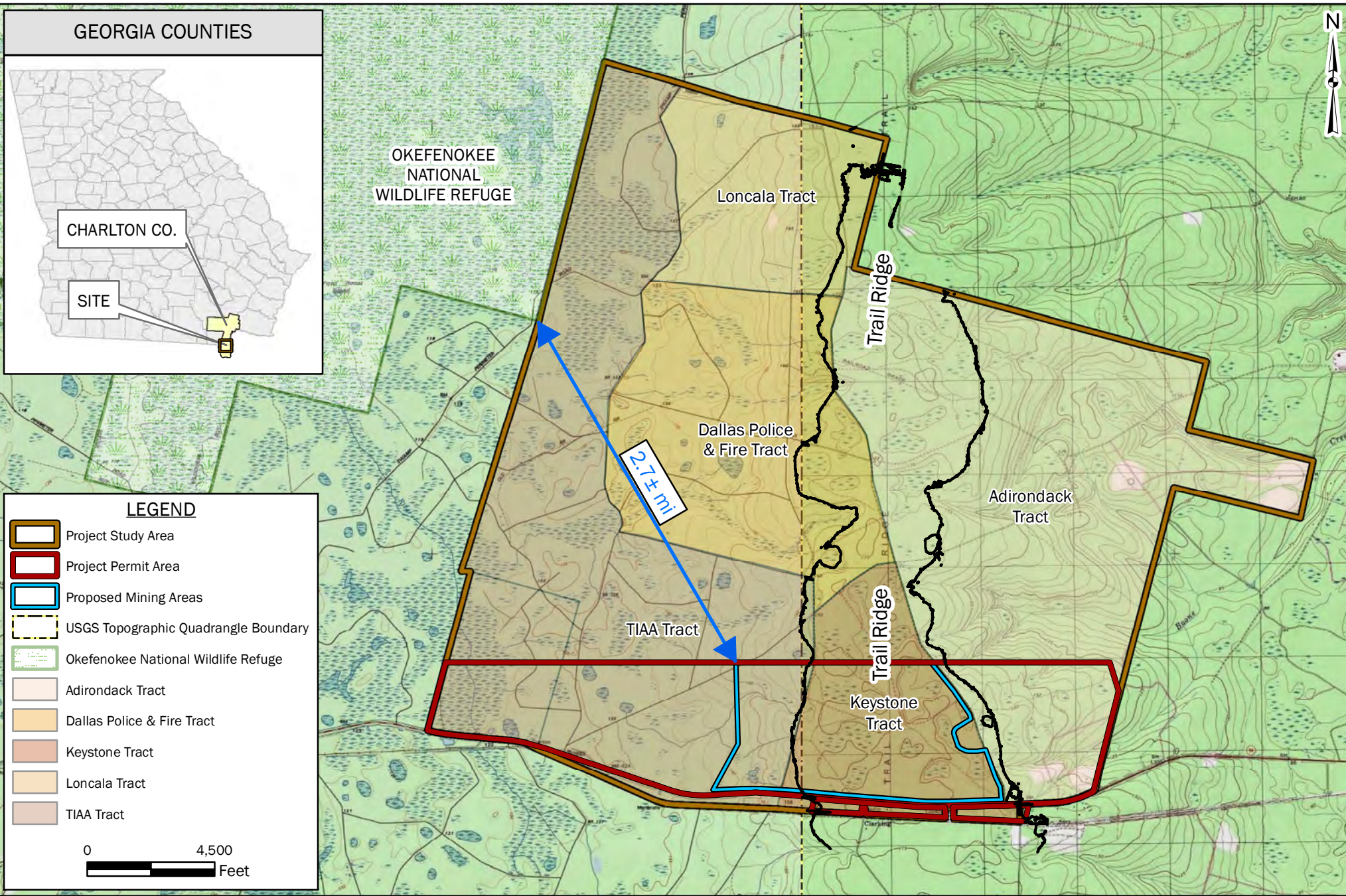
**FIGURE 1: LOCATION OF THE PROPOSED TWIN PINES MINE**  
**TWIN PINES MINERALS**

ST. GEORGE, CHARLTON COUNTY, GEORGIA

INSET BASEMAP: Open Street Map. BASEMAP: National Geographic World Map.



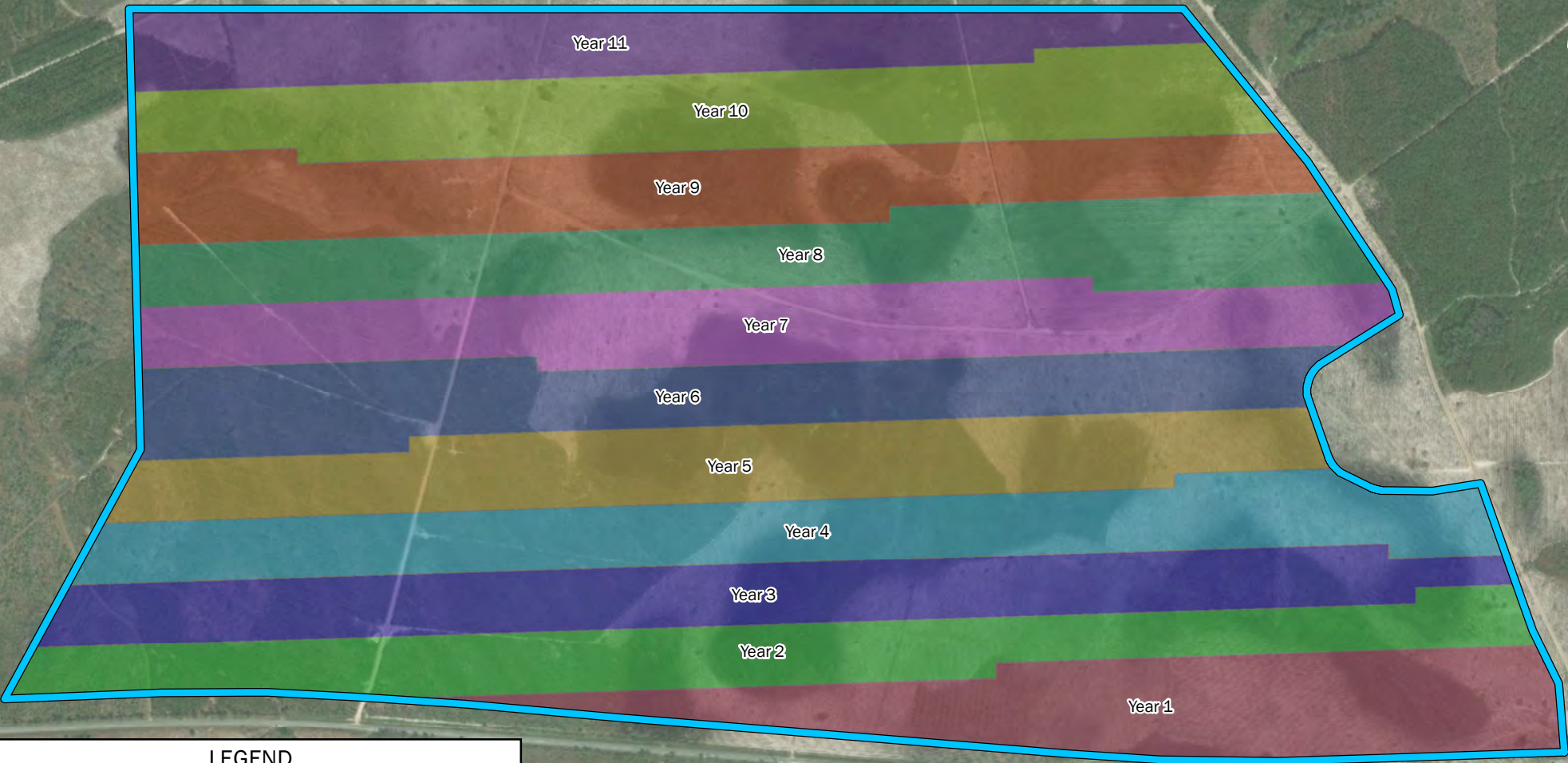
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CHECKED BY: RMH
DRAWING DATE: 1/14/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 100,000 ft



**FIGURE 2: PROJECT STUDY & PROPOSED PERMIT AREA**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: USGS 7.5 Minute Quadrangle Map, Florida & Georgia, (West) Moniac 1968 (10-ft Contour Interval), (East) Saint George 1982 (5-ft Contour Interval).

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APPROX. SCALE: 1 in = 4,500 ft



**LEGEND**

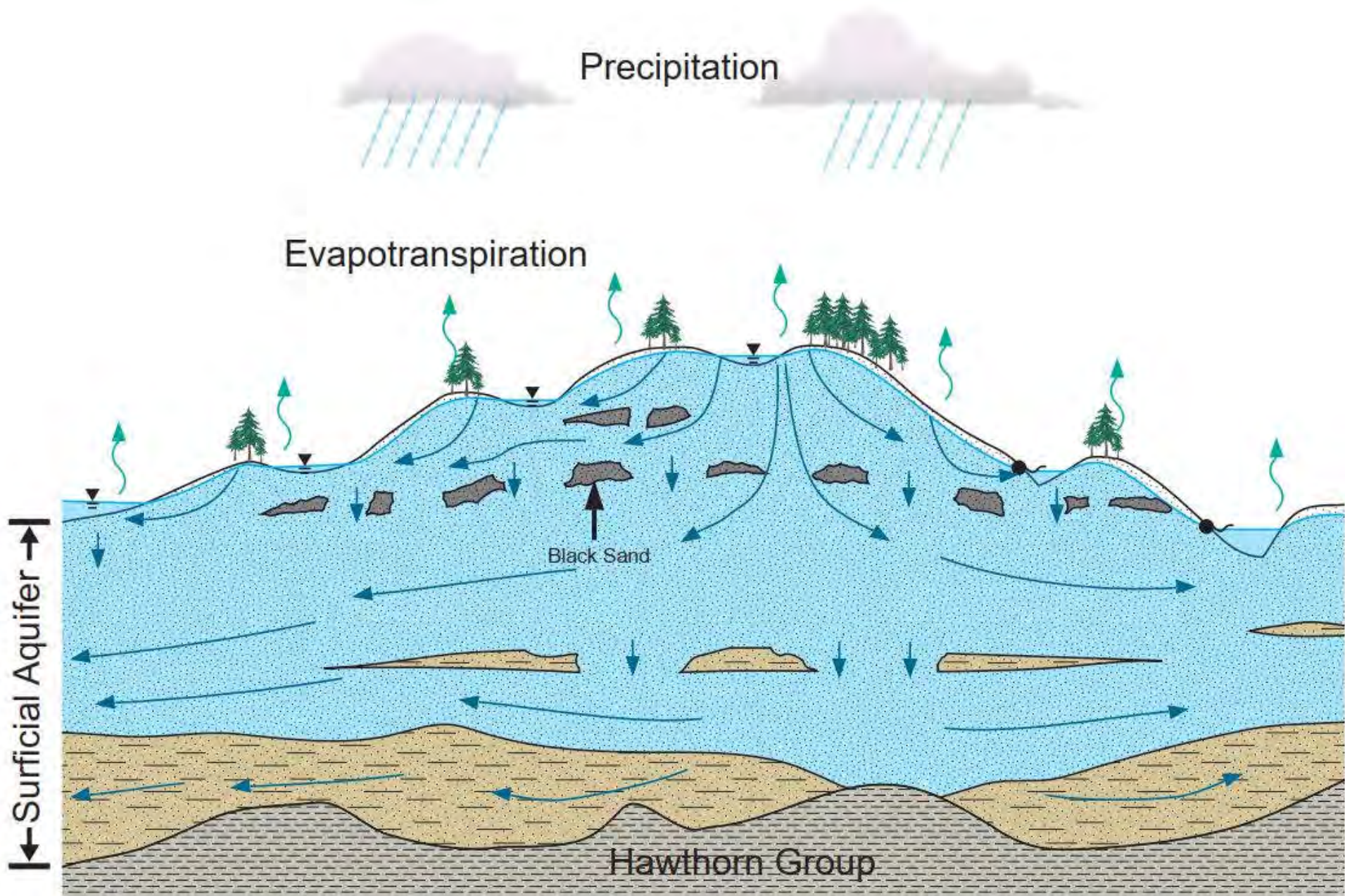
Mining Area	Year 3	Year 6	Year 9
Year 1	Year 4	Year 7	Year 10
Year 2	Year 5	Year 8	Year 11

0 1,000  
Feet



**FIGURE 3: MINING SCHEDULE**  
**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA  
BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution).

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APPROX. SCALE: 1 in = 1,000 ft

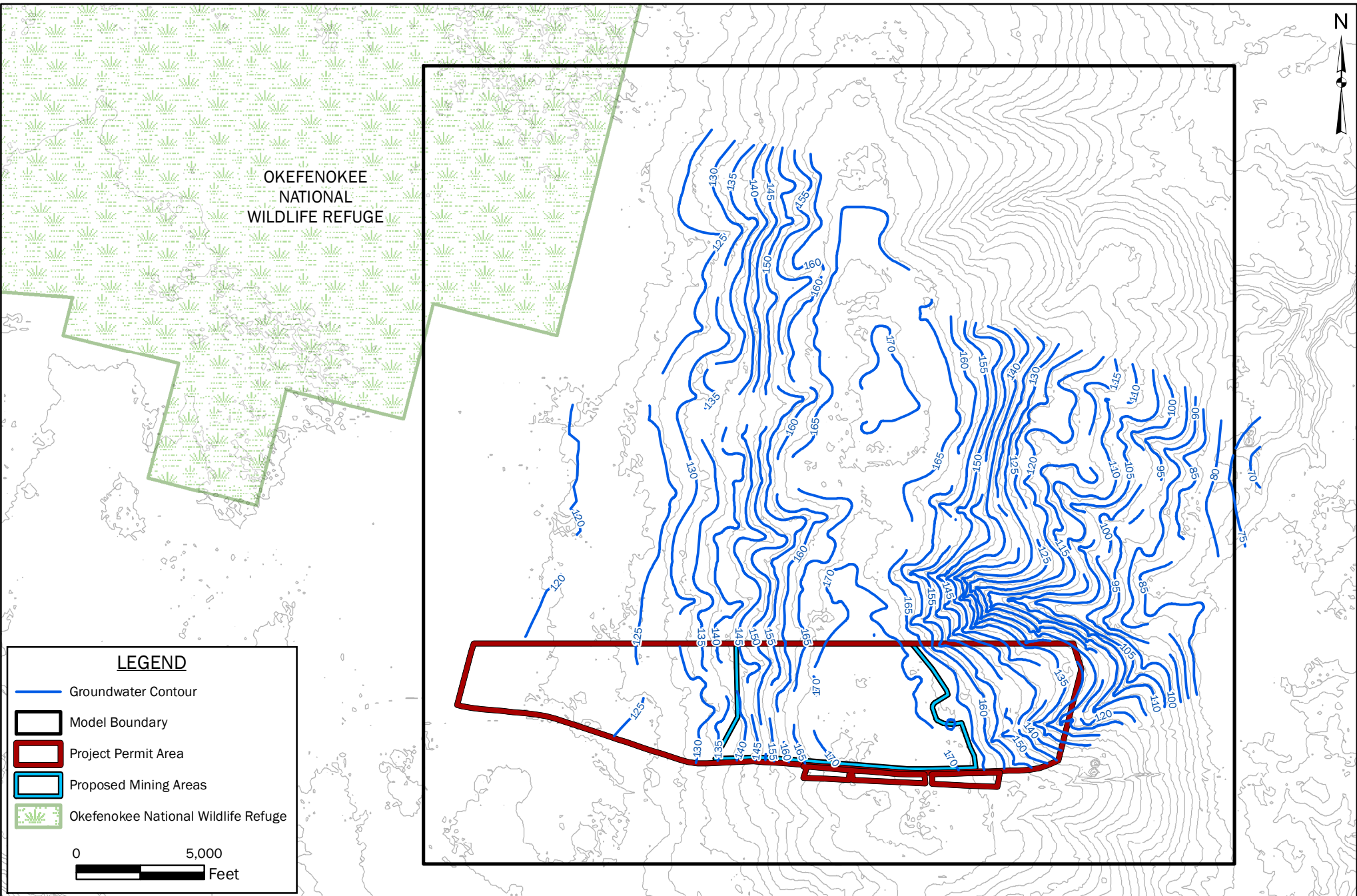


**FIGURE 4: CONCEPTUAL HYDROGEOLOGIC MODEL**

TWIN PINES MINERALS  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

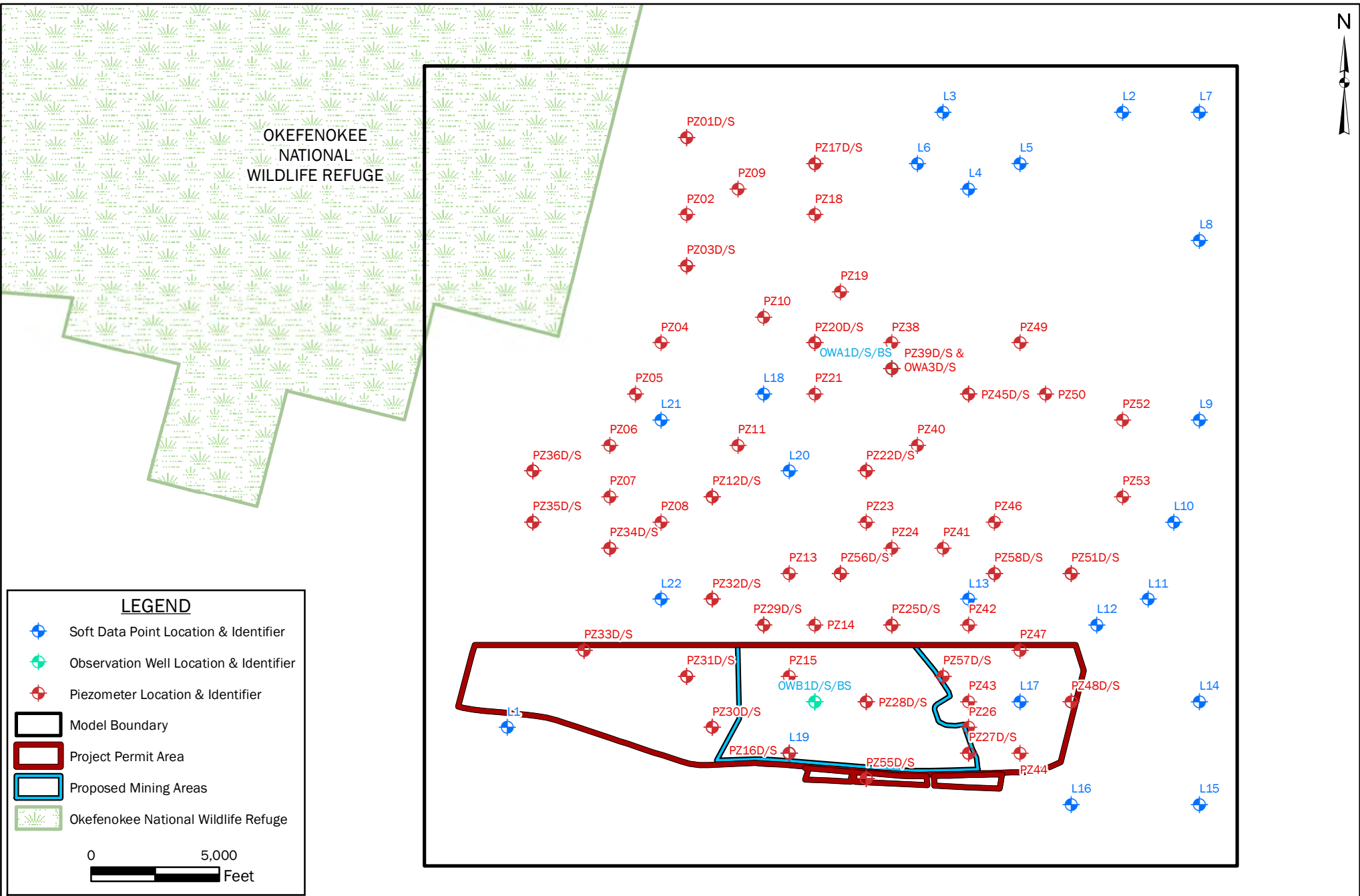


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CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE:



**FIGURE 5: POTENTIOMETRIC SURFACE MAP - JULY 26, 2019**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

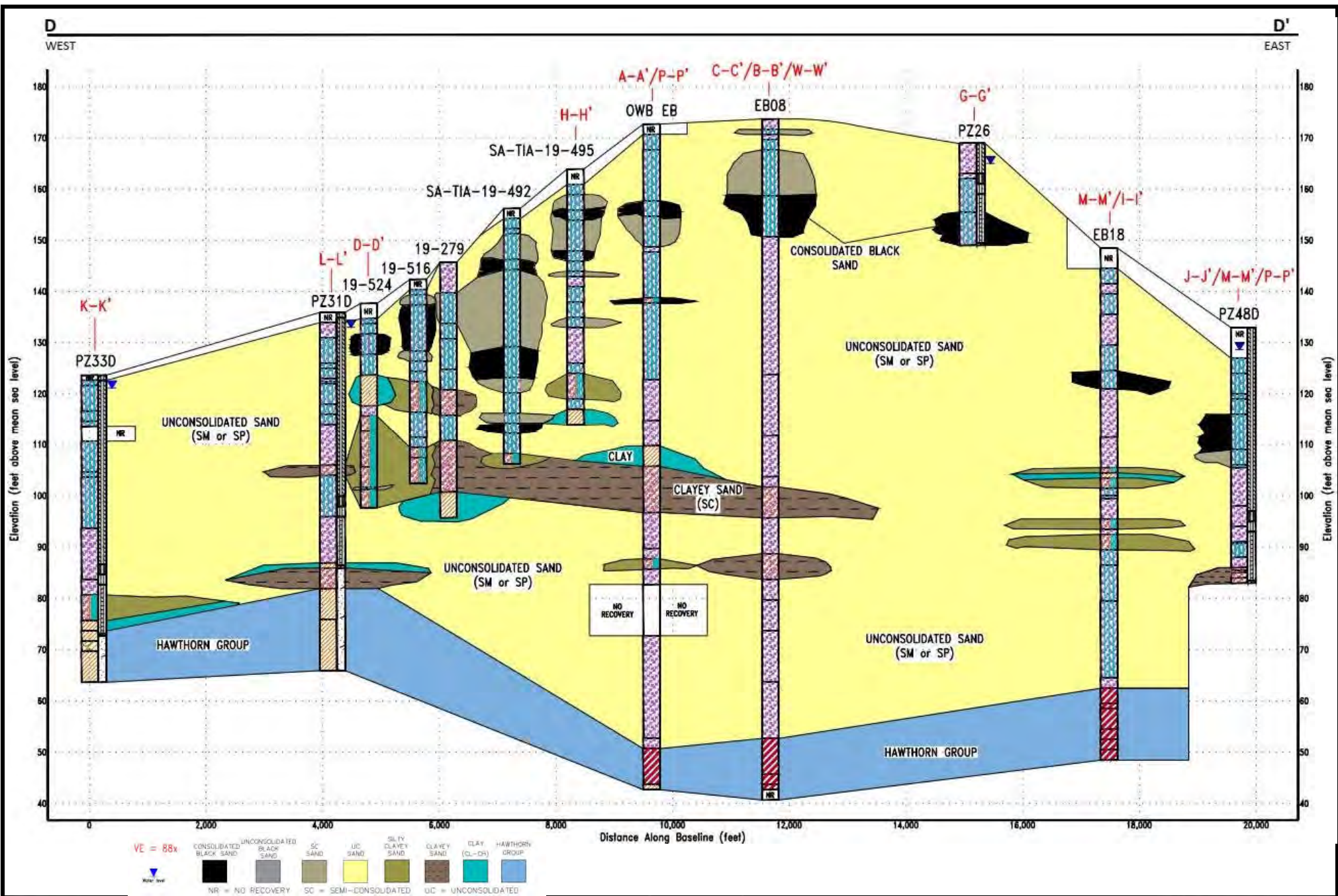
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APPROX. SCALE: 1 in = 5,000 ft



**FIGURE 6: PIEZOMETER & WELL LOCATION MAP**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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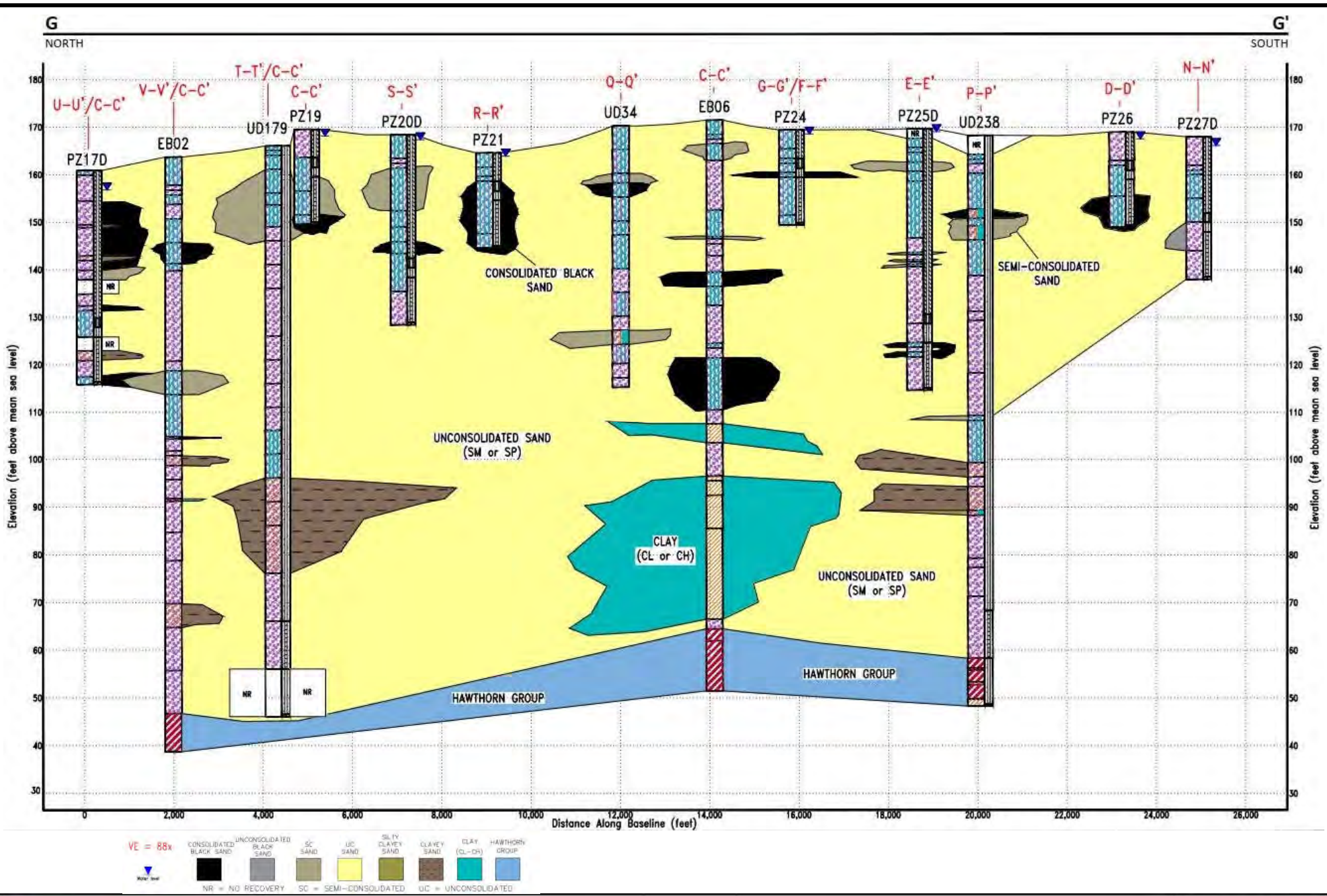
**FIGURE 7: EXAMPLE WEST-TO-EAST PROFILE**

TWIN PINES MINERALS  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE:

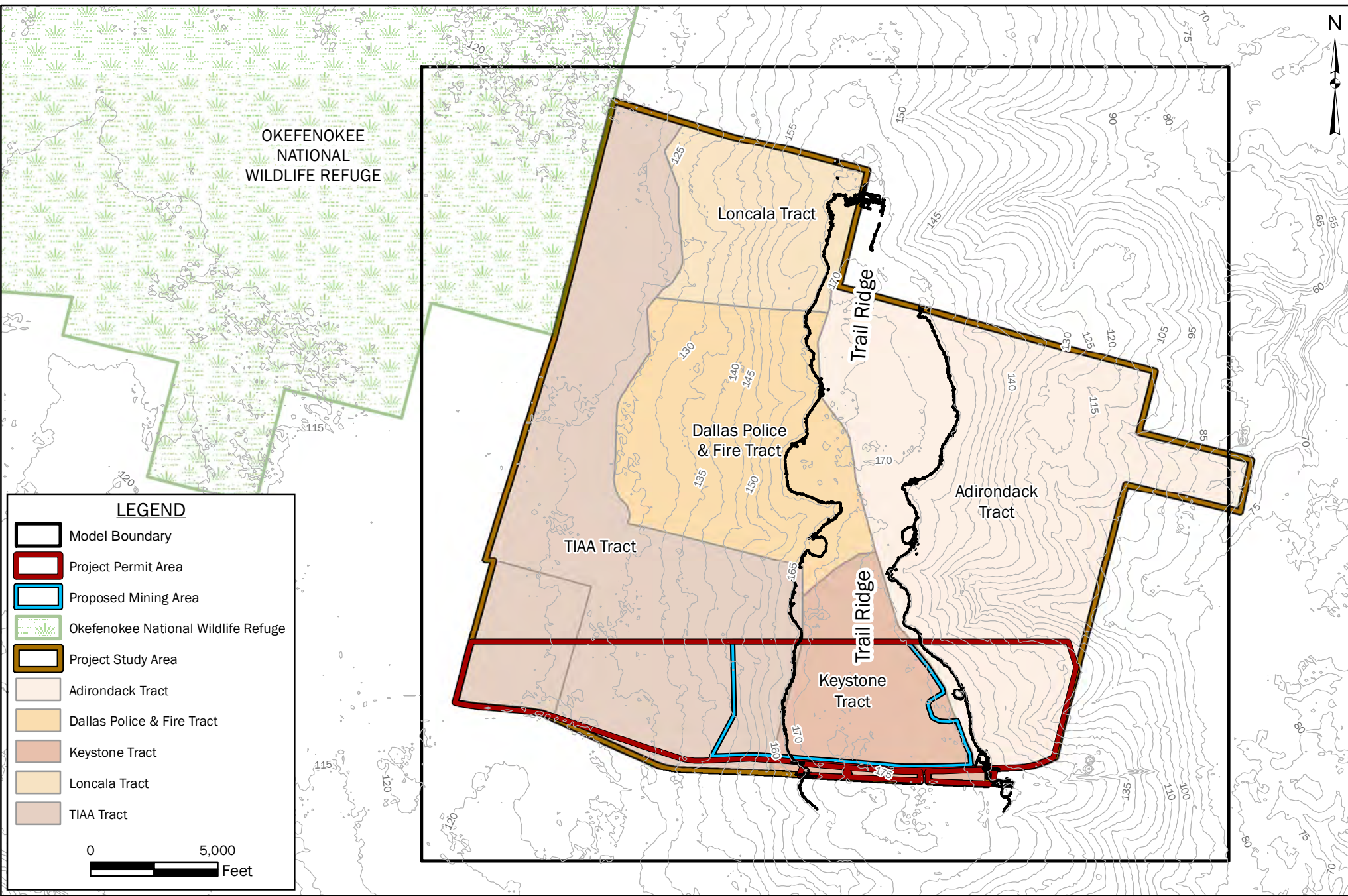




**FIGURE 8: EXAMPLE NORTH-TO-SOUTH PROFILE**  
 TWIN PINES MINERALS  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



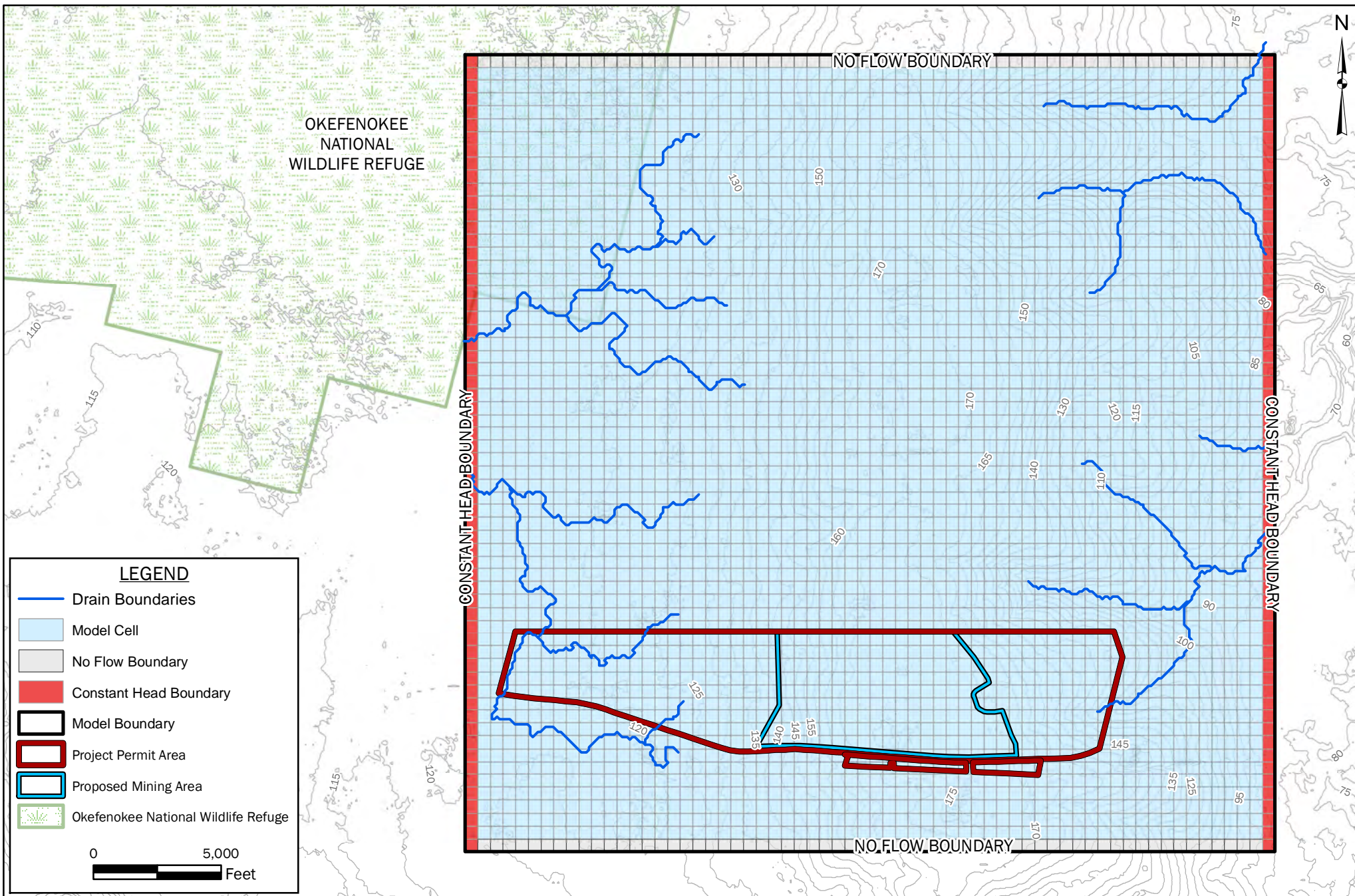
DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE:



**FIGURE 9: MODEL AREA MAP**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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APPROX. SCALE: 1 in = 5,000 ft



**LEGEND**

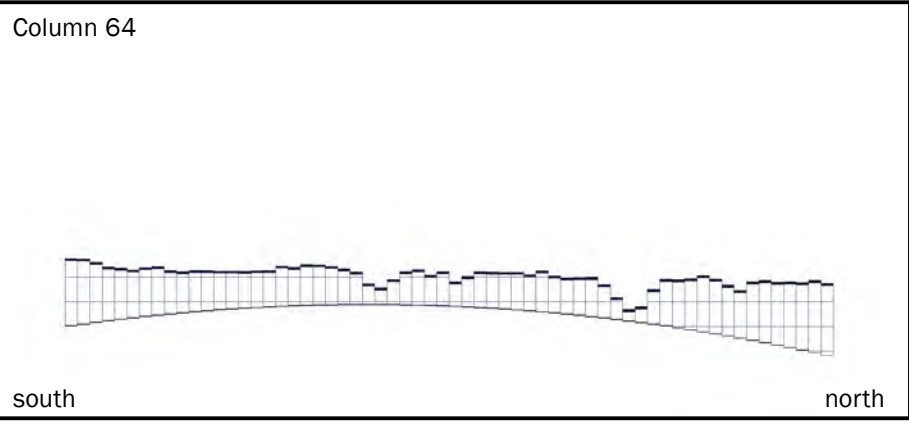
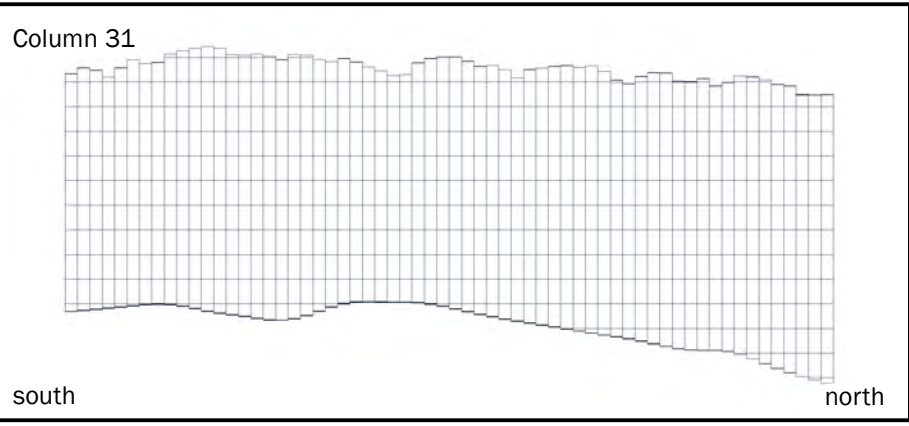
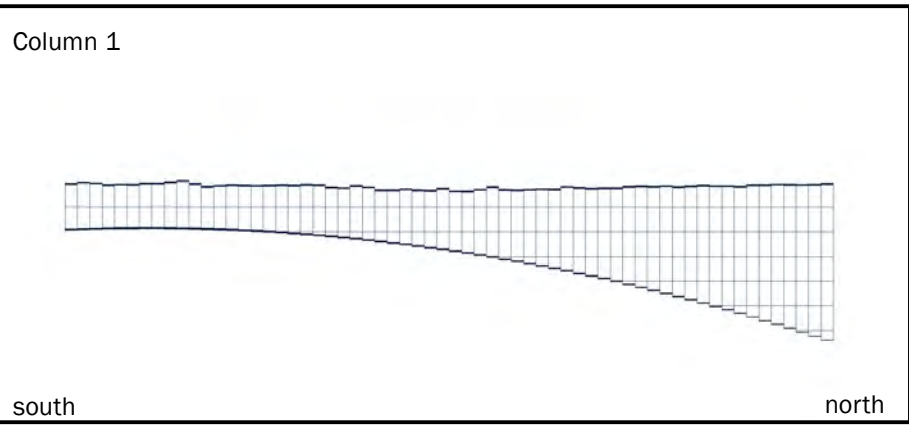
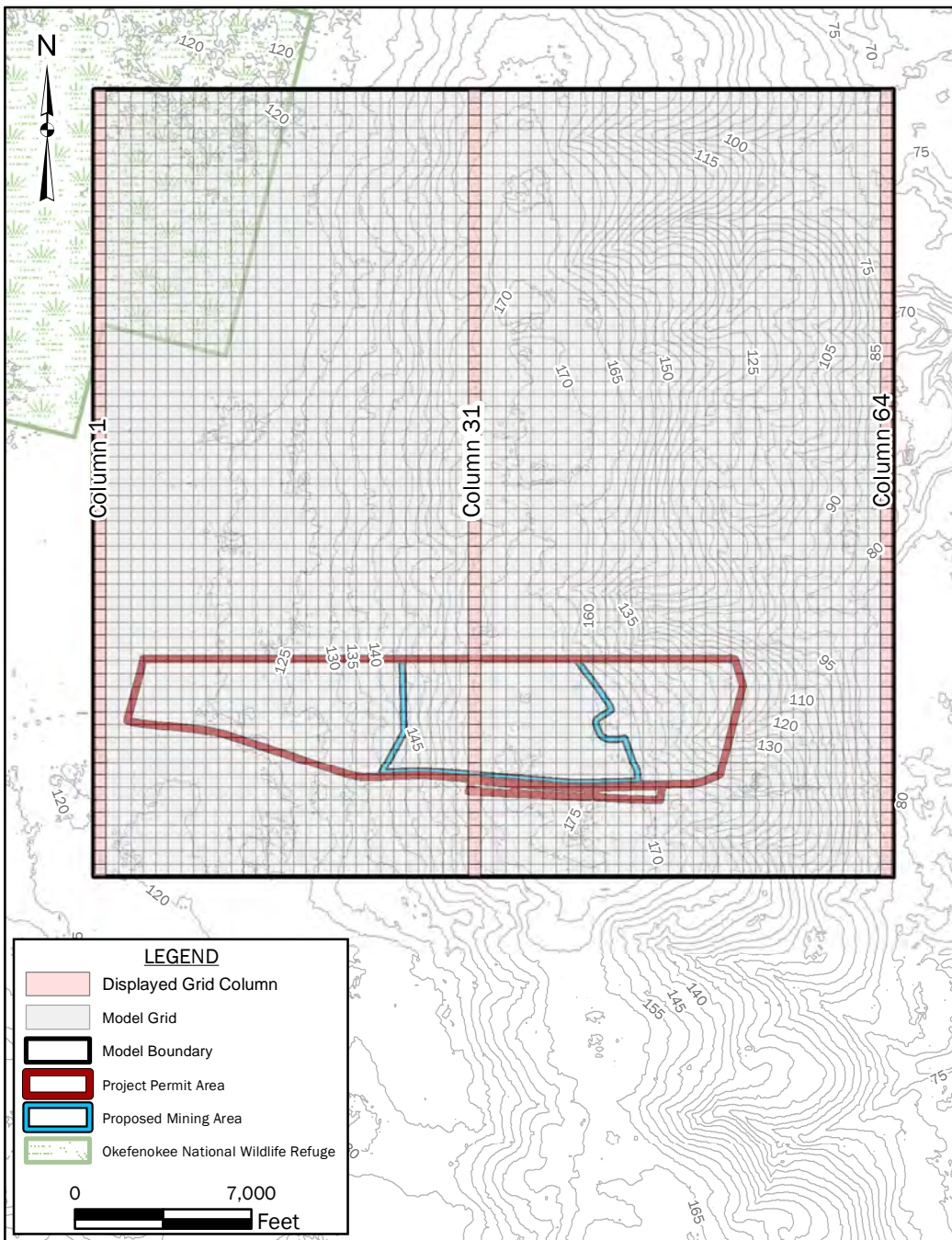
- Drain Boundaries
- Model Cell
- No Flow Boundary
- Constant Head Boundary
- Model Boundary
- Project Permit Area
- Proposed Mining Area
- Okefenokee National Wildlife Refuge

0 5,000 Feet



**FIGURE 10: MODEL GRID & BOUNDARY CONDITIONS**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

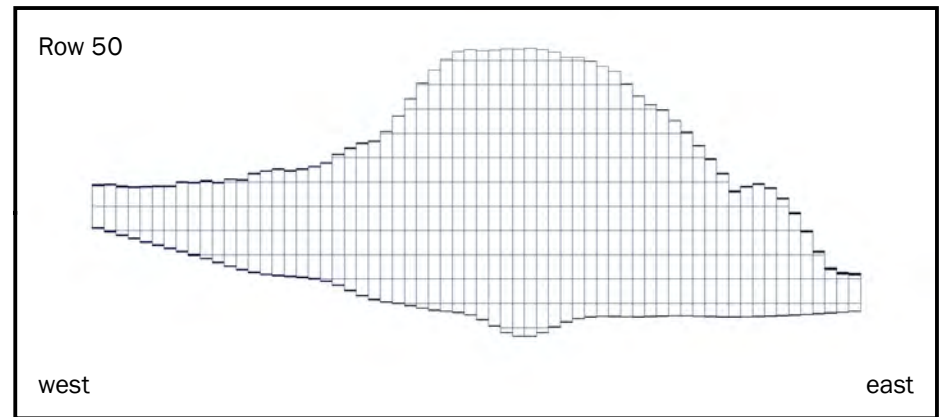
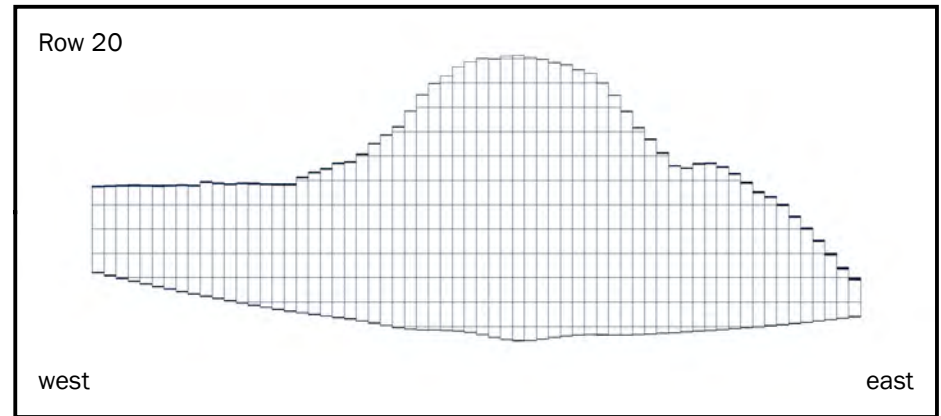
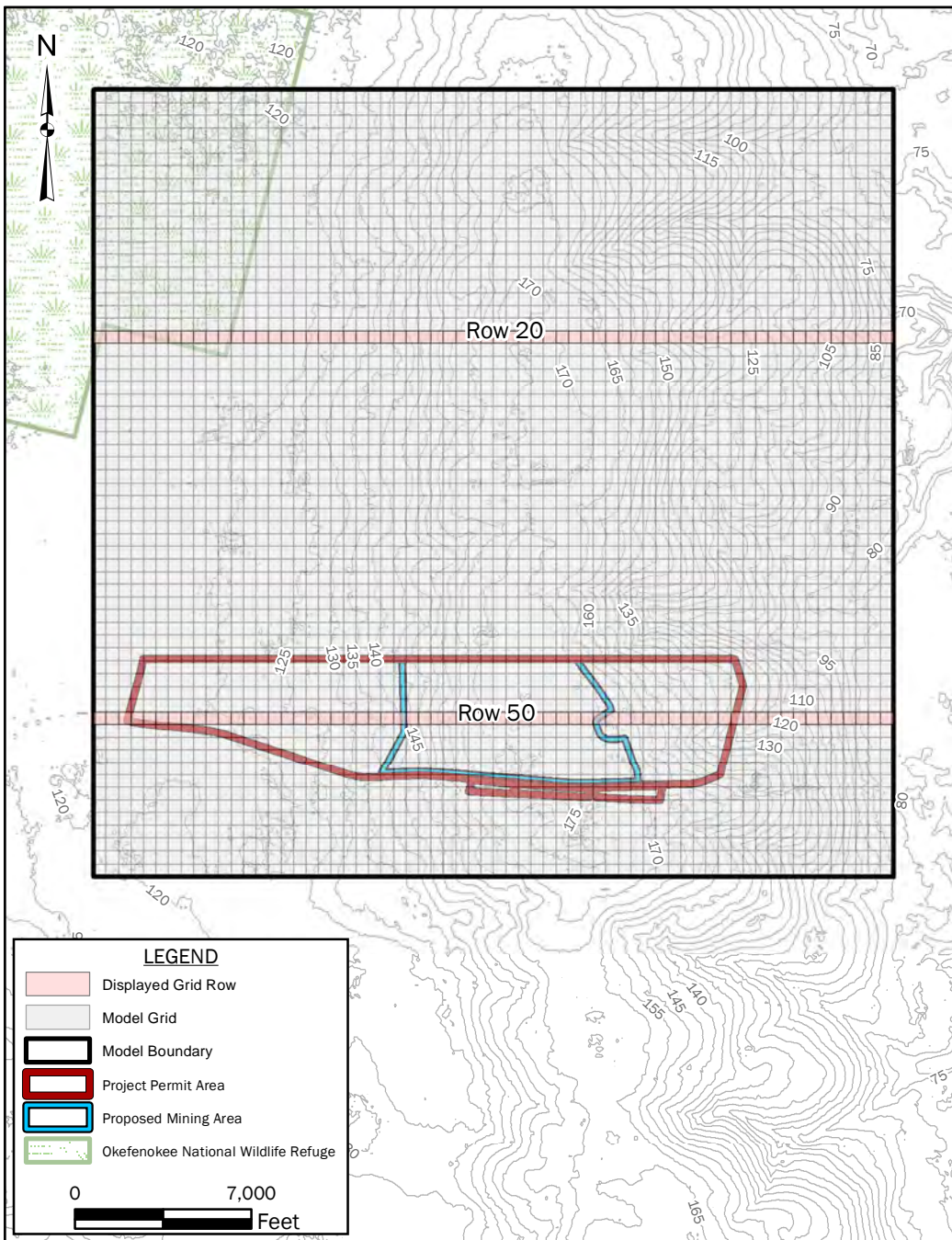
DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



**FIGURE 11: VERTICAL MODEL GRID NORTH TO SOUTH**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 7,000 ft








**FIGURE 12: VERTICAL MODEL GRID WEST TO EAST**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

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REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 7,000 ft





OKEFENOKEE  
NATIONAL  
WILDLIFE REFUGE

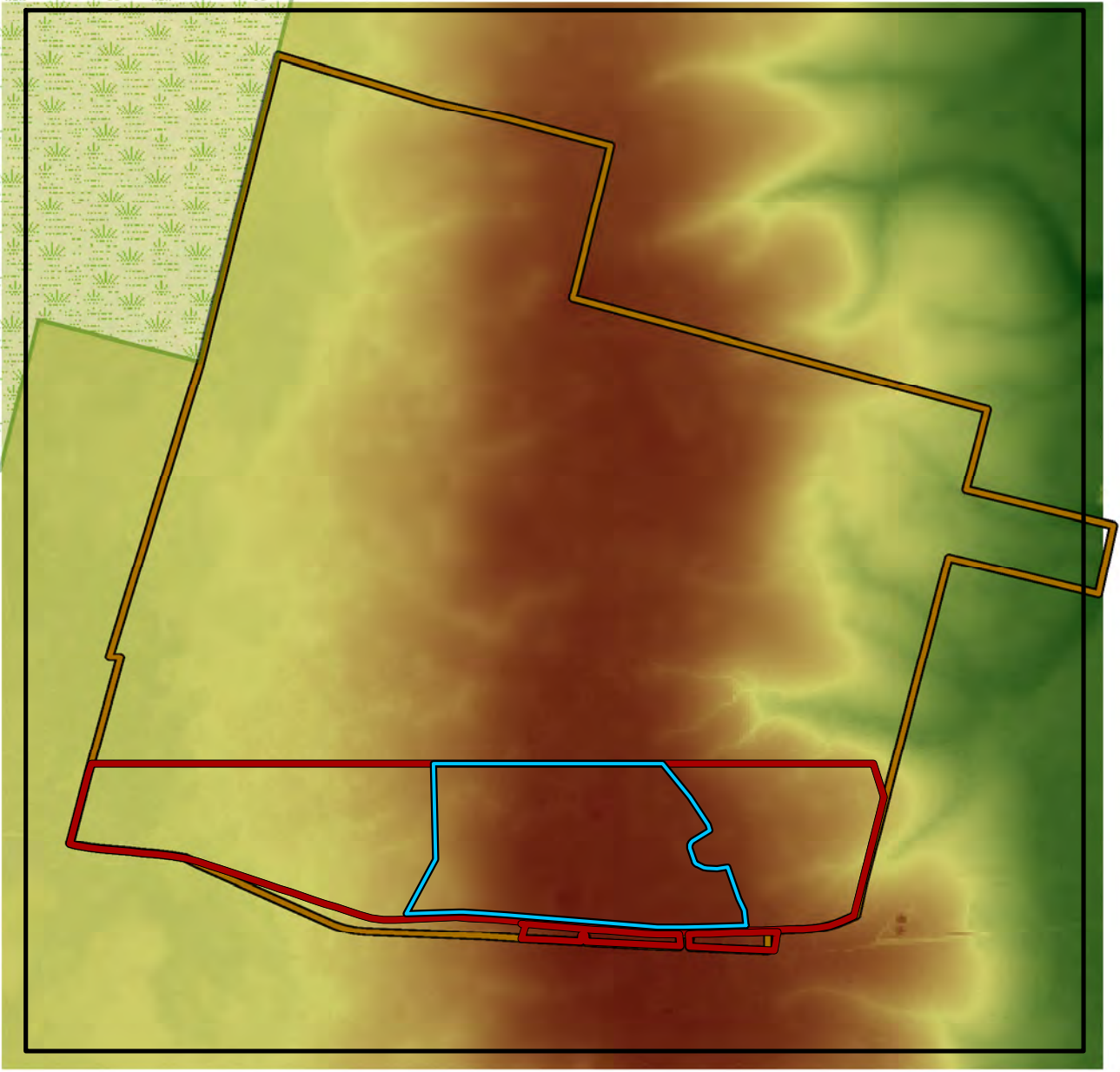
**LEGEND**

-  Model Boundary
-  Proposed Mining Area
-  Project Permit Area
-  Okefenokee National Wildlife Refuge
-  Project Study Area

Digital Elevation Model

-  180 ft AMSL
-  60 ft AMSL

0 5,000  
Feet








**FIGURE 13: SURFACE DIGITAL ELEVATION MODEL**  
TWIN PINES MINERALS  
ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft





OKEFENOKEE  
NATIONAL  
WILDLIFE REFUGE

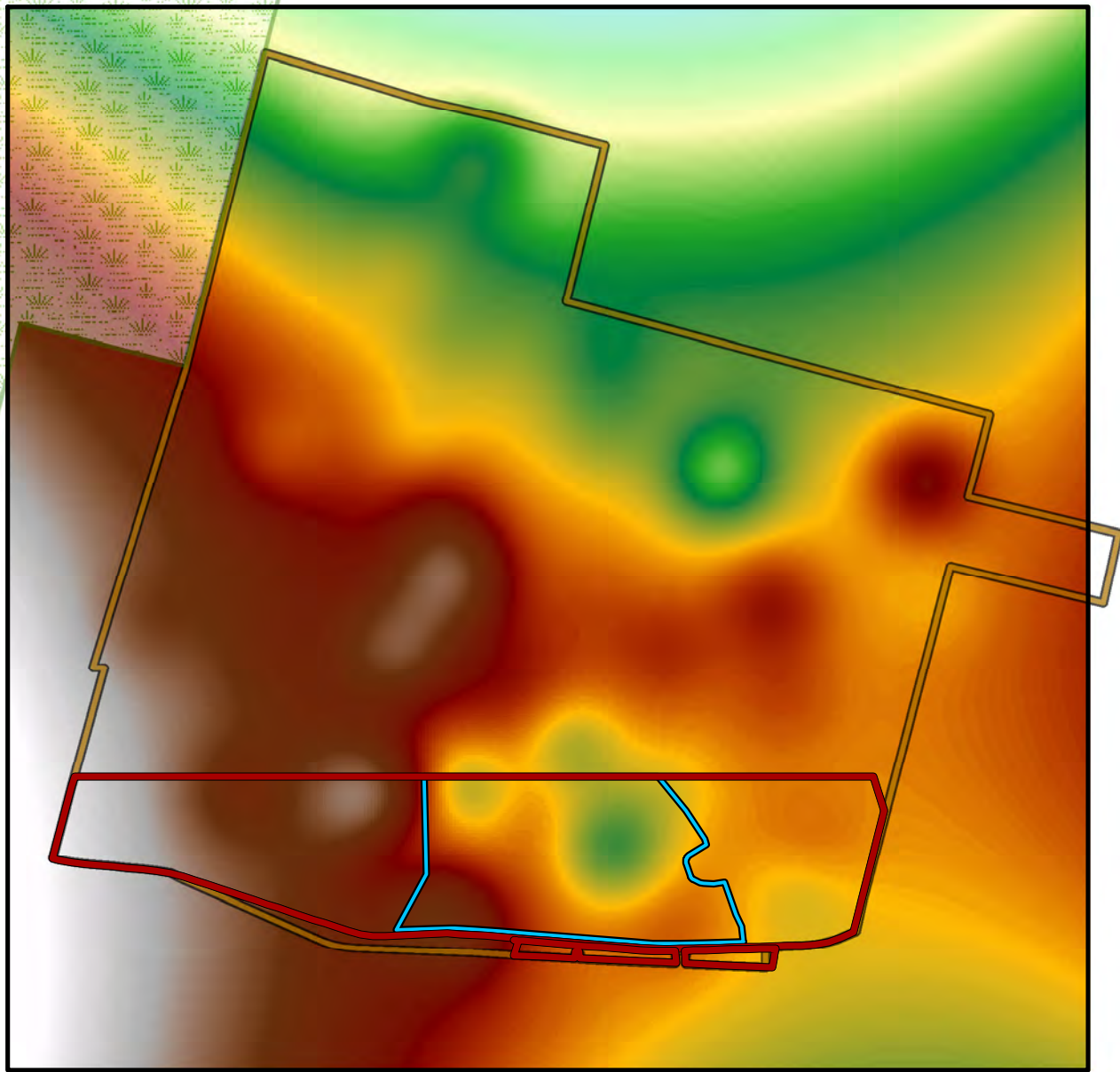
**LEGEND**

-  Model Boundary
-  Project Permit Area
-  Proposed Mining Area
-  Okefenokee National Wildlife Refuge
-  Project Study Area

Digital Elevation Model

-  - 100 ft AMSL
-  - 35 ft AMSL

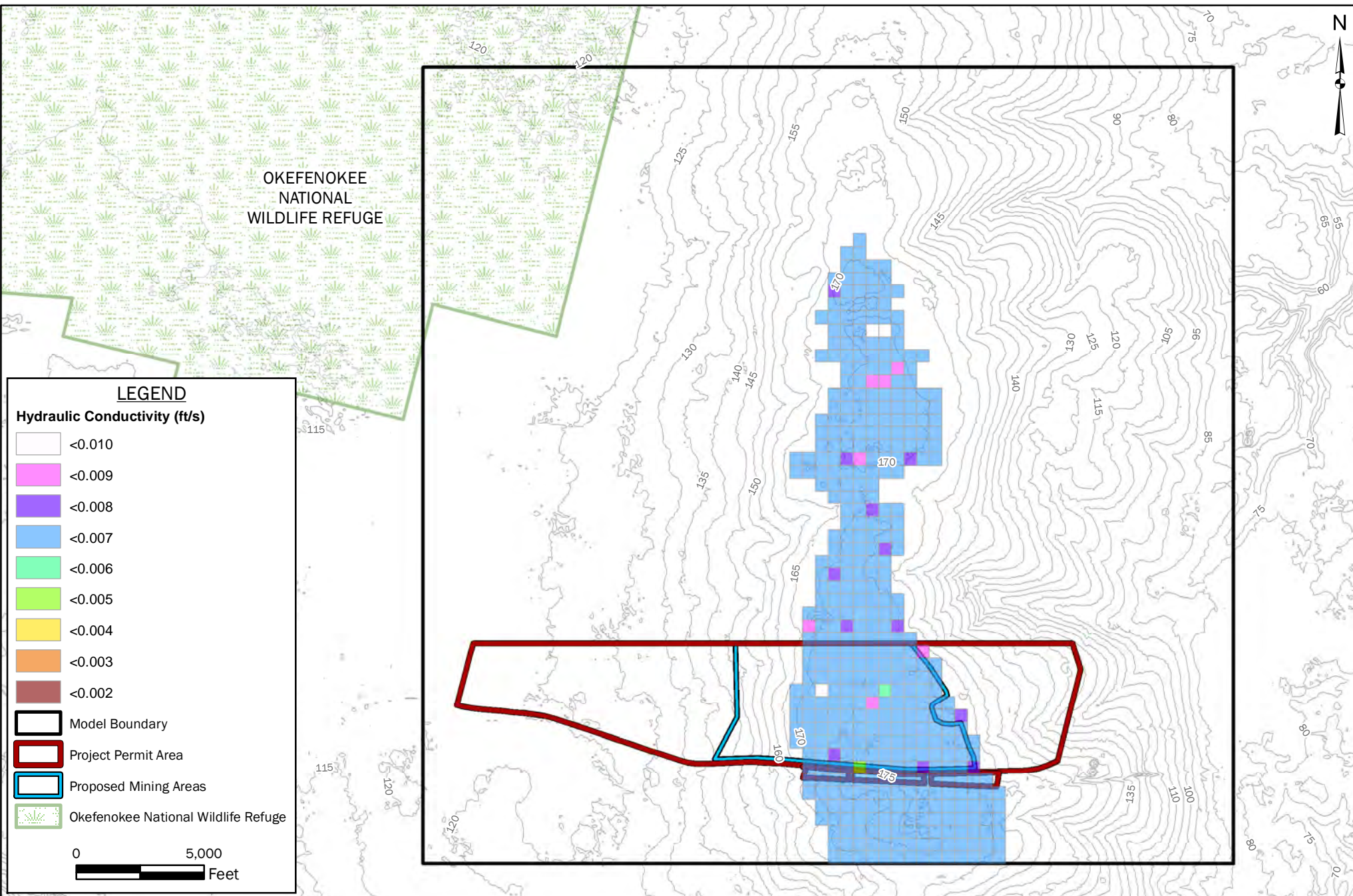
0 5,000  
Feet



**FIGURE 14: TOP OF HAWTHORN DIGITAL ELEVATION MODEL**  
TWIN PINES MINERALS  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



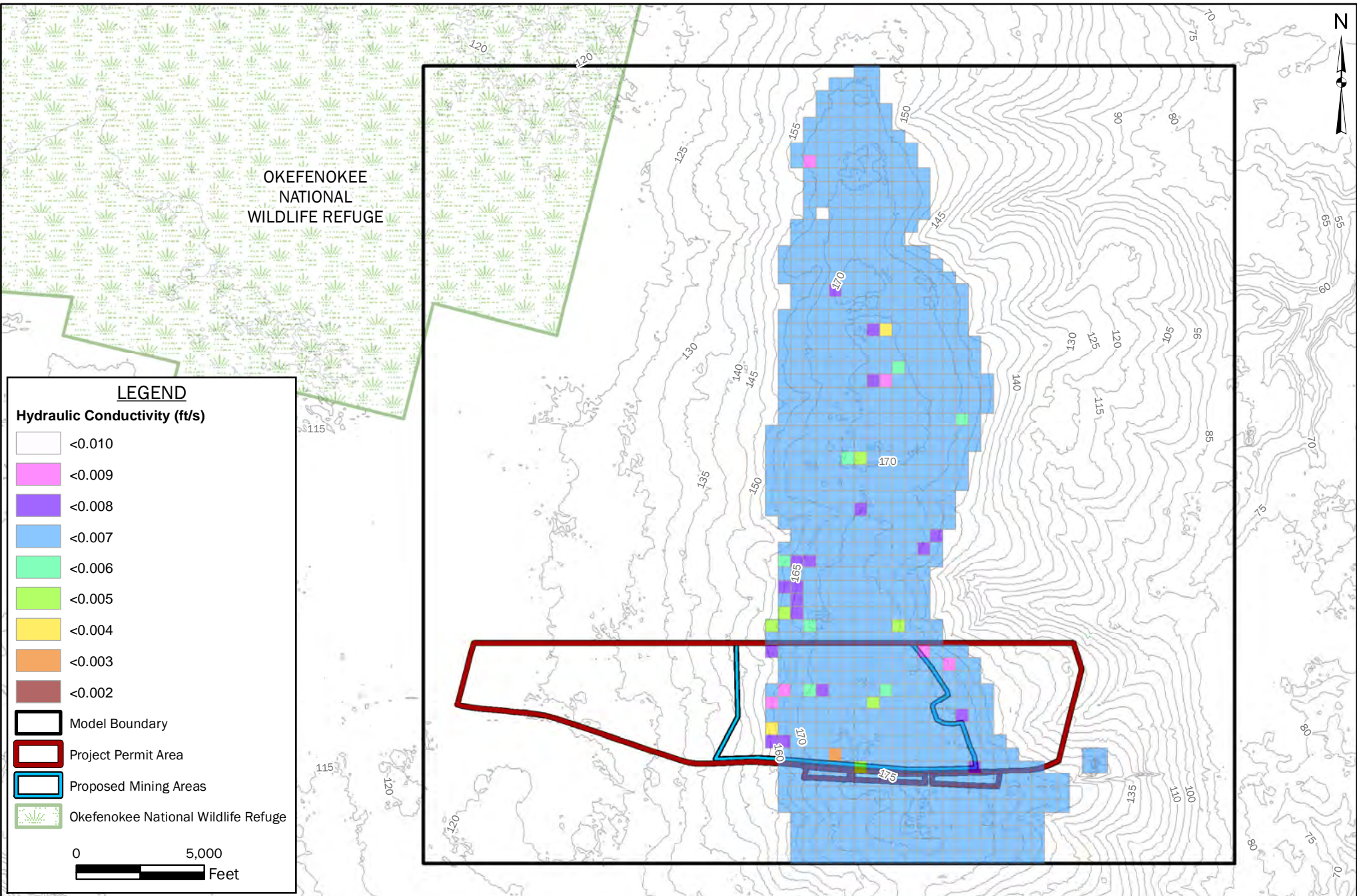
**FIGURE 15: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 1**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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APPROX. SCALE: 1 in = 5,000 ft



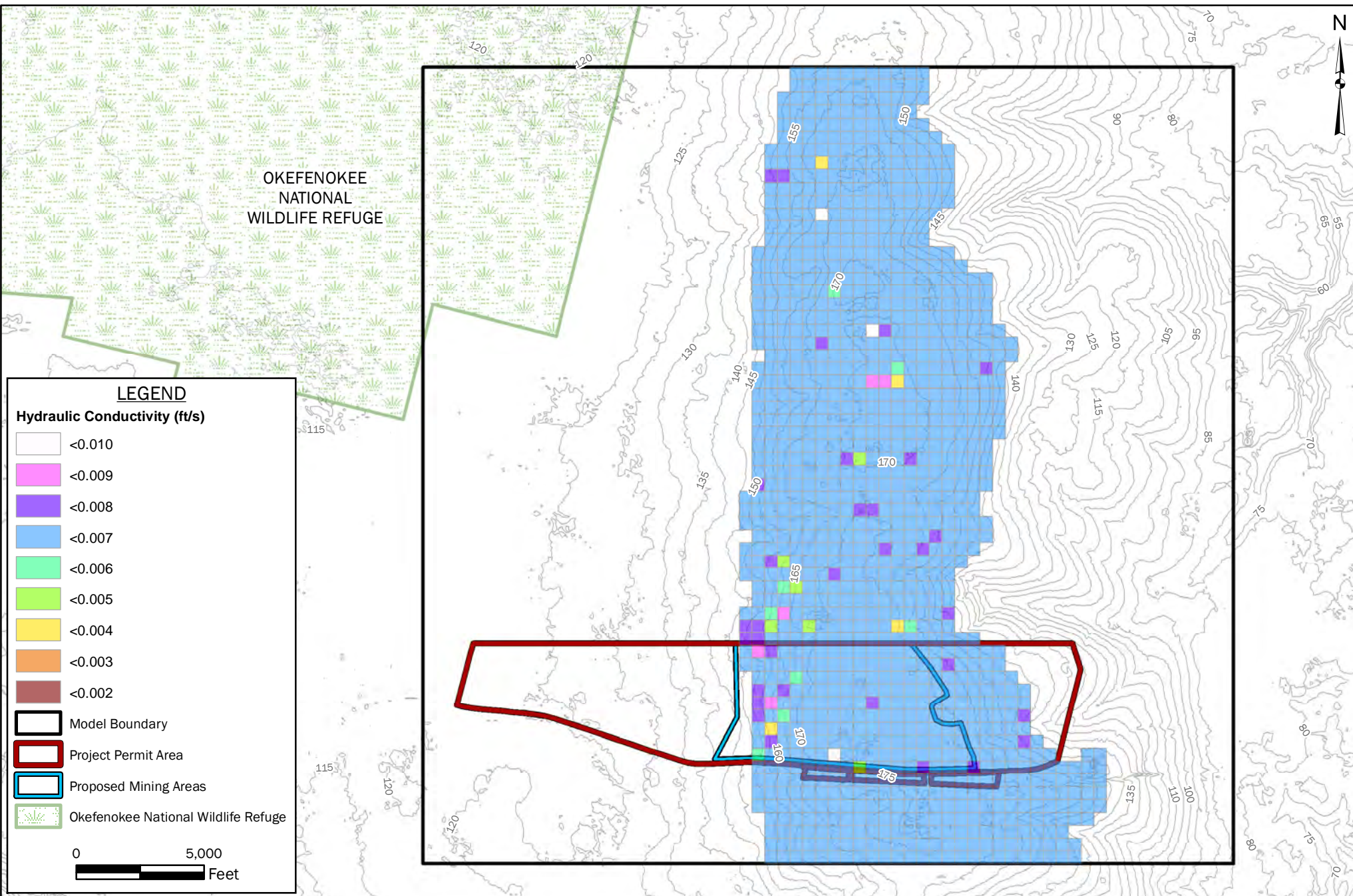


**FIGURE 16: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 2**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

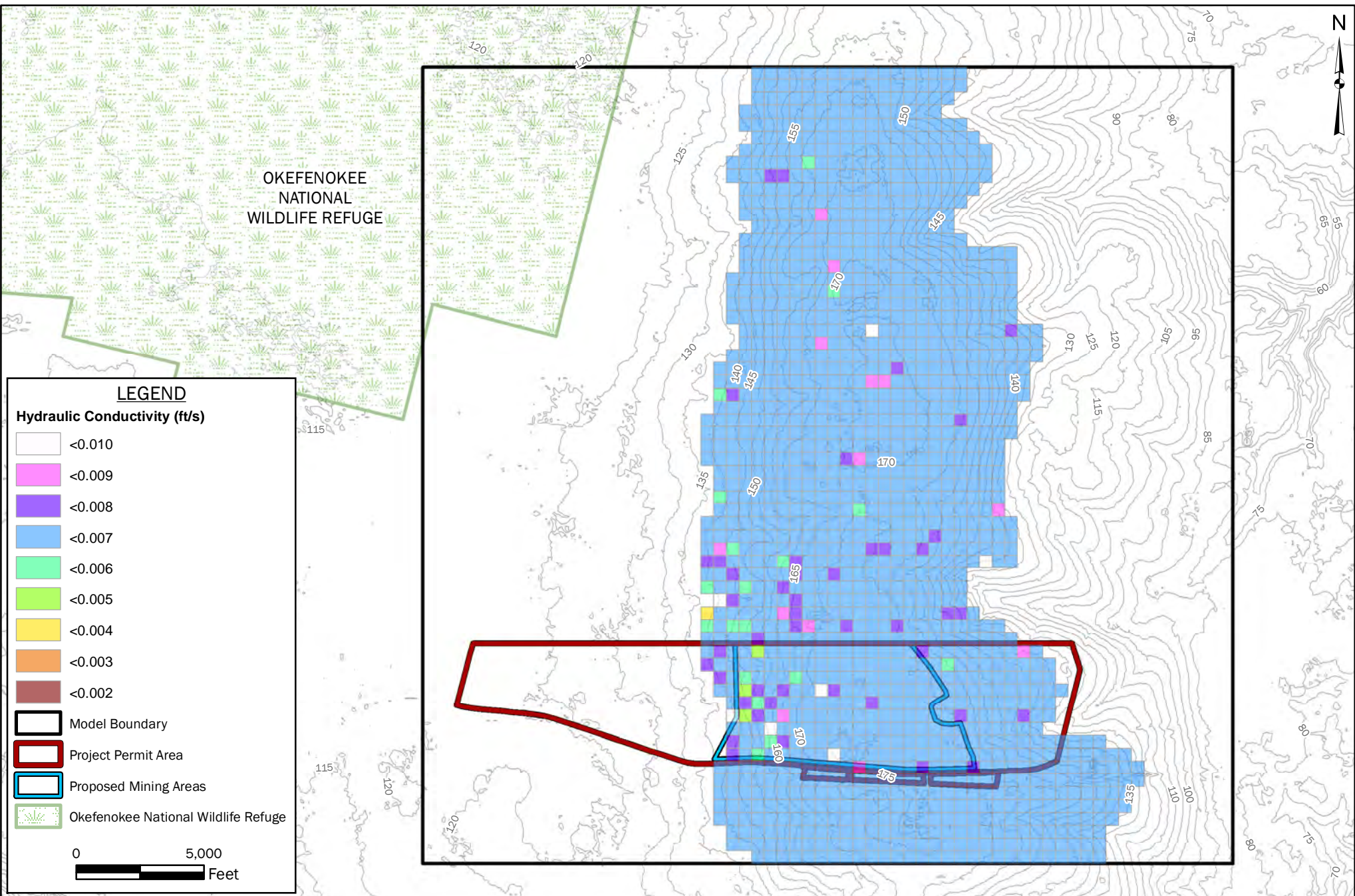


**FIGURE 17: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 3**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

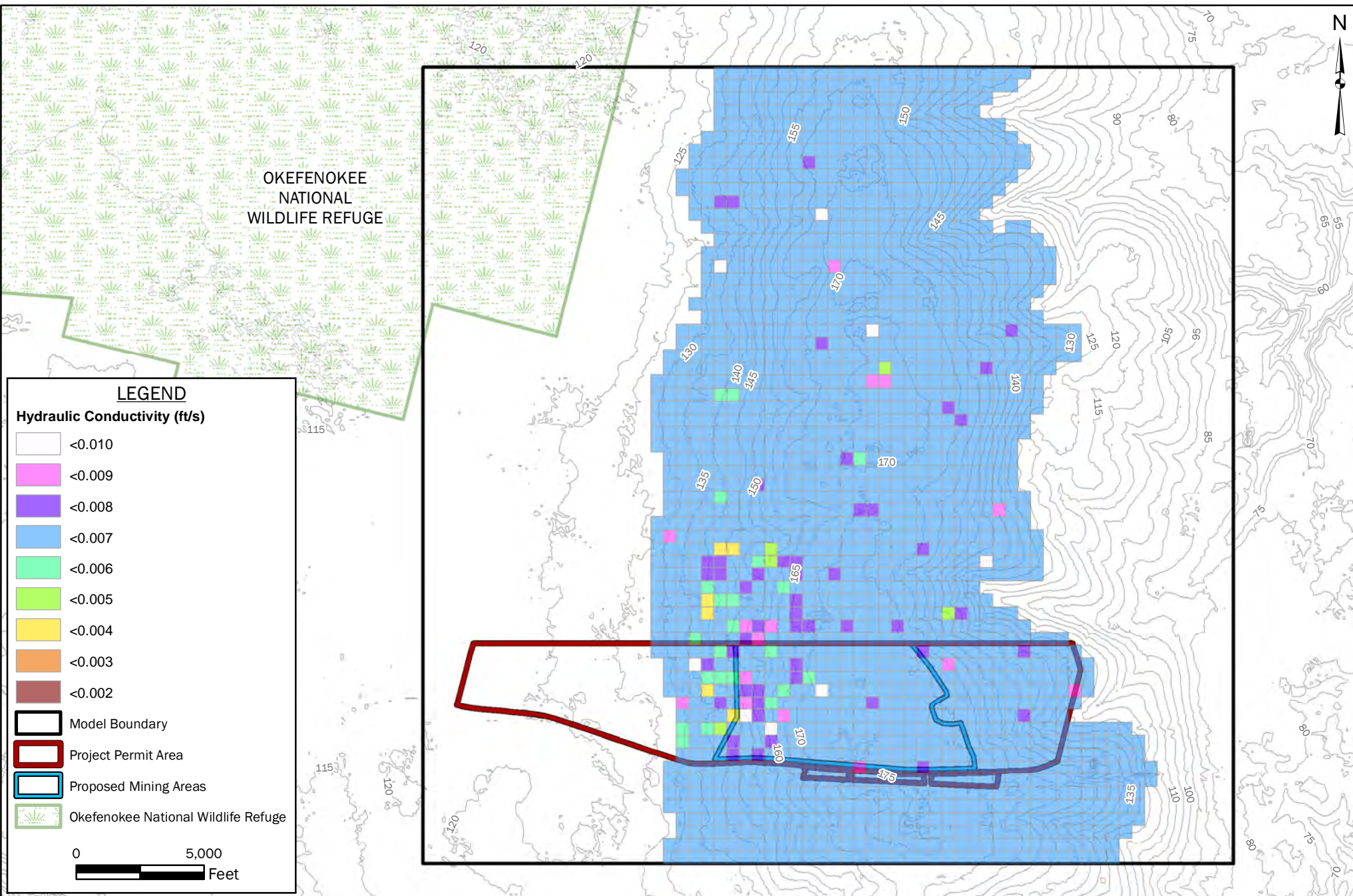


**FIGURE 18: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 4**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

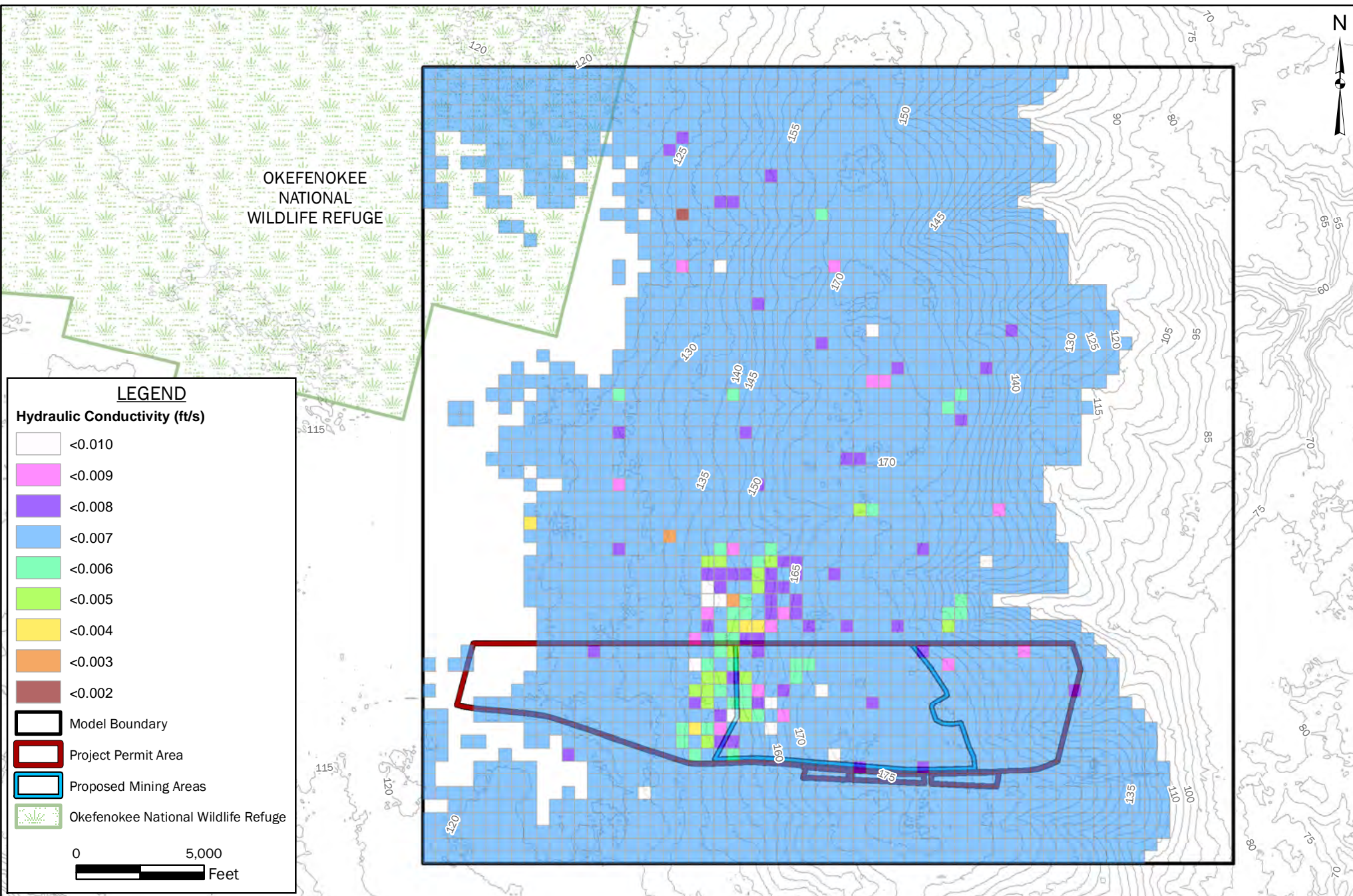


**FIGURE 19: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 5**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

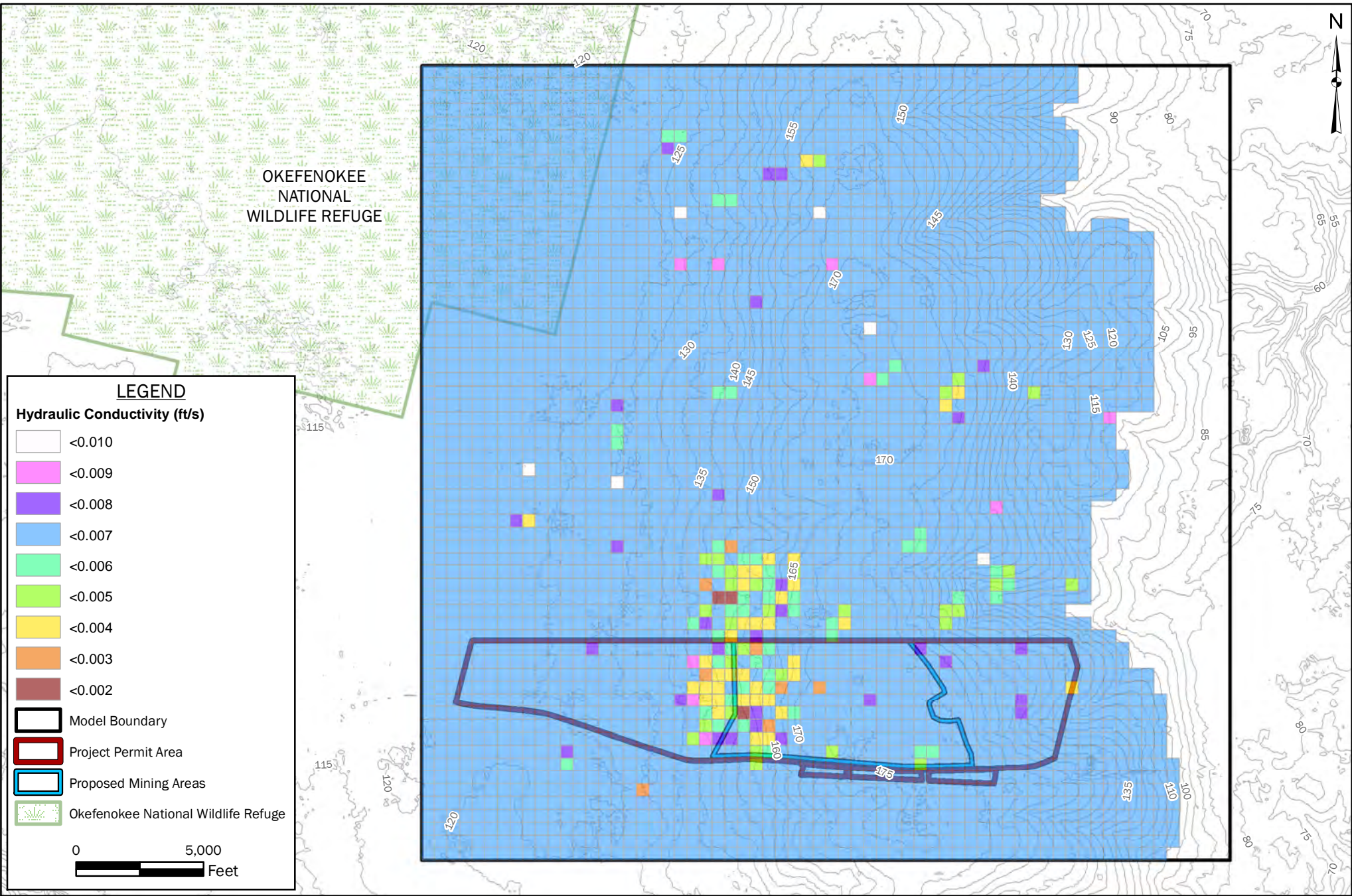


**FIGURE 20: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 6**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

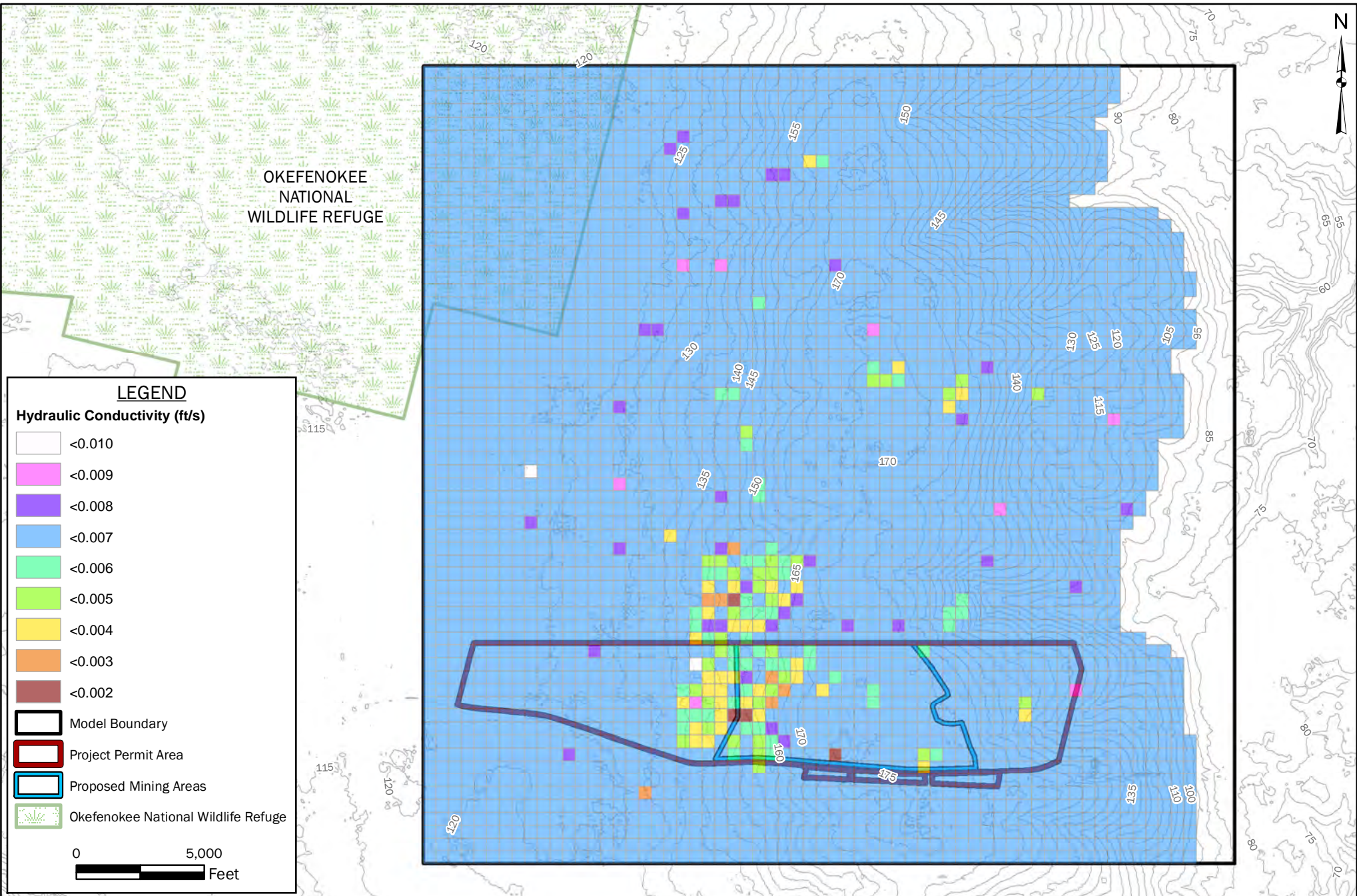


**FIGURE 21: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 7**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

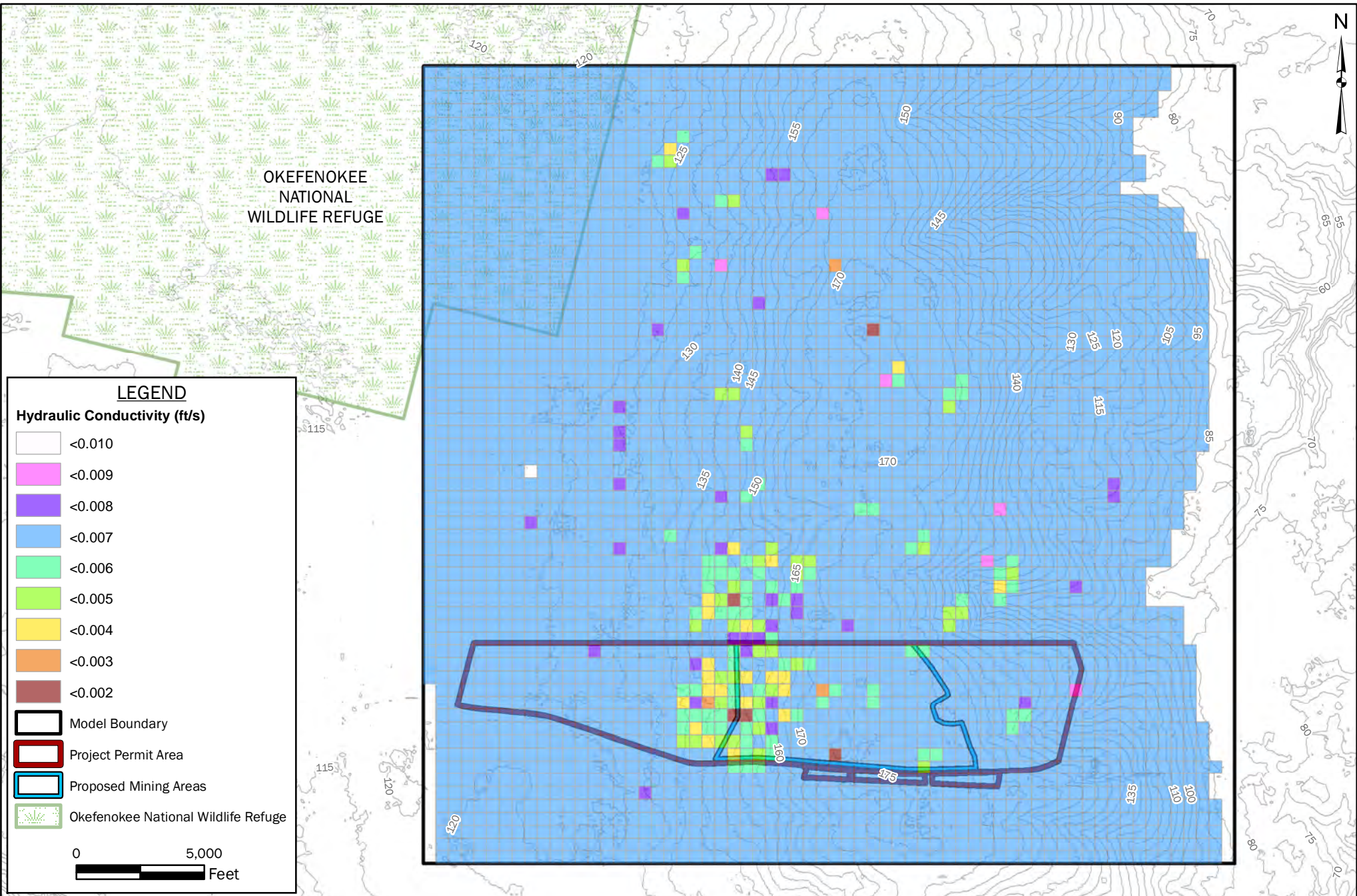


**FIGURE 22: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 8**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



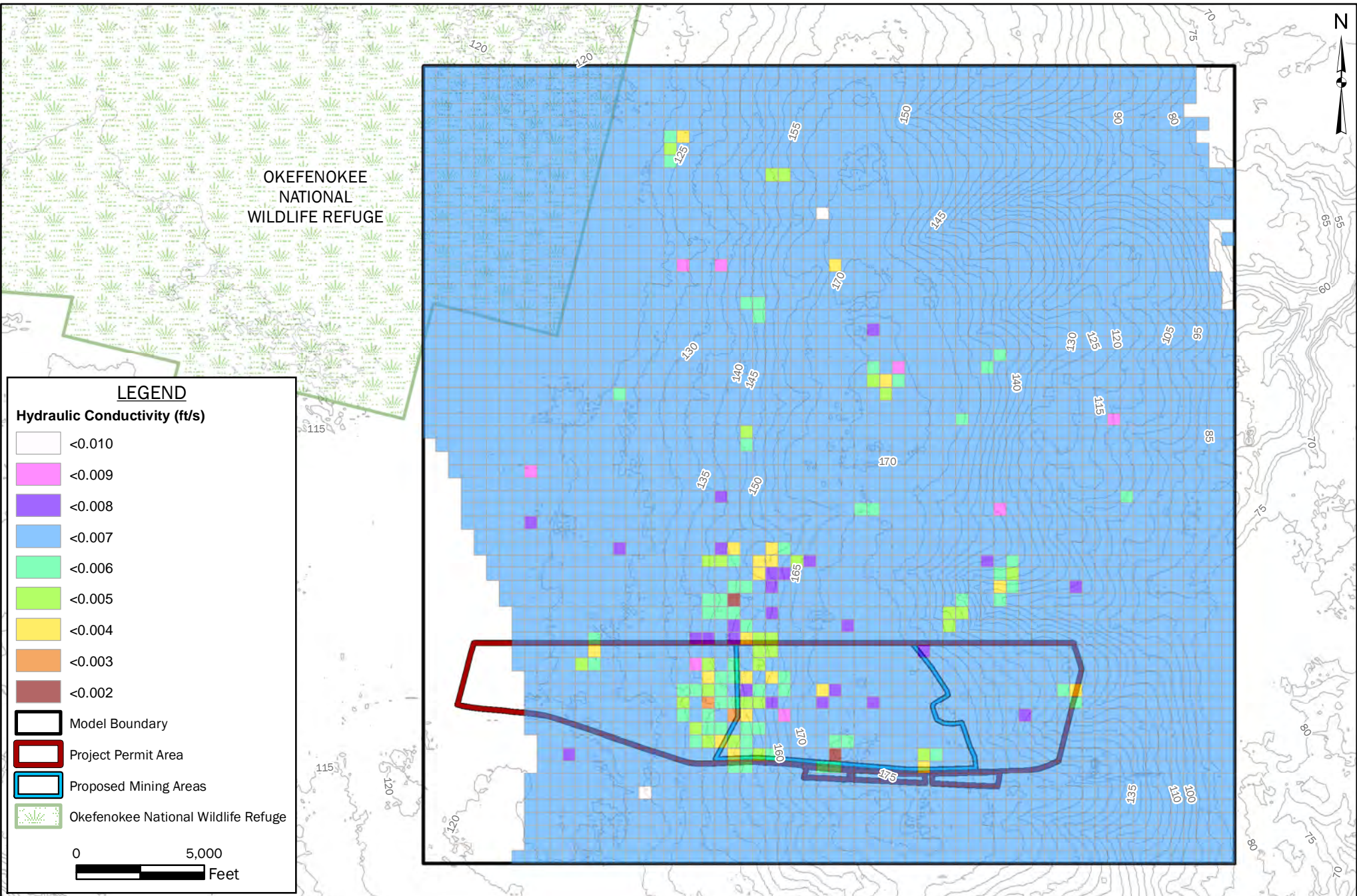
**FIGURE 23: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 9**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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APPROX. SCALE: 1 in = 5,000 ft



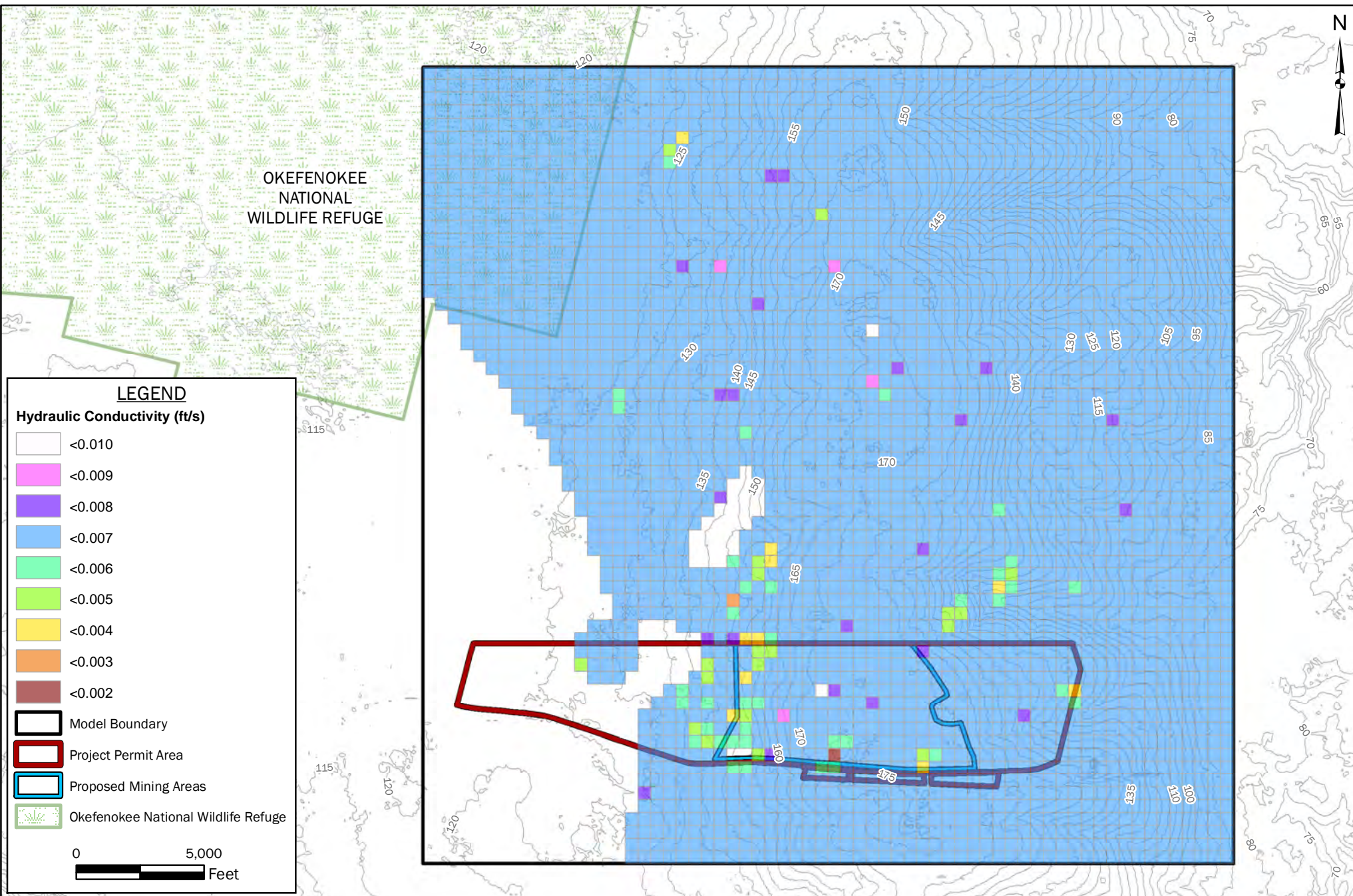


**FIGURE 24: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 10**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

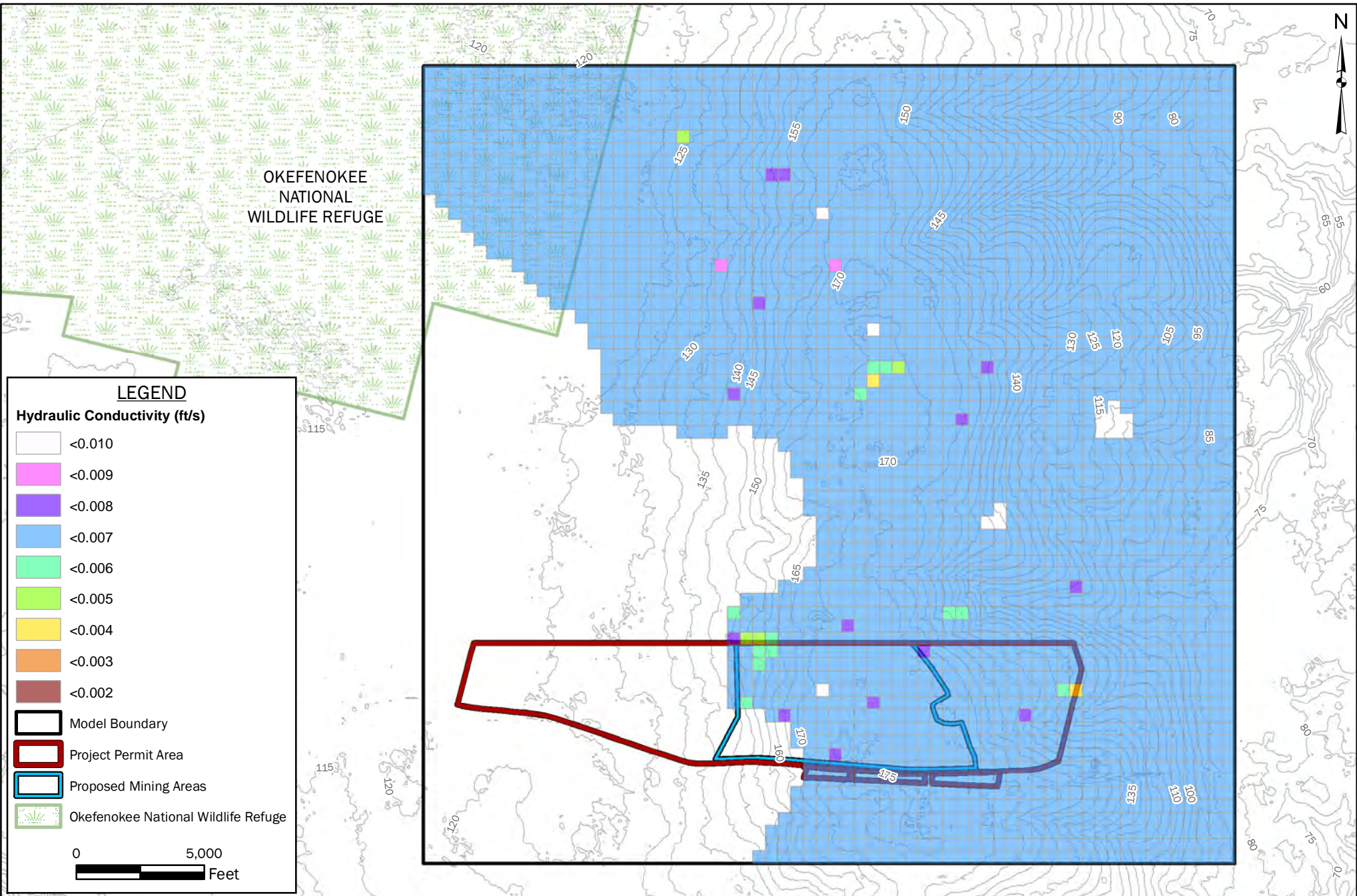


**FIGURE 25: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 11**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

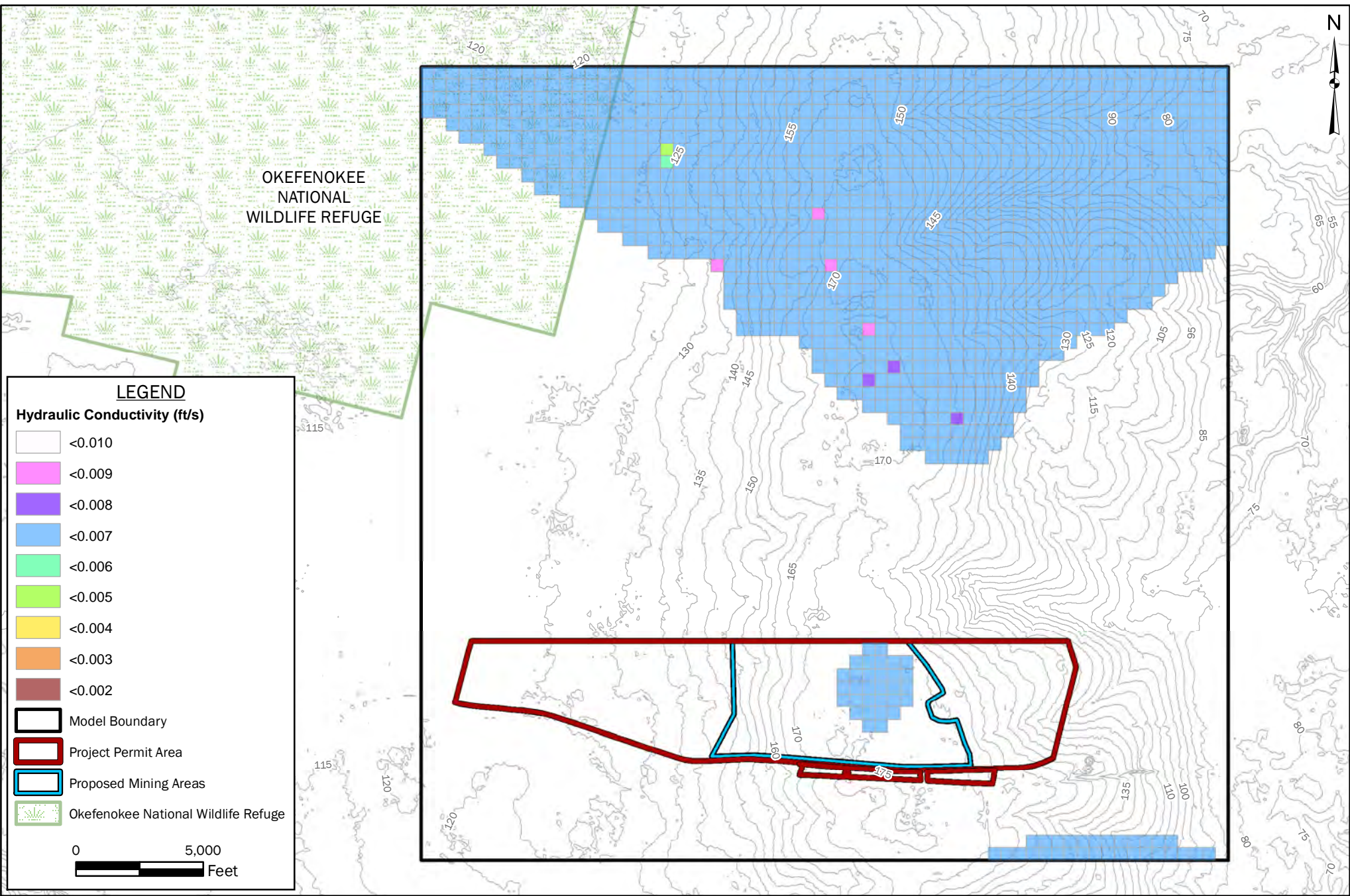


**FIGURE 26: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 12**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

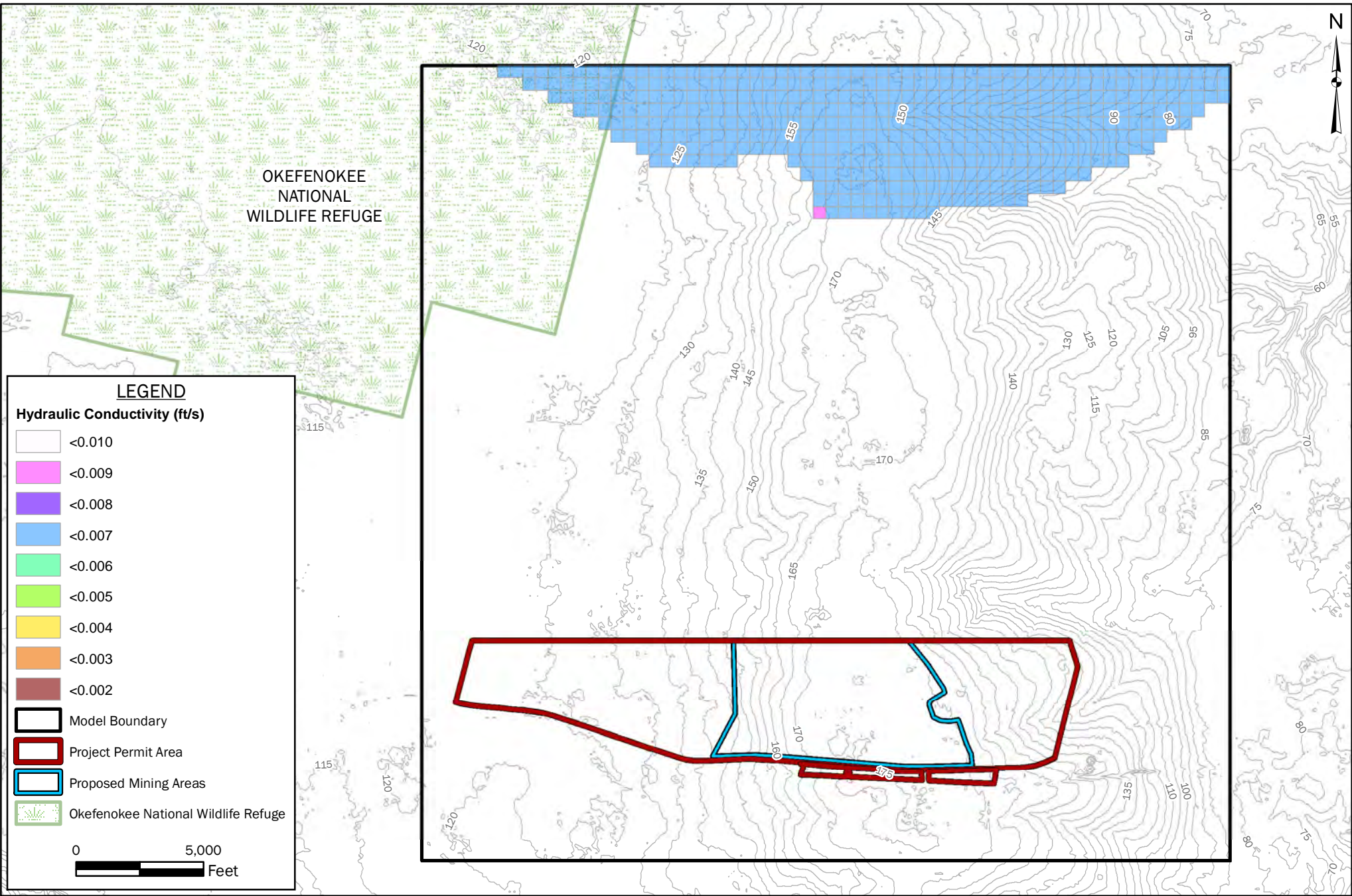


**FIGURE 27: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 13**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

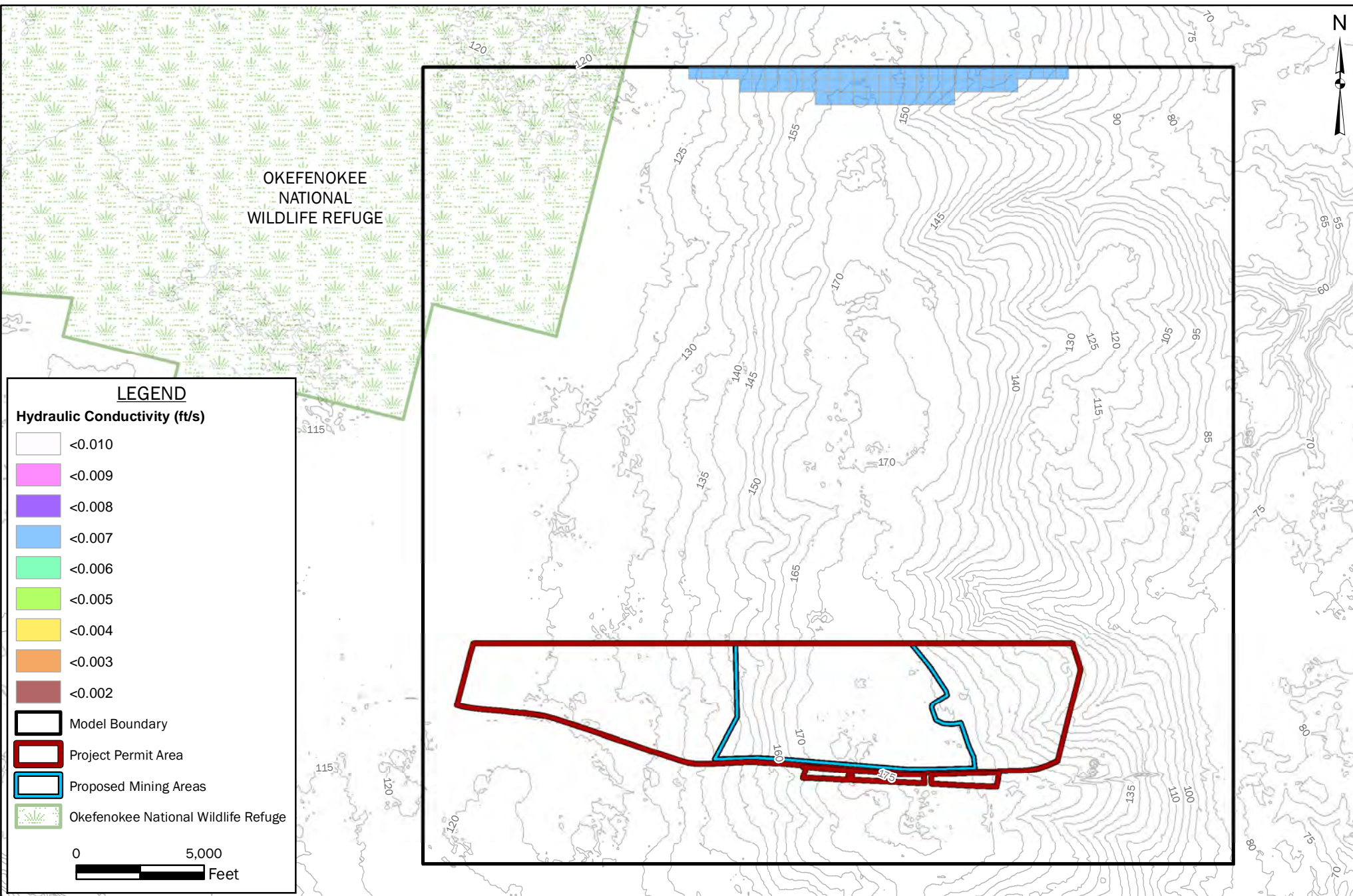


**FIGURE 28: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 14**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



OKEFENOKEE  
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WILDLIFE REFUGE

**LEGEND**

**Hydraulic Conductivity (ft/s)**

- <math><0.010</math>
- <math><0.009</math>
- <math><0.008</math>
- <math><0.007</math>
- <math><0.006</math>
- <math><0.005</math>
- <math><0.004</math>
- <math><0.003</math>
- <math><0.002</math>

Model Boundary

Project Permit Area

Proposed Mining Areas

Okefenokee National Wildlife Refuge

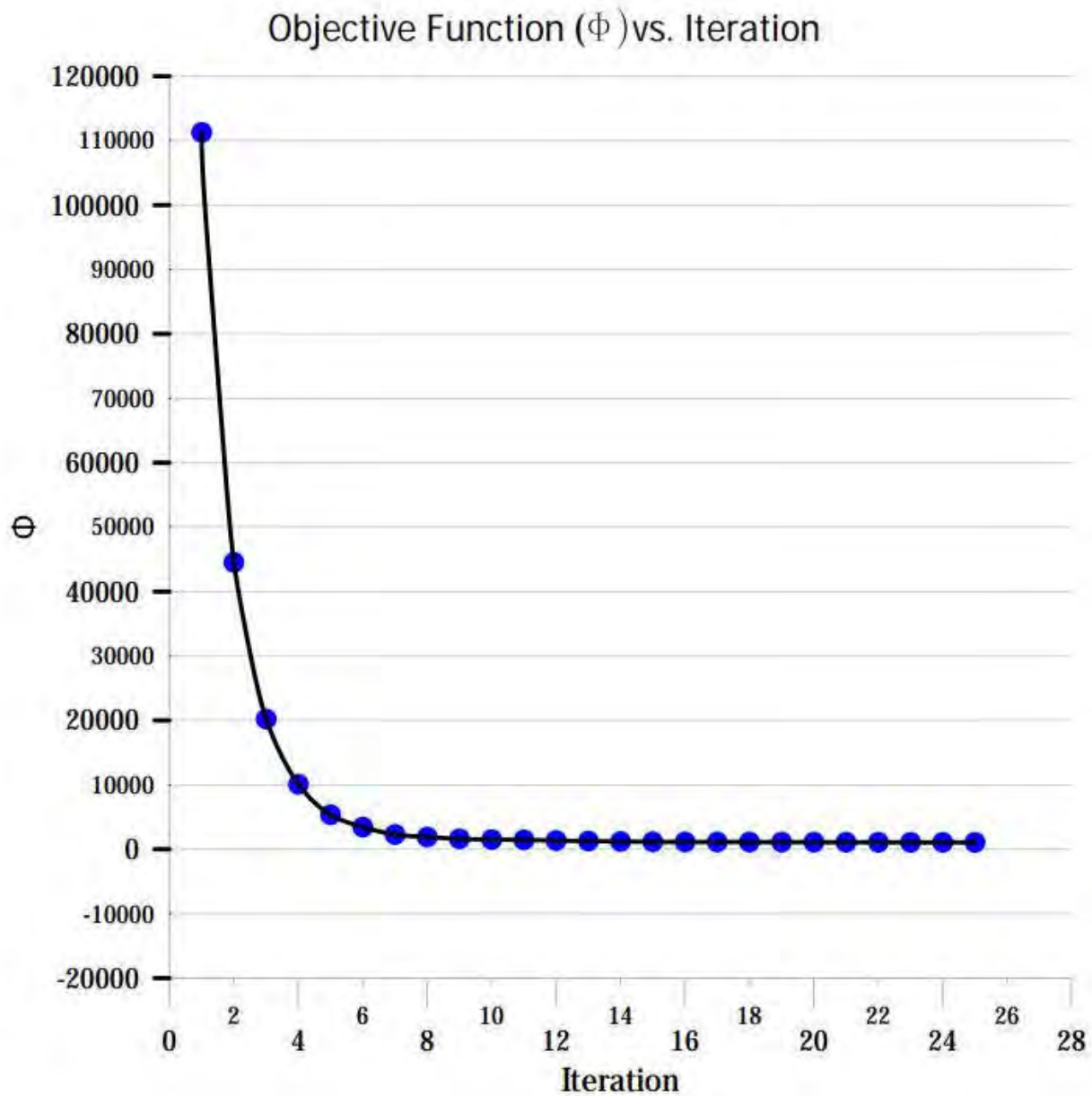


**FIGURE 29: INITIAL MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 15**

**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

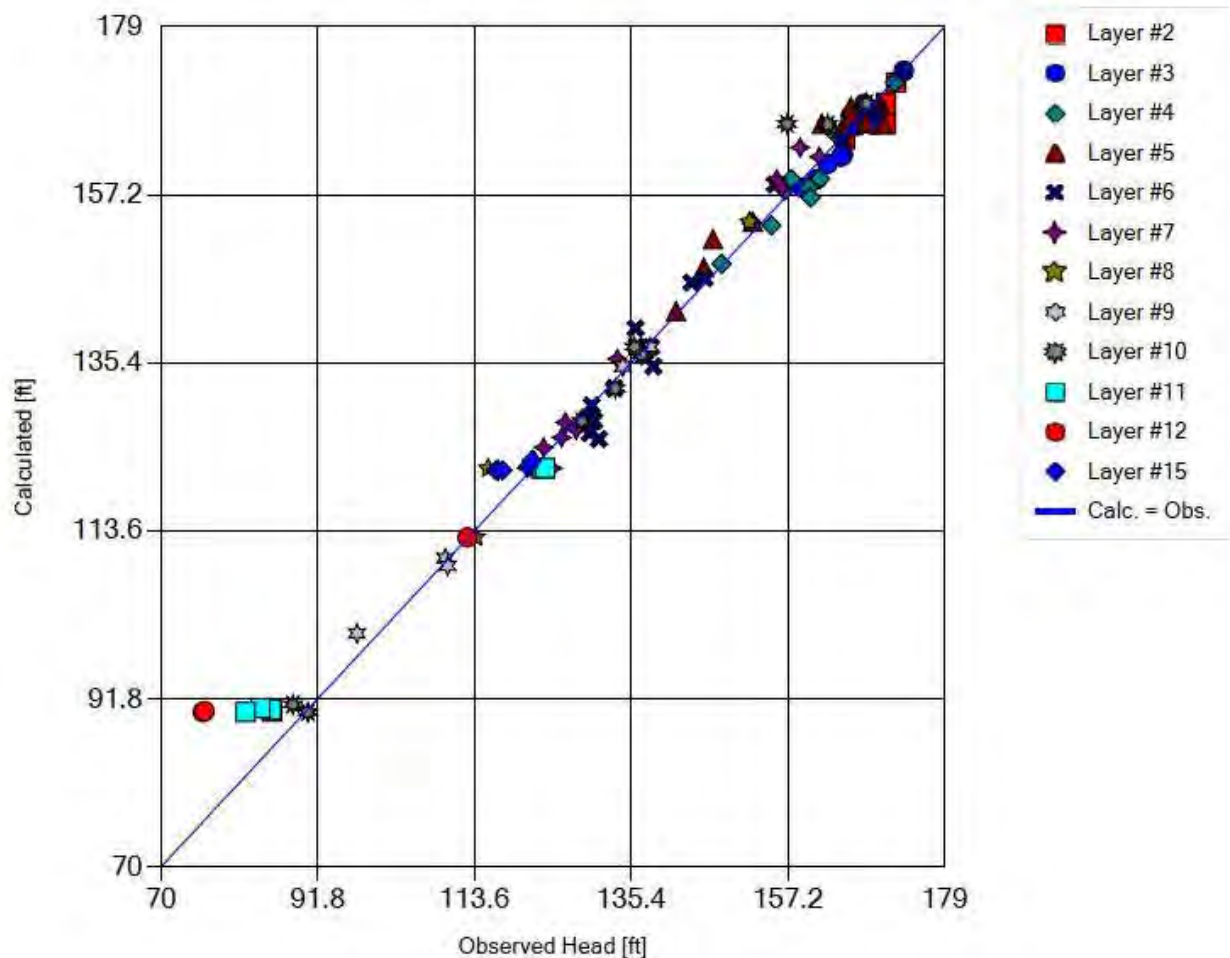


**FIGURE 30: OBJECTIVE FUNCTION V. ITERATION**

TWIN PINES MINERALS  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

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CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE:

Calculated vs. Observed Heads: Time = All



Min. Residual: -0.0051 (ft) at PZ06/PZ06 Time=0  
 Max. Residual: 14.27 (ft) at L7/L7 Time=0  
 Residual Mean: 0.76 (ft)  
 Abs. Residual Mean: 2.16 (ft)

Standard Error of the Estimate: 0.3 (ft)  
 Root Mean Squared: 3.23 (ft)  
 Normalized RMS: 3.31 (%)  
 Correlation Coefficient: 0.99

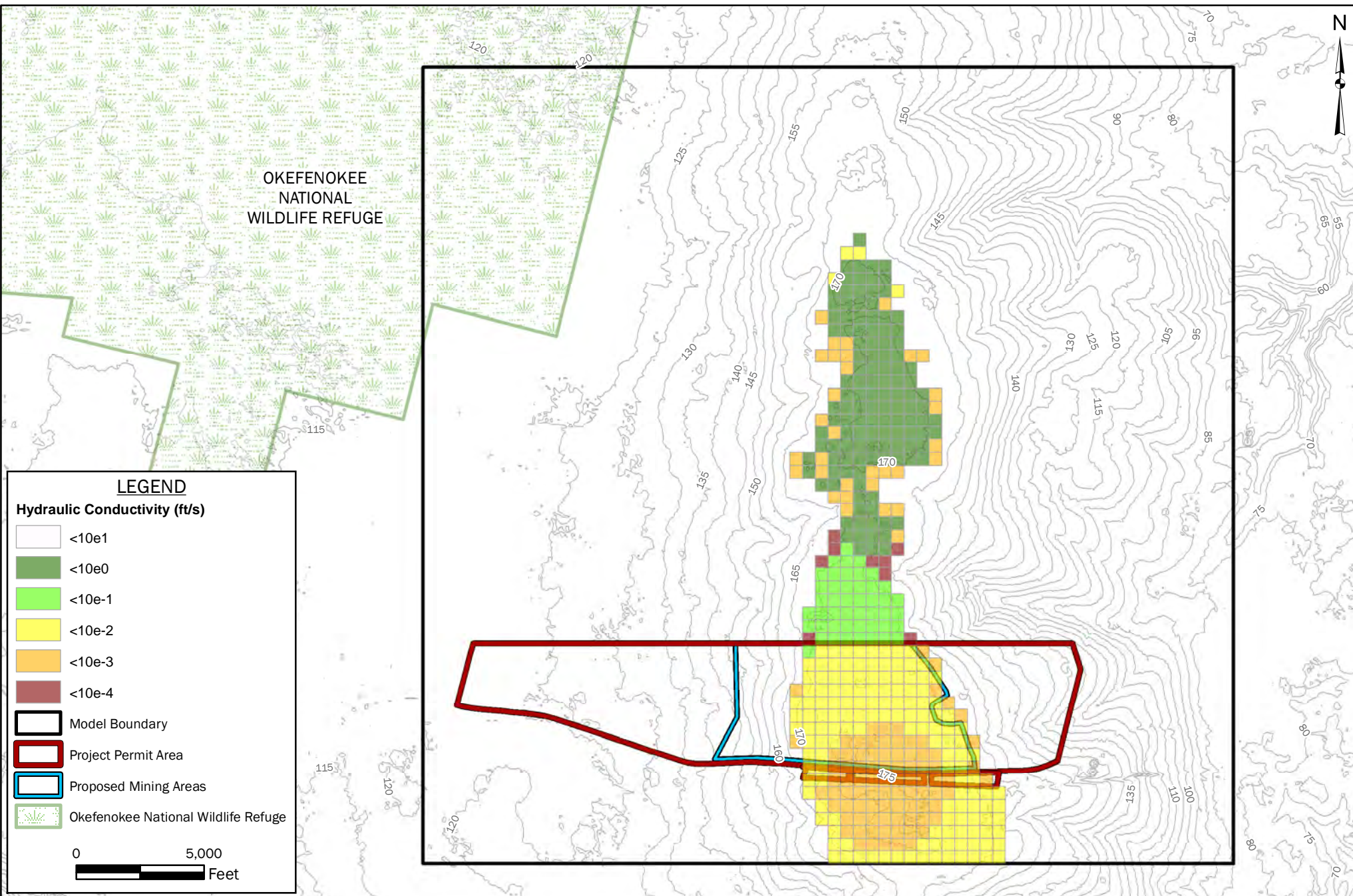
**FIGURE 31: CALCULATED V. OBSERVED HEADS - CALIBRATED**

TWIN PINES MINERALS  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE:



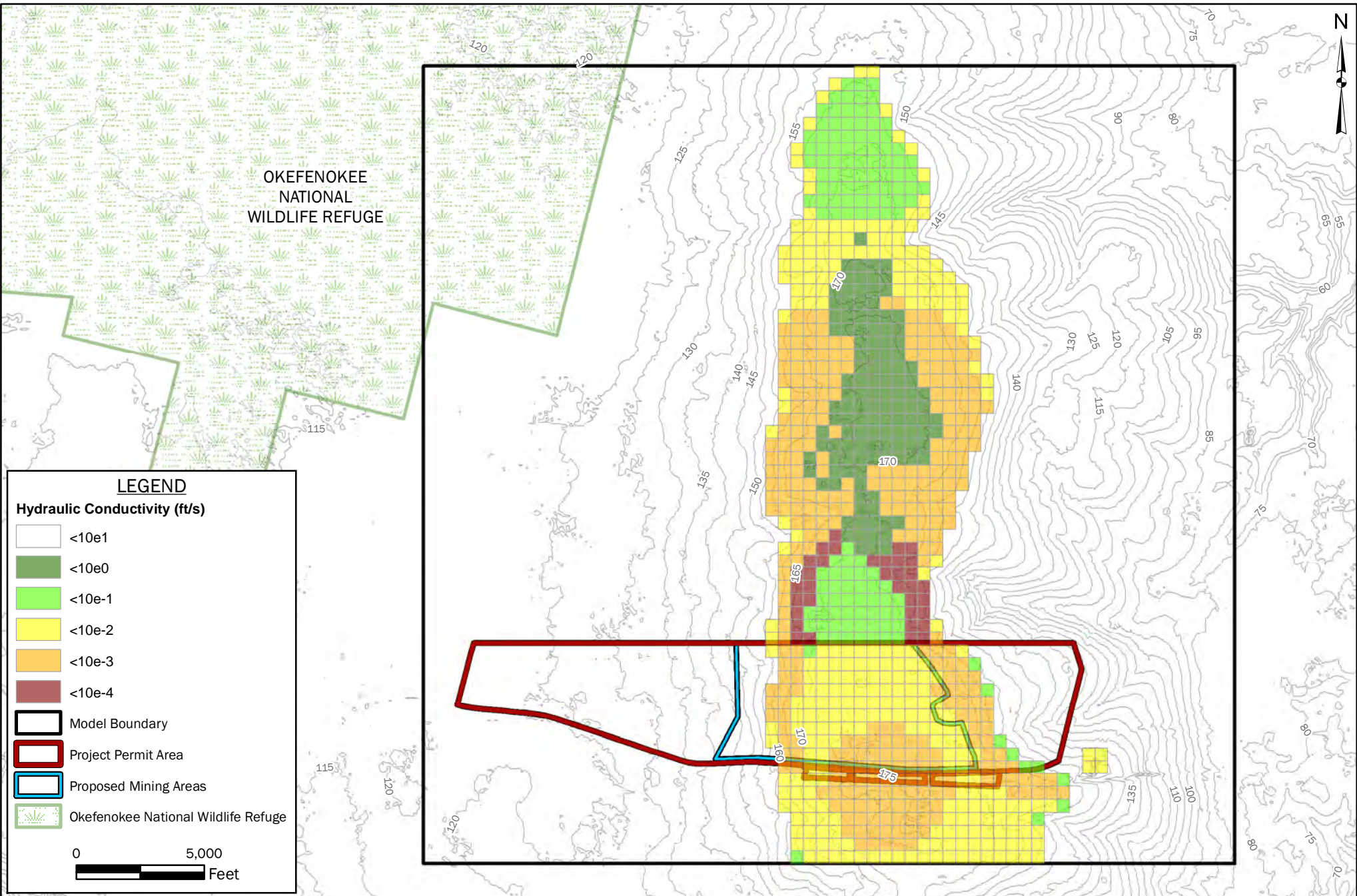


**FIGURE 32: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 1**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

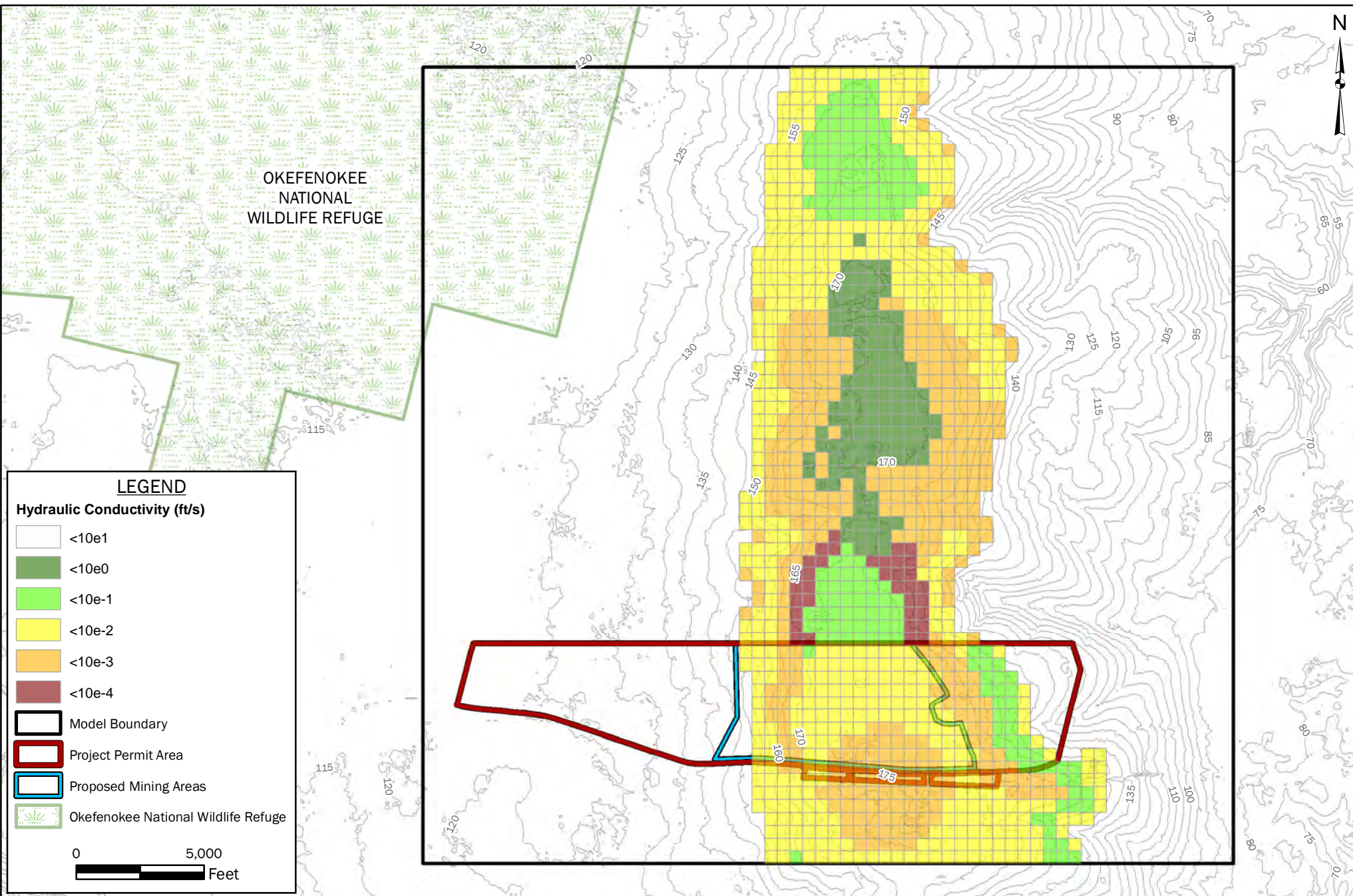


**FIGURE 33: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 2**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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CHECKED BY: RMH
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REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

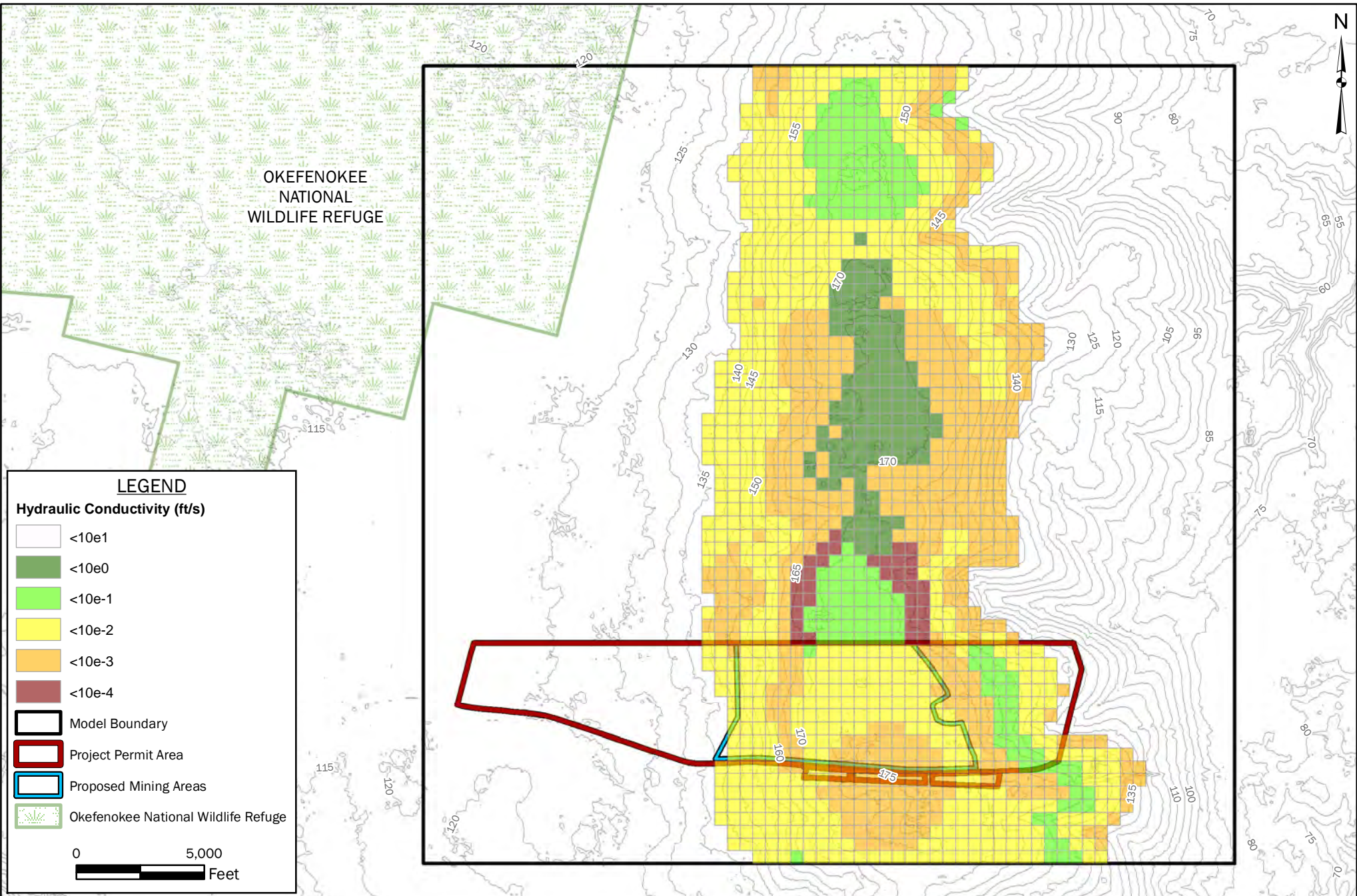


**FIGURE 34: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 3**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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APPROX. SCALE: 1 in = 5,000 ft

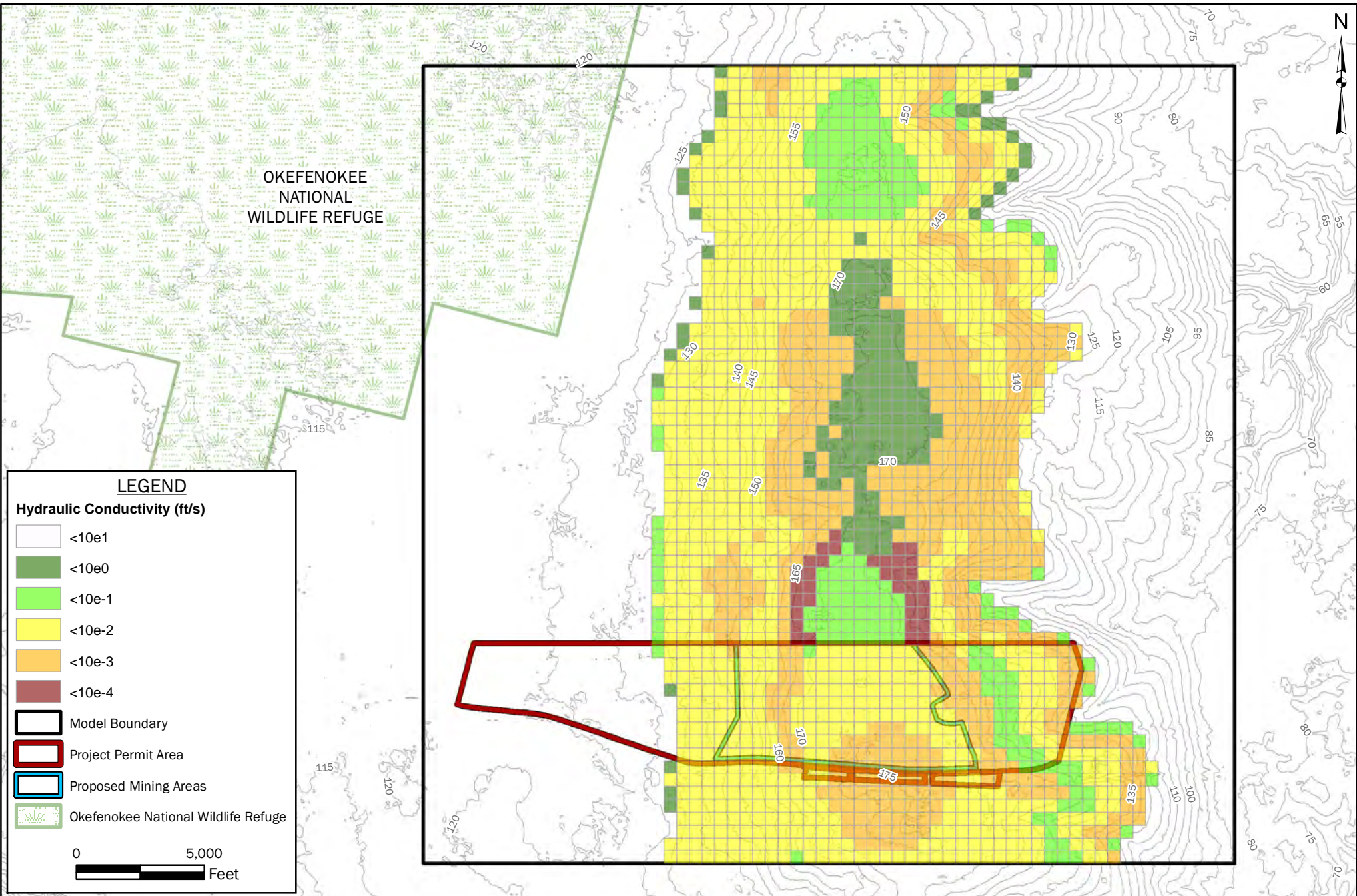


**FIGURE 35: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 4**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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APPROX. SCALE: 1 in = 5,000 ft

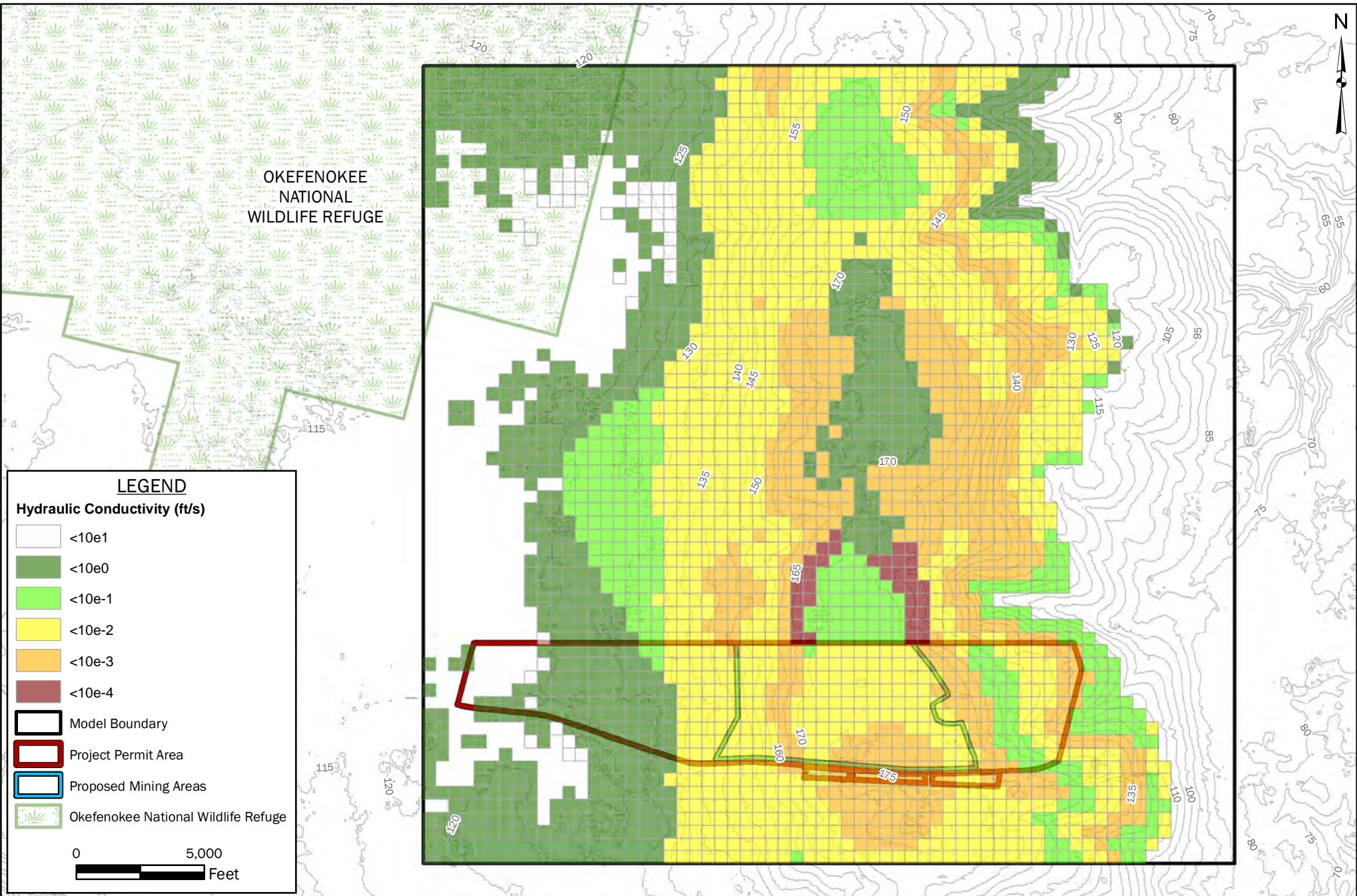


**FIGURE 36: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 5**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

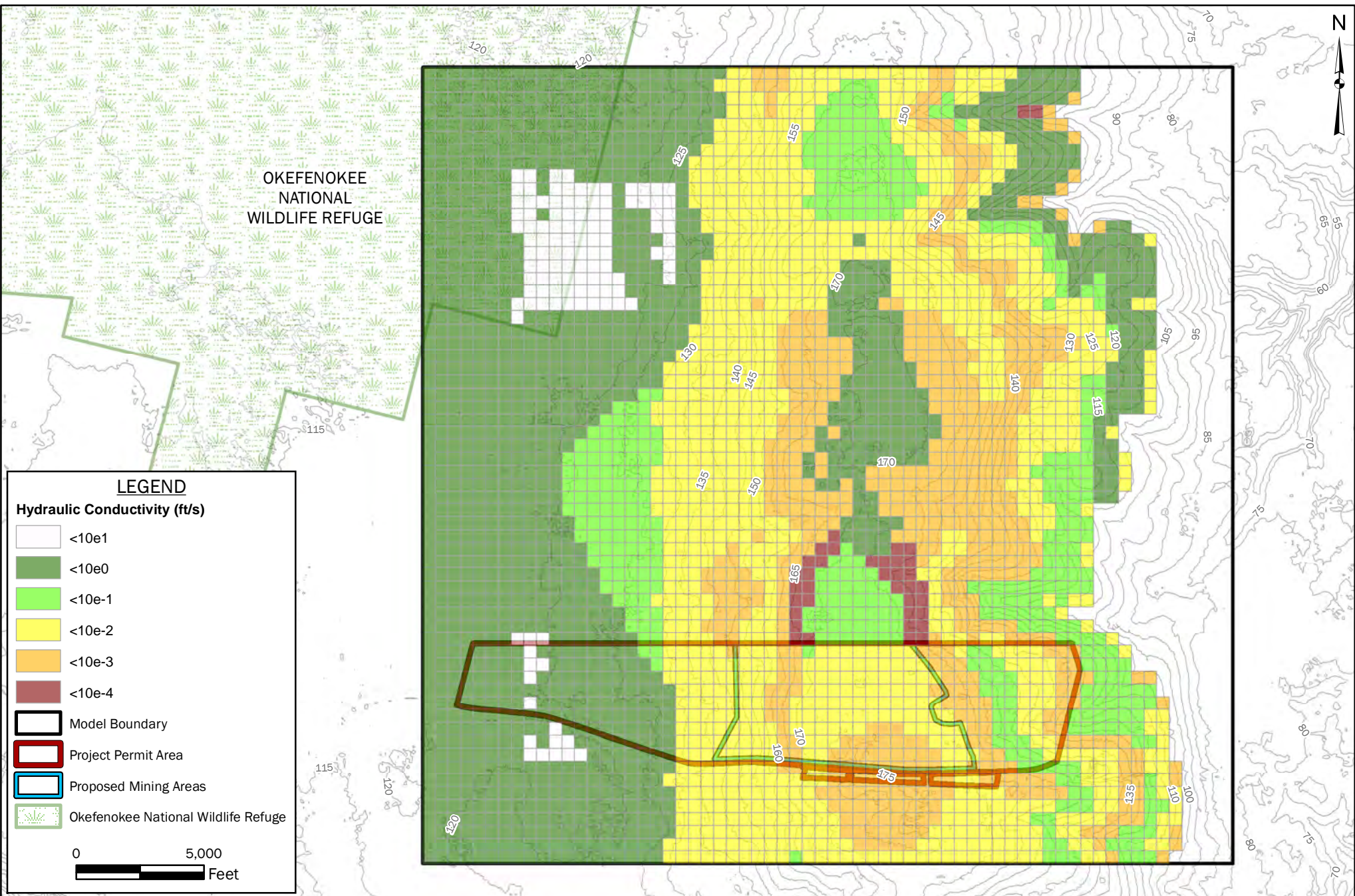


**FIGURE 37: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 6**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

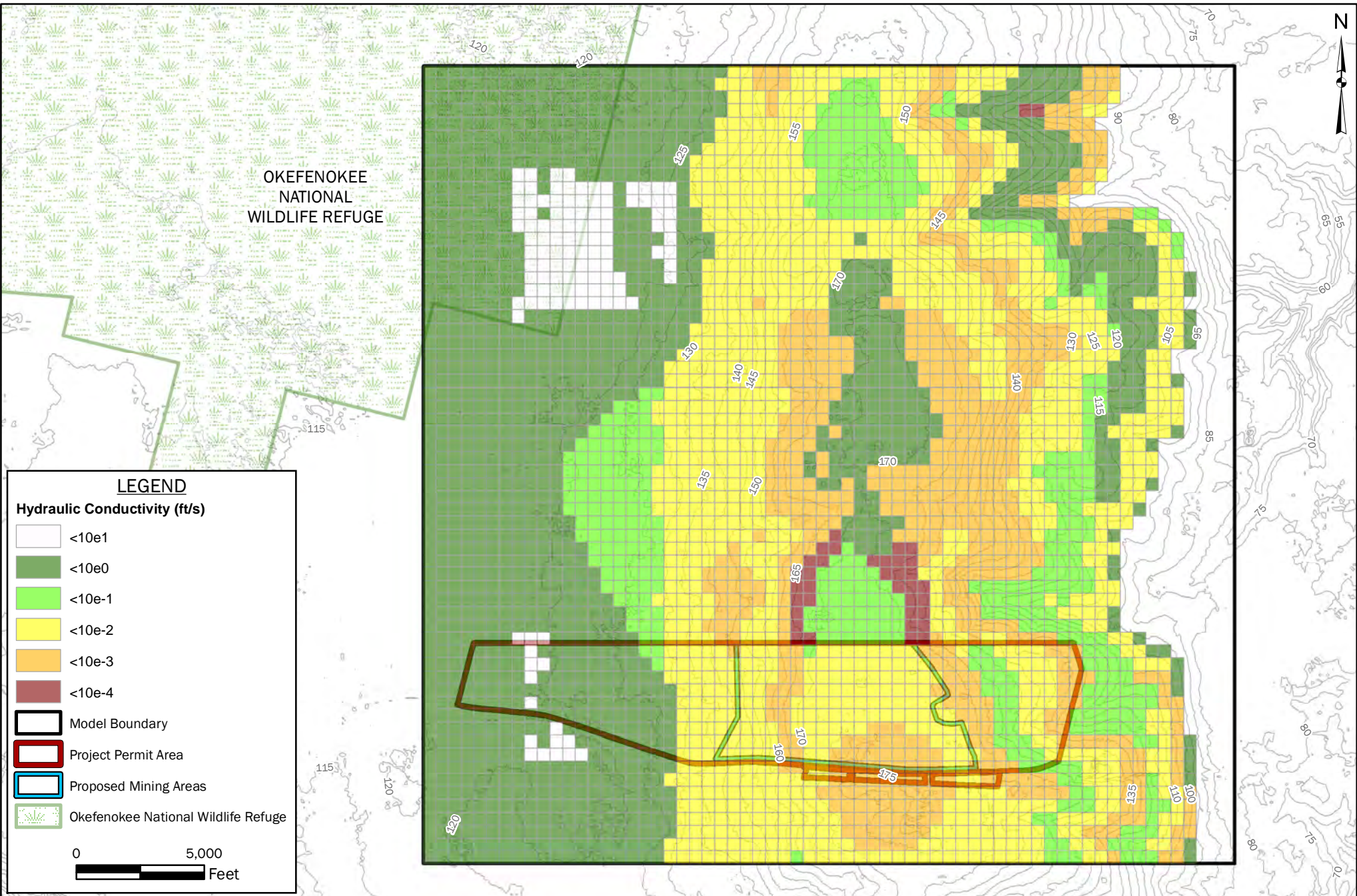


**FIGURE 38: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 7**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



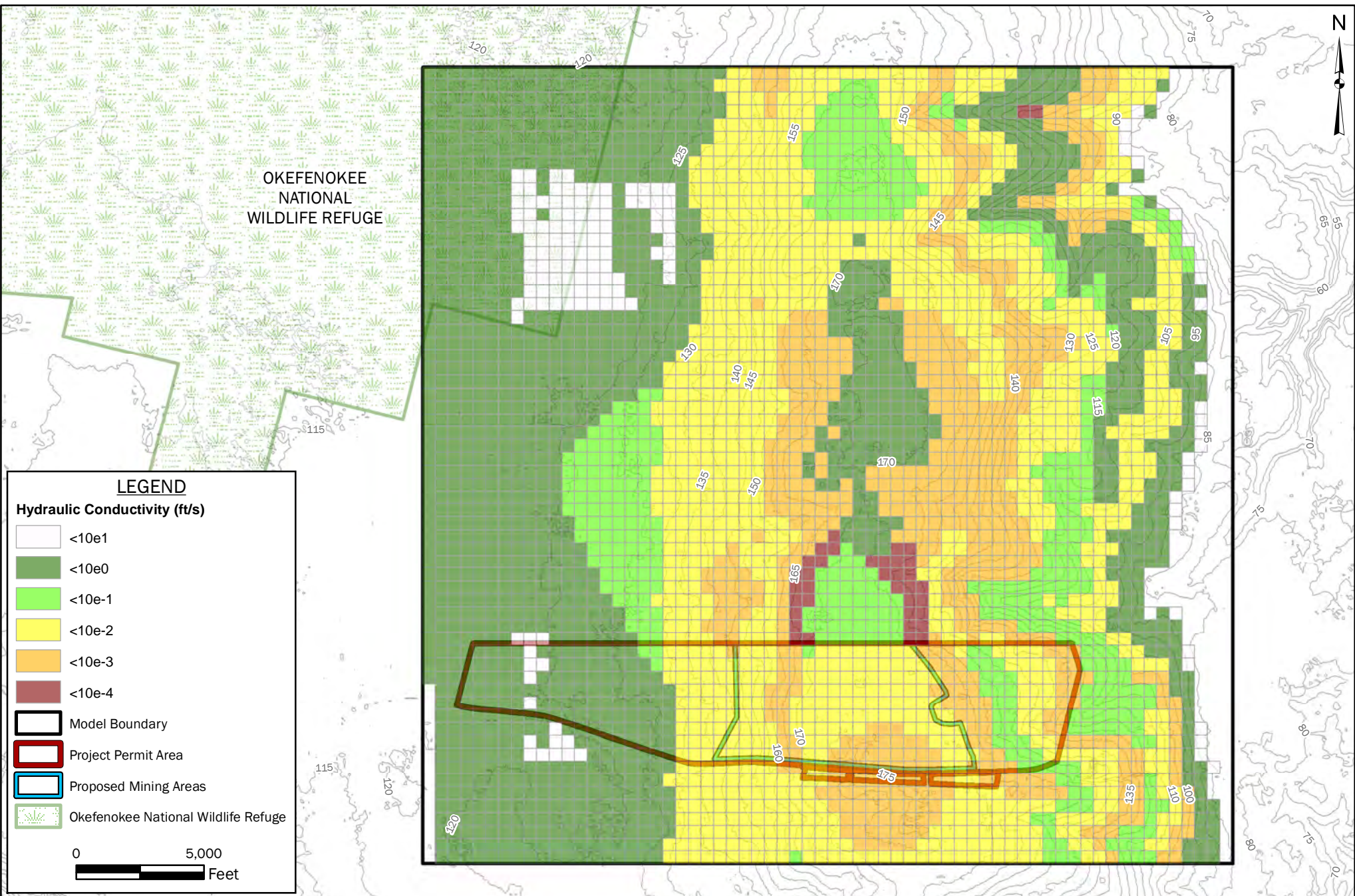
**FIGURE 39: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 8**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



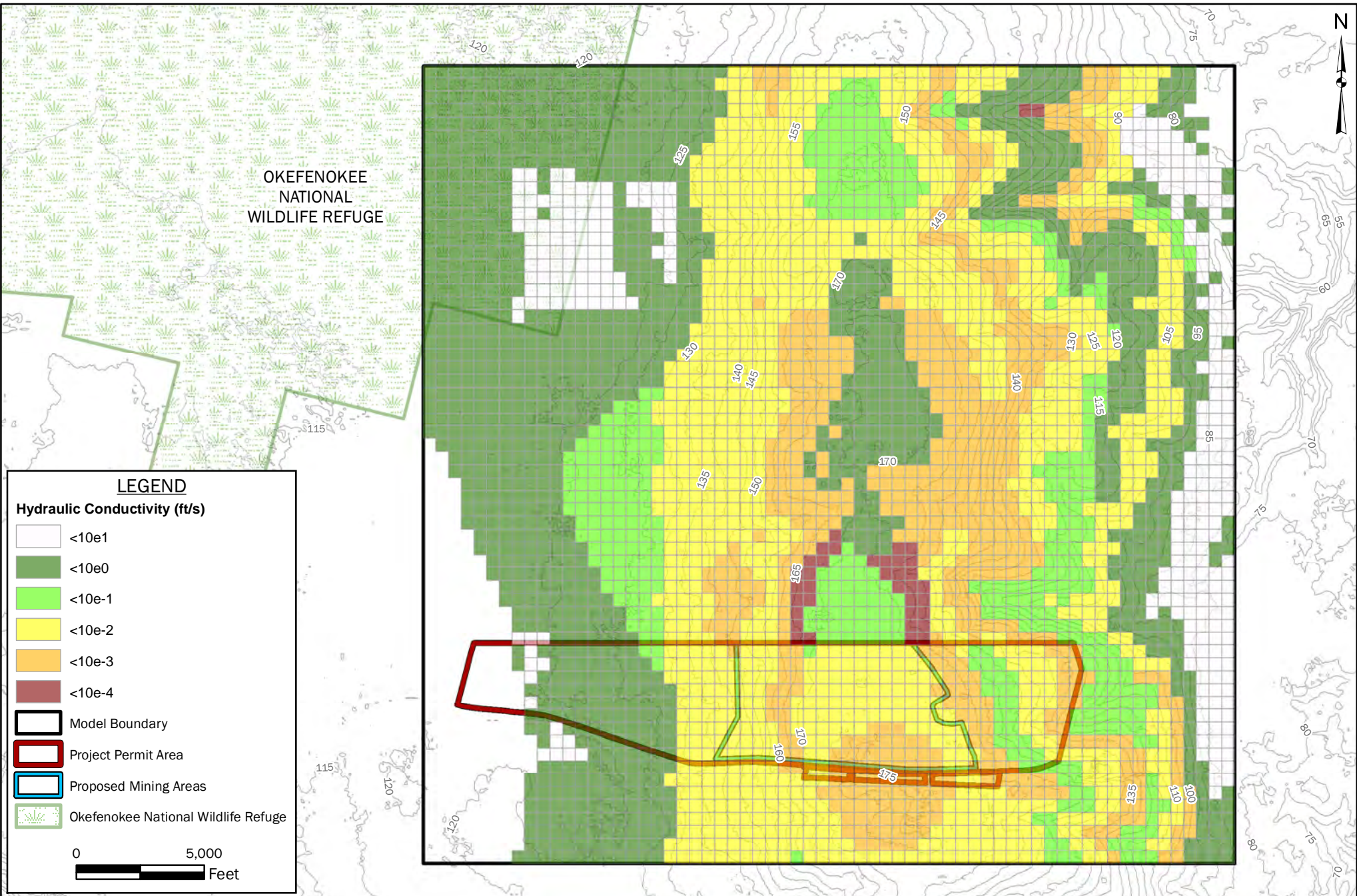


**FIGURE 40: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 9**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

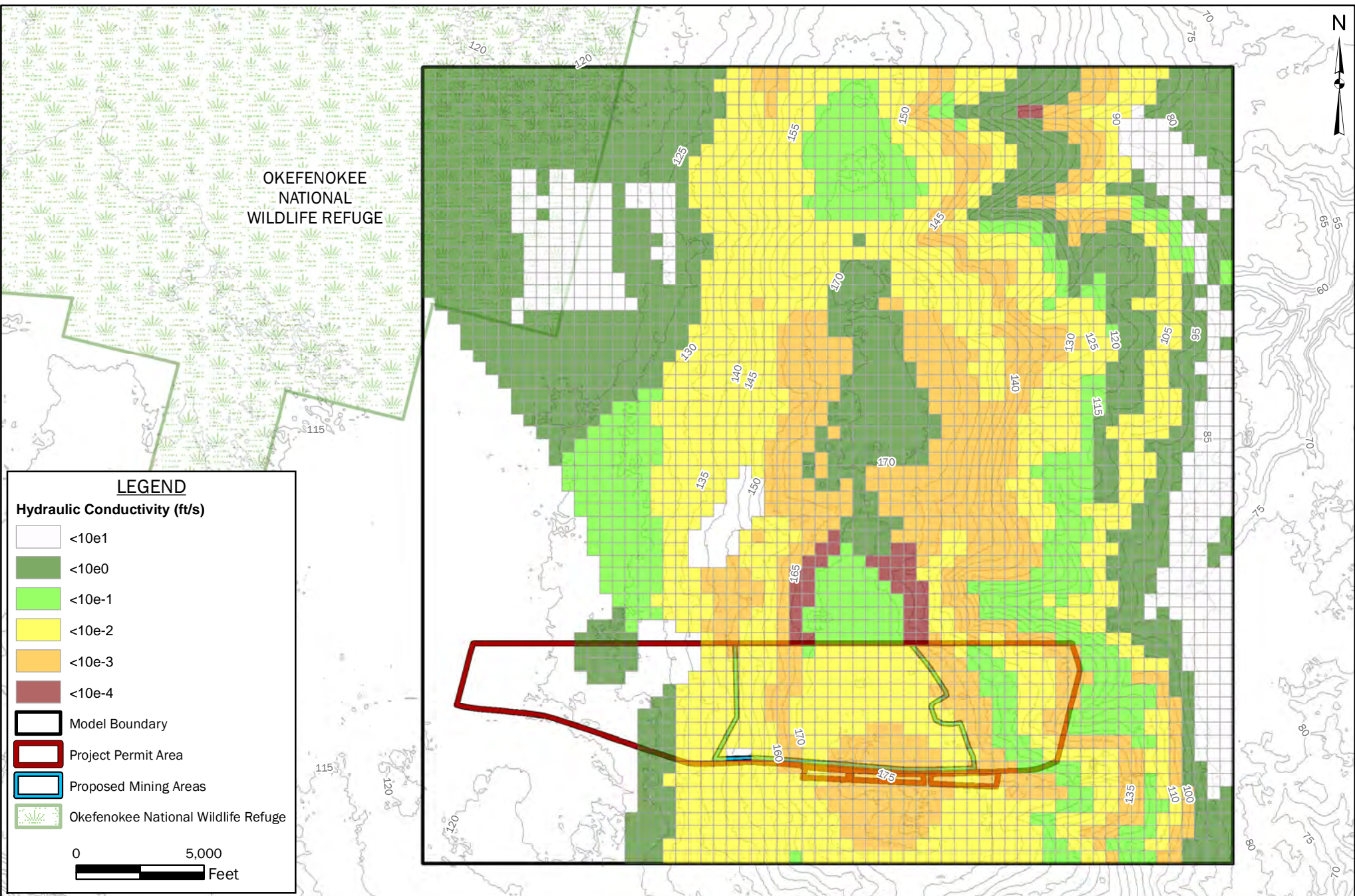


**FIGURE 41: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 10**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

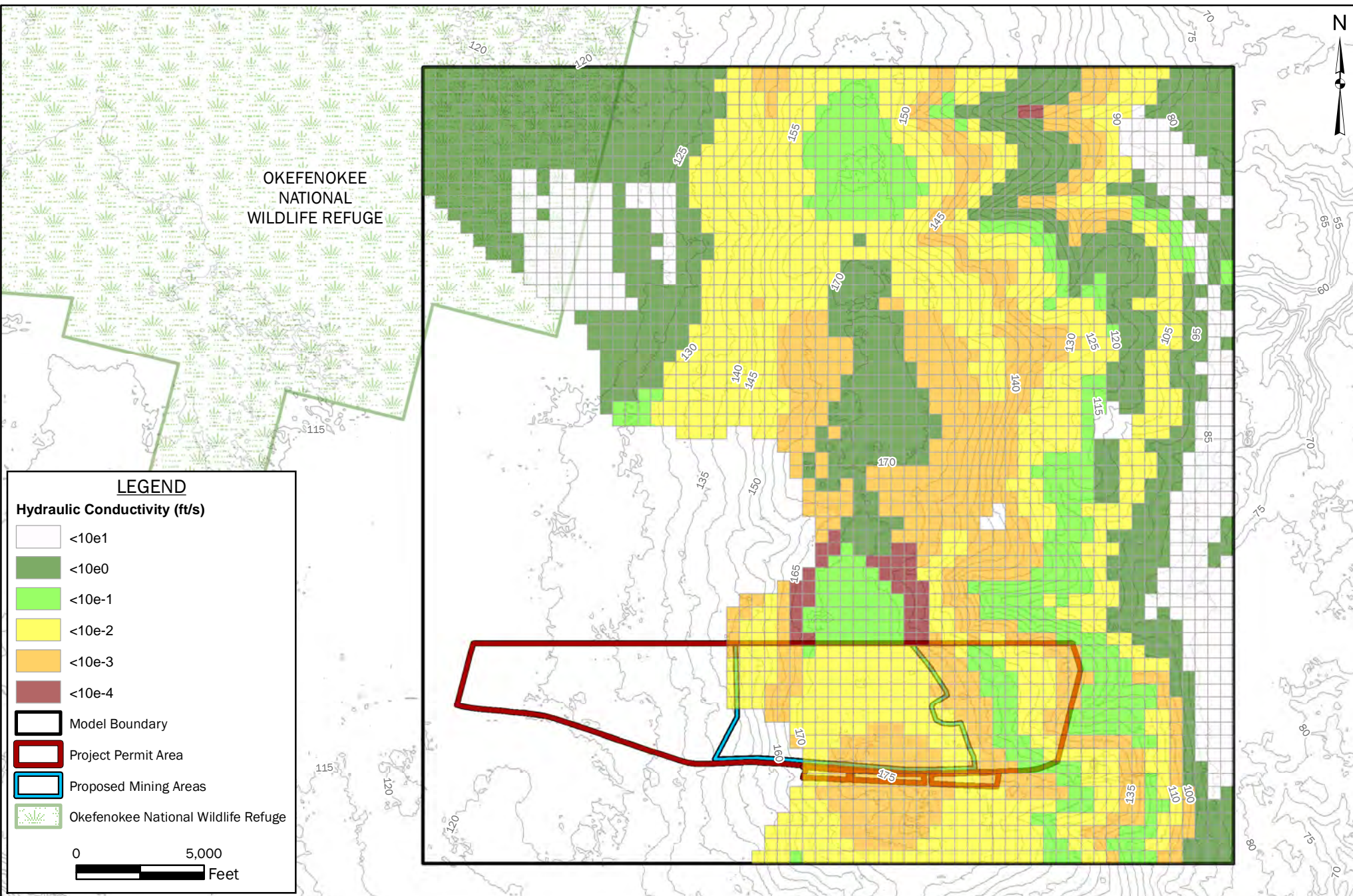


**FIGURE 42: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 11**

**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



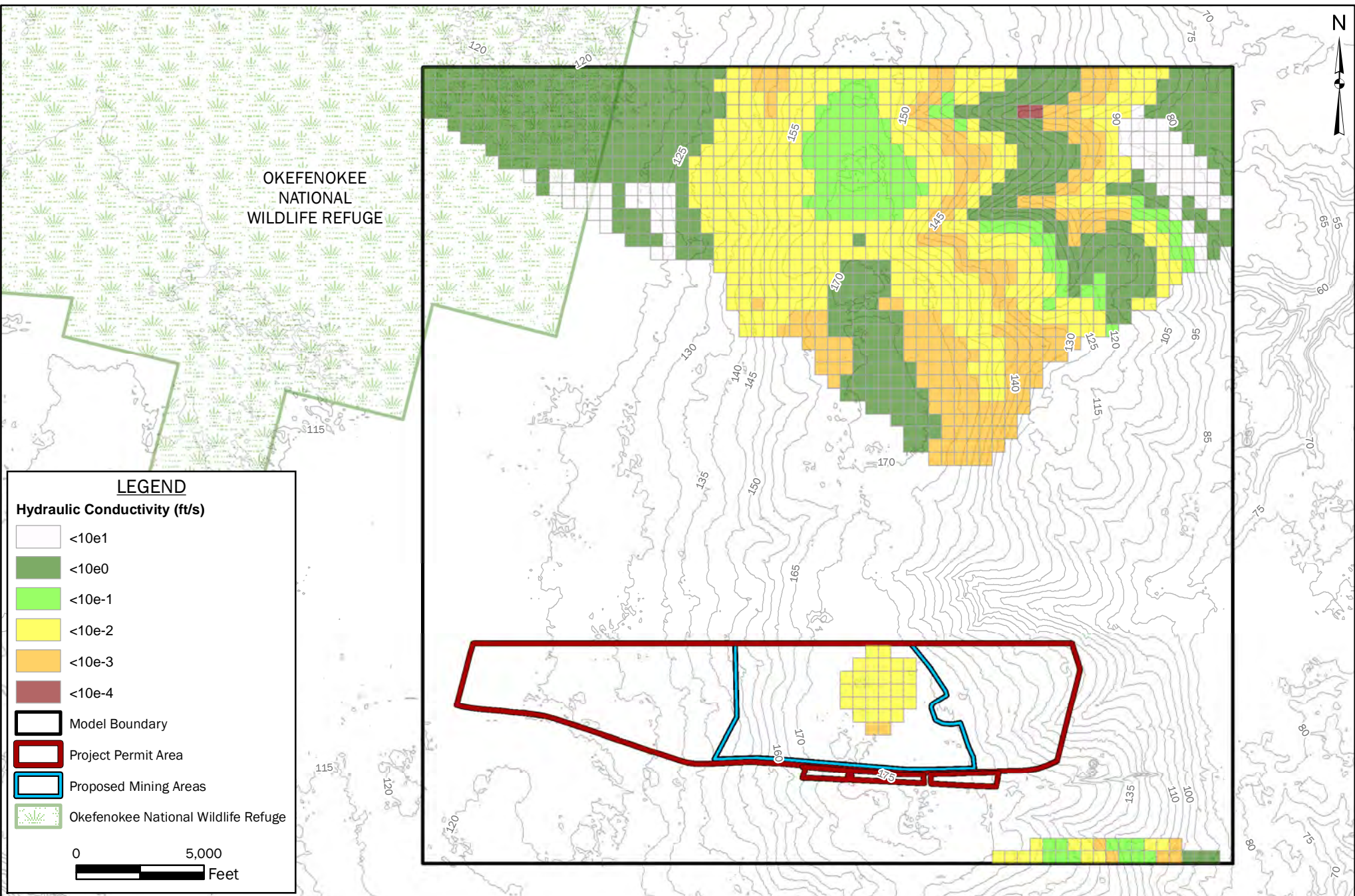
DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



**FIGURE 43: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 12**

**TWIN PINES MINERALS**  
**ST. GEORGE, CHARLTON COUNTY, GEORGIA**

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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

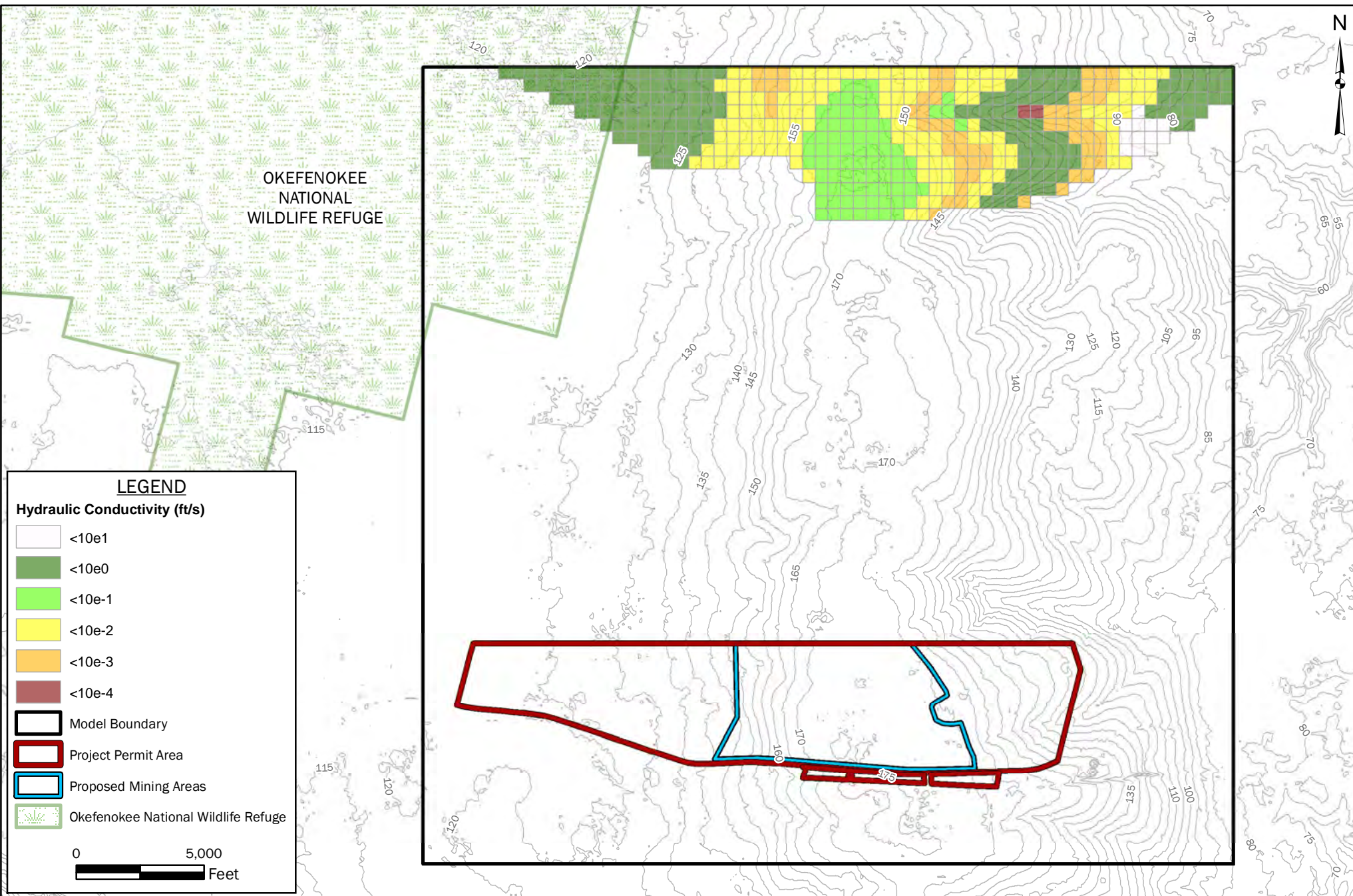


**FIGURE 44: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 13**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

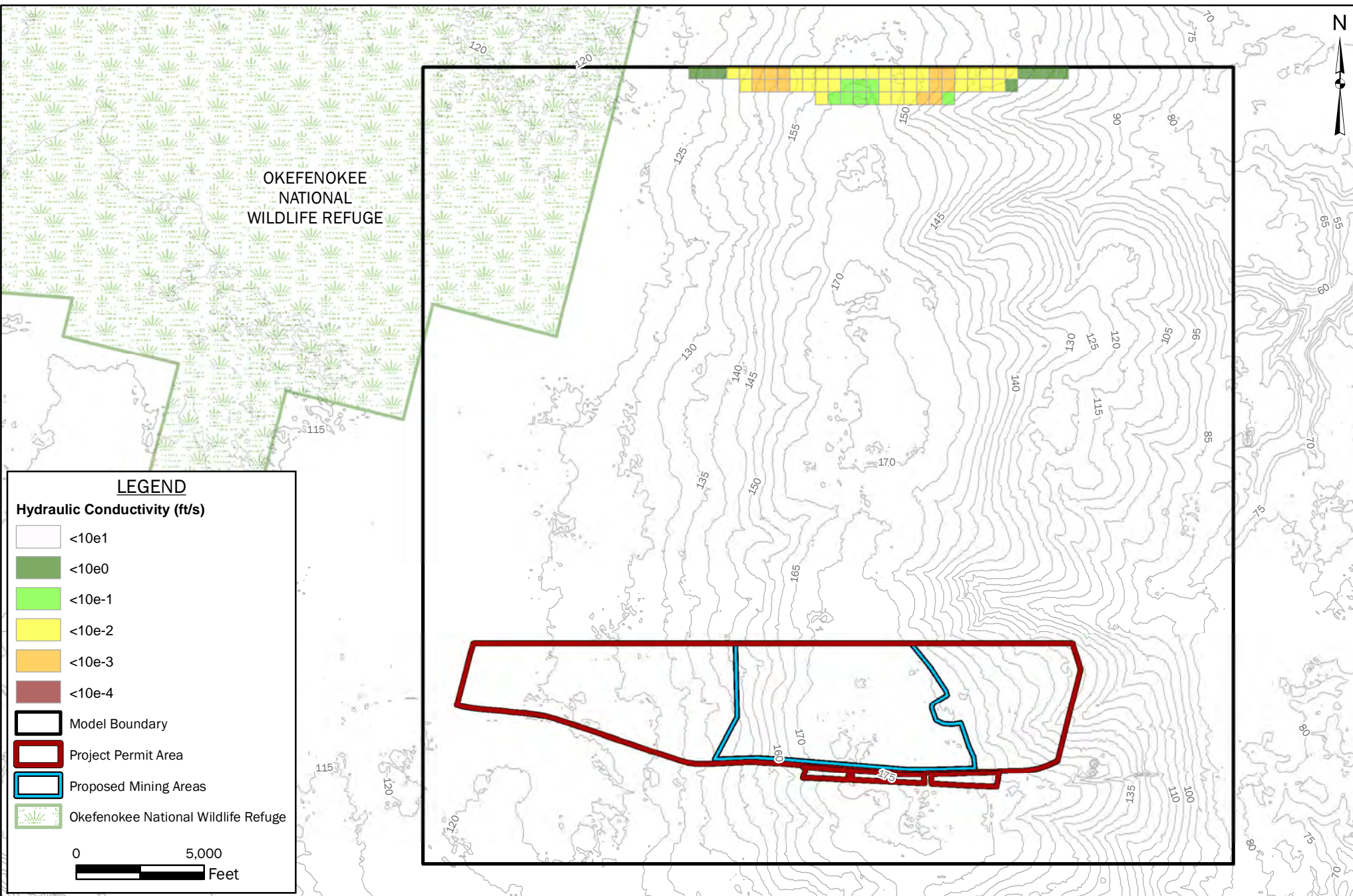


**FIGURE 45: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 14**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

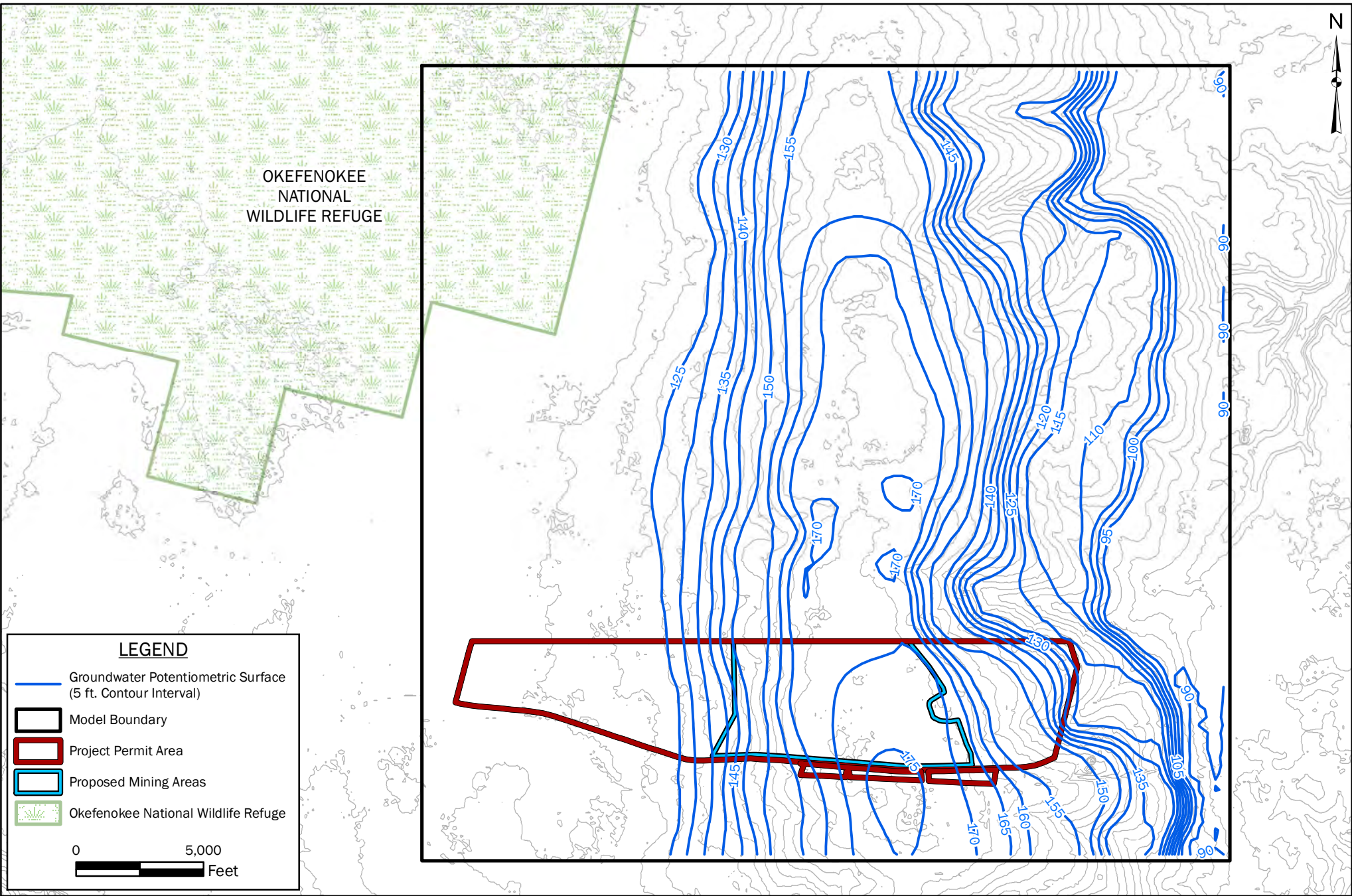


**FIGURE 46: CALIBRATED MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 15**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



**FIGURE 47: PRE-MINING MODEL POTENTIOMETRIC SURFACE MAP**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA








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CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft







OKEFENOKEE  
NATIONAL  
WILDLIFE REFUGE

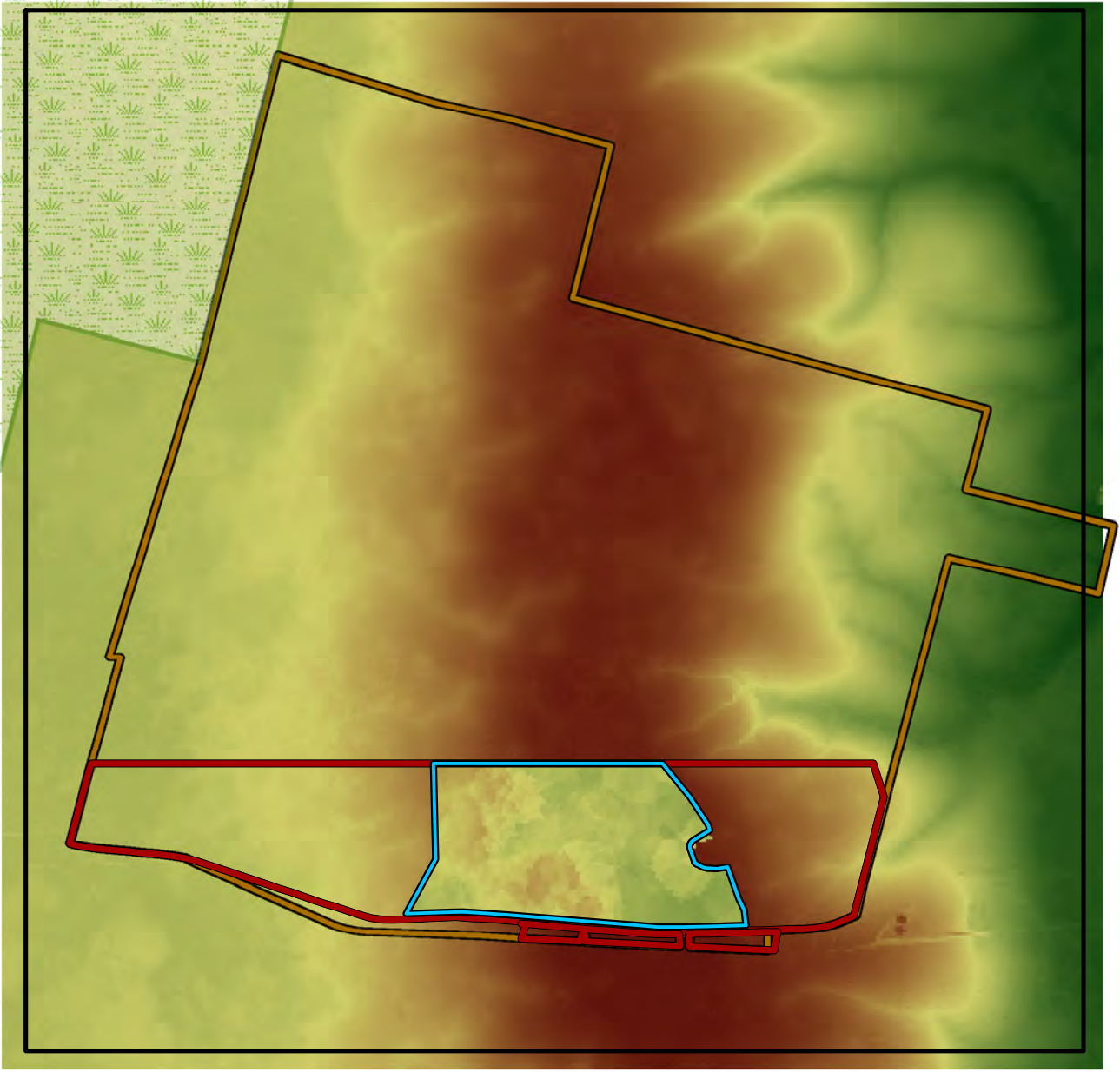
**LEGEND**

-  Model Boundary
-  Proposed Mining Area
-  Project Permit Area
-  Okefenokee National Wildlife Refuge
-  Project Study Area

Digital Elevation Model

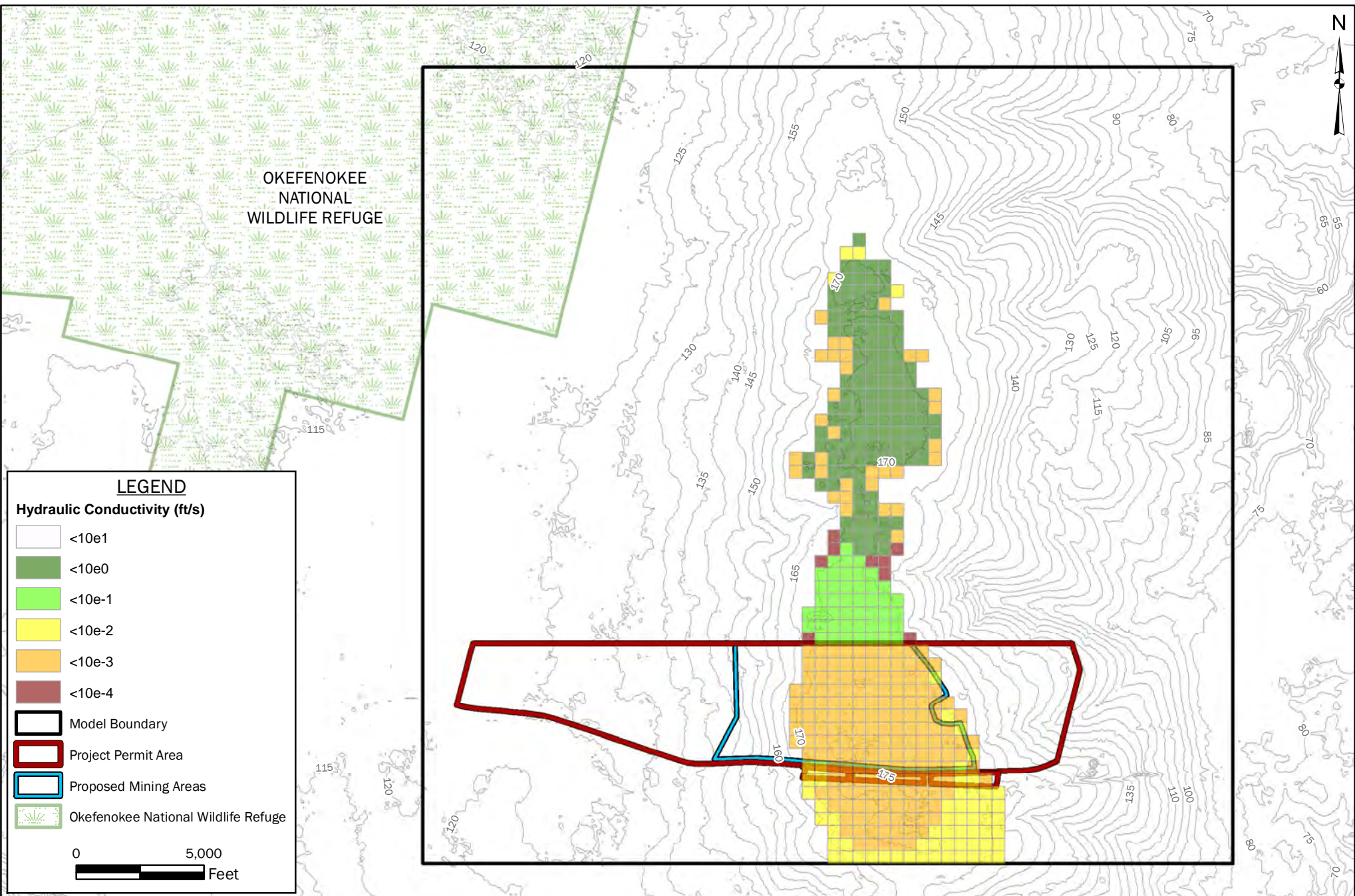
-  180 ft AMSL
-  60 ft AMSL

0 5,000  
Feet



**FIGURE 48: SURFACE & MINING BASE DIGITAL ELEVATION MODEL**  
TWIN PINES MINERALS  
ST. GEORGE, CHARLTON COUNTY, GEORGIA

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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

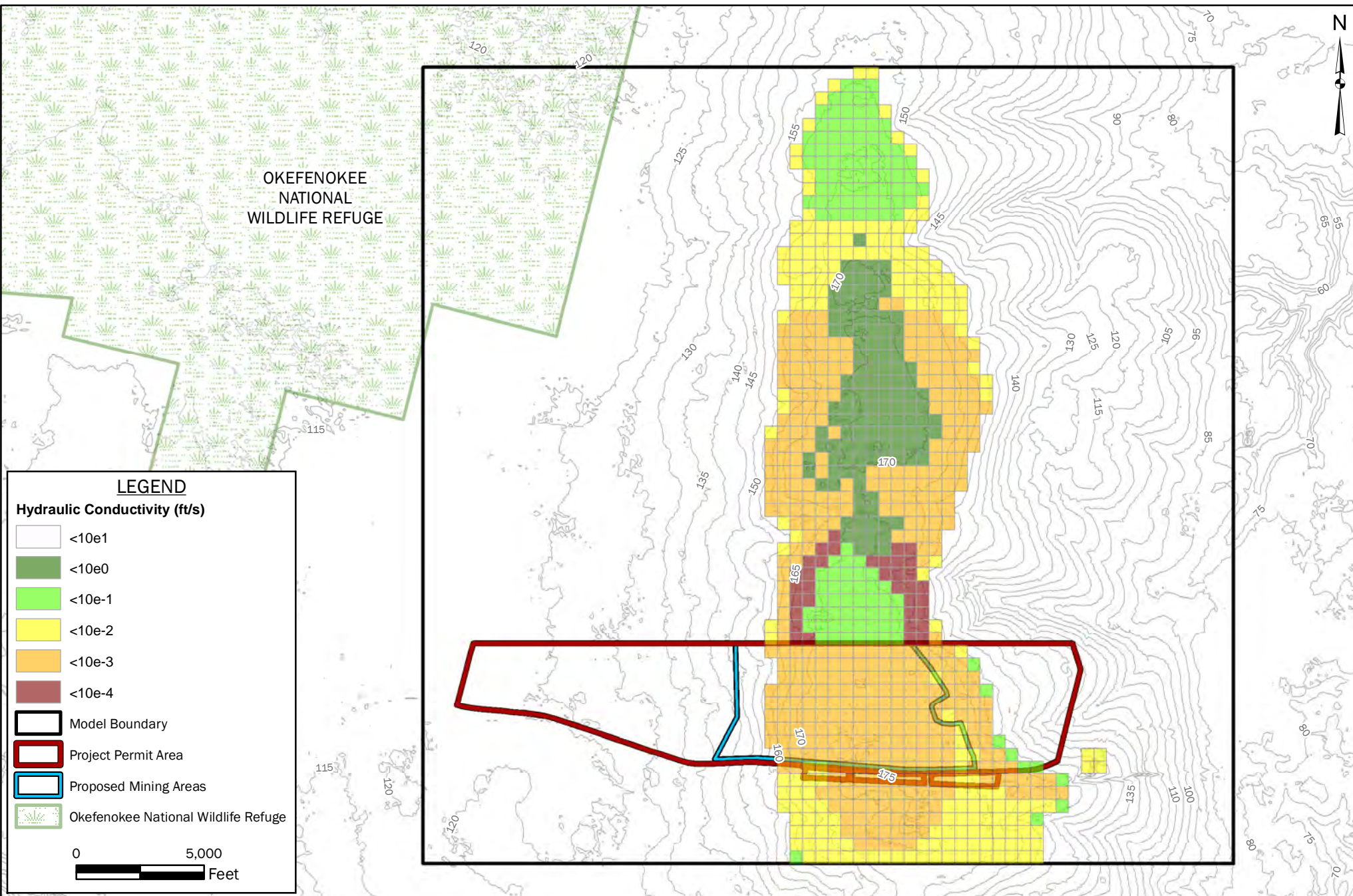


**FIGURE 49: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 1**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



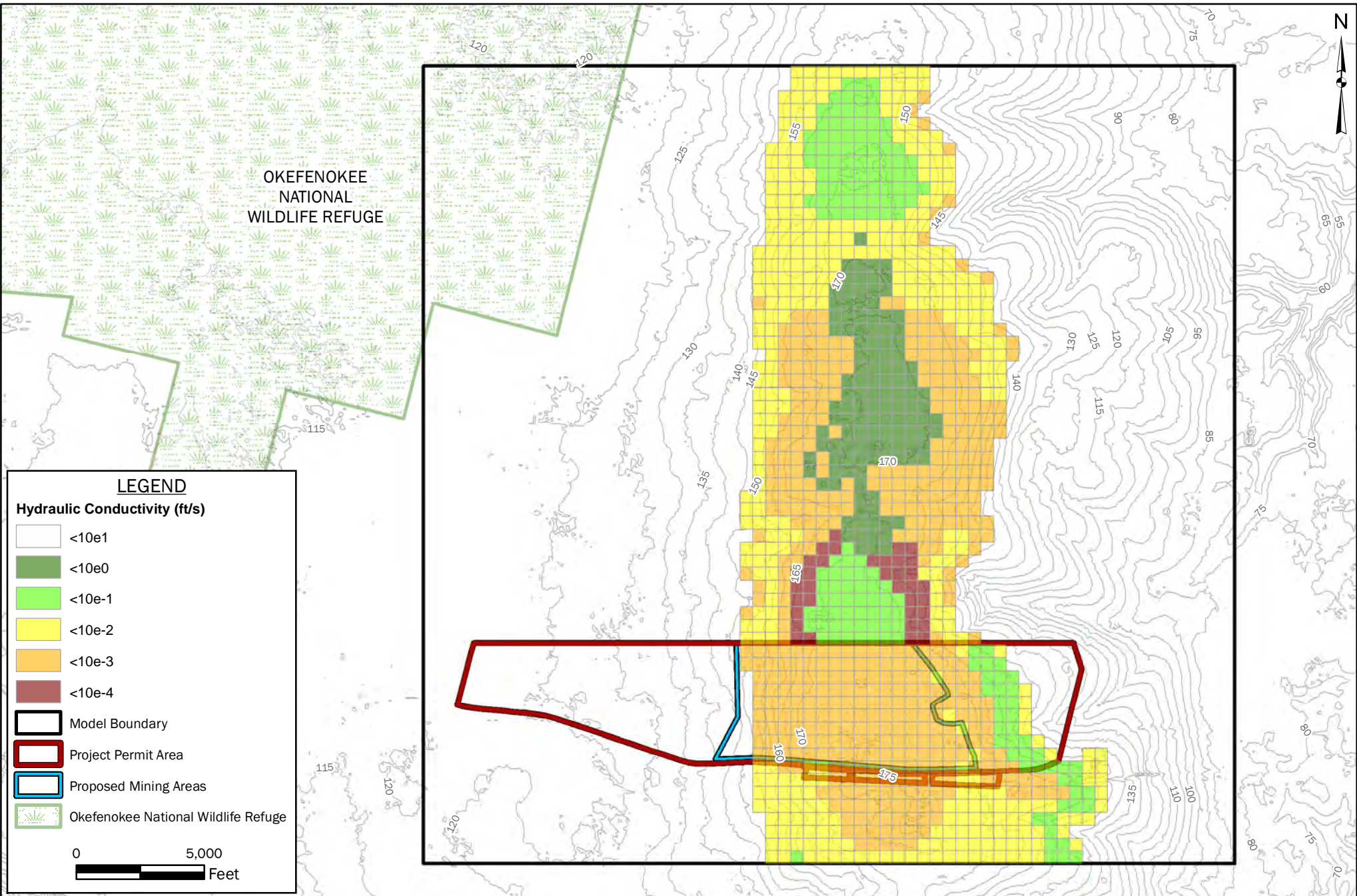
DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



**FIGURE 50: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 2**

**TWIN PINES MINERALS**  
**ST. GEORGE, CHARLTON COUNTY, GEORGIA**

DRAWN BY: DEK
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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

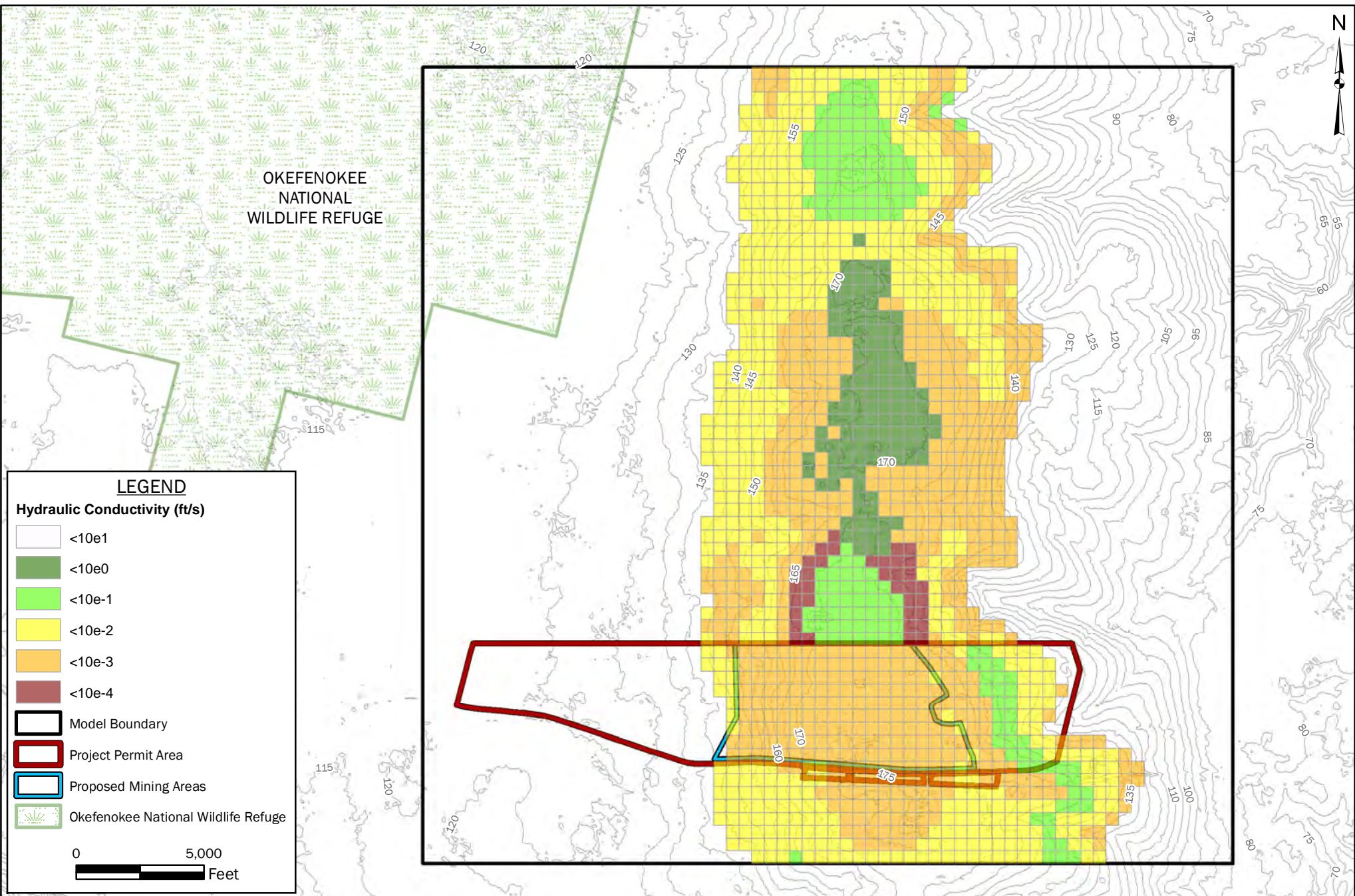


**FIGURE 51: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 3**

**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

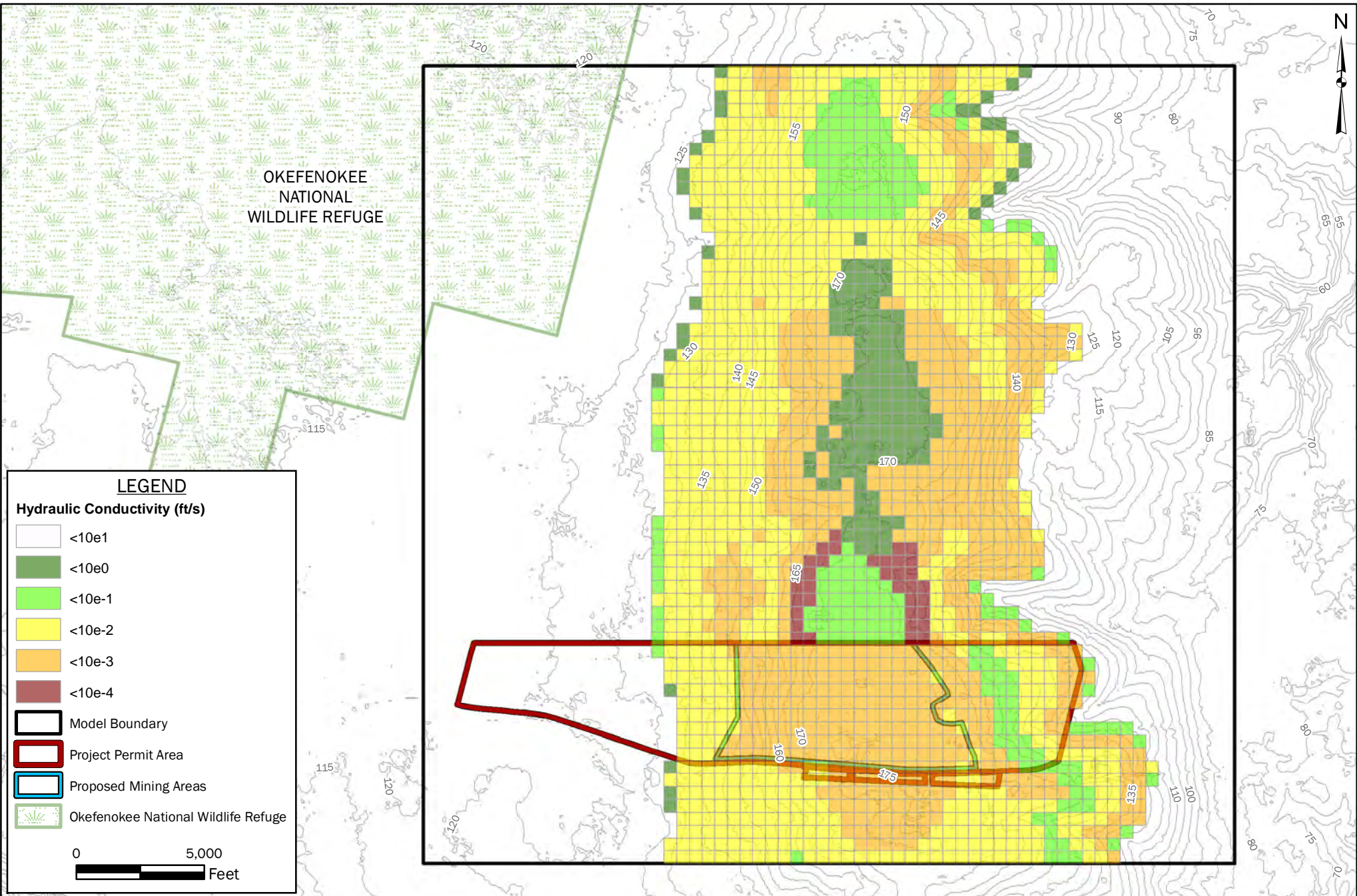


**FIGURE 52: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 4**

**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

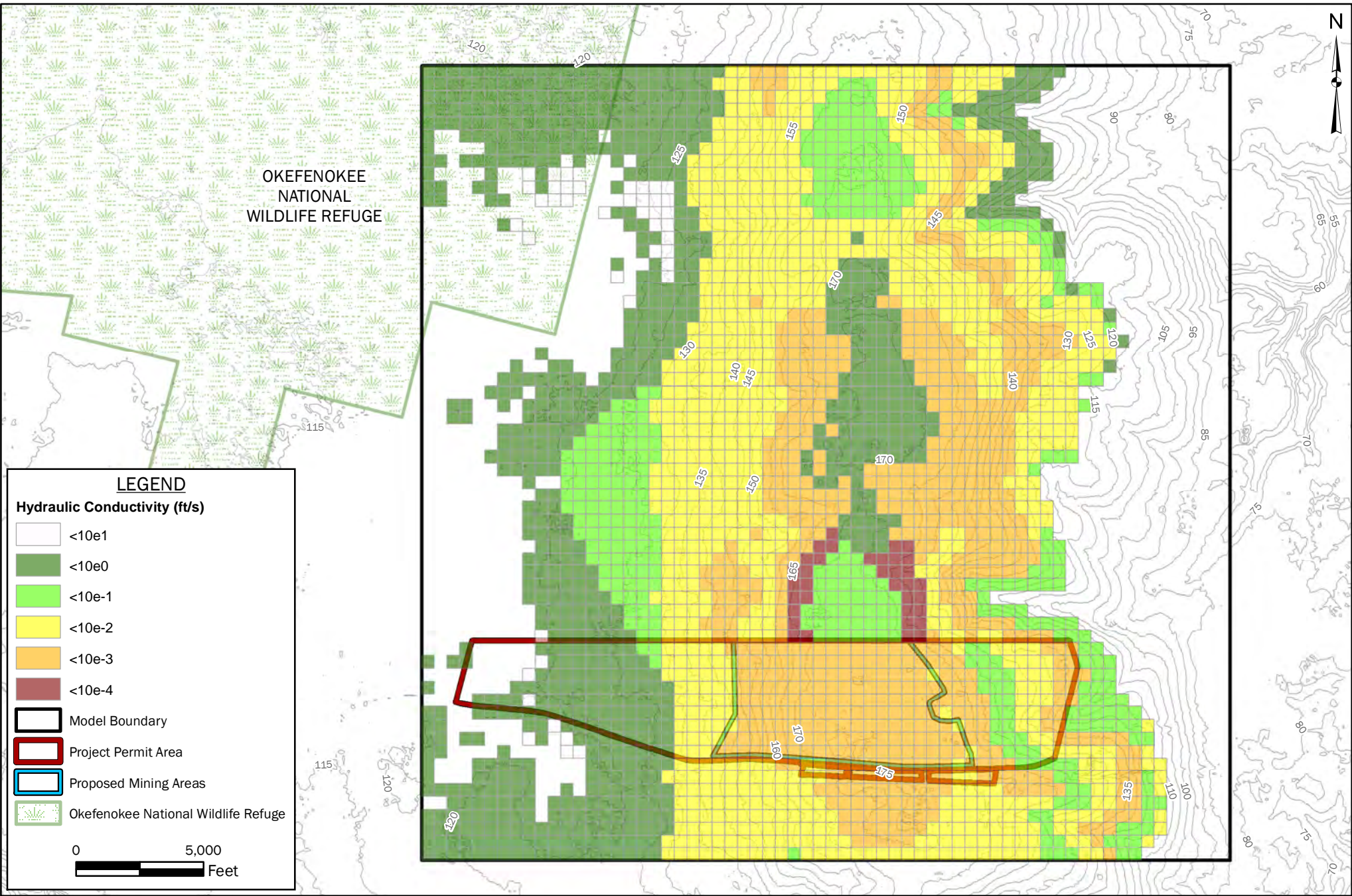


**FIGURE 53: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 5**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

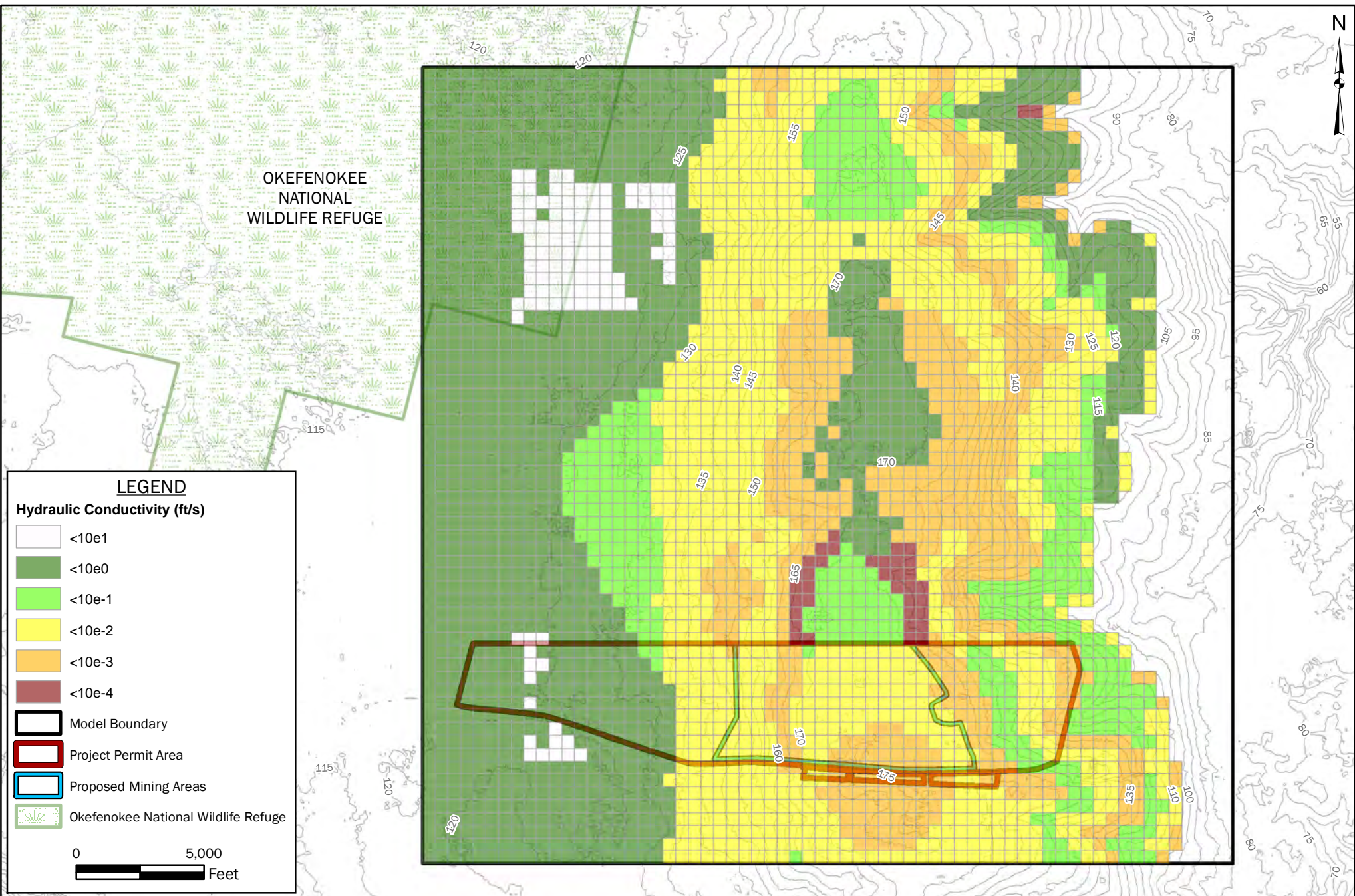


**FIGURE 54: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 6**

**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



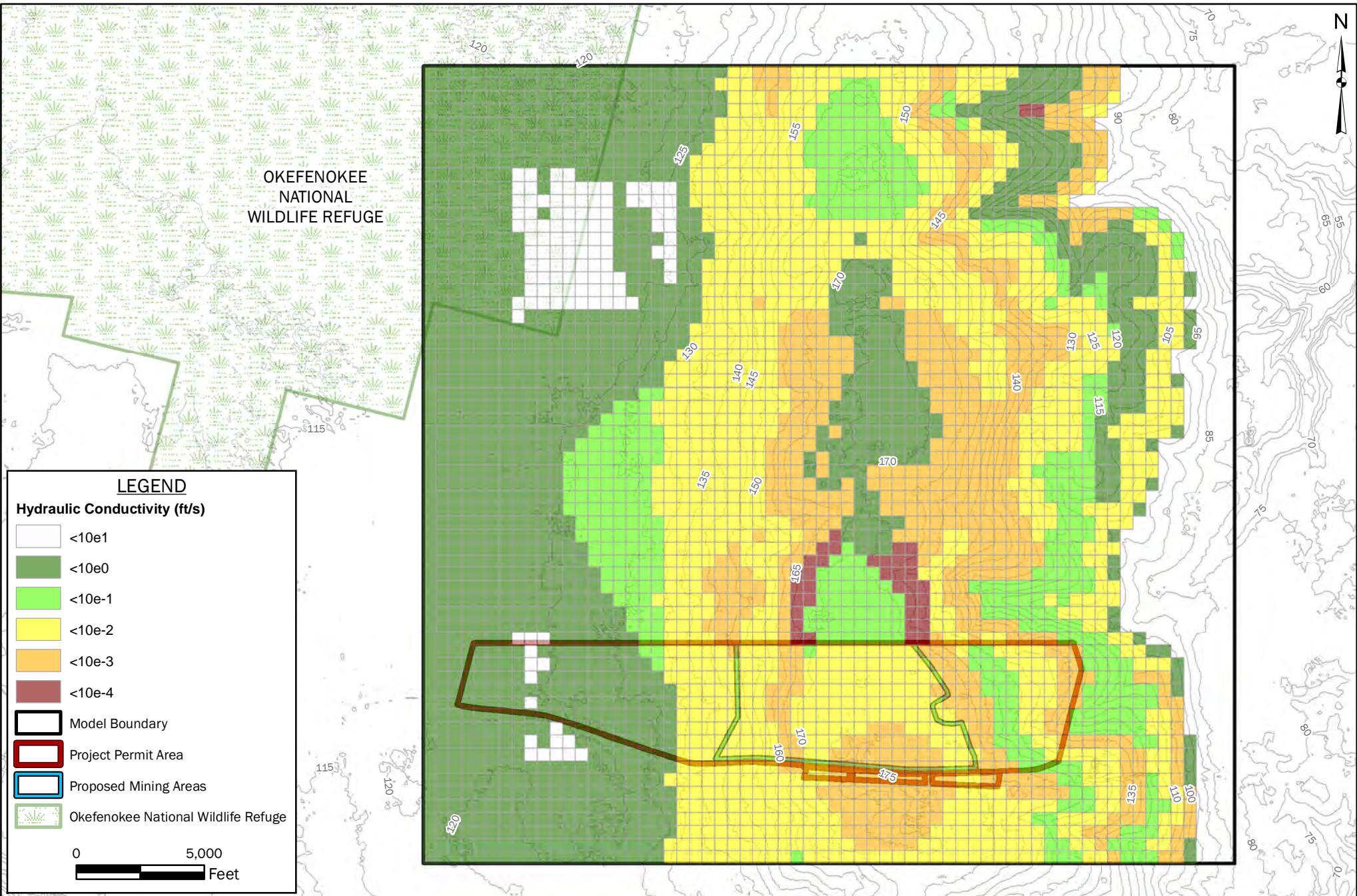
**FIGURE 55: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 7**

**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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DRAWING DATE: 1/13/2020
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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



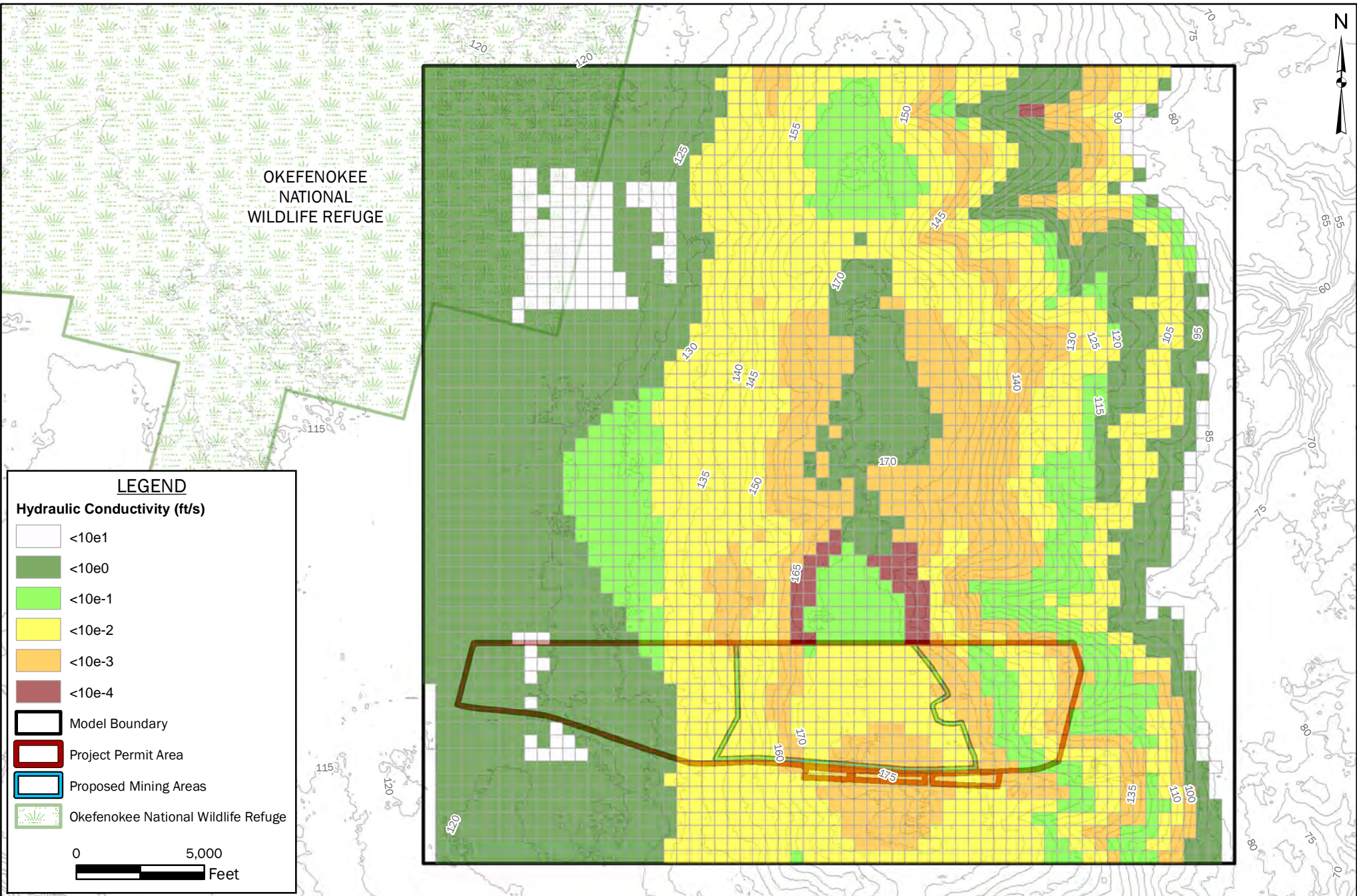


**FIGURE 56: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 8**

**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

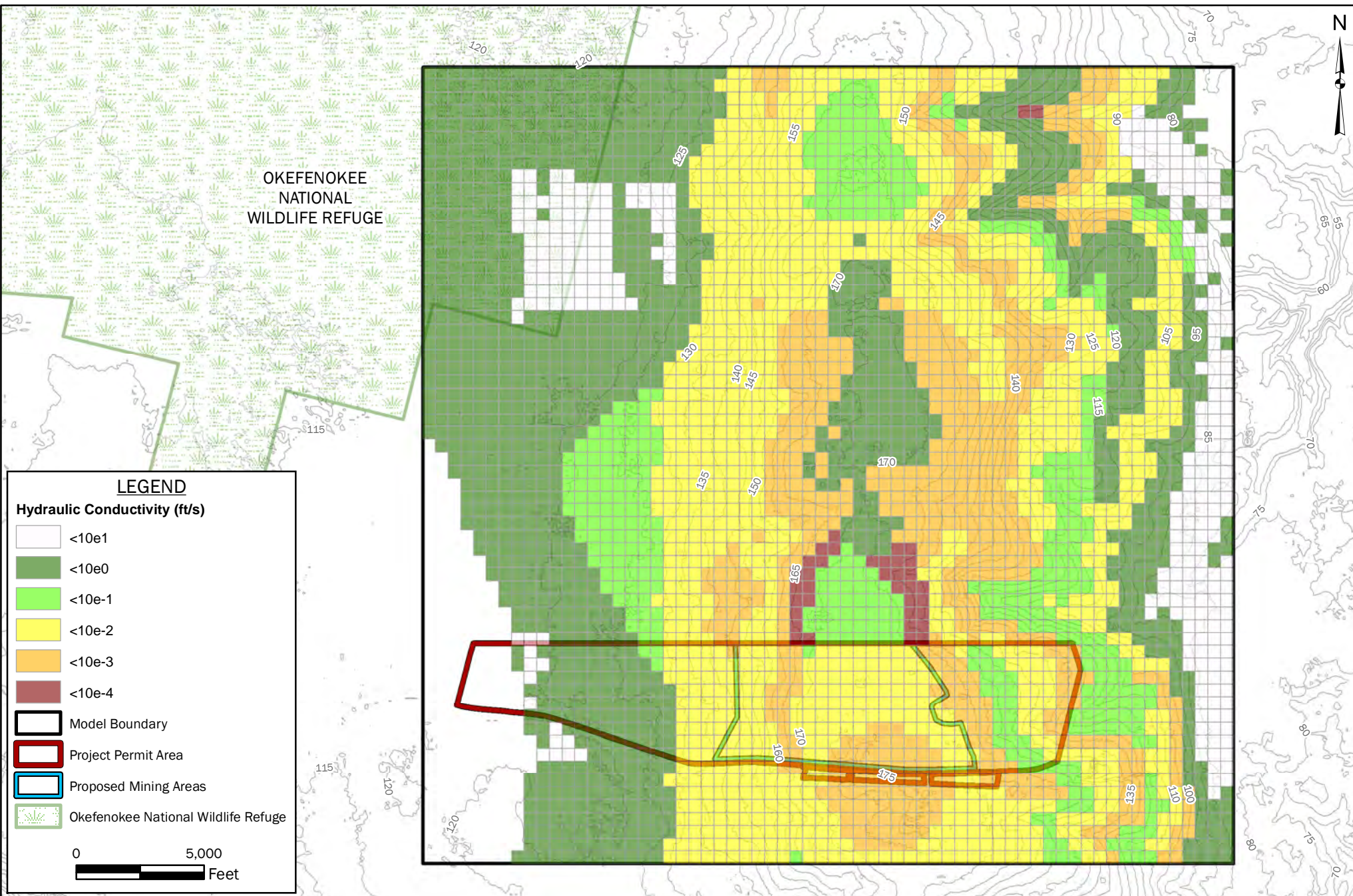


**FIGURE 57: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 9**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



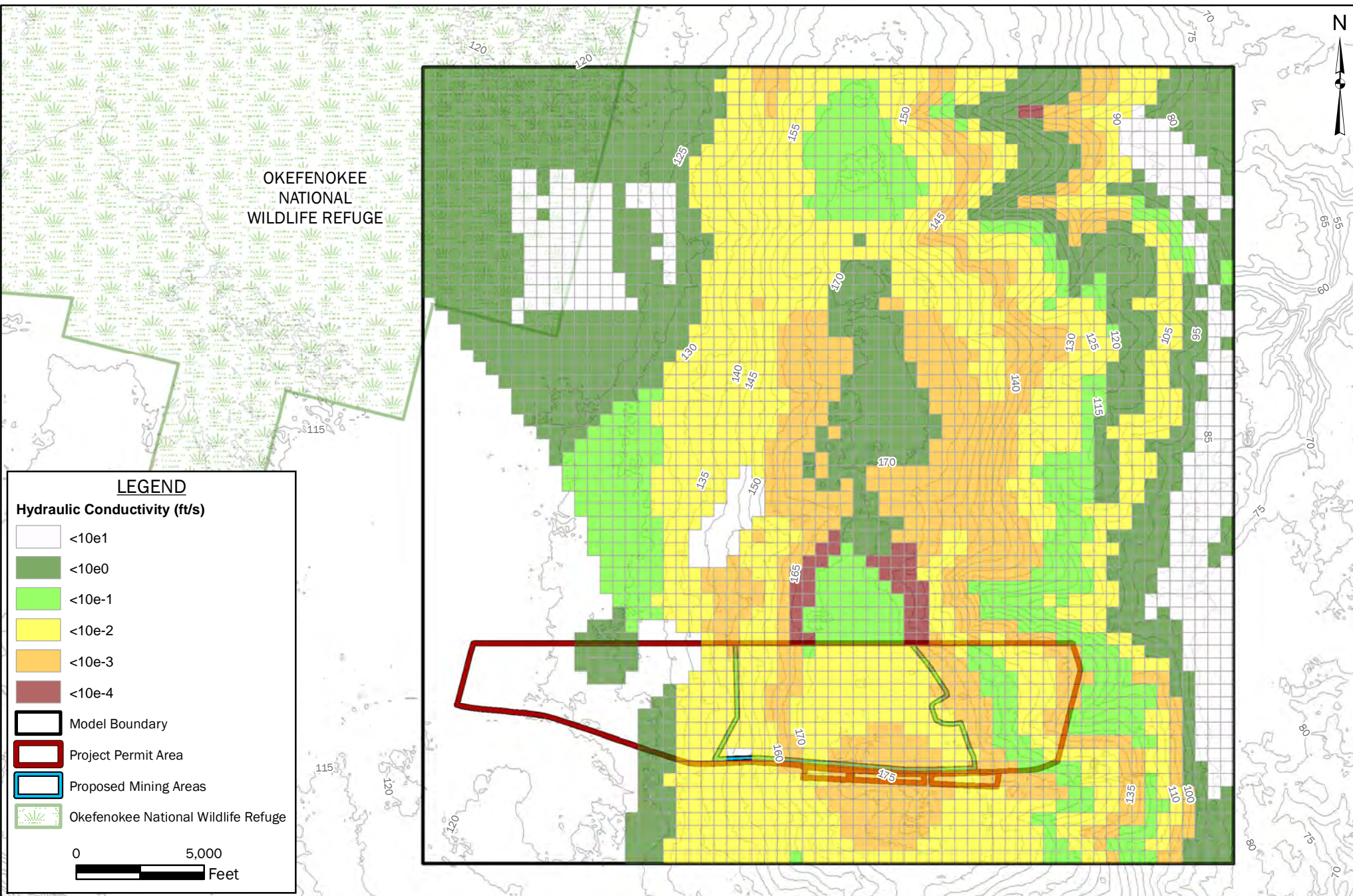
DRAWN BY: DEK
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REVISION DATE: N/A
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APPROX. SCALE: 1 in = 5,000 ft



**FIGURE 58: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 10**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



**LEGEND**

**Hydraulic Conductivity (ft/s)**

- $<10e1$
- $<10e0$
- $<10e-1$
- $<10e-2$
- $<10e-3$
- $<10e-4$
- Model Boundary
- Project Permit Area
- Proposed Mining Areas
- Okefenokee National Wildlife Refuge

0                      5,000  
 Feet

**FIGURE 59: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 11**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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APPROX. SCALE: 1 in = 5,000 ft

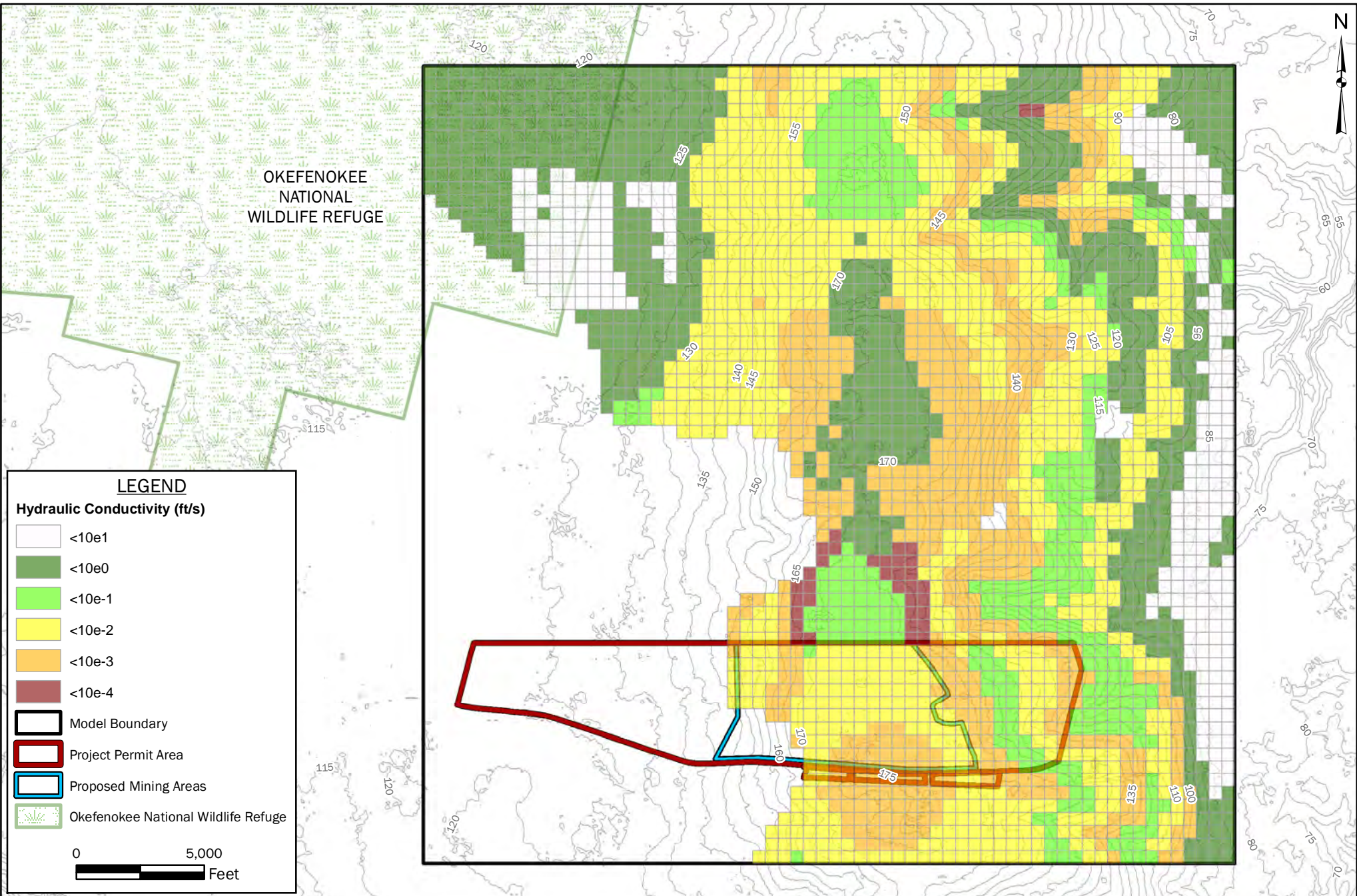
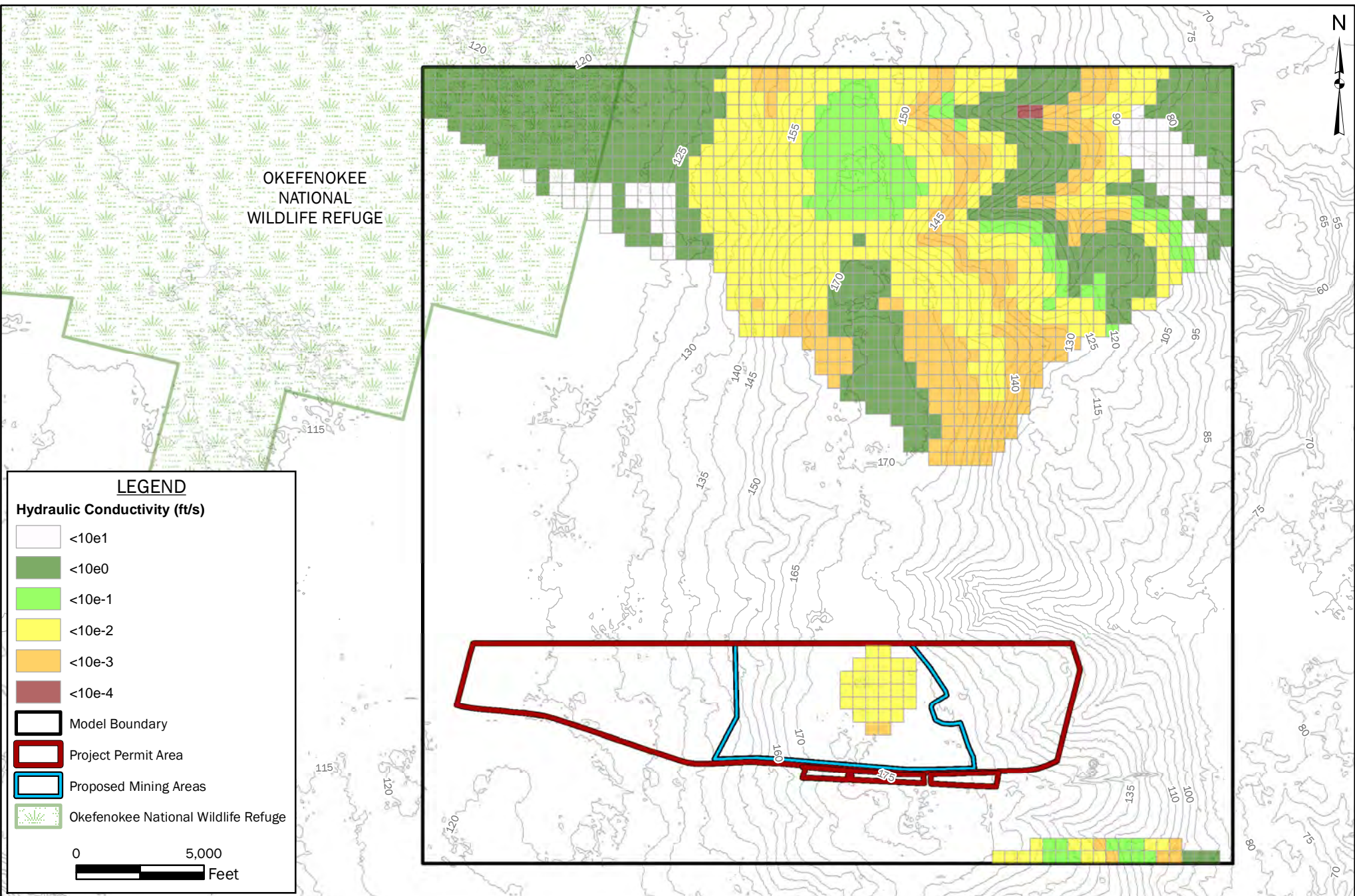


FIGURE 60: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 12

TWIN PINES MINERALS  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



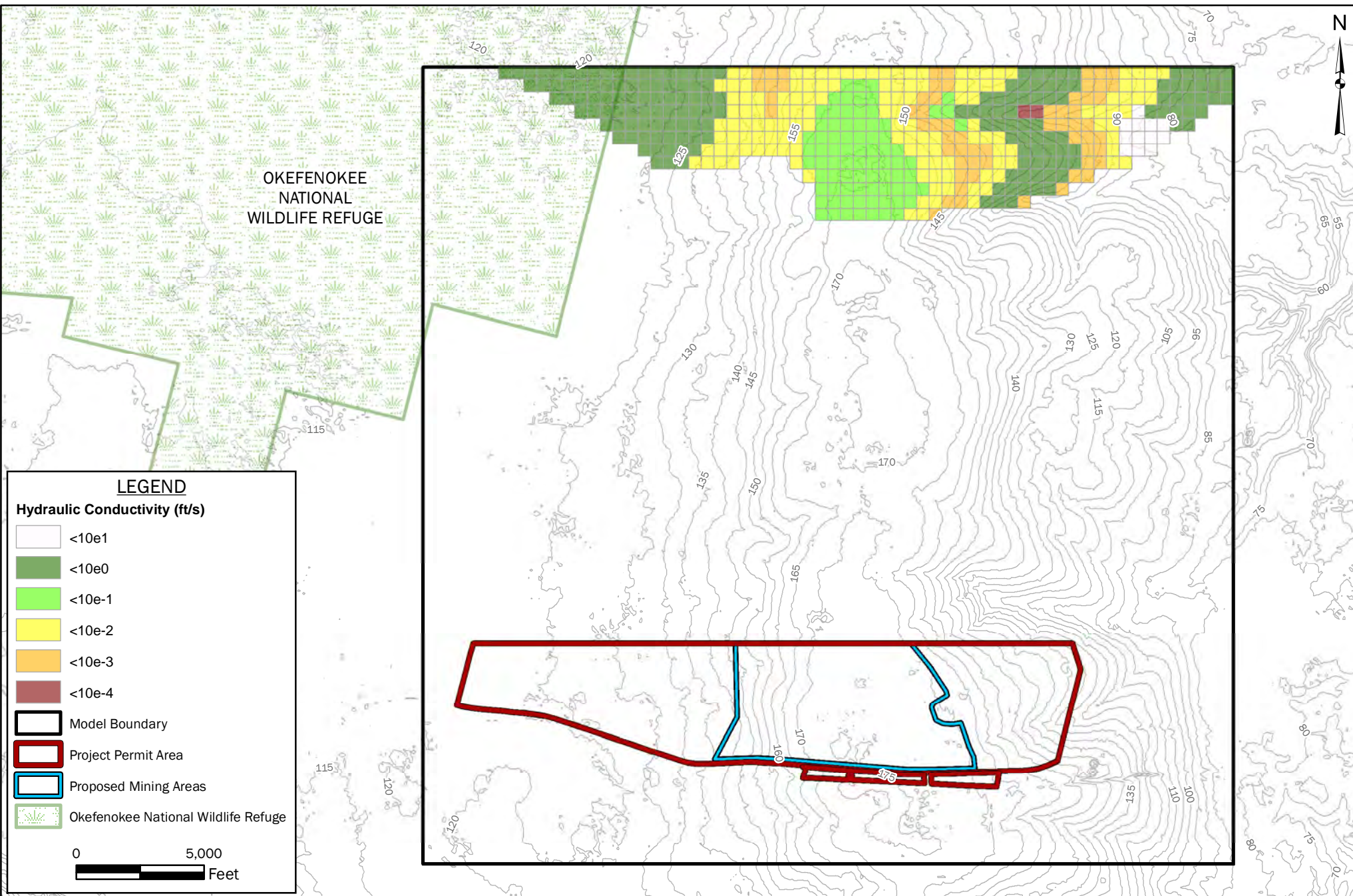
DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



**FIGURE 61: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY LAYER 13**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

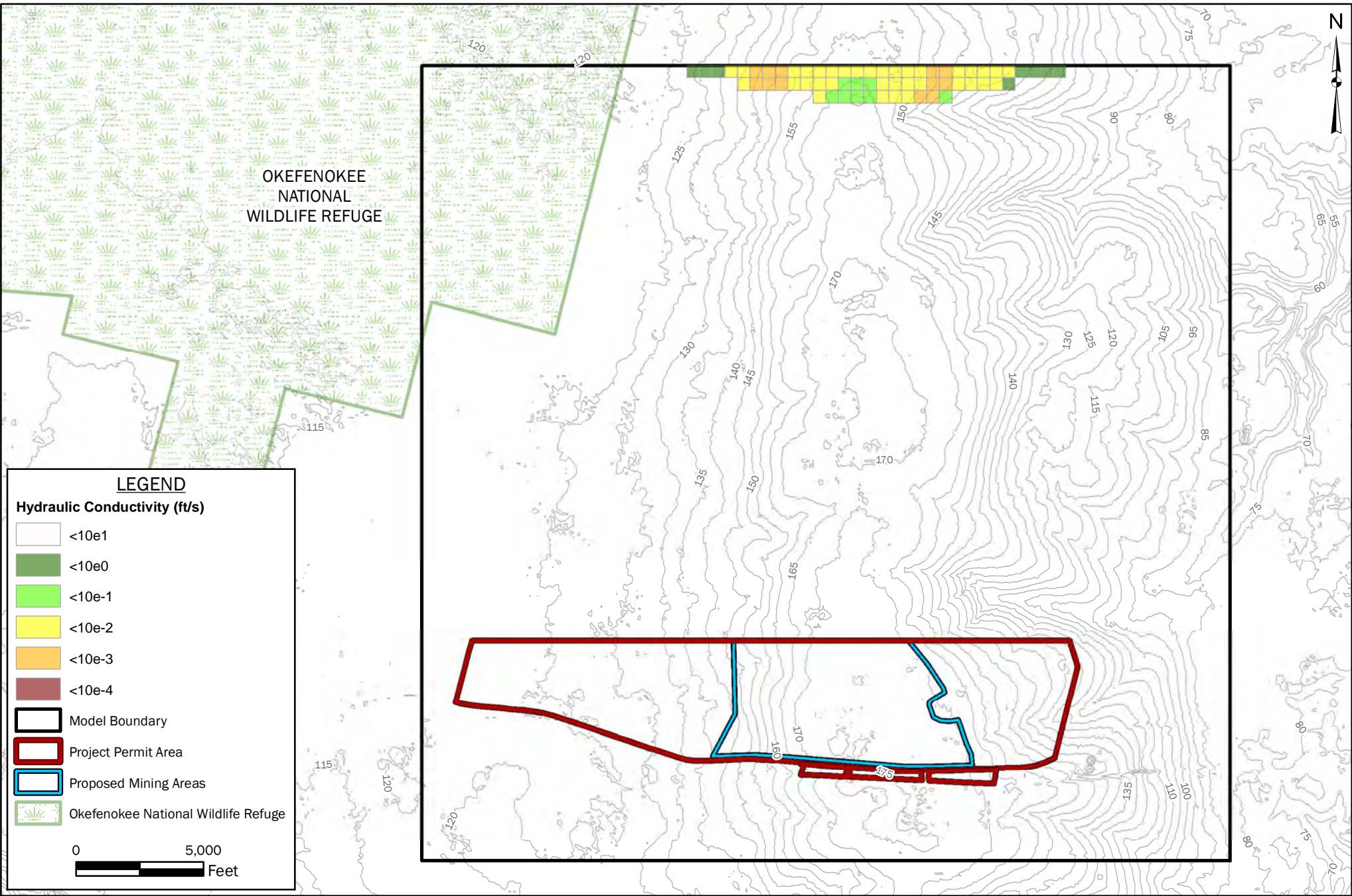


**FIGURE 62: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
 LAYER 14**

**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA



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TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



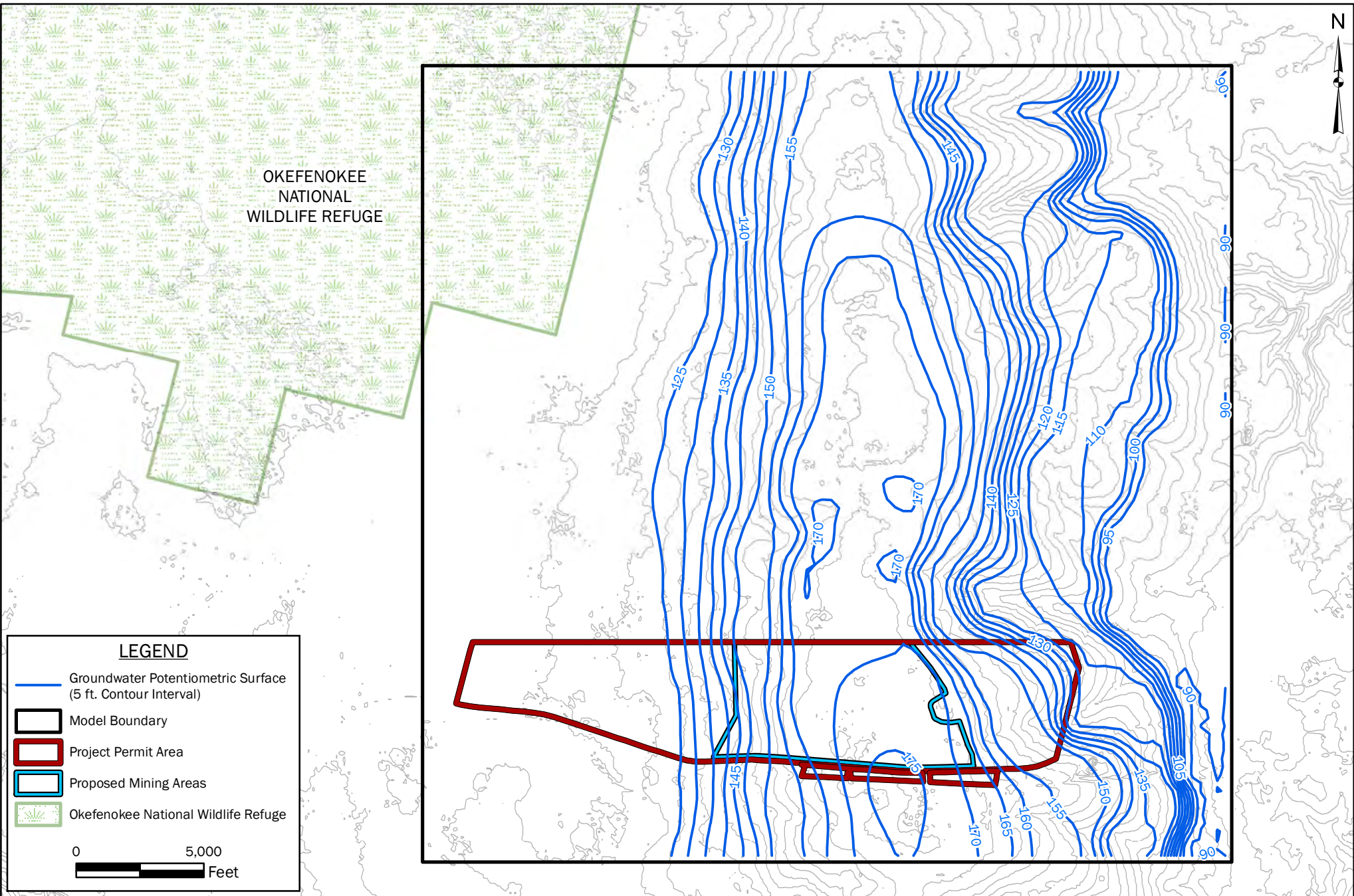
**FIGURE 63: POST-MINING HORIZONTAL HYDRAULIC CONDUCTIVITY  
LAYER 15**

**TWIN PINES MINERALS**  
ST. GEORGE, CHARLTON COUNTY, GEORGIA



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APPROX. SCALE: 1 in = 5,000 ft





**FIGURE 64: POST-MINING MODEL POTENTIOMETRIC SURFACE MAP**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

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REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

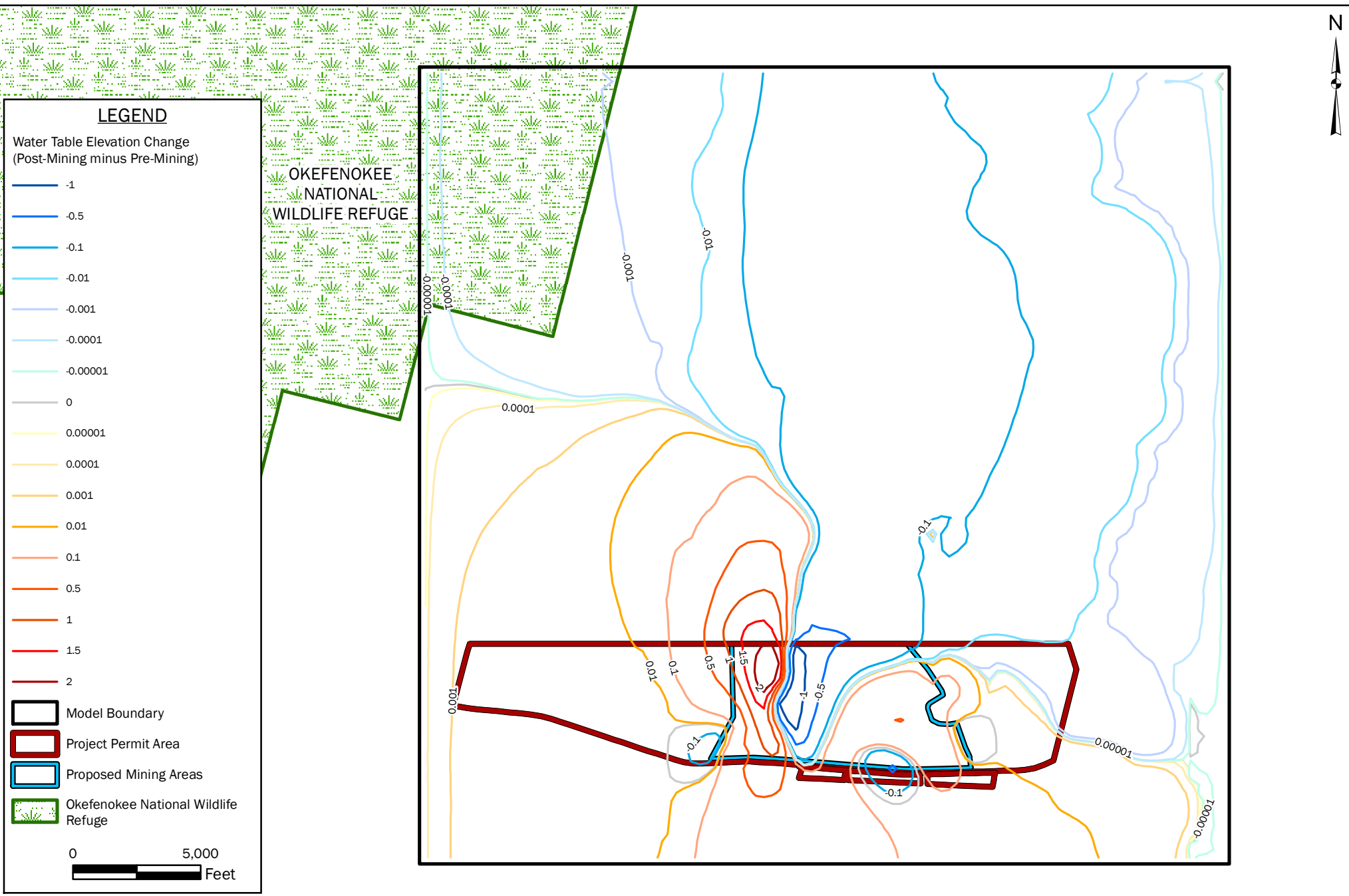
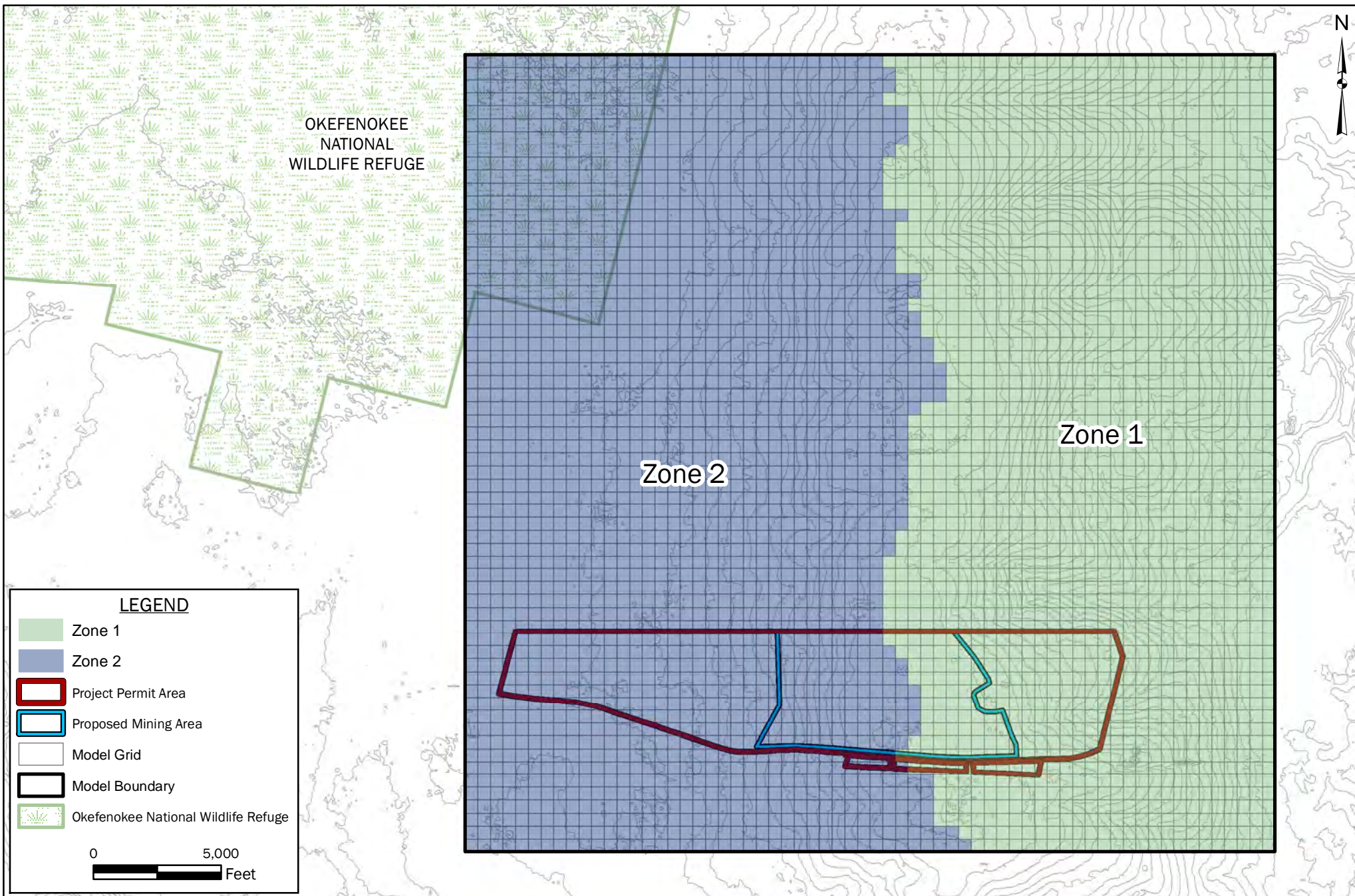


FIGURE 65: POST-MINING WATER TABLE ELEVATION CHANGE MAP  
TWIN PINES MINERALS  
ST. GEORGE, CHARLTON COUNTY, GEORGIA

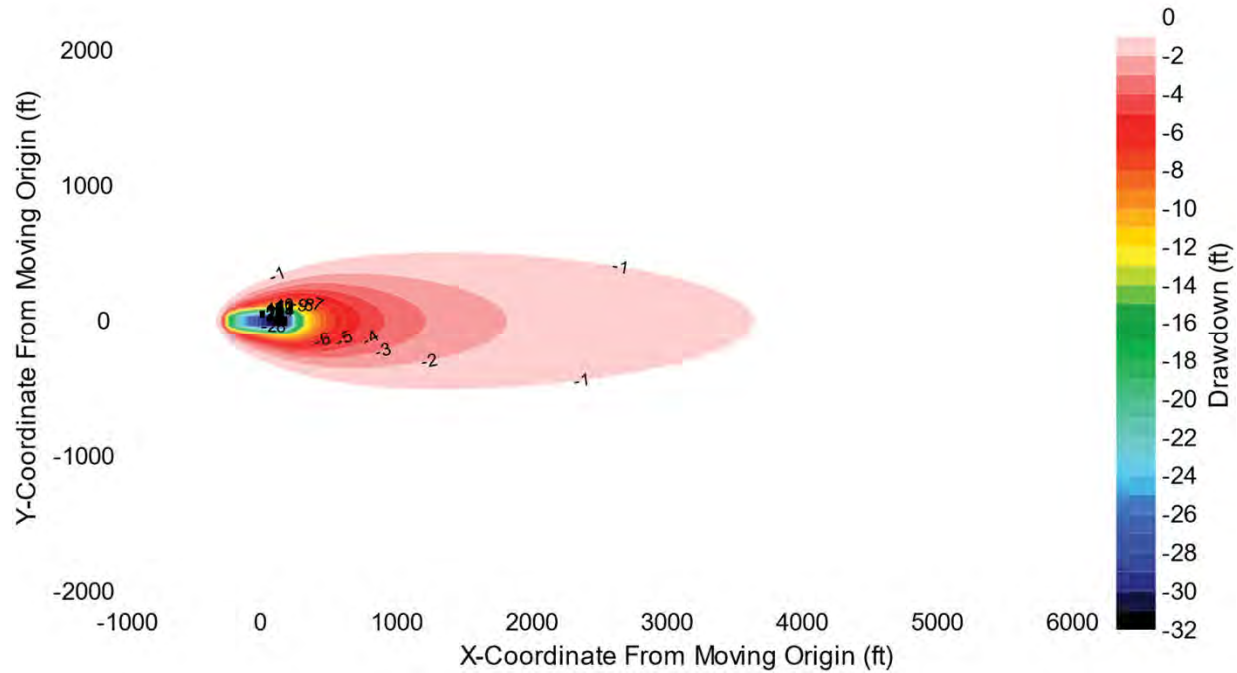
DRAWN BY: DEK
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DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft



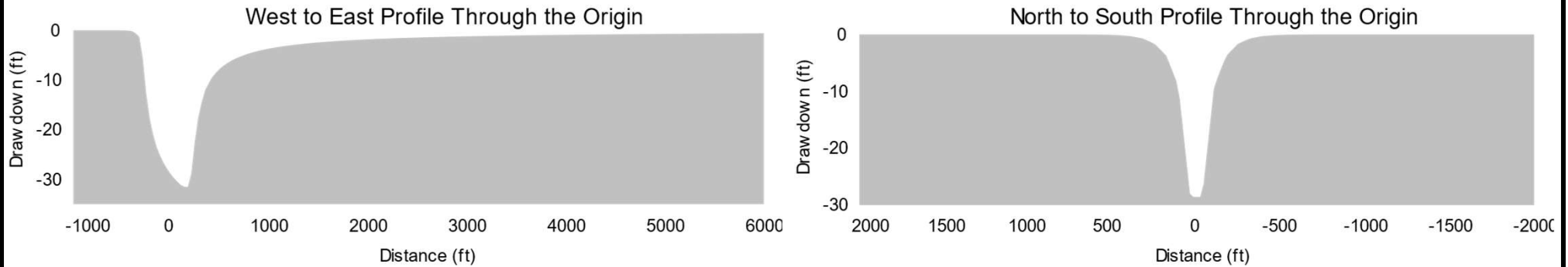
**FIGURE 66: MODEL WATER BUDGET ZONE MAP**  
**TWIN PINES MINERALS**  
 ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 5,000 ft

## Drawdown Due to a Moving Rectangular Pit



## Drawdown Profiles through the Origin



- *The zone of drawdown moves 100 ft/d in the x-direction*
- *Recovery is fast behind the pit, with drawdown decreasing to > -2 ft in less than 20 days*
- *When superimposed on the existing water table, groundwater divides will separate the moving pit from the Okefenokee to the west and the streams to the east*



## FIGURE 67: DRAWDOWN DUE TO THE MOVING MINE

TWIN PINES MINERALS  
ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY: DEK
CHECKED BY: RMH
DRAWING DATE: 1/13/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE:

# TABLES

<b>Table 1. Soil Conductivity Values Used to Determine Initial Grid Block Hydraulic Conductivity</b>	
<b>Soil Type</b>	<b>Hydraulic Conductivity (cm/s)</b>
Unconsolidated Sand	1.00E-02
Semi-Consolidated Sand	1.00E-03
Consolidated Sand	5.00E-05
Silty-Clayey Sand	1.00E-04
Clayey Sand	1.00E-04
Clay	5.00E-05

cm/s = centimeters per second



Table 2. Groundwater Observations Including Piezometers and Soft Data Points											
ObsIDname <sup>0</sup>	Easting <sup>1</sup>	Northing <sup>1</sup>	TOC <sup>2</sup>	ScreenT <sup>3</sup>	ScreenM <sup>4</sup>	ScreenB <sup>5</sup>	Layer	Time	Calc. <sup>6</sup>	Obs. <sup>6</sup>	Calc.-Obs. <sup>6</sup>
PZ41/PZ41	6.75E+05	1.97E+05	161.19	157.19	152.19	147.19	4	0	158.02	160.12	-2.1036
PZ42/PZ42	6.76E+05	1.94E+05	147.76	143.76	138.76	133.76	5	0	147.79	145.51	2.2838
PZ43/PZ43	6.76E+05	1.91E+05	161.88	157.88	152.88	147.88	4	0	156.79	160.37	-3.5796
PZ44/PZ44	6.78E+05	1.89E+05	154.07	149.07	144.07	139.07	4	0	153.57	152.14	1.4303
PZ45D/PZ45D	6.76E+05	2.03E+05	166.67	127.67	122.67	117.67	7	0	163.58	158.89	4.6936
PZ45S/PZ45S	6.76E+05	2.03E+05	166.72	162.72	157.72	152.72	3	0	162.63	164.85	-2.2178
PZ46/PZ46	6.77E+05	1.98E+05	139.99	134.99	129.99	124.99	6	0	136.93	137.43	-0.50338
PZ47/PZ47	6.78E+05	1.93E+05	138.47	133.47	128.47	123.47	6	0	139.86	136.02	3.8447
PZ48D/PZ48D	6.80E+05	1.91E+05	132.78	92.78	87.78	82.78	10	0	127.85	128.55	-0.70469
PZ48S/PZ48S	6.80E+05	1.91E+05	133.20	129.20	126.70	124.20	6	0	127.86	130.27	-2.4068
PZ49/PZ49	6.78E+05	2.05E+05	143.01	139.01	134.01	129.01	5	0	142.27	141.63	0.64132
PZ50/PZ50	6.79E+05	2.03E+05	127.87	123.87	118.87	113.87	7	0	125.76	125.72	0.039926
PZ51D/PZ51D	6.80E+05	1.96E+05	115.73	75.73	70.73	65.73	12	0	112.76	112.61	0.15068
PZ51S/PZ51S	6.80E+05	1.96E+05	115.84	111.84	109.34	106.84	8	0	112.80	113.80	-1.0033
PZ52/PZ52	6.82E+05	2.02E+05	111.44	107.44	102.44	97.44	9	0	110.07	109.55	0.52296
PZ53/PZ53	6.82E+05	1.99E+05	111.51	106.51	101.51	96.51	9	0	109.09	109.88	-0.78789
PZ55D/PZ55D	6.72E+05	1.88E+05	174.92	135.92	130.92	125.92	6	0	173.22	173.34	-0.11594
PZ55S/PZ55S	6.72E+05	1.88E+05	174.83	164.83	159.83	154.83	3	0	173.24	173.32	-0.083611
PZ56D/PZ56D	6.71E+05	1.96E+05	171.58	131.58	126.58	121.58	6	0	168.40	169.38	-0.98139
PZ56S/PZ56S	6.71E+05	1.96E+05	171.50	166.50	164.00	161.50	2	0	168.42	169.56	-1.1416
PZ57D/PZ57D	6.75E+05	1.92E+05	165.89	126.89	121.89	116.89	7	0	162.06	161.56	0.50229
PZ57S/PZ57S	6.75E+05	1.92E+05	165.68	156.68	154.18	151.68	3	0	162.09	164.57	-2.4795
PZ58D/PZ58D	6.77E+05	1.96E+05	139.98	99.98	94.98	89.98	9	0	134.97	134.25	0.71751
PZ58S/PZ58S	6.77E+05	1.96E+05	140.02	130.02	127.52	125.02	6	0	134.98	138.49	-3.5089
L20/L20	6.69E+05	2.00E+05	-	-	-	154.72	3	1	161.26	162.72	-1.4643
L21/L21	6.64E+05	2.02E+05	-	-	-	122.90	6	2	125.50	130.90	-5.3953
L22/L22	6.64E+05	1.95E+05	-	-	-	121.64	6	3	126.17	129.64	-3.4641

0 All "L" observation point are soft data points; groundwater elevations set to two feet below land surface elevation

1 NAD83-East Georgia State Plane Projection (feet)

2 Top of Casing measured in feet above mean sea level (amsl)

3 Top of screen measured in feet (amsl)

4 Middle of screen measured in feet (amsl)

5 Bottom of screen measured in feet (amsl)

6 Groundwater elevation measured in feet (amsl)



Table 3. Water Budget Comparisons of the Pre-Mining and Post-Mining Models						
Source	Pre-Mining		Post-Mining		Difference	
	In	Out	In	Out	In	Out
Storage*	0.00	0.00	0.00	0.00	0.00	0.00
Constant Head*	0.00	572,079.38	0.00	572,114.56	0.00	-35.19
Drains*	0.00	40,802.34	0.00	40,767.18	0.00	35.17
Recharge**	612,881.69	0.00	612,881.69	0.00	0.00	0.00
<b>Total</b>	<b>612,881.69</b>	<b>612,881.72</b>	<b>612,881.69</b>	<b>612,881.75</b>	<b>0.00</b>	<b>-0.02</b>

\* Cumulative Volume (ft<sup>3</sup>)

\*\* Rates for time step (ft<sup>3</sup>/day)

Table 4. Water Budget Comparison of the Pre-Mining and Post-Mining Models - Zone 1						
Source	Pre-Mining		Post-Mining		Differences	
	In	Out	In	Out	In	Out
Constant Head*	0.00	249,000.00	0.00	248,700.00	0.00	300.00
Drains*	0.00	29,670.00	0.00	29,630.00	0.00	40.00
Recharge**	276,900.00	0.00	276,900.00	0.00	0.00	0.00
Zone 2 to 1	74,254.00	0.00	72,518.00	0.00	1,736.00	0.00
Zone 1 to 2	0.00	72,489.00	0.00	71,092.00	0.00	1,397.00

\* Cumulative Volume (ft<sup>3</sup>)

\*\* Rates for time step (ft<sup>3</sup>/day)

Table 5. Water Budget Comparison of the Pre-Mining and Post-Mining Models - Zone 2						
Source	Pre-Mining		Post-Mining		Differences	
	In	Out	In	Out	In	Out
Constant Head*	0.00	323,080.00	0.00	323,420.00	0.00	-340.00
Drains*	0.00	11,133.00	0.00	11,137.00	0.00	-4.00
Recharge**	335,980.00	0.00	335,980.00	0.00	0.00	0.00
Zone 2 to 1	0.00	74,254.00	0.00	72,518.00	0.00	1,736.00
Zone 1 to 2	72,489.00	0.00	71,092.00	0.00	1,397.00	0.00

\* Cumulative Volume (ft<sup>3</sup>)

\*\* Rates for time step (ft<sup>3</sup>/day)