HAMILTON COUNTY MINING ORDINANCE

2017 ANNUAL PROGRESS REPORT AND 2018 ESTIMATES

FOR YEARS 2017-2018

April 15, 2018

SUBMITTED TO

HAMILTON COUNTY BOARD OF COUNTY COMMISSIONERS

on

APRIL 13, 2018

PRESENTED

PCS PHOSPHATE - WHITE SPRINGS

White Springs Agricultural Chemical, Inc. d.b.a. PCS Phosphate

SUMMARY OF ACTIVITIES

HAMILTON COUNTY MINE

YEAR 2017

ACRES MINED	**556**
MINED ACRES CONTOURED TO FINAL GRADE	**413**
MINED ACRES REVEGETATED	**309**

YEAR 2018 (ESTIMATES)

ACRES MINED	**600**
MINED ACRES REVEGETATED	**1,005**

TEN YEAR MINING AND RECLAMATION RECORD 2008-2017

ACRES MINED	**6,226**
ACRES RECLAIMED	**7,695**

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PROPOSED 2018 MINING SUMMARY

- Proposed mining area for 2018 mine wide --- See drawing number A-8989

- Proposed mining area location detail --- See drawing numbers A-8990 through A-8993.

In general, the areas to be mined in 2018 can be characterized as pine plantations interspersed with wetlands. Most of the areas have been managed for forestry operations. Specific Florida Land Use and Cover Classification System Codes (FLUCCS) can be found in the Master Mining Plan and the Master Mining Plan Amendment approved by Hamilton County in August 1996, February 2003, August 2013, and March 2018 respectively. The FLUCCS codes of the areas to be mined in 2018 can be identified as follows:

Dragline #2 is in FLUCCS:		
21.0%	620	Wetland Coniferous Forest
7.1%	411	Pine Flatwoods
40.9%	434	Mixed Hardwood Forest
31%	441	Coniferous Plantations

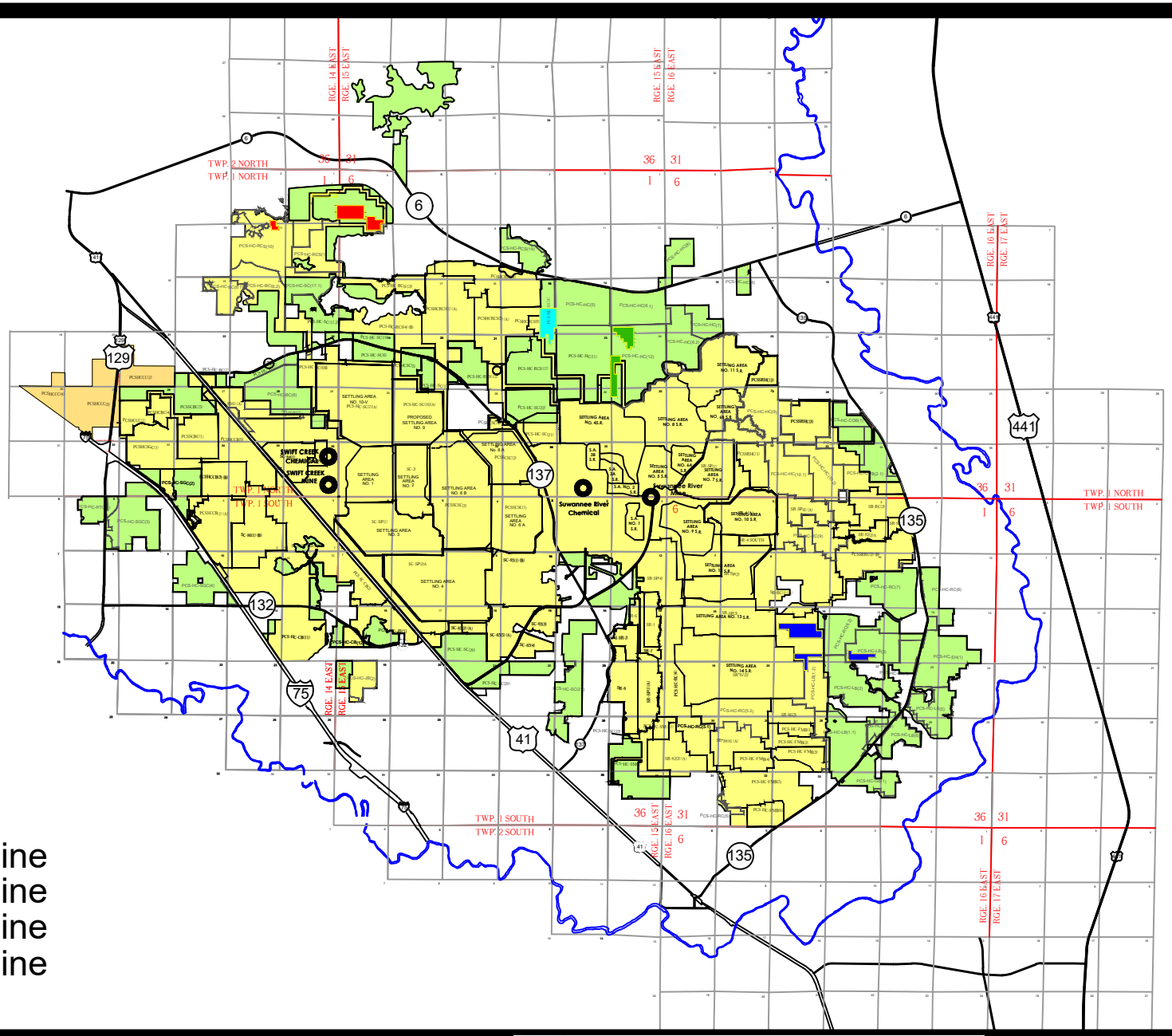
Dragline #3 is in FLUCCS:		
55.9%	620	Wetland Coniferous Forest
4.2%	411	Pine Flatwoods
39.9%	441	Coniferous Plantations

Dragline #4 is in FLUCCS:		
57.0%	411	Pine Flatwoods
8.8%	441	Coniferous Plantations
29.6%	630	Wetland Forested Mixed
0.1%	620	Wetland Coniferous Forest

Dragline #5 is in FLUCCS:		
18.1	411	Pine Flatwoods
8.7	441	Coniferous Plantations
0%	630	Wetland Forested Mixed
68.7%	611	Bay Swamps
4.5%	617	Mixed Wetland Hardwoods

The mining activity to take place in each of the areas is in preparation for and commencement of phosphate mining. The description of the activities is found below and in Section 4 of the Master Mining Plan dated March 2018.

> PCS Phosphate mines phosphate rock in the manner most commonly employed by operators in the Florida phosphate industry. Electrically powered draglines strip the overburden, averaging 24 feet in thickness, and excavate the exposed phosphate bearing ore (matrix) that is approximately 13 feet thick. The stripped overburden is cast back in the mined area and the matrix placed in an earthen sump, where it is mixed with high-pressure water to form pumpable slurry. The matrix slurry is pumped to the Hamilton County Mine processing plant where the matrix is treated to separate the clays, sand and phosphate rock. The process includes washing, screening, sizing and flotation. The recovered phosphate rock is stockpiled and transferred to PCS Phosphate Swift Creek and Suwannee River plants for conversion to phosphate fertilizer products or it will be shipped off-site by truck or rail."



SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

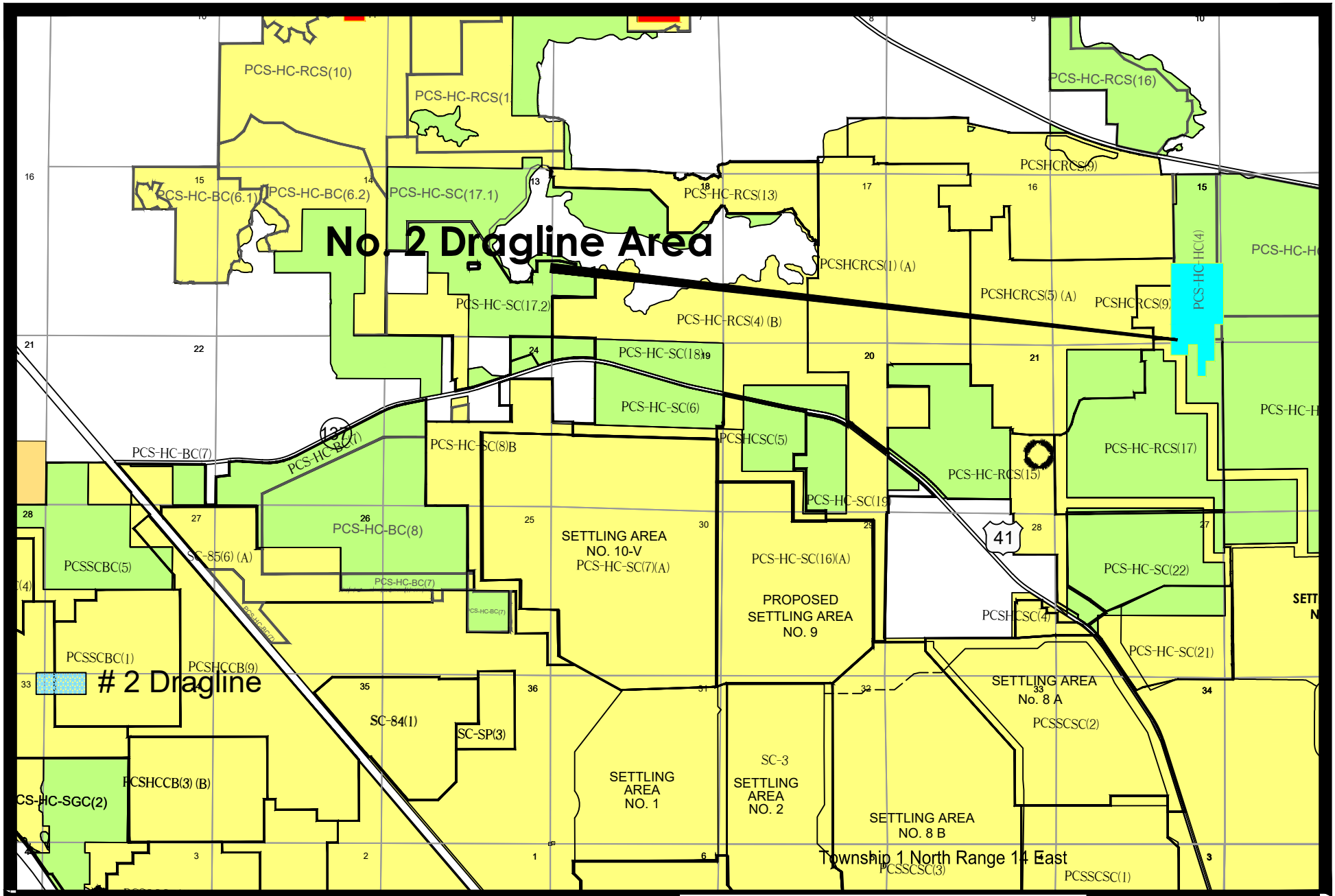
SPECIAL PERMIT 03-1

SPECIAL PERMIT LONCALA

HAMILTON COUNTY MINE
2017 ANNUAL REPORT
PROPOSED 2018 MINING

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/19/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8989
FILE NAME:	2017 Annual County Report.dwg



SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

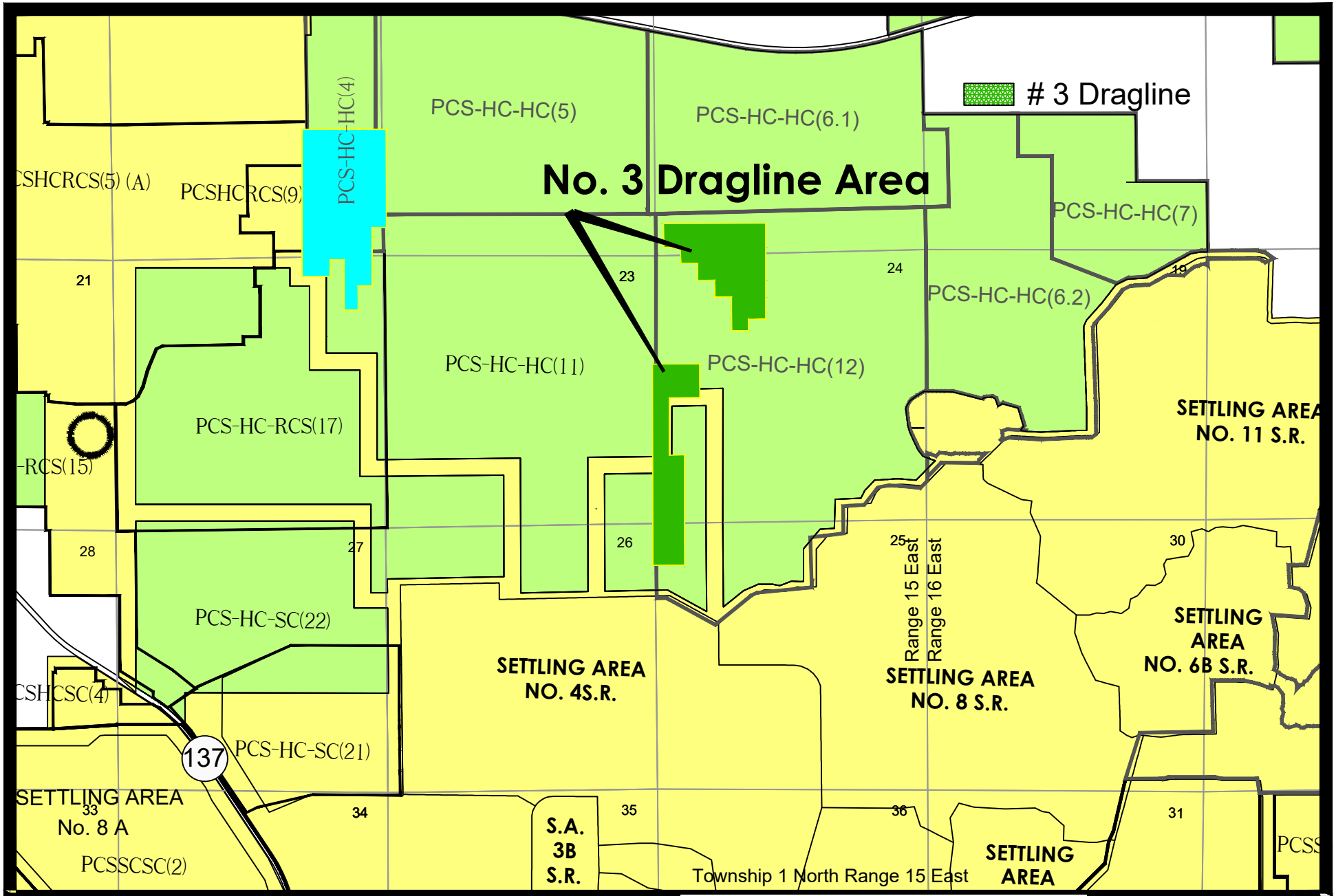
SPECIAL PERMIT 03-1

SPECIAL PERMIT Loncala

HAMILTON COUNTY MINE
2017 ANNUAL REPORT
PROPOSED 2018 MINING
NO 2 DRAGLINE

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/20/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8990
FILE NAME:	2017 Annual County Report.dwg



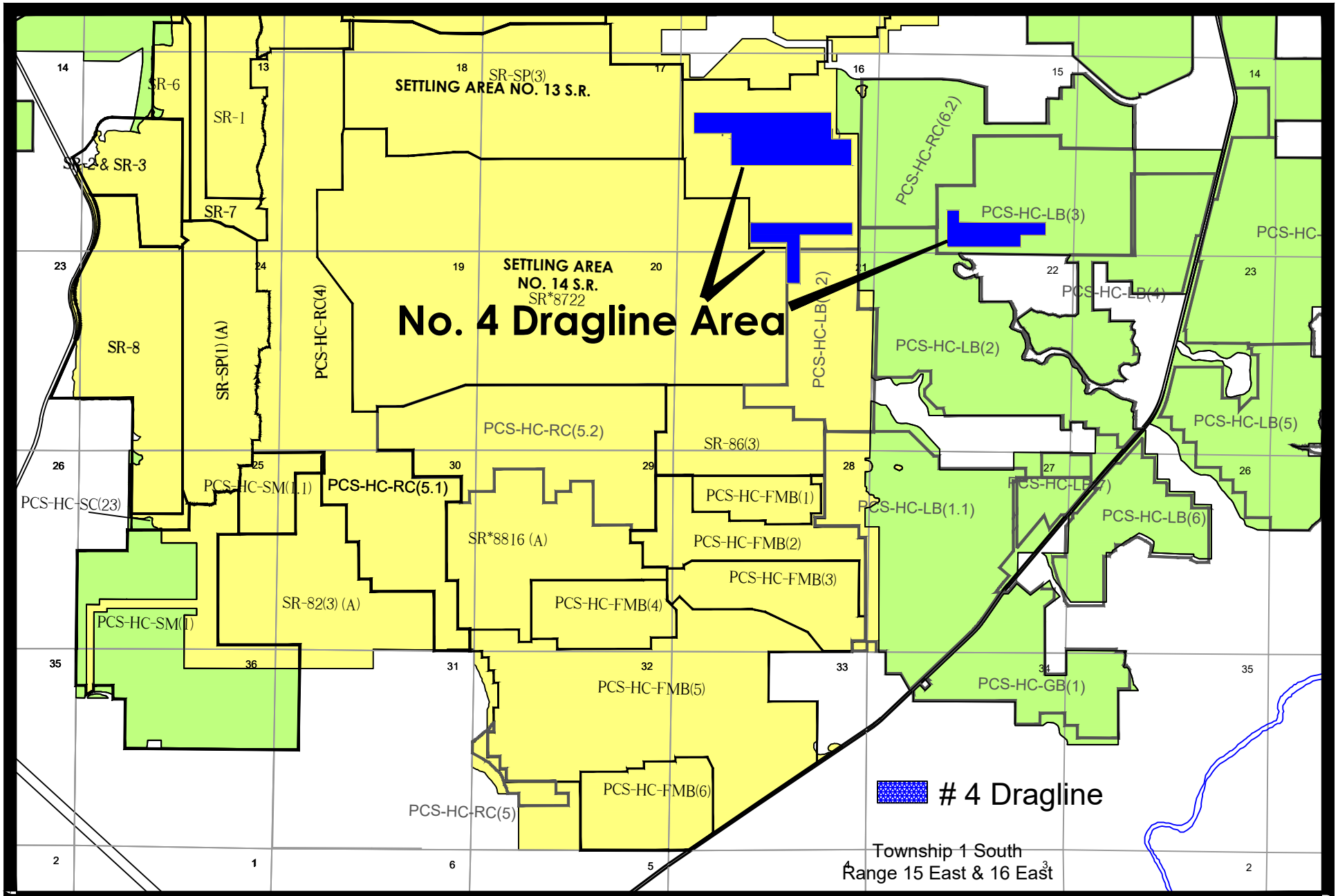
SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

SPECIAL PERMIT 03-1

HAMILTON COUNTY MINE
2017 ANNUAL REPORT
PROPOSED 2018 MINING
NO 3 DRAGLINE

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/20/187
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8991
FILE NAME:	2017 Annual County Report.dwg



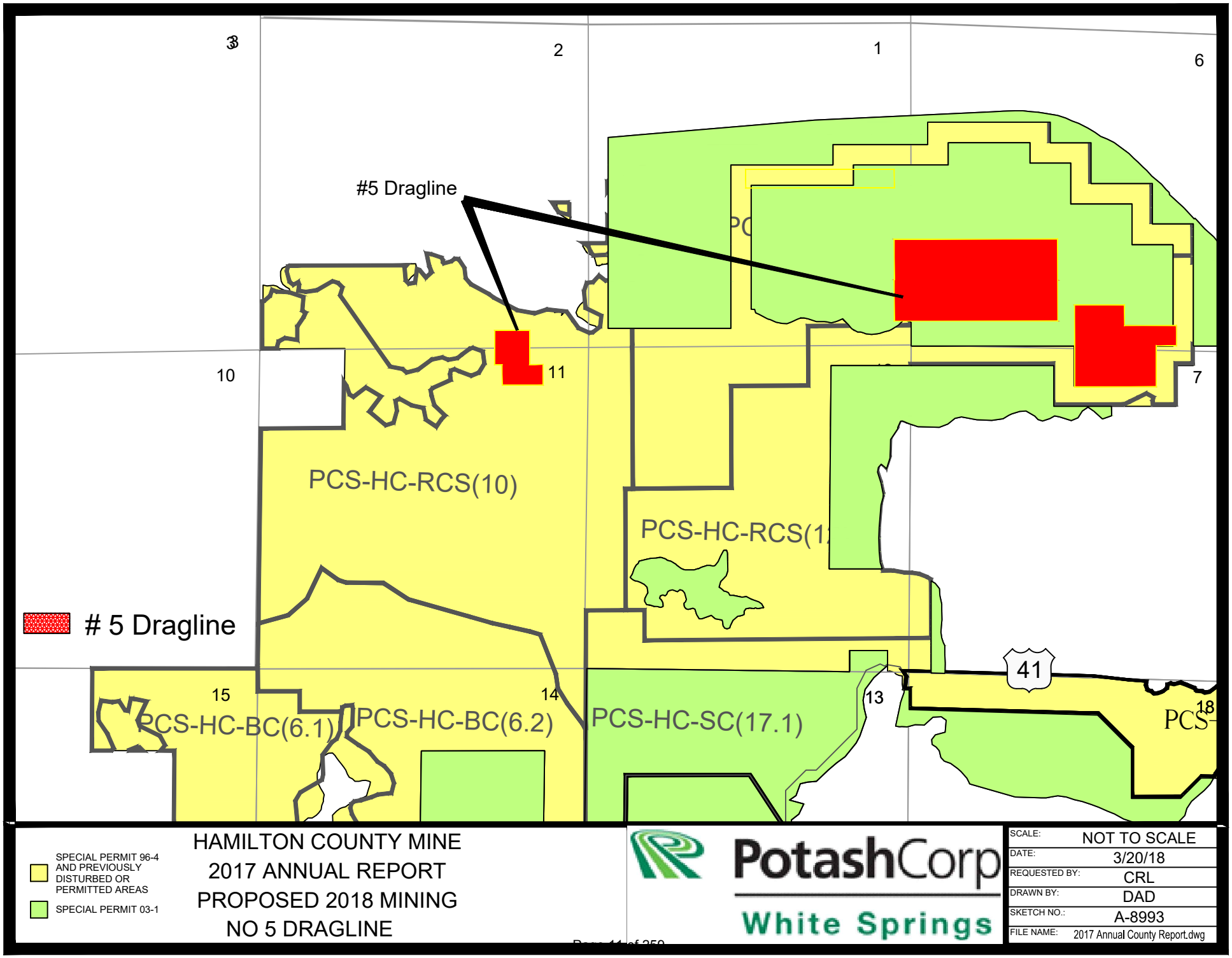
SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

SPECIAL PERMIT 03-1

HAMILTON COUNTY MINE
2017 ANNUAL REPORT
PROPOSED 2018 MINING
NO 4 DRAGLINE

PotashCorp White Springs

SCALE:	NOT TO SCALE
DATE:	3/20/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8992
FILE NAME:	2017 Annual County Report.dwg


3
2
1
6
#5 Dragline
10
11
7
PCS-HC-RCS(10)
PCS-HC-RCS(1
5 Dragline
41
15
14
13
18
PCS-HC-BC(6.1)
PCS-HC-BC(6.2)
PCS-HC-SC(17.1)
PCS
SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
SPECIAL PERMIT 03-1
HAMILTON COUNTY MINE
2017 ANNUAL REPORT
PROPOSED 2018 MINING
NO 5 DRAGLINE
PotashCorp
White Springs
SCALE: NOT TO SCALE
DATE: 3/20/18
REQUESTED BY: CRL
DRAWN BY: DAD
SKETCH NO.: A-8993
FILE NAME: 2017 Annual County Report.dwg

PROPOSED 2018 RECLAMATION SUMMARY
INCLUDING
DESCRIPTION OF RECLAMATION METHODS,
LANDFORMS AND VEGETATION

- 2018 Proposed reclamation mine wide --- See drawing number A-8998.

- 2018 Proposed reclamation activity by reclamation program areas --- See Drawings A-8999 through A-9003 and A-9009 through A-9018. Each program area is further described below:

PCS Phosphate - White Springs utilizes three techniques for reclamation of mined lands. The techniques are Land and Lakes, Tailings Fill, and Clay Fill. Landforms such as lakes, wetlands, and uplands are created. The three techniques are described below:

Land and Lakes: Following mining, uplands and wetlands are created by leveling and grading mine overburden spoil to design elevations. The areas void of overburden become water bodies. Wetlands created within the lakes are at times flooded and at times dry depending on the water level within the lake.

Tailings Fill: Following mining, sand tailings from the mill (beneficiation plant) are pumped in between the overburden piles to a pre-determined elevation. Remaining overburden material is used to cover the sand to produce a surface material that will support vegetation. By establishing a specific elevation and/or directing surface runoff in the desired direction, wetlands, lakes, or uplands can be developed.

Clay Fill: These areas are the repositories for the phosphatic clays separated at the mill. Following mining, the areas are encompassed by earthen dams into which the dilute clays are introduced. The areas are managed to obtain the maximum amount of storage reasonably possible. Following use as a clay settling area, the clays are dewatered and allowed to dry. Based on final elevations; areas of uplands, wetland and possibly lakes can be created.

Reclamation Program Areas for 2018

(See Drawings A-8998 through A-9003 and A-9009 through A-9018)

PCS-HC-RC(5.2):

This reclamation program uses the land and lakes reclamation technique. Reclamation commenced in this area in 2015. Additional mining in occurred in 2015 and 2016. Contouring of mined areas will continue in 2018. Areas contoured in 2018 will be planted during the 2018 planting season.

PCS-HC-BC(7):

This reclamation program uses the land and lakes reclamation technique. Contouring of mined areas will continue in 2018. Areas contoured in 2018 will be planted during the 2018 planting season

PCS-HC-BC(8):

This reclamation program uses the land and lakes reclamation and sand tailings techniques to construct wetlands and open water. Reclamation commenced in this area in 2016. Sand tailings in this unit has been completed. Contouring of mined areas will continue in 2018. Areas contoured in 2018 will be planted during the 2018 planting season.

PCS-HC-SGC(2):

This reclamation program uses the tailings fill reclamation technique. Tailings fill operations was completed in 2016. Areas contoured in 2018 will be planted during the 2018 planting season.

PCS-HC-CC(2):

This reclamation program uses the tailings fill reclamation technique. Tailings fill operations was completed in 2017. Areas contoured in 2018 will be planted during the 2018 planting season.

PCS-HC-CC(4):

This reclamation program uses the tailings fill reclamation technique. Tailings fill operations was completed in 2018. Areas contoured in 2018 will be planted during the 2018 planting season.

PCS-HC-LB(1.2):

This reclamation program uses the land and lakes reclamation technique. Areas contoured in 2018 will be planted during the 2018 planting season.

PCS-HC-FMB(2):

This reclamation program uses the land and lakes reclamation technique. Contouring of mined areas will commence in 2018. Areas contoured in 2018 will be planted during the 2018 planting season.

PCS-HC-HC(6.1):

This reclamation program uses the land and lakes reclamation technique. Contouring of mined areas will commence in 2018. Areas contoured in 2018 will be planted during the 2018 planting season.

Land forms and vegetation are shown on drawing numbers: A-9000, A-9003, A-9011, A-9014, and A-9017. Vegetation is based on the Florida Land Use and Cover Classification System (FLUCCS). Coniferous forest areas are planted with one or more of the pine species such as slash, longleaf or loblolly and a mixture of hardwoods such as live oak, laurel oak, sweetgum, red cedar, etc. Areas planted to tree plantations are planted with one of the above mentioned pine species.

Hardwood forest mixed areas are planted where neither upland conifers nor hardwoods achieve a 66 percent crown canopy dominance.

Wetlands hardwood forest areas are planted such that forested hardwood species dominate all other species. Hardwood species such as red maples, sweet bay, swamp bay, blackgum, river birch and swamp chestnut oak are examples of trees planted to achieve a wetland hardwood forest. Wetland forested mixed areas are where neither hardwoods nor conifers dominate the canopy. Species, such as cypress, red maple, pond pine, sweet gum, river birch and others are planted or may be found in wetland forested mixed areas.

It should be noted that reclamation contouring and, to a lesser degree, tree planting is a weather dependent activity that may require the substitution of a project for another due to conditions beyond our control. PCS Phosphate plans its activities so that the identified areas are normally available for construction activities. However, alternate areas may be reclaimed other than those identified if weather conditions or ground conditions dictate. The goal to reclaim at least as many acres per year as mined will continue to be pursued even if areas are changed.

SCHEDULE OF RECLAMATION OPERATIONS

The following is a projection of activities and completion dates for the following programs: (Note: Only reclamation programs being actively reclaimed in 2018 are shown).

Existing Reclamation Unit 1	Pre-Mining Disturbance 2	Disturbance	Mining (4) (6)	Mining Operations 5	Earthmoving & Revegetation 7	Establishment 7	Comments
PCS-HC-CB(3)	Existing	Existing	1996-1997	2016	2017	2018-2022	reclamation continues
PCS-HC-BC(7)	Existing	2013	2013-2016	2016-2017	2016-2019	2017-2021	reclamation continues
PCS-HC-BC(8)	Existing	2012-2013	2012-2016	2016-2017	2016-2019	2019-2023	reclamation continues
PCS-HC-RC(5.2)	Existing	2014	2014-2016	N/A	2015-2018	2018-2022	reclamation continues
PCS-HC-CC(2)		2013	2013	2017	2015-2018	2019-2023	reclamation continues
PCS-HC-LB(1.2)		2016-2017	2017-2018	N/A	2018	2019-2023	reclamation continues
PCS-HC-CC(4)		2014-2015	2015	2017-2018	2018-2019	2020-2024	reclamation continues
PCS-HC-FMB(2)		2015-2016	2016	N/A	2018	2019-2023	reclamation continues
PCS-HC-SGC(2)	Existing	2010-2011	2011-2012	2014-2016	2015-2018	2018-2022	reclamation continues

Notes:

1) See Drawing No. A-8998 for Reclamation Program locations.

2) Pre-mining disturbance - existing or future ditch or corridor areas within program.

3) The dates shown are based on updated CRP sequence, which show the updated mine plan

Dates may change due to economic conditions, varying production schedules, equipment needs, geologic conditions, and or varying regulatory requirements.

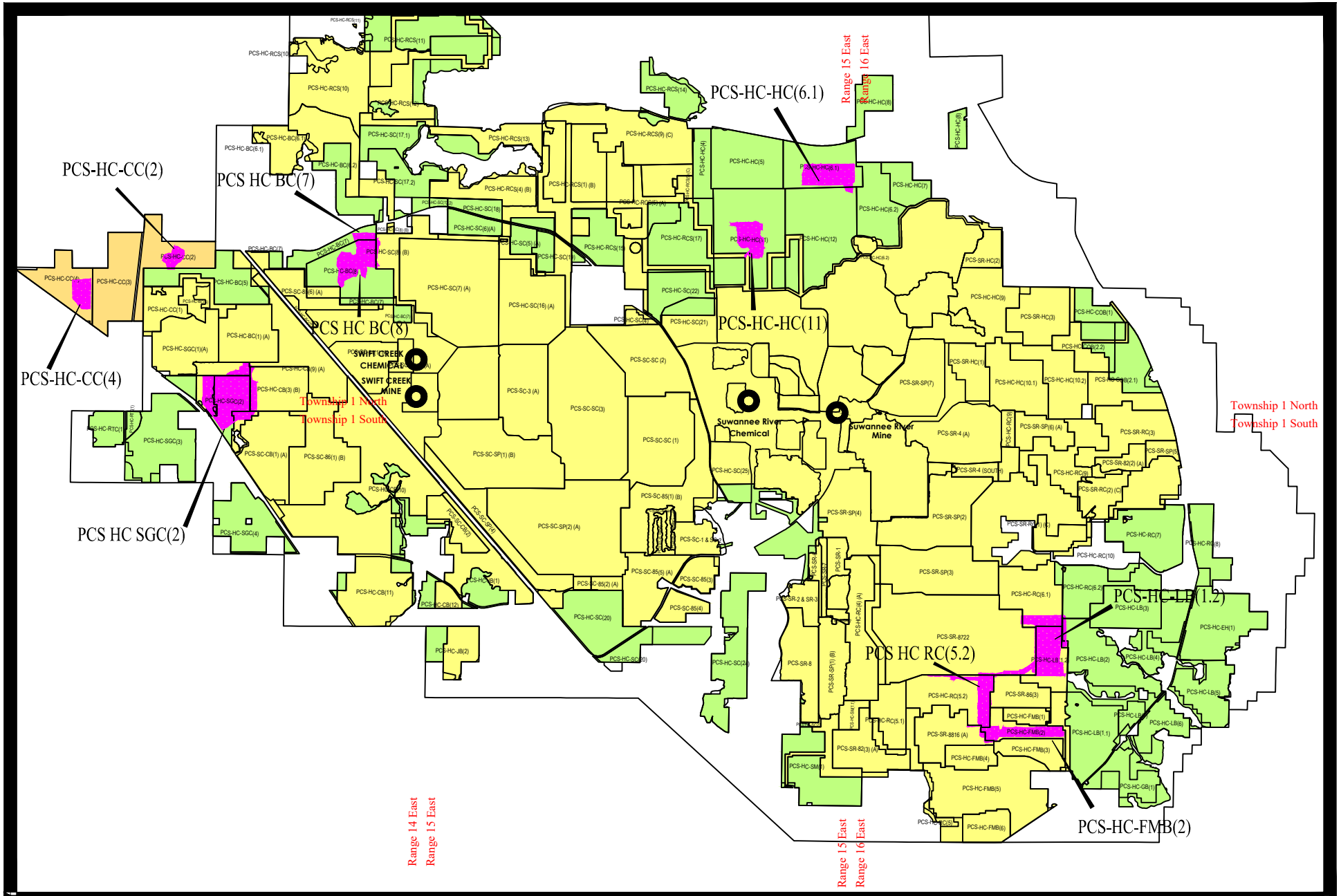
4) Mining - the actual years of mining.

5) Mining Operations - Operations associated with tailings, mudball disposal, or clay deposition.

Clay operations includes six years of dewatering after completion of clay deposition.

6) Mining may occur in programs that have previously been released. Adjacent programs will include the areas to be disturbed / mined. Mining timing may or may not be included in above analysis depending on the area of overlap.

7) Earthmoving, revegetation, and establishment may begin prior to dates shown.

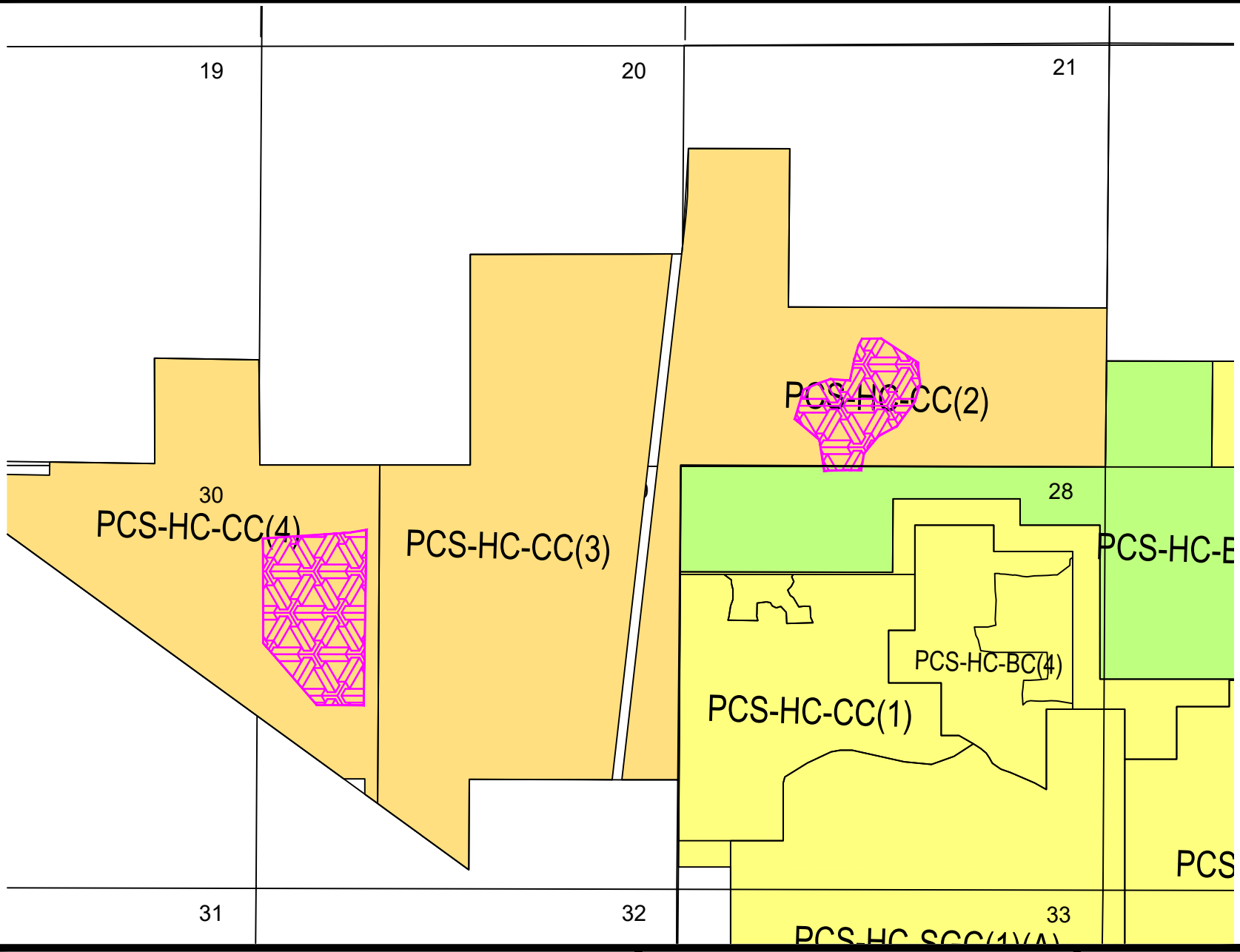


Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1
- SPECIAL PERMIT 021

PotashCorp
White Springs

SCALE:	1" = 10,000'
DATE:	3/20/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8998
FILE NAME:	2018 Proposed Reclamation.dwg

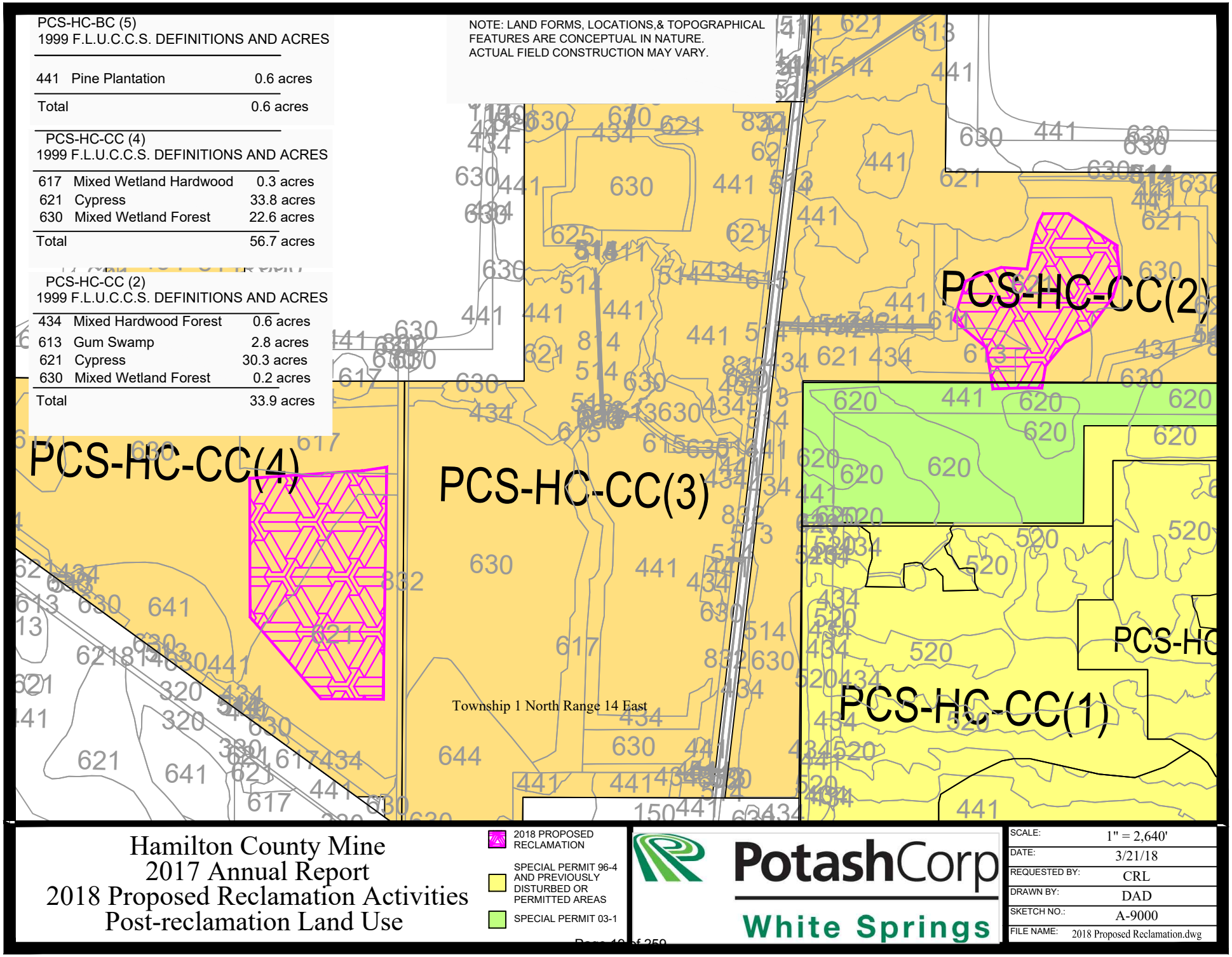


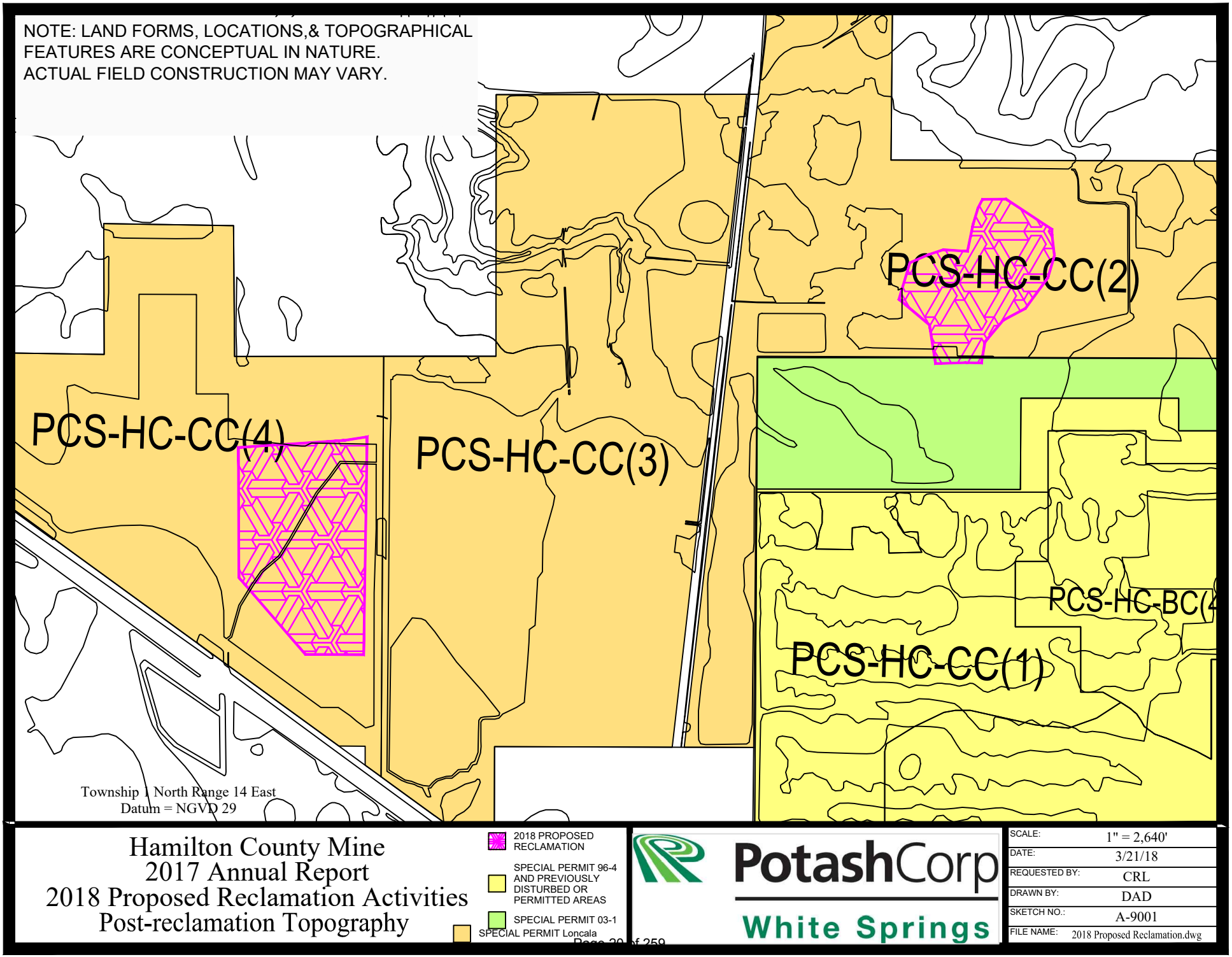
Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS SPECIAL PERMIT 03-1
- SPECIAL PERMIT Loncala

PotashCorp
White Springs

SCALE:	1" = 2,640'
DATE:	3/20/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8999
FILE NAME:	2018 Proposed Reclamation.dwg


PCS-HC-BC (5)
1999 F.L.U.C.C.S. DEFINITIONS AND ACRES
441 Pine Plantation 0.6 acres
Total 0.6 acres
PCS-HC-CC (4)
1999 F.L.U.C.C.S. DEFINITIONS AND ACRES
617 Mixed Wetland Hardwood 0.3 acres
621 Cypress 33.8 acres
630 Mixed Wetland Forest 22.6 acres
Total 56.7 acres
PCS-HC-CC (2)
1999 F.L.U.C.C.S. DEFINITIONS AND ACRES
434 Mixed Hardwood Forest 0.6 acres
613 Gum Swamp 2.8 acres
621 Cypress 30.3 acres
630 Mixed Wetland Forest 0.2 acres
Total 33.9 acres
NOTE: LAND FORMS, LOCATIONS,& TOPOGRAPHICAL FEATURES ARE CONCEPTUAL IN NATURE. ACTUAL FIELD CONSTRUCTION MAY VARY.
PCS-HC-CC(4)
PCS-HC-CC(3)
PCS-HC-CC(2)
PCS-HC-CC(1)
PCS-HC
Township 1 North Range 14 East
Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Land Use
2018 PROPOSED RECLAMATION
SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
SPECIAL PERMIT 03-1
PotashCorp
White Springs
SCALE: 1" = 2,640'
DATE: 3/21/18
REQUESTED BY: CRL
DRAWN BY: DAD
SKETCH NO.: A-9000
FILE NAME: 2018 Proposed Reclamation.dwg



Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Topography

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1
- SPECIAL PERMIT Loncala

PotashCorp
White Springs

SCALE:	1" = 2,640'
DATE:	3/21/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
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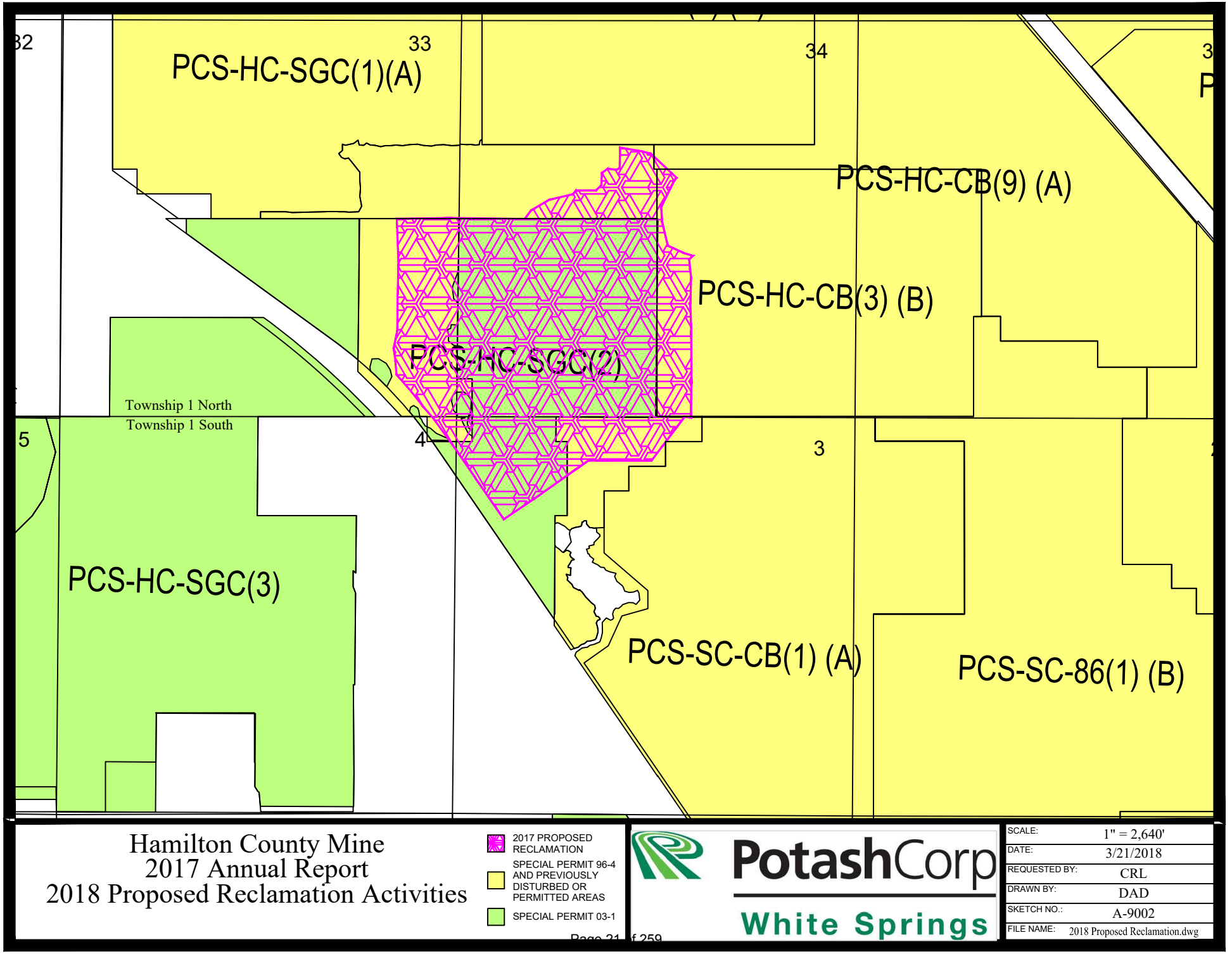
FILE NAME:	2018 Proposed Reclamation.dwg



Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities

- 2017 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,640'
DATE:	3/21/2018
REQUESTED BY:	CRL
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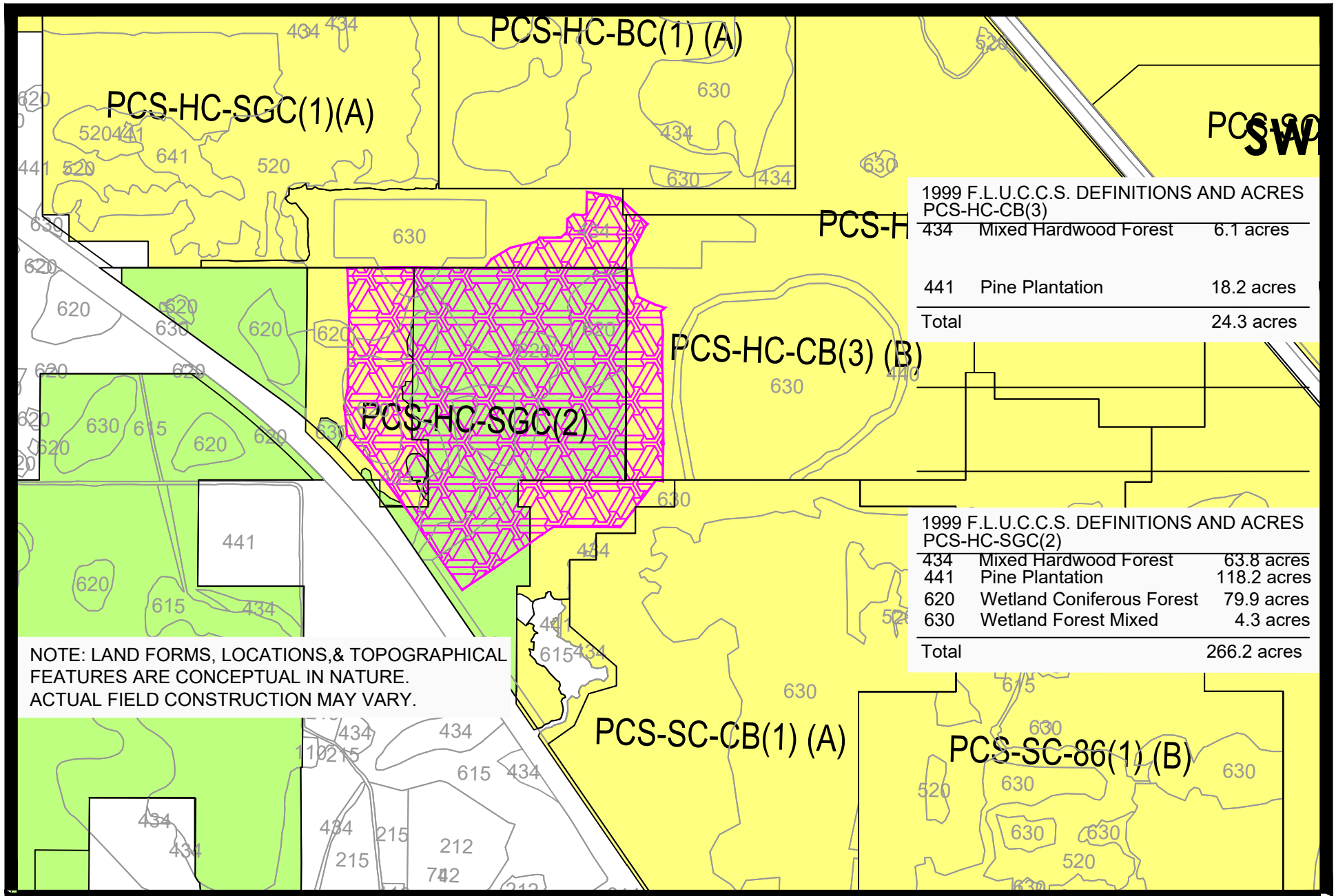
FILE NAME:	2018 Proposed Reclamation.dwg



Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Land Use

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,640'
DATE:	3/21/18
REQUESTED BY:	CRL
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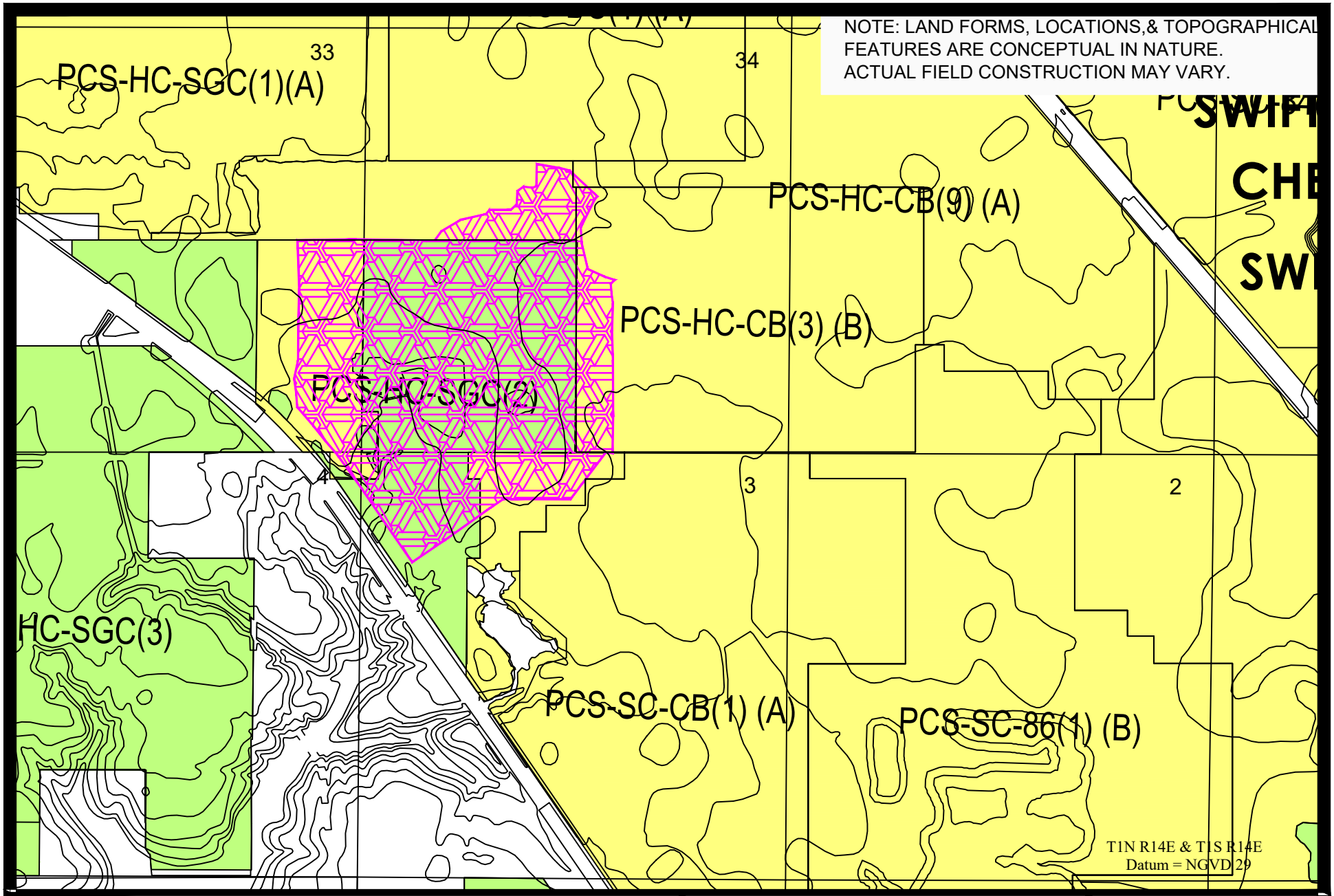
FILE NAME:	2018 Proposed Reclamation.dwg

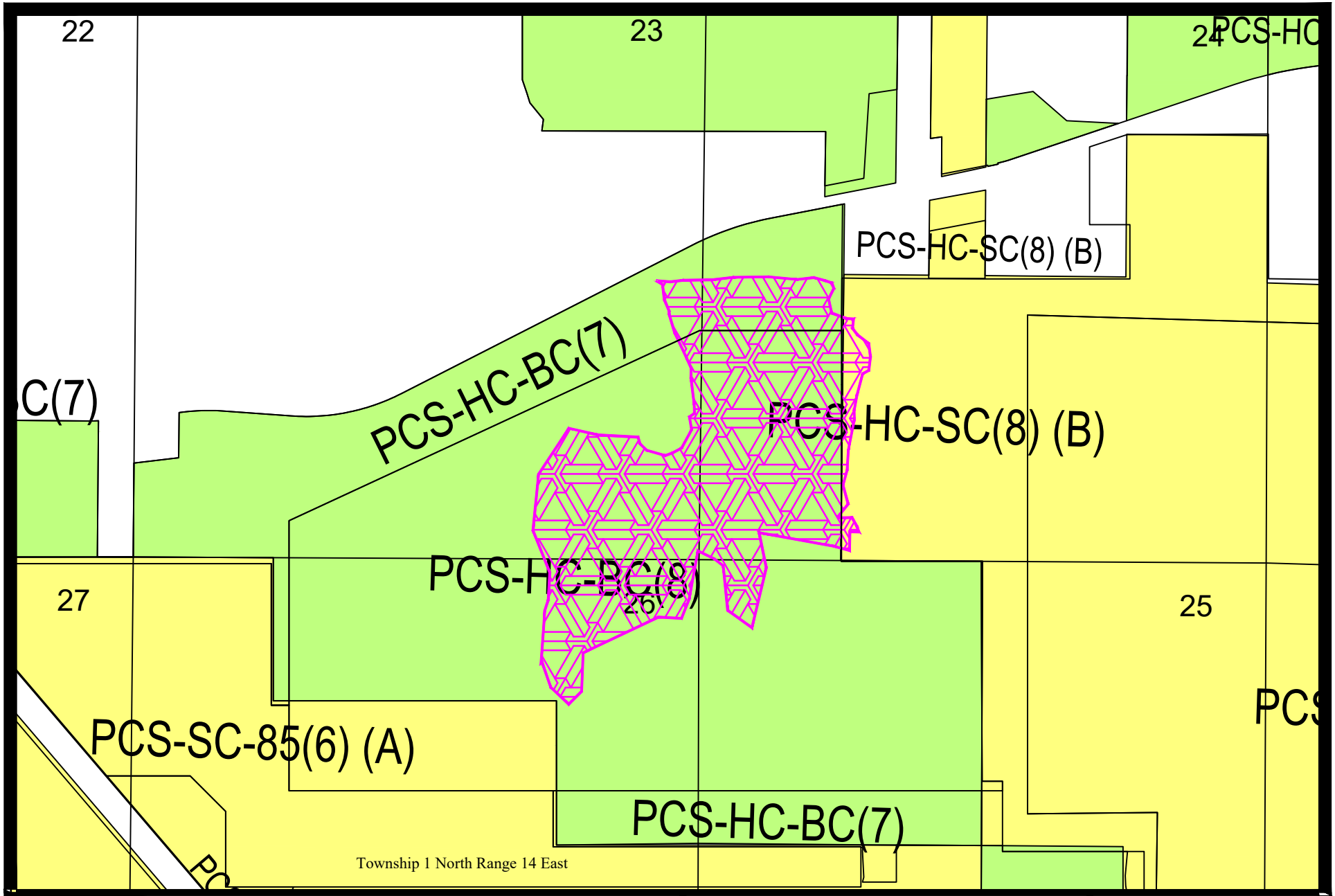


Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Topography

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,640'
DATE:	3/21/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-9009
FILE NAME:	2018 Proposed Reclamation.dwg



Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,000'
DATE:	3/21/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
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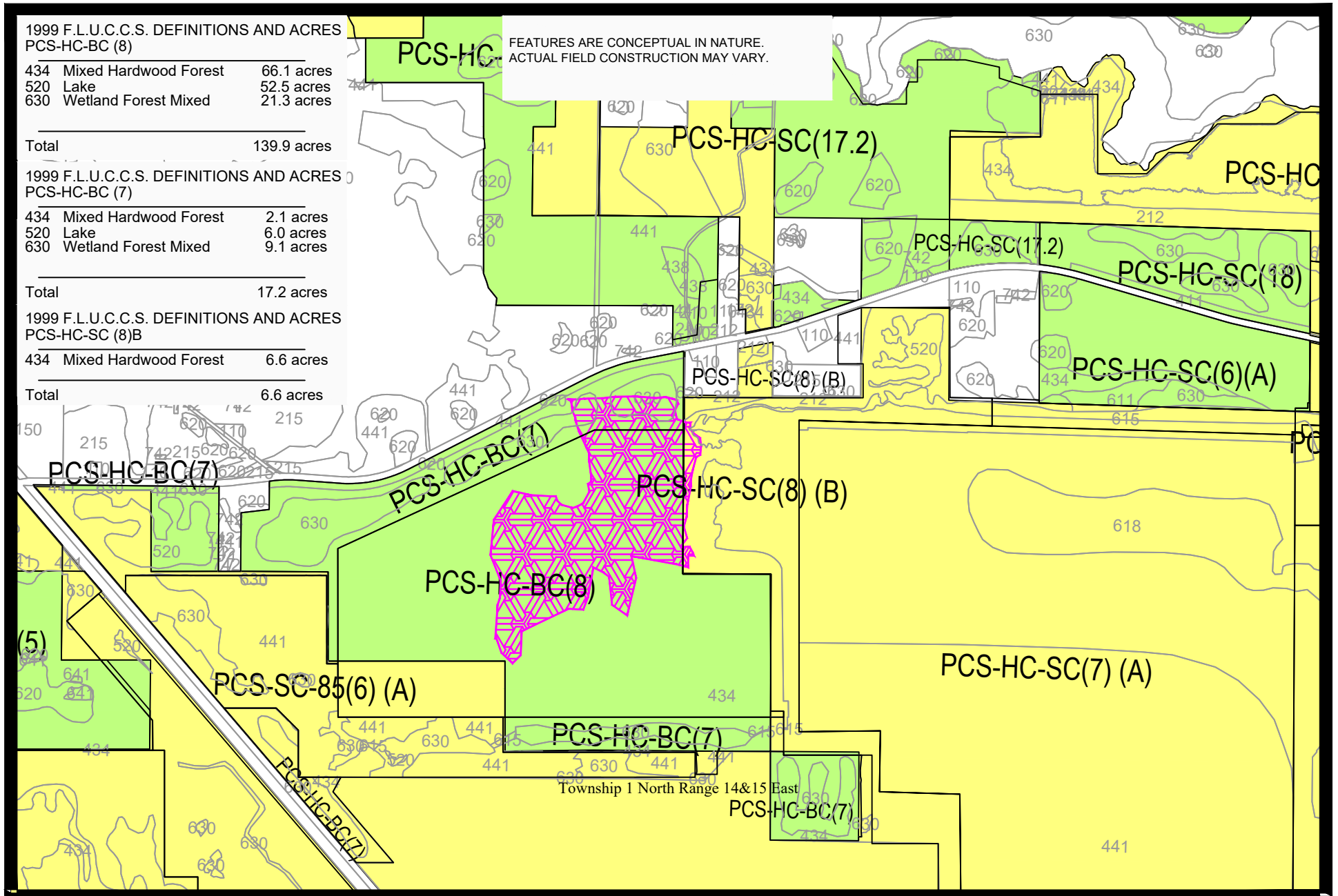
FILE NAME:	2018 Proposed Reclamation.dwg



Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Land Use

2018 PROPOSED RECLAMATION

SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

SPECIAL PERMIT 03-1

PotashCorp White Springs

SCALE:	1" = 2,000'
DATE:	3/21/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
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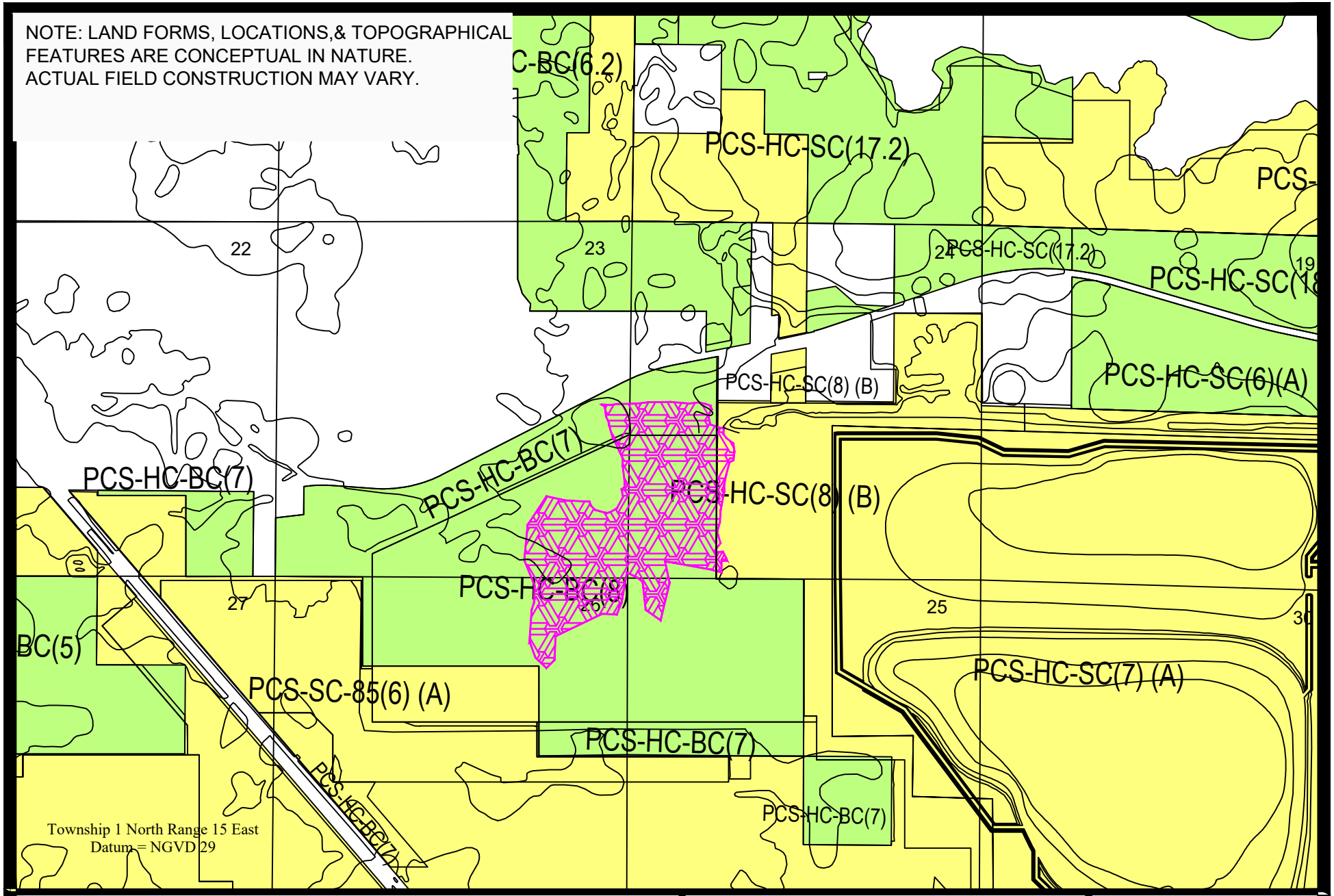
FILE NAME:	2018 Proposed Reclamation.dwg



Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Topography

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,000'
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REQUESTED BY:	CRL
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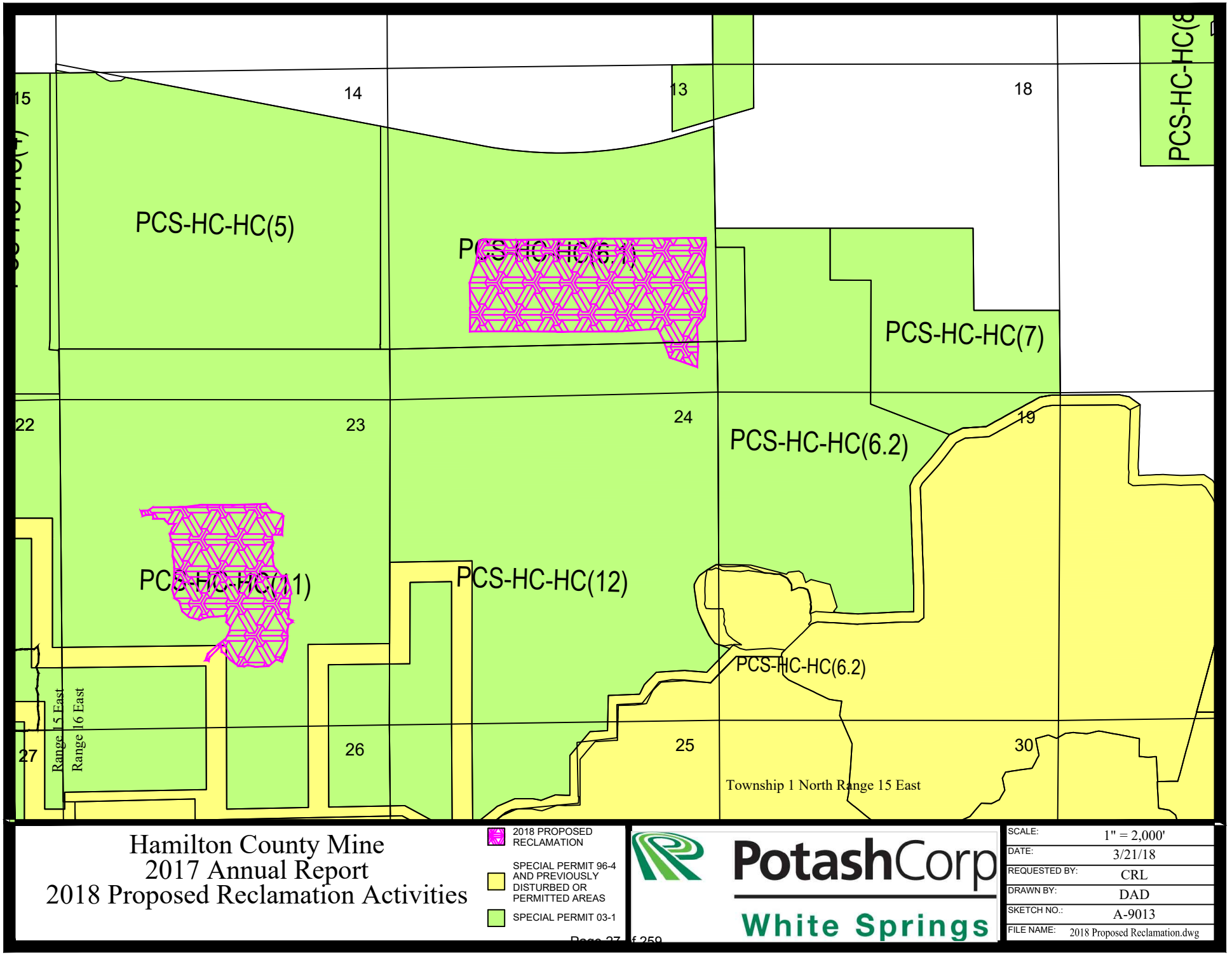

Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,000'
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REQUESTED BY:	CRL
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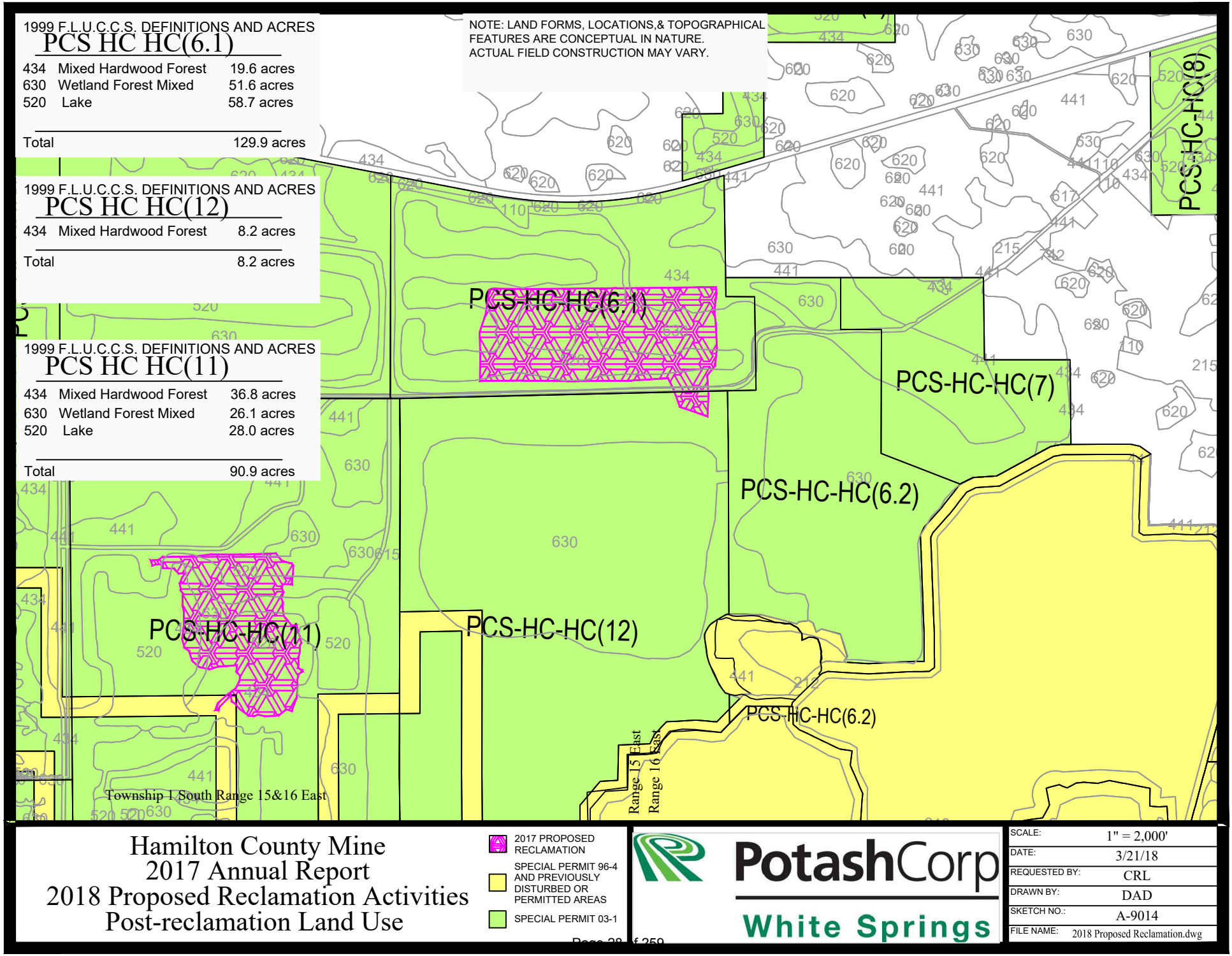

Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Land Use

- 2017 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,000'
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REQUESTED BY:	CRL
DRAWN BY:	DAD
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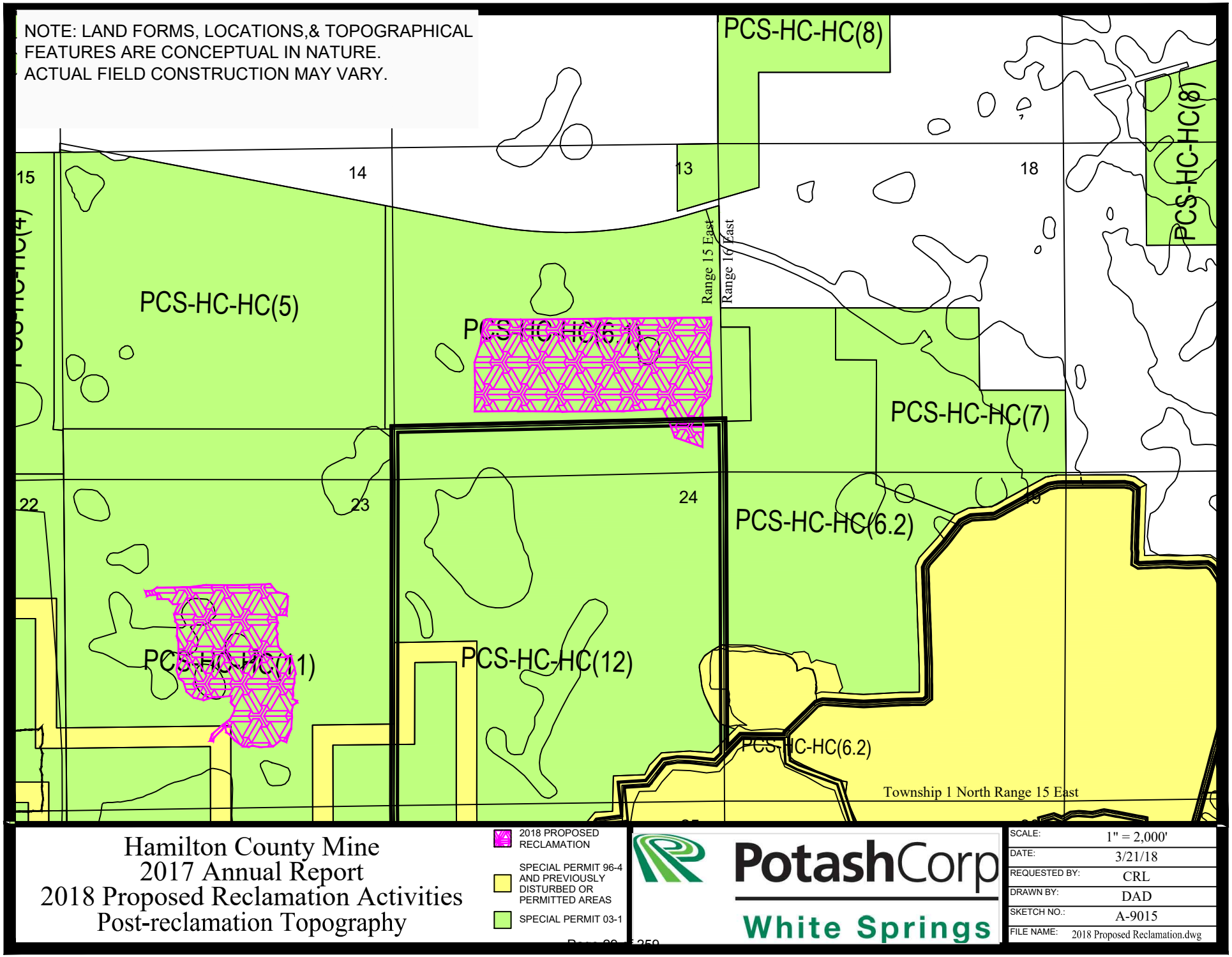
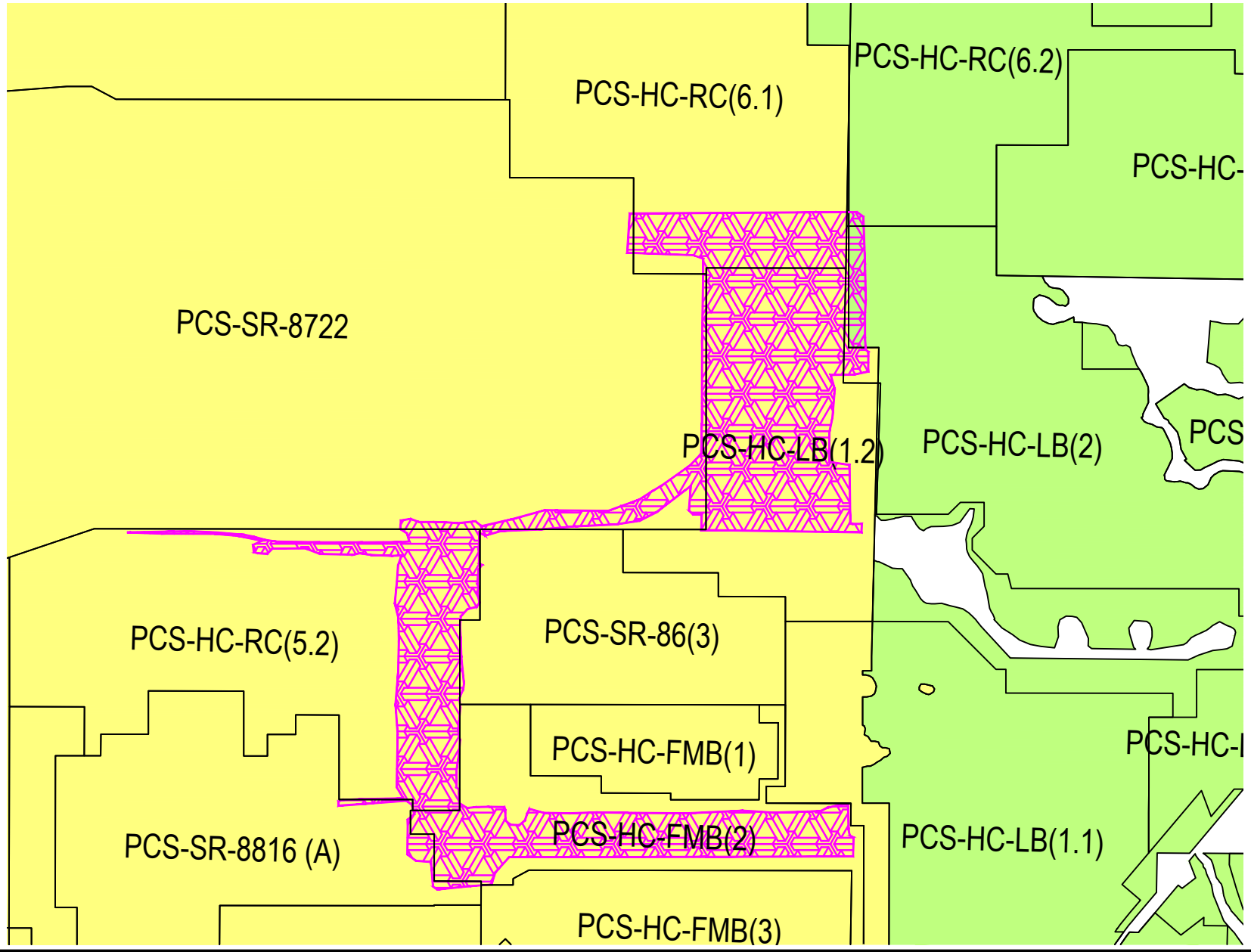
FILE NAME:	2018 Proposed Reclamation.dwg


NOTE: LAND FORMS, LOCATIONS,& TOPOGRAPHICAL FEATURES ARE CONCEPTUAL IN NATURE.
ACTUAL FIELD CONSTRUCTION MAY VARY.
PCS-HC-HC(8)
PCS-HC-HC(8)
15
14
13
18
Range 15 East
Range 16 East
PCS-HC-HC(5)
PCS-HC-HC(7)
22
23
24
PCS-HC-HC(6.2)
PCS-HC-HC(11)
PCS-HC-HC(12)
PCS-HC-HC(6.2)
Township 1 North Range 15 East
Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Topography
2018 PROPOSED RECLAMATION
SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
SPECIAL PERMIT 03-1
PotashCorp
White Springs
SCALE: 1" = 2,000'
DATE: 3/21/18
REQUESTED BY: CRL
DRAWN BY: DAD
SKETCH NO.: A-9015
FILE NAME: 2018 Proposed Reclamation.dwg

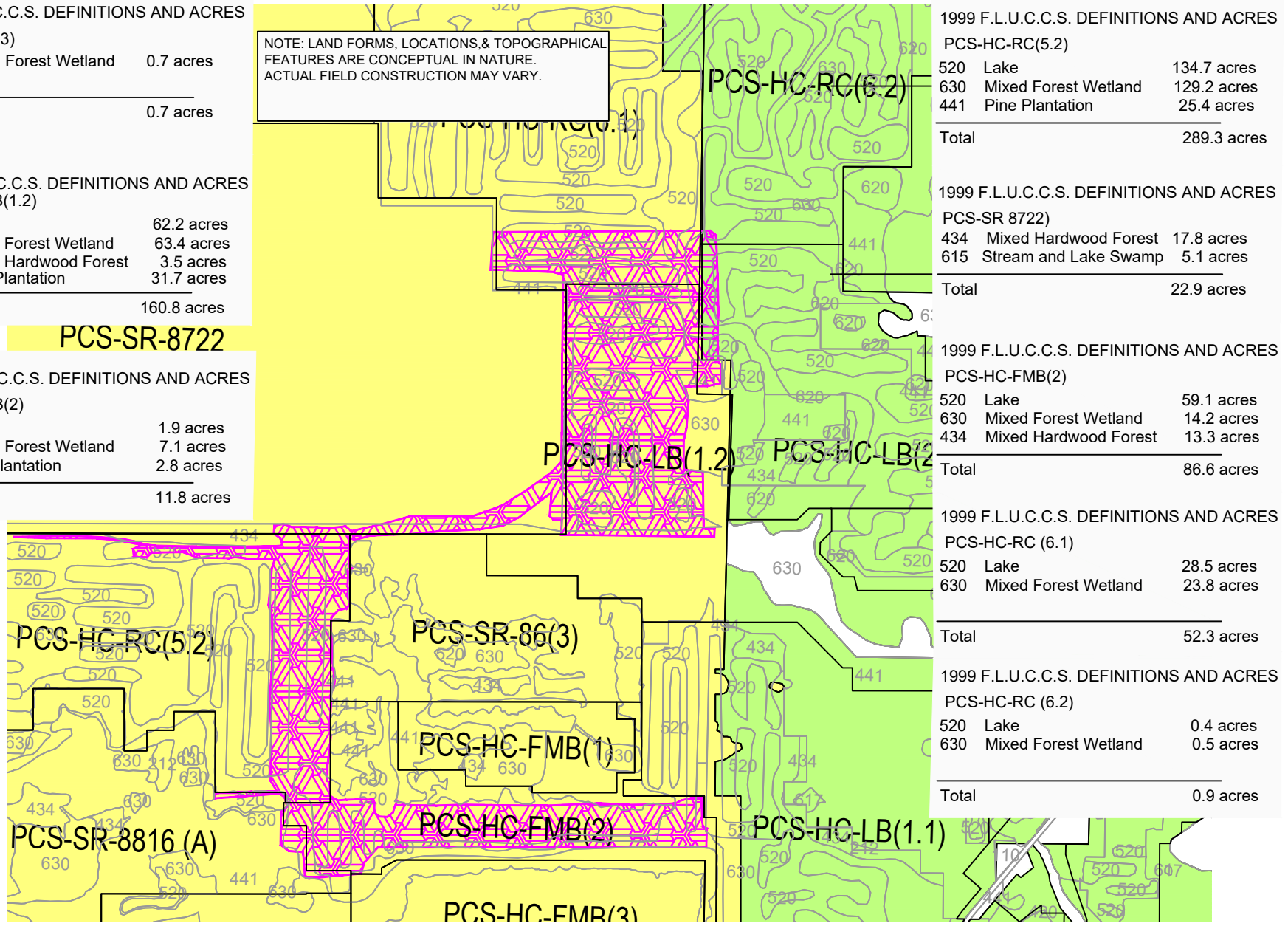


Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,640'
DATE:	3/21/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-9016
FILE NAME:	2018 Proposed Reclamation.dwg



Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-reclamation Land Use

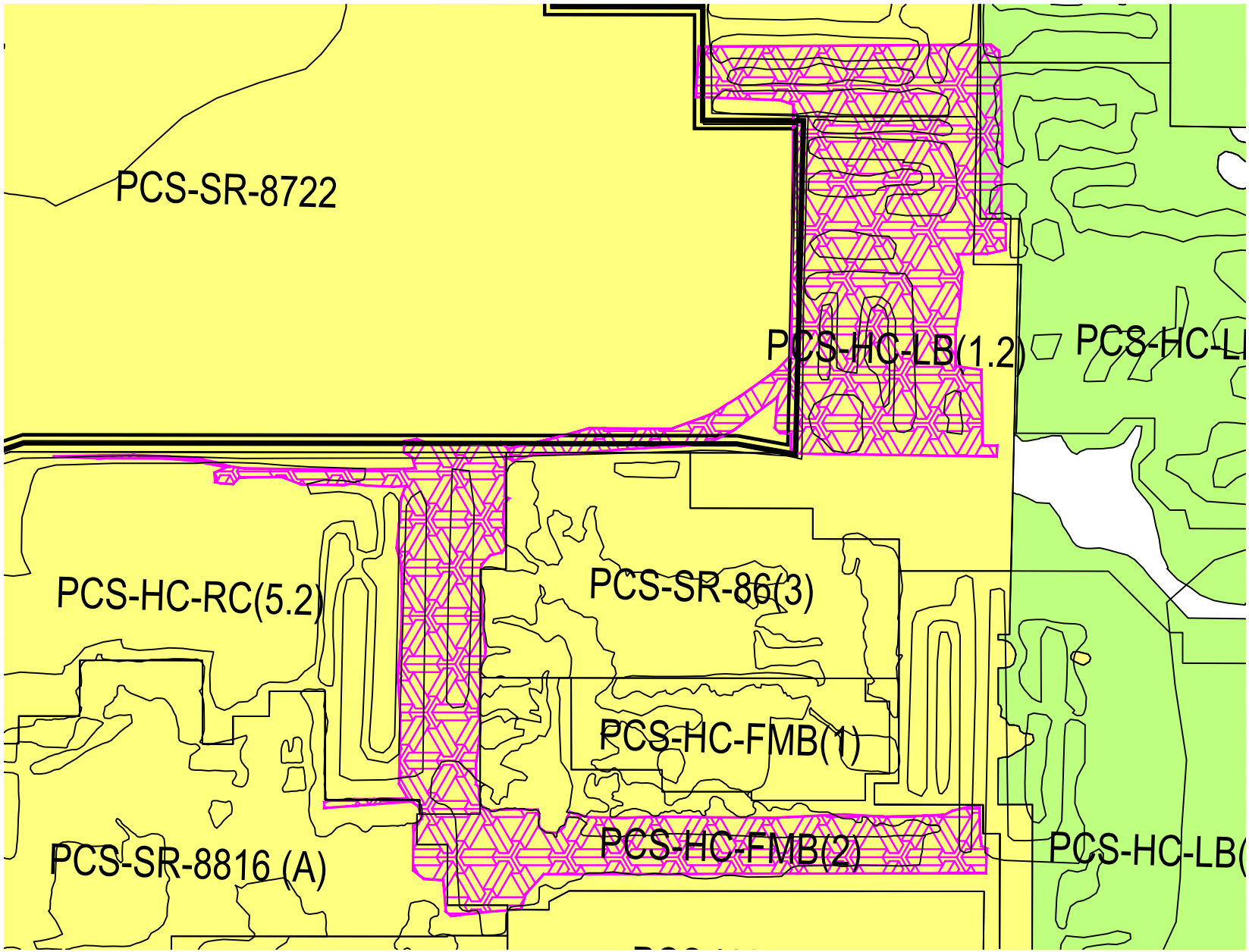
2018 PROPOSED RECLAMATION

SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,640'
DATE:	3/21/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-9017
FILE NAME:	2018 Proposed Reclamation.dwg



Hamilton County Mine
2017 Annual Report
2018 Proposed Reclamation Activities
Post-Reclamation Topography

- 2018 PROPOSED RECLAMATION
- SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
- SPECIAL PERMIT 03-1

PotashCorp
White Springs

SCALE:	1" = 2,640'
DATE:	3/21/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-9018
FILE NAME:	2018 Proposed Reclamation.dwg

2017 MINING SUMMARY

- Mining by dragline 2017 mine wide --- See Drawing Number A-8984.
- Mining location detail by dragline --- See Drawing Numbers A-8985 through A-8988.

Most of the areas have been managed for silviculture. Specific Florida Land Use and Cover Classification System Codes (FLUCCS) can be found in the Master Mining Plan and the Master Mining Plan Amendment. Generally, the areas can be classified as follows:

Dragline #2 was in FLUCCS

26.3%	441	Coniferous Plantation
16.4%	232	Poultry Feeding Ops
28.6%	620	Wetland Coniferous Forest
28.2%	411	Pine Flatwood
0.5%	814	Road

Dragline #3 was in FLUCCS

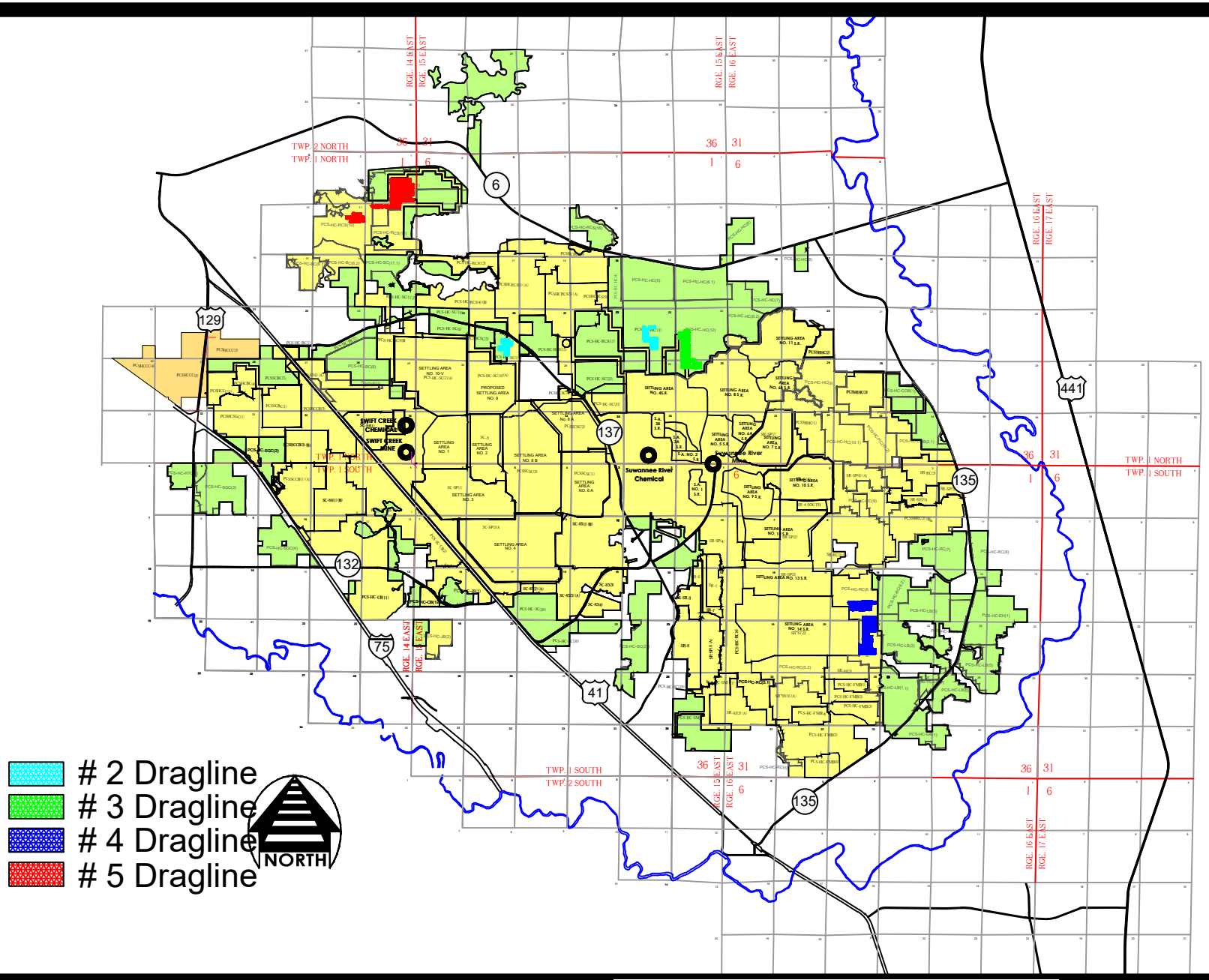
14.2%	441	Coniferous Plantation
58.2%	620	Wetland Coniferous Forest
27.6%	411	Pine Flatwoods

Dragline #4 was in FLUCCS

67.1%	411	Pine Flatwoods
1.8%	441	Coniferous Plantation
11.9%	620	Wetland Coniferous Forest
19.2%	630	Wetland Forested Mixed

Dragline #5 was in FLUCCS

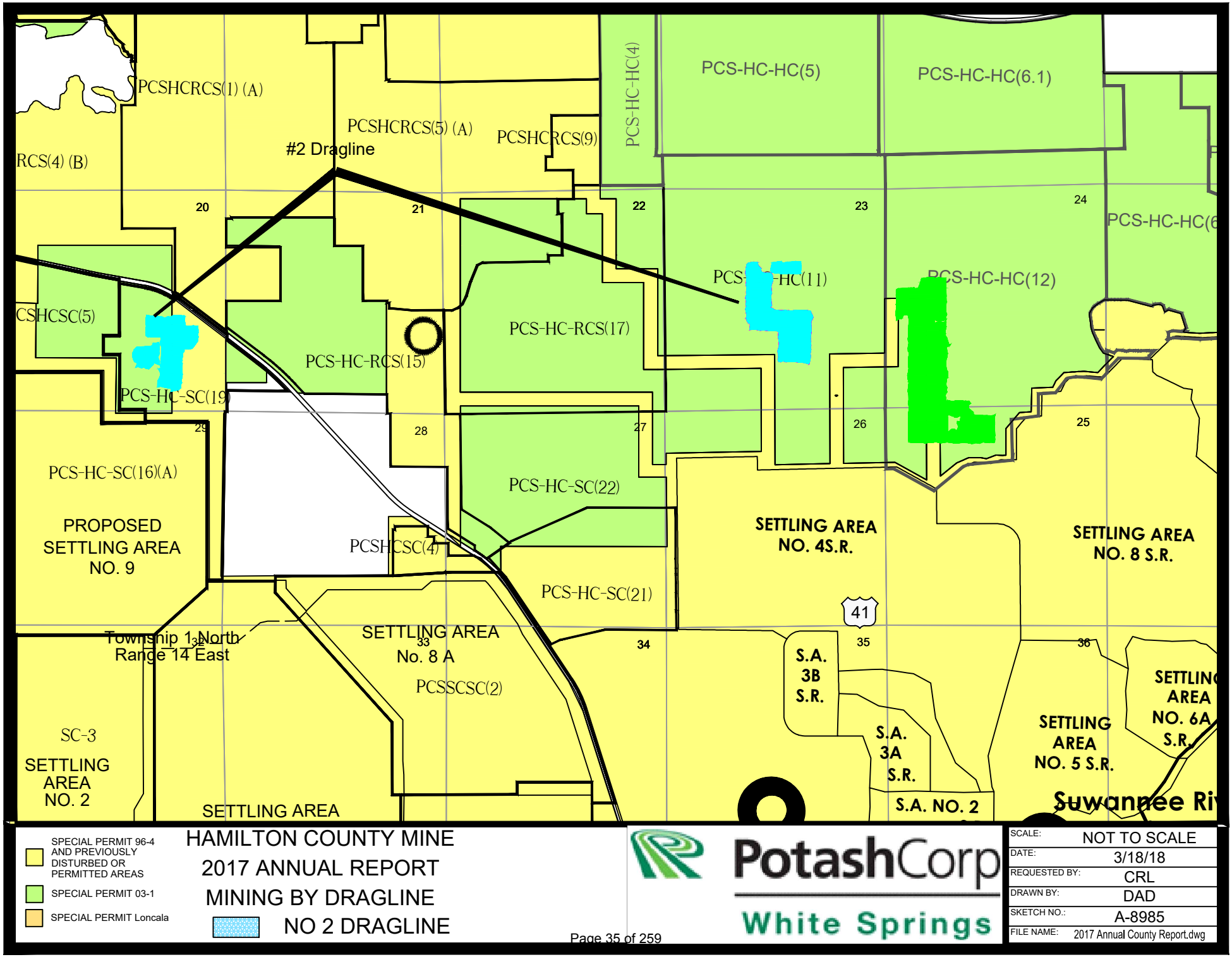
0.5%	411	Pine Flatwood
11.1%	441	Coniferous Plantation
25.2%	630	Wetland Forested Mixed
63.2%	611	Bay Swamp



HAMILTON COUNTY MINE
2017 ANNUAL REPORT
2017 MINING

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/19/2018
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8984
FILE NAME:	2017 Annual County Report.dwg



SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

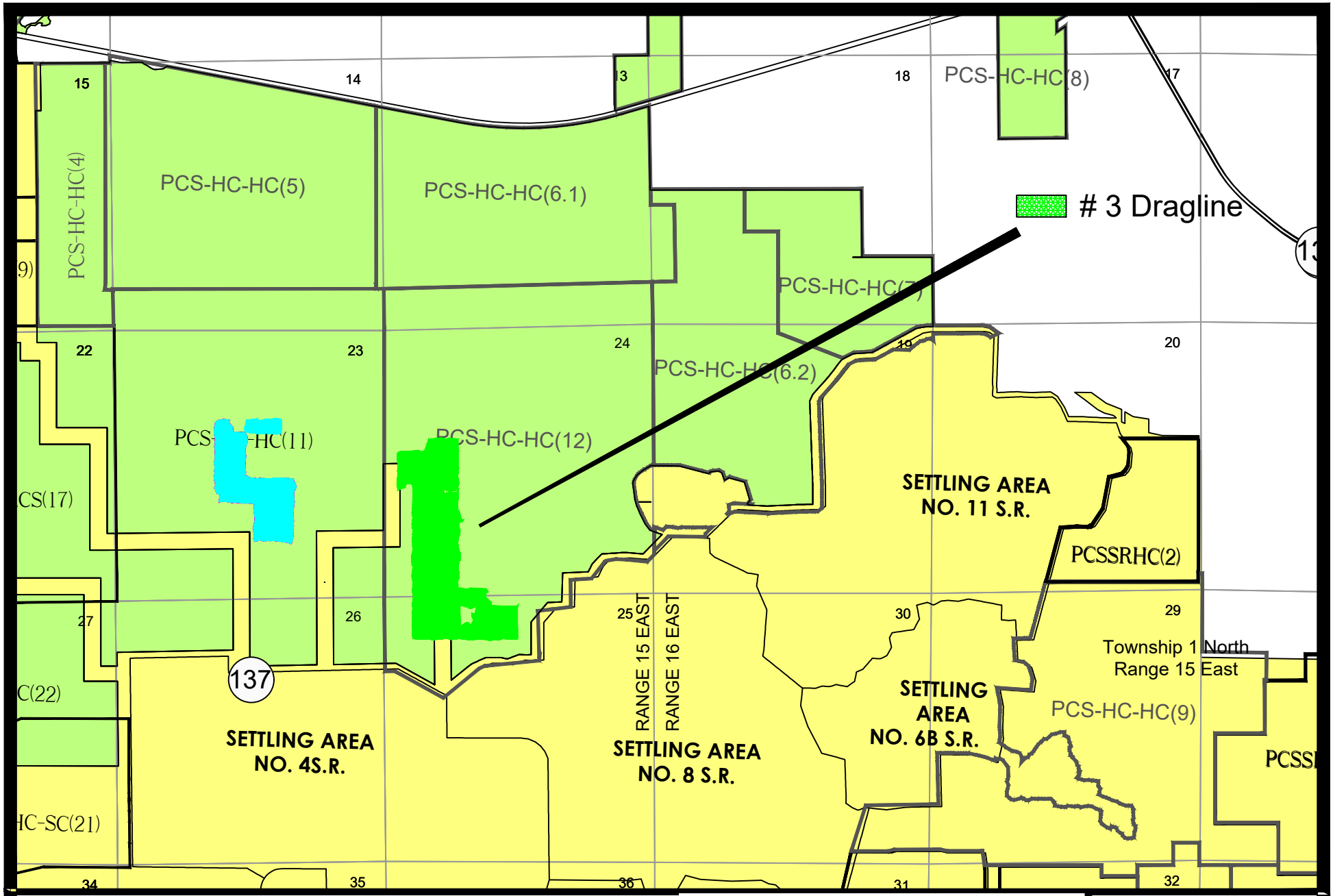
SPECIAL PERMIT 03-1

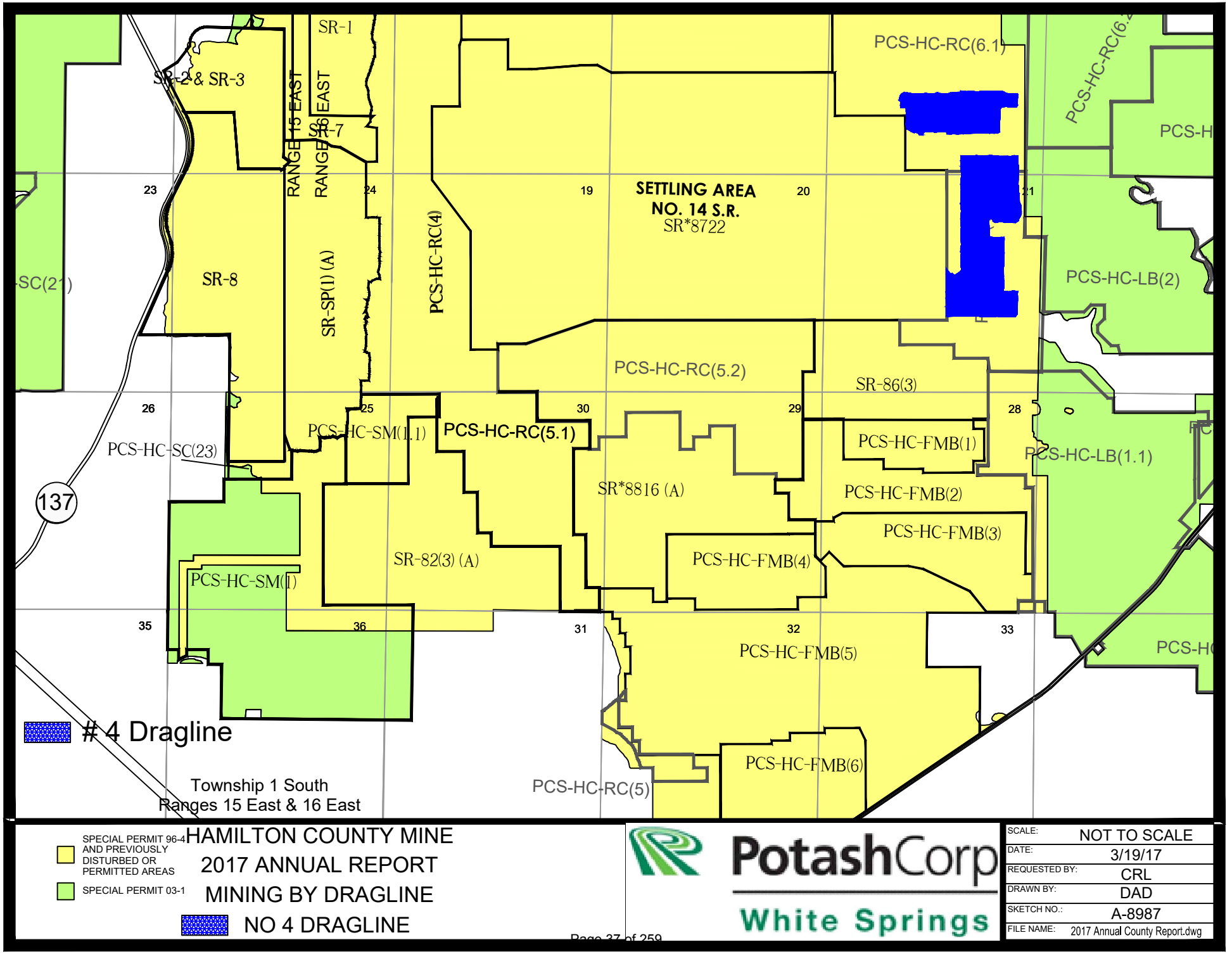
SPECIAL PERMIT Loncala

HAMILTON COUNTY MINE
2017 ANNUAL REPORT
MINING BY DRAGLINE
NO 2 DRAGLINE

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/18/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8985
FILE NAME:	2017 Annual County Report.dwg

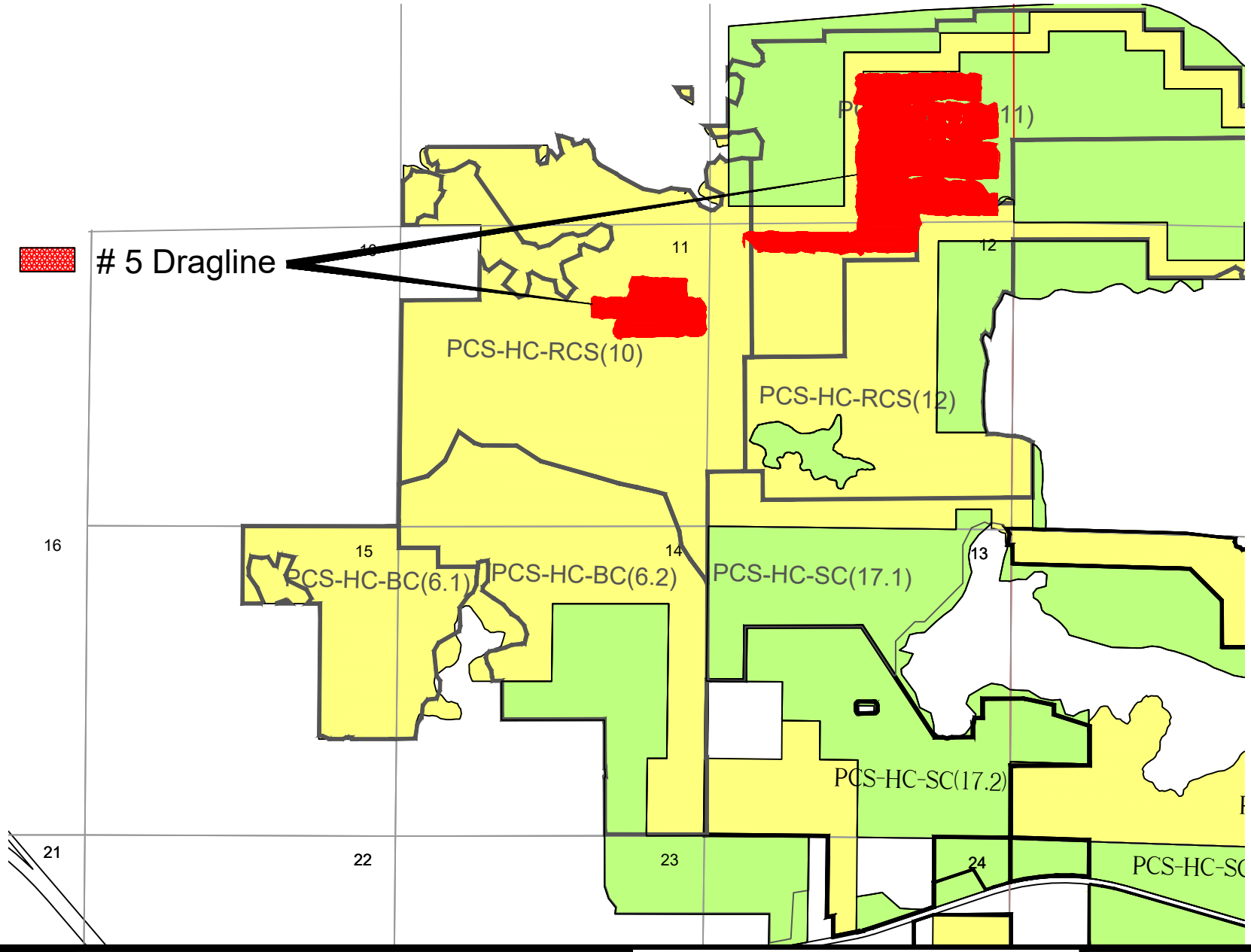

15
14
13
18
17
PCS-HC-HC(8)
PCS-HC-HC(4)
PCS-HC-HC(5)
PCS-HC-HC(6.1)
3 Dragline
PCS-HC-HC(7)
22
23
24
19
20
PCS-HC-HC(6.2)
PCS-HC-HC(11)
PCS-HC-HC(12)
SETTLING AREA NO. 11 S.R.
PCSSRHC(2)
27
26
25
30
29
RANGE 15 EAST
RANGE 16 EAST
Township 1 North
Range 15 East
137
SETTLING AREA NO. 4S.R.
SETTLING AREA NO. 8 S.R.
SETTLING AREA NO. 6B S.R.
PCS-HC-HC(9)
34
35
36
31
32
SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS
SPECIAL PERMIT 03-1
HAMILTON COUNTY MINE
2017 ANNUAL REPORT
MINING BY DRAGLINE
NO 3 DRAGLINE
PotashCorp
White Springs
SCALE: NOT TO SCALE
DATE: 3/18/18
REQUESTED BY: CRL
DRAWN BY: DAD
SKETCH NO.: A-8986
FILE NAME: 2017 Annual County Report.dwg



HAMILTON COUNTY MINE
2017 ANNUAL REPORT
MINING BY DRAGLINE

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/19/17
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8987
FILE NAME:	2017 Annual County Report.dwg



SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

SPECIAL PERMIT 03-1

HAMILTON COUNTY MINE
2017 ANNUAL REPORT
MINING BY DRAGLINE
NO 5 DRAGLINE

PotashCorp White Springs

SCALE:	NOT TO SCALE
DATE:	3/19/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8988
FILE NAME:	2017 Annual County Report.dwg

2017 RECLAMATION ACTIVITIES

- 2017 Reclamation Activities mine wide --- See drawing number A-8994
- 2017 Reclamation Activity Detail --- See drawing numbers A-8995 through A-8996.
- 2017 Released Reclamation Programs – One partial reclamation unit was released---See drawing number A-8997.

These reclamation activities are further described below:

PCS-HC-BC (1) – Thirteen (13) acres of mined/disturbed lands were contoured.

PCS-HC-CB (3) – Seventy-six (76) acres of mined/disturbed lands were planted in 2017. Twenty-one (21) acres were planted as hardwood forest. Six (6) acres were planted as wetland forest mixed.

PCS-HC-JB (1) –Four (4) acres of disturbed lands were contoured.

PCS-HC-RC(5.2) – Two hundred-one (201) acres mined/disturbed lands were contoured in 2017 and twenty-seven (27) acres were planted. Eighteen (18) acres were planted in pine plantation. One (1) acres were planted as wetland forested mixed. Eight (8) acres are classified as a low water body.

PCS-HC-CB(9) – Forty-eight (48) acres of mined/disturbed lands were contoured and forty-eight (48) acres were planted on 2017. Thirty-six (36) were planted as hardwood conifer mix. Twelve (12) acres were planted as wetland mixed forest. Two (2) acres are classified as a low water body.

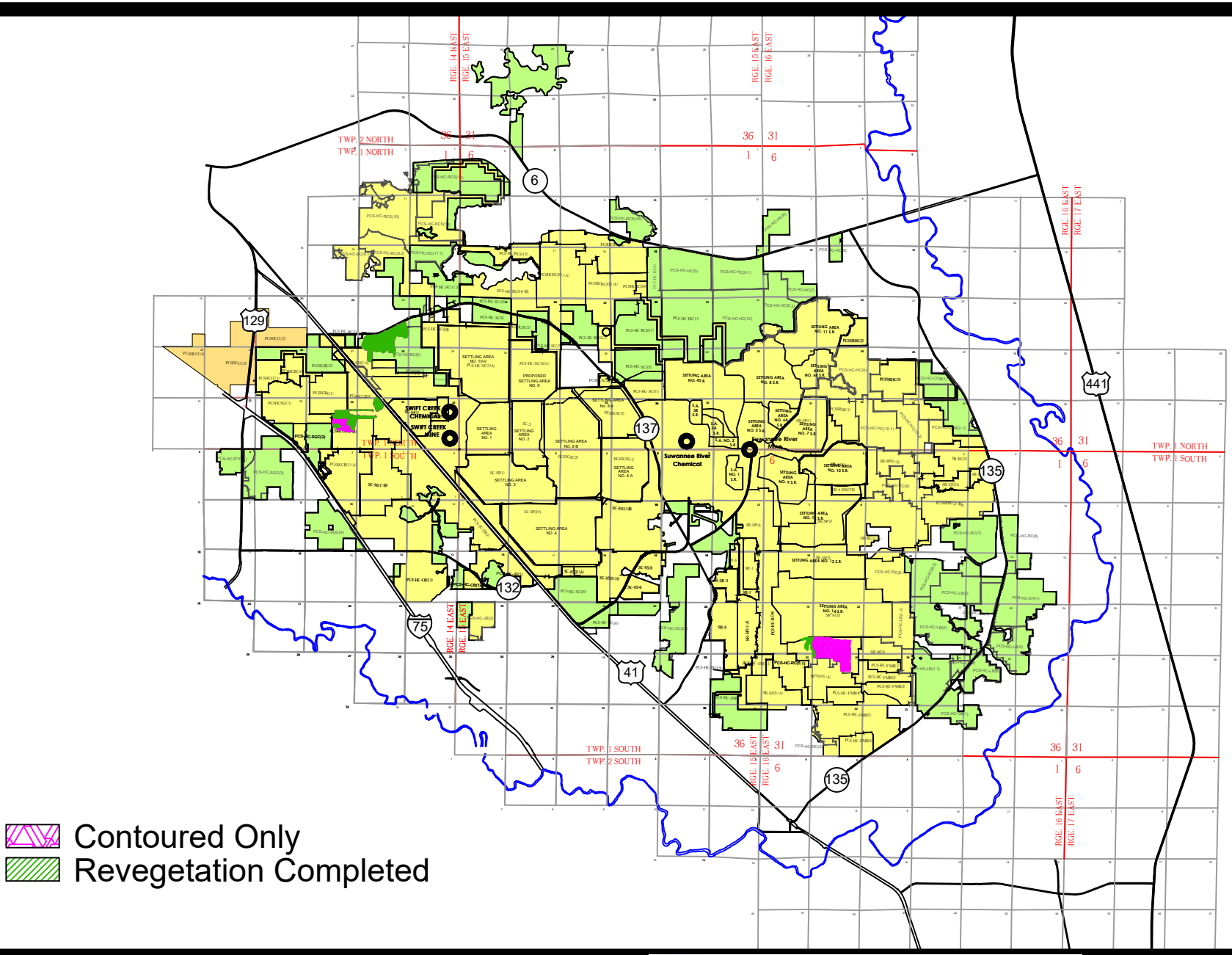
PCS-HC-BC(8)– Ninety-five (95) acres mined/disturbed lands were contoured and ninety-five (95) acres were planted in 2017. Twenty-six (26) acres were planted in pine plantation. Thirty-two (32) were planted as hardwood conifer mix. Five (5) acres were planted as wetland forested mixed. Thirty-two (32) acres are classified as a low water body.

PCS-HC-BC(7) – Eighty-six (86) acres mined/disturbed lands were contoured and eighty-six (86) acres were planted in 2017. Forty-five (45) acres were planted in pine plantation. Eighteen (18) acres were planted as wetland forested mixed. Twenty-three (23) acres are classified as a low water body.

PCS-SC-85(6)A – Ten (10) acres disturbed lands were contoured in 2017.

PCS-SR 8872 One (1) acres of disturbed lands were contoured and planted in 2017. One (1) acres were planted in pine plantation.

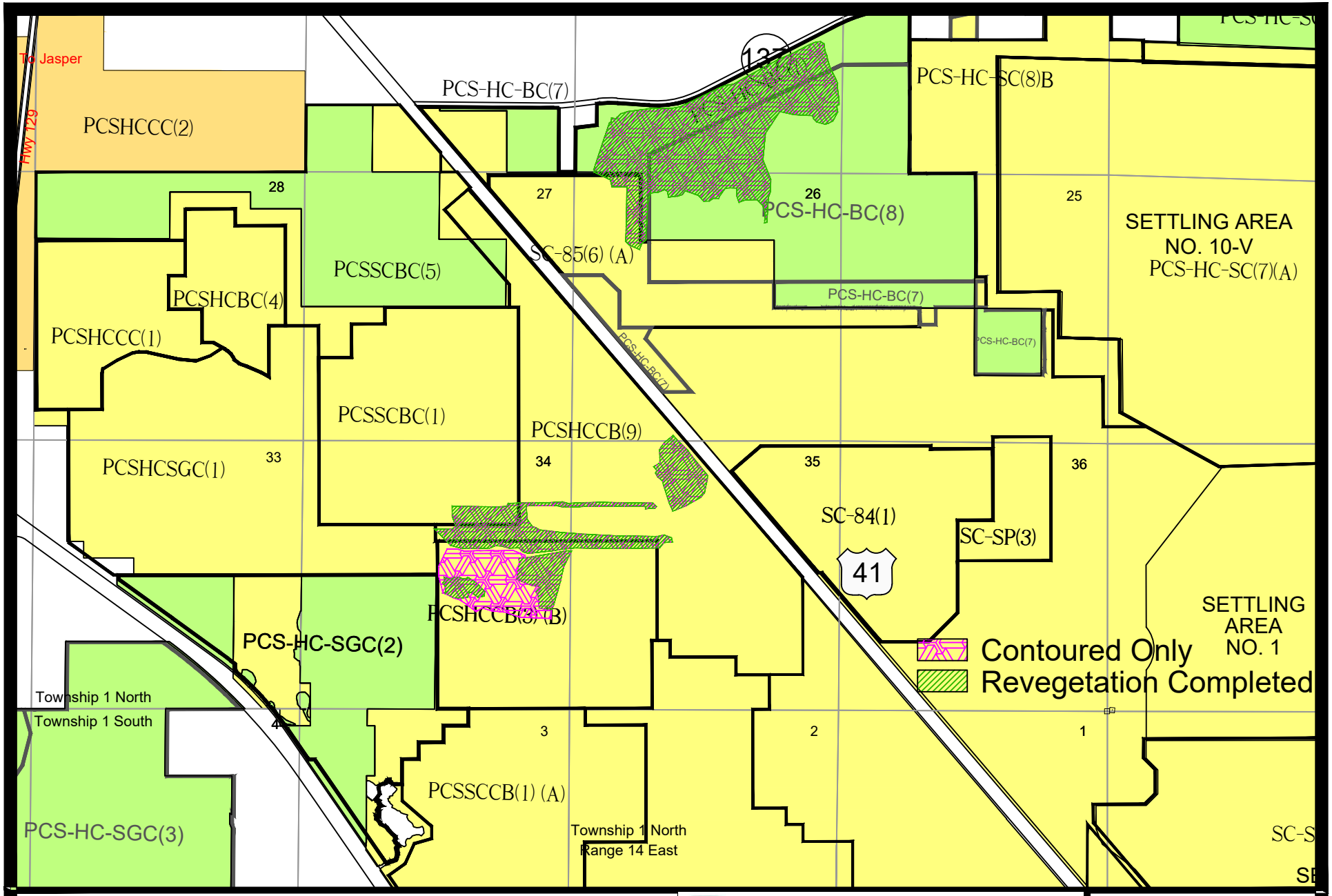
PCS-SR-8816A Five (5) acres of disturbed lands were contoured in 2017.



HAMILTON COUNTY MINE
2017 ANNUAL REPORT
2017 RECLAMATION ACTIVITIES
AS OF 12/31/2017

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/20/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8994
FILE NAME:	2017 Annual County Report.dwg



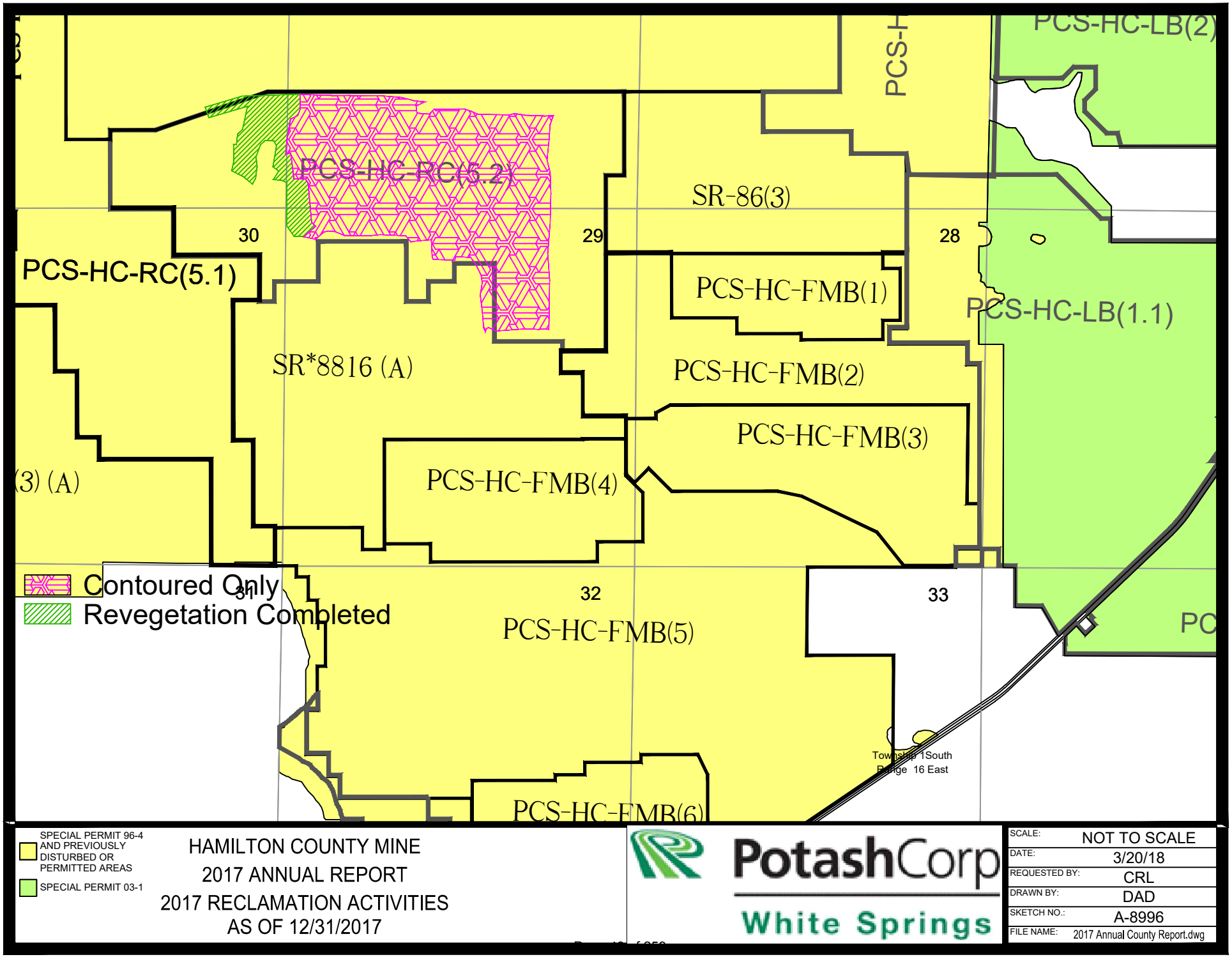
SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

SPECIAL PERMIT 03-1

HAMILTON COUNTY MINE
2017 ANNUAL REPORT
2017 RECLAMATION ACTIVITIES
AS OF 12/31/2017

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/20/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8995
FILE NAME:	2017 Annual County Report.dwg



SPECIAL PERMIT 96-4 AND PREVIOUSLY DISTURBED OR PERMITTED AREAS

SPECIAL PERMIT 03-1

HAMILTON COUNTY MINE
2017 ANNUAL REPORT
2017 RECLAMATION ACTIVITIES
AS OF 12/31/2017

PotashCorp
White Springs

SCALE:	NOT TO SCALE
DATE:	3/20/18
REQUESTED BY:	CRL
DRAWN BY:	DAD
SKETCH NO.:	A-8996
FILE NAME:	2017 Annual County Report.dwg

CURRENT PERMITS AND PERMIT STATUS
As of 12/31/17

There were no violations of the permit conditions of the mining and beneficiation operations during 2017.

There were no accidental releases of water or air pollutants from the mining or beneficiation operations during 2017.

RESPONSIBLE AGENCY	PERMIT TYPE	PERMIT NAME	PERMIT NUMBER	SUMMARY DESCRIPTION	CURRENT STATUS
EPA/FDEP					
	HAZARDOUS WASTE				
		HAZARDOUS WASTE GENERATOR (SC)	FLD000622548	SMALL QUANTITY GENERATOR	IN COMPLIANCE
		HAZARDOUS WASTE GENERATOR (SR)	FLD098372360	SMALL QUANTITY GENERATOR	IN COMPLIANCE
		Radioactive Materials	2702-1		IN COMPLIANCE
FDEP					
	INDUSTRIAL WASTE WATER	NPDES PERMIT - SR	FL0000655	SURFACE WATER DISCHARGE CONTROL AND MONITORING; INCLUDES PHOSPHOGYPSUM MANAGEMENT AND MONITORING	IN COMPLIANCE
	AIR OP. PERMITS				
		TITLE V AIR OPERATING PERMIT	0470002-110-AV	OPERATION AND MONITORING FOR ALL SOURCES OF AIR EMISSIONS; INCLUDES CHEMICAL AND MINE PLANT SOURCES	IN COMPLIANCE
	AQUATIC PLANT				
		ALTMAN BAY	SR-04-26	AQUATIC PLANT CONTROL	IN COMPLIANCE
		PURVIS LAKE	SR-04-24	AQUATIC PLANT CONTROL	IN COMPLIANCE

		EAGLE LAKE	SR-04-25	AQUATIC PLANT CONTROL	IN COMPLIANCE
		LANG LAKE	SR-06-27	AQUATIC PLANT CONTROL	IN COMPLIANCE
	MINE RECLAMATION				
		HAMILTON CO. MINE	VARIOUS	RECLAMATION PROGRAMS	IN COMPLIANCE
		HAMILTON CO. MINE	PCS-HC-CPD	CONCEPTUAL RECLAMATION PLAN	IN COMPLIANCE
FDOH	MISC.	NELAC CERTIFICATION - WS ENV LAB	E92846	CERTIFICATION TO PERFORM CERTAIN WATER QUALITY ANALYSIS	IN COMPLIANCE
FWCC					
	MISC.	TORTOISE RELOCATION	Wr06219		IN COMPLIANCE
		MIGRATORY BIRD NEST	WN04154		IN COMPLIANCE
FDEP	POTABLE WELL	POOLE POND CEMETARY	24-1-67	DRAINAGE WELL	IN COMPLIANCE
		SCM (SCMD3)	PWS-2240827	WATER SUPPLY WELL	IN COMPLIANCE
		ADMINISTRATION (MD4)	PWS-2240828	WATER SUPPLY WELL	IN COMPLIANCE
		SRC - 1 & 2 (CD4 & CD5)	PWS-2240826	WATER SUPPLY WELL	(CD4) IN COMPLIANCE (CD5) INACTIVE
		SRM WELL (MD5)	PWS-2240830	WATER SUPPLY WELL	IN COMPLIANCE
		SCC (SCD1 & SCD3)	PWS-2244129	WATER SUPPLY WELL	IN COMPLIANCE
		PCS MINE SUPPORT TRAILER (MD3)	24-58-0023-3	LIMITED USE COMMERCIAL	ABANDONED
		PCS CONFERENCE CENTER	24-58-00214	LIMITED USE COMMERCIAL	IN COMPLIANCE
		SWIFT CREEK OLD PAN PARKING LOT (SCOPP)	24-58-00020	LIMITED USE COMMERCIAL	INACTIVE
		MORGAN FARM WELL	24-57-1441223	LIMITED USE COMMERCIAL	IN COMPLIANCE
		PCS SKEET RANGE	24-57-1489019	LIMITED USE COMMERCIAL	IN COMPLIANCE
		SCC/MINE GUARD SHACK	24-57-1617293		
		RESCAR/UNION HALL	24-57-1490000	LIMITED USE COMMERCIAL	IN COMPLIANCE
	SOLID WASTE				
		SWIFT CREEK LANDFILL	0009789-002-S	LANDFILL PERMIT CLOSED LANDFILL @ SC	RELEASED FROM LONG TERM CARE

		SUWANNEE RIVER LANDFILL	0009851-002-S	LANDFILL PERMIT CLOSED LANDFILL @ SR	RELEASED FROM LONG TERM CARE
FDEP					
	STORAGE TANKS				
		SRM	24/8518515	STORAGE TANK REGISTRATION	IN COMPLIANCE
		SCM	24/8518523	STORAGE TANK REGISTRATION	IN COMPLIANCE
		SCC	24/8518521	STORAGE TANK REGISTRATION	IN COMPLIANCE
		SRC	24/8518518	STORAGE TANK REGISTRATION	IN COMPLIANCE
	WETLAND RES MGT.	LONG TERM - CORPS	198404652 (IP-RHL)	WETLAND IMPACT & MITIGATION MONITORING	IN COMPLIANCE
	WETLAND RES MGT.	FOUR MILE BRANCH & CABBAGE HD – LIFE OF MINE PERMIT	0144913-003	WETLAND IMPACT & MITIGATION MONITORING	IN COMPLIANCE
		SWIFT CREEK DITCH & SWAMP– LIFE OF MINE PERMIT	0144913-003	WETLAND IMPACT & MITGATION MONITORING	IN COMPLIANCE
		GREEN AREA	241341609	WETLAND IMPACT & MITIGATION MONITORING	IN COMPLIANCE
		ROARING CREEK– LIFE OF MINE PERMIT	0144913-003	WETLAND IMPACT & MITIGATION MONITORING	IN COMPLIANCE
		LONCALA WRP	0144913-021	WETLAND IMPACT, MITIGATION, AND MONITORING	IN COMPLIANCE
	WETLAND RESOURCE PERMIT	LIFE OF MINE PERMIT	0144913-003	WETLAND IMPACT, MITIGATION, AND MONITORING	IN COMPLIANCE
	WWTPS				
		WWTP #1 -SRM	FLA187712	WASTEWATER TREATMENT PLANT	IN COMPLIANCE
		WWTP #3 SCM	FLA011633	WASTEWATER TREATMENT PLANT	IN COMPLIANCE
		WWTP #5 SCC	FLA011626	WASTEWATER TREATMENT PLANT	IN COMPLIANCE
		WWTP #6 SRM	FLA011627	WASTEWATER TREATMENT PLANT	IN COMPLIANCE
HAMILTON COUNTY					
	HC MINING				
		HAMILTON CO. MINING PERMIT	PERMIT 96-4	MINING AND RECLAMATION	IN COMPLIANCE

HAMILTON COUNTY					
	HC MINING				
		HAMILTON CO. MINING PERMIT	PERMIT 03-1	MINING AND RECLAMATION	IN COMPLIANCE
		HAMILTON CO. MINING PERMIT	PERMIT -021	MINING AND RECLAMATION	IN COMPLIANCE
SRWMD					
	CONSUMPTIVE USE				
		PCS	2-047-219878-6	PCS - ALL PRODUCTION WELLS	IN COMPLIANCE

MONITORING

- PCS Phosphate - White Springs submits an annual report to the Florida Department of Environmental Protection (FDEP), Mining and Mitigation on mining and reclamation activities. The information contained in the annual report is the basis for this Annual Progress Report and Estimates. A copy of the 2017 FDEP Comprehensive Annual Report was sent to Hamilton County via Chairwoman Burnham on March 14, 2018.

- Detailed monitoring reports are submitted to FDEP on wetland mitigation projects. The monitoring reports are part of the 2017 Comprehensive Annual Report that was submitted to Chairwoman Burnham on March 14, 2018.

- Piezometer Monitoring associated with Preservations Areas is included in the United States Army Corp of Engineers (USACOE) Annual Report. A copy of the USACOE Report submitted by PCS Phosphate - White Springs will be provided to Hamilton County when it is complete.

- Routine monitoring for the permits listed in this report is available for review upon request. They are too voluminous for inclusion on this submission. Provided in this attachment is the result of the 2017 Annual Inspection of Settling Area and Cooling Pond Dikes conducted by Ardaman and Associates, Inc.

- In January 2001, PCS Phosphate installed a surficial aquifer recharge project. This project creates a water curtain along the open mining face to reduce drainage of shallow groundwater in the area. The recharge project piezometers and regional piezometers indicated that PCS Phosphate did not need to operate the system in 2015. The system was turned-off in September 2004, after groundwater levels were restored. Since that time, groundwater levels have naturally fluctuated based on rainfall events.

- Pursuant to agency permits issued in 2003, PCS Phosphate began monitoring additional piezometers as part of the Surficial Aquifer Monitoring Plan. Monitoring of ground water levels for this plan began in 2003. The 2017 monitoring results are presented in Tab 6 of this report, following the recharge data.

2017 Annual Inspection of Settling Area and Cooling Pond Dikes

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

February 26, 2018
File Number 17-13-0162

PCS Phosphate - White Springs
15843 SE 78TH Street
White Springs, Florida 32096

Attention: Mr. Cameron Lynch

Subject: 2017 Annual Inspection of Settling Area and Cooling Pond Dikes, PCS Phosphate - White Springs, Hamilton County, Florida

Gentlemen:

The following report summarizes the findings, conclusions and recommendations of the 2017 end-of-year annual inspection of the above subject settling area and cooling pond dikes. The inspection was conducted on February 7, 2018 by Mr. Bill Jackson, P.E. of our Orlando office, accompanied by Mr. Frank Johnson of PCS Phosphate. Routine inspections of the active settling area and cooling pond dikes are made weekly by the PCS Phosphate staff and not less than semi-annually by an engineer from Ardaman & Associates, Inc. The relative location of the settling area and cooling pond dikes and associated spillways are shown on the aerial photograph and schematic diagram presented herein as Figures 1 and 2, respectively.

The PCS Phosphate dikes are generally well maintained, safely operated and presently in good condition. While the following report makes some recommendations concerning future maintenance and some operational constraints for your dikes and settling areas, we did not find any conditions that require immediate corrective action.

Based on FDEP's letter of July 14, 1995, Suwannee River Settling Areas 1, 2, 3A, 3B and 10 have been classified as "abandoned" and no longer require inspection. These settling areas were not inspected and are not included in the discussion contained herein. The Suwannee River mine is shut down and has been dismantled. As a consequence, the remaining settling areas in the Suwannee River complex are currently inactive and have, for the most part, been substantially dewatered. The remaining inactive settling areas within the Suwannee River complex have been placed in the "retired" category and are inspected by PCS Phosphate personnel on a monthly basis, with the exception of Areas 4, 6B, 8, 9, 11, 12 and 13, which still have free standing water against one or more of their exterior dikes. These latter settling areas continue to be inspected on a weekly basis by PCS Phosphate. In accordance with a PCS Phosphate internal memorandum dated February 25, 2003, Areas 9 and 12 have been reclassified from "retired" to "active" categories for inspection purposes due to the presence of free standing water associated with the transfer and management of various water sources within the Suwannee River complex.

Required minimum freeboard levels for the process water ponds included herein have been updated to be consistent with previous recommendations contained in an Ardaman report titled: "Recommended Freeboards for the White Springs Phosphogypsum Stack Systems Based on Wind Surge and Wave Runup Criteria", dated July 31, 2006.

This annual report summary is based on a visual inspection of the PCS Phosphate settling area and cooling pond perimeter dikes and an external inspection of the associated spillway structures. Our services did not include inspection, assessment or endorsement of any process systems, gypsum disposal facilities or an internal inspection or structural evaluation of any spillway or water level control structure.

The conclusions and recommendations presented herein apply to existing conditions and operating procedures that were known to us at the time of the inspection. The inspection was conducted, the conclusions reached and the recommendations prepared in accordance with generally accepted engineering principles and practice. No other warranty, expressed or implied, is made. PCS Phosphate must continue to inspect these facilities on a regular basis and any changes in existing conditions should be brought to our immediate attention.

It has been a pleasure assisting you with the annual dam inspection. If needed, we will be pleased to discuss in greater detail the findings and recommendations presented herein.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Certificate of Authorization No. 5950

Bill E. Jackson, P.E. 2/26/18
Principal Engineer
Florida License No. 23479

John E. Garlanger, Ph.D., P.E.
Senior Consultant

BEJ/JEG/ed

Enclosure

S:\Projects\2017\17-13-0162\2017 SA and CP Annual.docx

HYDROLOGIC MONITORING

This information is being provided in partial fulfillment of the monitoring requirements in Permit No. 0144913-003.

ATTACHMENT C: HYDROLOGICAL DATA

This report represents a true, accurate, and representative description of the site conditions present at the time of monitoring.

William L. Donohue
General Manager

Submitted to:

Florida Department of Environmental Protection
Bureau of Mine Reclamation
2051 East Dirac Drive
Tallahassee, FL 32310

Submitted by:

White Springs AG Chem Inc. DBA PCS Phospate
15843 SE 78th Street
White Springs, FL 32096-0300

Data Collected by PCS and Summarized by:

Environmental Services & Permitting, Inc.
12580 NW US Highway 441
Alachua, FL 32615-8506
(386) 462-4334

February 20, 2018

This section contains 41 pages.

C.1.0 PCS Hydrological Data

Two types of hydrological data are included in this attachment; rainfall and groundwater levels. All data were collected by PCS environmental technicians. As required in FDEP permit # 0144913-003, these data are presented in both tabular and graphical forms. Figure C.1-1 shows the existing piezometer locations for 2017. Nine new installations are planned for 2018 (C.1-2 Proposed Piezometer Locations 2018). Locations of the rainfall gauges are shown on C.1-3 Rain Gauge Locations 2017 and Proposed New for 2018. Please note that the installations are based on current proposed mining areas which may change. They are also subject to ownership and access considerations.

C.2.0 Rainfall

Rainfall data are collected at seven locations evenly distributed over the site, locations are shown in Figure C.1-3 Rain Gauge Locations 2017 and Proposed New for 2018. It is important to note the rain gauge CB 004 was renamed IC 41 in 2012 following a permit change. Rainfall data are collected using tipping bucket gauges. These data are downloaded monthly and daily values generated. Daily and monthly sums are provided in Tables C.2-1 and C.2-2. A plot of the data is provided in Figure C.2-1. The majority of differences between stations is attributable to typical Florida thunderstorms. A few of the daily PCS rain gauge values seem to indicate that the funnel may have been clogged which resulted in the collected rainfall seeping through during the day or days following the actual rainfall event. SCC rainfall data were used to fill in some missing data for the IC-41 and SR-6 gauges. The specific data used can be seen in Table C.2-1.

C.3.0 Groundwater Elevations

Groundwater levels are monitored by piezometers distributed throughout the Hamilton County Mine (HCM). All locations were surveyed. All data are reported as NAD 83 and NGVD 27 in feet. Some locations may not have a full year of data due to installation timing. As the network is composed of locations that were originally established for other needs, the frequency of measurements varies.

Normally installed piezometer locations have both a shallow water table monitor well and a deeper surficial aquifer monitor well. Shallow monitor wells have “s” in the name and deeper monitor wells have a “d.” The piezometers installed in 2013 used an “i” designation rather than “d” which indicates intermediate aquifer. Stations lacking the “s” or “d” designation in their ID were installed

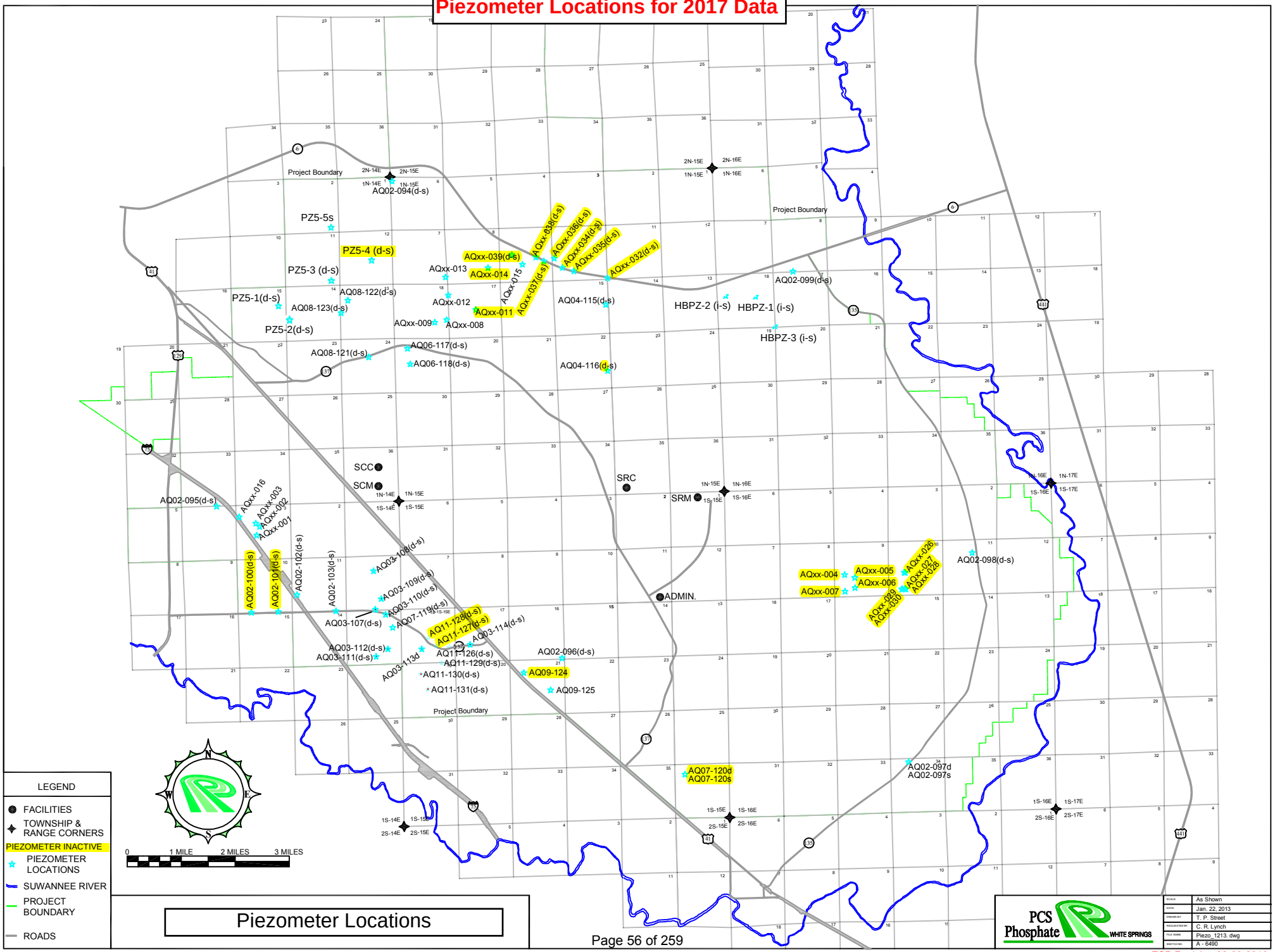
several years ago as part of other permit requirements, agency requests, or internal monitoring needs. Only one piezometer was installed at each of these sites, so there was no need to designate the depth at these locations. All were installed to monitor the shallow water table.

The piezometers are grouped into logical units based on location for plotting purposes on Figures C.3-1 through C.3-12. In a couple of instances, perimeter background monitor wells are not located near others and plotted separately. The higher concentrations of monitor wells are near the past or current mining areas. Please note that symbols on the plots were chosen to make these data as clear as possible. Where the same locations have both shallow and deeper monitor wells, the same color was used to represent the locations when possible.

There were no new piezometers installed in 2017. At this time nine new piezometers are proposed for installation in 2018 (Figure C.1-2). Two new rainfall gauges are planned for 2018. The planned locations are shown on Figure C.1-3. Please note that the installations are based on current proposed mining areas which may change. They are also subject to ownership and access considerations.

Due to access issues or damage, a few of the piezometer elevation measurements could not be made. Piezometers that are no longer active due to damage or permanent access issue were not included in this report. Notes pertaining to missing data due to temporary access issues are found in Tables C.3-1 through C.3-12. These tables display the groundwater elevations throughout the year for each piezometer set. As required in FDEP permit # 0144913-003, these data are presented in both tabular and graphical forms. The graphical forms are found in Figures C.3-1 through C.3-12. Rainfall data from the nearest rain gauge are plotted along with the groundwater elevations on each figure.

Figure C.1-1
Piezometer Locations for 2017 Data



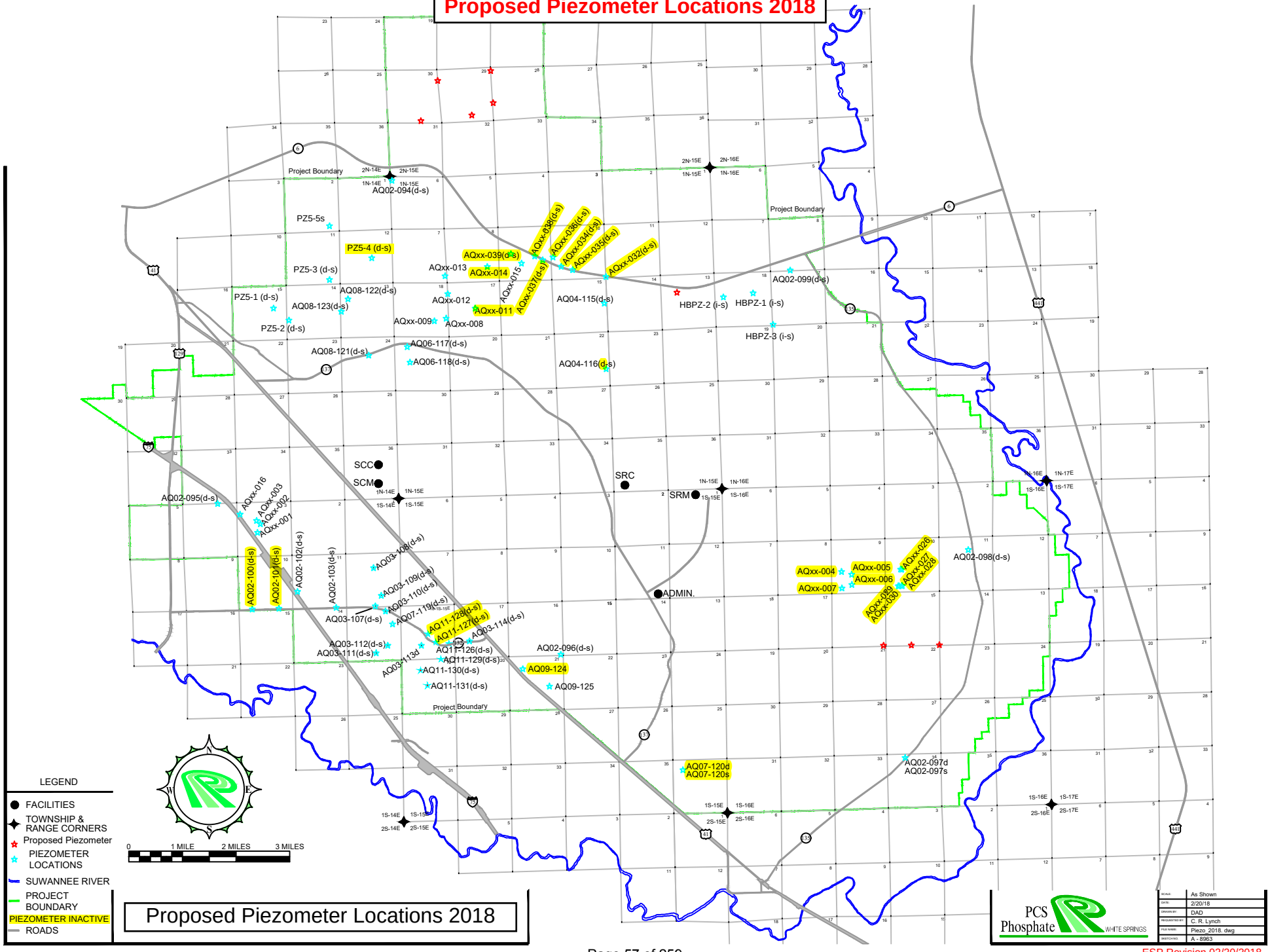
Piezometer Locations

PCS Phosphate WHITE SPRINGS

SCALE	As Shown
DATE	Jan. 22, 2013
DRAWN BY	T. P. Street
REQUESTED BY	C. R. Lynch
FILE NAME	Piezo_1213. dwg
WESTCHG NO.	A - 6490

ESP Revision 02-20-2018

Figure C.1-2
Proposed Piezometer Locations 2018



LEGEND

- FACILITIES
- TOWNSHIP & RANGE CORNERS
- Proposed Piezometer
- PIEZOMETER LOCATIONS
- SUWANNEE RIVER
- PROJECT BOUNDARY
- PIEZOMETER INACTIVE
- ROADS

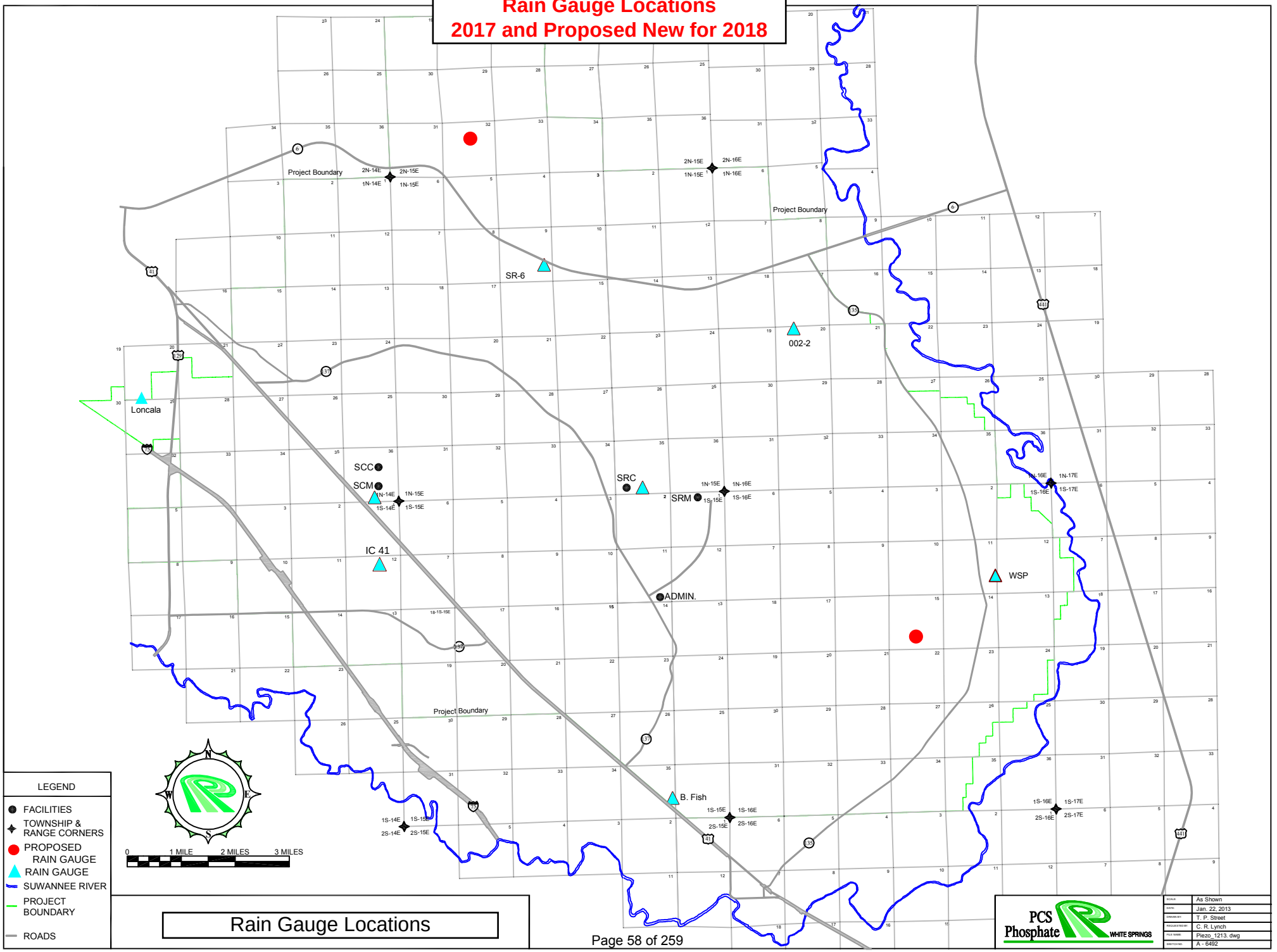
Proposed Piezometer Locations 2018

SCALE:	As Shown
DATE:	2/20/18
DRAWN BY:	DAD
REQUESTED BY:	C. R. Lynch
FILE NAME:	Piezo_2018. dwg
SKETCH NO.	A - 8963

PCS Phosphate WHITE SPRINGS

ESP Revision 02/20/2018

Figure C.1-3
Rain Gauge Locations
2017 and Proposed New for 2018



Rain Gauge Locations

PCS Phosphate WHITE SPRINGS

SCALE	As Shown
DATE	Jan. 22, 2013
DRAWN BY	T. P. Street
REQUESTED BY	C. R. Lynch
FILE NAME	Piezo_1213. dwg
WBS/TCHG	A - 6492

ESP Revision 02-20-2018

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
SCC data used to replace missing data.								
1/1/2017	0	0	0	0	0	0	0.01	0
1/2/2017	0	0	0	0.8	0	0.98	0	0
1/3/2017	0.16	1.52	0.83	0.7	1.43	0.57	0.63	1.08
1/4/2017	0.02	0	0.01	0	0.01	0	0.06	0.01
1/5/2017	0	0	0	0	0	0	0.02	0.01
1/6/2017	0.42	0.48	0.49	1.33	0.6	1.27	0.56	0.54
1/7/2017	0.39	0.48	0.58	0.13	0.73	0.14	0.31	0.62
1/8/2017	0	0	0	0	0	0	0	0
1/9/2017	0	0	0	0	0	0	0	0
1/10/2017	0	0	0	0	0	0	0	0
1/11/2017	0	0	0	0	0	0	0	0
1/12/2017	0	0	0	0	0	0	0	0
1/13/2017	0	0	0	0	0	0	0	0
1/14/2017	0	0.03	0	0	0	0	0	0
1/15/2017	0	0	0	0	0	0	0.01	0
1/16/2017	0	0	0	0	0	0	0	0
1/17/2017	0	0	0	0	0	0	0	0
1/18/2017	0	0	0	0	0	0	0	0
1/19/2017	0	0	0	0	0	0	0	0.01
1/20/2017	0.01	0	0.03	0	0	0	0	0.07
1/21/2017	1.03	1.22	1.64	1.8	1.76	1.69	1.54	1.39
1/22/2017	0.15	0.14	0.96	1.01	0.9	0.95	0.23	0.58
1/23/2017	0	0.01	0.01	0	0	0	0	0.01
1/24/2017	0	0	0	0	0	0	0	0
1/25/2017	0	0	0	0	0	0	0	0
1/26/2017	0.11	0.21	0.21	0.2	0.26	0.3	0.26	0.23
1/27/2017	0	0	0	0	0	0	0	0
1/28/2017	0	0	0	0	0	0	0	0
1/29/2017	0	0	0	0	0	0	0	0
1/30/2017	0	0	0	0	0	0	0	0
1/31/2017	0	0	0	0	0	0	0	0
2/1/2017	0	0.01	0	0	0	0	0	0
2/2/2017	0	0	0	0	0	0	0	0
2/3/2017	0	0	0	0	0	0	0	0
2/4/2017	0	0	0	0	0	0	0	0
2/5/2017	0	0	0	0	0	0	0	0
2/6/2017	0	0	0	0	0	0	0	0
2/7/2017	0	0.69	0.59	0.66	0.67	0.76	0.8	0.65
2/8/2017	0.01	0	0.01	0	0.02	0	0.01	0
2/9/2017	0	0	0	0	0	0	0	0
2/10/2017	0	0	0	0	0	0	0	0
2/11/2017	0	0	0	0	0	0	0	0

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
2/12/2017	0	0	0	0	0	0	0	0
2/13/2017	0	0	0	0	0	0	0	0
2/14/2017	0	0	0	0	0	0	0	0
2/15/2017	0	0	0	0	0	0	0	0
2/16/2017	0	0	0	0	0	0	0	0
2/17/2017	0	0	0	0	0	0	0	0
2/18/2017	0.03	0.07	0.08	0.1	0.06	0.1	0.05	0.09
2/19/2017	0	0	0	0	0	0	0	0.01
2/20/2017	0	0	0	0	0	0	0	0
2/21/2017	0	0	0	0	0	0	0	0
2/22/2017	0	0.03	0.03	0.05	0.02	0.07	0.06	0.05
2/23/2017	0	0	0	0	0	0	0	0.01
2/24/2017	0	0	0	0	0	0	0	0
2/25/2017	0	0	0	0	0	0	0	0
2/26/2017	0	0	0	0	0	0	0	0
2/27/2017	0	0	0	0	0	0	0	0
2/28/2017	0	0	0	0	0	0	0	0
3/1/2017	0.04	0.01	0	0	0	0	0	0
3/2/2017	0.12	0.19	0.31	0.26	0.2	0.28	0.29	0.28
3/3/2017	0	0	0	0	0	0	0	0
3/4/2017	0	0	0	0	0	0	0	0
3/5/2017	0	0	0	0	0	0	0	0
3/6/2017	0	0	0	0	0	0	0	0
3/7/2017	0	0	0	0	0	0	0	0
3/8/2017	0	0	0	0	0	0	0	0
3/9/2017	0	0	0	0	0	0	0	0
3/10/2017	0	0	0	0	0	0	0	0
3/11/2017	0	0	0	0	0	0	0	0
3/12/2017	0	0	0	0	0.01	0	0	0
3/13/2017	0.49	0.46	0.42	0.51	0.49	0.64	0.33	0.46
3/14/2017	0.01	0.01	0.01	0	0.03	0	0.01	0.01
3/15/2017	0	0	0	0	0	0	0	0
3/16/2017	0	0	0	0	0	0	0	0
3/17/2017	0	0	0	0	0	0	0	0
3/18/2017	0	0	0	0	0	0	0	0
3/19/2017	0	0	0	0	0	0	0	0
3/20/2017	0	0	0	0	0	0	0	0
3/21/2017	0	0	0	0	0	0	0	0
3/22/2017	0	0	0	0	0	0	0	0
3/23/2017	0	0	0	0	0	0	0	0
3/24/2017	0	0	0	0	0	0	0	0
3/25/2017	0	0	0	0	0	0	0	0
3/26/2017	0	0	0	0	0	0	0	0

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
3/27/2017	0	0	0	0	0	0	0	0
3/28/2017	0	0	0	0	0	0	0	0
3/29/2017	0	0	0	0	0	0	0	0
3/30/2017	0	0	0	0	0	0	0	0
3/31/2017	0	0	0	0	0	0	0	0
4/1/2017	0	0	0	0	0	0	0	0
4/2/2017	0	0	0	0	0	0	0	0
4/3/2017	0.96	0.52	1.27	1.91	0.71	2.05	0.42	0.98
4/4/2017	1.13	2.25	2.78	1.84	1.14	1.37	1.22	2.23
4/5/2017	0.61	0.17	0.77	1	0.83	1.73	0.34	0.87
4/6/2017	0.59	0.14	0.22	0	0.12	0	0.35	1.19
4/7/2017	0	0	0	0	0	0	0	0
4/8/2017	0	0	0	0	0	0	0	0
4/9/2017	0	0	0	0	0	0	0	0
4/10/2017	0	0	0	0	0	0	0	0
4/11/2017	0	0	0	0	0	0	0	0
4/12/2017	0	0	0	0	0	0	0	0
4/13/2017	0	0	0	0	0	0	0	0
4/14/2017	0	0	0	0	0	0	0	0
4/15/2017	0	0	0	0	0	0	0	0
4/16/2017	0	0	0	0	0	0	0	0
4/17/2017	0	0	0	0	0	0	0	0
4/18/2017	0	0	0	0	0	0	0	0
4/19/2017	0	0	0	0	0	0	0	0
4/20/2017	0	0	0	0	0	0	0	0
4/21/2017	0	0	0	0	0	0	0	0
4/22/2017	0	0	0	0	0	0	0	0
4/23/2017	0	0	0	0	0	0	0	0
4/24/2017	0	0	0	0	0	0	0	0
4/25/2017	0	0	0	0	0	0	0	0
4/26/2017	0	0	0	0	0	0	0	0
4/27/2017	0	0	0	0	0	0	0	0
4/28/2017	0	0	0	0	0	0	0	0
4/29/2017	0	0	0	0	0	0	0	0
4/30/2017	0	0	0	0	0	0	0	0
5/1/2017	0.02	0	0	0	0	0	0.01	0.04
5/2/2017	0	0	0	0	0	0	0	0
5/3/2017	0	0	0	0	0	0	0	0
5/4/2017	0	0.05	0.28	0	0.25	0.17	0	0.1
5/5/2017	0.14	0.04	0.1	0	0.1	0	0	0.04
5/6/2017	0	0	0	0	0	0	0	0
5/7/2017	0	0	0	0	0	0	0	0
5/8/2017	0	0	0	0	0	0	0	0

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
5/9/2017	0	0	0	0	0	0	0	0
5/10/2017	0	0	0	0	0	0	0	0
5/11/2017	0	0	0	0	0	0	0	0
5/12/2017	0	0	0	0	0	0	0	0
5/13/2017	0.57	0.63	0.72	0.91	1.17	0.91	0.65	0.53
5/14/2017	0.01	0	0	0	0.01	0	0	0.01
5/15/2017	0	0	0	0	0	0	0	0
5/16/2017	0	0.02	0	0	0	0	0	0
5/17/2017	0	0	0	0	0	0	0	0
5/18/2017	0	0	0	0	0	0	0	0
5/19/2017	0	0.01	0	0	0	0	0.01	0
5/20/2017	0	0	0	0	0.9	0	0	0
5/21/2017	0.05	0.13	0.15	0.3	0.36	0.18	0.09	0.23
5/22/2017	0	0	0.01	0	0.01	0	0	0.01
5/23/2017	0.26	0.6	0.77	1.22	0.96	0.62	0.52	0.68
5/24/2017	0.5	1.79	1.24	1.18	1.39	1.8	1.54	1.74
5/25/2017	0.02	0.01	0	0	0	0	0.01	0.01
5/26/2017	0.01	0	0	0	0	0	0	0
5/27/2017	0	0	0	0	0	0	0	0
5/28/2017	0	0	0	0	0	0	0	0
5/29/2017	0	0	0	0	0	0	0	0
5/30/2017	0.04	0	2.53	2.95	1.55	1.17	0.68	0.89
5/31/2017	0.1	0	0	0	0	0	0.01	0.01
6/1/2017	0	0.25	0	0	0	0.09	0	0.21
6/2/2017	0.01	0	0	0	0	0	0.01	0.01
6/3/2017	0	0.32	0.3	0.02	0.02	0	0	0.02
6/4/2017	0.44	1.02	1.17	2	0.87	1.56	0.36	1.62
6/5/2017	0	0.01	0.09	0	0.01	0.17	0.01	0.01
6/6/2017	2.03	3.46	2.94	2.86	2.08	4.232	2.51	3.1
6/7/2017	2.1	2.41	2.5	1.58	2.26	3.65	1.73	3.69
6/8/2017	0.11	0.12	0.15	0	0.14	0	0.08	0.07
6/9/2017	0	0	0	0	0	0	0	0
6/10/2017	0	0.15	0	0	0	0	0	0
6/11/2017	0.24	0.67	0.22	0.68	0.2	0.4	0.42	0.17
6/12/2017	0.02	0	0.01	0	0.37	0	0	0.02
6/13/2017	0.41	0.93	1.12	1.1	0.35	0.48	0.41	0.42
6/14/2017	0.05	0	0.32	0.38	0.49	0	0.01	0.26
6/15/2017	0	0.09	0	0	0	0	0.01	0
6/16/2017	0	0	0	0	0	0	0	0
6/17/2017	0.72	0.11	0.52	0.22	1.33	1.06	0.07	0.55
6/18/2017	0.12	0.36	0.43	0.45	0.24	0.23	0.05	0.2
6/19/2017	0.66	1.11	0.39	0.42	1.16	1.51	0.74	1.02
6/20/2017	0.1	0.1	0.37	0.43	0.21	0.21	0.09	0.15

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
6/21/2017	0.26	1.22	0.53	0.19	0.18	0.49	0.75	0.46
6/22/2017	0.06	0.01	0	0	0	0	0	0.01
6/23/2017	0	0	0	0	0	0	0	0
6/24/2017	0	0	0	0	0	0	0	0
6/25/2017	0	0	0	0	0	0	0	0
6/26/2017	0	0	0	0	0	0	0	0
6/27/2017	0.44	0.12	0.17	0.2	0.97	0.56	0.2	0.47
6/28/2017	0	0	0.02	0	0.01	0	0	0.01
6/29/2017	0.68	0.2	0.54	0.85	0.5	0.94	0.08	0.83
6/30/2017	0	0.35	0	0	0	0	0.97	0.01
7/1/2017	0	0	0	0	0	0	0	0
7/2/2017	0	0	0	0	0	0	0	0
7/3/2017	0	0	0	0	0	0	0	0
7/4/2017	0	0	0	0	0	0	0	0
7/5/2017	0	0.1	0	0	0	0	0	0.54
7/6/2017	0	0.08	0	0	0	0	0	0
7/7/2017	0	0	0	0	0	0	0	0
7/8/2017	0.14	0	0	0	0.87	0	0.04	0
7/9/2017	0.33	0.03	0.34	0.03	0	0.58	0.08	0.35
7/10/2017	0.04	0.09	0.08	0.08	0.06	0	0.61	0.1
7/11/2017	0.18	0.01	0	0.17	0.88	0.15	1.08	0.01
7/12/2017	0	0	0	0	0	0	0	0
7/13/2017	0	0.87	0.11	0	0.34	0.07	0.02	0.08
7/14/2017	0	0.01	0	0	0	0	0	0.01
7/15/2017	0	0	0	0	0	0	0.05	0.01
7/16/2017	0	0	0	0	0	0	0	0
7/17/2017	0.44	0.26	0	0	0.08	0.23	0.08	0.21
7/18/2017	0	0	0	0	0	0	0.01	0
7/19/2017	0.05	0.01	0	0.19	0.02	0	0.03	0
7/20/2017	0.1	0.01	0	0	0.04	0	0.05	0
7/21/2017	0.01	0	0.03	0.3	0.21	0	0	0.01
7/22/2017	0.09	0	0.17	0.09	0	0.58	0.16	0.36
7/23/2017	0.1	0	0.09	0.76	0.79	0.18	0.02	0.13
7/24/2017	0.07	0.08	0.13	0.22	0.15	0	0	0.03
7/25/2017	0.01	0.23	0.22	0.1	0.61	0.21	0.06	0.11
7/26/2017	0.02	0.19	0	0	0.06	0.12	0.09	0.02
7/27/2017	0	0	0	0	0.02	0	0	0
7/28/2017	0	0.52	0	0	0	0	0.1	0
7/29/2017	0.03	0.04	0.05	0	0.03	0.09	0.25	0.11
7/30/2017	0	1.69	0.51	0.2	0	0	0.26	0.09
7/31/2017	0	0	0	0	0	0	0	0
8/1/2017	0	0	0	0	0	0	0	0
8/2/2017	0.66	1.34	0.58	0.89	1.31	1.07	0.91	0.76

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
8/3/2017	0.12	0.29	0.19	0.15	0.22	0.26	0.2	0.27
8/4/2017	0.32	0.06	0.2	0.38	0.22	0.49	0.04	0.53
8/5/2017	0.02	0.05	0.01	0.04	0.01	0.07	0.03	0.03
8/6/2017	0	0	0	0	0	0	0	0
8/7/2017	0.03	0.08	0	0	0	0.11	0	0.01
8/8/2017	0	0	0.06	0.1	0.13	0	0	0
8/9/2017	0.06	0.05	0.08	0.1	0.07	0.17	0.1	0.11
8/10/2017	0.01	0.01	0	0	0.01	0	0.1	0.01
8/11/2017	1.25	0.11	0.18	0.26	0.52	1.2	1.1	0.73
8/12/2017	0.14	0.08	0.05	0.05	0.65	0	0.11	0.04
8/13/2017	0.18	0	0	0	0	0.16	0.03	0.06
8/14/2017	0.65	0.88	0.43	0.16	0.26	0.91	0.6	0.47
8/15/2017	0.01	0.01	0.01	0.04	0.01	0	0	0.01
8/16/2017	0	0	0	0	0	0	0	0
8/17/2017	0.24	0.02	0.02	0.62	0.44	1.45	0.02	0.56
8/18/2017	0.98	2.67	0.25	0	0.29	1.7	2.27	1.37
8/19/2017	0.04	0	0.15	0	0	0.16	0	0.04
8/20/2017	0.27	0.07	0.74	0.88	0.02	0.16	0.78	0.08
8/21/2017	0.01	0.01	0.01	0	0.01	0	0	0.01
8/22/2017	0	0	0	0	0	0	0	0
8/23/2017	0.08	0.01	0.07	0.04	0.02	0.18	0.11	0.3
8/24/2017	0.44	0	0	0	0	0	0.32	0.01
8/25/2017	0	0	0	0	0	0	0	0
8/26/2017	0.02	0	0.05	0	0	0	0	0.01
8/27/2017	0.2	0.15	0.19	0	0.04	0.19	0.16	0.13
8/28/2017	0	0	0	0	0	0	0	0.01
8/29/2017	0	0	0.01	0	0.01	0	0	0
8/30/2017	0.08	0	0.32	0.19	0.11	0.35	0	0.09
8/31/2017	0	0	0	0	0	0	0	0
9/1/2017	0.01	0.05	0.09	0.24	0.01	0.07	0.04	0.07
9/2/2017	0.03	0.07	0.09	0.03	0.23	0	0.06	0.01
9/3/2017	0.09	0.01	0	0.01	1.29	0	0	0
9/4/2017	0	0.24	0	0	0.01	0	0.01	0
9/5/2017	0.88	1.49	0	0	0.11	0.61	0.72	0.58
9/6/2017	0.08	0.18	0.16	0.19	0.12	0.21	0.29	0.14
9/7/2017	0	0	0	0	0	0	0	0.01
9/8/2017	0	0	0	0	0	0	0	0
9/9/2017	0	0	0	0	0	0	0	0
9/10/2017	0.95	1.61	1.3	3.15	1.43	5.75	0.34	1.63
9/11/2017	3.44	6.25	4.58	2.47	4.61	0	0.2	5.54
9/12/2017	0	0	0	0	0	0	0.02	0
9/13/2017	0.45	0.34	0.19	0.63	0.6	0.82	0.18	0.76
9/14/2017	0	0.07	0.13	0.04	0.01	0.22	0	0.22

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
9/15/2017	0	0	0.04	0.09	0	0	0	0.01
9/16/2017	0	0	0	0.13	0	0	0	0
9/17/2017	0	0	0	0	0	0	0	0
9/18/2017	0	0	0	0	0	0	0	0
9/19/2017	0	0	0	0	0	0	0	0
9/20/2017	0	0	0	0	0	0	0.01	0
9/21/2017	0.02	0.02	0.28	0.09	0.25	0	0	0.04
9/22/2017	0	0.05	0	0	0.32	0	0	0.01
9/23/2017	0	0.01	0	0	0.05	0	0	0
9/24/2017	0	0	0	0	0	0	0	0
9/25/2017	0	0	0	0	0	0	0	0
9/26/2017	0	0	0	0	0	0	0	0
9/27/2017	0	0	0	0	0	0	0	0
9/28/2017	0	0	0	0	0	0	0	0
9/29/2017	0	0	0	0	0	0	0	0
9/30/2017	0.13	0.51	0.08	0.19	0.09	0	0.14	0.18
10/1/2017	0.01	0.08	0.03	0.04	0.02	0.27	0.04	0.06
10/2/2017	0	0.03	0	0	0	0	0	0
10/3/2017	0	0	0	0	0	0	0.01	0
10/4/2017	0	0	0.01	0	0	0	0	0.01
10/5/2017	0.01	0.02	0	0	0	0	0.02	0
10/6/2017	0	0.01	0	0	0	0	0.25	0
10/7/2017	0.12	0.49	0.15	0.29	0.5	0.52	0.1	0.52
10/8/2017	0.03	0.29	0.24	0.24	0.3	0.27	0.28	0.17
10/9/2017	0.17	0.14	0.24	0.13	0.19	0.53	0.16	0.51
10/10/2017	0.02	0.01	0.13	0.08	0	0.45	0.1	0.22
10/11/2017	0	0	0	0	0	0	0.01	0
10/12/2017	0	0	0	0	0	0	0	0
10/13/2017	0	0	0	0	0	0	0	0
10/14/2017	0	0	0	0	0	0	0	0
10/15/2017	0	0	0	0	0	0	0	0
10/16/2017	0.03	0.01	0.36	0.58	0.35	0.12	0.05	0.2
10/17/2017	0	0	0	0	0	0	0.01	0.01
10/18/2017	0	0	0	0	0	0	0	0
10/19/2017	0	0	0	0	0	0	0	0
10/20/2017	0	0	0	0	0	0	0	0
10/21/2017	0	0	0	0	0	0	0	0
10/22/2017	0	0	0	0	0	0	0	0
10/23/2017	0.09	0.07	0.15	0.25	0.13	0.18	0.15	0.1
10/24/2017	0	0	0	0	0	0	0	0.01
10/25/2017	0	0	0	0	0	0	0	0
10/26/2017	0	0	0	0	0	0	0	0
10/27/2017	0	0	0	0	0	0	0	0

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
10/28/2017	0	0	0	0	0	0	0	0
10/29/2017	0	0	0	0	0	0	0	0
10/30/2017	0	0	0	0	0	0	0	0
10/31/2017	0	0	0	0	0	0	0	0
11/1/2017	0	0	0	0	0	0	0	0
11/2/2017	0	0	0	0	0	0	0	0
11/3/2017	0	0	0	0	0	0	0	0
11/4/2017	0	0	0	0	0	0	0	0
11/5/2017	0	0	0	0	0	0	0	0
11/6/2017	0	0	0	0	0	0	0	0
11/7/2017	0	0	0	0	0	0	0	0.01
11/8/2017	0	0	0	0	0	0	0	0
11/9/2017	0	0	0	0	0	0	0	0
11/10/2017	0	0	0	0	0	0	0	0
11/11/2017	0	0	0	0	0	0	0	0
11/12/2017	0	0	0	0	0	0	0	0
11/13/2017	0	0	0	0	0	0	0	0
11/14/2017	0	0	0	0	0	0	0	0
11/15/2017	0	0	0	0	0	0	0	0
11/16/2017	0	0	0	0	0	0	0	0
11/17/2017	0	0	0	0	0	0	0	0
11/18/2017	0	0	0	0	0	0	0	0
11/19/2017	0	0.02	0.03	0	0.02	0.04	0.05	0.06
11/20/2017	0	0	0	0	0	0	0	0
11/21/2017	0.03	0.1	0.09	0.15	0.1	0.21	0.07	0.15
11/22/2017	0	0.01	0.01	0	0	0	0.01	0.01
11/23/2017	0.08	0.51	0.4	0.43	0.36	0.51	0.01	0.43
11/24/2017	0	0	0	0	0	0	0	0.01
11/25/2017	0	0	0	0	0	0	0	0
11/26/2017	0	0	0	0	0	0	0.01	0
11/27/2017	0	0	0	0	0	0	0	0
11/28/2017	0	0	0	0	0	0	0	0
11/29/2017	0	0	0	0	0	0	0	0
11/30/2017	0	0	0	0	0	0	0	0
12/1/2017	0	0	0	0	0	0	0	0
12/2/2017	0	0	0	0	0	0	0	0
12/3/2017	0	0	0	0	0	0	0	0
12/4/2017	0	0	0	0	0	0	0	0
12/5/2017	0	0	0	0	0	0	0	0
12/6/2017	1.21	0.96	1.25	1.25	1.66	1.62	0.04	1.55
12/7/2017	0.4	0.42	0.3	0.46	0.56	0.72	0.01	0.64
12/8/2017	0.43	0.76	0.49	0.73	0.68	0.8	0	0.67
12/9/2017	0.12	0.05	0.04	0	0.05	0	0	0.05

Table C.2-1.
2017 Daily Rainfall Data (inches) from PCS Gauges

Date	002-2	BFish	IC 41	SCC	SR-6	SRC	WSP	SRWMD
12/10/2017	0	0	0	0	0	0	0	0
12/11/2017	0	0	0	0	0	0	0.01	0
12/12/2017	0	0	0	0	0	0	0	0
12/13/2017	0	0	0	0	0	0	0	0
12/14/2017	0	0	0	0	0	0	0	0
12/15/2017	0	0	0	0	0	0	0	0
12/16/2017	0	0	0	0	0	0	0	0
12/17/2017	0	0	0	0	0	0	0	0
12/18/2017	0	0	0.02	0	0.01	0	0	0
12/19/2017	0	0	0	0	0	0	0	0.01
12/20/2017	0	0	0.01	0	0.01	0	0	0
12/21/2017	0	0	0	0	0	0	0	0
12/22/2017	0	0	0	0	0	0	0	0
12/23/2017	0	0	0	0	0	0	0	0
12/24/2017	0	0	0	0	0	0	0	0
12/25/2017	0	0	0	0	0	0	0	0
12/26/2017	0	0	0	0	0	0	0	0
12/27/2017	0.18	0.19	0.27	0.36	0.17	0.38	0.02	0.28
12/28/2017	0.19	0.26	0.34	0.32	0.31	0.35	0	0.35
12/29/2017	0	0.01	0.01	0	0.02	0	0	0.01
12/30/2017	0.01	0	0	0	0	0	0	0
12/31/2017	0.09	0.12	0.17	0.31	0.18	0.45	0.01	0.17
TOTAL	**33.17**	**50.50**	**45.85**	**49.16**	**51.34**	**59.27**	**32.83**	**52.20**

Table C.2-2.
2017 Monthly Rainfall (inches) Summaries for PCS Gauges & SRWMD Raingauge at PCS

2017	002-2	B FISH	IC 41	SCC	SR-6	SRC	WSP	SRWMD
January	2.29	4.09	4.76	5.97	5.69	5.90	3.63	4.55
February	0.04	0.80	0.71	0.81	0.77	0.93	0.92	0.81
March	0.66	0.67	0.74	0.77	0.73	0.92	0.63	0.75
April	3.29	3.08	5.04	4.75	2.80	5.15	2.33	5.27
May	1.72	3.28	5.80	6.56	6.70	4.85	3.52	4.29
June	8.45	13.01	11.79	11.38	11.39	15.58	8.50	13.31
July	1.61	4.22	1.73	2.14	4.16	2.21	2.99	2.17
August	5.81	5.89	3.60	3.90	4.35	8.63	6.88	5.64
September	6.08	10.90	6.94	7.26	9.13	7.68	2.01	9.20
October	0.48	1.15	1.31	1.61	1.49	2.34	1.18	1.81
November	0.11	0.64	0.53	0.58	0.48	0.76	0.15	0.67
December	2.63	2.77	2.90	3.43	3.65	4.32	0.09	3.73
TOTAL	**33.17**	**50.50**	**45.85**	**49.16**	**51.34**	**59.27**	**32.83**	**52.20**

SCC data used to replace missing data for IC 41 Nov 24-Dec 06; and SR-6 May 31-Jun 01.

Figure C.2-1. Plot of 2017 Daily Rainfall
Daily Records for all Gauges

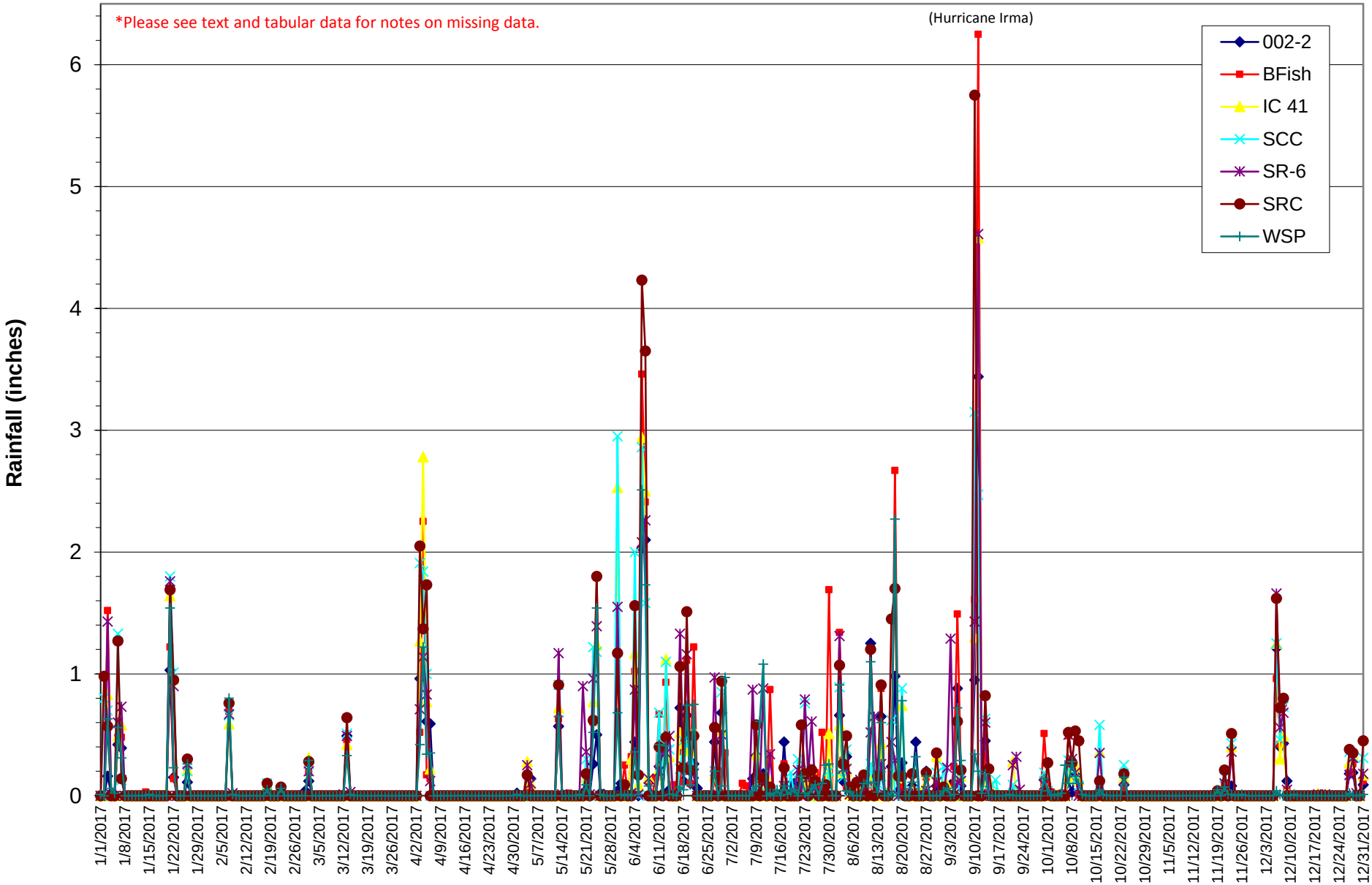


TABLE C.3-1
Groundwater Elevations from Piezometer Set
Sections 3 & 4 (1S14E)
I-75 North, 2017

ID	AQ02-095d	AQ02-095s	AQXX-001	AQXX-002	AQXX-003	AQXX-016
TOP	**153.46**	**153.27**	**143.18**	**144.93**	**145.94**	**132.2**
GE	**149.75**	**149.72**	**142.75**	**144.11**	**144.96**	**129.86**
1/30/2017	145.16	145.14	139.46	134.54	139.54	
2/1/2017						126.63
2/27/2017	144.33	144.33				
3/31/2017	143.90	143.91				
4/10/2017			139.86	134.52	140.16	
4/19/2017						126.89
4/27/2017	144.94	144.95				
5/22/2017	143.82	143.87				
6/30/2017	147.13	147.13				
7/12/2017			139.40	138.53	140.84	
7/13/2017						126.57
7/31/2017	146.26	146.28				
8/28/2017	145.37	145.37				
9/28/2017	146.84	146.81				
10/31/2017	145.56	145.55				
11/27/2017	144.55	144.59	138.46	136.70	138.95	
11/30/2017						126.08
12/26/2017	145.48	145.50				

ID = IDENTIFICATION
TOP = TOP OF PIPE
GE = GROUND ELEVATION

TABLE C.3-2
Groundwater Elevations from Piezometer Set
Sections 10 & 11 (1S14E)
I-75 South, 2017

ID	AQ02-102d	AQ02-102s	AQ02-103d	AQ02-103s
TOP	**146.48**	**146.19**	**145.01**	**144.94**
GE	**142.48**	**142.49**	**141.74**	**141.67**
1/30/2017	136.66	136.58	136.33	137.27
2/27/2017	137.04	136.98	134.28	134.72
3/31/2017	137.24	137.00	134.92	135.40
4/27/2017	136.91	136.84	135.85	135.99
5/22/2017	136.34	136.28	133.83	134.33
6/19/2017	141.76	142.12	139.79	140.73
7/12/2017	139.90	139.97	137.44	138.39
8/28/2017	138.71	138.90	136.46	137.11
9/28/2017	no access	no access	137.71	138.71
10/31/2017	137.59	138.76	135.79	137.13
11/27/2017	137.37	137.29	134.86	136.04
12/27/2017	136.61	137.01	134.09	135.31

ID = IDENTIFICATION

TOP = TOP OF PIPE

GE = GROUND ELEVATION

TABLE C.3-3
Groundwater Elevations from Piezometer Set
Sections 12 &13 (1S14E)

Camp Branch West, 2017

ID	AQ03-107d	AQ03-107s	AQ03-108d	AQ03-108s	AQ03-109d	AQ03-109s	AQ03-110d	AQ03-110s	AQ03-111d	AQ03-111s	AQ03-112d	AQ03-112s	AQ03-113d	AQ03-113s	AQ07-119d	AQ07-119s
TOP	**136.76**	**136.65**	**138.64**	**138.60**	**134.84**	**134.75**	**135.67**	**135.76**	**125.90**	**125.88**	**126.38**	**126.42**	**150.13**	**149.96**	**124.65**	**124.63**
GE	**133.50**	**133.77**	**135.31**	**135.13**	**131.61**	**131.60**	**132.44**	**132.44**	**123.04**	**123.00**	**123.56**	**123.52**	**146.75**	**146.73**	**122.02**	**121.78**
1/27/2017	131.16	131.11	131.61	130.94	127.82	127.98	123.73	123.71	119.73	119.65	110.75	112.49	132.53	132.46	115.78	115.62
2/27/2017	130.65	130.61	131.20	130.57	127.73	127.80	122.79	122.81	119.01	118.90	110.54	112.30	132.59	132.54		
3/31/2017	129.87	129.80	130.93	130.22	127.06	127.25	122.22	122.26	118.60	118.48	110.06	111.97	132.69	132.59		
4/27/2017	130.68	130.59	131.01	130.36	127.61	127.81	123.36	123.53	118.74	118.51	110.47	113.00	134.92	134.88	114.86	115.11
5/22/2017	129.22	129.12	130.16	129.50	126.28	126.25	121.17	121.15	118.21	117.97	109.66	111.80	133.30	133.24		
6/19/2017	133.42	133.37	134.02	133.90	no access	no access	128.56	128.77	120.76	120.70	112.94	117.05	140.05	140.10		
7/20/2017	131.42	131.35	131.07	131.50	128.30	128.65	125.53	125.48	118.94	118.65	110.98	113.97	139.05	139.05	114.95	115.05
8/17/2017	130.97	130.93	131.26	130.47	no access	no access	123.67	123.70	119.21	119.00	110.58	113.34	137.50	137.44		
9/28/2017	132.05	131.90	no acces	no acces	no access	no access	126.10	126.49	119.56	119.34	111.60	115.45	139.40	139.53		
10/16/2017	131.43	131.30	no acces	no acces	no access	no access	124.58	124.58	119.36	119.10	110.70	113.98	138.79	138.85	115.06	115.16
11/27/2017	129.87	129.77	130.68	129.98	127.11	127.31	121.89	121.91	119.21	119.03	109.75	112.54	135.83	135.77		
12/26/2017	130.37	130.24	131.01	130.19	127.43	127.61	122.54	122.53	119.29	119.00	110.46	112.91	134.84	134.76		

ID = IDENTIFICATION

TOP = TOP OF PIPE

GE = GROUND ELEVATION

TABLE C.3-4
Groundwater Elevations from Piezometer Set
Sections 16 & 21 (1S15E)
US 41, 2017

ID	AQO2-096d	AQ02-096s	AQ09-124d	AQ09-124s	AQ09-125d	AQ09-125s
TOP	**134.39**	**134.58**	**143.14**	**143.27**	**137.13**	**137.60**
GE	**131.00**	**131.01**	**140.13**	**140.13**	**134.43**	**134.90**
1/27/2017			grouted	grouted	127.29	127.61
1/30/2017	125.83	125.84				
2/12/2017			grouted	grouted	128.06	128.40
2/27/2017	125.18	125.20				
3/31/2017	124.90	124.92	grouted	grouted	127.08	127.41
4/27/2017	125.84	125.81	grouted	grouted	128.02	128.63
5/22/2017	124.79	124.79	grouted	grouted	127.59	128.10
6/19/2017			grouted	grouted	131.59	131.93
6/30/2017	127.71	127.71				
7/20/2017			grouted	grouted	129.77	130.10
7/31/2017	126.08	126.07				
8/17/2017			grouted	grouted	129.28	129.56
8/28/2017	126.65	126.64				
9/28/2017	127.75	127.75	grouted	grouted	130.52	130.90
10/18/2017			grouted	grouted	129.72	130.06
10/31/2017	125.76	125.70				
11/27/2017	124.96	124.96	grouted	grouted	129.47	129.80
12/26/2017	126.06	126.06				
12/27/2017			grouted	grouted	128.81	129.13

ID = IDENTIFICATION

TOP = TOP OF PIPE

GE = GROUND ELEVATION

TABLE C.3-5
Groundwater Elevations from Piezometer Set
Section 30 (1S15E) Section 34 (1S16E)
FMB, 2017

ID	AQ02-097d	AQ02-097s	AQ07-120d	AQ07-120s
TOP	**134.46**	**134.28**	**135.64**	**135.53**
GE	**130.68**	**131.02**	**132.84**	**132.93**
1/30/2017	124.92	125.27	120.18	120.26
2/27/2017	120.82	121.04		
3/31/2017	119.69	119.74		
4/27/2017	119.81	120.17		
5/18/2017			no access (locked gate)	no access (locked gate)
5/22/2017	118.04	118.08		
6/30/2017	126.95	126.81		
7/31/2017	127.53	127.34		
8/20/2017			no access (locked gate)	no access (locked gate)
8/28/2017	127.59	127.68		
9/28/2017	126.99	127.64		
10/11/2017			no access (locked gate)	no access (locked gate)
10/31/2017	125.95	126.08		
11/27/2017	125.08	125.23		
12/26/2017	125.37	125.52		

ID = IDENTIFICATION

TOP = TOP OF PIPE

GE = GROUND ELEVATION

TABLE C.3-6 Groundwater Elevations from Piezometer Set Section 11 (1S16E) Roaring Creek, 2017		
ID	**AQ02-098d**	**AQ02-098s**
TOP	**125.15**	**125.33**
GE	**121.74**	**121.93**
1/30/2017	112.14	115.00
2/27/2017	110.54	111.83
3/31/2017	110.51	110.77
4/27/2017	110.39	110.69
5/22/2017	109.63	109.68
6/30/2017	115.65	115.70
7/31/2017	112.85	113.45
8/28/2017	116.74	119.18
9/28/2017	115.26	117.17
10/31/2017	115.06	115.90
11/27/2017	115.13	115.65
12/26/2017	115.32	117.10

ID = IDENTIFICATION

TOP = TOP OF PIPE

GE = GROUND ELEVATION

TABLE C.3-7
Groundwater Elevations from Piezometer Set
Sections 17 & 18 (1N16E) 2017

ID	AQ02-099d	AQ02-099s	HB 1i	HB 1s	HB 2i	HB 2s	HB 3i	HB 3s
TOP	**132.32**	**132.12**	**124.45**	**124.43**	**129.96**	**129.9**	**125.86**	**126.25**
GE	**129.11**	**129.06**	**121.45**	**121.63**	**126.8**	**126.9**	**123.2**	**123.2**
1/30/2017	114.48	114.44	113.61	113.58	117.33	119.53	113.77	115.30
2/27/2017	114.33	113.99	114.22	114.18	116.90	118.55	114.85	116.44
3/16/2017			114.51	114.45	116.39	117.17	115.14	116.66
3/31/2017	113.93	113.88						
4/27/2017	113.78	113.72	112.90	112.90	115.41	116.37	112.95	114.52
5/22/2017	113.24	113.13	111.73	111.73	114.12	114.87	112.51	114.10
6/29/2017			114.18	114.17	117.96	119.88	113.51	115.16
6/30/2017	114.49	114.44						
7/31/2017	114.02	113.98	113.34	113.31	117.16	118.64	113.91	115.37
8/28/2017	114.62	114.57						
8/30/2017			115.33	115.36	119.49	121.68	114.98	116.51
9/27/2017			117.25	117.26	120.95	123.28	115.71	116.72
9/28/2017	121.77	121.70						
10/31/2017	118.61	118.56	115.51	115.44	118.53	120.21	114.61	115.72
11/27/2017	117.14	117.10						
11/29/2017			114.37	114.28	117.03	118.20	113.55	114.82
12/26/2017	116.52	116.44						
12/27/2017			114.78	114.70	117.40	118.53	114.18	115.46

ID = IDENTIFICATION

TOP = TOP OF PIPE

GE = GROUND ELEVATION

TABLE C.3-8
Groundwater Elevations from Piezometer Set
Sections 8,9,10,19 (1N15E)
BeeHaven, 2017

ID	AQ06-117d	AQ06-117s	AQ06-118d	AQ06-118s	AQXX-014	AQXX-015
TOP	**133.45**	**133.72**	**130.31**	**130.38**	**126.95**	**127.48**
GE	**130.89**	**131.10**	**127.72**	**127.64**	**124.40**	**125.92**
1/30/2017	127.19	126.21	125.76	125.55		
2/1/2017					no access (ditch)	124.95
4/17/2017	no access	no access	no access	no access		
4/19/2017					no access (ditch)	no access (ditch)
7/12/2017	no access	no access	no access	no access		
7/13/2017					no access (ditch)	no access (ditch)
10/9/2017	no access	no access	no access	no access		
11/30/2017					no access (trees)	no access (trees)

ID = IDENTIFICATION
TOP = TOP OF PIPE
GE = GROUND ELEVATION

TABLE C.3-9
Groundwater Elevations from Piezometer Set
Sections 6,7,17,18 (1N15E) 2017

ID	AQXX-008	AQXX-009	AQXX-011	AQXX-013	AQ02-094d	AQ02-094s
TOP	**131.30**	**130.74**	**130.21**	**131.33**	**132.40**	**132.32**
GE	**128.35**	**127.86**	**127.49**	**128.53**	**128.93**	**128.92**
1/30/2017					125.10	125.47
2/1/2017	126.48	125.57	no access (ditch)	126.37		
2/27/2017					115.57	118.99
3/31/2017					116.90	114.29
4/19/2017	126.04	124.85	no access (ditch)	no access (ditch)		
4/27/2017					116.97	114.31
5/22/2017					no acces	no acces
6/30/2017					no acces	no acces
7/13/2017	126.52	126.50	no access (ditch)	127.24		
7/31/2017					no acces	no acces
8/28/2017					no acces	no acces
9/28/2017					no acces	no acces
10/31/2017					no acces	no acces
11/27/2017					no acces	no acces
11/30/2017	no access (trees)	no access (trees)	no access (trees)	no access (trees)		
12/26/2017					no acces	no acces

ID = IDENTIFICATION
TOP = TOP OF PIPE
GE = GROUND ELEVATION

TABLE C.3-10 Groundwater Elevations from Piezometer Set Sections 15&22 (1N15E) Black Still, 2017			
ID	**AQ04-115d**	**AQ04-115s**	**AQ04-116s**
TOP	**135.50**	**135.13**	**137.97**
GE	**132.82**	**132.70**	**135.29**
1/30/2017	124.69	125.10	123.57
2/27/2017	124.28	124.85	122.95
3/16/2017	123.36	123.65	122.33
4/27/2017	122.14	122.21	122.05
5/22/2017	120.95	120.93	121.52
6/29/2017	127.97	129.11	124.06
7/31/2017	127.71	pushed	123.20
8/30/2017	129.17	pushed	123.13
9/27/2017	pushed	pushed	123.67
10/31/2017	pushed	pushed	122.51
11/29/2017	pushed	pushed	122.41
12/27/2017	pushed	pushed	122.63

ID = IDENTIFICATION

TOP = TOP OF PIPE

GE = GROUND ELEVATION

TABLE C.3-11
Groundwater Elevations from Piezometer Set
Sections 11,12,13,14,15,24 (1N14E) 2017

ID	AQ08-121d	AQ08-121s	AQ08-122d	AQ08-122s	AQ08-123d	AQ08-123s	PZ5-1d	PZ5-1s	PZ5-2d	PZ5-2s	PZ5-3d	PZ5-3s	PZ5-4s/d	PZ5-5s
TOP	**135.18**	**135.02**	**140.50**	**140.25**	**139.63**	**139.66**	**136.80**	**136.59**	**135.06**	**134.99**	**142.96**	**142.99**	**134.04**	**134.36**
GE	**132.14**	**132.03**	**137.67**	**137.46**	**136.54**	**136.77**	**133.82**	**133.79**	**132.29**	**132.12**	**140.07**	**140.24**	**131.18**	**131.22**
1/30/2017	124.96	124.98	130.37	130.30	128.74	128.83	124.45	125.43	96.00	124.63	130.81	132.69	no access (mining)	118.84
2/27/2017							123.56	124.53	95.72	123.60	129.54	129.96	no access (mining)	117.54
3/20/2017							122.62	123.58	95.44	123.40	129.04	129.90	no access (mining)	117.08
4/17/2017	124.02	124.04	128.81	128.80	127.53	127.61	123.73	124.04	95.59	123.52	129.22	129.93	no access (mining)	117.31
5/22/2017							122.22	123.17	94.73	121.43	128.16	128.57	no access (mining)	116.16
6/29/2017							126.95	128.21	96.53	127.48	133.17	134.84	no access (mining)	122.54
7/12/2017	126.53	126.54	131.15	131.04	131.29	131.52								
7/31/2017							127.03	128.08	97.16	126.95	132.56	134.18	no access (mining)	122.04
8/28/2017							127.56	128.55	97.35	127.66	131.91	133.10	no access (mining)	123.15
9/28/2017							127.31	128.35	97.69	127.84	133.51	135.04	no access (mining)	124.08
10/9/2017	126.40	126.44	130.20	130.18	131.03	131.22								
10/31/2017							126.92	127.89	97.35	127.24	132.32	133.55	no access (mining)	123.19
11/29/2017							126.49	127.47	96.91	126.26	130.94	131.55	no access (mining)	121.56
12/26/2017							127.10	128.11	96.34	126.90	131.24	132.39	no access (mining)	120.84

ID = IDENTIFICATION

TOP = TOP OF PIPE

GE = GROUND ELEVATION

TABLE C.3-12
Groundwater Elevations from Piezometer Set
Sections 17,18,19,20 (1S15E)
Camp Branch East, 2017

ID	AQ03-114d	AQ03-114s	AQ11-126d	AQ11-126s	AQ11-127d	AQ11-127s	AQ11-128d	AQ11-128s	AQ11-129d	AQ11-129s	AQ11-130d	AQ11-130s	AQ11-131d	AQ11-131s
TOP	**146.47**	**146.52**	**142.32**	**142.29**	**147.86**	**147.86**	**146.71**	**146.64**	**148.57**	**147.68**	**142.99**	**142.62**	**138.97**	**139.22**
GE	**143.03**	**143.04**	**139.02**	**139.15**	**144.16**	**143.94**	**143.41**	**143.41**	**145.99**	**145.22**	**140.32**	**140.08**	**136.36**	**136.80**
1/27/2017	135.82	135.97	135.27	135.31	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
2/12/2017			135.93	135.97	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	136.08	135.51	130.96	130.95	131.32	130.68
2/27/2017	135.56	135.72												
3/31/2017	135.05	135.22	134.98	135.00	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
4/3/2017									134.84	134.22	130.17	130.16	130.18	129.56
4/27/2017	136.04	136.18	136.08	136.11	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
5/22/2017	134.62	134.78	135.28	135.26	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
6/19/2017	138.56	138.69	137.66	137.68	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
7/12/2017									138.86	138.27	132.87	132.81	133.23	132.51
7/20/2017	136.63	136.74	136.52	136.56	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
8/17/2017	136.34	136.52	136.60	136.57	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
9/28/2017	137.37	137.50	136.94	136.97	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
10/16/2017	136.67	136.74												
10/18/2017			136.66	136.69	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	137.99	137.46	132.43	132.41	no access	no access
11/27/2017	135.48	135.62	136.22	136.27	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						
12/26/2017	136.12	136.10												
12/27/2017			135.60	135.62	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16	Removed 5/6/16						

ID = IDENTIFICATION
TOP = TOP OF PIPE
GE = GROUND ELEVATION

Figure C.3-1. Groundwater Levels & Rainfall
I-75N, 2017

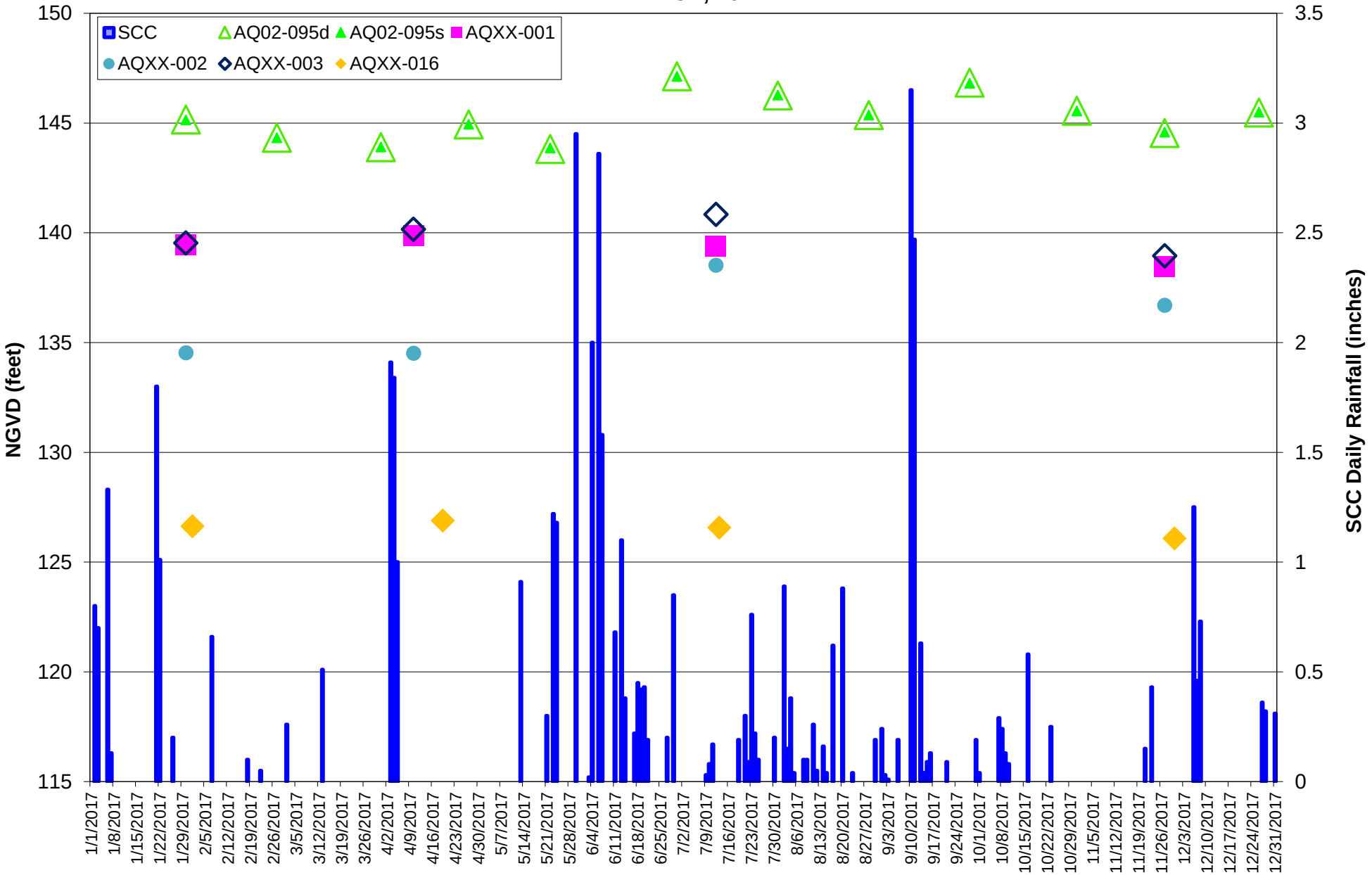


Figure C.3-2. Groundwater Levels & Rainfall
I-75S, 2017

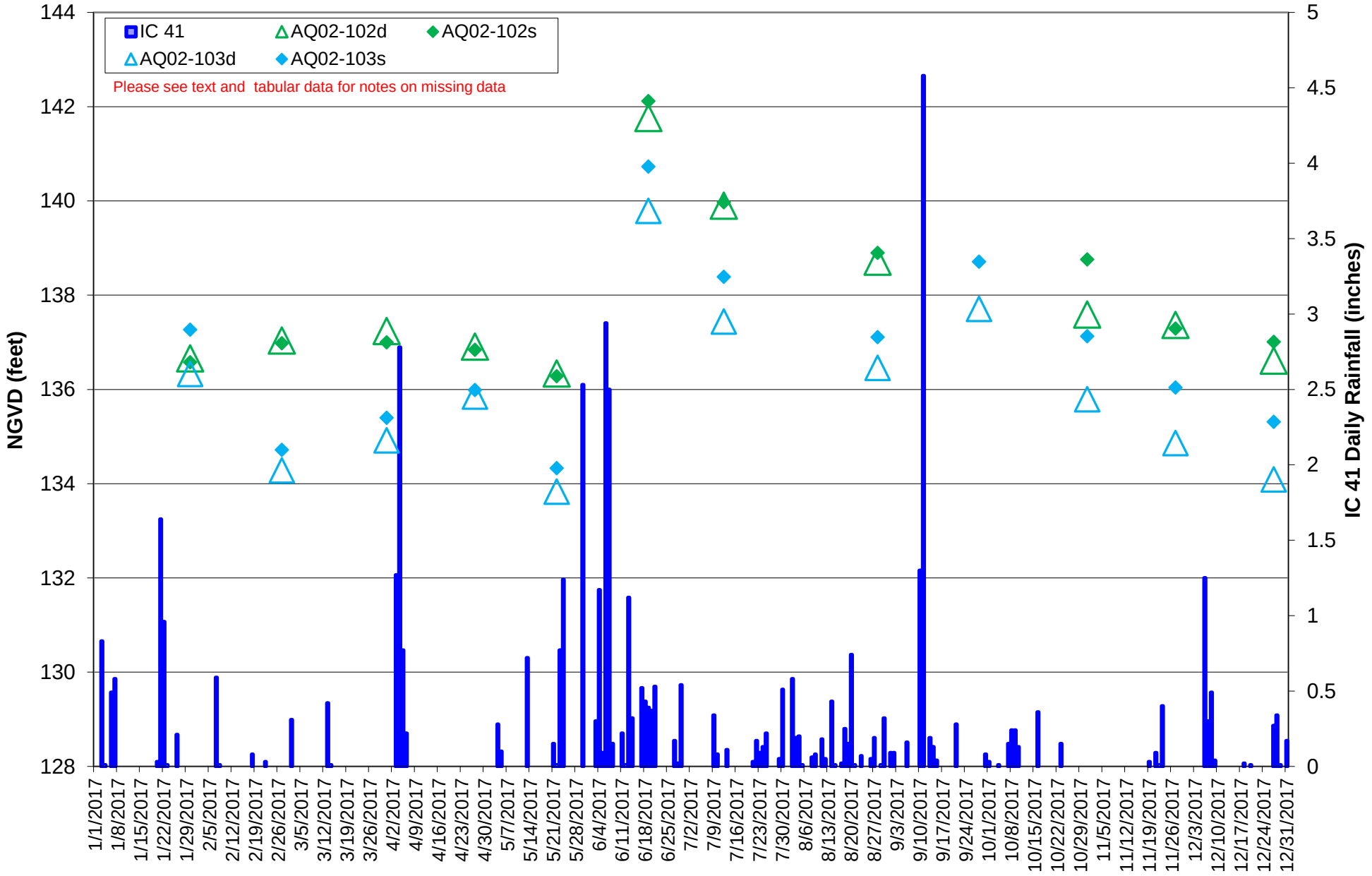


Figure C.3-3. Groundwater Levels & Rainfall
Camp Branch West, 2017

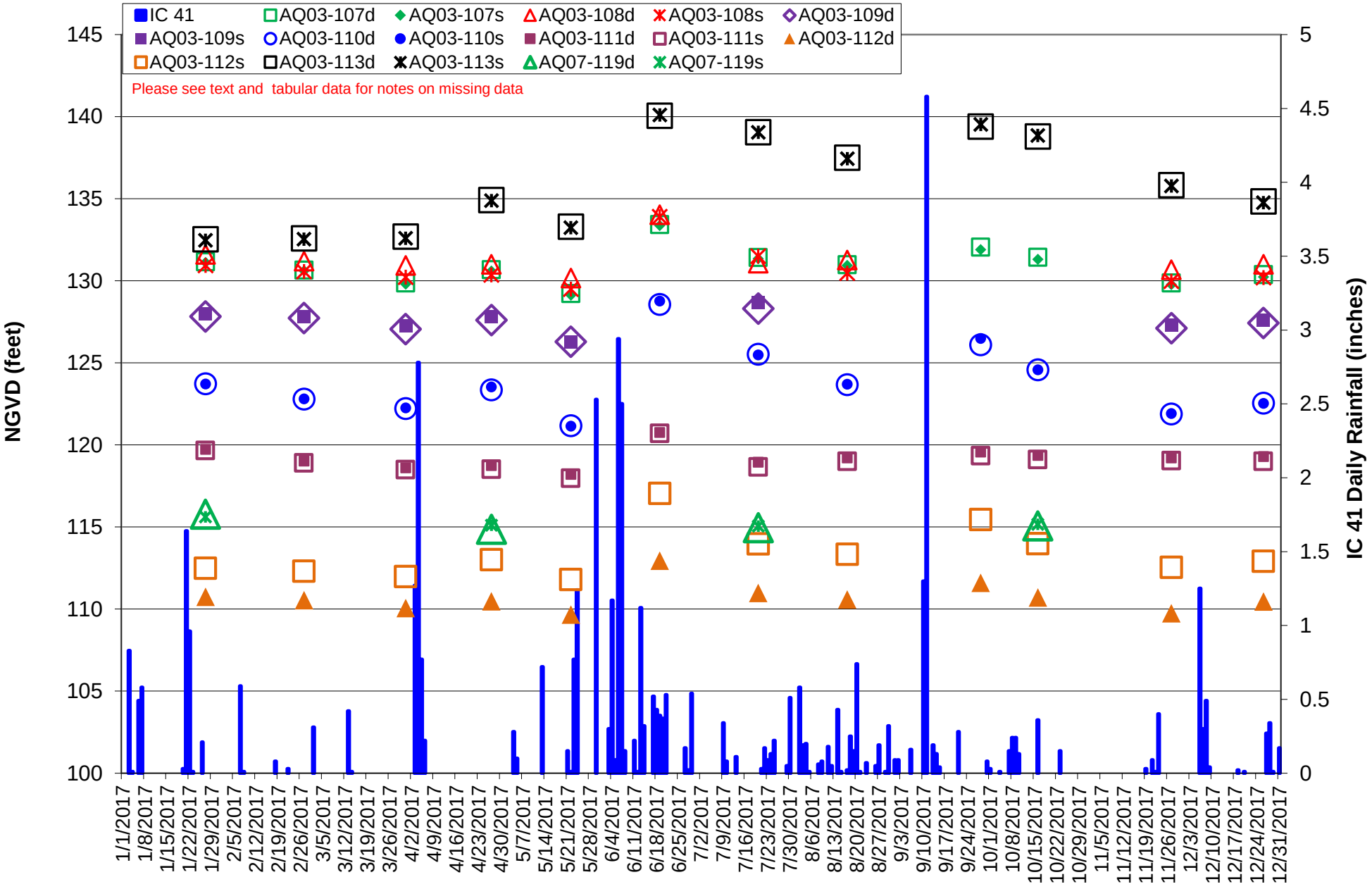


Figure C.3-4. Groundwater Levels & Rainfall
US 41, 2017

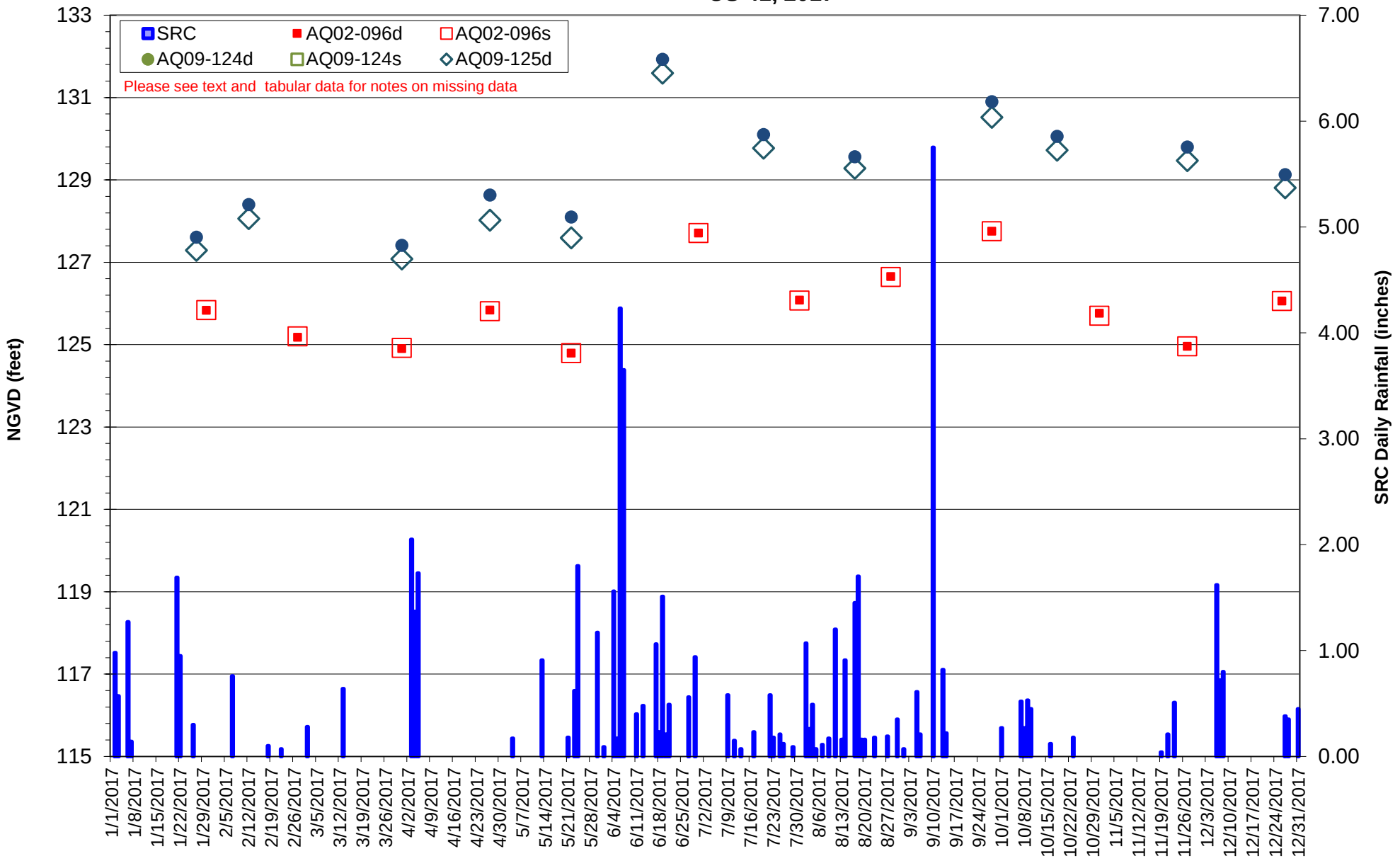


Figure C.3-5 Groundwater Levels & Rainfall
FMB, 2017

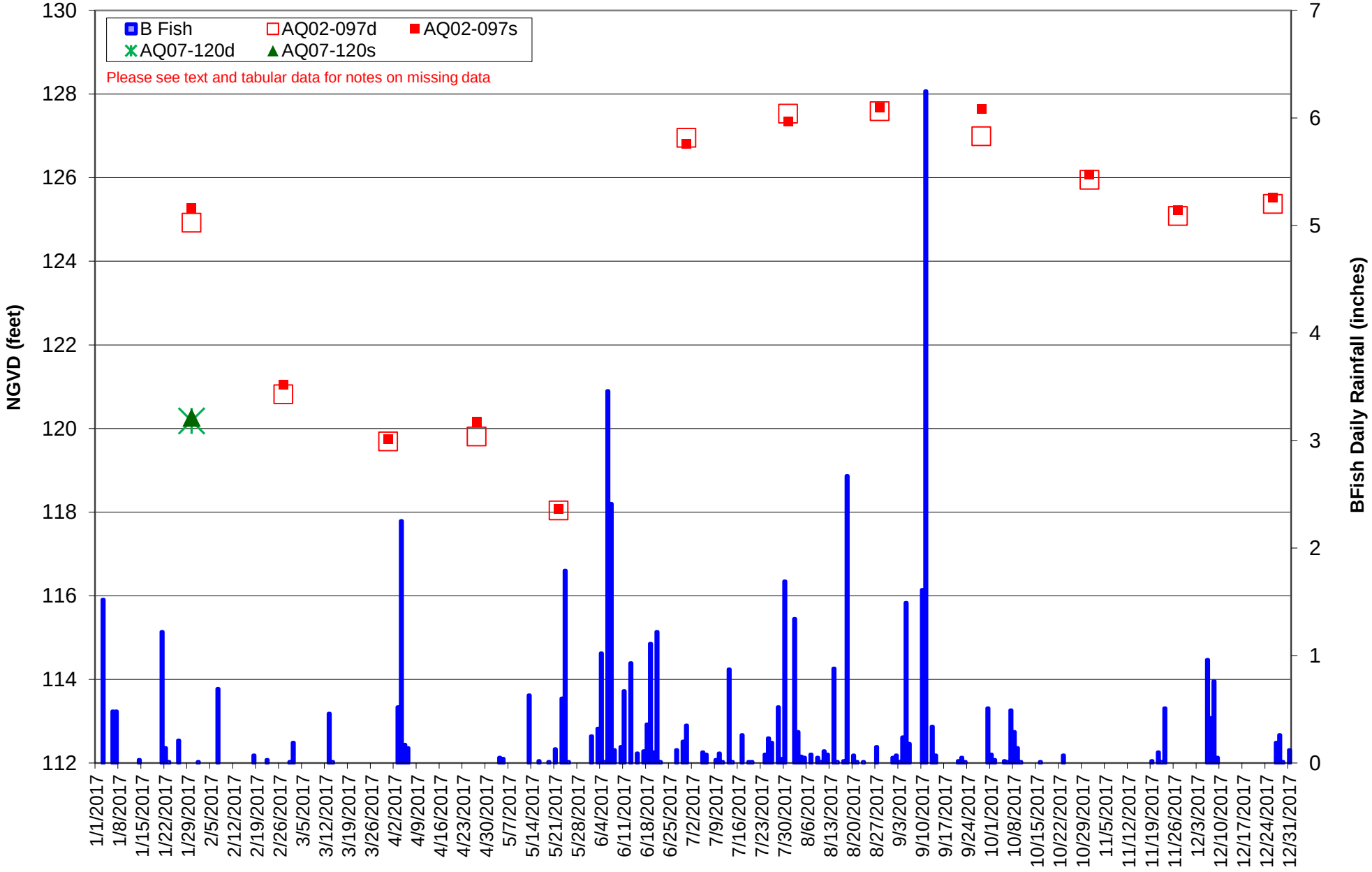


Figure C.3-6. Groundwater Levels & Rainfall
Roaring Creek, 2017

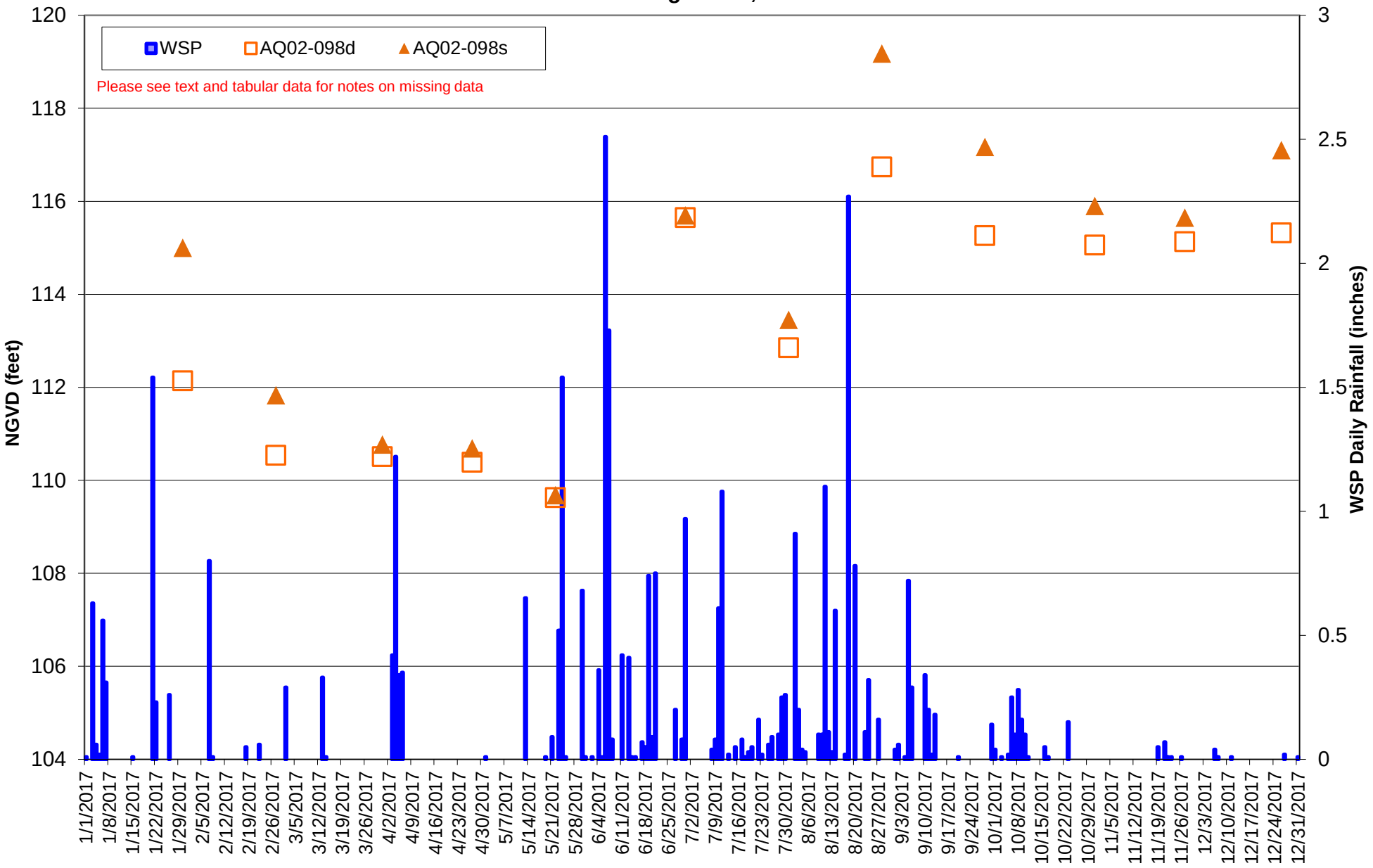


Figure C.3-7. Groundwater Levels & Rainfall
Sections 17&18 (1N16E) 2017

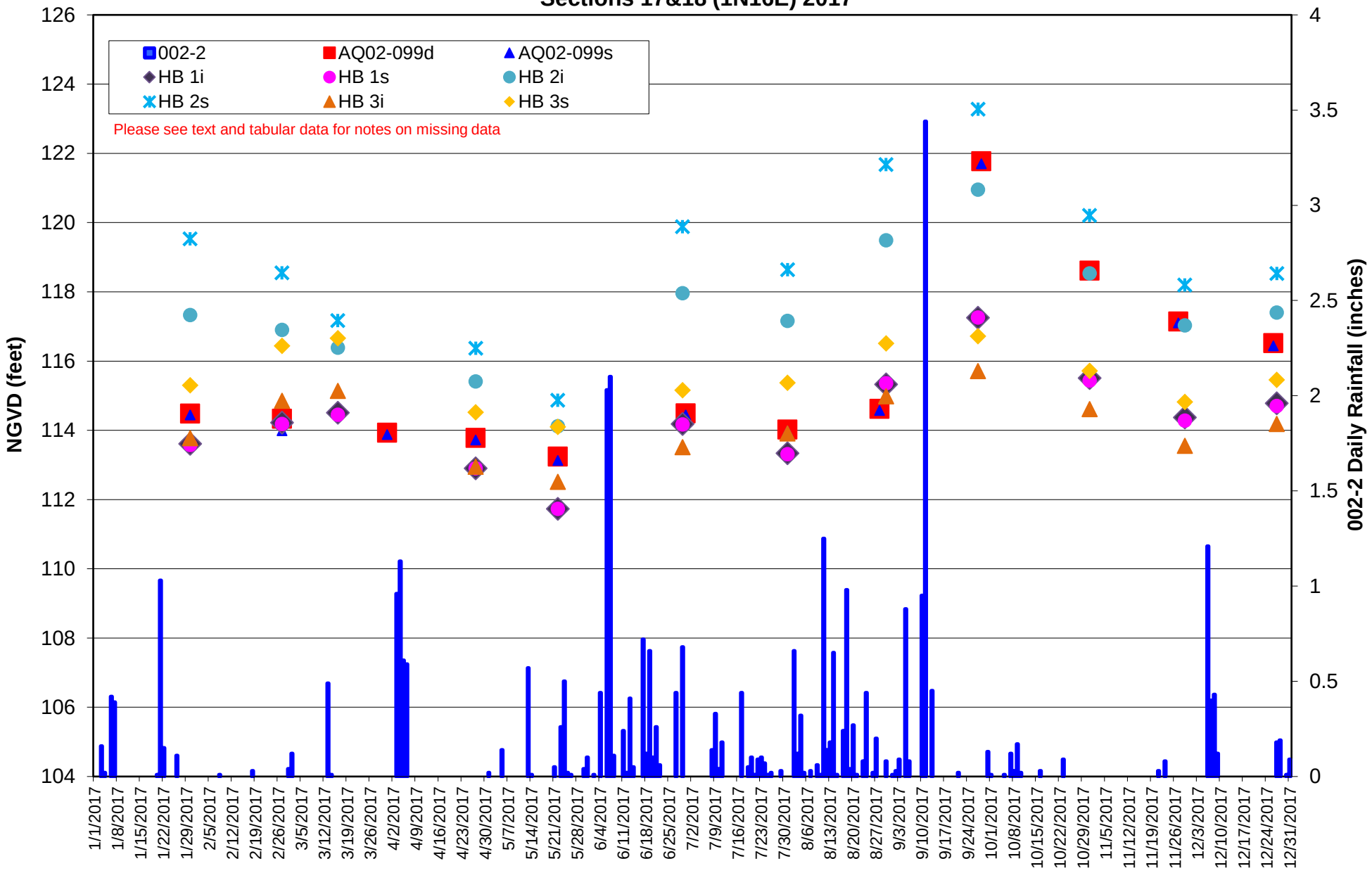


Figure C.3-8. Groundwater Levels & Rainfall
BeeHaven, 2017

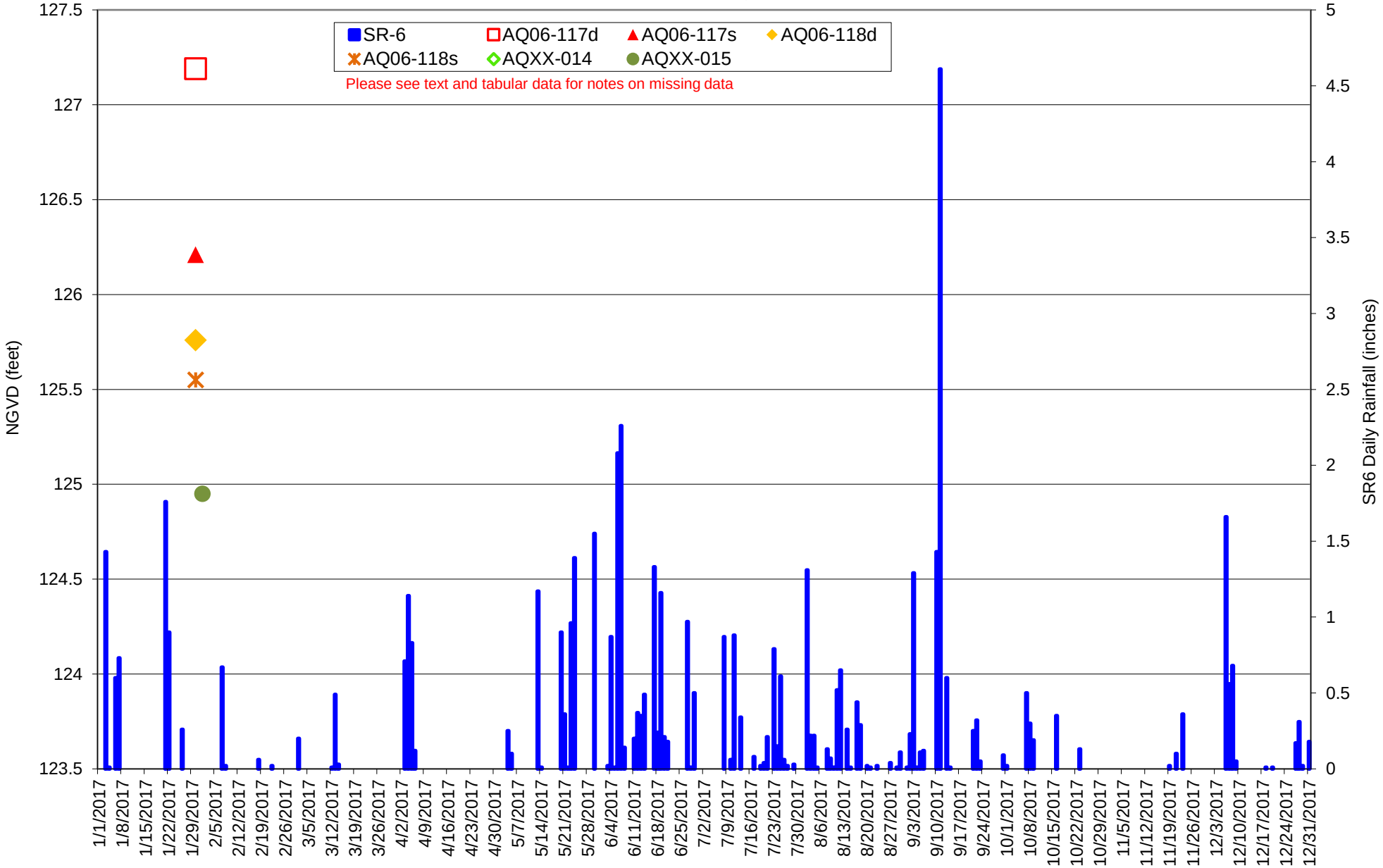


Figure C.3-9. Groundwater Levels & Rainfall
Sections 6,7,17,18 (1N15E) 2017

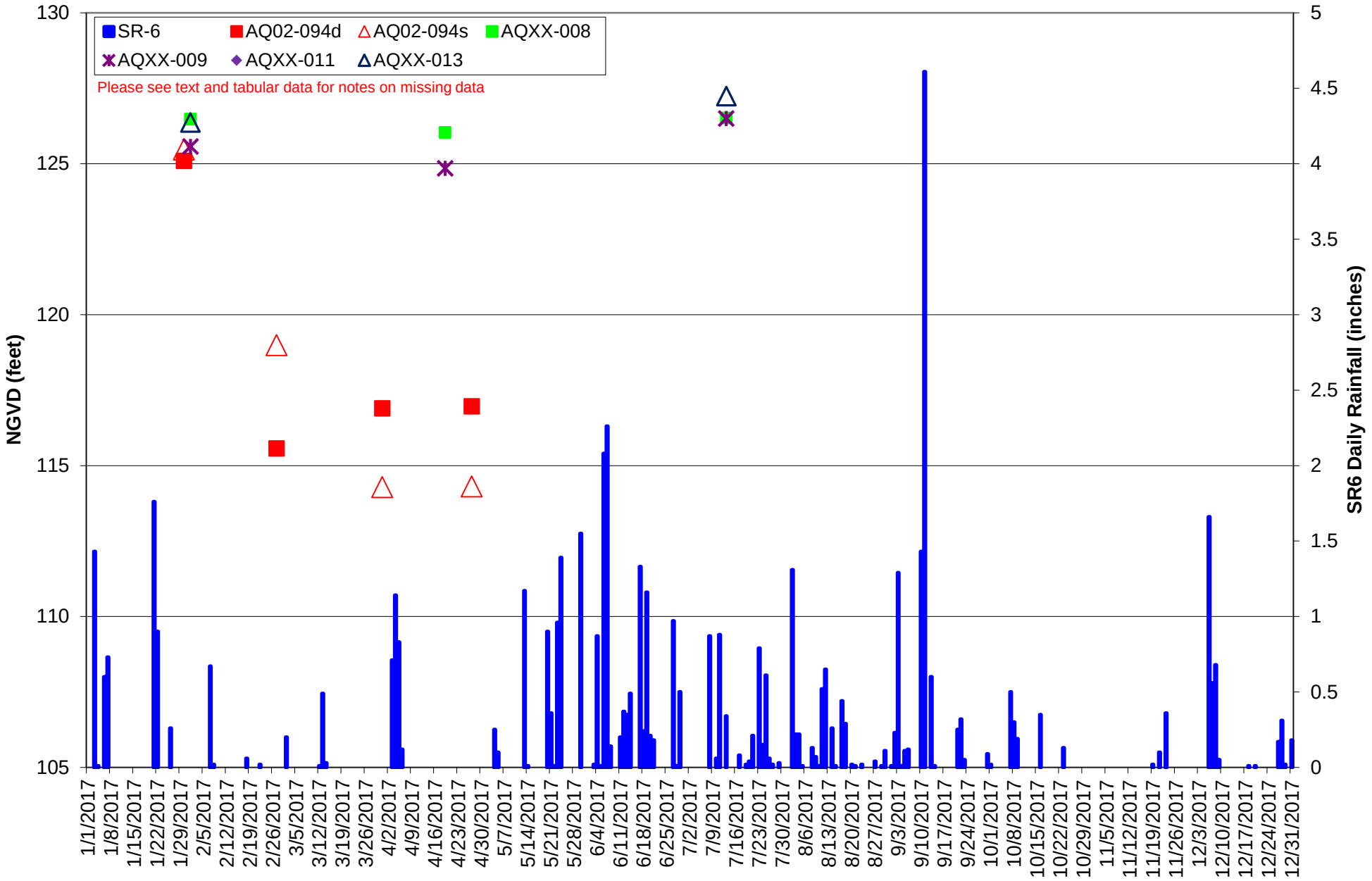


Figure C.3-10. Groundwater Levels & Rainfall
Black Still, 2017

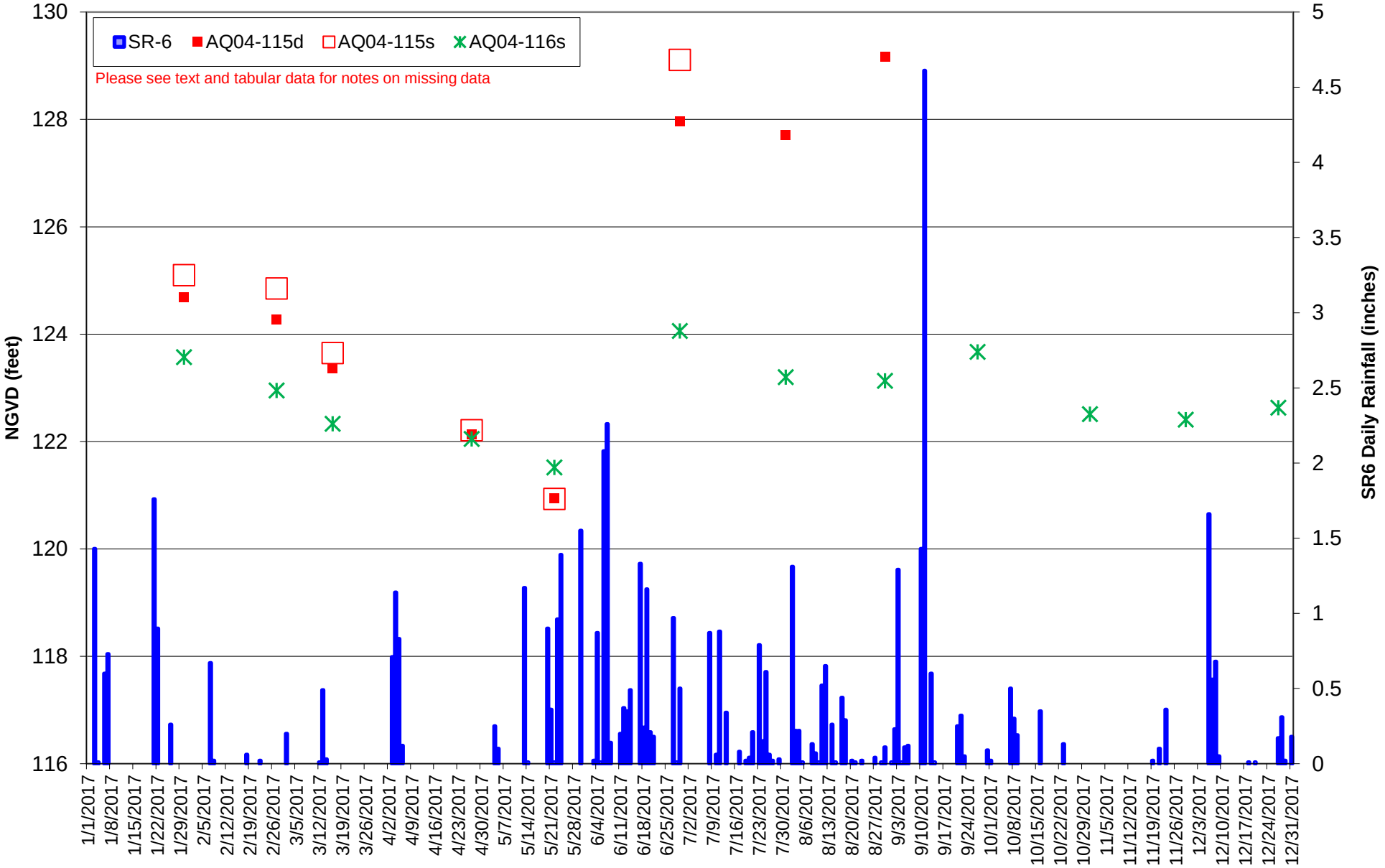


Figure C.3-11. Groundwater Levels & Rainfall
Sections 11,12,13,14,15,24 (1N14E) 2017

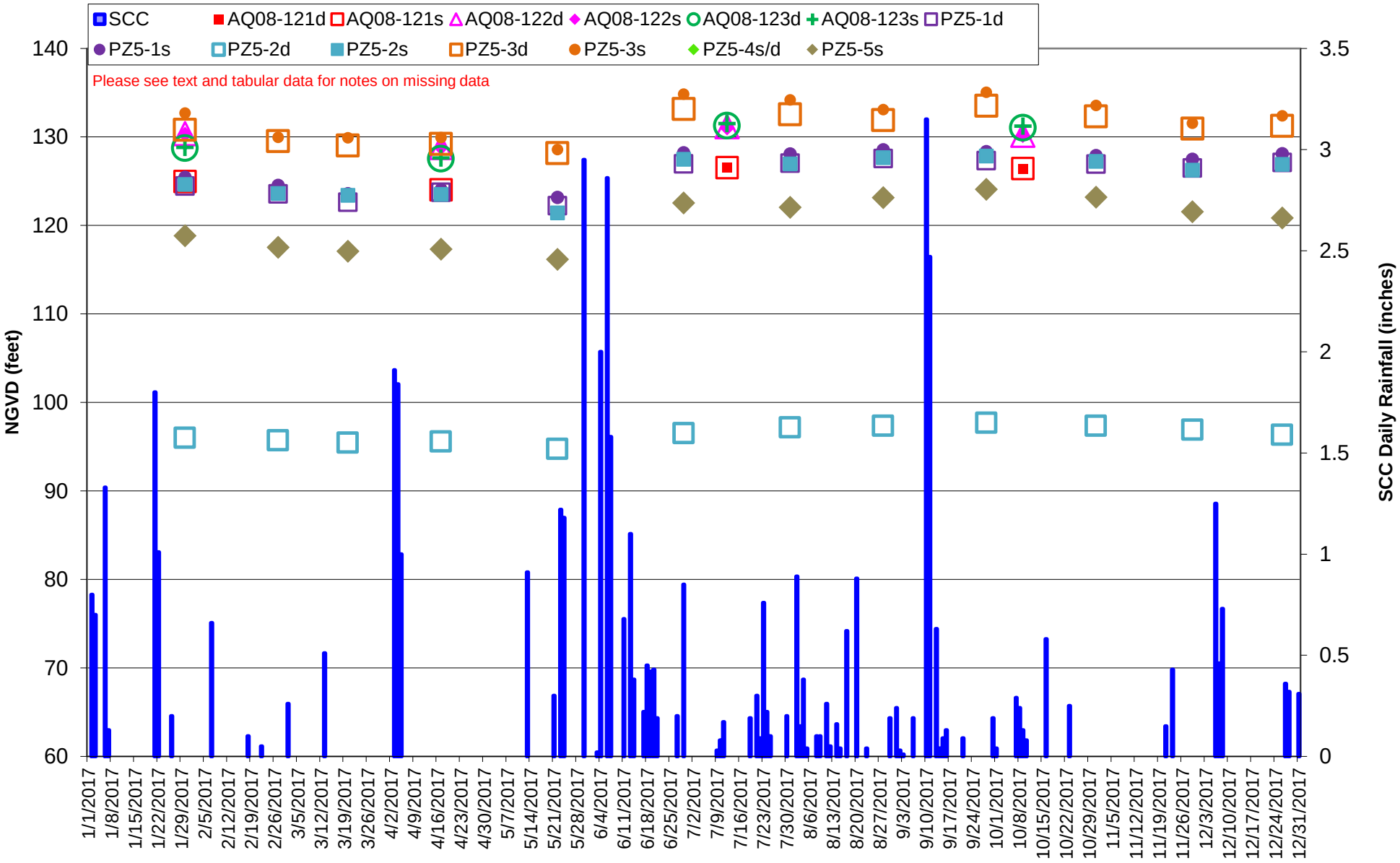
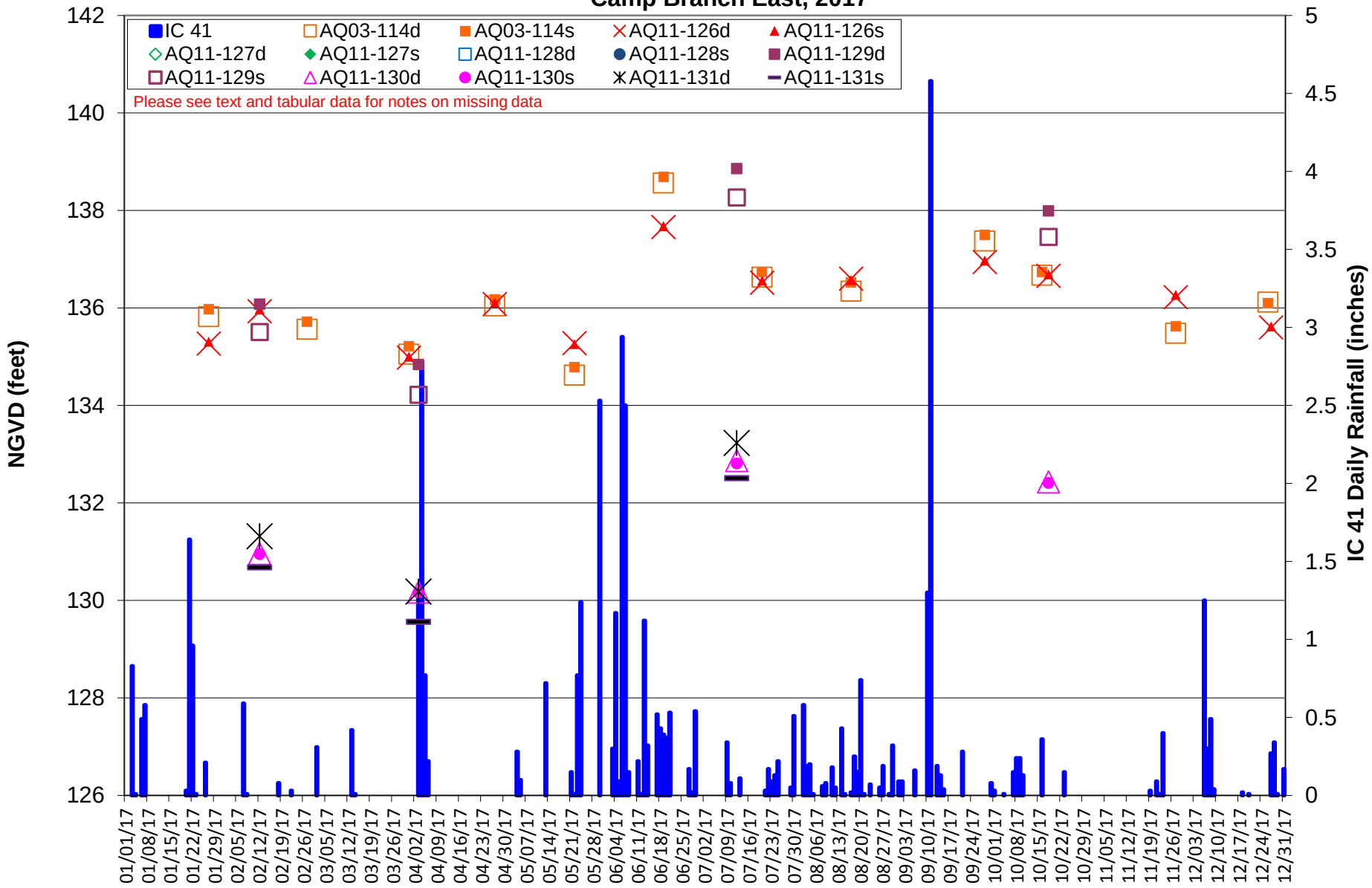


Figure C.3-12. Groundwater Levels & Rainfall
Camp Branch East, 2017



Monthly Piezometers

West BeeHaven Bay

January - December 2017

Initial Elevation	136.8	136.59	135.06	134.99	142.96	142.99		133.68		134.36
GPS										
	PZ 5	PZ 5	PZ 5	PZ 5	PZ 5	PZ 5	PZ 5	PZ 5	PZ 5	PZ 5
Date / Tech	1D	1S	2D	2S	3D	3S	4D	4S	5D	5S
30-Jan	12.35	11.16	39.06	10.36	12.15	10.3	no access			15.52
fj, cm, ls	124.45	125.43	96	124.63	130.81	132.69	mining	133.68		118.84
27-Feb	13.24	12.06	39.34	11.39	13.42	13.03	no access			16.82
fj, ls	123.56	124.53	95.72	123.6	129.54	129.96	mining	133.68		117.54
20-Mar	14.18	13.01	39.62	11.59	13.92	13.09	no access			17.28
fj, cm, ls	122.62	123.58	95.44	123.4	129.04	129.9	mining	133.68		117.08
17-Apr	13.07	12.55	39.47	11.47	13.74	13.06	no access			17.05
fj, ls	123.73	124.04	95.59	123.52	129.22	129.93	mining	133.68		117.31
22-May	14.58	13.42	40.33	13.56	14.8	14.42	no access			18.2
fj, cm, ls	122.22	123.17	94.73	121.43	128.16	128.57	mining	133.68		116.16
29-Jun	9.85	8.38	38.53	7.51	9.79	8.15	no access			11.82
fj, ls	126.95	128.21	96.53	127.48	133.17	134.84	mining	133.68		122.54
31-Jul	9.77	8.51	37.9	8.04	10.4	8.81	no access			12.32
fj, cm	127.03	128.08	97.16	126.95	132.56	134.18	mining	133.68		122.04
28-Aug	9.24	8.04	37.71	7.33	11.05	9.89	no access			11.21
fj, cm	127.56	128.55	97.35	127.66	131.91	133.1	mining	133.68		123.15
28-Sep	9.49	8.24	37.37	7.15	9.45	7.95	no access			10.28
fj, cm	127.31	128.35	97.69	127.84	133.51	135.04	mining	133.68		124.08
31-Oct	9.88	8.7	37.71	7.75	10.64	9.44	no access			11.17
fj, cm	126.92	127.89	97.35	127.24	132.32	133.55	mining	133.68		123.19
29-Nov	10.31	9.12	38.15	8.73	12.02	11.44	no access			12.8
fj, cm	126.49	127.47	96.91	126.26	130.94	131.55	mining	133.68		121.56
26-Dec	9.7	8.48	38.72	8.09	11.72	10.6	no access			13.52
fj	127.1	128.11	96.34	126.9	131.24	132.39	mining	133.68		120.84

Monthly Piezometers

Morgan Farm Hayfield

January - December 2017

	east	east	middle	middle	west	west
Elevation	**142.32**	**142.29**	**147.86**	**147.66**	**146.71**	**146.64**
GPS Readings		30 23 54.8 82 50 50.0		30 23 56.1 82 51 04.4		30 24 04.1 82 51 12.9
initial year	**AQ11-**	**AQ11-**	**AQ11-**	**AQ11-**	**AQ11-**	**AQ11-**
Date / Tech	**126d**	**126s**	**127d**	**127s**	**128d**	**128s**
1/27/2017	7.05	6.98	Removed 5/6/2016			
fj, ls	**135.27**	**135.31**				
2/12/2017	6.39	6.32	Removed 5/6/2016			
fj, cm, ls	**135.93**	**135.97**				
3/31/2017	7.34	7.29	Removed 5/6/2016			
fj, ls	**134.98**	**135**				
27-Apr	6.24	6.18	Removed 5/6/2016			
fj, ls	**136.08**	**136.11**				
22-May	7.04	7.03	Removed 5/6/2016			
fj	**135.28**	**135.26**				
19-Jun	4.66	4.61	Removed 5/6/2016			
fj, ls	**137.66**	**137.68**				
20-Jul	5.8	5.73	Removed 5/6/2016			
fj, cm	**136.52**	**136.56**				
17-Aug	5.72	5.72	Removed 5/6/2016			
fj, cm	**136.6**	**136.57**				
28-Sep	5.38	5.32	Removed 5/6/2016			
fj, cm	**136.94**	**136.97**				
18-Oct	5.66	5.6	Removed 5/6/2016			
fj	**136.66**	**136.69**				
27-Nov	6.1	6.02	Removed 5/6/2016			
fj, cm	**136.22**	**136.27**				
27-Dec	6.72	6.67	Removed 5/6/2016			
fj	**135.6**	**135.62**				

Morgan Farm

January - December 2017

Elevation	138.64	138.6	134.84	134.75	136.76	136.65	135.67	135.76	125.9	125.88	126.38	126.42
GPS readings		30 25 09.5 82 52 12.9		30 24 42.7 82 50 04.6		30 24 32.2 82 52 11.6		30 24 27.8 82 51 59.7		30 23 47.0 82 52 11.4		30 23 53.8 82 51 58.1
initial year	AQ03-	AQ03-	AQ03-	AQ03-	AQ03-	AQ03-	AQ03-	AQ03-	AQ03-	AQ03-	AQ03-	AQ03-
Date / Tech	pz0703	pz0803	pz0903	pz1003	pz1103	pz1203	pz1303	pz1403	pz1503	pz1603	pz1703	pz1803
27-Jan	7.03	7.66	7.02	6.77	5.6	5.54	11.94	12.05	6.17	6.23	15.63	13.93
fj, cm, ls	131.61	130.94	127.82	127.98	131.16	131.11	123.73	123.71	119.73	119.65	110.75	112.49
27-Feb	7.44	8.03	7.11	6.95	6.11	6.04	12.88	12.95	6.89	6.98	15.84	14.12
fj, ls	131.2	130.57	127.73	127.8	130.65	130.61	122.79	122.81	119.01	118.9	110.54	112.3
31-Mar	7.71	8.38	7.78	7.5	6.89	6.85	13.45	13.5	7.3	7.4	16.32	14.45
fj, ls	130.93	130.22	127.06	127.25	129.87	129.8	122.22	122.26	118.6	118.48	110.06	111.97
27-Apr	7.63	8.24	7.23	6.94	6.08	6.06	12.31	12.23	7.16	7.37	15.91	13.42
fj, cm, ls	131.01	130.36	127.61	127.81	130.68	130.59	123.36	123.53	118.74	118.51	110.47	113
22-May	8.48	9.1	8.56	8.5	7.54	7.53	14.5	14.61	7.69	7.91	16.72	14.62
fj, cm8.48	130.16	129.5	126.28	126.25	129.22	129.12	121.17	121.15	118.21	117.97	109.66	111.8
19-Jun	4.62	4.7			3.34	3.28	7.11	6.99	5.14	5.18	13.44	9.37
fj, ls	134.02	133.9	134.84	134.75	133.42	133.37	128.56	128.77	120.76	120.7	112.94	117.05
20-Jul	7.57	7.1	6.54	6.1	5.34	5.3	10.14	10.28	6.96	7.23	15.4	12.45
fj, cm	131.07	131.5	128.3	128.65	131.42	131.35	125.53	125.48	118.94	118.65	110.98	113.97
17-Aug	7.38	8.13			5.79	5.72	12	12.06	6.69	6.88	15.8	13.08
fj, cm	131.26	130.47	134.84	134.75	130.97	130.93	123.67	123.7	119.21	119	110.58	113.34
28-Sep					4.71	4.75	9.57	9.27	6.34	6.54	14.78	10.97
fj, cm	138.64	138.6	134.84	134.75	132.05	131.9	126.1	126.49	119.56	119.34	111.6	115.45
16-Oct					5.33	5.35	11.09	11.18	6.54	6.78	15.68	12.44
fj, cm	138.64	138.6	134.84	134.75	131.43	131.3	124.58	124.58	119.36	119.1	110.7	113.98
27-Nov	7.96	8.62	7.73	7.44	6.89	6.88	13.78	13.85	6.69	6.85	16.63	13.88
fj, cm	130.68	129.98	127.11	127.31	129.87	129.77	121.89	121.91	119.21	119.03	109.75	112.54
26-Dec	7.63	8.41	7.41	7.14	6.39	6.41	13.13	13.23	6.61	6.88	15.92	13.51
fj	131.01	130.19	127.43	127.61	130.37	130.24	122.54	122.53	119.29	119	110.46	112.91

Quarterly

150.13	149.96	146.47	146.52	124.65	124.63		128.04		128.02		
	30 23 57.2 82 50 26.2		30 23 53.4 82 51 20.5		30 24 14.5 82 51 52.5						
AQ03-	AQ03-	AQ03-	AQ03-	AQ07-	AQ07-	GB	2013	GB	2013	GB	
pz1903	pz2003	pz2103	pz2203	pz0107	pz0207		CB pz 1		CB pz 2		
17.6 132.53	17.5 132.46	10.65 135.82	10.55 135.97	8.87 115.78	9.01 115.62	dry	pushed	pushed	5.55 122.47	0.11	
17.54 132.59	17.42 132.54	10.91 135.56	10.8 135.72	124.65	124.63		pushed	pushed	5.91 122.11	dry	
17.44 132.69	17.37 132.59	11.42 135.05	11.3 135.22	124.65	124.63		pushed	pushed	6.2 121.82	dry	
15.21 134.92	15.08 134.88	10.43 136.04	10.34 136.18	9.79 114.86	9.52 115.11	dry	pushed	pushed	5.76 122.26	dry	
16.83 133.3	16.72 133.24	11.85 134.62	11.74 134.78	124.65	124.63		pushed	pushed	6.28 121.74	dry	
10.08 140.05	9.86 140.1	7.91 138.56	7.83 138.69	124.65	124.63		pushed	pushed	3.11 124.91	2.83	no access
11.08 139.05	10.91 139.05	9.84 136.63	9.78 136.74	9.7 114.95	9.58 115.05	dry	pushed	pushed	4.09 123.93	2.52	
12.63 137.5	12.52 137.44	10.13 136.34	10 136.52	124.65	124.63		pushed	pushed	4.01 124.01	2.79	no access
10.73 139.4	10.43 139.53	9.1 137.37	9.02 137.5	124.65	124.63		pushed	pushed	3.86 124.16	2.85	no access
11.34 138.79	11.11 138.85	9.8 136.67	9.78 136.74	9.59 115.06	9.47 115.16	dry	pushed	pushed	3.91 124.11	2.54	no access
14.3 135.83	14.19 135.77	10.99 135.48	10.9 135.62	124.65	124.63		pushed	pushed	4.71 123.31	1.62	
15.29 134.84	15.2 134.76	10.35 136.12	10.42 136.1	124.65	124.63		pushed	pushed	4.7 123.32	1.84	

Monthly Piezometers

Genoa - 41

January - December 2017

	north	north	south	south
Elevation	143.14	143.27	137.13	137.6
GPS		30 23 29.0 82 49 26.5		30 23 11.9 82 48 57.2
initial year	AQ09-	AQ09-	AQ09-	AQ09-
Date / Tech	**124d**	**124s**	**125d**	**125s**
1/27/2017	grouted Aug. 2016		9.84	9.99
fj, ls			**127.29**	**127.61**
2/12/2017	grouted Aug. 2016		9.07	9.2
fj, cm, ls			**128.06**	**128.4**
3/31/2017	grouted Aug. 2016		10.05	10.19
fj, ls			**127.08**	**127.41**
27-Apr	grouted Aug. 2016		9.11	8.97
fj, ls			**128.02**	**128.63**
22-May	grouted Aug. 2016		9.54	9.5
fj, ls			**127.59**	**128.1**
19-Jun	grouted Aug. 2016		5.54	5.67
fj, ls			**131.59**	**131.93**
20-Jul	grouted Aug. 2016		7.36	7.5
fj, cm			**129.77**	**130.1**
17-Aug	grouted Aug. 2016		7.85	8.04
fj, cm			**129.28**	**129.56**
28-Sep	grouted Aug. 2016		6.61	6.7
fj, cm			**130.52**	**130.9**
18-Oct	grouted Aug. 2016		7.41	7.54
fj			**129.72**	**130.06**
27-Nov	grouted Aug. 2016		7.66	7.8
fj, cm			**129.47**	**129.8**
27-Dec	grouted Aug. 2016		8.32	8.47
fj			**128.81**	**129.13**

Monthly Piezometers

Black Still & Hogan Branch

January - December 2017

	Black Still				Hogan Branch					
Elevation	**135.5**	**135.13**	**137.98**	**137.97**	**124.45**	**124.43**	**129.96**	**129.9**	**125.86**	**126.25**
GPS Readings		30/29/21.2 82/47/47.6		30/28/18.0 82/47/46.9						
initial year	**AQ04**	**AQ04**	**AQ04**	**AQ04**	**HB 1i**	**HB 1s**	**HB 2i**	**HB 2s**	**HB 3i**	**HB 3s**
Date / Tech	**115d**	**115s**	**116d**	**116s**						
30-Jan	10.81	10.03		14.4	10.84	10.85	12.63	10.37	12.09	10.95
fj, cm, ls	**124.69**	**125.1**	**pushed**	**123.57**	**113.61**	**113.58**	**117.33**	**119.53**	**113.77**	**115.3**
27-Feb	11.22	10.28		15.02	10.23	10.25	13.06	11.35	11.01	9.81
fj, ls	**124.28**	**124.85**	**pushed**	**122.95**	**114.22**	**114.18**	**116.9**	**118.55**	**114.85**	**116.44**
16-Mar	12.14	11.48		15.64	9.94	9.98	13.57	12.73	10.72	9.59
fj, cm, ls	**123.36**	**123.65**	**pushed**	**122.33**	**114.51**	**114.45**	**116.39**	**117.17**	**115.14**	**116.66**
27-Apr	13.36	12.92		15.92	11.55	11.53	14.55	13.53	12.91	11.73
fj, cm, ls	**122.14**	**122.21**	**pushed**	**122.05**	**112.9**	**112.9**	**115.41**	**116.37**	**112.95**	**114.52**
22-May	14.55	14.2		16.45	12.72	12.7	15.84	15.03	13.35	12.15
fj, cm, ls	**120.95**	**120.93**	**pushed**	**121.52**	**111.73**	**111.73**	**114.12**	**114.87**	**112.51**	**114.1**
29-Jun	7.53	6.02		13.91	10.27	10.26	12	10.02	12.35	11.09
fj	**127.97**	**129.11**	**pushed**	**124.06**	**114.18**	**114.17**	**117.96**	**119.88**	**113.51**	**115.16**
31-Jul	7.79			14.77	11.11	11.12	12.8	11.26	11.95	10.88
fj, cm	**127.71**	**pushed**	**pushed**	**123.2**	**113.34**	**113.31**	**117.16**	**118.64**	**113.91**	**115.37**
30-Aug	6.33			14.84	9.12	9.07	10.47	8.22	10.88	9.74
fj, cm	**129.17**	**pushed**	**pushed**	**123.13**	**115.33**	**115.36**	**119.49**	**121.68**	**114.98**	**116.51**
27-Sep				14.3	7.2	7.17	9.01	6.62	10.15	9.53
fj, cm	**pushed**	**pushed**	**pushed**	**123.67**	**117.25**	**117.26**	**120.95**	**123.28**	**115.71**	**116.72**
31-Oct				15.46	8.94	8.99	11.43	9.69	11.25	10.53
fj, cm	**pushed**	**pushed**	**pushed**	**122.51**	**115.51**	**115.44**	**118.53**	**120.21**	**114.61**	**115.72**
29-Nov				15.56	10.08	10.15	12.93	11.7	12.31	11.43
fj, cm	**pushed**	**pushed**	**pushed**	**122.41**	**114.37**	**114.28**	**117.03**	**118.2**	**113.55**	**114.82**
27-Dec				15.34	9.67	9.73	12.56	11.37	11.68	10.79
fj	**pushed**	**pushed**	**pushed**	**122.63**	**114.78**	**114.7**	**117.4**	**118.53**	**114.18**	**115.46**

Monthly Piezometers

Recharge System / BeeHaven Bay

January - December 2017

Initial Elevation	135.99	136.15	130.6	130.62	128.91	129.05	129.06	129.2	132.31	132.41	133.93	133.95	132.93	132.92
GPS		30 29 49.8 82 47 46.9		30 29 57.1 82 48 24.2		30 30 04.0 82 48 36.9		30 30 04.1 82 48 46.0		30 30 07.2 82 48 57.7		30 30 11.2 82 49 06.5		30 30 13.4 82 49 33.4
Date / Tech	032d	032s	034d	034s	035d	035s	036d	036s	037d	037s	038d	038s	039d	039s
30-Jan	inactive					inactive			inactive			inactive		
fj, cm, ls														
6-Feb	inactive					inactive			inactive			inactive		
fj, cm, ls	9.1	8.02	5.92	4.59	not located		3.9	3.87	8.64	8.7	7.47	7.39	6.79	6.85
31-Mar	inactive					inactive			inactive			inactive		
fj, ls														
27-Apr	inactive					inactive			inactive			inactive		
fj, cm, ls														
22-May	inactive					inactive			inactive			inactive		
fj, cm, ls														
30-Jun	inactive					inactive			inactive			inactive		
fj														
31-Jul	inactive					inactive			inactive			inactive		
fj, cm														
28-Aug														
fj, cm														
28-Sep	inactive					inactive			inactive			inactive		
fj, cm														
31-Oct	inactive					inactive			inactive			inactive		
fj, cm														
27-Nov	inactive					inactive			inactive			inactive		
fj, cm														
26-Dec	inactive					inactive			inactive			inactive		
fj														

Monthly Piezometers

Background Wells

January - December 2017

GPS readings		30 29 53.6 82 44 19.6		30 25 18.7 82 41 04.1		30 21 57.0 82 42 18.8		30 23 42.5 82 48 43.8		30 26 13.9 82 55 06.8		30 31 26.8 82 51 46.0	
Elevation	132.32	132.12	125.15	125.33	134.46	134.28	134.39	134.58	153.46	153.27	132.4	132.32	
	AQ02- 099d	AQ02- 099s	AQ02- 098d	AQ02- 098s	AQ02- 097d	AQ02- 097s	AQ02- 096d	AQ02- 096s	AQ02- 095d	AQ02- 095s	AQ02- 094d	AQ02- 094s	
Date / Tech	BGW 1d	BGW 1s	BGW 2d	BGW 2s	BGW 3d	BGW 3s	BGW 4d	BGW 4s	BGW 5d	BGW 5s	BGW 6d	BGW 6s	
30-Jan	17.84	17.68	13.01	10.33	9.54	9.01	8.56	8.74	8.3	8.13	7.3	6.85	
fj, cm, ls	**114.48**	**114.44**	**112.14**	**115**	**124.92**	**125.27**	**125.83**	**125.84**	**145.16**	**145.14**	**125.1**	**125.47**	
27-Feb	17.99	18.13	14.61	13.5	13.64	13.24	9.21	9.38	9.13	8.94	16.83	13.33	
fj, ls	**114.33**	**113.99**	**110.54**	**111.83**	**120.82**	**121.04**	**125.18**	**125.2**	**144.33**	**144.33**	**115.57**	**118.99**	
31-Mar	18.39	18.24	14.64	14.56	14.77	14.54	9.49	9.66	9.56	9.36	15.5	18.03	
fj, ls	**113.93**	**113.88**	**110.51**	**110.77**	**119.69**	**119.74**	**124.9**	**124.92**	**143.9**	**143.91**	**116.9**	**114.29**	
27-Apr	18.54	18.4	14.76	14.64	14.65	14.11	8.55	8.77	8.52	8.32	15.43	18.01	
fj, cm, ls	**113.78**	**113.72**	**110.39**	**110.69**	**119.81**	**120.17**	**125.84**	**125.81**	**144.94**	**144.95**	**116.97**	**114.31**	
22-May	19.08	18.99	15.52	15.65	16.42	16.2	9.6	9.79	9.64	9.4			no access
fj, cm, ls	**113.24**	**113.13**	**109.63**	**109.68**	**118.04**	**118.08**	**124.79**	**124.79**	**143.82**	**143.87**			
30-Jun	17.83	17.68	9.5	9.63	7.51	7.47	6.68	6.87	6.33	6.14			no access
fj	**114.49**	**114.44**	**115.65**	**115.7**	**126.95**	**126.81**	**127.71**	**127.71**	**147.13**	**147.13**			
31-Jul	18.3	18.14	12.3	11.88	6.93	6.94	8.31	8.51	7.2	6.99			no access
fj, cm, ls	**114.02**	**113.98**	**112.85**	**113.45**	**127.53**	**127.34**	**126.08**	**126.07**	**146.26**	**146.28**			
28-Aug	17.7	17.55	8.41	6.15	6.87	6.6	7.74	7.94	8.09	7.9			no access
fj, cm	**114.62**	**114.57**	**116.74**	**119.18**	**127.59**	**127.68**	**126.65**	**126.64**	**145.37**	**145.37**			
28-Sep	10.55	10.42	9.89	8.16	7.47	6.64	6.64	6.83	6.62	6.46			no access
fj, cm	**121.77**	**121.7**	**115.26**	**117.17**	**126.99**	**127.64**	**127.75**	**127.75**	**146.84**	**146.81**			
31-Oct	13.71	13.56	10.09	9.43	8.51	8.2	8.63	8.88	7.9	7.72			no access
fj, cm	**118.61**	**118.56**	**115.06**	**115.9**	**125.95**	**126.08**	**125.76**	**125.7**	**145.56**	**145.55**			
27-Nov	15.18	15.02	10.02	9.68	9.38	9.05	9.43	9.62	8.91	8.68			no access
fj, cm	**117.14**	**117.1**	**115.13**	**115.65**	**125.08**	**125.23**	**124.96**	**124.96**	**144.55**	**144.59**			
26-Dec	15.8	15.68	9.83	8.23	9.09	8.76	8.33	8.52	7.98	7.77			no access
fj	**116.52**	**116.44**	**115.32**	**117.1**	**125.37**	**125.52**	**126.06**	**126.06**	**145.48**	**145.5**			

Monthly Piezometers

Dragline #5

January - December 2017

GPS		30 24 30.9 82 54 29.6		30 24 31.1 82 53 59.7		30 24 31.8 82 52 56.1		30 24 47.7 82 53 38.6	
Elevation	142.46	142.48	148.42	148.14	145.01	144.94	146.48	146.19	
Initial year	AQ02-100d	AQ02-100s	AQ02-101d	AQ02-101s	AQ02-102d	AQ02-102s	AQ02-103d	AQ02-103s	
Date / Tech	West d	West s	East d	East s	North d	Norths	South d	South s	
30-Jan	INACTIVE				9.82	9.61	8.68	7.67	
fj, cm, ls					135.19	135.33	137.8	138.52	
27-Feb	INACTIVE				9.44	9.21	10.73	10.22	
fj, ls					135.57	135.73	135.75	135.97	
31-Mar	INACTIVE				9.24	9.19	10.09	9.54	
fj, ls					135.77	135.75	136.39	136.65	
27-Apr	INACTIVE				9.57	9.35	9.16	8.95	
fj, ls					135.44	135.59	137.32	137.24	
22-May	INACTIVE				10.14	9.91	11.18	10.61	
fj, ls					134.87	135.03	135.3	135.58	
19-Jun	INACTIVE				4.72	4.07	5.22	4.21	
fj, ls					140.29	140.87	141.26	141.98	
12-Jul	INACTIVE				6.58	6.22	7.57	6.55	
fj, cm, ls					138.43	138.72	138.91	139.64	
28-Aug	INACTIVE				7.77	7.29	8.55	7.83	
fj, cm					137.24	137.65	137.93	138.36	
28-Sep	INACTIVE						7.3	6.23	no access
fj,cm					145.01	144.94	139.18	139.96	
31-Oct	INACTIVE				8.89	7.43	9.22	7.81	
fj, cm					136.12	137.51	137.26	138.38	
27-Nov	INACTIVE				9.11	8.9	10.15	8.9	
fj, cm					135.9	136.04	136.33	137.29	
27-Dec	INACTIVE				9.87	9.18	10.92	9.63	
fj					135.14	135.76	135.56	136.56	

Monthly Readings

Loncala Tract Staff Gauges

 # 0144913-021

Don Dahlgren : ext.# 8630, cell # 386-365-4421, Turbidity Limit - 29 ntu

2017

		Staff Gauge Elevations									
Date	**Tech**	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	
4-Jan	fj	pushed	pushed	pushed	no access	0.16	1.21	0.68	0.56	0.27	
2-Feb	fj, cm ls	pushed	pushed	pushed	no access	0.7	1.45	0.72	0.64	0.27	
1-Mar	fj, ls	pushed	pushed	pushed	pushed	0.29	1.42	0.64	0.6	0.27	
5-Apr	fj, ls	pushed	pushed	pushed	pushed	0.5	1.26	0.7	0.68	0.35	
3-May	fj, ls	pushed	pushed	pushed	pushed	dry	1.17	dry	dry	dry	
4-Jun	fj	pushed	pushed	pushed	pushed	dry	1.19	dry	dry	dry	
5-Jul	fj, cm	pushed	pushed	pushed	pushed	1.04	1.1	0.86	0.93	0.3	
3-Aug	fj, cm	pushed	pushed	pushed	pushed	0.3	1.16	0.8	0.96	dry	
4-Sep	fj	pushed	pushed	pushed	pushed	dry	1.18	dry	0.62	0.3	
4-Oct	fj	pushed	pushed	pushed	pushed	0.88	1.12	0.82	0.78	dry	
24-Nov	fj	pushed	pushed	pushed	pushed	dry	1.14	dry	dry	dry	
20-Dec	fj	pushed	pushed	pushed	pushed	dry	1.21	dry	dry	dry	
						severance	cat creek	north129	diversion129	east side	

Twice a month readings - 1st & 15th

Loncala Tract Piezometers

 # 0144913-021

Don Dahlgren : ext.# 8630, cell # 386-365-4421, Turbidity Limit - 29 ntu

January 2017 - December 2017

No Access

Ground Elevation	NGVD 145.7	145.7	145.6	145.6	149.8	149.8	150.2	150.1	149.75	149.45	151.8	151.8	never installed	never installed	153.22	153.02	154.01	154.08	155.1	154.62	155.3	155.3			154.8	154.8	144.5	151	151	146.5	144.9	150.4	150.4	145.3	145.6			151.2	Bennett Tract Piezometers			
TOC Elevation	NGVD 148.51	148.71	148.32	149	153.19	153.09	152.95	153.1	152.75	152.45	155.01	154.85	never installed	never installed	156.24	156.08	157.01	157.08	158.1	157.62	158.64	158.67	157.39	157.15	157.75	157.84	147.41	154.1	153.95	149.45	148.05	152.81	153.07	148.63	149.05	never installed	never installed	154.64	148.53	148.66	145.99	145.59
Date/Tech	LCpz 1i	LCpz 1s	LCpz 2i	LCpz 2s	LCpz3i	LCpz 3s	LCpz 4i	LCpz 4s	LC MW 22	LCpz 5s	LCpz 6i	LCpz 6s	LCpz 7i	LCpz 7s	LC MW 24	LCpz 8s	LCpz 9i	LCpz 9s	LCpz 10i	LCpz 10s	LCpz 11i	LCpz 11s	LCpz 12i	LCpz 12s	LCpz 13i	LCpz 13s	LCpz 14i	LC MW 23	LCpz 15s	LCpz 16i	LCpz 17i	LCpz 18i	LCpz 18s	LCpz 19i	LCpz 19s	LCpz 20i	LCpz 20s	LC MW 21	BT 8D	BT 8S	BT 9D	BT 9S
4-Jan	9.59	9.73	8.36	7.87	12.4	12.12	8.6	8.09	8.99	8.03	17.16	17.24		no access									13.13	9.91	10.79	10.84	12.25	18.27	16.7	11.33	9.11	9.76	10.91	8.31	8.42			11.54	10.44	10.32	13.38	12.87
fj, ls	138.92	138.98	139.96	141.13	140.79	140.97	144.35	145.01	143.76	144.42	137.85	137.61		ditch →									144.26	147.24	146.96	147	135.16	135.83	137.25	138.12	138.94	143.05	142.16	140.32	140.63			143.1	138.09	138.34	132.61	132.72
18-Jan	8.7	8.82	7.35	6.8	11.68	11.42	7.76	7.24	8.41	7.38	16.79	16.89		no access									12.81	9.19	10.27	10.33	11.96	19.07	16.65	11.26	8.81	9.26	10.36	7.54	7.83			10.98	9.64	7.83	12.73	12.39
fj, ls	139.81	139.89	140.97	142.2	141.51	141.67	145.19	145.86	144.34	145.07	138.22	137.96		ditch →									144.58	147.96	147.48	147.51	135.45	135.03	137.3	138.19	139.24	143.55	142.71	141.09	141.22			143.66	138.89	140.83	133.26	133.2
2-Feb	7.78	7.89	6.45	5.95	10.59	10.27	6.9	6.39	7.7	6.59	15.82	15.91		no access									12.11	8.68	8.9	8.9	11.4	18.96	16.64	10.27	8.19	8.7	9.78	6.69	7.07			10.1	8.15	5.53	10.91	10.53
fj, cm, ls	140.73	140.82	141.87	143.05	142.6	142.82	146.05	146.71	145.05	145.86	139.19	138.94		ditch →									145.28	148.47	148.85	148.94	136.01	135.14	137.31	139.18	139.86	144.11	143.29	141.94	141.98			144.54	140.38	143.13	135.08	135.06
13-Feb	7.74	7.85	6.47	5.94	10.63	10.26	6.86	6.34	7.75	6.58	15.88	15.98		no access									12.05	8.74	8.96	8.97	11.41	18.66	16.64	10.32	8.13	8.77	9.88	6.68	6.98			9.95	8.06	5.56	10.72	10.27
fj, cm, ls	140.77	140.86	141.85	143.06	142.56	142.83	146.09	146.76	145	145.87	139.13	138.87		ditch →									145.34	148.41	148.79	148.87	136	135.44	137.31	139.13	139.92	144.04	143.19	141.95	142.07			144.69	140.47	143.1	135.27	135.32
1-Mar	8.28	8.4	7.07	6.5	11.1	10.68	7.45	6.94	8.31	7.24	16.18	16.27		no access									12.46	8.96	9.48	9.51	11.5	18.67	16.64	10.68	8.47	9.07	10.12	7.22	7.37			10.05	8.64	6.52	10.9	10.48
fj, ls	140.23	140.31	141.25	142.5	142.09	142.41	145.5	146.16	144.44	145.21	138.83	138.58		ditch →									144.93	148.19	148.27	148.33	135.91	135.43	137.31	138.77	139.58	143.74	142.95	141.41	141.68			144.59	139.89	142.14	135.09	135.11
20-Mar	8.72	8.84	7.65	7.08	11.66	11.23	7.9	7.35	8.82	7.8	16.71	16.79		no access									12.93	9.65	10.12	10.17	11.77	18.43	16.65	10.92	8.79	9.34	10.37	7.67	7.89			10.54	9.46	7.31	11.55	11.08
fj, ls	139.79	139.87	140.67	141.92	141.53	141.86	145.05	145.75	143.93	144.65	138.3	138.06		ditch →									144.46	147.5	147.63	147.67	135.64	135.67	137.3	138.53	139.26	143.47	142.7	140.96	141.16			144.1	139.07	141.35	134.44	134.51
5-Apr	8.53	8.72	7.54	6.5	12.07	11.47	7.36	6.39	8.34	7.33	16.8	16.91		no access									12.42	9.33	9.86	9.92	11.93	18.61	16.66	11.24	8.56	9.2	10.37	7.46	7.64			10.67	8.61	4.56	11.85	11.4
fj, ls	139.98	139.99	140.78	142.5	141.12	141.62	145.59	146.71	144.41	145.12	138.21	137.94		ditch →									144.97	147.82	147.89	147.92	135.48	135.49	137.29	138.21	139.49	143.61	142.7	141.17	141.41			143.97	139.92	144.1	134.14	134.19
17-Apr	8.2	8.31	7.34	6.66	11.81	11.44	7.32	6.68	8.31	7.28	16.23	16.33		no access									12.26	9.07	9.21	9.23	11.63	18.87	16.66	11.07	8.65	8.77	9.72	7.25	7.36			10.41	8.93	6.25	11.3	10.86
fj, ls	140.31	140.4	140.98	142.34	141.38	141.65	145.63	146.42	144.44	145.17	138.78	138.52		ditch →									145.13	148.08	148.54	148.61	135.78	135.23	137.29	138.38	139.4	144.04	143.35	141.38	141.69			144.23	139.6	142.41	134.69	134.73
3-May	8.92	9.03	8.12	7.35	12.5	12.18	8.17	7.52	9.17	8.08	16	16.11					10.53	9.89	12.27	10.08	12.27	12.27	12.62	9.48	10.02	10.08	11.98	14.57	16.66	10.1	9.87	9.19	10.16	8.02	8			10.64	9.85	8.14	12.06	11.58
fj, ls	139.59	139.68	140.2	141.65	140.69	140.91	144.78	145.58	143.58	144.37	139.01	138.74					146.48	147.19	145.83	147.54	146.37	146.4	144.77	147.67	147.73	147.76	135.43	139.53	137.29	139.35	138.18	143.62	142.91	140.61	141.05			144	138.68	140.52	133.93	134.01
17-May	9.12	9.25	8.49	7.71	12.97	12.61	8.52	7.85	9.53	8.51	14.1	14.18					10.93	10.18	12.49	10.31	12.48	12.47	12.52	9.6	10.47	10.52	12.07	12.24	13.71	9.21	8.89	9.32	10.3	8.32	8.28			10.78	10.24	9.41	12.58	12.13
fj, ls	139.39	139.46	139.83	141.29	140.22	140.48	144.43	145.25	143.22	143.94	140.91	140.67					146.08	146.9	145.61	147.31	146.16	146.2	144.87	147.55	147.28	147.32	135.34	141.86	140.24	140.24	139.16	143.49	142.77	140.31	140.77			143.86	138.29	139.25	133.41	133.46
4-Jun	7.97	8.07	7.61	6.6	13.22	12.88	7.75	6.96	8.8	7.75				no access									11.36	8.76	10.11	10.2	11.76	9.97	9.95	7.45	8.24	8.37	9.19	7.2	7.15			10.46	8.55	5.55	11.39	10.99
fj, cm	140.54	140.64	140.71	142.4	139.97	140.21	145.2	146.14	143.95	144.7				←ditch →									146.03	148.39	147.64	147.64	135.65	144.13	144	142	139.81	144.44	143.88	141.43	141.9			144.18	139.98	143.11	134.6	134.6
17-Jun	4.52	4.55	4.5	3.94	9.11	8.95	4.8	3.79	6.14	4.7				no access									10.27	7.92	6.33	6.33	9.34	10.34	9.69	5.09	6.29	6.68	7.17			7.91	5.78	4.4	6.72	5.48
fj, cm, ls	143.99	144.16	143.82	145.06	144.08	144.14	148.15	149.31	146.61	147.75				←ditch →									147.12	149.23	151.42	151.51	138.07	143.76	144.26	144.36	141.76	146.13	145.9			146.73	142.75	144.26	139.27	140.11
5-Jul	5.69	5.84	5.58	5.35	9.43	9.3	5.5	5.21	6.64	5.54	8.95	9.01		no access									10.69	7.84	7.32	7.34	9.42	10.82	10.21	5.68	6.85	7.6	8.34	5.15	5.48			7.98	6.55	5.13	7.23	6.43
fj, cm	142.82	142.87	142.74	143.65	143.76	143.79	147.45	147.89	146.11	146.91	146.06	145.84		ditch →									146.7	149.31	150.43	150.5	137.99	143.28	143.74	143.77	141.2	145.21	144.73	143.48	143.57			146.66	141.98	143.53	138.76	139.16
18-Jul			5.21	4.8	9.71	9.58	5.6	5.01	7.1	5.89	9.54	9.62		no access									10.83	8.1	8.14	8.2	10.28	11.05	10.51	5.98	7.1	7.7	8.65	4.9	5.6			8.47	6.95	6.02	8.02	7.04
fj, cm			143.11	144.2	143.48	143.51	147.35	148.09	145.65	146.56	145.47	145.23		ditch →									146.56	149.05	149.61	149.64	137.13	143.05	143.44	143.47	140.95	145.11	144.42	143.73	143.45			146.17	141.58	142.64	137.97	138.55
3-Aug	5.64	5.8	5.64	5.2	9.84	9.74	5.94	5.3	7.5	6.3	10.11	10.15		no access									11.35	8.53	8.84	8.9	10.85	12.11	11.64	6.77	7.52	7.9	8.95	5.25	5.95			8.78	7.35	6.21	8.49	7.11
fj, cm	142.87	142.91	142.68	143.8	143.35	143.35	147.01	147.8	145.25	146.15	144.9	144.7		ditch →									146.04	148.62	148.91	148.94	136.56	141.99	142.31	142.68	140.53	144.91	144.12	143.38	143.1			145.86	141.18	142.45	137.5	138.48
16-Aug	5.4	5.51	5.3	4.84	9.53	9.45	5.57	4.7	7.38	6.07				no access									11.3	8.28	9.07	9.11	11.1	12.22	11.86	6.74	7.4	7.86	8.85	5.26	6.03			8.8			9.09	8.44
fj, cm	143.11	143.2	143.02	144.16	143.66	143.64	147.38	148.4	145.37	146.38				←ditch →									146.09	148.87	148.68	148.73	136.31	141.88	142.09	142.71	140.65	144.95	144.22	143.37	143.02			145.84			136.9	137.15
4-Sep	5.69	5.8	5.73	5.45	9.96	9.8	6.47	5.97	8.05	6.94				no access									7.65	8.75	9.4	9.46	11.3	12.4	12.05	7.23	7.94	8	8.91	5.34	6.12			8.94			9.38	8.82
fj, cm	142.82	142.91	142.59	143.55	143.23	143.29	146.48	147.13	144.7	145.51				←ditch →									149.74	148.4	148.35	148.38	136.11	141.7	141.9	142.22	140.11	144.81	144.16	143.29	142.93			145.7			136.61	136.77
18-Sep			4.52	4.29			4.66	4.28	6.28	5.03				no access									10.35	7.33	6.66	6.61	9.58	10.99	10.43	5.22	6.42	6.54	6.84	3.83	4.52			6.63			6.43	5.52
fj, cm			143.8	144.71			148.29	148.82	146.47	147.42				←ditch →									147.04	149.82	151.09	151.23	137.83	143.11	143.52	144.23	141.63	146.27	146.23	144.8	144.53			148.01			139.56	140.07
4-Oct			5.46	5.31			5.79	5.45	7.26	6.1	9.6	9.68		no access									10.89	8.3	8.08	8.04	10.34	11.56	11.13	6.02	7.18	7.78	8.6	4.8	5.52			7.85	6.58	6.02	7.27	6.42
fj, cm			142.86	143.69			147.16	147.65	145.49	146.35	145.41	145.17		←ditch →									146.5	148.85	149.67	149.8	137.07	142.54	142.82	143.43	140.87	145.03	144.47	143.83	143.53			146.79	141.95	142.64	138.72	139.17
23-Oct			5.64	5.42	8.99	9.01	5.59	5.61	7.66	6.47	10.28	10.33		no access									11.19	8.7	8.8	8.81	10.88	12.04	11.51	6.4	7.45	8.08	9.12	5.11	5.77			8.29	6.99	6.4	7.86	6.87
fj, cm			142.68	143.58	144.2	144.08	147.36	147.49	145.09	145.98	144.73	144.52		←ditch →									146.2	148.45	148.95	149.03	136.53	142.06	142.44	143.05	140.6	144.73	143.95	143.52	143.28			146.35	141.54	142.26	138.13	138.72
16-Nov			6.27	6.09	9.43	9.37	6.69	6.03	8.09	6.89				no access									11.42	8.89	9.21	9.24	11.24	12.49	11.93	6.81	7.82	8.46	9.51	5.73	6.51			8.49	7.29	6.88	8.49	8.02
fj, cm			142.05	142.91	143.76	143.72	146.26	147.07	144.66	145.56				←ditch →									145.97	148.26	148.54	148.6	136.17	141.61	142.02	142.64	140.23	144.35	143.56	142.9	142.54			146.15	141.24	141.78	137.5	137.57
27-Nov			6.79	6.41	10.28	10.15	7.34	6.82	8.55	7.71	10.7	10.71		no access									12.02	9.45	9.96	9.95	11.6	13.17	12.7	7.83	8.35	8.94	9.96	6.54	7.15			9.13	8.72	8.31	9.6	9.17
fj, cm			141.53	142.59	142.91	142.94	145.61	146.28	144.2	144.74	144.31	144.14		←ditch →									145.37	147.7	147.79	147.89	135.81	140.93	141.25	141.62	139.7	143.87	143.11	142.09	141.9			145.51	139.81	140.35	136.39	136.42
11-Dec			5.64	5.24	9.35	9.37	6.08	5.45	7.9	6.72	10.1	10.09		no access									11.64	8.73	9.72	9.79	11.7	13.04	12.76	7.25	7.82	8.28	9.45	5.55	6.51			8.68	7.85	6.06	9.16	8.58
fj, cm			142.68	143.76	143.84	143.72	146.87	147.65	144.85	145.73	144.91	144.76		←ditch →									145.75	148.42	148.03	148.05	135.71	141.06	141.19	142.2	140.23	144.53	143.62	143.08	142.54			145.96	140.68	142.6	136.83	137.01
27-Dec			6.18	5.82	9.59	9.58	6.37	5.79	8.35	7.14	9.5	9.51		no access									11.8	8.91	10.13	10.18	11.51	13.08	12.38	7.43	8	8.52	9.62	6.02	6.93			8.72	8.03	6.53	9.37	8.54
fj			142.14	143.18	143.6	143.51	146.58	147.31	144.4	145.31	145.51	145.34		←ditch →									145.59	148.24	147.62	147.66	135.9	141.02	141.57	142.02	140.05	144.29	143.45	142.61	142.12			145.92	140.5	142.13	136.62	137.05

This information is being provided in partial fulfillment of the monitoring requirements in Permit No. 0144913-003 & Permit 0144913-021.

ATTACHMENT E:
WATER QUALITY DATA

This report represents a true, accurate, and representative description of the site conditions present at the time of monitoring.

William L. Donohue
General Manager

Submitted to:

Florida Department of Environmental Protection
Mining & Mitigation
2600 Blair Stone Road, MS715
Tallahassee, FL 32399

Submitted by:

White Springs Agricultural Chemicals, Inc.
d/b/a PCS Phosphate - White Springs
15843 SE 78th Street
White Springs, Florida 32096
(386) 386-8400

Data collected by PCS and Summarized by:
Environmental Services & Permitting. Inc
12580 NW US Highway 441
Alachua, FL 32615

February 23, 2018

Attachment E. Table E-0. Description of Approximate Locations of Water Quality Sampling Stations.

R1	50 ft. upstream of the culvert under a road crossing at the location designated in the permit and upstream of the connection of the natural portion of Roaring Creek and the relocated channel.
R2	100 ft. downstream of the Section 10 and 15 wetland connection to the relocated channel.
R3	50 ft. upstream of the culvert under the road crossing at the location designated in the permit.
R4	Near the mouth of Roaring Creek in the center of the stream at the wooden bridge upstream from its confluence with the Suwannee River.
HB5	In Hogan's Branch approximatley 50 feet upstream from its confuence with Hunter Creek. Currently a background station with no mining influence.
S6	In the Suwannee River approximately 100 ft. upstream from its confluence with Roaring Creek approximately 25 ft. from the north bank.
S7	In the Suwannee River approximately 100 ft. downstream from its confluence with Roaring Creek approximately 25 ft. from the north bank.
CH1	50 ft. downstream of the 100 acre wetland and within the stream channel.
CH2	In the stream channel 50 ft. upstream of the connection channel to natural Four Mile Branch.
CH3	In the stream channel 50 ft. downstream of the connection channel to natural Four Mile Branch.
SM1	Connection Channel, 50 feet Downstream of Restoration Wetland.
SM2	50 feet upstream of the connection channel to natural Swift Creek.
SM3	50 feet downstream from the connection channel in Swift Creek.
CB004	In Camp Branch just upstream of bridge on CR25: section 24, T1S, R14E

Water is only sampled if there is flow at the point of severance.

Attachment E. Table E-1. Roaring Creek Water Quality and Quantity Data for Station R1 (in the relocation, near CR-135)

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/17/2017	10/29/2017
Time	1100	1430	950	1300
Samplers	AD/KG	AD	AD/KG	AD/KG
Water Temp. (C)				
Water Depth (ft.)				
Sample Depth (ft.)				
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Scat Clds Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 90 Lo 68	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	E 5 mph / SE 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station R1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

Attachment E. Table E-2. Roaring Creek Water Quality and Quantity Data for Station R2 (in the relocation, about mid-way)

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/17/2017	10/29/2017
Time	1100	1430	950	1300
Samplers	AD/KG	AD	AD/KG	ad,kg
Water Temp. (C)				
Water Depth (ft.)				
Sample Depth (ft.)				
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Scat Clds Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 90 Lo 68	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	E 5 mph / SE 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station R1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

Attachment E. Table E-3. Roaring Creek Water Quality and Quantity Data for Station R3 (in the relocation, near the headwater connection)

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/17/2017	10/29/2017
Time	1100	1430	950	1300
Samplers	AD/KG	AD	AD/KG	AD/KG
Water Temp. (C)				
Water Depth (ft.)				
Sample Depth (ft.)				
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Scat Clds Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 90 Lo 68	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	E 5 mph / SE 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station R1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

Attachment E. Table E-4. Roaring Creek Water Quality and Quantity Data for Station R4 (in Roaring Creek, near the mouth)

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/17/2017	10/29/2017
Time	1100	1430	950	1300
Samplers	AD/KG	AD	AD/KG	AD/KG
Water Temp. (C)				
Water Depth (ft.)				
Sample Depth (ft.)				
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Scat Clds Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 90 Lo 68	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	E 5 mph / SE 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station R1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

Attachment E. Table E-5. Water Quality and Quantity Data for Station HB5 (in Hogans Branch, for background)

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/17/2017	10/29/2017
Time	1100	1430	950	1300
Samplers	AD/KG	AD	AD/KG	AD/KG
Water Temp. (C)				
Water Depth (ft.)				
Sample Depth (ft.)				
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Scat Clds Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 90 Lo 68	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	E 5 mph / SE 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station R1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

Attachment E. Table E-6. Roaring Creek Water Quality and Quantity Data for Station S6 (in the Suwannee River, upstream of Roaring Creek)

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/17/2017	10/29/2017
Time	1100	1430	950	1300
Samplers	AD/KG	AD	AD/KG	AD/KG
Water Temp. (C)				
Water Depth (ft.)				
Sample Depth (ft.)				
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Scat Clds Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 90 Lo 68	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	E 5 mph / SE 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station R1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

Attachment 7. Table E-7. Roaring Creek Water Quality and Quantity Data for Station S7 (in the Suwannee River, downstream of Roaring Creek)

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/17/2017	10/29/2017
Time	1100	1430	950	1300
Samplers	AD/KG	AD	AD/KG	AD/KG
Water Temp. (C)				
Water Depth (ft.)				
Sample Depth (ft.)				
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Scat Clds Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 90 Lo 68	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	E 5 mph / SE 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station R1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

Attachment E. Table E-8. Swift Creek Water Quality and Quantity for Sampling Station SM1, Connection Channel, 50 feet Downstream of Restoration Wetland

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/21/2017	10/29/2017
Time	1305	1130	718	1515
Samplers	AD/KG	AD/CM	AD/KG	AD/KG
Water Temp. (C)				
Water Depth (ft.)				
Sample Depth (ft.)				
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Clear Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 93 Lo 73	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	S 3 mph / S 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station SM1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

Attachment E. Table E-9. Swift Creek Water Quality and Quantity for Sampling Station SM2, 50 feet upstream of the connection channel to natural Swift Creek

PARAMETER	Jan-17	Apr-17	JUL-17	OCT-17
Flow (cfs)	(1)	(1)	(1)	(1)
Color (C.U.)				
Alkalinity (mg/L)				
TKN (mg/L)				
NO2/NO3 as N (mg/L)				
Fluoride (mg/L)				
pH (S.U.)				
TOC (mg/L)				
Conductivity (mmhos)				
DO (mg/L)				
TSS (mg/L)				
TDS (mg/L)				
Total p (mg/L)				
Ortho-p (mg/L)				
Date	1/16/2017	4/17/2017	7/21/2017	10/29/2017
Time	1311	1130	718	N/A
Samplers	AD/KG	AD/CM	AD/KG	ad,kg
Water Temp. (C)				
Water Depth (ft.)		0.00	0.00	0.00
Sample Depth (ft.)	0.00	0.00	0.00	0.00
Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Clear Hi 91 Lo 72	Clear Hi 65 Lo 40
Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 93 Lo 73	Scat Clds Hi 80 Lo 48
Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	S 3 mph / S 8 mph	NW 5 mph / W 7 mph

(1) There was no flow at Station SM1. No further sampling was required.
(2) Wind direction and speed - day of sample / day before sample
U = Compound was analyzed for but not detected.

	A	B	C	D	E
1	**Attachment E. Table E-10. Swift Creek Water Quality and Quantity for Sampling Station SM3, 50 feet downstream from the connection channel in Swift Creek**				
2					
3	**PARAMETER**	**Jan-17**	**Apr-17**	**JUL-17**	**OCT-17**
4	Flow (cfs)	(1)	(1)	(1)	(1)
5	Color (C.U.)				
6	Alkalinity (mg/L)				
7	TKN (mg/L)				
8	NO2/NO3 as N (mg/L)				
9	Fluoride (mg/L)				
10	pH (S.U.)				
11	TOC (mg/L)				
12	Conductivity (mmhos)				
13	DO (mg/L)				
14	TSS (mg/L)				
15	TDS (mg/L)				
16	Total p (mg/L)				
17	Ortho-p (mg/L)				
18	Date	1/16/2017	4/17/2017	7/21/2017	10/29/2017
19	Time	1320	1130	718	N/A
20	Samplers	AD/KG	AD/CM	AD/KG	AD/KG
21	Water Temp. (C)				
22	Water Depth (ft.)		0.00	0.00	0.00
23	Sample Depth (ft.)	0.00	0.00	0.00	0.00
24	Weather - Sample Day	Scat Clds Hi 77 Lo 54	Scat Clds Hi 86 Lo 61	Clear Hi 91 Lo 72	Clear Hi 65 Lo 40
25	Weather - Day before	Scat Clds Hi 75 Lo 50	Lt Scat Clds Hi 84 Lo 60	Clear Hi 93 Lo 73	Scat Clds Hi 80 Lo 48
26	Wind Direction/Speed (2)	SW 10 mph / S 15 mph	SE 7mph / E 5 mph	S 3 mph / S 8 mph	NW 5 mph / W 7 mph
27					
28	(1) There was no flow at Station SM1. No further sampling was required.				
29	(2) Wind direction and speed - day of sample / day before sample				
30	U = Compound was analyzed for but not detected.				

Attachment E. Table E-14. Water Quality Data from Camp Branch NPDES/IW CB004 @ CR 25

2017

DATE	ga	FLOW (mgd)	Total N as N	Sp Cond	TURB (ntu)	DO mg/l	DO%sat.	Total P as P	pH
1/3/2017	0.92	3.53	0.91	142	2.7	7.0	73.6	0.92	7.2
1/10/2017	0.54	1.08	0.77	184	2.5	10.1	88.9	0.85	7.5
1/17/2017	0.54	1.08	0.78	186	1.5	8.8	89.7	0.91	7.5
1/24/2017	0.88	3.38	0.86	168	3.0	8.4	83.0	0.96	7.3
1/31/2017	0.62	1.24	1.08	174	9.5	9.4	84.1	0.85	7.5
2/7/2017	0.88	3.38	1.46	212	6.9	8.7	85.3	0.75	7.6
2/14/2017	0.6	1.20	1.24	187	2.7	8.4	84.2	1.00	7.5
2/21/2017	0.58	1.16	1.07	181	2.5	8.2	84.2	0.92	7.4
2/28/2017	0.56	1.12	1.17	184	1.8	8.1	84.8	0.91	7.5
3/7/2017	0.56	1.12	1.00	168	1.8	8.3	82.1	0.90	7.5
3/14/2017	0.65	2.35	1.47	152	2.8	8.7	83.4	0.96	7.4
3/21/2017	0.48	0.91	1.37	176	2.4	8.2	81.8	0.89	7.6
3/28/2017	0.43	0.82	1.19	176	1.7	7.4	78.9	1.02	7.6
4/4/2017	2.98	31.00	2.00	106	18.4	6.1	66.5	1.32	6.8
4/11/2017	0.59	1.18	1.32	140	2.8	8.2	85.1	0.99	7.4
4/18/2017	0.53	1.01	1.88	169	1.4	7.8	83.6	0.99	7.6
4/25/2017	0.46	0.87	1.12	157	1.7	8.1	83.9	0.97	7.4
5/2/2017	0.41	0.78	1.25	173	3.4	7.0	78.6	1.09	7.5
5/9/2017	0.39	0.74	1.22	171	1.1	8.4	87.1	0.94	7.6
5/16/2017	0.39	0.74	1.35	161	2.4	7.7	84.5	1.03	7.5
5/23/2017	0.35	0.81	1.30	178	2.7	6.8	78.1	1.07	7.3
5/30/2017	0.38	0.72	2.09	161	2.2	6.7	78.2	1.06	7.4
6/6/2017	1.92	20.15	1.50	109	15.6	6.9	80.5	0.86	7.0
6/13/2017 (1)	1.80 est.	18.89	1.54	159	5.3	5.9	72.1	1.01	7.1
6/20/2017 (1)	1.60 est.	15.29	1.53	134	4.2	6.0	73.3	1.02	7.0
6/27/2017 (1)	1.20 est.	7.81	1.67	151	2.9	5.8	71.6	0.98	7.3
7/4/2017 (1)	.85 est.	3.26	1.31	157	3.0	6.0	73.9	1.00	7.4
7/11/2017	0.87	3.34	1.34	117	2.2	6.7	80.1	0.96	7.4
7/18/2017	0.7	2.53	1.36	163	1.9	6.9	81.2	0.92	7.3
7/25/2017	0.74	2.67	1.37	172	1.8	6.8	81.3	0.92	7.5
8/1/2017	0.74	2.67	1.29	168	1.9	7.2	83.0	0.91	7.5
8/8/2017	0.7	2.53	1.40	175	2.8	7.1	85.0	0.91	7.4
8/15/2017	1	5.69	1.30	177	2.5	6.4	77.7	1.03	7.3
8/22/2017	0.92	3.53	1.34	170	3.8	6.6	80.4	0.98	7.3
8/29/2017	0.7	2.53	1.26	177	2.7	6.8	79.8	0.95	7.4
9/5/2017	0.6	1.20	1.30	164	3.2	6.9	80.9	0.90	7.4
9/14/2017 (2)	2.0+	20.99	(3)	(3)	(3)	6.1	71.7	(3)	(3)
9/19/2017	1.38	11.41	1.37	153	2.7	5.8	69.4	0.92	7.1
9/26/2017	1.23	8.01	1.56	168	3.0	5.9	70.6	0.95	7.3

DATE	ga	FLOW (mgd)	Total N as N	Sp Cond	TURB (ntu)	DO mg/l	DO%sat.	Total P as P	pH
10/3/2017	0.9	3.45	1.74	136	3.0	6.7	77.0	0.93	7.4
10/10/2017	0.81	3.05	1.48	161	2.4	6.1	72.4	1.07	7.1
10/17/2017	0.72	2.60	1.34	160	2.5	6.8	76.9	0.94	7.3
10/24/2017	0.64	2.31	1.22	176	2.1	7.2	79.2	0.89	7.3
10/31/2017	0.57	1.14	1.14	158	1.3	9.5	89.2	1.06	7.5
11/7/2017	0.58	1.16	1.14	165	3.1	8.3	88.3	0.91	7.5
11/14/2017	0.54	1.08	1.15	143	1.7	8.4	85.5	0.86	7.5
11/21/2017	0.54	1.08	1.24	166	3.1	9.2	88.7	0.77	7.5
11/28/2017	0.54	1.08	1.36	165	2.2	8.8	85.1	0.84	7.3
12/5/2017	0.54	1.08	1.31	141	2.1	7.9	81.0	0.87	7.4
12/12/2017	0.72	2.60	1.08	158	1.2	10.0	90.8	0.76	7.6
12/19/2017	0.65	2.35	1.02	153	2.1	8.1	84.5	0.80	7.6
12/28/2017	0.74	2.83	1.05	171	2.5	8.9	82.1	0.89	7.6

(1) From 6-5-17 to 7-4-17, Area had 8.02" of rain. The gauge board was pushed over. Gauge board at IC41 was used to estimate flow.
(2) Guage board was pushed over. Flow was estimated. Irma passed through on 9/12/17.
(3) No samples due to Irma on 9/12/17

Daily Readings

Loncala Tract Turbidity

 # 0144913-021

Don Dahlgren : ext.# 8630, cell # 386-365-4421, Turbidity Limit - 29 ntu

January 2017 - December 2017

start date	Cat Creek Enhancement			start date	Cat Creek Diversion Channel			start date	The Point of Severance		
	Upstream	Downstream	Daily		Upstream	Downstream	Daily		Upstream	Downstream	Daily
Date	Turbidity	Turbidity	Rainfall	Date	Turbidity	Turbidity	Rainfall	Date	Turbidity	Turbidity	Rainfall
weekly	Turbidity readings have gone from Daily to Weekly, plus additional readings with a 1/2" rainfall.										
1-Jan											
4-Jan	IFS	IFS	1.44		dry	dry	1.44			dry	1.44
7-Jan	2.23	1.79	0.96		dry	dry	0.95			dry	0.95
11-Jan	IFS	IFS			dry	dry				dry	
18-Jan	IFS	IFS			dry	dry				dry	
22-Jan	3.26	3.20	2.16		dry	dry	2.16			dry	2.16
23-Jan	2.66	3.2			IFS	IFS				IFS	
1-Feb											
3-Feb	IFS	IFS			dry	dry				dry	
8-Feb	2.18	2.23	0.90		dry	dry	0.90			dry	0.90
17-Feb	IFS	IFS	0.06		dry	dry	0.06			dry	0.06
23-Feb	IFS	IFS			dry	dry				puddle	
28-Feb	3.47	IFS			dry	dry				dry	
1-Mar											
8-Mar	2.13	2.17			dry	nf				dry	
14-Mar	IFS	IFS			dry	nf				dry	
22-Mar	IFS	IFS			dry	nf				dry	
27-Mar	3.69	IFS			dry	nf				dry	
1-Apr											
4-Apr	3.79	4.11	0.59"		IFS	IFS	0.59"			IFS	0.59"
5-Apr	3.09	3.92	1.77"		IFS	IFS	1.77"			IFS	1.77"
6-Apr	3.50	3.20	.53"		IFS	IFS	.53"			IFS	.53"
12-Apr	4.19	4.20			IFS	IFS				dry	
20-Apr	IFS	IFS			dry	dry				dry	
27-Apr	3.47	IFS	.02"		dry	dry	.02"			dry	.02"
1-May											
3-May	4.01	IFS			dry	dry				dry	
4-May			.48"				.48"				.48"
8-May	2.75	IFS			dry	dry				dry	
14-May			1.14"				1.14"				1.14"
15-May	4.69	IFS			dry	dry				dry	
22-May			.38"				.38"				.38"
23-May			1.60"				1.60"				1.60"
24-May	3.09	IFS	.10"		dry	dry	.10"			dry	.10"
30-May			.77"				.77"				.77"
31-May	IFS	IFS			dry	dry				dry	
1-Jun											
4-Jun			1.41"				1.41"				1.41"
5-Jun	3.12	IFS			boggy	nf				boggy	
6-Jun			2.22"				2.22"				2.22"
7-Jun	5.67	7.34	2.12"		16.10	16.90	2.12"			69.30	2.12"
8-Jun	4.29	5.78	.10"		4.00	10.9	.10"			31.20	.10"
13-Jun			1.83"				1.83"				1.83"
14-Jun	4.15	5.27			3.56	8.65				39.60	
17-Jun			.67"				.67"				.67"
18-Jun	1.57	1.72	.17"		3.07	2.96	.17"			nf	.17"
19-Jun			1.77"				1.77"				1.77"
20-Jun	3.55	4.11	.19"		3.54	5.16	.19"			28.70	.19"
21-Jun			.41"				.41"				.41"
26-Jun	10.50	8.79			nf	2.14				nf	
27-Jun			.33"				.33"				.33"
29-Jun			.79"				.79"				.79"
30-Jun	10.10	9.96			nf	nf				nf	
1-Jul											
5-Jul	3.30	4.80			IFS	IFS				IFS	
10-Jul	6.23	9.01			IFS	IFS				IFS	
13-Jul			0.88				0.88				0.88
14-Jul	4.99	5.67			IFS	IFS				IFS	
19-Jul	7.56	6.08			stagnant	IFS				stagnant	
23-Jul	5.73	6.12			stagnant	IFS				stagnant	
27-Jul	9.46	9.36			stagnant	IFS				stagnant	
1-Aug											
3-Aug	9.37	8.22	.64"		IFS	IFS	.64"			IFS	.64"
4-Aug			.57"				.57"				.57"

5-Aug	3.63				IFS	IFS				stagnant	
10-Aug	11.50	10.80	0.28"		IFS	IFS	.28"			dry	.28"
13-Aug	9.08	7.76	.65"		IFS	IFS	.65"			dry	.65"
15-Aug	4.02	3.65	.50"		IFS	IFS	.50"			dry	.50"
16-Aug	8.23	7.63	.52"		IFS	IFS	.52"			dry	.52"
18-Aug	3.13	3.40	.67"		nf	nf	.67"			nf	.67"
25-Aug	4.83	5.05			dry	dry				dry	
31-Aug	8.41	7.32			dry	dry				dry	
1-Sep											
2-Sep	8.21	7.83	.58"		boggy	dry	.58"			dry	.58"
3-Sep	7.28	7.63			IFS	IFS				dry	
7-Sep	6.99	7.05	.16"		IFS	IFS	.16"			IFS	.16"
13-Sep	3.39	nd	5.95"		2.46	2.71	5.95"			nd	5.95"
18-Sep	3.5	3.79	.48"		6.42	11.21	.48"			IFS	.48"
22-Sep	2.13	3.62	.69"		IFS	4.30	.69"			378.00	.69"
27-Sep	5.74	4.87			IFS	IFS				IFS	
1-Oct											
4-Oct	3.88	4.12			IFS	IFS				IFS	
8-Oct	4.46	5.13	.58"		ifs	ifs	.58"			ifs	.58"
9-Oct	4.44	4.09	.60"		ifs	ifs	.60"			ifs	.60"
17-Oct	3.96	4.23	1.01"		ifs	ifs	1.01"			stagnant	1.01"
23-Oct			.36"				.36"				.36"
27-Nov	5.36	2.82			ifs	ifs				stagnant	
1-Nov											
2-Nov	3.86	4.11			ifs	ifs				stagnant	
11-Nov	5.52	6.21			dry	ifs				dry	
16-Nov	4.92	ifs			dry	dry				dry	
24-Nov	5.98	ifs			dry	dry				dry	
30-Nov	3.93	ifs			dry	ifs				dry	
1-Dec											
7-Dec	2.99	3.62	1.28"		ifs	ifs	1.28"			dry	1.28"
9-Dec	3.88	ifs			boggy	boggy				dry	
13-Dec	1.74	2.21			boggy	nf				nf	
20-Dec	4.34	5.11			dry	nf				boggy	
25-Dec	4.53	ifs			ifs	ifs				dry	

PCS LAB DATA SHEET

ENVIRONMENTAL CONTROL LABORATORY Daily Water Sheet & Chain of Custody Log

Project: Loncala Tract, PCS Permit # 0144913 - 021

12F, Quarterly Sampling												
Sample Frequency			2017 Quarterly Sampling									
		Units	March	May	July	November						
	Date		4-Mar	30-Apr	23-Jul	29-Oct						
	Time		10:41	11:36	11:05	8:14						
Quarterly	Static Water Level	feet/tenths	110.75	112.45	111.9	108.19						
	Water Level - NGVD	feet/tenths										
in-situ	temperature	°C	21.5	20.8	20.9	20.7						
	pH	su	7.54	7.46	7.43	7.53						
	D.O.	mg/l	1.26	3.99	3.81	3.52						
	Conductivity	umhos/cm	439.9	453.7	445.6	442.3						
	Turbidity	ntu	0.32	0.23	0.78	0.36						
Quarterly	TDS	mg/l	254	284	268	286						
PCS Lab	TSS	mg/l	2.8	1.6	0.4	1.6						
	TP	mg/l	0.11	0.1	0.12	0.12						
	Ortho "P"	mg/l	0.1	0.12	0.1	0.1						
	NO_2NO_3	mg/l	0.01	0.01	0.01	0.01						
	TKN	mg/l	0.48	0.83	0.38	0.42						
	TN	mg/l	0.49	0.84	0.39	0.43						
	Fluoride	mg/l	0.41	0.44	0.37	0.41						
Quarterly	Total Alkalinity	mg/l	210	210	200	210						
Pace Labs, Inc.	Sulfate	mg/l	15	16	15	14						
	Chloride	mg/l	6.7	6.8	7.3	6.2						
	Apparent Color	PCU	5	5	5	5						
	Oil and Grease	mg/l	2.3	2.2	2.2	2.2						
	Hardness	mg/l	220	220	220	210						
	Aluminum	ug/l	61	61	61	61						
	Selenium	ug/l	0.58	0.58	0.58	0.58						
	Calcium	ug/l	52000	51000	52000	49000						
	Magnesium	ug/l	21000	21000	21000	22000						
	Arsenic	ug/l	0.077	0.01	0.077	0.077						
	Cadmium	ug/l	0.028	0.01	0.028	0.028						
	Chromium	ug/l	0.11	0.01	0.11	0.11						
	Iron	ug/l	30	30	30	30						
	Lead	ug/l	0.24	0.01	0.24	0.24						
	Mercury	ug/l	0.011	0.015	0.011	0.011						
	Nickel	ug/l	1.1		0.58	0.11						
	Zinc	ug/l	14	2	5.1	16						
	Gross Alpha	pCi/L	2.9	3.8	2	3						
	Rads 226/228	pCi/L	1	1	0.7	1						

PCS LAB DATA SHEET

ENVIRONMENTAL CONTROL LABORATORY Daily Water Sheet & Chain of Custody Log

Project: Loncala Tract, PCS Permit # 0144913 - 021

6F, Quarterly Sampling												
Sample Frequency			2017 Quarterly Sampling									
		Units	March	May	July	November						
	Date		4-Mar	30-Apr	23-Jul	29-Oct						
	Time		10:03	8:34	11:48	8:49						
Quarterly	Static Water Level	feet/tenths	113.96	115.84	115.41	111.37						
	Water Level - NGVD	feet/tenths										
in-situ	temperature	°C	21.6	20.8	20.8	20.7						
	pH	su	7.46	7.51	7.46	7.6						
	D.O.	mg/l	1.7	3.78	3.57	3.75						
	Conductivity	umhos/cm	447.1	457.6	440.7	449.7						
	Turbidity	ntu	0.56	3.51	1.46	0.58						
Quarterly	TDS	mg/l	252	266	284	296						
PCS Lab	TSS	mg/l	2.8	2	1.6	3.6						
	TP	mg/l	0.11	0.09	0.12	0.12						
	Ortho "P"	mg/l	0.09	0.03	0.04	0.05						
	NO_2NO_3	mg/l	0.01	0.01	0.02	0.01						
	TKN	mg/l	0.49	0.9	0.46	0.35						
	TN	mg/l	0.5	0.91	0.48	0.36						
	Fluoride	mg/l	0.38	0.39	0.36	0.38						
Quarterly	Total Alkalinity	mg/l	220	220	210	210						
Pace Labs, Inc.	Sulfate	mg/l	13	13	13	12						
	Chloride	mg/l	7	7	7.4	6.4						
	Apparent Color	PCU	20	20	20	20						
	Oil and Grease	mg/l	1.3	2.2	2.2	2.2						
	Hardness	mg/l	230	220	220	210						
	Aluminum	ug/l	61	61	61	61						
	Selenium	ug/l	0.58	0.58	0.58	0.58						
	Calcium	ug/l	55000	54000	55000	51000						
	Magnesium	ug/l	22000	21000	21000	21000						
	Arsenic	ug/l	0.22	0.01	0.14	0.12						
	Cadmium	ug/l	0.028	0.01	0.028	0.028						
	Chromium	ug/l	0.11	0.01	0.11	0.11						
	Iron	ug/l	930	860	830	870						
	Lead	ug/l	0.24	0.01	0.24	0.24						
	Mercury	ug/l	0.011	0.02	0.011	0.011						
	Nickel	ug/l	0.11		0.22	0.14						
	Zinc	ug/l	52	29	46	54						
	Gross Alpha	pCi/L	2.3	2.8	2.1	5.4						
	Rads 226/228	pCi/L	1.2	0.3	1	1.7						

PCS LAB DATA SHEET

ENVIRONMENTAL CONTROL LABORATORY Daily Water Sheet & Chain of Custody Log

Project: Loncala Tract, PCS Permit # 0144913 - 021

LC MW 21, Monthly Sampling												
Sample Frequency			2017 Quarterly Sampling									
		Units	March	May	July	November						
	Date		4-Mar	30-Apr	23-Jul	29-Oct						
	Time		11:24	9:46	10:27	9:36						
MONTHLY	Static Water Level	feet/tenths	10.20	10.56	8.57	8.45						
	Water Level - NGVD	feet/tenths										
in-situ	temperature	°C	22.20	21.60	22.10	22.30						
	pH	su	6.22	6.75	6.42	6.42						
	D.O.	mg/l	0.14	0.31	0.16	0.06						
	Conductivity	umhos/cm	181.40	321.90	230.50	237.10						
	Turbidity	ntu	3.02	3.37	3.39	3.71						
MONTHLY	TDS	mg/l	98.00	152.00	120.00	156.00						
PCS Lab	TSS	mg/l	2.00	0.80	4.80	9.60						
	TP	mg/l	1.29	0.99	0.88	0.94						
	Ortho "P"	mg/l	1.19	0.81	0.74	0.88						
	NO_2NO_3	mg/l	0.01	0.00	0.02	0.01						
	TKN	mg/l	0.66	0.34	0.56	1.33						
	TN	mg/l	0.67	0.35	0.58	1.34						
	Fluoride	mg/l	0.60	0.65	0.49	0.67						
MONTHLY	Total Alkalinity	mg/l	75.00	140.00	100.00	110.00						
Pace Labs, Inc.	Sulfate	mg/l	0.46	0.63	0.85	0.44						
	Chloride	mg/l	6.50	6.50	5.90	5.80						
	Apparent Color	PCU	20.00	15.00	20.00	15.00						
	Oil and Grease	mg/l	1.70	2.20	2.20	2.20						
	Hardness	mg/l	76.00	140.00	100.00	130.00						
	Aluminum	ug/l	61.00	61.00	210.00	180.00						
	Selenium	ug/l	0.58	0.58	0.58	0.58						
	Calcium	ug/l	18000.00	32000.00	24000.00	28000.00						
	Magnesium	ug/l	7700.00	16000.00	11000.00	14000.00						
	Arsenic	ug/l	1.10	0.01	1.70	1.40						
	Cadmium	ug/l	0.03	0.01	0.06	0.03						
	Chromium	ug/l	0.73	0.01	0.59	0.48						
	Iron	ug/l	1700.00	1600.00	1500.00	1600.00						
	Lead	ug/l	0.24	0.01	0.24	0.24						
	Mercury	ug/l	0.01	0.01	0.01	0.01						
	Nickel	ug/l	0.67		0.86	0.78						
	Zinc	ug/l	7.70	2.00	5.70	20.00						
	Gross Alpha	pCi/L	2.80	6.70	1.90	3.30						
	Rads 226/228	pCi/L	1.00	0.40	0.70	0.90						

PCS LAB DATA SHEET

ENVIRONMENTAL CONTROL LABORATORY Daily Water Sheet & Chain of Custody Log

Project: Loncala Tract, PCS Permit # 0144913 - 021

LC MW 24, Monthly Sampling												
Sample Frequency			2017 Quarterly Sampling									
		Units	March	May	July	November						
	Date		4-Mar	30-Apr	23-Jul	29-Oct						
	Time		12:26	12:04	9:31	9:51						
MONTHLY	Static Water Level	feet/tenths	no access	no access	no access	no access						
	Water Level - NGVD	feet/tenths										
in-situ	temperature	°C										
	pH	su										
	D.O.	mg/l										
	Conductivity	umhos/cm										
	Turbidity	ntu										
MONTHLY	TDS	mg/l										
PCS Lab	TSS	mg/l										
	TP	mg/l										
	Ortho "P"	mg/l										
	NO_2NO_3	mg/l										
	TKN	mg/l										
	TN	mg/l										
	Fluoride	mg/l										
MONTHLY	Total Alkalinity	mg/l										
Pace Labs, Inc.	Sulfate	mg/l										
	Chloride	mg/l										
	Apparent Color	ug/l										
	Oil and Grease	ug/l										
	Hardness	ug/l										
	Aluminum	ug/l										
	Selenium	ug/l										
	Calcium	ug/l										
	Magnesium	ug/l										
	Arsenic	ug/l										
	Cadmium	ug/l										
	Chromium	ug/l										
	Iron	ug/l										
	Lead	ug/l										
	Mercury	ug/l										
	Nickel	ug/l										
	Zinc	ug/l										
	Gross Alpha	pCi/L										
	Rads 226/228	pCi/L										

PCS LAB DATA SHEET

ENVIRONMENTAL CONTROL LABORATORY Daily Water Sheet & Chain of Custody Log

Project: Loncala Tract, PCS Permit # 0144913 - 021

LC MW 23, Monthly Sampling												
Sample Frequency			2017 Quarterly Sampling									
		Units	March	May	July	November						
	Date		4-Mar	30-Apr	23-Jul	29-Oct						
	Time		12:06	11:16	9:14	10:31						
MONTHLY	Static Water Level	feet/tenths	18.65	15.18	11.39	11.23						
	Water Level - NGVD	feet/tenths										
in-situ	temperature	°C	22.3	21.60	21.60	21.20						
	pH	su	7.04	7.07	6.96	6.83						
	D.O.	mg/l	0.1	0.19	0.65	1.42						
	Conductivity	umhos/cm	378.1	385.90	370.20	362.40						
	Turbidity	ntu	0.35	3.64	1.32	2.54						
MONTHLY	TDS	mg/l	214	210.00	226.00	232.00						
PCS Lab	TSS	mg/l	2.8	1.20	2.40	3.60						
	TP	mg/l	0.12	0.11	0.13	0.14						
	Ortho "P"	mg/l	0.05	0.02	0.03	0.05						
	NO_2NO_3	mg/l	0.01	0.01	0.02	0.01						
	TKN	mg/l	0.35	1.01	0.46	1.25						
	TN	mg/l	0.36	1.02	0.48	1.26						
	Fluoride	mg/l	0.44	0.43	0.37	0.45						
MONTHLY	Total Alkalinity	mg/l	190	190.00	180.00	180.00						
Pace Labs, Inc.	Sulfate	mg/l	3.3	3.40	3.30	3.00						
	Chloride	mg/l	4.4	4.20	4.30	3.80						
	Apparent Color	PCU	20	30.00	20.00	20.00						
	Oil and Grease	mg/l	2	2.20	2.20	2.20						
	Hardness	mg/l	190	190.00	180.00	180.00						
	Aluminum	ug/l	61	61.00	61.00	61.00						
	Selenium	ug/l	0.58	0.58	0.58	0.58						
	Calcium	ug/l	43000	42000.00	40000.00	39000.00						
	Magnesium	ug/l	21000	21000.00	20000.00	21000.00						
	Arsenic	ug/l	0.55	0.01	0.43	0.46						
	Cadmium	ug/l	0.028	0.01	0.03	0.03						
	Chromium	ug/l	0.11	0.01	0.11	0.11						
	Iron	ug/l	820	910.00	840.00	820.00						
	Lead	ug/l	0.24	0.01	0.24	0.24						
	Mercury	ug/l	0.011	0.01	0.01	0.01						
	Nickel	ug/l	0.16		0.29	0.22						
	Zinc	ug/l	6.7	2.00	4.70	15.00						
	Gross Alpha	pCi/L	2.3	2.70	2.40	3.10						
	Rads 226/228	pCi/L	1.3	0.80	0.80	1.20						

PCS LAB DATA SHEET

ENVIRONMENTAL CONTROL LABORATORY Daily Water Sheet & Chain of Custody Log

Project: Loncala Tract, PCS Permit # 0144913 - 021

LC MW 22, Monthly Sampling												
Sample Frequency			2017 Quarterly Sampling									
		Units	March	May	July	November						
	Date		4-Mar	30-Apr	23-Jul	29-Oct						
	Time		12:54	10:29	8:02	11:40						
MONTHLY	Static Water Level	feet/tenths	8.46	9.03	7.35	7.84						
	Water Level - NGVD	feet/tenths										
in-situ	temperature	°C	20.3	20.40	23.60	23.40						
	pH	su	5.03	4.96	4.91	5.04						
	D.O.	mg/l	0.2	0.25	1.00	1.62						
	Conductivity	umhos/cm	68.8	77.10	75.90	75.60						
	Turbidity	ntu	0.73	0.32	1.39	0.91						
MONTHLY	TDS	mg/l	36	48.00	64.00	68.00						
PCS Lab	TSS	mg/l	2	0.80	1.20	2.00						
	TP	mg/l	0.15	0.18	0.20	0.22						
	Ortho "P"	mg/l	0.15	0.19	0.20	0.22						
	NO_2NO_3	mg/l	0.04	0.03	0.05	0.15						
	TKN	mg/l	0.46	0.32	0.45	0.55						
	TN	mg/l	0.5	0.35	0.50	0.70						
	Fluoride	mg/l	0.24	0.25	0.24	0.26						
MONTHLY	Total Alkalinity	mg/l	6.1	6.00	6.40	6.10						
Pace Labs, Inc.	Sulfate	mg/l	0.46	0.40	0.53	0.44						
	Chloride	mg/l	14	16.00	17.00	14.00						
	Apparent Color	PCU	5	5.00	5.00	5.00						
	Oil and Grease	mg/l	2.4	3.70	2.20	2.20						
	Hardness	mg/l	14	16.00	15.00	15.00						
	Aluminum	ug/l	86	110.00	100.00	100.00						
	Selenium	ug/l	0.58	0.01	0.58	0.58						
	Calcium	ug/l	3800	4200.00	3900.00	3900.00						
	Magnesium	ug/l	1200	1300.00	1300.00	1300.00						
	Arsenic	ug/l	0.17	0.01	0.13	0.12						
	Cadmium	ug/l	0.057	0.01	0.05	0.06						
	Chromium	ug/l	0.11	0.01	0.11	0.11						
	Iron	ug/l	30	30.00	30.00	30.00						
	Lead	ug/l	0.24	0.01	0.24	0.24						
	Mercury	ug/l	0.031	0.01	0.02	0.01						
	Nickel	ug/l	0.24		0.25	0.26						
	Zinc	ug/l	9.7	2.00	9.30	15.00						
	Gross Alpha	pCi/L	7.9	2.60	3.20	6.00						
	Rads 226/228	pCi/L	1.6	0.60	1.70	2.30						

PCS LAB DATA SHEET

ENVIRONMENTAL CONTROL LABORATORY Daily Water Sheet & Chain of Custody Log

Project: Loncala Tract, PCS Permit # 0144913 - 021

CC West Outfall, Monthly Sampling

Sample Frequency		Units	2017 Monthly Sampling											
			Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	Date		23-Jan	28-Feb	27-Mar	30-Apr	30-May	8-Jun	23-Jul	17-Aug	18-Sep	29-Oct	30-Nov	28-Dec
	Time		9:50	13:56	11:50	11:36	7:55	09:49	08:18	11:.04	11:51	10:51	07:39	08:08
MONTHLY	temperature	℃	16.60	19.60	17.30	22.20	23.30	24.10	23.50	25.80	23.10	15.70	13.70	11.90
in-situ	pH	su	6.76	7.08	7.25	6.99	7.08	6.40	7.12	6.76	6.59	7.27	7.30	7.31
	D.O.	mg/l	1.28	2.16	1.40	0.24	0.48	4.70	1.38	0.46	0.74	1.33	1.65	2.93
	Conductivity	umhos/cm	237.30	347.10	341.10	382.70	256.30	69.10	318.70	226.90	138.10	327.60	374.50	343.40
	Turbidity	ntu	3.10	4.15	3.87	5.38	7.53	4.09	3.93	7.40	5.21	2.61	3.62	3.93
MONTHLY	TDS	mg/l	158.00	208.00	196.00	228.00	228.00	66.00	198.00	224.00	158.00	228.00	2224.00	196.00
PCS Lab	TSS	mg/l	6.00	3.60	1.60	4.00	1.60	4.00	3.60	16.80	0.80	3.20	2.00	3.20
	TP	mg/l	0.57	0.33	0.45	0.67	0.47	0.26	0.39	0.54	0.41	0.32	0.23	0.43
	Ortho "P"	mg/l	0.52	0.33	0.33	0.36	0.34	0.22	0.23	0.37	0.35	0.27	0.34	0.35
	NO_2NO_3	mg/l	0.01	0.01	0.40	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.01
	TKN	mg/l	0.53	1.25	2.30	1.13	1.09	1.06	0.83	1.18	2.18	2.71	1.19	0.74
	TN	mg/l	0.54	1.26	2.70	1.14	1.10	1.07	0.85	1.20	2.19	2.72	1.21	0.75
	NH_3	mg/l	0.04	0.21	0.07	0.03	0.05	0.12	0.05	0.08	0.10	0.06	0.06	0.14
	Fluoride	mg/l	0.61	0.66	0.53	0.57	0.54	0.23	0.45	0.53	0.33	0.53	0.52	0.68
MONTHLY	Total Alkalinity	mg/l	96.00	160.00	180.00	180.00	160.00	21.00	150.00	140.00	49.00	160.00	170.00	140.00
Pace Labs, Inc.	Sulfate	mg/l	6.00	2.00	1.50	1.20	1.40	3.90	1.60	1.60	2.00	1.60	1.70	3.00
or	TOC	mg/l	16.00	6.30	5.40	5.40	7.40	19.00	7.80	9.50	30.00	7.30	5.30	7.80
AEL Labs	BOD	units	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.10	2.00	2.00	2.00
	Chloride	mg/l	10.00	7.90	7.60	7.20	8.20	2.50	6.90	7.30	5.70	6.70	6.70	8.50
	Chlorophyll-a	mg/l	1.00	3.20	2.10	2.10	1.00	3.20	2.10	9.60	4.30	1.30	1.30	1.30
BI-MONTHLY	Apparent Color	ug/l	100.00	50.00	40.00	60.00	60.00	200.00	60.00	100.00	250.00	50.00	30.00	50.00
Pace Labs, Inc.	Oil and Grease	ug/l	2.20	1.50	1.30	2.20	2.20	2.20	2.30	3.40	2.20	2.20	2.20	2.20
or	Hardness	ug/l	110.00	180.00	180.00		160.00	32.00	160.00	160.00	63.00	170.00	170.00	170.00
AEL Labs	Aluminum	ug/l	95.00	180.00	61.00	61.00	61.00	300.00	61.00	69.00	320.00	61.00	28.00	28.00
	Selenium	ug/l	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
	Calcium	ug/l	25000.00	39000.00	38000.00	41000.00	34000.00	8800.00	34000.00	33000.00	16000.00	34000.00	36000.00	35000.00
	Magnesium	ug/l	12000.00	21000.00	21000.00	22000.00	19000.00	2500.00	18000.00	18000.00	5500.00	19000.00	20000.00	20000.00
	Arsenic	ug/l	0.57	0.42	0.36	0.49	0.47	0.81	0.65	0.75	1.70	0.38	0.32	0.41
	Cadmium	ug/l	0.03	0.03	0.03	0.03	0.14	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Chromium	ug/l	0.29	0.20	0.18	0.11	0.18	0.52	0.17	0.26	0.79	0.15	0.16	0.52
	Iron	ug/l	780.00	1100.00	540.00	1300.00	730.00	340.00	1100.00	1100.00	1100.00	760.00	460.00	1100.00
	Lead	ug/l	0.24	0.29	0.24	0.24	0.24	0.53	0.24	0.24	0.24	0.24	0.24	0.24
	Mercury	ug/l	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Nickel	ug/l	0.11	0.32	0.63	0.20	0.22	0.55	0.31	0.39	0.84	0.26	0.38	0.37
	Zinc	ug/l	2.00	8.90	2.00		7.60	4.70	4.40	2.90	13.00	13.00	33.00	33.00
	Gross Alpha	pCi/L	1.40		1.50					2.10	1.20		1.30	
	Rads 226/228	pCi/L	0.50		0.90					0.90	0.90		0.90	

ENVIRONMENTAL CONTROL LABORATORY Daily Water Sheet & Chain of Custody Log

Project: Loncala Tract, PCS Permit # 0144913 - 021

CC East Outfall, Monthly Sampling

Sample Frequency		Units	2017 Monthly Sampling											
			Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	Date		23-Jan	28-Feb	27-Mar	30-Apr	29-May	8-Jun	23-Jul	17-Aug	18-Sep	29-Oct	30-Nov	28-Dec
	Time		10:03	14:17	12:11	11:52	7:42	9:32	8:14	11:26	11:25	10:42	7:31	8:00
MONTHLY	temperature	°C	dry	dry	dry	dry	dry	24.30	dry	dry	24.00	dry	dry	dry
in-situ	pH	su						6.10			6.13			
	D.O.	mg/l						3.27			0.39			
	Conductivity	umhos/cm						59.40			80.60			
	Turbidity	ntu						4.40			4.32			
MONTHLY	TDS	mg/l						106.00			138.00			
PCS Lab	TSS	mg/l						3.60			5.20			
	TP	mg/l						0.12			0.18			
	Ortho "P"	mg/l						0.07			0.08			
	NO_2NO_3	mg/l						0.01			0.01			
	TKN	mg/l						1.09			1.99			
	TN	mg/l						1.10			2.00			
	NH_3	mg/l						0.10			0.12			
	Fluoride	mg/l						0.18			0.28			
MONTHLY	Total Alkalinity	mg/l						19.00			57.00			
Pace Labs, Inc.	Sulfate	mg/l						3.30			120.00			
or	TOC	mg/l						12.00			34.00			
AEL Labs	BOD	units						2.00			3.60			
	Chloride	mg/l						1.70			73.00			
	Chlorophyll-a	mg/l						4.30			2.10			
BI-MONTHLY	Apparent Color	ug/l						100.00			300.00			
Pace Labs, Inc.	Oil and Grease	ug/l						2.20			2.20			
or	Hardness	ug/l						26.00			36.00			
AEL Labs	Aluminum	ug/l						260.00			470.00			
	Selenium	ug/l						0.58			0.58			
	Calcium	ug/l						7900.00			12000.00			
	Magnesium	ug/l						1500.00			1700.00			
	Arsenic	ug/l						0.08			1.90			
	Cadmium	ug/l						0.03			0.05			
	Chromium	ug/l						0.11			0.91			
	Iron	ug/l						210.00			1300.00			
	Lead	ug/l						0.24			0.52			
	Mercury	ug/l						0.01			0.01			
	Nickel	ug/l						0.11			0.96			
	Zinc	ug/l						5.20			17.00			
	Gross Alpha	pCi/L									2.30			
	Rads 226/228	pCi/L									0.90			

This information is being provided in partial fulfillment of the monitoring requirements in Permit No. 0144913-003 & Permit 0144913-021.

ATTACHMENT D:
VEGETATION MONITORING

This report represents a true, accurate, and representative description of the site conditions present at the time of monitoring.

William Donohue
General Manager

Submitted to:

Florida Department of Environmental Protection
Mining & Mitigation
2600 Blair Stone Road, MS715
Tallahassee, FL 32399

Submitted by:

White Springs Agricultural Chemicals, Inc.
d/b/a PCS Phosphate - White Springs
15843 SE 78th Street
White Springs, Florida 32096
(386) 386-8400

VEGETATION MONITORING FOR 2017

February 23, 2018

BIANNUAL WETLAND MONITORING
CB-10
CB-11
JERRY BRANCH

This report represents a true, accurate, and representative description of the site conditions present at the time of monitoring.

Jackie L. Fry, President: Jackie L Fry

Prepared for

POTASH CORP
WHITE SPRINGS, FLORIDA

Prepared by

THE PHOENIX ENVIRONMENTAL GROUP, INCORPORATED
2916 E. Park Avenue
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850-878-3331

December 15, 2017

Table of Contents

EXECUTIVE SUMMARY

Biannual vegetation monitoring was conducted by The Phoenix Environmental Group, Incorporated (Phoenix) of several reclaimed wetland areas located within the Potash Corporation's (PCS) mine boundary in Hamilton County, Florida. The wetlands that were monitored are designated as follows: CB-10, CB-11, and Jerry Branch (Figures 1-3). The monitoring is required by the Florida Department of Environmental Protection (FDEP) as part of Wetland Resource Permit No. 0144913-003.

All of the program areas have been affected by wide variations in climate conditions between 2008 and 2017. Lower than average rainfall was experienced in the area from 2008 until 2011, and higher than average rainfall has been recorded since that time to present. In September 2016 and September 2017, Hurricanes Hermine and Irma, respectively, affected Hamilton County with significant winds and rain. The rain events were further compounded when an abundance of stormwater in other PCS operations areas had to be moved into the reclamation areas to provide additional storage.

Most likely as a result of these extreme conditions, tree densities have declined in all areas, and flooding conditions in the eastern and western lobes of CB-10 and most of CB-11 continued. Groundcovers, tree densities and species diversity have been affected in all program areas. A comparison of the 2011, 2013, 2015 and 2017 summary data is provided in Attachment 1, Table 1. Table 2 contains details of desirable wetland species, open water and bare ground, and Tables 3-8 contain the details of tree diversity and species richness by program area.

When reviewing the data, please note the difference between "open water" and "inundation." Open water, for the purposes of this report, is defined as those areas where no vegetation is present. Areas where obligate trees and aquatic vegetation are present are not denoted as open water, but are considered to be inundated.

CB-10

The reclaimed Upper Camp Branch area known as CB-10 in this report consists of 173 acres, of which 25 acres in the northeastern and northwestern portions were planted in 2011. Supplemental planting occurred in the southeastern and southwestern lobes in 2014. This area consists of a mixture of Streams and Lake Swamps, Florida Land Use Cover and Forms Classification System (FLUCFCS) code 615 and Wetland Forested Mixed FLUCFCS code 630. Only three newly-established transects were evaluated within the southwestern portion of the CB-10 area due to extreme high water that made access unsafe or impossible for the majority of the program area. With the limited sampling size, and devastating tree mortality due to flooding, there were only 41 individual trees, consisting of five different species, counted in a very limited area. Although this

small amount of data is not statistically valid or significant, it will be included in this report for informational purposes.

CB-11

The CB-11 reclamation program area consists of 146 acres, all of which were planted in 2011 with supplemental planting in 2014. The area consists of FLUCFCS code 630, Wetland Forested Mixed and a few open water features classified as FLUCFCS code 524 (Lakes less than 10 acres). The littoral shelves of the lakes were planted with wetland vegetation and included in the assessment. A total of 75 circle plots were placed within the CB-11 area; however, five plots were not sampled in 2017 due to unsafe access at Transect E. There were 167.71 trees per acre comprised of 19 different species.

Transects B, I J, K, L, and N were relocated in 2017 due to high water and safety concerns. A portion of Transect H (Plots 3, 4, and 5) was relocated due to landowner activities altering the transect.

While efforts have been underway to drain the program area, and water levels are down from 2015, flood conditions were still prevalent in many areas at the time of the sampling event.

Jerry Branch

Based on aerial photography, Jerry Branch was mined in late 2010 and recontoured and reclaimed in 2016. Trees were planted shortly after recontouring in 2016. This area was reclaimed as a Wetland Forested Mix category (FLUCFCS 630). Jerry Branch has a combination of inundated wetlands, small ponds and herbaceous wetlands with some upland connections. The program area is approximately 198 acres with 20 transects that were established in early summer of 2017. A total of 98 plots (two transects had only four plots due to close proximity to other transects) were monitored in June and July of 2017.

1,196 trees were counted in Jerry Branch, which equates to 244 trees per acre. A total of 15 different tree species were noted.

Hancock Area

The Hancock area was not monitored Phoenix in 2017; please contact Don Dahlgren of PCS for this information.

Swift Creek Mitigation Area

The Swift Creek area was not monitored by Phoenix in 2017; please contact Don Dahlgren of PCS for this information.

1.0 Introduction

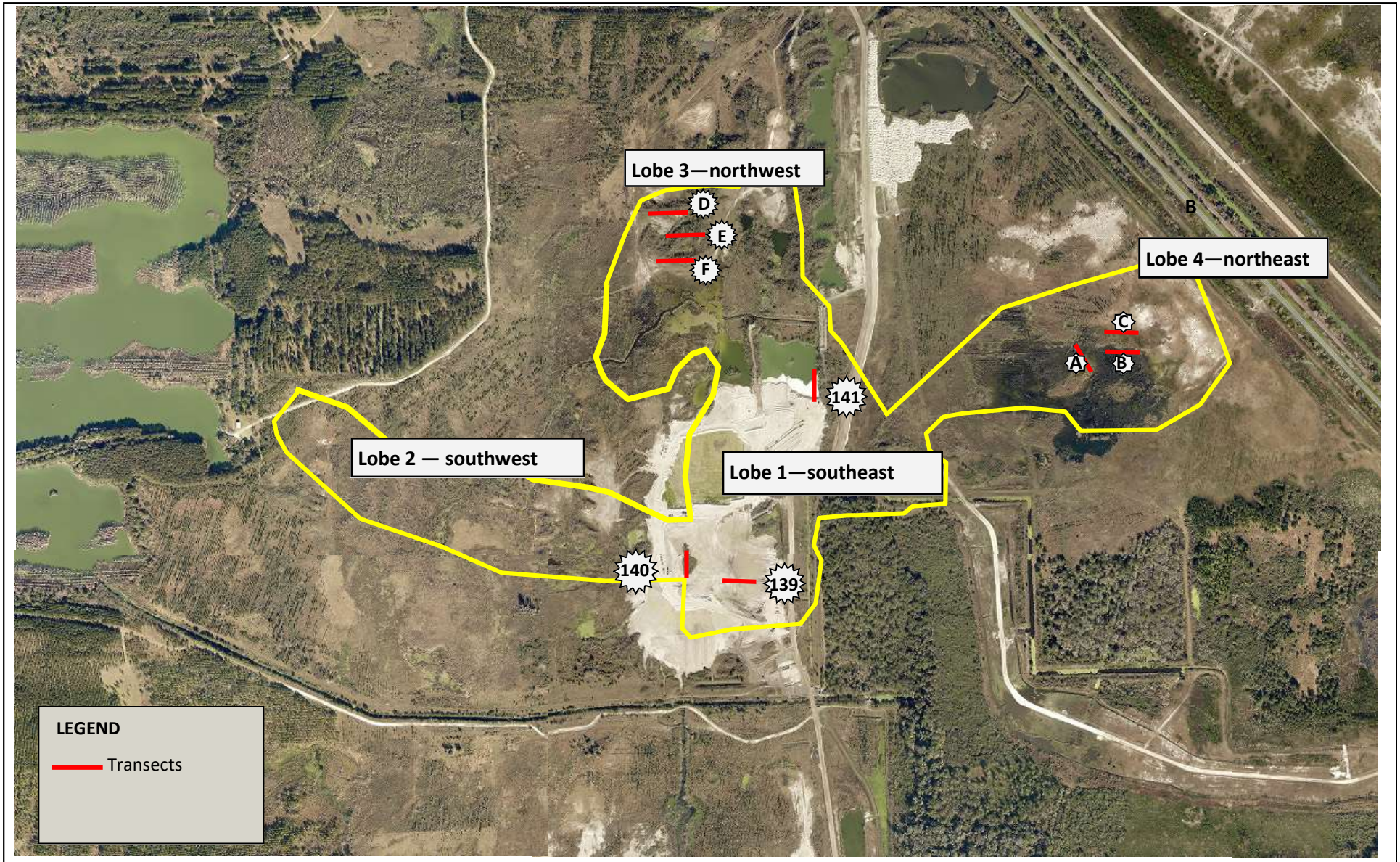
The Florida Department of Environmental Protection (FDEP) issued Wetland Resource Permit (WRP) No. 0144913-003 dated March 31, 2003 to PCS Phosphate for phosphate mining that disturbs approximately 805 acres of jurisdictional wetlands and surface waters in Hamilton County, Florida. FDEP also issued WRP No. 241341569 in July, 1990, which required the construction of a 220-acre restoration wetland and a connection channel to connect the wetland to Swift Creek. Monitoring of the reclaimed wetlands is required as part of the permit conditions. The results of the biannual monitoring are provided in this report. Monitoring was conducted by biologists from The Phoenix Environmental Group, Incorporated (Phoenix) on various dates between June and October of 2017.

2.0 Methodology

The monitoring methodology included a combination of quantitative and qualitative evaluations transects established within the CB-10 and CB-11 program areas, which were initially planted in 2011 and 2014. Three new transects (totaling 20 plots) were added to CB-10 in 2017. The Jerry Branch monitoring area was established in 2017. The locations of the transects are provided on Figure 1. The transects vary in length depending on the location within the program areas, but are typically 300 feet long and 30 feet wide with four polyvinyl chloride (PVC) poles spaced at 0', 100', 200', 300' and 400' along the transect. Circle plots that are 26 feet in radius were established at each PVC pole. The following data were collected at each circle plot:

- Global positioning system (GPS) location of center point
- Density/number of trees by species
- Diversity
- Florida Department of Environmental Protection (FDEP) and U.S. Army Corps of Engineers (Corps) classification of vegetation (obligate, facultative wetland, facultative or upland)
- Average height of trees by species
- Soil description (organic content and moisture content)
- Hydrology at the circle plot center (water depth)
- Vegetation composition within two one-meter square plots (one permanent location and one random location)
- Photographs of circle plots and one-meter square plots

In addition to the above data, a qualitative assessment was conducted at several locations within each of the four wetland sites. The qualitative assessment included a narrative description of the overall condition of the entire mitigation area along with estimations of percent bare ground, percent desirable species,



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CB-10

Transect Locations

Source: Fla. Dept. of Transportation, 2016

N

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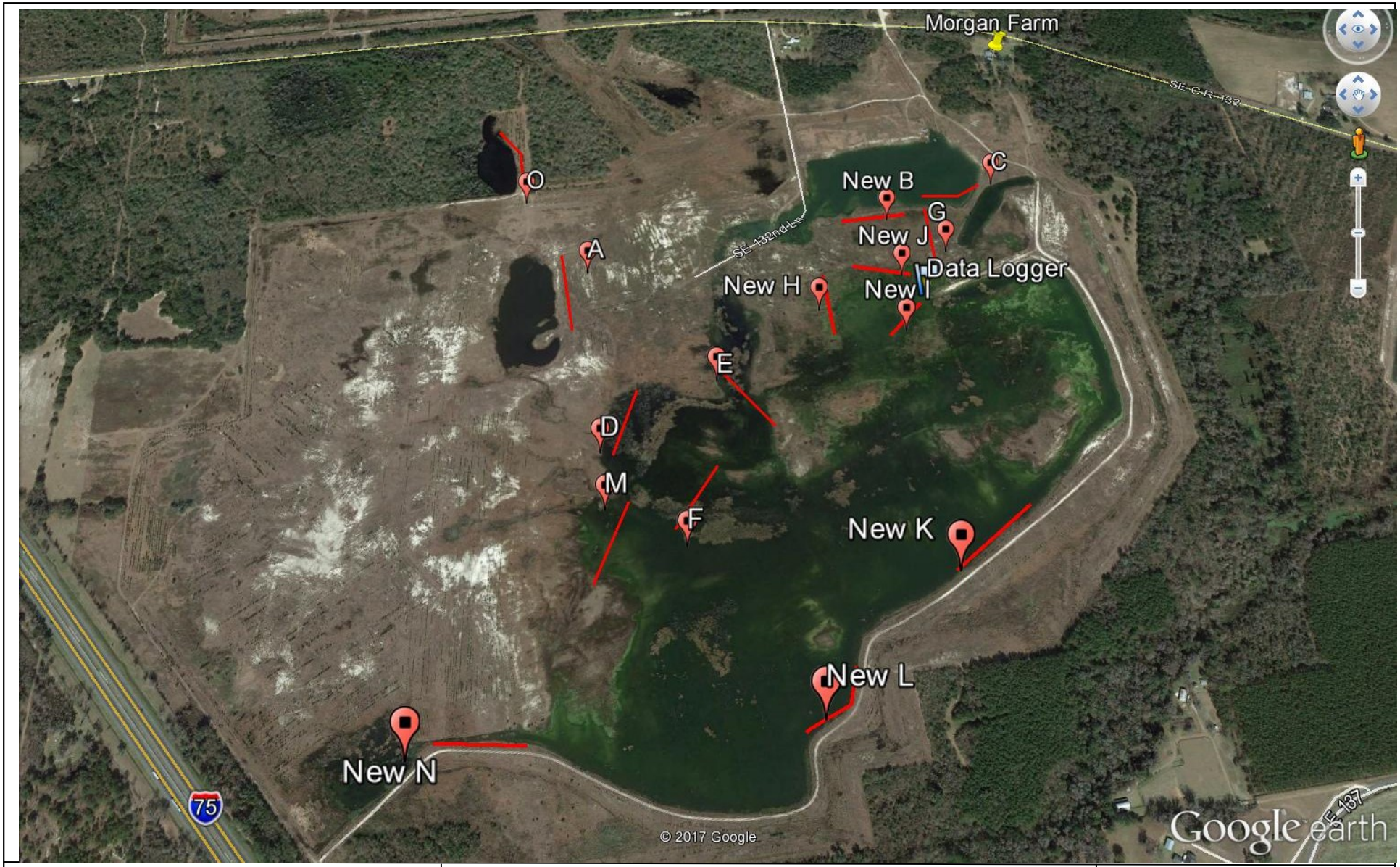
Jerry Branch

Transect Locations

Source: Google Earth, 2015

N



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CB-11

Transect Locations

Source: Google Earth, 2015

N

percent nuisance species, animal usage (observations such as tracks, scat, etc.) and the habitat types observed in each program area. Photographs were also taken within the qualitative assessment areas.

Cephalanthus occidentalis (buttonbush) were not counted as trees in 2015 or 2017. This species was counted in 2013 as they were planted by PCS. However, upon further consideration, they should be assessed within the vegetation analysis, but not counted as a tree as they are technically a shrub.

Percent desirable wetland vegetation was calculated based on the FDEP vegetative index found in Chapter 62-340.450, Florida Administrative Code (FAC). Plants are designated as Facultative (essentially wetland neutral), Facultative Wet (plants found mostly in wetlands), or Obligate (plants found almost exclusively in wetlands). Those plants that are Not Listed include aquatic plants, upland plants, exotic (non-native) plants, known nuisance plants, and plants listed on the 2017 Florida Exotic Pest Plant Council list. Therefore, for purposes of this report, Desirable species are those wetland species listed in 62-340.450 as either FACW or OBL. As cattails (*Typha spp*.) and Carolina willow (*Salix caroliniana*) are listed in the rule under Obligate species, they were counted as desirable wetland species.

Qualitative assessment methodology was as follows:

The program areas were evaluated on 14 different factors, as described below, which were rated on a scale of 1 to 4. Generally, a higher number denotes a higher perceived quality. Percentages were given to describe the following four conditions of groundcover: % desirable species, % nuisance species, % bare ground and % open water, where applicable. Surface water fluctuation was noted as yes or no and is based on water stains, lichen lines and detritus material in prop roots. The following is a specific list of the 14 rated criteria and a description of the value's meaning.

1. Algal Presence Evaluated based on the overall presence in the area.
    4. Excellent: Less than 10% coverage
    3. Good: 11-30% coverage
    2. Fair: 31-50% coverage
    1. Poor: Greater than 50% coverage

2. Water Fluctuation. If there was evidence of water fluctuation "Yes" was noted. The extent and possible sources for variability were noted in the general comments section of each site.

3. Desired Species. Percent cover was estimated for desired species (all percentage categories must total 100%).

4. Nuisance Species. Percent cover was estimated for nuisance species (all percentage categories must total 100%).

5. Bare Ground. Percent cover was estimated for bare ground (all percentage categories must total 100%).

6. Open Water. This category is reserved for lakes or other open water features.

7. Vegetative Diversity. Overall estimate of species diversity

    4. Excellent: At least 80 species present
    3. Good: 50-79 species present
    2. Fair: 30-49 species present
    1. Poor: Less than 30 species present

8. Overall Wildlife Use. Estimated overall wildlife use (based on actual observations, tracks, fur, skeletal remains, scat, etc.)

    4. Excellent
    3. Good
    2. Fair
    1. Poor

9. Avian Use. Estimated overall avian use (uses the same scale as wildlife use).

10. Mammal Use. Estimated overall mammal use (uses the same scale as wildlife use).

11. Reptile Use. Estimated overall reptile use (uses the same scale as wildlife use).

12. Invertebrate Use. Estimated overall invertebrate use (uses the same scale as wildlife use).

13. Fish Use. Estimated overall fish use (uses the same scale as wildlife use).

14. Amphibian Use. Estimated overall amphibian use (uses the same scale as wildlife use).

3.0 Results

The results of the 2017 biannual monitoring event are presented by program area in the following sections. Details of the breakdown of tree and vegetation species into various categories, such as species diversity and wetland classification, are found in Attachment 1, and are organized by program area.

Representative photographs are provided from each of the program areas in Attachment 2.

3.1 CB-10

Three new transects were established in the southern portion of the program area in 2017. Each circle plot is 2,123 square feet, which represents 5% of an acre. Six transects, consisting of 5 circle plots each, were previously established in the northwestern and northeastern portion of the program area. Those areas have become inaccessible due to extreme high water over the past four years. There was no way to safely monitor those transects in 2017, so they were not counted. Based on qualitative reconnaissance and some limited data from 2015, tree mortality is extremely high in those areas due to excessive water levels.

3.1.1 CB-10 Tree Data

41 trees and five different tree species were counted in the three new transects established in the southwestern and southeastern portion of CB10.

Other indicators of ecological success, such as species richness (total number of species) and species equitability (relative abundance of species), were limited. In terms of species richness, the total number of different tree species counted is two (*Taxodium distichum* and *Liquidambar styraciflua*). The Simpson Index of Diversity was calculated to evaluate trees in terms of both diversity and relative abundance. This index (shown as D-1, where D = the Simpson Index) yielded a value of 0.1, which indicates a very poor diversity of species. The range of the Simpson Index of Diversity is 0 to 1, with 1 being the highest amount of diversity. In terms of dominance, results indicated that *Taxodium distichum* is disproportionally high, with 94.74% of the total.

Attachment 1, Table 1 compares the change in tree counts from 2011 to 2015. The downward trend points to a failure of the system to adequately support wetland tree species at this time, due to increasing open water, inundation and above average rainfall.

Recommended corrective action is to continue efforts to remove surface water from the system, monitor surface water conditions and take action when planted areas are excessively flooded. The entire monitoring area should be replanted once water levels recede adequately. Tree species should include a mix of *Acer rubrum, Betula nigra, Nyssa sylvatica var. biflora, Carya aquatica, Liquidambar styraciflua, Quercus laurifolia, Quercus nigra, Fraxinus pennsylvanica, and Quercus lyrata.*

3.1.2 CB-10 Herbaceous Vegetation Coverage

Evaluations included estimating both absolute and relative coverage in the circle plots, and sampling herbaceous vegetation coverage via square meter quadrats in both random and fixed locations. Circle plots and quadrats were then averaged to determine cover, diversity and richness. Summary data for percent desirable species, diversity, bare ground and open water are provided in Attachment 1, Table 2.

As stated previously, data are not valid statistically, as not enough of the area was sampled. Flood conditions reduced diversity and richness of all species that were able to be counted in the few plots that were accessible.

In terms of absolute vegetation cover in CB-10, bare ground made up 5.21% of the total sampled area, open water accounted for 25.74% and 69.07% was vegetated.

It should be noted that PCS plants bermudagrass, bahiagrass and vaseygrass in an effort to control erosion and stabilize the soils during reclamation activities. Bermudagrass and bahiagrass are counted as upland species and vaseygrass is counted as a nuisance species. The flooding in the area greatly reduced those three groundcover species in 2015.

Cattails, while listed in Chapter 62-340.450 as desirable wetland species, are frequently mentioned by FDEP as a nuisance species. In CB-10, cattails made up an average of approximately 38% of the vegetation counted. Carolina willow (*Salix caroliniana*), also frequently discussed as a nuisance species despite being listed in the rule, accounted for 8.37% of the relative vegetation

3.1.3 CB-10 Qualitative Assessment

Due to limited access, a qualitative assessment was not conduced in the northern lobes of CB-10 in 2017. Two new areas were added in the southern lobes and are shown in the tables below.

Site 1 is located between transects 139 & 140 and is an open water edge feature. The shoreline in this area has been planted with trees, including *Taxodium* sp., *Betula nigra*, *Acer rubrum* and *Liquidambar styraciflua*. Nuisance species included *Ludwigia peruviana* and *Panicum repens*. *Typha latifolia* was also present, but not in large numbers. Minnows were observed in the water and wading birds (great egret and herons) were seen in the wetland. Raccoon tracks were also observed on the shoreline.

	CB-10 Site 1 – Between Transects 139 & 140 Qualitative Evaluation Results										
YR.	**DES SPP**	**NUIS SPP**	**BARE GRND**	**OPEN H2O**	**VEG DIV**	**WILD USE**	**AVI USE**	**MAM USE**	**REP USE**	**INV USE**	**AMP USE**
2017	60%	25%	0%	15%	3	3	3	2	3	3	3

Site 2 is located near transect 139 and is immediately adjacent to an open water feature. Trees were sparse in this area, presumably due to the inundation that occurred shortly after the trees were planted. The dominant vegetation in this area was *Typha latifolia* and *Salix caroliniana*. Alga was present in the water feature.

	CB-10 Site 2 – near 139 Qualitative Evaluation Results										
YR.	**DES SPP**	**NUIS SPP**	**BARE GRND**	**OPEN H2O**	**VEG DIV**	**WILD USE**	**AVI USE**	**MAM USE**	**REP USE**	**INV USE**	**AMP USE**
2017	20%	55%	0%	25%	2	3	4	3	3	3	3

3.2 CB-11

Program Area CB-11 consists of 146 acres, which were planted in 2011 with supplemental planting in 2014. The majority of the area consists of FLUCFCS code 630, Wetland Forested Mixed with a few open water features (FLUCFCS code 524, Lakes less than 10 acres). The littoral shelves of the lakes were planted with wetland vegetation. 75 circle plots were placed in the forested wetlands at CB-11. Each circle plot is 2,123 square feet, which represents 5% of an acre. The area included in the quantitative assessment is 3.65 acres or 2.5% of the CB-11 area.

It is estimated that CB-11 is presently 40% inundated, which is a reduction from 2015 water levels, but still more than desirable for forested wetlands.

3.2.1 CB-11 Trees

A total of 593 trees were counted in the CB-11 program area, for a yield of 169 trees per acre. While this is below the release criteria of 400 trees per acre, it is important to evaluate other indicators of the ecological health of the program area, such as vegetation cover, recruiting species richness and recruiting species diversity.

Bareroot trees were planted in CB-11 in the winter of 2011 and again in 2014, and have only been in the ground four growing seasons. The normal high mortality of bare root seedlings, coupled with the extreme flooding prior to 2016 has likely contributed to the lower tree counts.

Species richness (total number of species) and species equitability (relative abundance of species), were analyzed, which provide a better indication of ecological success. In terms of species richness, the total number of different species is 19. The Simpson Index of Diversity was used to evaluate trees in terms of both diversity and relative abundance (see Attachment 1). This index (shown as D-1, where D = the Simpson Index) yielded a value of 0.66, which is slightly lower than 2015. This is primarily due to the high number of cypress trees, which are surviving at better rates than other species.

So, while number of trees per acre is insufficient, the number of species of trees is generally good and indicates a fairly diverse system. Recommended corrective action is to continue efforts to remove water from the system and to re-plant an additional 400 trees per acre to reach the desired amount of 400 trees per acre. Tree species selected should include a mix of *Acer rubrum, Betula nigra, Carya aquatica, Quercus laurifolia, Quercus nigra, Liquidambar styraciflua, Fraxinus pennsylvanica, Nyssa sylvatica* var*. biflora and Quercus lyrata.*

3.2.2 CB-11 Herbaceous Vegetation Coverage

Measurements of herbaceous vegetation coverage included estimating both absolute and relative coverage in the circle plots, and sampling coverage via square meter quadrats in both random and fixed locations. Circle plots and quadrats were then averaged to determine cover, diversity and richness. Summary data for percent desirable species, diversity, bare ground and open water are provided in Attachment 1, Table 2.

In terms of absolute vegetation cover in CB-11, bare ground made up 9.32% of the total sampled area, open water accounted for 15.79% and 74.89% was vegetated. Of the percentage that is covered with vegetation (which is shown as relative vegetation), *Andropogon glomeratus (*Bushy bluestem, FACW*)*, was the most dominant, followed by *Paspalum notatum* (Bahiagrass*) and Panicum repens* (Torpedo grass*).* Bahiagrass and Torpedo grass are not desirable species, although Bahiagrass is frequently planted for soil stabilization and tends to die out in wetter areas over time.

The average total number of plant species (species richness) observed in the circle and quadrat plots in CB-11 was 69 which is very good. The Simpson Index of Diversity averaged 0.93, which is outstanding.

Undesirable, Desirable and Non-Native vegetation species were also categorized. Undesirables are those species not listed in the FDEP Vegetative Index (Section 62-340.450 F.A.C.), non-native species, species listed on the Florida Exotic Pest Plant Council (FEPPC) as Category I or II invasive plants, and those species cited by FDEP via permit conditions as undesirable. Details of these species are found in Attachment 1, Table 2. Desirable wetland species made up 39.08% of the total coverage (with bare ground accounting for 9.32%

and open water equaling 15.79%). Desirable species made up 52.16% of the relative vegetation coverage in CB-11.

Cattails (*Typha spp*.), while listed in Chapter 62-340.450 as desirable wetland species, are frequently mentioned by FDEP as a nuisance species. In CB-11, cattails made up an average of 1.9% of the vegetation counted. Carolina willow (*Salix caroliniana*), also frequently discussed as a nuisance species despite being listed in the rule as an obligate species, accounted for only .07% of the relative vegetation. The undesirable species decreased considerably as compared to the data in 2015 and is most likely due to extreme hydrological fluctuation.

3.2.3 CB-11 Qualitative Assessment

In addition to the quantitative evaluations, a qualitative analysis was also conducted of the CB-11 Area. Each area was evaluated on 14 different factors, as previously described in the methodology section. The approximate locations are shown on Figure 2.

CB-11 Site 1

Qualitative Site 1 within the CB-11 Area is located near the north-central portion of the property near Transect A. An open water feature is functioning well and comprises approximately 50% of the area. The slope leading to the pond is somewhat steep, which limits hydrologic fluctuation and causes the adjacent land that is supposed to be a wetland to drain excessively (thus functioning more as upland). This has also limited wetland plant growth at the edge of the pond and resulted in several rills and gullies. The edge of the pond had some weedy species as expected, such as willows, some vaseygrass and a few cattails. Wildlife usage of the pond was high. Opportunistic groundcovers were as expected for this early stage of succession and included bahiagrass, *Crotalaria* sp., *Indigofera hirsuta* and *Baccharis halimifolia*.

Many bird species were seen in the area, little blue herons (*Egretta caerulea*), American coots (*Fulica americana*) and Great egrets (*Ardea alba*).

	CB-11 Site 1 – near A Qualitative Evaluation Results										
YR.	**DES SPP**	**NUIS SPP**	**BARE GRND**	**OPEN H2O**	**VEG DIV**	**WILD USE**	**AVI USE**	**MAM USE**	**REP USE**	**INV USE**	**AMP USE**
2017	20%	10%	10%	50%	1	3	4	3	3	2	3

CB-11 Area Site 2

Qualitative Site 2 of CB-11 is located on the eastern side of the program area near an open water “finger” north of Transect I. The area currently functions as a wet prairie, but bald cypress and blackgum trees have been planted and are

expected to eventually provide a canopy. There is less open water in the area than was noted in 2015. Avifauna use is outstanding and species noted included ibis, killdeer, grackles, red-winged blackbirds, great egrets and cormorants. Undesirable plant species have been reduced (most likely from previous high water levels) and general vegetative diversity has greatly improved. Open water was approximately 10%, but much of the area was saturated. The scores for each of the evaluation categories are provided in the table below.

	CB-11 Site 2 – near I Qualitative Evaluation Results										
YR.	**DES SPP**	**NUIS SPP**	**BARE GRND**	**OPEN H2O**	**VEG DIV**	**WILD USE**	**AVI USE**	**MAM USE**	**REP USE**	**INV USE**	**AMP USE**
2017	75%	10%	5%	10%	4	3	4	2	2	2	3

CB-11 Area Site 3

Qualitative Site 3 of CB-11 was located on the south-central side of the program area near the new Transect K. This area currently functions as open water with a littoral edge. There is significant evidence of water fluctuation. While water levels are down from 2015, hydrological fluctuation is high. Bass, bluegill and warmouth perch were observed in the water. Avifauna usage is outstanding. Bird species noted include coots, Great egrets, a marsh hawk and vultures. The scores for each of the evaluation categories are provided in the table below.

	CB-11 Site 3 – near K Qualitative Evaluation Results										
YR.	**DES SPP**	**NUIS SPP**	**BARE GRND**	**OPEN H2O**	**VEG DIV**	**WILD USE**	**AVI USE**	**MAM USE**	**REP USE**	**INV USE**	**AMP USE**
2017	15%	5%	5%	75%	2	3	4	2	2	2	3

3.3 Hancock Area

The Hancock Area was not evaluated as part of this report.

3.4 Swift Creek Mitigation Area

The Swift Creek Mitigation Area was not evaluated as part of this report.

3.5 JERRY BRANCH

3.5.1 Jerry Branch Tree Data

A total of 1,196 trees were counted in the Jerry Branch program area, for a yield of 244 trees per acre. Species richness (total number of species) and species equitability (relative abundance of species), were analyzed, which provide a better indication of ecological success. In terms of species richness, the total number of different species counted was 15. The Simpson Index of Diversity was used to evaluate trees in terms of both diversity and relative abundance (see Attachment 1). This index (shown as D-1, where D = the Simpson Index) yielded a value of 0.82, which indicates good diversity of tree species.

3.5.2 **Jerry Branch Herbaceous Vegetation**

Herbaceous vegetation measurements included estimating both absolute and relative coverage in the circle plots, and sampling coverage via square meter quadrats in both random and fixed locations. Circle plots and quadrats were then averaged to determine cover, diversity and richness. Summary data for percent desirable species, diversity, bare ground and open water are provided in Attachment 1, Table 2.

In terms of absolute vegetation cover in Jerry Branch, bare ground made up 22.76% of the total sampled area, open water accounted for 2.52% and 73.74% was vegetated. Of the percentage that is covered with vegetation (which is shown as relative vegetation), *Andropogon glomeratus* (Bushy bluestem) a FACW herbaceous plant, was the most dominant, followed by *Paspalum urvillei* (Vaseygrass) and *Eupatorium capillifolium* (Dog fennel).

The average total number of plant species (species richness) observed in the circle and quadrat plots in Jerry Branch was 62 which is very good. The Simpson Index of Diversity averaged 0.87, which is very good.

Undesirable, Desirable and Non-Native species were also categorized. Undesirables are those species not listed in the FDEP Vegetative Index (Section 62-340.450 F.A.C.), non-native species, species listed on the Florida Exotic Pest Plant Council (FEPPC) as Category I or II invasive plants, and those species cited by FDEP via permit conditions as undesirable. Details of these species are found in Attachment 1, Table 2. Desirable wetland species made up 47.52% of the total coverage (with bare ground accounting for 22.76% and open water equaling 2.52%). Desirable species made up 63.5% of the relative vegetation coverage in Jerry Branch.

Cattails (*Typha* spp.), while listed in Chapter 62-340.450 as desirable wetland species, are frequently mentioned by FDEP as a nuisance species. In Jerry Branch, cattails made up an average of 1.5% of the vegetation counted. Carolina willow (*Salix caroliniana*), also frequently discussed as a nuisance species

despite being listed in the rule as an obligate wetland species, accounted for only 3.42% of the relative vegetation.

3.5.3 Jerry Branch Qualitative Assessment

In addition to the quantitative evaluations, a qualitative analysis was also conducted of the Jerry Branch Area. Each area was evaluated on 14 different factors, as previously described in the methodology section. The approximate locations are shown on Figure 2.

JB Site 1

Qualitative Site 1 within the Jerry Branch Area is located near Transect 16. Tree species observed included *Betula nigra*, *Liquidambar styraciflua*, *Taxodium* sp. and *Platanus occidentalis*. Herbaceous species included *Cyperus haspan*, *Eupatorium capillifolium*, *Rumex* sp., *Panicum repens*, *Juncus marginatus*, *Paspalum urvillei*, *Diodia teres*, *Kummerowia striata* and *Mimosa strigillosa*. Shrubs included *Cephalanthus occidentalis* and *Sesbania herbacea*. As this area was recently planted and has an extremely open canopy, soils and vegetation do not support a wide variety of plant and animal species yet.

	JB Site 1 - near 16 Qualitative Evaluation Results										
YR.	**DES SPP**	**NUIS SPP**	**BARE GRND**	**OPEN H2O**	**VEG DIV**	**WILD USE**	**AVI USE**	**MAM USE**	**REP USE**	**INV USE**	**AMP USE**
2017	65%	20%	15%	0%	2	2	1	2	1	1	1

JB Site 2

Qualitative Site 2 within the Jerry Branch Area is located between Transects 2&3 and is currently functioning as a wet prairie with scattered trees. Tree species observed included *Platanus occidentalis*, *Betula nigra*, *Quercus lyrata*, *Pinus elliottii*, *Quercus virginiana, Liriodendron tulipfera* and *Pinus palustris*. *Hypericum* sp. was the only shrub species in this qualitative site. Herbaceous species included *Diodia teres*, *Dichanthelium* sp., *Panicum hemitomon*, *Andropogon glomeratus*, *Rhexia* sp., *Cyperus haspan* and *Ambrosia artemisiifolia*. As this area is recently planted and has an extremely open canopy, soils and vegetation do not support a wide variety of plant and animal species yet.

	JB Site 2 - Between transects 2&3 Qualitative Evaluation Results										
YR.	**DES SPP**	**NUIS SPP**	**BARE GRND**	**OPEN H2O**	**VEG DIV**	**WILD USE**	**AVI USE**	**MAM USE**	**REP USE**	**INV USE**	**AMP USE**
2017	85%	10%	5%	0%	2	2	1	2	1	1	1

JB Site 3

Qualitative Site 3 within the Jerry Branch Area is located between Transects 17&18. This is an open marsh area adjacent to an open water feature. Vegetation diversity is very good in this area, and the hydrology appears to be supporting the plant community. As this area has only been recently formed and planted, it is not yet supporting a wide variety of animal and insect life, but that should change in subsequent years. Tree species observed included *Taxodium* sp. and *Quercus lyrata*. Shrubs were comprised of *Baccharis halimifolia* and *Salix caroliniana*. The herbaceous strata was comprised of *Andropogon glomeratus*, *Juncus marginatus*, *Diodia teres*, *Ludwigia repens*, *Scirpus cyperinus*, *Polygonum hydropiperoides*, *Eupatorium capillifolium* and *Cirsium* sp.

	JB Site 3 – between transects 17&18 Qualitative Evaluation Results										
YR.	**DES SPP**	**NUIS SPP**	**BARE GRND**	**OPEN H2O**	**VEG DIV**	**WILD USE**	**AVI USE**	**MAM USE**	**REP USE**	**INV USE**	**AMP USE**
2017	95%	5%	0%	0%	3	2	2	2	1	1	1

4.0 Success/Release Criteria

The release criteria established in the FDEP Permit 0144913-003 are summarized in bullet form below.

Permit No. 0144913-003

- ✓ Vegetation in the reclaimed wetlands shall consist of ≥80% of non-nuisance, non-exotic wetland plant species as listed in Chapter 62-340.450, Florida Administrative Code (FAC)
- ✓ Nuisance vegetation must be limited to <10% of the total wetland area
- ✓ No invasive vegetation species
- ✓ Trees must be at a density of 400 trees per acre and at least 12-feet tall or ≥4 inches DBH with no area greater than one acre having a density less than 200 trees per acre
- ✓ The shrub layer shall have a density of 100 shrubs per acre
- ✓ The following early successional species do not count in meeting the shrub density but should be included in monitoring reports: willow, saltbush, wax myrtle and elderberry (*Sambucus canadensis*)
- ✓ The following percentages of tree species are allowed for FLUCFCS code 630:
  30% Nyssa
  35% Taxodium
  15% Bays
  5% Pines
  15% miscellaneous hardwoods (*Acer rubrum*, *Carya aquatica*, *Liquidambar styraciflua*, *Quercus laurifolia*, *Quercus nigra*)

- ✓ Wetlands of FLUCFCS code 630 must have at least five species with neither hardwoods nor conifers at a dominance of ≥66%
- ✓ The following percentage of trees is allowed for FLUCFCS code 620:
  60% Taxodium
  20% Pines
  20% miscellaneous hardwoods (*Acer rubrum*, *Carya aquatica*, *Liquidambar styraciflua*, *Quercus laurifolia*, *Quercus nigra*)
- ✓ No one species of tree can have a dominance of ≥66%
- ✓ Species richness values and dominance regimes of the trees shall be within the range of values documented in the reference wetlands of the target community type
- ✓ Species richness and dominance regimes of the herbaceous vegetation shall be within or exceed the range of values documented within the reference wetlands of the target community type
- ✓ Irrigation, dewatering or replanting must not occur for a period of two consecutive years unless approved in writing by the Bureau of Mining and Minerals Regulation

5.0 General Discussion

It is obvious from this monitoring event that the extreme rainfall events in 2014 and 2015 and the introduction of water in these systems from other means have continued to affect both the hydrology and the plant composition of the three program areas notwithstanding the drier conditions prevailing in 2016 and 2017. The overall coverage of open water decreased in CB-11, and increased in CB-10.

Due to the amount and duration of the elevated water levels in the three program areas over the past several years, vegetation diversity and tree numbers have been negatively affected in CB-10. However, the increased water levels have reduced the amount of facultative and upland plant species observed in the wetlands, resulting in an increase in facultative wet and obligate shrub and herbaceous species. Cattails have also been greatly reduced in CB-11.

Jerry Branch was first evaluated this year following planting that occurred in 2016. This area has some diverse habitat types ranging from areas that should become forested wetlands to wet prairies with shrubs interspersed. Transects were not set in areas of open water due to access issues.

6.0 Conclusions

None of the three program areas that were sampled meet the tree density of 400 trees per acre as required in the permit. Also, the predominance of *Typha latifolia* in CB-10 exceeds the release criteria for nuisance species and should be addressed.

As expected from recently planted areas, neither CB-10, CB-11 nor Jerry Branch have achieved the release criteria. The tree diversity in CB-11 is good, but poor in CB-10 due primarily to excessive water levels resulting in high tree mortality. Additionally, access issues from excessive water in CB-10 precluded monitoring most of the transects that had been established in 2013. Diversity is good in Jerry Branch, but tree density needs to increase.

7.0 Recommendations

Corrective action should include the following measures:

<u>CB-10</u>

- Replant 600 trees per acre (not including *Taxodium distichum*) in the 25 acres that were planted in 2011 and 2014
- Plant 800 trees per acre in the areas that have not yet been planted

- Drain the eastern and western halves of the northernmost areas and continue to monitor water levels in the southern lobes to ensure high water levels do not return
- Apply herbicide to cattails

CB-11

- Plant 600 trees per acre (not including *Taxodium distichum*)
- Install transects in areas where trees were replanted in 2014
- Continue efforts to move water out of the system
- Apply herbicide to cattails

Jerry Branch

- Add additional tree species at 600 trees per acre (not including *Taxodium distichum*)

Attachment 1
Tables 1-10

PCS Phosphate
Biannual Vegetation Monitoring
CB-10
CB-11
Jerry Branch

July-October 2017

Table 1
Overall Comparisons 2011-2017
PCS Phosphate - 2017 Biannual Vegetation Monitoring

TREES

*CB10	2011	2013	2015	2017
Total Trees Counted	196	186	48	60
Trees Per Acre	130.67	124	35	80
Simpson's Index	0.74	0.57	0.1	0.27
CB11	**2011**	**2013**	**2015**	**2017**
Total Trees Counted	1045	946	454	593
Trees Per Acre	278.67	252.27	124.38	169
Simpson's Index	0.78	0.66	0.69	0.66
Hancock	**2011**	**2013**	**2015**	**2017**
Total Trees Counted	501	761	404	N/A
Trees Per Acre	303.64	545.45	244.85	N/A
Simpson's Index	0.78	0.76	0.526	N/A
Swift Creek	**2011**	**2013**	**2015**	**2017**
Total Trees Counted	1206	725	563	N/A
Trees Per Acre	438.55	263.64	274.63	N/A
Simpson's Index	0.68	0.65	0.54	N/A
Jerry Branch	**2011**	**2013**	**2015**	**2017**
Total Trees Counted	N/A	N/A	N/A	1196
Trees Per Acre	N/A	N/A	N/A	244
Simpson's Index	N/A	N/A	N/A	0.82

Wetland Status - Circle Plot Trees Only Absolute

CB10	2011	2013	2015	2017
FAC	15	0	0	0
FACW	13	15.59	5.26	16.67
OBL	71	84.41	94.74	83.33
NL	0	0	0	0
CB11	**2011**	**2013**	**2015**	**2017**
FAC	16	1.9	0.22	1.69
FACW	20	12.26	6.39	4.38
OBL	57	80.23	73.79	74.54
NL	4.78	3.81	0	0
UPL	2.31	1.8	19.6	19.39
Hancock	**2011**	**2013**	**2015**	**2017**
FAC	0	2	0	N/A
FACW	15	10.11	5.2	N/A
OBL	78	87.89	94.8	N/A
NL	7	0	0	N/A
Swift Creek	**2011**	**2013**	**2015**	**2017**
FAC	0.08	0	0	N/A
FACW	18.09	10.48	4.87	N/A
OBL	81.83	89.52	95.13	N/A
NL	0	0	0	N/A
Jerry Branch	**2011**	**2013**	**2015**	**2017**
FAC	N/A	N/A	N/A	0.84
FACW	N/A	N/A	N/A	19.73
OBL	N/A	N/A	N/A	68.98
NL	N/A	N/A	N/A	0
UPL	N/A	N/A	N/A	10.45

****VEGETATION (Circle Plots and Quadrats)**

CB10	2011	2013	2015	2017
Open Water	0.03	22.28	22.07	25.74
Bare Ground	3.07	9.4	4.45	5.21
Simpson's Index	0.93	0.88	0.89	0.81
Desirable Species	N/A	49.79	55.76	60.12
CB11	**2011**	**2013**	**2015**	**2017**
Open Water	0.74	15.30	25.03	15.79
Bare Ground	52.8	18.95	7.87	9.32
Simpson's Index	0.89	0.88	0.90	0.93
Desirable Species	N/A	18.27	42.71	39.08
Hancock	**2011**	**2013**	**2015**	**2017**
Open Water	2.12	36.13	26.92	N/A
Bare Ground	15.69	0	0.06	N/A
Simpson's Index	0.88	0.87	0.83	N/A
Desirable Species	N/A	61.38	71.65	N/A
Swift Creek	**2011**	**2013**	**2015**	**2017**
Open Water	4.01	28.08	24.25	N/A
Bare Ground	9.2	0	0	N/A
Simpson's Index	0.62	0.79	0.69	N/A
Desirable Species	N/A	62.73	57.34	N/A
Jerry Branch	**2011**	**2013**	**2015**	**2017**
Open Water	N/A	N/A	N/A	2.52
Bare Ground	N/A	N/A	N/A	22.76
Simpson's Index	N/A	N/A	N/A	0.87
Desirable Species	N/A	N/A	N/A	47.52

***2013 data reflects revised numbers using 2015 methodology; 2011 data not available to calculate using 2015 methodology.*

Table 2
2017 Average Percentage of Desirable Species, Undesirable, Open Water & Bare Ground of Circle Plots & Quadrats

CB10

Circle Plot	Relative	Absolute
Desirable Wetland	90.83	65.5
NL/FAC/Nuisance	9.17	6.61
Bare Ground		6.01
Open Water		21.88
Quadrats		
Desirable Wetland	82.92	54.73
NL/FAC/Nuisance	17.08	11.28
Bare Ground		4.4
Open Water		29.59
Averaged Totals		
AVG Desirable	86.88	60.10
NL/FAC/Nuisance	13.13	8.95
AVG Bare Ground		5.21
AVG Open Water		25.74
TOTAL	**100.00**	**100.00**

CB11

Circle Plot	Relative	Absolute
Desirable Wetland	53.93	40.55
NL/FAC/Nuisance	46.04	34.60
Bare Ground		8.43
Open Water		16.41
Quadrats		
Desirable Wetland	50.39	37.60
NL/FAC/Nuisance	49.61	37.02
Bare Ground		10.20
Open Water		15.16
Averaged Totals		
AVG Desirable	52.16	39.08
NL/FAC/Nuisance	47.825	35.81
AVG Bare Ground		9.32
AVG Open Water		15.79
TOTAL	**100.00**	**100.00**

JERRY BRANCH

Circle Plot	Relative	Absolute
Desirable Wetland	65.18	50.62
NL/FAC/Nuisance	34.82	27.04
Bare Ground		20.13
Open Water		2.21
Quadrats		
Desirable Wetland	61.89	44.42
NL/FAC/Nuisance	38.11	27.36
Bare Ground		25.39
Open Water		2.83
Averaged Totals		
AVG Desirable	63.54	47.52
NL/FAC/Nuisance	36.47	27.20
AVG Bare Ground		22.76
AVG Open Water		2.52
TOTAL	**100.00**	**100.00**

Table 3
2017 CB-10 Vegetation Diversity & Species Richness

Vegetation Diversity
Circle Plots

Species	n	n-1	n(n-1)	% Tot
Ambrosia artemisiifolia	7	6	42	2.33%
Amphicarpaea bracteata	1	0	0	0.33%
Andropogon glomeratus	1	0	0	0.33%
Carex sp.	1	0	0	0.33%
Cyperus haspan	32	31	992	10.67%
Cyperus odoratus	1	0	0	0.33%
Diodia virginiana	1	0	0	0.33%
Eleocharis vivipara	3	2	6	1.00%
Eupatorium capillifolium	2	1	2	0.67%
Hydrocotyle umbellata	8	7	56	2.67%
Indigofera hirsuita	2	1	2	0.67%
Juncus coriaceus	1	0	0	0.33%
Juncus effusus	8	7	56	2.67%
Lemna valdiviana	1	0	0	0.33%
Ludwigia octovalvus	0	-1	0	0.00%
Ludwigia peruviana	5	4	20	1.67%
Ludwigia repens	15	14	210	5.00%
Mimosa strigillosa	3	2	6	1.00%
Panicum hemitomon	1	0	0	0.33%
Paspalum laeve	9	8	72	3.00%
Paspalum notatum	1			0.33%
Paspalum urvillei	2			0.67%
Phyla nodiflora	3	2	6	1.00%
Pluchea odorata	31	30	930	10.33%
Polygonum densiflorum	14	13	182	4.67%
Pontederia cordata	1	0	0	0.33%
Rhynchospora sp.	1	0	0	0.33%
Scirpus cyperinus	4	3	12	1.33%
Salix caroliniana	6	5	30	2.00%
Typha latifolia	135	134	18090	45.00%
Total	**300**	**269**	**20714**	**100.00%**
Species Richness	S=27			
Simpson's Index	D =	0.230925		
Index of Diversity	**1 - D =**	**0.769075**		

Vegetation Diversity
Quadrangle Plots

Species	n	n-1	n(n-1)	% Tot
Ambrosia artemisiifolia	28	5	140	9.21%
Andropogon glomeratus	3	2	6	0.99%
Cyperus haspan	12	11	132	3.95%
Cyperus odoratus	19	18	342	6.25%
Cyperus surinamensis	12	11	132	3.95%
Eupatorium capillifolium	3	2	6	0.99%
Juncus coriaceus	4	3	12	1.32%
Juncus marginatus	1	0	0	0.33%
Ludwigia peruviana	10	9	90	3.29%
Ludwigia repens	16	15	240	5.26%
Oxypolis filiformis	2	1	2	0.66%
Panicum hemitomon	1	0	0	0.33%
Paspalum laeve	22	21	462	7.24%
Panicum repens	11	10	110	3.62%
Pluchea odorata	11	10	110	3.62%
Polygonum densiflorum	10	9	90	3.29%
Salix caroliniana	44	43	1892	14.47%
Typha latifolia	95	94	8930	31.25%
TOTAL	**304**	**264**	**12696**	**100.00%**
Species Richness	S=17			
Simpson's Index	D =	0.137832		
Index of Diversity	**1 - D =**	**0.862168**		

Vegetation Diversity
Average of Both

Species Richness	**17**
Simpson's Index of Diversity	**0.815621**

Table 4
2017 CB-11 Vegetation Diversity & Species Richness

Vegetation Diversity
Circle Plots

Species	n	n-1	n(n-1)	% Tot
Andropogon glomeratus	984	983	967272	15.60%
Andropogon virginicus	105	104	10920	1.66%
Baccharis halimifolia	165	164	27060	2.62%
Carex spp.	10	9	90	0.16%
Carex longii	6	5	30	0.10%
Carex striata	20	19	380	0.32%
Cephalanthus occidentalis	15	14	210	0.24%
Ceratophyllum demersum	25	24	600	0.40%
Crotalaria rotundifolia	30	29	870	0.48%
Crotalaria spectabilis	63	62	3906	1.00%
Cynodon dactylon	130	129	16770	2.06%
Cyperus haspan	107	106	11342	1.70%
Cyperus oderata	5	4	20	0.08%
Cyperus strigosus	25	24	600	0.40%
Cyperus virens	85	84	7140	1.35%
Cyperus surinamensis	10	9	90	0.16%
Dicanthelium commutatum	47	46	2162	0.75%
Eleocharis spp.	5	4	20	0.08%
Eleocharis vivipara	76	75	5700	1.20%
Eragrostis elliottii	1	0	0	0.02%
Eupatorium capillifolium	460	459	211140	7.29%
Indigofera hirsuita	345	344	118680	5.47%
Juncus marginatus	54	53	2862	0.86%
Lemna valdiviana	32	31	992	0.51%
Lespedeza hirta	20	19	380	0.32%
Ludwigia octovalvis	15	14	210	0.24%
Ludwigia peruviana	70	69	4830	1.11%
Ludwigia repens	98	97	9506	1.55%
Lythrum lineare	10	9	90	0.16%
Mikania scandens	15	14	210	0.24%
Mimosa strigillosa	45	44	1980	0.71%
Morella cerifera	35	34	1190	0.55%
Najas guadalupensis	20	19	380	0.32%
Oxypolis rigidor	60	59	3540	0.95%
Panicum repens	698	697	486506	11.07%
Panicum dichotomiflorum	25	24	600	0.40%
Panicum hemitomon	90	89	8010	1.43%
Paspalum laeve	115	114	13110	1.82%
Paspalum notatum	665	664	441560	10.54%
Persicaria glabra	245	244	59780	3.88%
Persicaria hydropiperoides	300	299	89700	4.76%
Pontederia cordata	1	0	0	0.02%
Pluchea foetida	4	3	12	0.06%
Rhexia alifanus	30	29	870	0.48%
Rhexia mariana	10	9	90	0.16%
Rhynchospora sp.	25	24	600	0.40%
Rubus sp.	85	84	7140	1.35%
Rubus trivialis	10	9	90	0.16%
Rumex crispus	10	9	90	0.16%
Sagittaria filiformis	35	34	1190	0.55%
Salix caroliniana	75	74	5550	1.19%
Scirpus cyperinus	298	297	88506	4.72%
Scleria cilata	1	0	0	0.02%
Sesbania herbacea	20	19	380	0.32%
Smilax bona-nox	16	15	240	0.25%
Solidago canadensis	145	144	20880	2.30%
Solidago fistulosa	35	34	1190	0.55%
Sphagnum sp.	0	-1	0	0.00%
Taxodium distichum	5	4	20	0.08%
Toxicodendron radicans	12	11	132	0.19%
Typha latifolia	127	126	16002	2.01%
Utricularia radiata	19	18	342	0.30%
Woodwardia virginica	9	8	72	0.14%
Xyris spp.	5	4	20	0.08%
Total	**6308**	**6244**	**2653854**	**100.00%**
Species Richness	S=63			
Simpson's Index	D =	0.066706		
Index of Diversity	**1 - D =**	**0.933294**		

Vegetation Diversity
Quadrangle Plots

Species	n	n-1	n(n-1)	% Tot
Ambrosia artemisiifolia	5	5	25	0.04%
Andropogon glomeratus	1845	1844	3402180	13.90%
Andropogon virginicus	75	74	5550	0.57%
Azolla sp.	2	1	2	0.02%
Baccharis halimifolia	220	219	48180	1.66%
Carex sp.	25	24	600	0.19%
Carex longii	25	24	600	0.19%
Carex striata	100	99	9900	0.75%
Cephalanthus occidentalis	15	14	210	0.11%
Ceratophyllum demersum	230	229	52670	1.73%
Croatalaria rotundifolia	45	44	1980	0.34%
Crotalaria spectabilis	5	4	20	0.04%
Cynodon dactylon	260	259	67340	1.96%
Cyperus haspan	179	178	31862	1.35%
Cyperus odoratus	25	24	600	0.19%
Cyperus surinamensis	5	4	20	0.04%
Cyperus virens	102	101	10302	0.77%
Dichanthelium commutatum	70	69	4830	0.53%
Dicanthelium strigosum	20	19	380	0.15%
Diodia virginiana	5	4	20	0.04%
Eleocharis vivipara	125	124	15500	0.94%
Eragrostis elliottii	5	4	20	0.04%
Eupatorium capillifolium	393	392	154056	2.96%
Hydrocotyle bonariensis	40	39	1560	0.30%
Hydrocotyle umbellata	135	134	18090	1.02%
Indigofera hirtsuita	491	490	240590	3.70%
Juncus coriaceus	180	179	32220	1.36%
Juncus effusus	645	644	415380	4.86%
Juncus marginatus	90	89	8010	0.68%
Juncus megacephalus	3	2	6	0.02%
Lemna valdiviana	160	159	25440	1.21%
Lespedeza hirta	30	29	870	0.23%
Ludwigia octovalvis	10	9	90	0.08%
Ludwigia peruviana	80	79	6320	0.60%
Ludwigia repens	295	294	86730	2.22%
Lythrum lineare	5	4	20	0.04%
Mikania scandens	30	29	870	0.23%
Mimosa strigillosa	90	89	8010	0.68%
Najas guadalupensis	630	629	396270	4.75%
Oxypolis rigidor	90	89	8010	0.68%
Panicum dichotomiflorum	30	29	870	0.23%
Panicum dichotomum	105	104	10920	0.79%
Panicum hemitomon	30	29	870	0.23%
Panicum repens	1633	1632	2665056	12.31%
Paspalum laeve	140	139	19460	1.06%
Paspalum notatum	1285	1284	1649940	9.68%
Paspalum urvillei	390	389	151710	2.94%
Persicaria glabra	671	670	449570	5.06%
Persicaria hydropiperoides	573	572	327756	4.32%
Pluchea foetida	5	4	20	0.04%
Pluchea odorata	20	19	380	0.15%
Polypremum procumbens	10	9	90	0.08%
Rhexia mariana	55	54	2970	0.41%
Rhus copallinum	13	12	156	0.10%
Rubus sp.	110	109	11990	0.83%
Rubus trivialis	10	9	90	0.08%
Rumex crispus	10	9	90	0.08%
Sagittaria filiformis	140	139	19460	1.06%
Salix caroliniana	10	9	90	0.08%
Scirpus cyperinus	624	623	388752	4.70%
Smilax bona-nox	5	4	20	0.04%
Solidago candensis	159	158	25122	1.20%
Solidago fistulosa	60	59	3540	0.45%
Solidago gigantea	30	29	870	0.23%
Taxodium distichum	10	9	90	0.08%
Toxicodendron radicans	12	11	132	0.09%
Trifolium sp.	5	4	20	0.04%
Typha latifolia	268	267	71556	2.02%
Utricularia radiata	17	16	272	0.13%
Woodwardia virginica	60	59	3540	0.45%
TOTAL	**13270**	**13201**	**10860710**	**100.00%**
Species Richness	S=69			
Simpson's Index	D =	0.061681		
Index of Diversity	**1 - D =**	**0.938319**		

Vegetation Diversity
Average of Both

Species Richness	**66**
Simpson's Index of Diversity	**0.935807**

Table 5
2017 Jerry Branch Vegetation Diversity & Species Richness

Vegetation Diversity
Circle Plots

Species	n	n-1	n(n-1)	% Tot
Ambrosia artemisiifolia	20	19	380	1.38%
Andropogon glomeratus	456	455	207480	31.44%
Baccharis halimifolia	46	45	2070	3.17%
Betula nigra	4	3	12	0.28%
Carex alata	0.4	-0.6	-0.24	0.03%
Carex striata	1	0	0	0.07%
Cephalanthus occidentalis	1	0	0	0.07%
Cynodon dactylon	19	18	342	1.31%
Cyperus haspan	9	8	72	0.62%
Cyperus odoratus	13	12	156	0.90%
Cyperus virens	30	29	870	2.07%
Dichanthelium laxiflorum	0.2	-0.8	-0.16	0.01%
Dichanthelium scoparium	57	56	3192	3.93%
Dichanthelium strigosum	53	52	2756	3.65%
Diodia teres	40	39	1560	2.76%
Eleocharis vivipara	5	4	20	0.34%
Eupatorium capillifolium	123	122	15006	8.48%
Eupatorium mohrii	12	11	132	0.83%
Euthamia caroliniana	4	3	12	0.28%
Fimbristylis autumnalis	3	2	6	0.21%
Hypericum cistifolium	1	0	0	0.07%
Hydrocotyle umbellata	7	6	42	0.48%
Hypericum sp.	18	17	306	1.24%
Indigofera hirsuita	29	28	812	2.00%
Juncus coriaceus	57	56	3192	3.93%
Juncus effusus	96	95	9120	6.62%
Juncus marginatus	101	100	10100	6.96%
Juncus megacephalus	9	8	72	0.62%
Juncus scirpoides	3	2	6	0.21%
Juncus sp.	18	17	306	1.24%
Kummerowia striata	31	30	930	2.14%
Lachnanthes caroliniana	36	35	1260	2.48%
Ludwigia octovalvis	13	12	156	0.90%
Ludwigia peruviana	1	0	0	0.07%
Ludwigia repens	5	4	20	0.34%
Mimosa strigillosa	30	29	870	2.07%
Morella cerifera	1	0	0	0.07%
Nyssa sylvatica var. biflora	1	0	0	0.07%
Panicum hemitomon	90	89	8010	6.21%
Panicum repens	7	6	42	0.48%
Paspalum urvillei	168	167	28056	11.58%
Persicaria hydropiperoides	19	18	342	1.31%
Pinus elliottii	3	2	6	0.21%
Pluchea rosea	52	51	2652	3.59%
Polygonum hydropiperoides	19	18	342	1.31%
Polypremum procumbens	15	14	210	1.03%
Polytrichum commune	5	4	20	0.34%
Pteridium aquilinum	5	4	20	0.34%
Rhexia mariana	1	0	0	0.07%
Rhexia sp.	7	6	42	0.48%
Rhynchospora sp.	1	0	0	0.07%
Rhus copallinum	3	2	6	0.21%
Rubus sp.	7	6	42	0.48%
Rumex hastatulus	11	10	110	0.76%
Salix caroliniana	82	81	6642	5.65%
Scirpus cyperinus	35	34	1190	2.41%
Sesbania herbacea	87	86	7482	6.00%
Taxodium distichum	1	0	0	0.07%
Typha latifolia	41	40	1640	2.83%
Urochloa ramosa	5	4	20	0.34%
Vernonia noveboracensis	1	0	0	0.07%
Xyris sp.	1	0	0	0.07%
Total	**1450.2**	**1938.6**	**317751.6**	**100.00%**
Species Richness	S=61			
Simpson's Index	D =	0.151193		
Index of Diversity	**1 - D =**	**0.848807**		

Vegetation Diversity
Quadrangle Plots

Species	n	n-1	n(n-1)	% Tot
Ambrosia artemisiifolia	43	5	215	1.07%
Andropogon glomeratus	1042	1041	1084722	26.04%
Andropogon virginicus	19	18	342	0.47%
Baccharis halimifolia	47	46	2162	1.17%
Bacopa monnieri	1	0	0	0.02%
Betula nigra	39	38	1482	0.97%
Carex alata	1	0	0	0.02%
Carex striata	1	0	0	0.02%
Cynodon dactylon	61	60	3660	1.52%
Cyperus lecontei	7	6	42	0.17%
Cyperus haspan	15	14	210	0.37%
Cyperus odoratus	3	2	6	0.07%
Cyperus sp.	1	0	0	0.02%
Cyperus virens	27	26	702	0.67%
Diodia teres	112	111	12432	2.80%
Dichanthelium scoparium	143	142	20306	3.57%
Dichanthelium strigosum	216	215	46440	5.40%
Eleocharis vivipara	38	37	1406	0.95%
Eupatorium capillifolium	165	164	27060	4.12%
Euthamia caroliniana	1	0	0	0.02%
Fimbristylis autumnalis	7	6	42	0.17%
Fraxinus pennsylvanica	2	1	2	0.05%
Hydrocotyle umbellata	16	15	240	0.40%
Hypericum sp.	22	21	462	0.55%
Juncus coriaceus	92	91	8372	2.30%
Juncus effusus	292	291	84972	7.30%
Juncus marginatus	177	176	31152	4.42%
Juncus megacephalus	8	7	56	0.20%
Juncus sp.	2	1	2	0.05%
Indigofera hirsuta	15	14	210	0.37%
Kummerowia striata	144	143	20592	3.60%
Lachnanthes caroliniana	39	38	1482	0.97%
Liquidambar styraciflua	2	1	2	0.05%
Ludwigia octovalvis	25	24	600	0.62%
Ludwigia peruviana	1	0	0	0.02%
Ludwigia repens	29	28	812	0.72%
Magnolia virginiana	6	5	30	0.15%
Mimosa strigillosa	46	45	2070	1.15%
Panicum hemitomon	122	121	14762	3.05%
Panicum repens	54	53	2862	1.35%
Paspalum laeve	45	44	1980	1.12%
Paspalum notatum	7	6	42	0.17%
Pasplaum urvillei	287	286	82082	7.17%
Pinus elliottii	8	7	56	0.20%
Pluchea odorata	4	3	12	0.10%
Pluchea rosea	67	66	4422	1.67%
Polygonum hydropiperoides	28	27	756	0.70%
Polypremum procumbens	93	92	8556	2.32%
Polytrichum commune	33	32	1056	0.82%
Pteridium aquilinum	2	1	2	0.05%
Rhexia mariana	12	11	132	0.30%
Rhexia sp.	6	5	30	0.15%
Rhus copallinum	10	9	90	0.25%
Rhynchospora sp.	4	3	12	0.10%
Rubus sp.	13	12	156	0.32%
Rumex hastatulus	28	27	756	0.70%
Salix caroliniana	89	88	7832	2.22%
Scirpus cyperinus	17	16	272	0.42%
Sesbania herbacea	104	103	10712	2.60%
Smilax sp.	1	0	0	0.02%
Taxodium distichum	18	17	306	0.45%
Toxicodendron radicans	1	0	0	0.02%
Typha latifolia	37	36	1332	0.92%
Urochloa ramosa	5	4	20	0.12%
TOTAL	**4002**	**3901**	**1490523**	**100.00%**
Species Richness	S=63			
Simpson's Index	D =	0.093088		
Index of Diversity	**1 - D =**	**0.906912**		

Vegetation Diversity
Average of Both

Species Richness	**62**
Simpson's	**0.87**

Table 6
2017 CB-10 Tree Diversity

Species	n	n-1	n(n-1)	% Tot	DEP Status	Avg Tree Height (in)
Acer rubrum	9	8	63	15.00%	FACW	14.5
Betula nigra	7	6	14	11.67%	OBL	24
Fraxinus pennsylvanica	2	1	2	3.33%	OBL	23
Liquidambar styraciflua	1	0	41	1.67%	FACW	24
Taxodium distichum	41	40	2460	68.33%	OBL	29.67
Total	**60**	**55**	**2580**	**100.00%**		

Species richness:	S=5			**Wetland Species**	
Simpson's Index	D =	0.728814		0.00%	FAC
Index of Diversity	1 - D =	0.271186		16.67%	FACW
Trees per acre:	80.00			83.33%	OBL
				100.00%	**TOTAL**
Total circle plots	15				
r=	26				
d=	52				
C=	163.28				
Area in sf	2122.64				
circle plot % of acre	4.87%				
Acre	43560				

Trees per acre is the total number of trees times 20, divided by the number of circle plots.

NOTE: only 15 plots sampled in 2017 due to unsafe or no access

Table 7
2017 CB-11 Tree Diversity

Species	n	n-1	n(n-1)	% Tot	DEP Status	Avg Tree Height
Acer rubrum	16	15	240	2.70%	FACW	47
Betula nigra	12	11	132	2.02%	OBL	58.00
Diospyros virginiana	10	9	90	1.69%	FAC	54.00
Fraxinus caroliniana	12	11	132	2.02%	OBL	49.00
Fraxinus pennsylvanica	31	30	930	5.23%	OBL	45.33
Gordonia lasianthus	1	0	0	0.17%	UPL	36.00
Liquidambar styraciflua	12	11	132	2.02%	OBL	48.00
Liriodendron tulipfera	7	6	42	1.18%	FACW	48.00
Magnolia virginiana	4	3	12	0.67%	OBL	15.00
Nyssa sylvatica var. *biflora*	11	10	110	1.85%	OBL	46.00
Pinus elliottii	32	31	992	5.40%	UPL	88.00
Pinus palustris	2	1	2	0.34%	UPL	174.00
Pinus taeda	45	44	1980	7.59%	UPL	88.00
Platanus occidentalis	2	1	2	0.34%	FACW	77.00
Rhus copallinum	1	0	0	0.17%	UPL	96.00
Quercus falcata	1	0	0	0.17%	FACW	122.00
Quercus lyrata	26	25	650	4.38%	OBL	62.00
Quercus virginiana	34	33	1122	5.73%	UPL	95.00
Taxodium distichum	334	333	111222	56.32%	OBL	61.00
Total	**593**	**574**	**117790**	**100.00%**		

Species richness:	S=19			**Wetland Species**	
Simpson's Index	D =	0.335531		1.69%	FAC
Index of Diversity	1 - D =	0.664469		4.38%	FACW
Trees per acre:	169.43			74.54%	OBL
				19.39%	UPL
Total circle plots	75			0.00%	NL
r=				**100.00%**	**TOTAL**
d=					
C=					
Area in square feet	2122.64				
Circle plot % of acre	4.87%				
Acre	43560				

Trees per acre is the total number of trees times 20, divided by the number of circle plots.

70 plots sampled (Transect E was inaccessible)

Table 8
2017 Jerry Branch Tree Diversity

Species	n	n-1	n(n-1)	% Tot	DEP Status	Avg Tree Height
Acer rubrum	121	120	14520	0.101171	FACW	14.5
Betula nigra	126	125	15750	10.54%	OBL	23.27
Diospyros virginiana	10	9	90	0.84%	FAC	13.63
Fraxinus pennsylvanica	24	23	552	2.01%	OBL	16.38
Liquidambar styraciflua	114	113	12882	9.53%	FACW	14.50
Magnolia virginiana	103	102	10506	8.61%	OBL	14.42
Nyssa sylvatica var. *biflora*	160	159	25440	13.38%	OBL	19.56
Pinus elliottii	61	60	3660	5.10%	UPL	45.00
Pinus palustris	7	6	42	0.59%	UPL	17.00
Pinus taeda	49	48	2352	4.10%	UPL	29.40
Quercus alba	3	2	6	0.25%	UPL	16.00
Quercus lyrata	11	10	110	0.92%	OBL	22.00
Quercus stellata	1	0	0	0.08%	FACW	6.00
Quercus virginiana	5	4	20	0.42%	UPL	21.25
Taxodium distichum	401	400	160400	33.53%	OBL	23.65
Total	**1196**	**1181**	**246330**	**100.00%**		

Species richness:	S=15			**Wetland Species**	
Simpson's Index	D =	0.172353		0.84%	FAC
Index of Diversity	1 - D =	0.827647		19.73%	FACW
Trees per acre:	244.08			68.98%	OBL
				10.45%	UPL
Total circle plots	98			0.00%	NL
r=	26			**100.00%**	**TOTAL**
d=	52				
C=	163.28				
Area in square feet	2122.64				
Circle plot % of acre	4.87%				
Acre	43560				

Trees per acre is the total number of trees times 20, divided by the number of circle plots.

18 transects have 5 plots; 2 transects have 4 plots, therefore, 98 plots total

ATTACHMENT 2
REPRESENTATIVE PHOTOGRAPHS

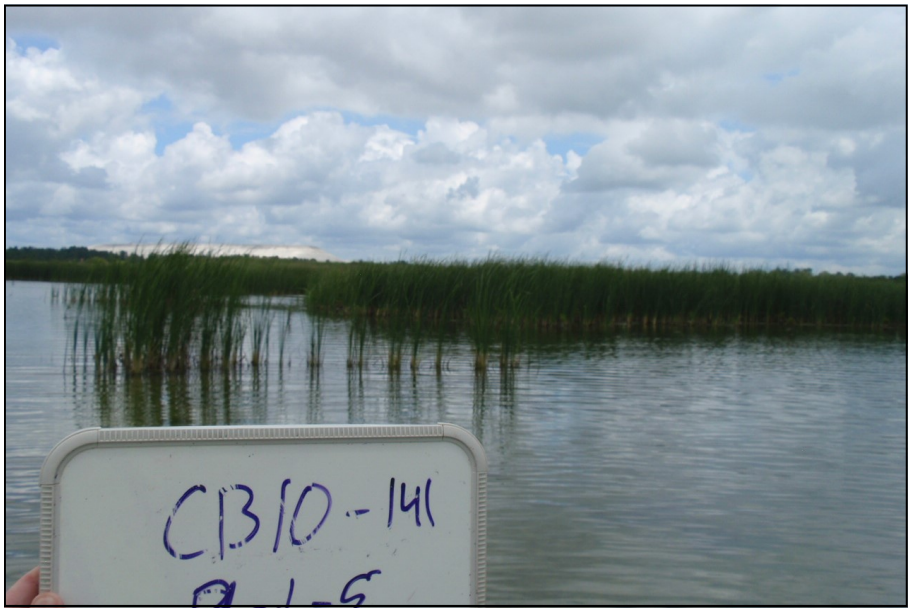
PCS Phosphate
Biannual Vegetation Monitoring
CB-10
CB-11
Jerry Branch

July-October 2017

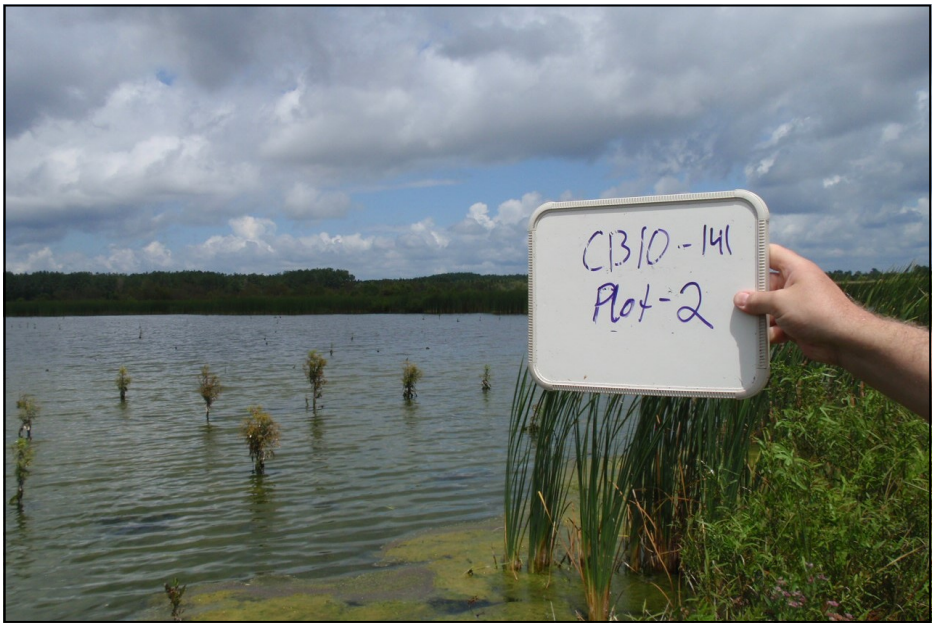
Attachment 2
PCS Vegetation Monitoring
Qualitative Sites & Representative Photos

CB-10 new Circle Plot 139-4

CB-10 Plot 139-2 Fixed quadrat



CB-10 Circle plot 141-5



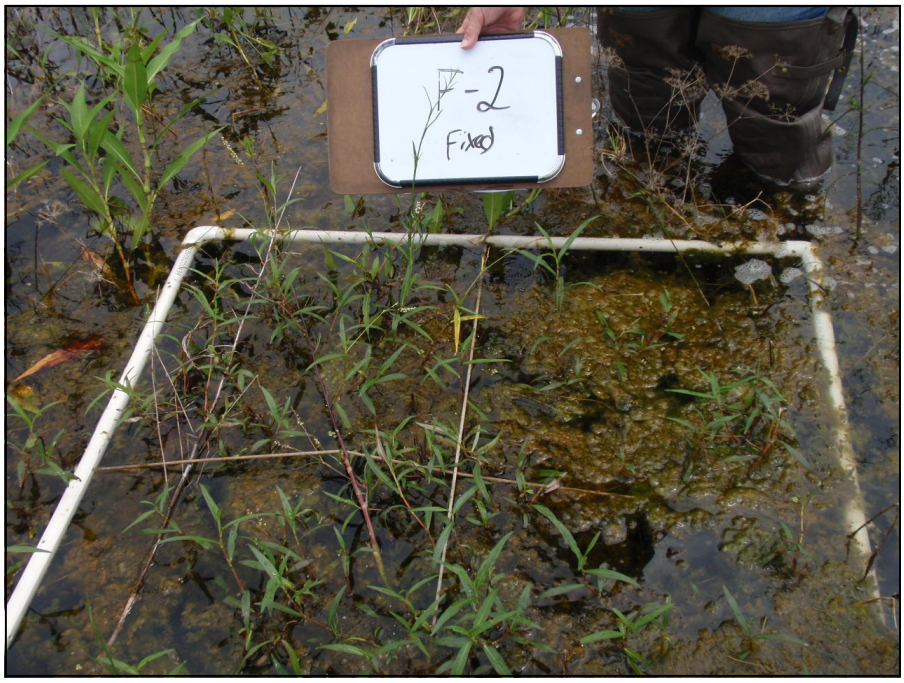
CB-10 Circle plot 141-2

CB-10 Minnows in Plot 139

CB-10 southwestern lobe, edge of marsh

CB-11 Plot D-2. Adventitious roots on cypress

CB-11 C-3 Circle plot



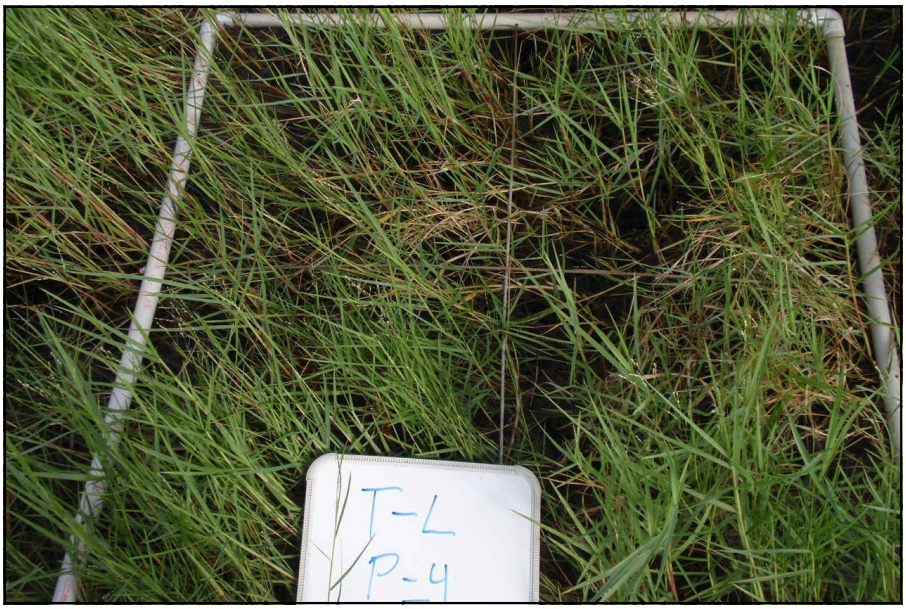
CB-11 F-2 Fixed quadrat

CB-11 F-5 Random quadrat

CB-11 Circle plot M-2

CB-11 Scirpus near Transect O

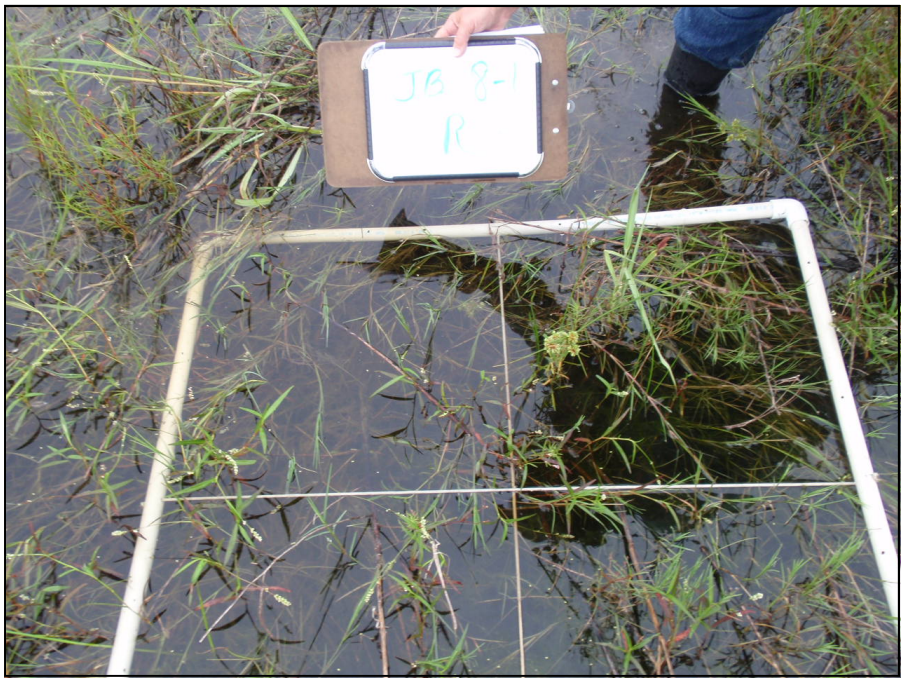
CB-11 Green tree snake near Transect N



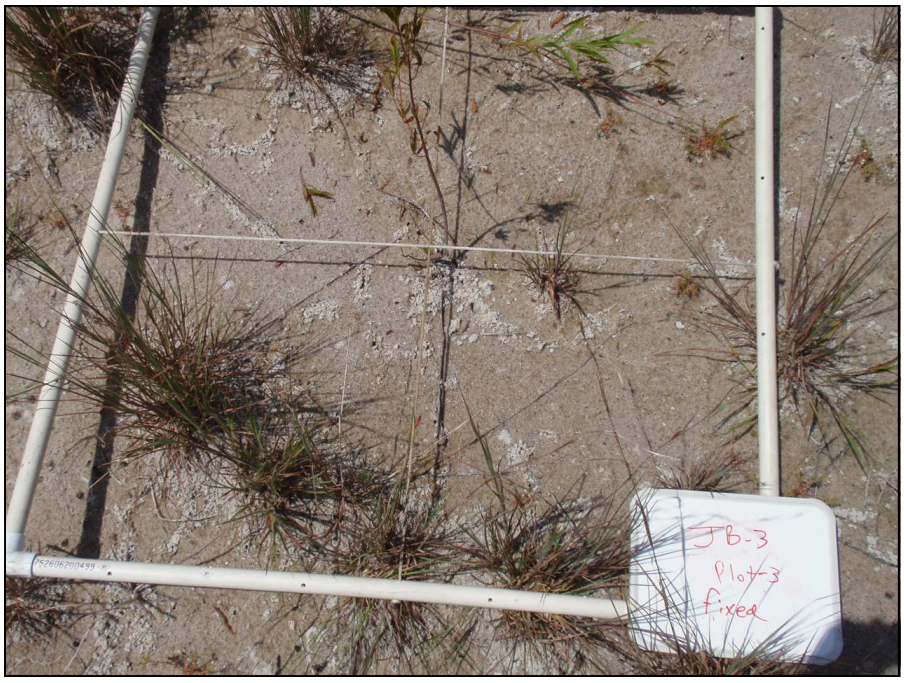
CB-11 L-4 Fixed quadrat

Hypericum in Jerry Branch

Jerry Branch Circle Plot 5-1

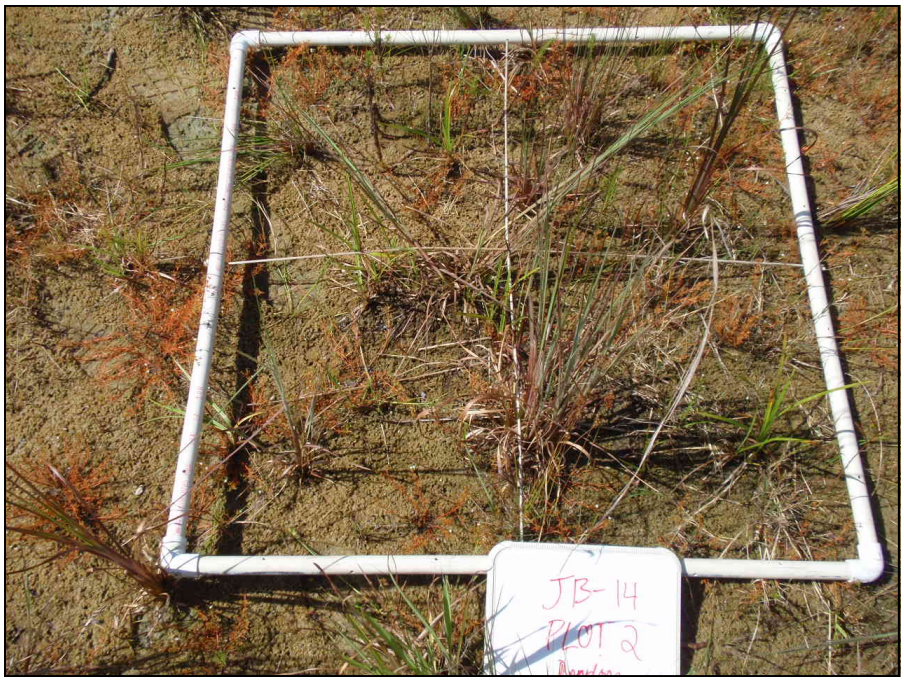


Jerry Branch Plot 8-1 Random



Jerry Branch Plot 3-3 Fixed

Jerry Branch Circle Plot 12-3



Jerry Branch Plot 14-2 Random

Jerry Branch Qualitative Site 3

Jerry Branch—Buttonbush in Qualitative Site 1

Cyperus in Jerry Branch

Rhexia in Jerry Branch

Qualitative Assessment of Wetlands Associated With Piezometers in Beehaven Bay Sites Potash Corporation

This report represents a true, accurate and representative description of the site conditions at the time of monitoring.

Jackie L. Fry, President: Jackie L. Fry

Prepared by:

The Phoenix Environmental Group, Incorporated
2916 E. Park Avenue
Tallahassee, FL 32301

December 28, 2017

Qualitative Assessment of Wetlands Associated with Piezometers in Beehaven Bay Sites, PCS Phosphate November 29 & 30, 2017

Background

The Phoenix Environmental Group, Inc. (Phoenix) conducted qualitative assessments on wetlands adjacent to the eight piezometers (PZ-1 through PZ-8) on November 28 and 29, 2017. These wetlands are located in Upper Bee Haven Bay. Approximate locations of the monitoring stations are provided on 1 - 7. Included in each of the assessments is a description of the current vegetation, hydrology and soils at each site. As requested by agency staff, the assessment was conducted during the end of the growing season. All of these wetlands have been monitored since 1998, but the last monitoring of PZ-9 occurred in 2010 due to mining of the area in 2011.

Purpose

This report was prepared to address monitoring requirements of the modification dated January 7, 1997 of the U.S. Army Corps of Engineers (Corps) permit number 198404652 issued to PCS Phosphate – White Springs in 1987. This modification requires a qualitative assessment of the vegetation, hydrology and soils in certain preservation areas.

Methods

Three individuals evaluated each of the referenced sites on November 30 and December 1, 2016. Each area was evaluated on 14 different factors (see Table 1). The assessment used three scales and the criteria were rated on a scale of 1 to 4. Generally, a higher number denotes a higher perceived quality. Percentages were given to describe three conditions of groundcover (% desirable species, % nuisance species, and % bare ground). Surface water fluctuation was noted as yes or no and is based on water stains, lichen lines and detritus material in prop roots. Phoenix has used this same qualitative rating system annually to evaluate wetland reclamation systems within PCS Phosphate property. The following is a specific list of the 14 rated criteria and a description of the value's meaning.

1. Algal Presence Evaluated based on the overall presence in the area.
    - 4. Excellent: Less than 10% coverage
    - 3. Good: 11-30% coverage
    - 2. Fair: 31-50% coverage
    - 1. Poor: Greater than 50% coverage

2. Water Fluctuation. If there was evidence of water fluctuation "Yes" was noted. The extent and possible sources for variability were noted in the general comments section of each site.

3. Desired Species. Percentage cover was estimated for desired species (all percentage categories must total 100%).

4. Nuisance Species. Percentage cover was estimated for nuisance species (all percentage categories must total 100%).

5. Bare Ground. Percentage cover was estimated for bare ground (all percentage categories must total 100%).

6. Open Water. This category is reserved for lakes and was not applicable throughout this assessment.

7. Vegetative Diversity. Overall estimate of species diversity

4.	Excellent:	At least 80 species present
3.	Good:	50-79 species present
2.	Fair:	30-49 species present
1.	Poor:	Less then 30 species present

8. Wildlife Use. Estimated overall wildlife use.

4. Excellent
3. Good
2. Fair
1. Poor

9. Avian Use. Estimated overall avian use (uses the same scale as wildlife use).

10. Mammal Use. Estimated overall mammal use (uses the same scale as wildlife use).

11. Reptile Use. Estimated overall reptile use (uses the same scale as wildlife use).

12. Invertebrate Use. Estimated overall invertebrate use (uses the same scale as wildlife use).

13. Fish Use. Not applicable for this assessment.

14. Amphibian Use. Estimated overall amphibian use (uses the same scale as wildlife use).

- *Faunal use was established based on presence of tracks, scat, fur, skeletal remains, and habitat.*

Results

The wetlands that were assessed are primarily forested bay and cypress strands. Logging has affected most of the sites to varying degrees. Dominant vegetation and comments were noted for each site. The average and standard deviation for each factor at each site are provided in Table 1, Qualitative Assessments Summary. Photographs of each of the sites evaluated are included in Appendix A.

Locations of the monitoring stations are provided in Figures 1-7. Graphs depicting the trends in percent desirable species were added to the report in an effort to graphically depict the vegetative trends exhibited over the past twenty years (Figures 8 - 15). Six of the piezometer wetlands are exhibiting increases in percent desirable species while one has decreased and one remained constant.

PZ-1

In 1999, the wetland in the PZ-1 location was a cypress-mixed hardwood swamp that was characterized by numerous large canopy size trees; however, several areas had been cut over in the past. The cut-over areas were colonized by a dense cover of subcanopy and shrub size class species including loblolly bay (*Gordonia lasianthes*), red maple (*Acer rubrum* L.), water oak (*Quercus nigra*) and swamp red-bay (*Persea palustris* [Raf.] Sarg.). The canopy was dominated by swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), red maple, pond cypress (*Taxodium ascendens* Brongn.), bald cypress (*T. distichum*) and slash pine (*Pinus elliottii* Engelm.). A dense population of sweet pepperbush (*Clethra alnifolia* L.) was present in the understory. Other species included bushy bluestem (*Andropogon glomeratus* [Walt.] BSP), broomsedge (*Andropogon virginicus* L.), poison ivy (*Toxicodendron radicans* [L.] Kuntze), highbush blackberry (*Rubus argutus* Link), muscadine grape (*Vitis rotundifolia* Michx.), Virginia chain fern (*Woodwardia virginica* [L.] Smith), fetterbush (*Lyonia lucida* [Lam.] K. Koch), sweetbay (*Magnolia virginiana* L.), royal fern (*Osmunda regalis*), greenbrier (*Smilax laurifolia*), dahoon holly (*Ilex cassine*), swamp bay (*Persea palustrus*), royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*) and saw greenbrier (*Smilax bona-nox*).

The condition of the wetland near PZ-1 on October 21, 2003 was similar to that seen in September 2002. The area was also very dry at that time with no evidence of past inundation being present. Oxidation of peat at the bases of trees and cypress knees appears to be progressive, being qualitatively greater than that seen in September 2002. Soil oxidation is estimated at four to six inches.

On November 10, 2004, despite extensive recent rainfall, this site was again dry with the water table being approximately 12” below the surface. This area had the appearance of an excessively drained wetland.

On October 11, 2005, the PZ-1 area was dry with no recent signs of surface water fluctuations being present. The understory was very open with essentially no groundcover herbaceous species. Soil oxidation, root exposure and tree fall were extensive indicating a prolonged lowering of the water table in the area.

On October 31, 2006, the PZ-1 area was excessively dry with no signs of inundation. Surviving trees appeared healthy, but shrub and groundcover vegetation were sparse. Evidence of surface peat oxidation was widespread throughout the wetlands. Additionally, moss collars and lichen lines were ill-defined throughout the area indicating an absence of water fluctuation.

During the November 8, 2007 monitoring event, the wetland floor of PZ-1 was still subsiding and the soil was dry with no evidence of recent inundation. There were many cypress knees and abundant red maple seedlings, however. Muck oxidation was apparent and had resulted in exposure of roots of canopy and subcanopy species. Several downed large pond cypress (*Taxodium ascendens* Brongn.) were present, which appeared

to have been the possible result of high winds. The canopy was generally in good health, but the cover of herbaceous species was sparse.

On October 29, 2008, the PZ-1 area was dry with soil subsidence evident. Many of the canopy trees had exposed roots resulting from the soil subsidence. The canopy and subcanopy appeared to be in generally good health, but herbaceous species coverage was sparse. There were seed cones on the cypress trees and several trees had fallen, presumably due to high winds as noted during the 2007 evaluation. Numerous red maple seedlings and saplings were present in this wetland.

On November 5, 2009, the PZ-1 area was somewhat dry with hummocks beginning to develop. The soils appeared more hydric than in recent years. The canopy species were healthy, but herbaceous cover was sparse and most of the shrub layer had died.

During the October 26, 2010 evaluation the PZ-1 area had more water than in the previous years. There were new cypress knees and existing cypress knees had experienced new growth. Substantial regrowth of adventitious roots of species such as red maple and swamp black gum had occurred within the past year. This subsequent root growth was resulting in formation of new hummocks in which there was substantial regrowth of moss occurring. Ferns were returning to the area and the cypress trees appeared healthier than in the previous several years. There was some dieback of shrubs in the lower elevation areas, presumably as a result of inundation.

On October 25, 2011, the PZ-1 area was moist to saturated with less muscadine grape than previous years. There had been a substantial improvement in the hydrology of this wetland since 2010. The cypress trees did not appear as stressed as previous years and lizard's tail was prevalent in the groundcover. Hummocks were observed in the wetland. An area to the north-northwest was flooded with extensive red maple mortality. Based on hydrologic indicators, the water level in this area had been approximately 18 inches higher than the level observed on the date of the field investigation. The water level apparently persisted long enough to result in the death of all shrub, subcanopy and canopy plant species except cypress trees. The pooled area was colonized by a dense growth of small-fruit beggar-ticks (*Bidens mitis*) and viviparous spikerush (*Eleocharis vivipara*) with the water's surface being covered by duckweed (*Lemna* sp.).

On October 16, 2012 there was more surface water in the PZ-1 area than had been present since 1999. The soil saturation and inundation boundary was found to be in the area of GPS point 192 as shown on Figure 3. This GPS point corresponds to the approximate jurisdiction boundary that would have been found at this site prior to mining. The canopy vegetation at this location abruptly shifted from FACW species such as pond cypress (*Taxodium ascendens* Brongn.) and red maple (*Acer rubrum* L.) to a canopy of mixed slash pine (*Pinus elliottii* Engelm.), loblolly pine (*Pinus taeda* L.), and laurel oak (*Quercus hemisphaerica* Bartr.) to more upland species. Extensive regrowth of cypress knees had continued to occur in all areas. In addition, adventitious root growth on the majority of red maple (*Acer rubrum* L.) trees was apparent. All surface water in the area was covered with a dense cover of algae and lemnids. The hydrologic condition of

the PZ-1 area on October 16, 2012 was indicative of the historic condition of the wetland prior to hydrologic alterations constructed for drainage and mining.

The wetland associated with PZ-1 had standing water with duckweed present during the October 10, 2013 evaluation. The current surface water and wetland boundary of this wetland is designated by GPS locations 389 and 388, respectively (Figure 3). The wetland line corresponds to a well-defined jurisdiction line that is defined by the differential occurrences of slash pine (*Pinus elliottii* Engelm.) and swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.). The water surface was encountered waterward of the jurisdiction line at GPS point 389; however, the entire area between the surface water and wetland boundary was saturated to the surface. Most herbs and shrubs that colonized the area during the preceding periods of low water have been killed by the continued presence of surface water. Cypress knees and black gum root regrowth have continued since first observed in 2012. Soils were inundated and saturated throughout the PZ-1 evaluation area.

The upland extent of surface water in this area has not significantly changed from October 2013 to December 2014. The current water levels would be comparable to a low normal wet season level as compared to the historical condition. Water levels are not at the extent of what would be expected if no historical drainage or alterations had occurred but levels are the highest seen since mining of adjacent areas was performed in 1999. Cypress knee growth has continued and adventitious root growth on maples and blackgum is apparent. All trees appeared healthy at the time of the survey. Lemnids now cover 80% of the surface water area. The continual rise in water levels has caused a significant die-off of all previously existing shrubs and groundcover species.

On 19 November 2015, the surface water levels in the PZ-1 location were essentially equal to those encountered within the last several years. The surface water on this date was ±90% covered with Lemnids and herbaceous and shrub growth has been reduced since the water levels have increased. Walter's sedge (*Carex striata* Michx.) and lizard's tail (*Saururus cernuus* L.) provide more cover than previously seen and the water level indicators show that the current water levels are stable. There has been a regeneration of moss cover on hummocks and a well-defined moss line is apparent on most trees. Regrowth of cypress knees are apparent and adventitious root growth continues on red maple (*Acer rubrum*).

On December 1, 2016, there was no surface water within the general vicinity of the extent of the sample area. A small pool of lemnid covered surface water exists within a natural depression that occurs along the south jurisdictional boundary of the wetland. Throughout the sample area there is a paucity of herbaceous groundcover. However, lizard's tail (*Saururus cernuus* L.) and threeway sedge (*Dulichium arundinaceum* [L.] Britton) are common. Shrubs are sparse except for a dense band of fetterbush (*Lyonia lucida* [Lam.] K. Koch) that occurs at the northern extent of the forested area of this community. There are distinct moss and lichen lines along with new cypress knee and adventitious root growth. There is a significant amount of dead limbs and fallen subcanopy boles on the wetland surface as a result of the hurricanes that passed through

North Florida in fall 2016. Surface soils, although no inundated, are saturated throughout the area.

On 29 November 2017, the PZ-1 area was saturated in the general sample area extending to the pine dominated jurisdiction line. Surface water exists north of the jurisdiction line and extends north throughout the remaining wetland area. There is minimal groundcover within the sample area with only a relatively sparse cover of Virginia chain fern (*Woodwardia virginica* [L.] Sm.), soft rush (*Juncus effusus* L.), and netted chain fern (*Woodwardia areolata* [L.] T. Moore) being present. It appears that peat subsidence in the area has stabilized and moss and lichen populations are apparent, indicating recent higher water levels. There is scattered debris associated with Hurricane Irma. Since 2010, water levels in the area reflect seasonal variation which is much improved over the hydrologic condition that existed prior to 2010. This area, as well as the PZ-2 area, shows a hydrologic condition indicative of a long-term regional degradation of the water table; however, as mentioned, this situation is much improved as compared to the 1999–2010 condition of the wetland.

SUMMARY:

Vegetation: Surviving trees appeared healthy; debris present from Hurricane Irma
Hydrology: Improving each year since 2010
Soils: Inundated and saturated

PZ-2

The wetland adjacent to PZ-2 was a mixed hardwood swamp dominated by large swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.) with canopy size red maple (*Acer rubrum* L.), sweetbay (*Magnolia virginiana* L.), slash pine (*Pinus elliottii* Engelm.), loblolly pine (*Pinus taeda* L.), and occasional pond cypress (*Taxodium ascendens* Brongn.) being present. Other common species included fetterbush (*Lyonia lucida* [Lam.] K. Koch), muscadine grape (*Vitis rotundifolia* Michx.), sweet pepperbush (*Clethra alnifolia* L.), and maleberry (*Lyonia ligustrina* [L.] DC.), wax myrtle (*Morella cerifera* L.), yellow jessamine (*Gelsemium sempervirens*), poison ivy (*Toxicodendron radicans*), Virginia willow (*Itea virginica*), dahoon holly (*Ilex cassine*), highbush blueberry (*Vaccinium corymbosum*), fetterbush (*Leucothoe racemosa*) and Virginia chain fern (*Woodwardia virginica* [L.] Smith); however, the understory was very open with groundcover species being limited in distribution.

The area around PZ-2 was found to be very dry on October 21, 2003. The vegetation was stressed and extensive death of shrubby vegetation had occurred. This was noted during the previous survey; however, the mortality appeared to be progressive. The PZ-2 area on October 21, 2003 was found to be excessively dry with numerous dead trees and shrubs. This had been the prevailing condition at this site since May 1999.

On November 10, 2004, there was no surface water in the wetland and the groundwater was approximately six inches below the peat surface. There was no evidence of storm damage. Dead limbs and trunks were abundantly littered throughout this area of the wetland due to the absence of water. At this time, the water table was highest in this area than that previously seen; however, no surface water was present.

During the October 11, 2005 survey, the PZ-2 location was found to be very dry with no evidence of recent surface water being present. Tree fall and root exposure were found to be extensive throughout the area. Many small red maple and slash pine seedlings were present; however, few large seedlings or saplings of any species were present within this area. This wetland was similar in condition to the 2004 monitoring event in that the wetland floor had subsided with many tree roots exposed. Grape vine was prevalent on the ground surface and red maple and pine seedlings were recruiting, which indicated an absence of water. There were large bear tracks observed on the dirt road adjacent to this wetland. Additionally, the odor of a skunk was detected within the wetland.

In October 2006, the PZ-2 wetland was again excessively dry. There was evidence of excessive peat oxidation in the swamp with many standing dead and fallen trees observed. Most trees were healthy, but root exposure and basal rot were common. The plant community composition had remained static during the monitoring period; however, there remained very little herbaceous or shrubby vegetation.

During November 2007, the PZ-2 area was found to be very dry and consistent in appearance to that seen since 1999. The wetland floor of PZ-2 was continuing to subside, but there were more canopy trees present than in PZ-1. The roots were exposed on many

of the cypress trees. The soils were dry and there was no evidence of recent inundation. The canopy trees were healthy, but dead branches were common on the ground throughout the area. The shrub cover was approximately six feet tall and extended throughout the area but there was a great paucity of groundcover species. Soil oxidation was moderate throughout the site and the lack of water had led to a flush of loblolly pine (*Pinus taeda* L.) seedlings scattered throughout the area.

On October 29, 2008, the area was dry with soil subsidence evident. Many of the trees had exposed roots and the lichen lines were near the ground surface on most trees. The tree tops were healthy, but the tree roots were exposed in some of the wetland. There were some shrubs with minimal herbaceous species. Deer tracks were observed on the road near this wetland. There was no standing water nor was there any evidence of recent water fluctuation.

On November 5, 2009, the PZ-2 area was generally similar to conditions that existed when monitoring began in 1998. Although substantial oxidation of peat had occurred, the subsurface groundwater levels were higher than observed in previous years. The soils appeared more hydric; however, there was not substantial evidence of a surface or near-surface prolonged water table. The standing dead saplings and shrubs observed in the past had disintegrated and there was an obvious paucity of herbaceous vegetation or any facultative wetland ground cover species. A great blue heron and a hawk were observed near the PZ-2 wetland.

On October 26, 2010, the PZ-2 area had evidence of recent inundation. The cypress knees were regrowing and appeared healthy. Roots that had been exposed during 10 years of soil/peat oxidation showed extensive evidence of new growth. There was extensive new growth of fibrous roots around the bases of most red maple trees. Buttressed trunks were forming on the black gum trees. There were deer tracks throughout the wetland and hummocks were forming in the area.

During the October 25, 1011 monitoring event, the hydrologic improvement first observed in 2010 had continued in the PZ-2 area. Although the wetland was not inundated, soils were saturated. A notable regrowth of cypress knees was observed and lizard's tail was common in the groundcover.

On October 16, 2012 the wetland lying adjacent to the PZ-2 location was flooded. The soils were saturated extending to the pine canopy boundary located at GPS location 205 (Figure 3). Surface water was located at GPS 206 (Figure 3). The entire visible surface water area was covered with lemnids. The wetland surface water on this date extended to the approximate jurisdiction line that would have been present prior to mining. The extent of the surface water was higher than that seen at any time during the study period since 1999.

On 10 October 2013 the jurisdictional wetland and surface water boundaries of the wetland were located at GPS points 392 and 393, respectively (Figure 3). The site was saturated all the way to the access road located on the south side of the piezometer

locations. The water levels had recently been at least six inches higher than those seen on this sample date. The surface water was 90% covered with a layer of lemnids. Most herbs and shrubs had died but regrowth of red maple (*Acer rubrum* L.), swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), and cypress roots was apparent. Hypertrophied lenticels were readily apparent on exposed swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.) roots. There was evidence (claw marks on cypress tree) that a black bear had recently visited the area.

In December 2014, the PZ-2 wetland appeared similar to the condition found in 2013. Due to the continual surface water rise and extended periods of inundation, almost all previously existing shrubs and groundcover species are dead with little regrowth of other species being noted. Lemnids cover 90% of the surface water area. The health and vigor of all canopy trees is good with no notable top bole death or lateral branch death being observed.

On 19 November 2015, the PZ-2 location had not significantly changed since the 2014 monitoring event. The surface water boundary is stable and continued development of moss on trees and hummocks is proceeding. The surface water is covered with Lemnids and the cover of shrubs and emergent herbs is minimal, which is expected due to the recent rise in the local water table of the area.

The PZ-2 study site was dry throughout the survey area on December 1, 2016. Due to the recent storms associated with the fall hurricanes, there was substantial limb and tree debris present on the ground. The area has distinct moss and lichen lines and adventitious roots as a result of the previous high water levels. The ground was covered with dry cypress and hardwood litter that covered saturated muck soils. There is a paucity of groundcover herbs or any substantial cover of tree seedlings or shrub growth. The health and growth of canopy trees was good and there were no signs of recent death of boles or canopy death due to stress or disease.

On 29 November 2017, the upper boundary of the PZ-2 wetland area was saturated with surface water occurring mostly waterward of the survey area. As in the past, the wetland has very minimal herbaceous and shrub cover. Debris from storm damage was present, however, not widespread. The soils are firm and stable and peat subsidence, though historically present, has not substantially changed since 2010. New growth on old cypress knees is present and obvious moss and lichen growth indicates stability in the surface water levels. Water levels within the wetland had recently been higher than that observed on the sample date.

SUMMARY:

Vegetation: Canopy trees are healthy; minimal shrubs and groundcover
Hydrology: Surface water present waterward of the survey area
Soils: Saturated or inundated

PZ-3

The plant community in the PZ-3 area was a transitional flatwoods system with very dry mineral soils that bordered a large cypress-mixed hardwood swamp. Dominant plant species included water oak (*Quercus nigra* L.), slash pine (*Pinus elliottii* Engelm.), loblolly pine (*Pinus taeda* L.), persimmon (*Diospyros virginiana* L.), swamp red-bay (*Persea palustris* [Raf.] Sarg.), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua* L.) and sweetbay (*Magnolia virginiana* L.). Other species included:

False nettle	*(Boehmeria cylindrical)*
Sweet pepperbush	(*Clethra alnifolia)*
Dwarf huckleberry	(*Gaylussacia dumosa* [Andrews] Torr. & Gray)
Dahoon holly	(*Ilex cassine*)
Ink-berry	(*Ilex glabra* [L.] Gray)
Virginia willow	(*Itea virginica* L.)
Redroot	(*Lachnanthes caroliniana* [Lam.] Dandy)
Fetterbush	(*Leucothoe racemosa*)
Rusty lyonia	(*Lyonia ferruginea* [Walt.] Nutt.)
Fetterbush	*(Lyonia lucida)*
Cinnamon fern	*(Osmunda cinnamomea)*
Wax myrtle	*(Morella cerifera)*
Swamp black gum	(*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.)
Bracken fern	(*Pteridium aquilinum* [L.] Kuhn)
Laurel oak	(*Quercus laurifolia*)
Saw palmetto	(*Serenoa repens* [Bartr.] Small)
Saw greenbrier	(*Smilax bona-nox* L.)
Bamboo-vine	(*Smilax laurifolia* L.)
Bald cypress	*(Taxodium distichum)*
Poison ivy	*(Toxicodendron radicans)*
Highbush blueberry	(*Vaccinium corymbosum* L.)
Virginia chain fern	(*Woodwardia virginica* [L.] Smith)

Since September 2001, this area had been very dry with no discernable differences compared to the previous survey. Conditions at the site during the October 2003 evaluation were similar to previous years' surveys. As with PZ-1 and PZ-2, many trees had fallen, presumably due to soil subsidence. Soils were damp and consisted of a mucky surface layer with peat below the surface. Evidence of surface saturation was observed.

On November 10, 2004, the water levels were the highest seen in this area. However, water was still restricted to small, inundated pools two to four inches deep in the area. There were no signs of widespread surface inundation. This area was much drier than it should have been considering the extensive rainfall that occurred in the summer/fall of 2004. Tree fall was prevalent in this wetland.

During the October 11, 2005 event, the PZ-3 area was very dry. Peats were moist; however, no recent evidence of surface inundation was apparent. Soil oxidation at the site had been extensive and tree fall throughout the area was widespread. Deer and bear tracks were observed on the dirt road between PZ-3 and PZ-2.

In October 2006, the large cypress swamp in the PZ-3 area was dry. There was a notable increase in the death of cypress knees; moss collars and lichen lines had also degenerated, indicating an absence of water fluctuation. There were numerous red maple seedlings present, but few sapling-sized red maples were observed. This area had been dry for an extended period of time.

During the November 8, 2007 monitoring event, soil subsidence was evident in the PZ-3 area. Several trees had fallen over and the cypress trees were very tall and thin, possibly indicative of deep root systems. Water was present in the small, naturally-occurring sinkhole near the monitoring station, but the water was lower than in previous years at greater than four feet below the surface. There was no evidence of recent inundation. This area was in the best shape of any wetland addressed in the report. There was good structure and species composition in the canopy, subcanopy, and groundwater, but evidence of soil oxidation was apparent throughout the wetland.

On October 29, 2008, the PZ-3 area was dry with extensive regeneration of red maples, pines and bays. The lichen line was near the ground surface on most trees. Soils were moist, but subsidence was significant with many exposed roots. Deer tracks were observed on the road near this wetland. The red maple seedlings and saplings were too numerous to count.

During the November 5, 2009 sampling event, the wetland at PZ-3 was much wetter than the previous year. The ground was saturated and there was hydrologic evidence present that shallow inundation had occurred in small pools distributed throughout the area. Sphagnum moss (*Sphagnum* sp.) was present in some areas and a large number of red maple saplings were present in the ground cover. The canopy was healthy and although there was ample evidence of historic oxidation present, the existing groundwater table was higher than observed since 2004. The naturally-occurring sinkhole that was present in this area had more water in it than ever observed in previous years.

On October 26, 2010, the PZ-3 area was substantially wetter than the previous several years. The water level in the naturally-occurring sinkhole that was near the PZ-3 area was higher than ever observed during the previous monitoring events (12 years). The trees appeared healthier with abundant regrowth of red maples. There was substantial

evidence based on biological indicators that a measurable enhancement of the existing hydroperiod had occurred during 2010.

The PZ-3 wetland on October 25, 2011 was similar to that found in 2010. Regrowth of roots of pond cypress and swamp black gum was extensive. The area did not appear to have been drained. An emergent marsh was observed to the east of the natural sinkhole. A dense groundcover consisting of the following species was observed in the marsh area: viviparous spikerush, Walter's sedge (*Carex striata*), smooth beggar-ticks (*Bidens laevis*) and American white water lily (*Nymphaea odorata*). The marsh area was saturated with several small pools of inundation. The hydrologic evidence indicated this area was regularly inundated.

On October 16, 2012, the PZ-3 area was inundated to the pine canopy boundary indicated by GPS point 235 shown on Figure 3. Surface water was covered with lemnids. There were positive hydrologic recovery indicators such as cypress knees and adventitious root growth apparent throughout the area.

On 10 October 2013, surface water boundaries were located at GPS location 407 (Figure 3). The surface of the water was covered 100% with lemnids. There were few herbs and shrubs present due to the past year's rise in water levels. All canopy vegetation was healthy with extensive evidence of knee and root regrowth.

The 2014 condition of the wetland was not significantly different than that observed in 2013. Water levels were highest yet seen in the study and corresponded to a low normal wet season level that would have occurred prior to past disturbance of the area. Lemnids covered 80% of the surface water area. The vigor of canopy trees was excellent; however, die-off of shrubs and groundcover species is similar to that found in the PZ-1 and PZ-2 wetland areas. The sinkhole has overflowed and is essentially directly connected hydrologically to the forested wetland.

The condition of the PZ-3 area on 19 November 2015 was similar to that seen in the past three years. The vigor of all canopy trees is good with no indication of any top death or other related stress. Groundcover of herbs and shrubs is minimal with cover of surface water Lemnids being extensive. The water levels are stable as supported by continued regrowth of moss on hummocks and tree bases and continued growth of cypress and blackgum knees as well as adventitious roots on maples.

On December 1, 2016, the PZ-3 area was dry and the area was littered with widespread dead limbs and fallen standing dead snags from the hurricanes that occurred in fall 2016. Groundcover throughout the area is sparse with various quantities of Virginia chain fern (*Woodwardia virginica* [L.] Smith), lizard's tail (*Saururus cernuus* L.), and cinnamon fern (*Osmunda cinnamomea* L.) being present. The northern area of the sample site is much wetter than the southern area where site access is facilitated. Dominant canopy species include bald cypress (*Taxodium distichum* [L.] L. Rich.), red maple (*Acer rubrum* L.), swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), pond cypress

(*Taxodium ascendens* Brongn.), and sweetbay (*Magnolia virginiana* L.), all of which appear healthy.

On 29 November 2017, the PZ-3 area did not appear substantially different than the condition seen in 2016. Since 2010, oxidation of dry peat soils has terminated and water levels are currently maintained at or above the surface in all areas waterward of the existing jurisdiction boundary. The circular landscape depression adjacent to the sample area was inundated and the water surface was densely covered with lemnids. The dominant groundcover in the area is lizard's tail (*Saururus cernuus* L.) and three-way sedge (*Dulichium arundinaceum* [L.] Britton) as has been the condition in the recent past. The mosses and lichens on trees are well-defined and water levels were approximately eight inches below that of the defined lichen elevation. Adventitious root growth was evident on red maple (*Acer rubrum* L.) as well as coppicing bases of sweetbay (*Magnolia virginiana*). There was a moderate amount of scattered limb debris from Hurricane Irma but no tree fall of large live trees was evident.

SUMMARY:

Vegetation: Mature hardwood wetland with improvement in health
Hydrology: Inundated areas waterward of the jurisdiction boundary
Soils: Saturated and inundated

PZ-4

In May 1999, the wetland in the vicinity of PZ-4 was characterized by a dominance of large canopy size swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.) trees. Canopy trees appeared healthy but moderate peat oxidation was present throughout the areas with exposed tree bases and cypress knee bases being common. Tree fall was common in the subcanopy size class and base rot was present in many trees. The peat and sphagnum moss were excessively dry. Commonly occurring plant species included the following:

Red maple	(*Acer rubrum* L.)
Buttonbush	(*Cephalanthus occidentalis* L.)
Sweet pepperbush	(*Clethra alnifolia* L.)
Threeway sedge	(*Dulichium arundinaceum* [L.] Britton)
Fireweed	(*Erechtites hieracifolia* [L.] Raf.)
Dahoon holly	(*Ilex cassine* L.)
Virginia willow	(*Itea virginica* L.)
Swamp doghobble	(*Leucothoe racemosa* [L.] A. Gray)
Maleberry	(*Lyonia ligustrina* [L.] DC.)
Fetterbush	(*Lyonia lucida* [Lam.] K. Koch)
Sweetbay	(*Magnolia virginiana* L.)
Wax myrtle	(*Morella cerifera* L.)
Climbing fetterbush	(*Pieris phillyreifolia* [Hook.] DC.)
Slash pine	(*Pinus elliottii* Engelm.)
Winged sumac	*(Rhus copallinum)*
Highbush blackberry	(*Rubus argutus* Link)
Lizard's tail	(*Saururus cernuus* L.)
Bamboo-vine	(*Smilax laurifolia* L.)
Pond cypress	*(Taxodium ascendens)*
Bald cypress	*(Taxodium distichum)*
Virginia marsh St. John's-wort	(*Triadenum virginicum* [L.] Raf.)
Highbush blueberry	(*Vaccinium corymbosum* L.)
Virginia chain fern	(*Woodwardia virginica* [L.] Smith)

During the September 14, 2000, survey, the PZ-4 area had been recently logged. Few remaining trees were present, most of which were red maple (*Acer rubrum* L.). The peat was excessively dry and powdery. Many herbaceous species were present, including:

Bushy beardgrass	(*Andropogon glomeratus* var. *glaucopsis* Ell.)
Bushy bluestem	(*Andropogon glomeratus* L.)
Eastern false-willow	(*Baccharis halimifolia* L.)
Smooth beggar-ticks	(*Bidens laevis* [L.] BSP.)
Bur marigold	(*Bidens mitis* Michx.)
False nettle	(*Boehmeria cylindrica*)
Walter's sedge	(*Carex striata* Bailey)
Canada horseweed	(*Conyza canadensis* [Torr. & Gray] Gray)
Retrorse flatsedge	(*Cyperus retrorsus* Chapm.)
Witchgrass	(*Dichanthelium ensifolium* [Baldwin ex Elliott] Gould var. *ensifolium*)
Southern crabgrass	(*Digitaria ciliaris* [Retz.] Koel.)
Baldwin's spikerush	(*Eleocharis baldwinii* [Torr.] Chapm.)
Fireweed	(*Erechtites hieracifolia* [L.] Raf.)
Small dog-fennel thorough-wort	(*Eupatorium capillifolium* [Lam.] Small)
Dog fennel	*(Eupatorium leptophyllum)*
Mohr's thoroughwort	(*Eupatorium mohrii* Greene)
Slender fragrant golden-rod	(*Euthamia minor* [Michx.] Greene)
Camphorweed	(*Heterotheca subaxillaris* [Lam.] Britton & Rusby)
Soft rush	(*Juncus effusus*)
Needlepod rush	(*Juncus scirpoides*)
Redroot	(*Lachnanthes caroliniana* [Lam.] Dandy)
Fall Panicum	(*Panicum dichotomiflorum* Michx.)
Common pokeweed	(*Phytolacca americana* L.)
Mild water-pepper	(*Persicaria hydropiperoides* Michx.)
Highbush blackberry	(*Rubus argutus* Link)
Woolgrass	(*Scirpus cyperinus*)
Goldenrod	(*Solidago fistulosa* Mill.)
Poison ivy	(*Toxicodendron radicans* [L.] Kuntze)
Muscadine grape	(*Vitis rotundifolia* Michx.)
Virginia chain fern	(*Woodwardia virginica* [L.] Smith)

On 27 September 2001, the PZ-4 area was found to have an extensive herbaceous groundcover dominated by redroot (*Lachnanthes caroliniana* [Lam.] Dandy), small dog-fennel thorough-wort (*Eupatorium capillifolium* [Lam.] Small), and Walter's sedge (*Carex striata* Bailey). The area was dry with no signs of recent inundation.

During the October 21, 2003 field survey, the wetland associated with PZ-4 had extensive dog fennel coverage with primarily transitional species present. The cypress trees appeared stressed and were covered by Spanish moss (*Tillandsia usneoides*). Extensive top death was also occurring to the cypress trees.

On November 10, 2004, the surface water in the area was two to three inches deep. The area was colonized by a host of species, including Walter's sedge (*Carex striata*), needlepod rush (*Juncus scirpoides*), mild water-pepper (*Persicaria hydropiperoides*), redroot (*Lachnanthes caroliniana*) and lizard's tail (*Saururus cernuus*). Some regrowth of swamp red bay (*Persea palustris*) and sweetbay (*Magnolia virginiana*) had occurred along with colonization of red maple (*Acer rubrum*), which were presently sapling sized individuals. A pair of red-shouldered hawks was observed in flight nearby.

On October 11, 2005, the system was dominated by smallfruit beggar ticks (*Bidens mitis*) and warty Panicum (*Kellochloa verrucosa* Muhlenburg) with recruiting bays, red maples and cypress. Redroot, Walter's sedge, Virginia chain fern and Mohr's thoroughwort were distributed throughout the area. Spanish moss covered many of the remaining mature trees. There was no standing water, even in depressional areas. The herbaceous coverage was extensive, but small tree seedlings were recruiting. A catbird was heard vocalizing in the area.

In October 2006, the PZ-4 area was dry with evidence of recent inundation restricted to small areas where water pools infrequently following rainfall events. The groundcover in the area was extensively dominated by Walter's sedge. This area would function as good marsh habitat if more frequently inundated.

During the November 8, 2007 monitoring event, the PZ-4 area was dominated by Walter's sedge with recruitment of red maple and sweetbay magnolia seedlings. The surface and subsurface were dry with no evidence of recent inundation. A deer fawn was observed in the area. The area was best characterized by having a large marsh dominated by Walter's sedge (*Carex striata* Michx.) surrounded by a band of bay and mixed hardwood trees. Walter's sedge (*Carex striata* Michx.) comprised approximately 90% of the existing groundcover.

During the October 29, 2008 monitoring event, the wetland near PZ-4 had a small pocket of standing water with thick alga coverage. Soils were moist to saturated. Red maple seedlings were evident around the perimeter of the interior marsh. This area was clear cut several years previously, but appeared to be regenerating with red maples and bays. Evidence of hog rooting was present.

The PZ-4 wetland on November 5, 2009 was inundated to depths of six to 10 inches. The area was dominated by Walter's sedge and appeared to be a well-developed, high-quality marsh. Of the nine wetlands evaluated as part of this permit, PZ-4 was the most frequently inundated. Scattered saplings of red maple distributed throughout the marsh provided for a significant bird and wildlife resource.

During the October 26, 2010 monitoring event, the wetland near PZ-4 was the wettest observed in the previous 12 years. The extent of the wetland area that was inundated had expanded several hundred feet east to the retaining berm located along the reclamation area. Dog fennel plants were replaced with obligate wetland species, especially Walter's sedge and smallfruit beggar ticks. The red maple regeneration was extensive. Overall, this wetland was greatly improved in condition as compared to previous years.

On October 25, 2011 the PZ-4 marsh was not inundated but the area had been recently flooded for an extended period. The high quality marsh was covered with a dense groundcover of Walter's sedge with small-fruit beggar-ticks distributed throughout. The cover of Walter's sedge was so dense that no bare ground was visible. Buttonbush and red maple were present in various areas, which provided significant habitat for roosting waterfowl. Deer tracks and a frog were observed in the PZ-4 wetland.

On October 16, 2012, the PZ-4 wetland was flooded all the way to the east access berm. This extent of flooding had never been observed at this area. This area continued to remain a high quality, regularly and periodically inundated mixed marsh-shrub wetland system. Numerous red maple seedlings were observed and the herbaceous coverage was extensive with wetland species (softrush clumps were numerous). The red bays were affected by the ambrosia beetle (*Xyleborus glabratus*), which is a nuisance species that has been documented in the southeastern United States since 2002.

On 10 October 2013, the entire PZ-4 area was again flooded all the way to the eastern access berm. The area was currently a high quality emergent marsh dominated by Walter's sedge (*Carex striata* Michx.). Sand spikerush (*Eleocharis montevidensis* Kunth) and viviparous spikerush (*Eleocharis vivipara* Link.) were widespread as well as American cupscale (*Sacciolepis striata* [L.] Nash.). The forested area east of the piezometer location was healthy with numerous seedlings and saplings of red maple (*Acer rubrum* L.) being present.

On 10 December 2014, flooding all the way to the east access berm was present at levels higher than seen in previous years. The red maple (*Acer rubrum* L.) dominated habitat occurring north of the access trail was completely inundated with six to 12 inches of surface water. This wetland area continues to be a high quality marsh dominated by Walter's sedge (*Carex striata* Michx.), with a viviparous spikerush (*Eleocharis* sp.) being co-dominant and a cover of small-fruit beggar-ticks (*Bidens mitis* [Michx.] Sherff), soft rush (*Juncus effusus* [L.] subsp. *solutus* [Fernald & Weigand] Hamet-Ahti), woolgrass bulrush (*Scirpus cyperinus* [L.] Kunth) and Virginia chain fern (*Woodwardia virginica* [L.] Sm.) being extensive.

Due to access issues to the PZ-4 area, the sample area was moved to location 4A (see Figure 6). Within this area, there is a very well-developed Walter's sedge (*Carex striata* Michx.) marsh beyond a well-defined fringe of mixed hardwood swamp. Within the forested area, red maple (*Acer rubrum* L.), bald cypress (*Taxodium distichum* [L.] L. Rich.), swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), swamp red-bay (*Persea palustris* [Raf.] Sarg.), sweetbay (*Magnolia virginiana* L.), and loblolly bay

(*Gordonia lasianthus* [L.] Ellis.) are common. The water is dark tannic with a minimal cover of Lemnids as compared to PZ areas 1–3. Water levels in this area are stable and canopy trees as well as herbaceous vegetation are healthy.

Area PZ-4A was the wettest of the sample areas found on December 1, 2016. This area is a mix of marsh, shrub, and forest habitat. The marsh is dominated by a dense growth of Walter's sedge (*Carex striata* Michx.) with considerable growth of a viviparous *Eleocharis* species as well as small-fruit beggar-ticks (*Bidens mitis* [Michx.] Sherff) and Virginia chain fern (*Woodwardia virginica* [L.] Smith). There are areas with dense shrubs consisting of fetterbush (*Lyonia lucida* [Lam.] K. Koch) and common buttonbush (*Cephalanthus occidentalis* L.). There is a well developed marsh system along the north boundary of the sample area. There are large bald cypresses (*Taxodium distichum* [L.] L. Rich.), red maple (*Acer rubrum* L.), swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), and laurel oak (*Quercus hemisphaerica* Bartr.) trees within the mixed hardwood swamp habitat.

On 29 November 2017, the PZ-4A area was inundated with tannic water covered with an extremely dense assemblage of Walter's sedge (*Carex striata* Michx.). Additional common herbaceous species include small fruit beggarticks (*Bidens mitis* [Michx.] Sherff), three-way sedge (*Dulichium arundinaceum* [L.] Britton), swamp loosestrife *Decodon verticillatus* (L.), Elliott, lizard's tail (*Saururus cernuus* L.), and a prolific cover of viviparous spikerush (cf. *Eleocharis vivipara* Link). The sample area floods 2-4 inches in average depth and is best described as a high quality emergent grass marsh habitat. The marsh provides significant habitat for a host of mammal, reptile, amphibian, water bird, and wading bird species. Between the marsh and perimeter berm is a forested wetland habitat dominated by pond cypress (*Taxodium ascendens* Brongn.), bald cypress (*Taxodium distichum* [L.] L. Rich.), red maple (*Acer rubrum* L.), laurel oak (*Quercus laurifolia* Michx.), swamp blackgum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), and sweetbay (*Magnolia virginiana* L.). This wetland area has the most stable hydroperiod of all the piezometer study sites.

SUMMARY:

Vegetation: Excellent herbaceous vegetation; high quality emergent marsh
Hydrology: Area inundated
Soils: Saturated and inundated throughout

PZ-5

In 1999, the wetland in the PZ-5 area consisted of a mosaic of marshes dominated by Virginia chain fern (*Woodwardia virginica* [L.] Smith) surrounded by subcanopy sized bay communities in which swamp red-bay (*Persea palustris* [Raf.] Sarg.), sweetbay (*Magnolia virginiana* L.), and loblolly bay (*Gordonia lasianthus* [L.] Ellis.) were dominant with occasional pond cypress (*Taxodium ascendens* Brongn.) trees. In May 1999, extensive foraging by feral hogs had occurred within the marshes where large areas had been disturbed. These disturbed areas were typically colonized by redroot (*Lachnanthes caroliniana* [Lam.] Dandy), which formed relatively low, carpet-like areas nestled within the extremely dense populations of Virginia chain fern. The marsh areas typically had a surface layer of peat that ranged from six to 12 inches thick. At the time of the survey, the peat layer appeared to be excessively dry.

In 2003, The PZ-5 area appeared to be improving with the return of normal rainfall. The area was still primarily marsh dominated by redroot and Virginia chain fern. During past visits, this area was found to be co-dominated by redroot and Virginia chain fern. During this most recent field visit, redroot was dominant with Virginia chain fern scattered throughout the wetland. Other species observed included: Walter's sedge (*Carex striata*), bamboo-vine (*Smilax laurifolia*), slash pine (*Pinus elliottii*), red maple (*Acer rubrum*) and dahoon holly (*Ilex cassine*).

On November 10, 2004, the entire site was covered with redroot (*Lachnanthes caroliniana*) and Virginia chain fern (*Woodwardia virginica*) again being the dominant species. The area had the highest water levels ever observed to date, which had resulted in some decrease in the amount of total herbaceous cover. Egrets were observed in this area.

The October 11, 2005 monitoring event was conducted in an area east of the piezometer due to alterations in the roads. The new site was similar to the previous site in being disturbed bay swamp with deep peat soils with an extensive groundcover of Virginia chain fern and redroot. No surface water was present on the site with the water table being approximately two feet below the surface. Soil oxidation in the area was apparent with surface water occurrence being the exception rather than the rule. There was some mortality of trees and soil subsidence was evident. A dense leaf litter mat was present on the wetland floor. No standing water was observed.

In October 2006, the PZ-5 area was found to be very dry. The vegetation in the area had shown no significant change except for an increase in the numbers of dead loblolly bay. There were several cracks in the dried surface peat indicating continual and prolonged drying of the surface horizon. There was no evidence that any inundation had occurred during the entire monitoring period.

During the November 8, 2007 monitoring event, the area of PZ-5 was dry and dominated by small swamp red-bay recruits. Abundant leaf litter was present and the soil had peat at the surface. There were no signs that inundation had occurred in this area for years.

There was a dense litter layer that covered deep cracking in the dry muck layer covering the site. This area was covered with a mosaic of Virginia chain fern and redroot-dominated marshes and dense bay regrowth areas.

On October 29, 2008, the wetland near PZ-5 was dry with no evidence of water fluctuation. This wetland had only subcanopy-sized plants with swamp bay and Virginia chain fern dominating the vegetation. There were many hummocks present throughout the area. Soils were oxidized with peat and leaf litter prevalent. Roots were exposed on the shrubs. Wildlife usage appeared to be limited due to the reclamation activities nearby. Ducks were observed in a small pond within the reclamation area.

During the November 5, 2009 monitoring event, there was no evidence of surface water, but the surface was saturated indicating higher levels of groundwater than previously observed. There had been little change in vegetation since 1999. The area continued to be a dense tangle of successional bays interspersed with impenetrable barriers of bamboo-vine.

On October 26, 2010, the wetland near PZ-5 had standing water and exhibited more moisture than the previous 13 years. Presumably, the reclamation activities that were conducted adjacent to PZ-5 had reestablished water levels in the wetlands. There was open water in the adjacent wetland and numerous egrets were observed. Although the vegetation had not changed significantly since the last monitoring event, the hydrologic enhancement that had occurred was prominent.

Due to the problems with road access, the survey area for the PZ-5 location was moved in 2011 as indicated on Figure 1. This area was previously logged and was a mosaic of emergent marsh and subcanopy vegetation. Dominant vegetation included red maple, pond cypress, slash pine, swamp red bay and swamp black gum. Groundcover vegetation was comprised of Savannah yellow-eyed grass (*Xyris fimbriata*), sweet pepperbush, small-fruit beggar-ticks, warty panicum (*Kellochloa verrucosa*), pickerelweed (*Pontederia cordata*), redroot, Virginia chain fern, Mohr's thoroughwort (*Eupatorium mohrii*) and a 20% cover of sphagnum moss (*Sphagnum* sp.). The area had a hydroperiod that was similar to that found in the area that was previously evaluated.

On October 16, 2012, the sample area for PZ-5 corresponded to the area indicated by GPS 158 as shown on Figure 4. This was the farthest west that pedestrian travel could proceed along the north access berm lying north of the PZ-5 and PZ-4 wetland areas. The site was inundated 18 to 24 inches all the way to the base of the access berm. This was the only time this area had been observed to be wet and represented the highest water levels to occur in the area since 1999 based on all existing physical and biological indicators. Due to the historic oxidation of the soils resulting in creation of deep crevices in the peat surface, pedestrian survey beyond the base of the berm and immediate area was not possible due to the imminent danger of deep water-filled holes occurring throughout the area. Both song and wading birds were vocalizing nearby.

Due to access being restricted by poor berm conditions, the PZ-5 qualitative was performed at GPS location 421 (Figure 4). In this area, the wetland was flooded with slash pine (*Pinus elliottii* Engelm.) and pond cypress (*Taxodium ascendens* Brongn.) being the most common canopy species. The surface water was 40% covered with lemnids while exposed ground was covered with 70% cover of sphagnum, Virginia chain fern (*Woodwardia virginica* [L.] Smith), redroot (*Lachnanthes caroliniana* [Lam.] Dandy), and Walter's sedge (*Carex striata* Michx.) were the dominant groundcover species. The bays were dying from the Ambrosia beetle infestation and pines appeared to be dying back due to the water level increase. This area for the past two years has had a significantly greater extent and depth of surface water than had been present since 1999. A turkey was observed on the berm and frogs were prevalent in the wetland.

The sample area for PZ-5 in December 2014 was extended westward to the berm breach. This is where sampling was originally conducted in 1999. The water level rise in this area has been so extensive that currently all pre-existing loblolly bay (*Gordonia lasianthus* [L.] Ellis.), swamp bay (*Persea palustris* [Raf.] Sarg.), and the majority of sweetbay (*Magnolia virginiana* L.) have been killed. The area is currently dominated by marsh, with Walter's sedge (*Carex striata* Michx.), Virginia chain fern (*Woodwardia virginica* [L.] Smith), redroot (*Lachnanthes caroliniana* [Lam.] Dandy), maidencane (*Panicum hemitomon* Schult.), and bamboo-vine (*Smilax laurifolia* L.) being the most commonly occurring species. White ibis (*Eudocimus albus*), juvenile wood storks (*Mycteria americana*) and great egrets (*Ardea alba*) were observed in the area.

On 19 November 2015, the location of the PZ-5 sample area was moved to PZ-5A due to access issues (see Figure 6). Within this area there is a well-developed mixed hardwood swamp canopy and the groundcover is more extensive than any of the other forested sample areas with Virginia chain fern (*Woodwardia virginica* [L.] Smith) and Walter's sedge (*Carex striata* Michx.) being dominant. There was no Lemnid cover of the surface water seen.

The PZ-5A area on December 1, 2016 had no surface water but muck soils were saturated. The southern perimeter of this area near the access route is a mixed hardwood swamp community dominated by pond cypress (*Taxodium ascendens* Brongn.), swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), red maple (*Acer rubrum* L.), and laurel oak (*Quercus hemisphaerica* Bartr.). In the northern area, the community changes from a mixed hardwood community to marsh and shrub habitat dominated by Walter=s sedge (*Carex striata* Michx.), clustered sedge (*Carex glaucescens*), Virginia chain fern (*Woodwardia virginica* [L.] Smith), small-fruit beggar-ticks (*Bidens mitis* [Michx.] Sherff), fetterbush (*Lyonia lucida* [Lam.] K. Koch), and common buttonbush (*Cephalanthus occidentalis* L.).

The PZ-5A habitat area was saturated with minimal pooled surface water areas on 28 November 2017. The area is best described as a forested habitat with a variable cover of groundcover vegetation. There was a substantial amount of debris present as a result of winds associated with Hurricane Irma. Common groundcover species include fringed yellow-eyed grass *Xyris fimbriata* Elliott), Virginia chain fern (*Woodwardia virginica*

[L.] Smith), cinnamon fern (*Osmunda cinnamomea* L.), viviparous spikerush (cf. *Eleocharis vivipara* Link), warty panicum (*Kellochloa verrucosa* Muhl.), fall panic grass (*Panicum dichotomiflorum* Michx.), Walter's sedge (*Carex striata* Michx.), lizard's tail (*Saururus cernuus* L.), three-way sedge (*Dulichium arundinaceum* [L.] Britton), and purple bluestem (*Andropogon glomeratus* [Walter] Britton et al. var. *glaucopsis* [Elliott] C. Mohr). Common shrubs include sweet pepperbush (*Clethra alnifolia* L.), fetterbush (*Lyonia lucida* (Lam.) K. Koch), Virginia willow (*Itea virginica* L.), and swamp doghobble (*Eubotrys racemosus* [L.] Nutt.). The canopy is dominated by red maple (*Acer rubrum* L.), with slash pine (*Pinus elliottii* Engelm.), loblolly pine (*Pinus taeda* L.), laurel oak (*Quercus laurifolia* Michx.), sweetgum (*Liquidambar styraciflua* L.), and pond cypress (*Taxodium ascendens* Brongn.) also being present. The water levels within this area have recently been higher and moss and lichen populations are discrete, indicating predictable water levels. The cover of sphagnum moss ranges from 5–10% of the vegetative cover.

SUMMARY:

Vegetation: Excellent coverage of groundcover species
Hydrology: Water level lower than recent high water marks
Soils: Saturated and inundated

PZ-6

In 1999, the wetland in the PZ-6 area was previously clear-cut with existing groundcover being bulldozed and arranged in long linear piles. This appeared to have been a common management activity for this area for many years. In May 1999, the area was dry but extensive dry algal mats present on the soil surface indicated this area had recently been very wet. No canopy species were present but trees common in the debris piles include swamp red-bay (*Persea palustris* [Raf.] Sarg.), slash pine (*Pinus elliottii* Engelm.), loblolly bay (*Gordonia lasianthus* [L.] Ellis.) and sweetbay (*Magnolia virginiana* L.). Also tangled within these piles was an extensive wall of muscadine grape (*Vitis rotundifolia* Michx.), bamboo-vine (*Smilax laurifolia* L.), and highbush blackberry (*Rubus argutus* Link). Several swamp dog hobble (*Leucothoe racemosa* [L.] A. Gray) individuals were present in the regrowth area.

All of the soils in the area were severely disturbed; however, they had been colonized by an extensive growth of redroot (*Lachnanthes caroliniana* [Lam.] Dandy) and Walter's sedge (*Carex striata* L. H. Bailey) with occasional individuals of Savannah yellow-eyed grass (*Xyris fimbriata* Ell.), Virginia chain fern (*Woodwardia virginica* [L.] Smith), and bushy bluestem (*Andropogon glomeratus* [Walt.] BSP) being present.

The PZ-6 area as seen on October 21, 2003, was not significantly different than the condition seen on September 14, 2000. Cover of redroot (*Lachnanthes caroliniana* [Lam.] Dandy) and Virginia chain fern (*Woodwardia virginica* [L.] Smith) was extensive. No noticeable differences in species occurrence were encountered. The PZ-6 area during the October 21, 2003 survey was saturated to very shallowly inundated in areas. Redroot, Virginia chain fern, and capitate beakrush (*Rhynchospora microcephala* Britt. ex Small) were the dominant groundcover. Other species observed during this field inspection included: fascicled beakrush (*Rhynchospora fascicularis*), yellow-eyed grass (*Xyris* sp.), gallberry (*Ilex glabra*), dahoon holly (*Ilex cassine*) and bunched beaksedge (*Rhynchospora cephalantha*). This area existed in a similar condition as seen during the initial visit conducted in May 1999.

During the November 10, 2004 monitoring event, 90% of the cover in the area was attributed to redroot (*Lachnanthes caroliniana*). Soils in this area were saturated with the soil's surface covered by an extensive algal mat; however, little standing surface water was present. Deer and hog tracks were observed in this area.

The PZ-6 area was found to be very dry during the October 2005 monitoring event. The site had changed very little since 1999 with Virginia chain fern, redroot and fetterbush being the most commonly occurring species. The area near PZ-6 had been plowed for use as food plots during hunting season. Evidence of hog rooting was observed.

In October 2006, the PZ-6 area was found to be in similar condition to that found during previous monitoring events. The area was managed extensively for hunting. Redroot and Virginia chain fern constituted a large percentage of the groundcover. The site was

dry; however, there were extensive algal mats, indicating previous recent inundation. The type, nature and function of this area had not changed significantly since 1999.

During the November 8, 2007 monitoring event, the area of PZ-6 was dominated by red root that had apparently been affected by a recent freeze. Since 1999, the area had not changed significantly in nature. This area was actively utilized by hunters and both deer and dog tracks were observed in the wetlands. There was not much recruitment of trees in the clear cut areas, presumably due to the absence of seed source and the ongoing drought. Regrowth of the bays had occurred in some areas, however. The vegetation was primarily groundcover species with redroot and Virginia chain fern being dominant. At the time of field survey, the area was dry.

On October 29, 2008, the area of PZ-6 was dominated by herbaceous species, such as red root and beakrush (*Rhynchospora fascicularis* and *R. microcephala*). Dense clumps of Walter's sedge were also observed. The area was actively managed for hunting with cleared shooting lanes throughout and vehicle tracks present. Feral hogs had disturbed the soils throughout the wetland.

During the November 5, 2009 monitoring event, the area of PZ-6 appeared as it had in the past: a mowed, intensively managed, disturbed bay community used for hunting. The area was wet prairie dominated by redroot. The wetland was dry but evidence of short periods of inundation was widespread throughout the area. No remarkable changes had occurred in this area since 1999.

On October 26, 2010, the wetland near PZ-6 had extensive sedge (*Carex striata*) and cypress growth. The wetland had more water than in the past several years. There was evidence of hog activity and algal mats were observed beneath the redroot.

The character of the PZ-6 area on October 25, 2011 was similar to that found in 1999 when the evaluations began. This area was regularly inundated but was dry on October 26, 2011. The dominant vegetation was redroot, Virginia chain fern and broomsedge with minor amounts of Mohr's thoroughwort, shortleaf yellow-eyed grass (*Xyris brevifolia*) and Savannah yellow-eyed grass. This area was intensively managed for hunting and was mowed frequently.

No significant changes in the PZ-6 area were apparent on October 16, 2012. The entire survey area was shallowly inundated and a shallow high quality marsh continued to exist in an area intensively managed for turkey and deer hunting. The herbaceous coverage was excellent with high diversity and red root dying out in areas of deeper water. Deer tracks were observed, also. The red bays were affected by the ambrosia beetle in this area.

The entire PZ-6 site was flooded on 10 October 2013. This was the highest water levels seen to date. Walter's sedge (*Carex striata* Michx.) was the dominant groundcover species equaling 50% of the total groundcover. Redroot (*Lachnanthes caroliniana* [Lam.] Dandy) and Virginia chain fern (*Woodwardia virginica* [L.] Smith) were common with

coverages equaling 30% and 10%, respectively. Sphagnum moss densely covered the ground throughout the study area. The area was a well-developed high quality emergent marsh. There had been significant die-back of swamp red-bay (*Persea palustris* [Raf.] Sarg.) due either to invasion by ambrosia beetles or the increase in the water levels. Raccoon and deer tracks were observed in the wetland.

Consistent with the conditions noted in 2012–2013, the water level in PZ-6 in December 2014 was high and higher than previously seen. The area has developed into a high quality emergent marsh dominated by Walter's sedge (*Carex striata* Michx.), Virginia chain fern (*Woodwardia virginica* [L.] Smith), redroot (*Lachnanthes caroliniana* [Lam.] Dandy) and sphagnum moss (*Sphagnum* sp.). Watershield (*Brasenia schreberi*) was observed for the first time in this wetland. Due to the continued high water, the slash pine (*Pinus elliottii* Engelm.), which invaded into the area from 1999 through 2012, are currently stressed with noticeable chlorotic needles. A large colony of ducks was observed in PZ-6, as well as deer tracks.

In the area of PZ-6, the marsh is managed periodically for support of hunting activities. On 19 November 2015, there was a large area where herbicides had been recently applied to create more open water habitat, presumably for ducks. This open water area occurs primarily west of the PZ-6 location. No herbicide application has occurred east of the piezometer location. In this area there is a high quality marsh composed of a dense cover of Walter's sedge (*Carex striata* Michx.), Virginia chain fern (*Woodwardia virginica* [L.] Smith) and redroot (*Lachnanthes caroliniana* [Lam.] Dandy). Other species include watershield (*Brasenia schreberi* J. F. Gmel.), floating bladderwort (*Utricularia radiata*), American white water lily (*Nymphaea odorata* Sol.), fringed yellow-eyed grass (*Xyris fimbriata*), and broomsedge (*Andropogon virginicus* L. var. *glaucus* Hack.). The area surrounding PZ-6 provides a high quality emergent marsh habitat for water and wading birds as well as reptiles, mammals, and amphibians.

On November 30, 2016, the entire PZ-6 area was dry. Due to historical land clearing and herbicide activity, this area displays two (2) distinct plant associations. The area located west of the existing piezometer is composed of substantial bare ground areas with redroot (*Lachnanthes caroliniana* [Lam.] Dandy) and purple bluestem (*Andropogon glomeratus* var. *glaucopis*) forming a mosaic of vegetation coverages. The area east of the piezometer is covered with extremely dense Walter's sedge (*Carex striata* Michx.) with various coverage of redroot (*Lachnanthes caroliniana* [Lam.] Dandy) and Virginia chain fern (*Woodwardia virginica* [L.] Smith). Other species that form remnant coverages of uncleared but historically logged habitats include slash pine (*Pinus elliottii* Engelm.), swamp doghobble (*Leucothoe racemosa* [L.] A. Gray), loblolly bay (*Gordonia lasianthus* [L.] Ellis.), sweetbay (*Magnolia virginiana* L.), fetterbush (*Lyonia lucida* [Lam.] K. Koch), titi (*Cyrilla racemiflora* L.), and others. The herbaceous communities in this area are the result of past and present management programs for hunting.

As found during previous survey dates, on 28 November 2017 the PZ-6 area is being managed differently within the east and west areas of the wetland. West of the existing piezometer, the area has significant bare ground areas within a mosaic of dense redroot

(*Lachnanthes caroliniana* [Lam.] Dandy), Virginia chain fern (*Woodwardia virginica* [L.] Smith) and small coverages of Walter's sedge (*Carex striata* Michx.). The location east of the piezometer is nearly 100% covered by a dense growth of Walter's sedge (*Carex striata* Michx.). Distributed within this Walter's sedge coverage there are small populations of Virginia chain fern (*Woodwardia virginica* [L.] Smith), bunched beaksedge (*Rhynchospora microcephala* [Britton] Britton ex Small), purple bluestem (*Andropogon glomeratus* [Walter] Britton et al. var. *glaucopsis* [Elliott] C. Mohr), Mohr's thoroughwort (*Eupatorium mohrii* Greene), and redroot (*Lachnanthes caroliniana* [Lam.] Dandy). Around the perimeter of the marsh habitat there is a dense band of shrubs, briars, and trees to include pond cypress (*Taxodium ascendens* Brongn.), swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), sweet pepperbush (*Clethra alnifolia* L.), fetterbush (*Lyonia lucida* [Lam.] K. Koch), bamboo-vine (*Smilax laurifolia* L.), sweet gallberry (*Ilex coriacea* [Pursh] Chapm.), red maple (*Acer rubrum* L.), slash pine (*Pinus elliottii* Engelm.), loblolly pine (*Pinus taeda* L.), sweetbay (*Magnolia virginiana* L.), and loblolly bay (*Gordonia lasianthus* [L.] Ellis.). The marsh on this sample date only had a few isolated surface water pools; however, evidence of recent water level fluctuation was apparent.

SUMMARY:

Vegetation: Herbaceous wetland species were evident throughout the wetland
Hydrology: Water level fluctuation was evident with slightly lower water levels than recent times
Soil: Saturated and inundated

PZ-7

In 1999, the wetland in the PZ-7 area was a cypress-mixed hardwood swamp in which canopy trees were medium sized (not as large as PZ-8) and shrub cover and groundcover was dense. The area was drier than the situation noted at PZ-8; however, no specific signs of peat oxidation were present, although there was some top death of canopy trees noted. A well-defined moss collar was present indicating regular and periodic inundation. Commonly occurring species included:

Canopy & Subcanopy

Red maple	(*Acer rubrum* L.)
Loblolly bay	(*Gordonia lasianthus* L.)
Sweetbay	(*Magnolia virginiana* L.)
Wax myrtle	(*Morella cerifera* L.)
Swamp black gum	(*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.)
Swamp red-bay	(*Persea palustris* [Raf.] Sarg.)
Slash pine	(*Pinus elliottii* Engelm.)
Loblolly pine	(*Pinus taeda* L.)
Pond cypress	(*Taxodium ascendens* Brongn.)

Groundcover

Sweet pepperbush	(*Clethra alnifolia* L.)
Ink-berry	(*Ilex glabra* [L.] Gray)
Virginia willow	(*Itea virginica* L.)
Swamp doghobble	(*Leucothoe racemosa* [L.] A. Gray)
Fetterbush	(*Lyonia lucida* [Lam.] K. Koch)
Wax myrtle	(*Morella cerifera* L.)
Highbush blackberry	(*Rubus argutus* Link)
Bamboo-vine	(*Smilax laurifolia* L.)
Sphagnum moss	(*Sphagnum* species)
Poison ivy	(*Toxicodendron radicans* [L.] Kuntze)
Highbush blueberry	(*Vaccinium corymbosum* L.)
Muscadine grape	(*Vitis rotundifolia* Michx.)
Virginia chain fern	(*Woodwardia virginica* [L.] Smith)

The PZ-7 area on October 21, 2003, was very dry; however, the canopy and subcanopy were not significantly different than that seen previously. Species seen in May 1999 were essentially the same as those seen during the present survey. Moderate tree death of all species had occurred, as had moderate death of groundcover and shrub species.

The PZ-7 area on November 10, 2004 had generally higher water levels with surface saturation occurring and the water table being zero to six inches below the peat surface. Root exposure and soil oxidation were observed. Some windfall damage had occurred in the area. The wetland, on this date, had isolated pools of water; however, there was no widespread evidence of recent surface inundation.

The wetland associated with PZ-7 was more saturated than other nearby wetlands during the October 2005 monitoring event. Water was observed in an apparent manmade ditch across the berm from the piezometer. There was some soil subsidence in the wetland and tree mortality was noted, but may have been attributed to wind damage. There had been very little change in the vegetation in this area since monitoring began in 1999.

During the October 2006 monitoring event, the PZ-7 area was again very dry. There were no signs of recent inundation. Both moss collars and lichen lines were poorly defined, indicating an absence of water fluctuation. There were dead cypress knees present throughout the area with subsurface oxidation of peat apparent when trying to extract a soil core. Vegetation composition in the area had changed little since 1999; however, the area was showing distinct signs of significant drainage. A pair of bald eagles was observed in flight between PZ-7 and PZ-8. Deer tracks were observed on the road adjacent to PZ-8.

On November 8, 2007, the PZ-7 area was very dry with numerous fallen trees. Soils were dry to moist with no evidence of recent inundation. A large green frog was observed at the edge of the berm in this area. Oxidation of surface peat was obvious and it was difficult to extract a soil core from below the root mat. Exposure of roots of canopy trees was apparent. The species composition in the area had not changed significantly since 1999; however, changes in the characteristics of surface mucks were apparent.

During the October 29, 2008 monitoring event, the PZ-7 area had been logged to the northwest since the previous year's monitoring event. The logging appeared to be within the preservation area. Soil subsidence was evident with moist to saturated soils. Exposed roots were evident on many of the trees. There was no evidence of recent inundation.

The PZ-7 wetland area was excessively dry during the November 5, 2009 monitoring event. Soils were excessively dry, which precluded extraction of a soil sample in the sampling auger; the duff layer was greater than three feet deep. There were essentially no herbaceous species to be found in the ground cover, which was dominated by persistent rhizomatous, woody facultative wet species. There was no moss present on trees or hummocks and soil oxidation, root rot and tree fall were widespread. This wetland area appeared to have been severely drained.

On October 26, 2010, the wetland near PZ-7 was exhibiting signs of improvement, presumably due to the reclamation activities that had been completed to the south. The soil was saturated at approximately six inches below land surface, but oxidation

continued to occur due to receding groundwater. The detrital coverage was good and the mature trees appeared to be thriving, although regeneration is not occurring.

On October 25, 2011 the PZ-7 area was found to be very dry with no evidence of any inundation. Additionally, there was no evidence that the water table had been close to the surface. This wetland was the lowest quality wetland of the nine that had been monitored and it had not changed significantly since 1999. The area was providing minimal habitat for wetland-dependent species.

On October 16, 2012, the majority of the PZ-7 wetland area displayed saturated soils with lower areas being shallowly inundated with small pools of water. This was the first time since 1999 that any hint of a surface water table had been present in this area. However, the water table still remained far below the level that would have historically been present in this wetland area. Adventitious rooting on red maple (*Acer rubrum* L.) was present; however, the water table had not been present long enough to promote regrowth of a herbaceous groundcover layer that was still largely absent in this wetland area. There was much less *Lyonia lucida* than in previous years and the red bays were being affected by the ambrosia beetles.

In 2013, the appearance of the PZ-7 area had changed substantially since the last sampling event. Due to the rise in groundwater and surface water levels, there had been a substantial decrease in the density of understory shrub species. Except for this trend, vegetation diversity and composition changes had been minimal; however, structural changes in roots, cypress knees, and soil consistency were obvious. New growth of roots for cypress and black gum was apparent as well as adventitious root growth on red maple (*Acer rubrum* L.). Soils were more compact due to the rise in groundwater levels and a stabilization of the water surface. Surface water currently existed as discontinuous pools; however, this represented a marked change in the significantly drained condition that was present from 1999 to 2011.

On 10 December 2014, the PZ-7 wetland area was inundated over 80% of the wetland area. These are by far the highest water levels seen in this area since monitoring began. Flow from the wetland at this time was occurring across the access berm south to the southern wetland area. Pines occurring south of the berm are dying due to the high water levels. Within the PZ-7 area, extensive death of preexisting groundcover and shrub species has occurred. The canopy trees in the area of PZ-7 are healthy, with no apparent die-back of either the main bole or lateral branches being evident. Cypress knee growth is apparent and prolific growth of new red maple (*Acer rubrum* L.) roots indicates the canopy is responding well to the inundation levels. The existing water level in the wetland is equivalent to a low normal wet season level that existed historically prior to drainage. Lemnids covered 80% of the surface water area.

The PZ-7 area continues to improve in response to the higher surface water levels since 2012. The water levels on 19 November 2015 appeared to be ±6 inches less than the maximum levels that have recently occurred in the area based on water marks. Regrowth of shrub and herbaceous vegetation has been minimal and the water surface is 100%

covered with Lemnids; however, all canopy trees exhibit excellent vigor and regrowth of cypress knees, blackgum knees, and adventitious roots of maples is apparent. Due to the continued presence of surface water, the sediments have become stable and no longer contain air voids that do not support pedestrian access.

On November 30, 2016, the PZ-7 area was dry with no surface water present in the vicinity of the sample area. Surface water occurring south of the access road is being artificially elevated due to a series of earthen berms. These berms caused substantial flooding of the area in 2015. Within the study area, there is limb fall and tree fall associated with the fall hurricane winds. There is a paucity of herbaceous groundcover, seedlings of shrubs or trees, or saplings of any tree species. There is occasional top death of trees but most canopy species are healthy. Dominant trees include bald cypress (*Taxodium distichum* [L.] L. Rich.), swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), red maple (*Acer rubrum* L.), and sweetbay (*Magnolia virginiana* L.). Wax myrtle (*Morella cerifera* L.) and fetterbush (*Lyonia lucida* [Lam.] K. Koch) are the dominant shrubs present in the area.

On 28 November 2017, the PZ-7 area was dry with the groundcover table ±8" below the surface. The water levels have been higher recently in the past as is evidenced by the adventitious rooting of red maple (*Acer rubrum* L.) in the area. There is minimal herbaceous growth in the area and a sparse cover of shrubs is also notable. Herbaceous cover is generally limited to a very sparse cover of cinnamon fern (*Osmunda cinnamomea* L.) and Virginia chain fern (*Woodwardia virginica* [L.] Smith). Soil subsidence in the area is moderate but the stability of the peat is substantially more stable than was present prior to 2010. The canopy is dominated by red maple (*Acer rubrum* L.), with bald cypress (*Taxodium distichum* [L.] L. Rich.) being very common north of the site. The canopy species are healthy with no evidence of recent top canopy bole death. Common species currently in the area include sweet pepperbush (*Clethra alnifolia* L.), swamp laurel oak (*Quercus laurifolia* Michx.), sawtooth blackberry (*Rubus argutus* Link), fetterbush (*Lyonia lucida* [Lam.] K. Koch), netted chain fern (*Woodwardia areolata* [L.] Moore), sweetbay (*Magnolia virginiana* L.), and dahoon holly (*Ilex cassine* L.). There is evidence of some storm damage in the sample area and surrounding habitats.

SUMMARY:

Vegetation: Minimal herbaceous growth; canopy species appear healthy
Hydrology: Standing water in some areas, but evidence of higher water levels observed
Soils: Inundated in areas and saturated throughout wetland

PZ-8

In May 1999, the wetland in the area of PZ-8 was best characterized as a cypress-mixed hardwood swamp. Very large canopy trees were present throughout this area of the wetland. Canopy species included slash pine (*Pinus elliottii* Engelm.), loblolly pine (*Pinus taeda* L.), pond cypress (*Taxodium ascendens* Brongn.), sweetbay (*Magnolia virginiana* L.), swamp black gum (*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.), swamp red-bay (*Persea palustris* [Raf.] Sarg.), water oak (*Quercus nigra* L.), and red maple (*Acer rubrum* L.). Shrub and groundcover species included Virginia chain fern (*Woodwardia virginica* [L.] Smith), sweet pepperbush (*Clethra alnifolia* L.), Virginia willow (*Itea virginica* L.), dimorphic chain fern (*Woodwardia areolata* [L.] Moore), fetterbush (*Lyonia lucida* [Lam.] K. Koch), lizard's tail (*Saururus cernuus* L.), highbush blueberry (*Vaccinium corymbosum* L.), muscadine grape (*Vitis rotundifolia* Michx.), false nettle (*Boehmeria cylindrica* [L.] Sw.), and poison ivy (*Toxicodendron radicans* [L.] Kuntze). Woolgrass (*Scirpus cyperinus*), wild goldenglow (*Bidens laevis*), fall panicum (*Panicum dichotomiflorum*), wax myrtle (*Morella cerifera*), dog fennel (*Eupatorium capillifolium*) and smallfruit beggarticks (*Bidens mitis*) were new species observed during the October 21, 2003 survey.

The wetland was inundated with one to two feet of tannic water at the time of the October 21, 2003 survey. Soils were inundated and mucky with a peat layer evident. Herbaceous species were naturally recruiting in this system. Approximately 30% of the water surface was covered by duckweed (*Lemna* sp.).

During the 2004 monitoring event, the PZ-8 area was the wettest seen to date. Areas where logging holes were previously created were too deep to support emergent herbaceous plants. Water was ponded several feet higher north of the berm than existed in the ditch to the south of the berm. Duckweed (*Lemna* spp.) covered approximately 20% of the surface. Regrowth of sweetbay (*Magnolia virginiana*) had continued; however, many of the surviving pond cypress (*Taxodium ascendens*) appeared stressed.

The wetland associated with PZ-8 had standing water present during the October 11, 2005 monitoring event. The water appeared to be originating from the rehydration effort being conducted to the east of this location. Regrowth of some surviving bay saplings continued with sweetbay and swamp red bay being most prominent. Much of the site was too deep to promote extensive emergent cover development; however, common cattail (*Typha latifolia*), smallfruit beggarticks and woolgrass bulrush were present throughout the site.

In October 2006, the PZ-8 wetland was dry. Small-fruit beggar ticks were the predominant groundcover species totaling approximately 80% of the total groundcover. This area was good marsh habitat with evidence of recent inundation. Since the area was logged, there had been a regrowth of red maple, swamp red-bay and sweetbay; however, the area was best described as a freshwater marsh.

During the November 8, 2007 monitoring event, the PZ-8 area was dry with no evidence of recent inundation. The area to the west had been recountoured/reclaimed, which should improve the hydrology of this wetland over time. Dog fennel was present in the higher elevations and a very small patch of cattails was identified. The surficial layer of the peat was moist, but no recent signs of inundation were present. Small-fruit beggar-ticks and fall panic grass were the dominant groundcover species present. Some evidence of soil oxidation was present. There had been substantial regrowth of sweetbay, swamp red-bay, red maple and swamp black gum in this area.

On October 29, 2008, the wetland near PZ-8 was moist with good herbaceous coverage in the area that had been logged previously. There were regenerating bays and red maples that were 15-20 feet in height. The soils were moist to saturated. One area that was inundated had dense spikerush (*Eleocharis* sp.) growth. Camphor weed (*Pluchea odorata*) was noted during this event. A bald eagle was observed in flight over the wetland.

During the November 5, 2009 monitoring event, the PZ-8 area was inundated with a dense mat of a viviparous *Eleocharis* species covering the surface water. Water depths ranged from six to 10 inches; however, hydrologic indicators showed recent water levels were eight to 10 inches higher. The water was clear and tannic with a host of herbaceous species present. This wetland provided substantial habitat for aquatic-dependent species and had maintained a measurable surface hydroperiod since 2003. There were numerous wildlife trails observed in this area.

On October 26, 2010, the wetland near PZ-8 appeared to be improving in condition. There was an increase in cattails near the berm road, but they appeared to be in an isolated small area. The wetland floor was inundated and water lilies were present.

On October 25, 2011 there was no surface inundation found at PZ-8. However, the area was saturated and surface water had recently been present. Warty Panicum was the dominant species covering approximately 80% of the area. Small-fruit beggar-ticks, woolgrass bulrush and fall panicum were also found throughout the area. Regrowth of sweetbay, swamp red bay and red maple continued to be observed. Some cattails were observed, but the coverage was less than in previous years.

On October 16, 2012 the PZ-8 area was completely inundated by levels that would be considered as normal seasonal high for this area. A substantial herbaceous cover was present that included American white water lily (*Nymphaea odorata* Sol.), small-fruit beggar-ticks (*Bidens mitis* [Michx.] Sherff), warty panicum (*Kellochloa verrucosa* Muhl.), club-head cutgrass (*Leersia hexandra* Swartz), and shrubs and small trees to include common buttonbush (*Cephalanthus occidentalis* L.), wax myrtle (*Morella cerifera* L.), sweetbay (*Magnolia virginiana* L.), and dahoon holly (*Ilex cassine* L.). Many of the swamp red-bay (*Persea palustris* [Raf.] Sarg.) had been killed by the redbay ambrosia beetle–laurel wilt pathogen. The appearance of the area had not significantly changed in the last several years.

In 2013, the PZ-8 area had not changed significantly in the last several years. Surface water was present throughout the wetland, which was a mix of moderate quality emergent marsh dispersed through wetland hardwood areas dominated by small red maple (*Acer rubrum* L.), sweetbay (*Magnolia virginiana* L.), dahoon holly (*Ilex cassine* L.), and swamp red-bay (*Persea palustris* [Raf.] Sarg.). Some cattails were present in this wetland.

The appearance of the PZ-8 wetland on 10 December 2014 has not changed significantly since 2013. The water levels were higher in 2014 but this has not changed the general appearance of the swamp. The area remains a mixed shrub–marsh system with forest canopy regeneration occurring. Dominant species include red maple (*Acer rubrum* L.), sweetbay (*Magnolia virginiana* L.), slash pine (*Pinus elliottii* Engelm.), dahoon holly (*Ilex cassine* L.), and woolgrass bulrush (*Scirpus cyperinus* [L.] Kunth), with Virginia chain fern (*Woodwardia virginica* [L.] Smith) as the dominant groundcover. A few cattails (*Typha latifolia*) were observed in PZ-8.

Due to the increase in water levels over the past several years, the PZ-8 area has become somewhat devoid of a diverse herbaceous cover. On 19 November 2015, it was obvious that the open water area has recently expanded. There was minimal Lemnid cover and there has been a die-off of cattail. The water color is extremely dark tannic, but clear. American white water lily (*Nymphaea odorata* Sol.) is the dominant herbaceous species.

PZ-8 is an historically clear-cut area that is currently a marsh habitat. On November 30, 2016, the area was mostly dry with only a small pool of shallow standing water. There are few remnant southern cattail (*Typha domingensis* Pers.), woolgrass bulrush (*Scirpus cyperinus* [L.] Kunth), and American white water lily (*Nymphaea odorata* Sol.) with occasional small-fruit beggar-ticks (*Bidens mitis* [Michx.] Sherff) present. Regeneration of red maple (*Acer rubrum* L.), dahoon holly (*Ilex cassine* L.), and sweetbay (*Magnolia virginiana* L.) is occurring in the area.

The PZ-8 area as found on 28 November 2017 had not changed significantly in appearance since the previous monitoring event. As previously described, the survey area is an emergent marsh created from a clear-cut of a previously forested wetland habitat. The wetland area has a central deep surface water pool with ±40% coverage of American white water lily (*Nymphaea odorata* Sol.). The emergent areas are covered with pine barren goldenrod (*Solidago fistulosa* Mill.), mild water-pepper (*Persicaria hydropiperoides* Michx.), woolgrass bulrush (*Scirpus cyperinus* [L.] Kunth), soft rush (*Juncus effusus* L.), and fall panic grass (*Panicum dichotomiflorum* Michx.). There is a very small population of southern cattail (*Typha domingensis* Pers.) present. The coppiced canopy species have continued to grow since the initial clear-cut such that extensive coverage of subcanopy size species are present. Common species include red maple (*Acer rubrum* L.), sweetbay (*Magnolia virginiana* L.), slash pine (*Pinus elliottii* Engelm.), loblolly pine (*Pinus taeda* L.), swamp red-bay (*Persea palustris* [Raf.] Sarg.), and loblolly bay (*Gordonia lasianthus* [L.] Ellis.). Shrub species include sweet pepperbush (*Clethra alnifolia* L.), Virginia willow (*Itea virginica* L.), and fetterbush (*Lyonia lucida* [Lam.] K. Koch). This area in the past has displayed a predictable hydroperiod and this continues to date.

SUMMARY:

Vegetation: Cattail coverage continues to decline; substantial coverage of subcanopy species
Hydrology: Open water somewhat reduced from 2016
Soils: Inundated

PZ-9 NEAR I-75 AT CB-1

The wetland located in the vicinity of PZ-9 had recently been clear-cut prior to the May 1999 survey with less than 5% of the previous canopy remaining. The wetland was a riparian system characterized by a well-defined stream channel with adjacent steeply sloping transitional seepage areas. The wetland was inundated during the October 22, 2003 survey. Canopy cover still remained below 10%; however, regrowth of herbaceous groundcover had been extensive and large common buttonbush (*Cephalanthus occidentalis* L.) was frequent within the wetland. A list of the commonly occurring species within the wetland and adjacent seepage areas included the following:

Red maple	(*Acer rubrum* L.)
False nettle	(*Boehmeria cylindrica* [L.] Sw.)
Sedge	(*Carex* L. species)
Long's sedge	(*Carex longii* Mack.)
Walter's sedge	(*Carex striata* L. H. Bailey)
Common buttonbush	(*Cephalanthus occidentalis* L.)
Compact dodder	(*Cuscuta compacta* Juss. ex Choisy)
Sheathed flatsedge	(*Cyperus haspan* L.)
Flatsedge	(*Cyperus stenolepis* Torr.)
Baldwin's spikerush	(*Eleocharis baldwinii* [Torr.] Chapm.)
Fireweed	(*Erechtites hieracifolia* [L.] Raf.)
Small dog-fennel thorough-wort	(*Eupatorium capillifolium* [Lam.] Small)
Clustered mille graine	(*Hedyotis uniflora* [L.] Lam.)
Dahoon holly	(*Ilex cassine* L.)
Virginia willow	(*Itea virginica* L.)
Soft rush	(*Juncus effusus* L.)
Many-head rush	(*Juncus polycephalus* Michx.)
American frogbit	(*Limnobium spongia* [Bosc.] L.C. Rich. Ex Steud)
Sweetgum	(*Liquidambar styraciflua* L.)
Seaside seedbox	(*Ludwigia maritima* F. Harper)
Creeping seedbox	(*Ludwigia repens* J. Forst.)
Fetterbush	(*Lyonia lucida* [Lam.] K. Koch)
Sweetbay	(*Magnolia virginiana* L.)
Wax myrtle	(*Morella cerifera* L.)
Swamp black gum	(*Nyssa sylvatica* Marsh. var. *biflora* [Walt.] Sarg.)
Cinnamon fern	(*Osmunda cinnamomea* L.)
Needleleaf witchgrass	(*Dicanthelium aciculare* Desv. ex Poir)
Panic grass	(*Dicanthelium ensifolium* Trin.)

Fall panic grass	(*Panicum dichotomiflorum* Michx.)
Redtop panicum	(*Coleataenia rigidula* Bosc ex Nees)
Swamp red-bay	(*Persea palustris* [Raf.] Sarg.)
Common pokeweed	(*Phytolacca americana* L.)
Slash pine	(*Pinus elliottii* Engelm.)
Mild water-pepper	(*Persicaria hydropiperoides* Michx.)
Mermaidweed	(*Proserpinaca palustris* L.)
Water oak	(*Quercus nigra* L.)
Live oak	(*Quercus virginiana* Mill.)
Highbush blackberry	(*Rubus argutus* Link)
Heartwing dock	(*Rumex hastatulus* Baldwin)
Sabal palm	(Sabal palmetto Walt.)
Lizard's tail	(*Saururus cernuus* L.)
Saw palmetto	(*Serenoa repens* [Bartr.] Small)
Bamboo-vine	(*Smilax laurifolia* L.)
Sphagnum moss	(*Sphagnum* species)
Poison ivy	(*Toxicodendron radicans* [L.] Kuntze)
Highbush blueberry	(*Vaccinium corymbosum* L.)
Muscadine grape	(*Vitis rotundifolia* Michx.)
Virginia chain fern	(*Woodwardia virginica* [L.] Smith)

The upland areas surrounding the wetland were best described as mesic hammocks with common species being present to include:

Dwarf huckleberry	(*Gaylussacia dumosa* [Andrews] Torr. & Gray)
Ink-berry	(*Ilex glabra* [L.] Gray)
Sweetgum	(*Liquidambar styraciflua* L.)
Southern magnolia	(*Magnolia grandiflora* L.)
Bracken fern	(*Pteridium aquilinum* [L.] Kuhn)
Laurel oak	(*Quercus hemisphaerica* Bartr.)
Water oak	(*Quercus nigra* L.)
Live oak	(*Quercus virginiana* Mill.)
Winged sumac	(*Rhus copallina* L.)
Saw palmetto	(*Serenoa repens* [Bartr.] Small)
Saw greenbrier	(*Smilax bona-nox* L.)
Cat greenbrier	(*Smilax glauca* Walter)
Muscadine grape	(*Vitis rotundifolia* Michx.)

During the 2004 monitoring event, water levels were found to be the highest seen to date, due, in part, to the high rainfall that occurred in later summer of 2004. However, beavers have moved into this area and constructed an east-west dam across the southern portion of the wetland, which pooled water to the north.

There was a dense coverage of algae in the water at the PZ-9 wetland on October 11, 2005. The water levels were substantially lower than those found in 2004. The surface of the water was covered with American frogbit (*Limnobium spongia*); however, little vegetation change had occurred since the previous monitoring event. The subcanopy trees, comprised of primarily red maple, were vigorously growing. Hummocks were prevalent throughout the wetland. Frogs and a red-shouldered hawk were observed vocalizing in and near the wetland.

At the time of the eighth monitoring event conducted on October 31, 2006, the PZ-9 wetland was completely dry. Buttonbush coverage had increased to approximately 70% of the area. Extensive regrowth of red maple had occurred in the past seven years. Normally, this area was inundated by 12-18 inches of water, but was dry in response to the 2006 drought. The subcanopy trees, composed primarily of red maple, were vigorously growing.

During the November 8, 2007 monitoring event, the PZ-9 area was very dry with many adventitious roots exposed on the buttonbush shrubs. The trees in this system appeared to be severely stressed rather than dormant. Approximately 10% of the red maple trees showed some trunk and branch death in the canopy. There was a well-defined lichen line present on trees, but the moss collar on the tree buttresses was not well defined. The area had developed into a good common buttonbush shrub swamp in the area of the survey with about 30% coverage of golden canna. There were well-developed adventitious roots present on the common buttonbush indicating water depths commonly approach 12 inches in the area. Soils were dry and there was no evidence of recent inundation.

On October 29, 2008, the PZ-9 area was very dry with extensive red maple regeneration. Water lines were evident on many of the trees and shrubs. Soils were moist but not saturated. The buttonbush shrubs were thriving with adventitious roots evident. Moss was approximately six inches above the ground level.

The PZ-9 wetland area was dry on November 5, 2009; however, the dryness appeared to be a result of low rainfall rather than drainage of the area. There were robust hydrologic indicators throughout the wetland indicating water levels quite commonly ranged from one to two feet deep. Since logging prior to 1999, the wetland had developed into a high-quality shrub swamp dominated by buttonbush and red maple seedlings, which ranged in size from three to five inches in dbh (diameter at breast height). There was an abundance of facultative wet and obligate herbaceous groundcover species that were distributed throughout the wetland. Evidence of beaver activity was observed (gnawed trees).

On October 26, 2010, the wetland near PZ-9 was somewhat dry due to a lack of recent rainfall. The soil had more moisture than previous years and contained a healthy organic layer. The red maples had buttressed trunks and there were channels where water had been recently conveyed. This was a high quality wetland that experienced regular and periodic inundation. Passerine birds were vocalizing during the monitoring event.

During the October 25, 2011 monitoring event, the entire area near PZ-9 was cleared in preparation for mining. Therefore, the last monitoring event was conducted in 2010.

Discussion

Table 1, Qualitative Assessment Summary, is a compilation of the reviewers' evaluations of the sites. Average value and standard deviation for each factor and site are included. All unitless numeric values on the qualitative scale are discussed in the methods section with the factors rated from 1 to 4 where 1 is poor and 4 is excellent.

A comparison between the twenty years' data (1998-2017) by area is provided in the following tables. The average value for the selected parameter is compared between years.

PZ-1 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	80.0	0.0	20.0	3.2	2.8	1.8	3.3	1.3	1.3	1.8
1999	50.0	0.0	50.0	2.2	2.5	3.0	2.2	2.1	1.3	1.2
2000	85.0	6.7	8.3	2.8	3.0	3.0	3.0	3.0	3.0	3.0
2001	81.7	0.0	18.3	2.7	2.7	2.0	2.5	2.5	1.8	2.2
2002	68.3	3.3	28.3	2.5	2.3	2.0	2.3	1.5	1.3	1.5
2003	51.7	0.0	48.3	2.3	2.5	2.2	2.5	1.3	1.3	1.3
2004	43.3	0.0	56.7	2.5	2.3	2.7	2.5	2.2	1.8	1.8
2005	43.3	1.7	55.0	2.3	2.2	2.2	2.2	2.3	1.8	1.8
2006	56.7	0.0	43.3	2.5	2.7	2.5	2.5	2.0	2.0	1.8
2007	60.0	0.0	40.0	2.5	3.0	2.3	3.0	2.3	1.7	1.7
2008	60.0	0.0	40.0	2.7	3.0	2.3	2.5	2.3	2.0	2.0
2009	51.7	3.3	45.0	2.7	2.7	2.7	2.5	2.3	2.3	2.3
2010	76.7	0.0	23.3	2.5	3.0	3.0	2.8	3.2	3.2	3.2
2011	63.3	0.0	36.7	3.0	3.0	3.3	3.0	2.8	2.7	2.8
2012	63.3	0.0	36.7	2.7	3.0	3.0	3.0	3.2	3.2	3.2
2013	56.7	0.0	43.3	2.5	2.7	3.0	2.7	2.8	2.5	3.2
2014	70.0	0.0	30.0	2.7	2.7	3.0	3.0	2.8	3.2	2.8
2015	61.7	0.0	38.3	2.7	2.7	2.3	2.3	3.0	2.3	3.0
2016	56.7	0.0	41.7	3.3	3.0	2.7	3.0	3.3	2.7	2.7
2017	58.3	0.0	41.7	3.0	3.7	4.0	3.7	3.3	2.3	2.3

Percent desirable species decreased from 1998 to 1999, increased from 1999 to 2001, decreased during 2002 through 2004, remained constant in 2005, increased in 2006 through 2008 with a slight decrease in 2009. In 2010, the percent desirable species increased significantly in the wetland associated with PZ-1 with a minor decrease in 2011, no change in 2012, a decrease in 2013, an increase in 2014 and then a decrease in 2015 and 2016 due to increased water levels. Nuisance species have remained below 10% during all 19 years of monitoring with a slight increase from 2001 to 2002. Percent bare ground has fluctuated from year to year, but generally increased from 2001 to 2004, with a slight decrease in 2005. Between 2006 and 2008, the percent bare ground has remained fairly constant, but decreased considerably in 2010, increased in 2011, remained constant in 2012, increased somewhat in 2013, decreased in 2014 and increased somewhat in 2015 and 2016. In 2017, the desirable species increased slightly.

PZ-2 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	78.3	0.0	21.7	2.7	2.5	2.2	2.7	1.3	1.5	1.5
1999	35.0	0.0	65.0	2.2	2.2	2.3	2.2	2.3	1.3	1.3
2000	75.0	3.3	21.7	3.3	2.5	2.7	2.3	2.3	2.3	2.3
2001	68.3	0.0	31.7	2.2	2.0	1.7	2.2	2.2	1.8	1.3
2002	41.7	0.0	58.3	1.8	2.2	2.5	1.8	2.0	1.3	1.3
2003	46.7	0.0	53.3	2.2	2.2	2	2.3	1.7	1.5	1.5
2004	50.0	0.0	50.0	2.3	2.5	2.2	2.8	2.2	1.8	2.2
2005	46.7	1.7	51.7	2.2	2.7	2.2	2.7	2.7	2.2	1.8
2006	50.0	0.0	50.0	2.3	2.3	2.5	2.0	2.0	2.0	1.7
2007	53.3	0.0	46.7	2.7	2.7	2.3	2.7	2.0	1.7	1.7
2008	58.3	0.0	41.7	2.7	2.3	2.3	2.2	2.0	1.7	1.7
2009	50.0	1.7	48.3	2.5	2.7	2.8	2.7	2.5	2.3	2.3
2010	73.3	0.0	26.7	2.8	2.8	3.0	2.8	2.7	2.7	2.7
2011	71.7	0.0	28.3	3.0	3.0	3.3	2.8	3.0	2.5	2.5
2012	65.0	3.3	31.7	2.7	3.0	2.5	2.8	3.2	3.2	3.2
2013	50.0	0.0	50.0	2.7	3.0	2.8	3.0	3.2	3.2	3.2
2014	63.3	0.0	36.7	2.7	3.0	3.0	3.0	3.2	3.2	2.8
2015	48.3	0.0	51.7	2.3	2.7	2.3	2.3	3.0	2.0	3.0
2016	48.3	0.0	50.0	3.3	3.0	3.0	2.7	2.7	2.0	2.3
2017	61.7	0.0	38.3	2.7	3.3	3.7	3.3	3.0	2.0	2.0

Percent desirable species decreased in 1999, increased in 2000 and has been decreasing until 2002 when slight increases occurred. Desirable species remained generally constant from 2003 through 2009 with an increase in 2010. Slight decreases in desirable species were observed from 2011 through 2013, but 2014 had an increase. In 2015, the desirable species decreased due to an increase in open water, which continued in 2016. In 2017, the open water was reduced resulting in an increase of desirable species. A slight increase in percentage of nuisance species occurred in 2000, but was reduced to zero from 2001 through 2004 with a slight increase in 2005 and 2009. In 2011, no nuisance species were observed, but in 2012 a slight increase was noted, which was back down to

zero in 2013 through 2017. Bare ground coverage had been decreasing since 2005, increased slightly in 2009, decreased substantially in 2010 and increased each year since 2011 with a decrease in 2014 and increase in 2015. In 2016, the bare ground coverage remained nearly the same as 2015. In 2017, the bare ground coverage decreased due to an increase in desirable species and lack of open water.

PZ-3 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	63.3	11.7	25.0	2.0	1.7	1.3	2.0	1.2	1.2	1.2
1999	80.0	0.0	20.0	2.5	2.0	2.2	1.5	1.5	1.3	1.3
2000	75.0	3.3	21.7	3.3	2.5	2.7	2.3	2.3	2.3	2.3
2001	75.0	0.0	25.0	2.7	2.7	2.3	2.3	2.0	2.2	2.2
2002	73.3	6.7	20.0	2.8	2.3	2.3	2.5	1.3	1.3	1.3
2003	36.7	10.0	53.3	2.2	2.3	2.2	2.3	2.2	1.7	1.5
2004	50.0	0.0	50.0	2.7	3.0	3.0	2.8	3.0	3.0	3.0
2005	60.0	3.3	36.7	2.5	2.7	2.2	2.7	2.3	2.3	2.3
2006	65.0	0.0	35.0	3.0	3.0	3.3	2.7	2.8	2.2	2.2
2007	68.3	0.0	31.7	3.0	2.7	2.7	3.0	2.7	2.0	2.0
2008	75.0	0.0	25.0	3.0	3.0	2.7	2.8	2.8	2.2	1.8
2009	60.0	3.3	36.7	3.0	3.0	3.0	3.0	3.2	2.8	3.2
2010	75.0	0.0	25.0	3.0	3.0	3.0	2.8	3.2	2.8	3.2
2011	66.7	0.0	33.3	3.0	3.0	3.0	3.3	3.0	2.5	2.7
2012	73.3	3.3	25.0	2.7	3.0	3.3	2.5	3.2	3.2	3.2
2013	53.3	0.0	46.7	2.7	3.0	3.0	3.0	3.0	3.2	3.2
2014	70.0	0.0	30.0	2.7	3.0	3.0	3.0	3.0	3.0	3.0
2015	60.0	0.0	40.0	2.0	2.7	2.3	2.7	3.0	2.3	3.0
2016	43.3	0.0	55.0	2.7	3.0	3.0	2.7	2.7	2.0	2.0
2017	60.0	0.0	40.0	4.0	3.7	3.7	3.7	3.7	4.0	4.0

The percent desirable species has remained fairly constant since 2003 with minor increases and decreases periodically. In 2013, the percent desirable species decreased significantly due primarily to the decrease in plants resulting from the increased water levels in the wetland. In 2014, the percent desirable species increased considerably, but decreased in 2015 and 2016 due to increased water levels. Desirable species increased in 2017 as a result of a decrease in water levels. Nuisance species coverage has varied somewhat during the 20-year monitoring period, but remains very low. Bare ground remained fairly constant for the first five years of monitoring, but has fluctuated somewhat since 2003. The fluctuations for the last few years are believed to be the result of the increase in water levels that has reduced some of the groundcover plant coverage.

PZ-4 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	60.0	16.7	23.3	1.5	1.5	1.7	1.3	1.2	1.3	1.5
1999	46.7	0.0	53.3	2.3	2.3	3.0	2.0	2.5	2.0	1.3
2000	10.0	6.7	83.3	1.0	1.0	1.0	1.0	1.0	1.3	1.3
2001	81.7	0.0	18.3	2.7	2.2	2.0	2.3	2.2	2.2	1.7
2002	88.3	0.0	11.7	2.7	2.5	2.3	2.3	2.2	2.0	2.2
2003	90.0	0.0	10.0	2.5	2.7	2.5	2.5	2.3	1.7	2.0
2004	86.7	0.0	13.3	2.8	2.8	3.0	3.0	2.5	2.2	2.2
2005	86.7	0.0	13.3	2.5	2.7	3.0	2.8	2.2	1.8	1.8
2006	95.0	0.0	5.0	2.8	3.0	3.0	3.0	2.5	2.2	1.8
2007	88.3	1.7	10.0	2.5	3.0	3.0	3.0	2.5	2.8	2.2
2008	90.7	3.3	6.0	2.5	3.0	3.2	3.0	2.8	2.5	2.5
2009	95.0	0.0	5.0	2.8	3.3	3.0	3.0	3.5	3.2	3.2
2010	95.0	0.0	5.0	3.7	3.8	3.5	3.5	4.0	4.0	4.0
2011	95.0	0.0	5.0	3.3	3.8	4.0	3.3	3.2	3.2	3.2
2012	90.7	0.0	9.3	3.3	3.3	3.3	3.0	3.5	2.3	3.5
2013	91.7	0.0	8.3	3.7	4.0	4.0	3.5	4.0	3.7	3.7
2014	62.5	0.1	23.7	2.4	2.5	2.7	2.6	2.7	2.7	2.6

Vegetation diversity decreased dramatically at PZ-4 due to the clear cutting of the area in 2000; however, natural recruitment has occurred and the percent coverage of desirable species as well as vegetation diversity has increased during the subsequent monitoring periods with relatively similar coverage the past 13 years. In 2015, the percent desirable vegetation decreased due to the increase in bare ground resulting from the increased water levels. The bare ground category increased as a result of the silviculture activities in the area in 2000, but has remained fairly constant the past six monitoring events. Nuisance species appear to be tapering off with a nominal amount recorded during the 2008 monitoring period, none for the next five years and a small amount in 2014.

PZ-4A WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
2015	81.7	0.3	18.0	2.2	2.5	2.4	2.4	2.7	2.3	2.7
2016	76.0	0.0	7.3	2.7	2.7	2.6	2.5	2.6	2.2	2.3
2017	90.0	0.0	5.7	2.8	3.1	3.1	3.0	2.9	2.5	2.5

Because PZ-4 was inaccessible in 2015, a new location was evaluated for the past two years, as depicted in the table above. In 2016, desirable species were slightly reduced due to the presence of more open water. Desirable species in 2017 increased substantially due to the lack of open water. Nuisance species have remained very low.

PZ-5 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	80.0	15.0	5.0	2.2	2.2	2.5	2.3	1.7	1.3	1.5
1999	80.0	0.0	20.0	2.0	2.0	1.8	3.0	2.0	1.3	1.3
2000	85.0	6.7	8.3	2.2	2.5	2.3	2.7	2.3	2.5	2.3
2001	93.3	0.0	6.7	2.5	2.7	2.3	2.3	2.5	2.7	2.5
2002	90.0	0.0	10.0	2.0	2.2	2.2	2.2	1.8	1.8	1.8
2003	98.3	0.0	1.7	2.3	2.8	2.5	2.8	3.0	1.8	2.8
2004	75.0	0.0	25.0	3.2	3.2	3.2	3.0	2.8	2.8	3.2
2005	68.3	0.0	31.7	2.3	2.3	2.5	2.2	2.7	2.0	2.0
2006	75.0	0.0	25.0	2.3	2.2	2.2	2.2	2.2	1.8	1.8
2007	63.3	0.0	36.7	2.0	2.3	2.3	2.3	2.0	2.0	1.7
2008	71.7	0.0	28.3	2.2	2.2	2.2	2.5	2.5	2.2	1.8
2009	70.0	0.0	30.0	2.2	2.7	2.7	2.7	2.8	2.5	2.5
2010	80.0	0.0	20.0	2.7	3.0	3.2	2.8	3.2	2.8	3.2
2011	81.7	0.0	18.3	3.2	3.0	3.2	3.0	3.2	3.0	2.8
2012	76.7	3.3	20.0	3.0	3.7	3.5	3.2	3.3	3.3	3.3
2013	65.0	0.0	35.0	3.2	3.2	3.0	2.7	2.8	3.2	3.2
2014	63.6	0.3	21.9	2.5	2.8	2.8	2.7	2.9	2.8	2.8

The percent desirable species for the PZ-5 area remained fairly constant for the first three years, then increased for three years and has fluctuated up and down the last 15 years. Nuisance species have fluctuated slightly over the 19 years with coverage of zero for 11 consecutive monitoring periods prior to a slight increase in 2012 and 2014. Bare ground coverage has fluctuated up and down in response to the desirable species coverage and water levels.

PZ-5A WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
2015	66.7	0.0	33.3	2.3	2.7	2.4	2.5	2.9	2.4	2.9
2016	68.3	0.0	30.0	2.8	2.7	2.8	2.5	2.6	2.2	2.3
2017	56.7	0.0	43.3	2.9	3.0	2.9	2.9	2.9	2.5	2.6

In 2015, the location of PZ-5 was inaccessible so a new location was evaluated and is labeled as PZ-5A. In 2016, the desirable species and nuisance species remained nearly the same as 2015. The desirable species decreased in 2017.

PZ-6 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	80.0	15.0	5.0	2.2	2.2	2.5	2.3	1.7	1.3	1.5
1999	57.0	0.0	43.3	1.2	1.2	2.0	1.3	1.3	0.8	1.3
2000	8.3	5.0	86.7	1.0	1.0	1.0	1.0	1.0	2.0	1.3
2001	61.7	0.0	38.3	1.8	2.2	2.2	2.0	1.5	1.5	1.3
2002	70.0	0.0	30.0	2.5	2.7	2.7	3.0	2.2	2.5	2.7
2003	86.7	0.0	13.3	2.2	2.7	2.8	2.5	2.5	2.2	1.8
2004	71.7	0.0	28.3	2.5	3.0	2.8	3.0	2.5	2.5	2.2
2005	76.7	0.0	23.3	2.3	2.3	2.2	2.3	2.2	1.8	1.8
2006	53.3	0.0	46.7	2.2	2.2	2.2	2.3	1.7	1.0	1.3
2007	73.3	6.7	20.0	2.3	2.5	2.5	2.5	2.0	2.0	1.7
2008	75.0	0.0	25.0	2.2	2.3	2.2	2.7	1.7	1.7	1.7
2009	81.7	3.3	15.0	2.3	2.5	2.7	2.2	1.8	1.8	1.5
2010	80.0	0.0	20.0	2.7	3.0	3.0	3.0	3.0	3.2	3.2
2011	85.0	0.0	15.0	2.7	3.0	3.0	2.8	2.7	3.0	2.3
2012	78.3	0.0	21.7	2.7	3.3	3.5	3.3	3.0	2.8	3.3
2013	85.0	0.0	15.0	3.2	3.5	3.2	2.8	3.5	3.5	3.5
2014	85.0	0.0	15.0	3.5	3.5	3.7	3.8	3.7	3.7	3.7
2015	73.3	0.3	26.3	3.7	4.0	4.0	3.3	4.0	3.0	3.7
2016	86.7	0.0	13.3	2.7	3.3	3.7	3.0	3.0	2.0	2.0
2017	91.7	0.0	8.3	3.0	3.3	3.0	4.0	3.0	2.3	2.3

Due to silvicultural activities, the percent desirable species was drastically reduced in the wetland near PZ-6 between 1999 and 2000. However, natural recruitment has increased the coverage of desirable species from 2001 to 2014 with a decrease in 2015 due to the increase in open water. In 2016, the desirable species increased due to a decrease in open water. Desirable species increased somewhat in 2017. Nuisance species were not observed in 2016 or 2017 and have remained low for most of the twenty monitoring events. Bare ground has fluctuated over the 20-year period, primarily due to the land being managed for hunting purposes. Extensive hog activity was observed in 2017.

PZ-7 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	70.0	23.3	6.7	2.5	1.7	1.2	1.3	1.3	1.2	1.3
1999	61.7	0.0	38.3	2.0	3.0	3.0	3.3	2.7	2.2	2.3
2000	65.0	13.3	21.7	3.2	2.7	2.3	2.8	2.3	2.7	2.5
2001	83.3	0.0	16.7	2.5	3.0	3.0	3.0	2.2	2.0	2.0
2002	70.0	0.0	30.0	2.8	2.5	2.5	2.3	2.0	1.8	2.3
2003	63.3	0.0	36.7	2.5	2.5	2.7	2.5	2.7	1.5	2.2
2004	63.3	0.4	36.3	2.8	2.7	2.7	3.0	2.5	2.5	2.5
2005	63.3	0.0	36.7	2.7	2.7	2.7	2.5	2.7	2.3	2.3
2006	75.0	0.0	25.0	2.3	2.7	2.7	2.8	2.8	2.5	2.3
2007	65.0	0.0	35.0	2.7	2.7	2.3	2.3	2.3	2.3	2.3
2008	60.0	0.0	40.0	2.7	2.7	2.7	2.7	2.8	2.2	2.5
2009	63.3	6.7	30.0	2.8	2.5	2.7	2.5	2.0	1.7	1.7
2010	66.7	0.0	33.3	2.7	3.0	3.3	2.3	3.0	2.3	2.3
2011	43.3	3.3	53.3	2.3	2.5	2.5	2.2	2.3	2.2	2.2
2012	61.7	3.3	35.0	2.7	3.0	3.3	2.8	3.2	3.2	3.2
2013	51.7	3.3	45.0	2.7	3.0	2.8	2.7	3.0	3.3	3.0
2014	60.0	0.0	40.0	2.7	3.0	3.0	3.0	3.2	3.2	3.2
2015	58.3	0.0	41.7	3.0	3.0	2.3	3.0	3.3	2.7	3.0
2016	36.7	0.0	63.3	3.0	3.0	3.0	3.0	2.7	2.0	2.0
2017	60.0	0.0	40.0	2.3	3.0	2.7	2.7	2.7	1.7	2.0

The percent desirable species in the wetland near PZ-7 has remained fairly constant during the 19-year monitoring period with identical numbers for three years (2003 through 2005) and minor fluctuations between 2006 and 2010. In 2011, the desirable species coverage declined considerably, primarily due to the drought conditions. In 2012, desirable species increased, but decreased in 2013 presumably due to the increased water levels, which resulted in a reduction in ground cover species. In 2014 and 2015, desirable species fluctuated slightly and in 2016, the desirable species decreased considerably. In 2017, desirable species increased to levels formerly observed prior to 2016. Nuisance species appeared to be nearly eliminated from 2005 through 2008 with minor fluctuations from 2009 to 2013. Bare ground coverage has fluctuated due to the drought conditions from 2010 to 2011 and subsequent flooding experienced in 2013.

PZ-8 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	81.7	5.0	13.3	2.3	2.3	2.2	2.2	2.5	1.2	1.3
1999	58.3	0.0	41.7	2.2	3.2	3.3	3.2	3.0	2.0	2.5
2000	83.3	1.7	15.0	3	3.2	2.7	3.2	3.0	3.0	3.0
2001	18.3	0.0	81.7	1.3	1.2	1.2	1.3	1.0	.83	1.0
2002	75.0	5.0	20.0	2.5	2.3	2.2	2.2	2.0	1.8	2.0
2003	51.7	3.3	45.0	2.5	2.7	2.7	2.3	3.2	3.2	3.2
2004	63.0	0.7	36.3	3.0	2.7	3.0	2.5	2.7	2.7	2.7
2005	78.3	2.0	19.7	2.7	2.8	3.0	2.5	2.7	3.0	3.0
2006	91.7	1.0	7.3	2.8	3.0	3.5	2.8	3.2	3.2	2.8
2007	92.3	5.4	2.3	3.0	2.8	2.5	2.8	2.8	2.2	1.8
2008	93.3	0.0	6.7	3.3	3.0	3.2	3.0	3.5	3.2	3.2
2009	88.0	2.7	9.3	3.3	3.2	3.2	2.8	3.2	3.5	3.8
2010	70.0	14.0	16.0	3.0	3.3	3.5	3.3	3.5	3.5	3.2
2011	92.0	2.7	5.3	3.2	3.0	3.0	2.8	3.2	2.5	3.2
2012	87.0	1.0	12.0	3.0	3.0	3.5	3.0	3.2	3.2	3.2
2013	76.7	10.0	13.3	3.0	3.0	3.0	3.0	3.0.	3.2	3.2
2014	78.3	8.3	10.0	3.0	3.0	3.2	2.8	3.2	3.2	3.2
2015	68.3	5.0	26.7	2.7	3.0	3.3	2.3	3.7	3.0	3.3
2016	40.0	3.3	53.3	2.7	3.3	2.7	2.7	2.7	2.0	2.0
2017	79.3	1.0	13.0	3.0	3.3	3.0	2.7	3.0	3.3	3.3

Due to the clearcutting of this wetland, percent desirable species decreased dramatically during the 2001 monitoring period; however, the coverage increased significantly during the 2002 monitoring event, experienced a decline during the 2003 monitoring event, increased from 2004 through 2008 and experienced a small decrease in 2009 and 2010. In 2011, the desirable species coverage increased significantly, but decreased slightly in 2012 with a larger decrease in 2013. In 2014, percent desirable species increased slightly, as did nuisance species coverage. In 2015 and 2016, percent desirable species decreased somewhat due to an increase in open water. The lack of open water resulted in a substantial increase in desirable species in 2017. Bare ground coverage has similarly fluctuated over the 20-year period as a result of varying water levels that reduced vegetation growth.

PZ-9 WETLAND

YR.	DES SPP	NUIS SPP	BARE GRND	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	AMP USE
1998	61.7	5.0	33.3	2.0	1.3	1.5	2.0	2.0	1.2	1.3
1999	46.3	0.0	56.3	2.3	2.0	1.7	2.2	1.2	1.2	1.5
2000	71.7	5.0	25.0	2.0	2.3	2.5	2.2	2.7	2.7	3.0
2001	96.7	0.0	3.3	2.8	2.5	2.5	2.3	3.0	3.0	2.8
2002	76.7	0.0	23.3	3.0	3.0	3.0	2.3	2.8	3.3	3.3
2003	60.0	0.0	40.0	3.2	2.8	3	2.8	3.2	3.2	3.2
2004	80.0	0.0	20.0	3.3	3.5	3.7	3.8	3.5	3.5	3.5
2005	61.7	0.0	38.3	3.0	2.8	2.8	2.5	3.2	3.2	3.2
2006	76.7	0.0	23.3	3.0	3.2	2.8	2.8	3.3	3.5	3.5
2007	73.3	0.0	26.7	2.7	2.5	2.3	2.7	2.2	1.8	1.5
2008	71.7	0.0	28.3	2.8	3.3	2.7	2.8	2.7	2.0	2.3
2009	68.3	0.0	31.7	2.7	3.2	2.8	2.8	2.7	2.3	2.3
2010	66.7	0.0	33.3	3.0	3.0	3.0	3.0	3.0	2.3	2.3
2011	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The percent desirable species in the wetland near PZ-9 has increased since the initial monitoring event with fluctuations up and down over the monitoring period. Since 2006, the percent desirable species has declined each year. Nuisance species coverage appears stable and bare ground coverage has fluctuated since 1998 due in large part to silvicultural activities.

In 2011, the PZ-9 area had been cleared for mining and no vegetation remained. Therefore, this area will no longer be included in the assessment of these wetlands.

WETLAND HYDROLOGY AND RAINFALL

The expected average annual rainfall for White Springs, Florida, which is south of and in the vicinity of the piezometer wetlands evaluated, is 47.27 inches (provided by the Florida Climate Center of Florida State University). In 2017, the actual rainfall recorded for the White Springs station was 51.39 inches, which is 4.12 inches, or approximately 1.09%, above the yearly average of 47.27 inches. There were higher rain events in the months of January, April, May, June and September. In the remaining months, the actual rainfall was less than the averages.

Jasper has an official NOAA-NWS rainfall monitoring station. The yearly average annual rainfall for Jasper based on the years 1950-2013 is 51.46 inches. During 2017, the rainfall recorded for the Jasper station was 45.68, which is 5.78 inches, or approximately 1.12%, below the yearly average. There were higher rainfall events in January, May, June and September.

For 2017, the actual rainfall values measured at White Springs were below the average values for seven months and above average for five months of the year. At Jasper, the actual rainfall values were below the average values for eight months and above the average for four months. June and September were the only months during which significant increases in actual rainfall values versus average rainfall values were observed for both stations. During the other months when the actual rainfall exceeded the average rainfall, it was by a fairly nominal amount. The data are shown in graph format on Figures 16 and 17.

The hydrology of the piezometer wetlands is beginning to more closely mimic the rainfall events, indicating that reclamation activities are positively affecting the adjacent, unmined wetlands.

CONCLUSIONS AND RECOMMENDATIONS

An annual qualitative survey of the PCS piezometer wetlands was performed 28 and 29 November 2017. From 2004 to 2012, North Florida experienced a long-term drought, which came to an abrupt end in May 2012 when a ±100-year event occurred. Since this time, above normal rainfall patterns have continued throughout the year and extended through November 2015. During the 19 November 2015 sampling event, all wetland areas surrounding the piezometer wetlands contained water and were inundated to historical normal seasonal levels. The water levels that were encountered in all piezometer study wetlands on 19 November 2015 were as high as any previous levels encountered during the study. It appears hydrologic conditions in all wetlands have returned to levels that would be expected in the pre-mining condition. It is apparent that mechanical manipulation of the surface water and groundwater levels in the area by drainage has been discontinued based on the general in-situ hydrologic condition of the wetlands seen from 2012 to 2015. The surface water and wetland boundaries in all areas during this period corresponded to the historical waterward extent of upland canopy vegetation that was present immediately prior to mining. In 2016, North Florida rainfall was less than what occurred from 2012 to 2015. The reduction in rainfall in 2016 has resulted in a substantial reduction in the surface water extent in all PZ-1 to PZ-8 sample areas. However, the 2016 surface water levels reflected a normal low rainfall year level that would have historically been experienced. Within areas of North Florida, 2017 rainfall levels from June through October were at levels exceeding any historical recorded rainfall totals. These very high rainfall totals occurred within Alachua County and neighboring counties to the north, east, and west; however, from on-ground indicators these high rainfall totals do not appear to have occurred within Hamilton or Columbia counties. The rainfall within the area of the piezometer wetlands does not appear to have been excessive based on the condition of the wetlands and surrounding habitat as seen during the November 2017 survey. There is evidence of moderate wind damage occurring as a result of Hurricane Irma in September 2017; however, excessive rainfall apparently did not occur within the study area. Water levels were at low normal levels which are expected for the October–November fall dry season typically occurring within North Florida on an annual basis. Although the entire study area shows historical signs of regional drawdown, the current levels are not indicative of the expected condition when active dewatering of an area is occurring in response to active mining conditions.

These recent trends in regional rainfall are an important factor and should be considered when evaluating the results of the field surveys provided within this report. Critical observations regarding the general comparative conditions of the wetlands are described briefly below with a more complete summary provided for each wetland within the context of this report.

Nine (9) wetlands (**Figures 1 and 2**) were monitored from 1999 to 2011 to evaluate the comparative changes in hydrology and vegetation occurring from year to year. Monitoring of Wetland 9 was discontinued in 2011 due to mining of the area. Shallow piezometers were placed in each wetland in 1999 and water levels have been monitored

by PCS since vegetation monitoring began. The areas where surveys were performed during 2012–2014 are shown in **Figures 3, 4,** and **5**. Due to access issues, monitoring wetlands for the PZ-4 and PZ-5 areas were moved to the PZ-4A and PZ-5A locations in 2015 as shown on **Figures 6** and **7**. The general monitoring access routes and piezometer locations are shown on Figure 7.

In general, the nine (9) original wetlands can be divided into five (5) general hydrologic groups based on historical appearance as related to hydrologic conditions.

Group 1: Piezometer 9 was located within an inundated area east of I-75. This wetland for the intent and purpose of this study was considered as a control wetland. Since the study began, this area had shown periods of regular and periodic inundation that would be indicative of a natural hydroperiod for this wetland. This wetland, due to landscape position, displayed hydroperiod fluctuations in direct response to rainfall but this wetland did not retain water for extended periods in times of drought. The piezometer 9 wetland area was completely removed in preparation for mining in 2011.
Group 2: Wetland 8 is a second category of wetland that has been inundated extensively on many field visits; however, the water table in this area appears to have been artificially manipulated to some degree by PCS in the past by surface application of water from possibly pumping from deeper groundwater sources. The water table in this wetland has been consistent with and reflects the current condition of adjacent created and natural wetland areas.

Group 3: Wetland 6 is an intensively managed area that has been logged and cleared but not mined. This area has been variously wet and dry since 1999 in response to seasonal rainfall. The area is regularly and periodically inundated. During the October 2011 field visit, the area was saturated within 6 in. of the surface but no surface water was present. In October 2012, the entire wetland 6 survey area was shallowly inundated. In October 2013, the entire area was inundated to depths ranging from 8 in. to 12 in. The water levels in December 2014 were the highest observed to date. In November 2016 and 2017, the wetland 6 area was dry. During all survey events the PZ-6 wetland area consistently showed signs of a regularly and periodically fluctuating water table.

Group 4: The wetland 4 area is a mixed emergent marsh/shrub wetland that historically was forested but was logged. Since 1999, this area has shown a significant degree of hydrologic fluctuation but the area is inundated on a regular and periodic basis. The water levels seen in December 2014 were the highest encountered in this area to date, with surface waters extending east and south to the access berm. On 19 November 2015, the vegetation monitoring station was moved to location 4A because of access issues for Station 4. The new monitoring area is shown on Figures 6 and 7. The piezometer 4 wetland area has exhibited the most stable surface water levels of all sample areas over the entire study period.

Group 5: Wetlands 1, 2, 3, 5, and 7 in the past have been severely drained with significant vegetative and soils changes occurring that reflect the hydrologic alteration. In the past, these areas have experienced similar hydrologic conditions. In 2010, the

hydrologic conditions in wetlands 1, 2, 3, and 5 had significantly changed for the better. There has been a vast improvement in the elevation of the surficial groundwater table, which has continued to the present. Within these wetlands, significant growth of cypress knees has occurred as well as adventitious root production occurring on red maple (*Acer rubrum* L.). As a result, hummock production is occurring with subsequent regrowth of moss collars, etc. This change in hydrology is too dramatic to be a natural change and appears to be a man-made alteration in the local water table. These wetlands in 2010 were remarkably wetter than the wetland 9 area, which is considered as the control. In 2011, the wetland areas were significantly wetter than wetlands located in other parts of the county, which are currently dry as a result of the extended drought. In October 2012 wetlands 1, 2, 3, and 5 were inundated and water levels were the highest seen since 1999. Wetlands were inundated to levels that precluded pedestrian survey of areas that were visited when the sites had been dry. This trend has continued through 2013. Since 2013, the water levels in these wetlands have continued to increase with the November 2015 levels being maintained at levels seen since 2012. The Wetland 5 monitoring location was moved to Location 5A on 19 November 2015 due to access issues for Location 5 (Figures 6 and 7).

Wetland 7 has historically been excessively dry over the entire period and no change in the appearance of this wetland was noted in October 2011. However, in October 2012 this wetland area was inundated to a degree in which shallow pools of water were present in the lower elevation areas. No signs of surface inundation or saturation had been seen in this area since 1999. This trend has continued through 2014. In December 2014, surface water cover within the wetland was extensive.

Throughout all wetland areas visited until 16 October 2012 there was noticeable evidence of dieback of swamp red-bay (*Persea palustris* [Raf.] Sarg.) due to attacks by the redbay ambrosia beetle (*Xyleborus glabatus*)–laurel wilt pathogen (*Raffaelea lauricola*).0F0F[1] The effects of this disease on this species should not be confused or attributed to changes in the hydrologic condition on the vigor of swamp red-bay (*Persea palustris* [Raf.] Sarg.). The die-off has continued through 2017. Currently most of the swamp red-bay population has died.

[1] Crane, J. H., J. Peña, and J. L. Osborne. 2008. Redbay Ambrosia Beetle–Laurel Wilt Pathogen: A Potential Problem for the Florida Avocado Industry. UF IFAS Extension Article HS1136.

TABLE 1

PCS PHOSPHATE

2017 QUALITATIVE ASSESSMENT OF PIEZOMETER WETLANDS

PZ-1

	ALGA	H20 FLUC	DES SPEC	NUIS SPEC	BARE GRD	OPEN H20	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	FISH USE	AMP USE
#1	4	Y	60.0	0.0	40.0	0.0	3.0	3.0	4.0	3.0	3.0	2.0	1.0	2.0
#2	4	Y	60.0	0.0	40.0	0.0	3.0	4.0	4.0	4.0	3.0	3.0	1.0	2.0
#3	4	Y	55.0	0.0	45.0	5.0	3.0	4.0	4.0	4.0	4.0	2.0	1.0	3.0
Ave.	4.0	N/A	58.3	0.0	41.7	1.7	3.0	3.7	4.0	3.7	3.3	2.3	1.0	2.3
STD	0.0	N/A	50.0	0.0	2.4	2.4	0.0	0.5	0.0	0.5	0.5	0.5	0.0	0.5

PZ-2

	ALGA	H20 FLUC	DES SPEC	NUIS SPEC	BARE GRD	OPEN H20	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	FISH USE	AMP USE
#1	4	Y	60.0	0.0	40.0	0.0	3.0	3.0	4.0	3.0	3.0	2.0	1.0	2.0
#2	4	Y	65.0	0.0	35.0	0.0	2.0	4.0	4.0	4.0	3.0	2.0	1.0	2.0
#3	4	Y	60.0	0.0	40.0	5.0	3.0	3.0	3.0	3.0	3.0	2.0	1.0	2.0
Ave.	4.0	N/A	61.7	0.0	38.3	1.7	2.7	3.3	3.7	3.3	3.0	2.0	1.0	2.0
STD	0.0	N/A	80.0	0.0	2.4	2.4	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0

PZ-3

	ALGA	H20 FLUC	DES SPEC	NUIS SPEC	BARE GRD	OPEN H20	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	FISH USE	AMP USE
#1	4	Y	60.0	0.0	40.0	0.0	4.0	3.0	3.0	3.0	4.0	4.0	2.0	4.0
#2	2	Y	65.0	0.0	35.0	0.0	4.0	4.0	4.0	4.0	3.0	4.0	2.0	4.0
#3	3	Y	55.0	0.0	45.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	4.0
Ave.	3.0	N/A	60.0	0.0	40.0	1.7	4.0	3.7	3.7	3.7	3.7	4.0	2.0	4.0
STD	0.8	N/A	4.1	0.0	4.1	2.4	0.0	0.5	0.5	0.5	0.5	0.0	0.0	0.0

PZ-4A

	ALGA	H20 FLUC	DES SPEC	NUIS SPEC	BARE GRD	OPEN H20	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	FISH USE	AMP USE
#1	4	Y	85.0	0.0	10.0	5.0	4.0	3.0	2.0	2.0	4.0	3.0	3.0	4.0
#2	4	Y	95.0	0.0	2.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	4.0
#3	2	Y	90.0	0.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0
Ave.	3.0	N/A	90.0	0.0	5.7	4.3	2.8	3.1	3.1	3.0	2.9	2.5	1.3	2.5
STD	0.9	N/A	18.8	0.0	17.1	0.9	1.3	1.2	1.4	1.3	1.3	1.3	0.9	1.4

PZ-5A

	ALGA	H20 FLUC	DES SPEC	NUIS SPEC	BARE GRD	OPEN H20	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	FISH USE	AMP USE
#1	N/A	Y	60.0	0.0	40.0	0.0	3.0	3.0	2.0	3.0	3.0	2.0	1.0	2.0
#2	N/A	Y	60.0	0.0	40.0	0.0	2.0	3.0	3.0	3.0	3.0	2.0	1.0	2.0
#3	N/A	Y	50.0	0.0	50.0	0.0	3.0	3.0	3.0	3.0	3.0	2.0	1.0	2.0
Ave.	N/A	N/A	56.7	0.0	43.3	0.0	2.9	3.0	2.9	2.9	2.9	2.5	1.4	2.6
STD	N/A	N/A	23.0	0.0	17.5	0.0	1.3	1.1	1.2	1.1	1.2	1.3	0.8	1.4

PZ-6

	ALGA	H20 FLUC	DES SPEC	NUIS SPEC	BARE GRD	OPEN H20	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	FISH USE	AMP USE
#1	N/A	Y	90.0	0.0	10.0	0.0	3.0	3.0	2.0	4.0	3.0	2.0	1.0	2.0
#2	N/A	Y	90.0	0.0	10.0	0.0	2.0	3.0	3.0	4.0	2.0	2.0	1.0	2.0
#3	N/A	Y	95.0	0.0	5.0	0.0	4.0	4.0	4.0	4.0	4.0	3.0	1.0	3.0
Ave.	N/A	N/A	91.7	0.0	8.3	0.0	3.0	3.3	3.0	4.0	3.0	2.3	1.0	2.3
STD	N/A	N/A	2.4	0.0	2.4	0.0	0.8	0.5	0.8	0.0	0.8	0.5	0.0	0.5

PZ-7

	ALGA	H20 FLUC	DES SPEC	NUIS SPEC	BARE GRD	OPEN H20	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	FISH USE	AMP USE
#1	4	Y	65.0	0.0	35.0	0.0	3.0	3.0	2.0	2.0	3.0	2.0	0.0	2.0
#2	4	Y	60.0	0.0	40.0	0.0	2.0	3.0	3.0	3.0	3.0	1.0	0.0	1.0
#3	4	Y	55.0	0.0	45.0	0.0	2.0	3.0	3.0	3.0	2.0	2.0	0.0	3.0
Ave.	4.0	N/A	60.0	0.0	40.0	0.0	2.3	3.0	2.7	2.7	2.7	1.7	0.0	2.0
STD	0.0	N/A	4.1	0.0	4.1	0.0	0.5	0.0	0.5	0.5	0.5	0.5	0.0	0.8

PZ-8

	ALGA	H20 FLUC	DES SPEC	NUIS SPEC	BARE GRD	OPEN H20	VEG DIV	WILD USE	AVI USE	MAM USE	REP USE	INV USE	FISH USE	AMP USE
#1	4	Y	74.0	1.0	20.0	5.0	3.0	3.0	2.0	2.0	4.0	4.0	3.0	4.0
#2	4	Y	89.0	1.0	0.0	10.0	3.0	4.0	4.0	3.0	2.0	3.0	3.0	3.0
#3	3	Y	75.0	1.0	19.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ave.	3.7	N/A	79.3	1.0	13.0	6.7	3.0	3.3	3.0	2.7	3.0	3.3	3.0	3.3
STD	0.5	N/A	6.8	0.0	9.2	2.4	0.0	0.5	0.8	0.5	0.8	0.5	0.0	0.5

Figure 1. Locations of nine (9) piezometer wetlands.

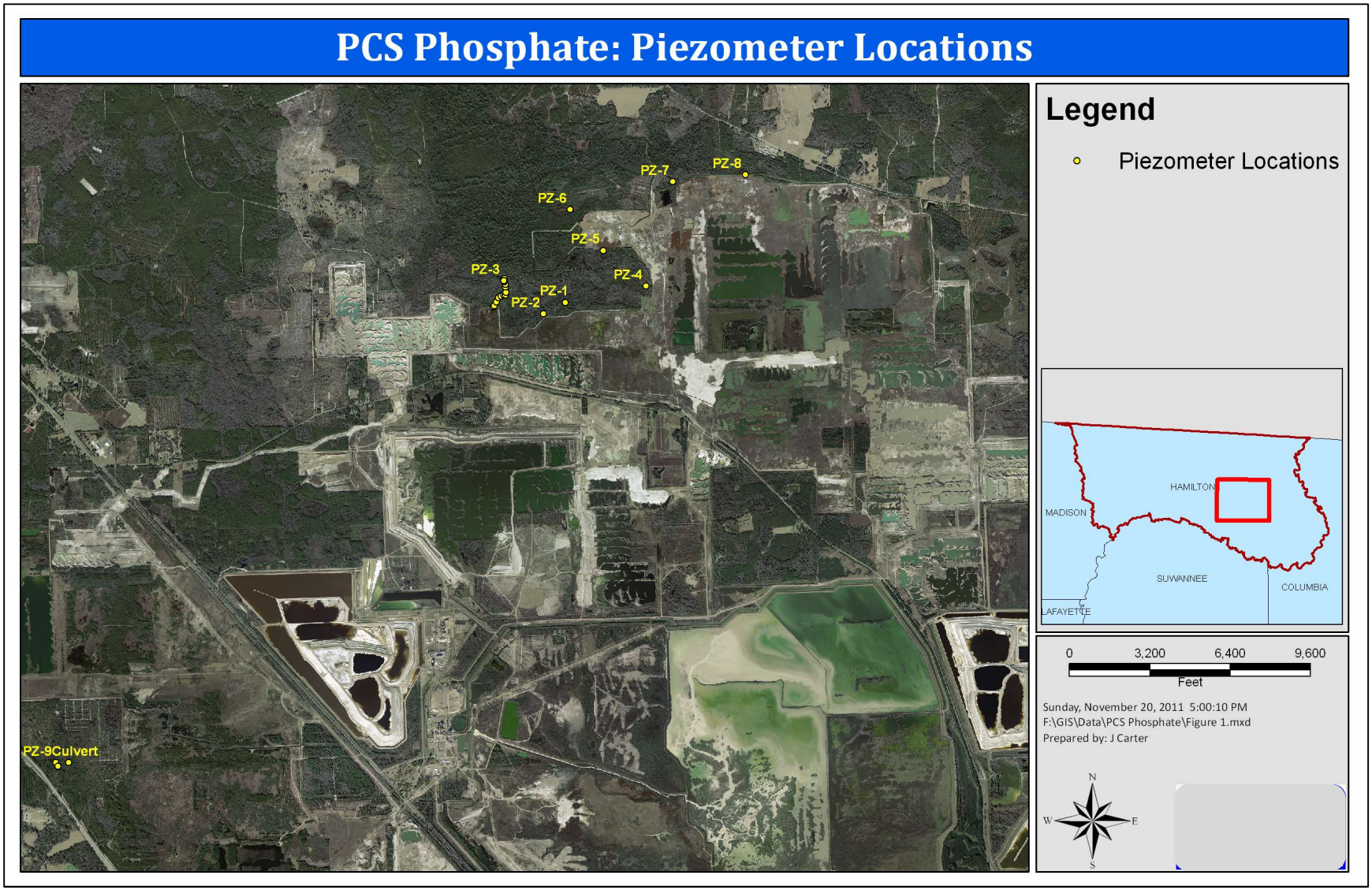


Figure 2. Locations of piezometers 1 through 8.

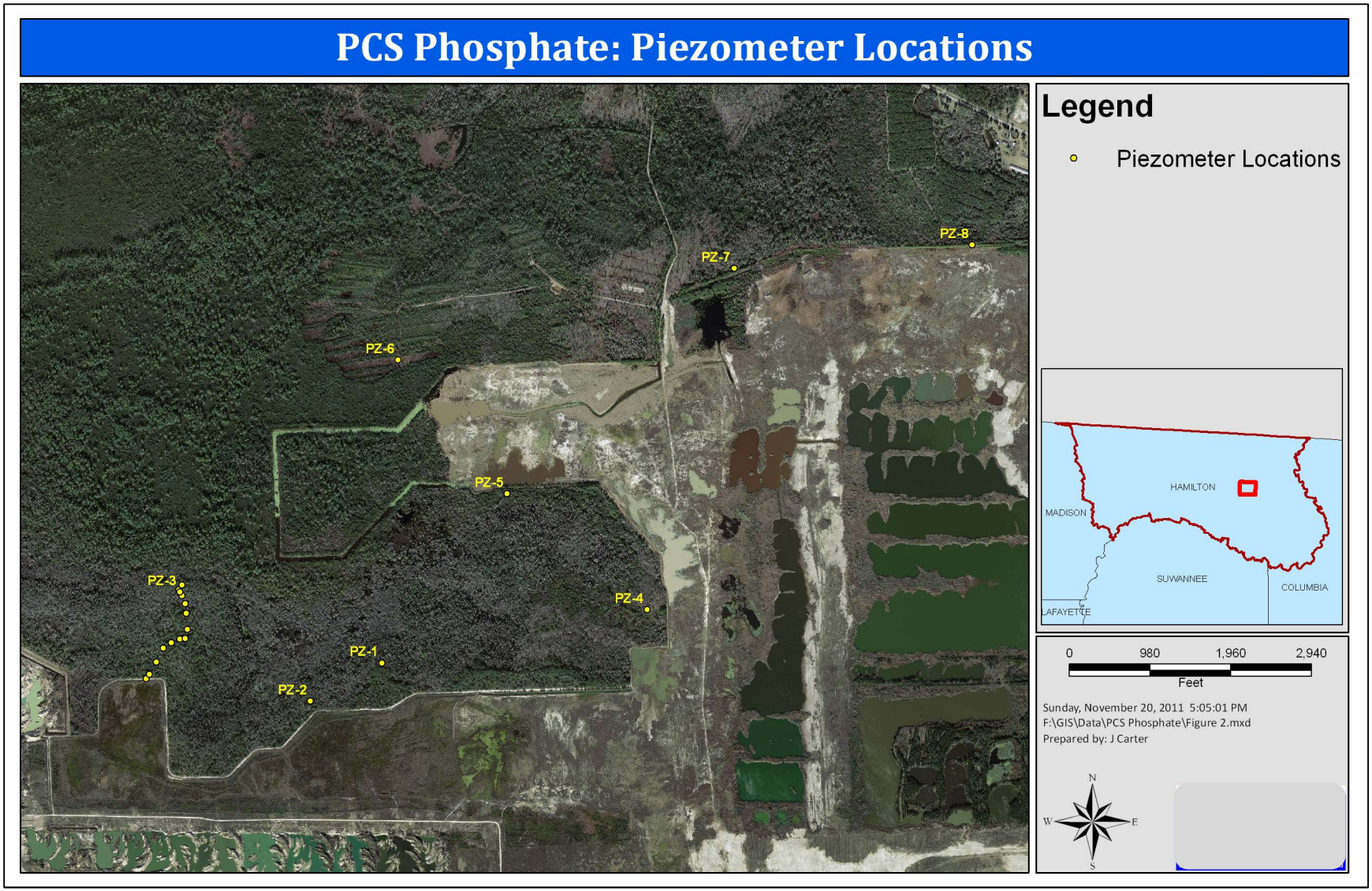


Figure 3. Close-up view of piezometer locations 1 through 3 established in 2014 and used in 2015–2017.

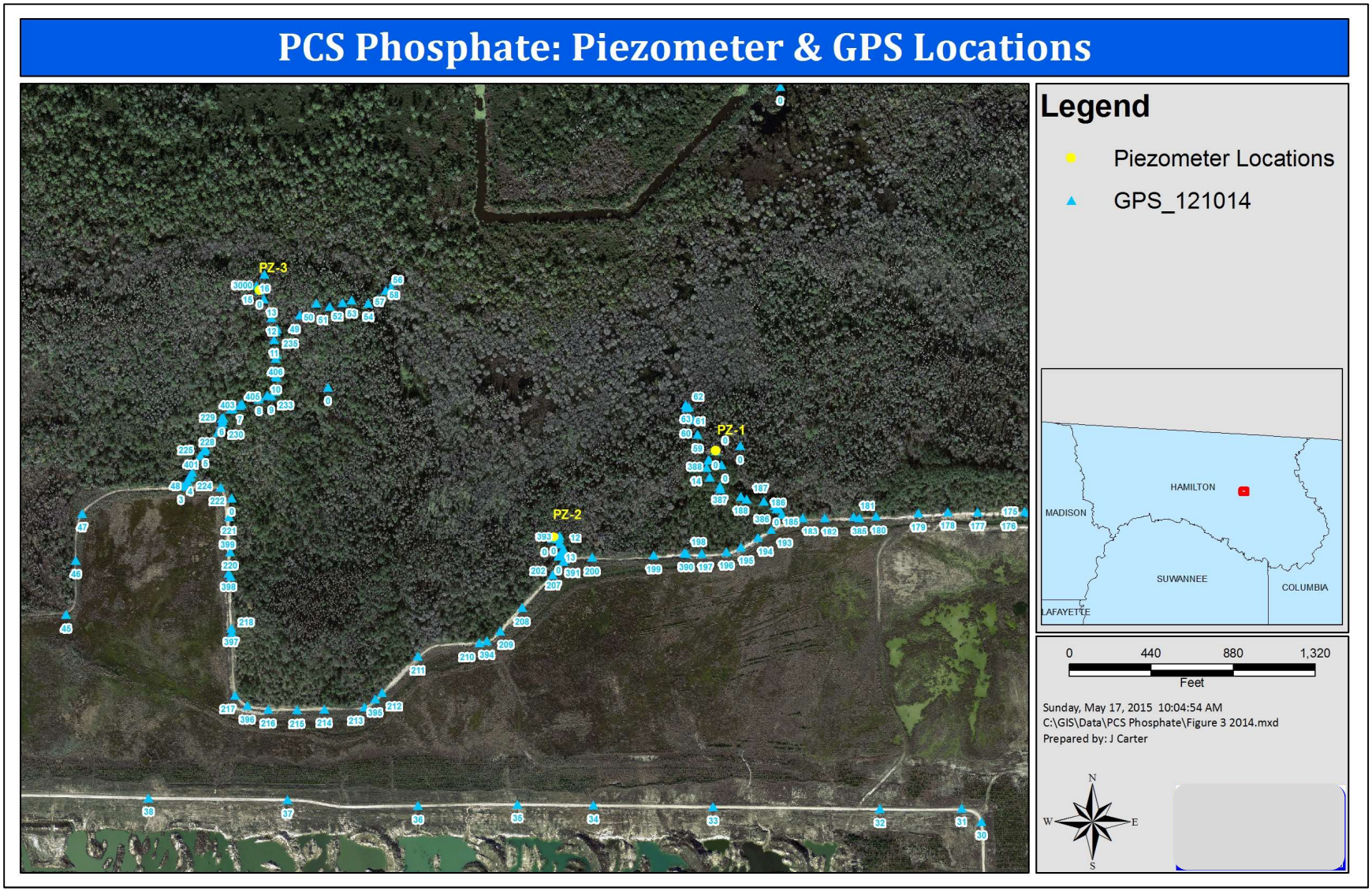


Figure 4. Close-up view of piezometer locations 4 and 5 showing location of piezometer 5 (GPS location 78) sampled in 2014.

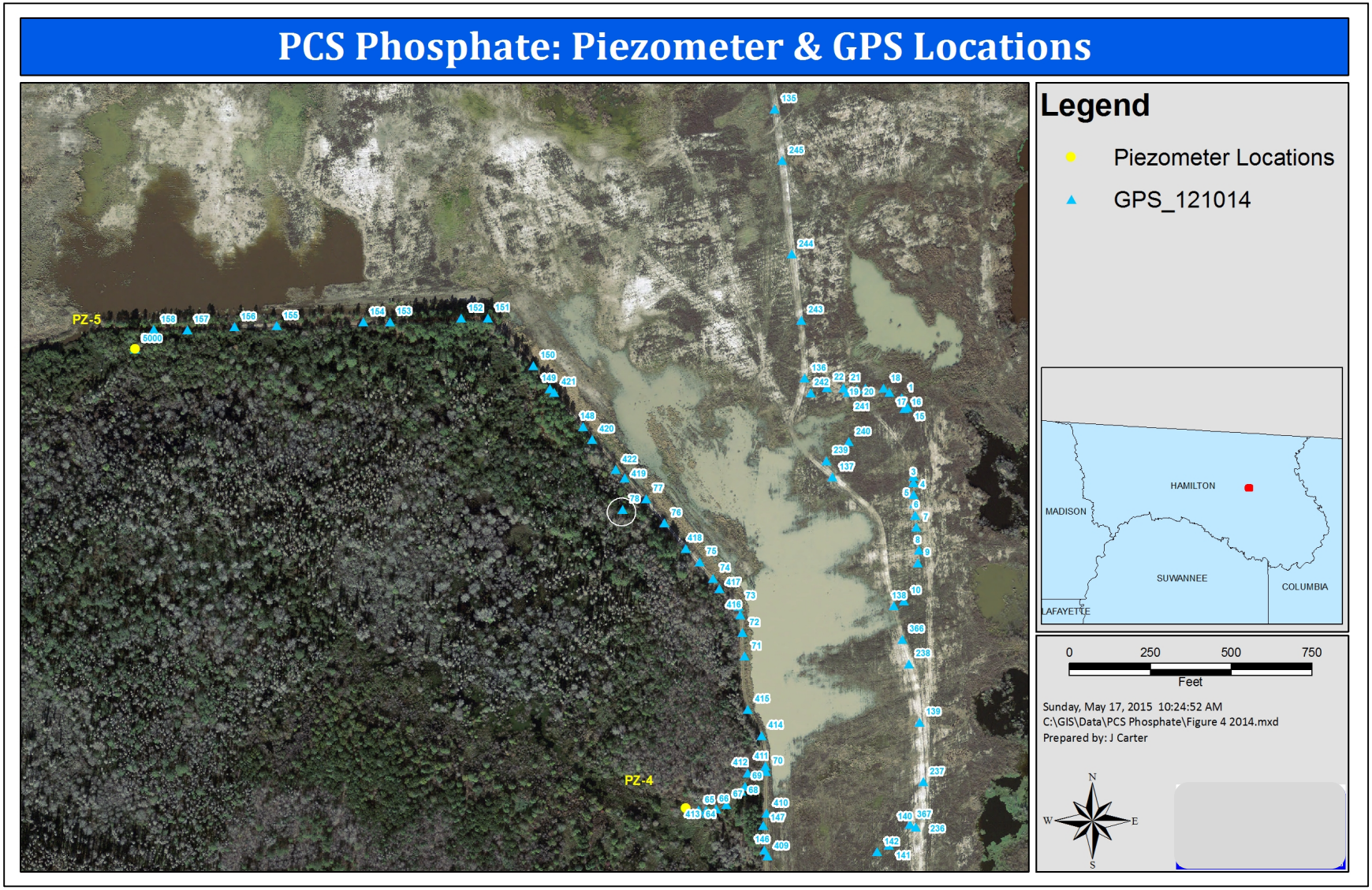


Figure 5. View of piezometer locations and survey routes taken during 2012, 2013, and 2014.

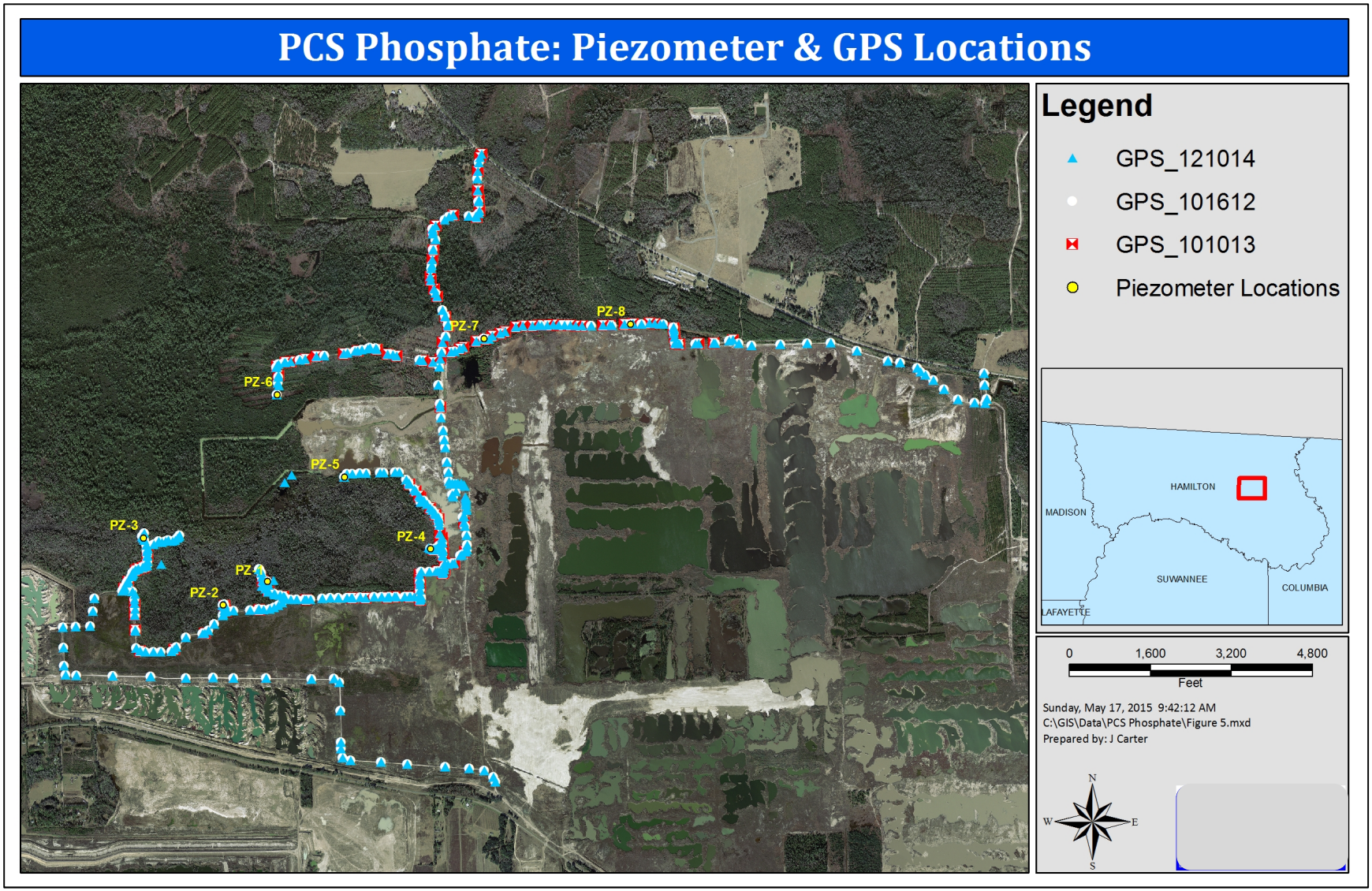


Figure 6. View of piezometer locations and pedestrian survey route taken 19 November 2015 showing new locations of PZ-4A and PZ-5A.

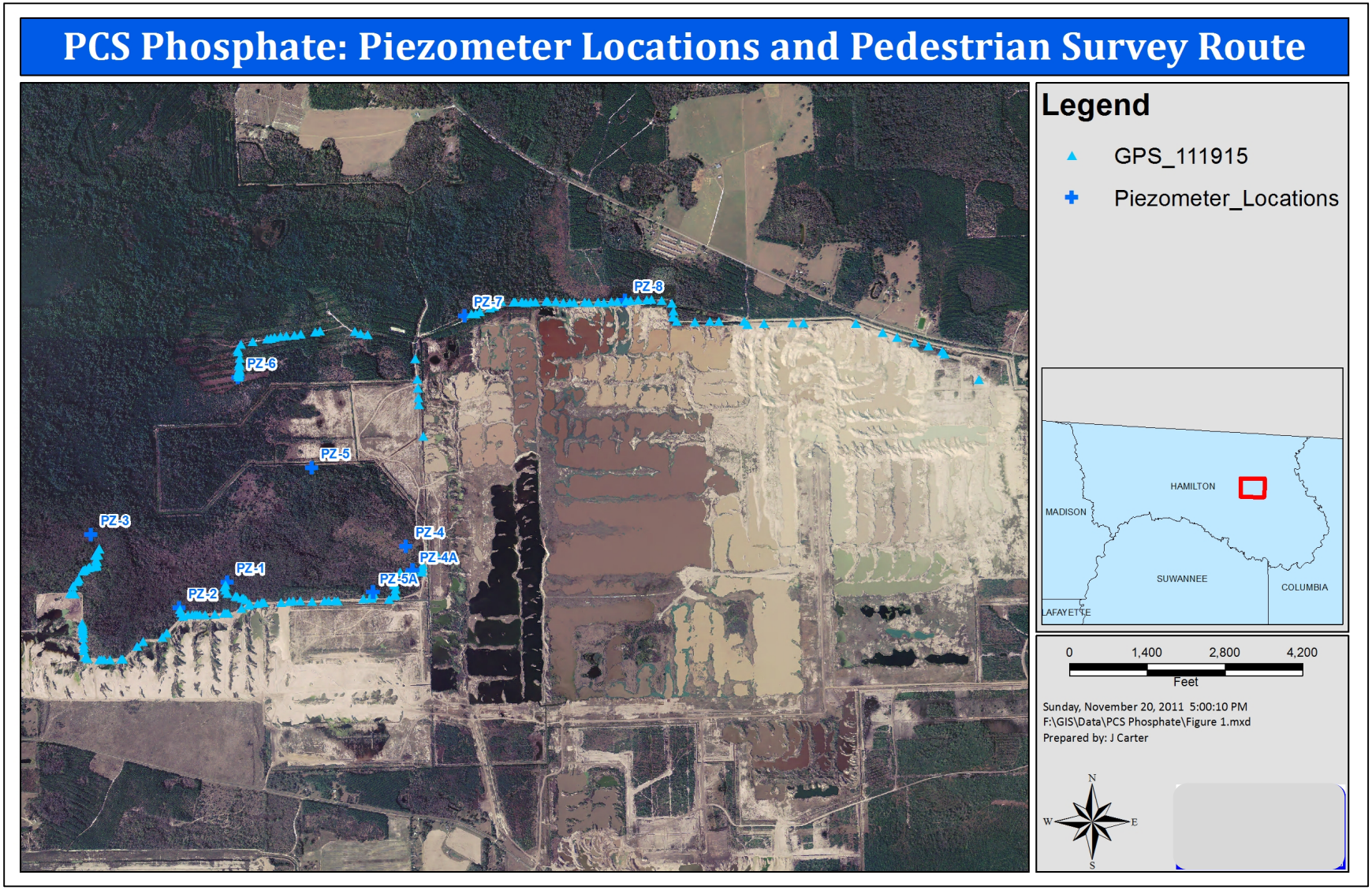


Figure 7. View of piezometer locations and pedestrian survey route taken 29–30 November 2016 and 28–29 November 2017.

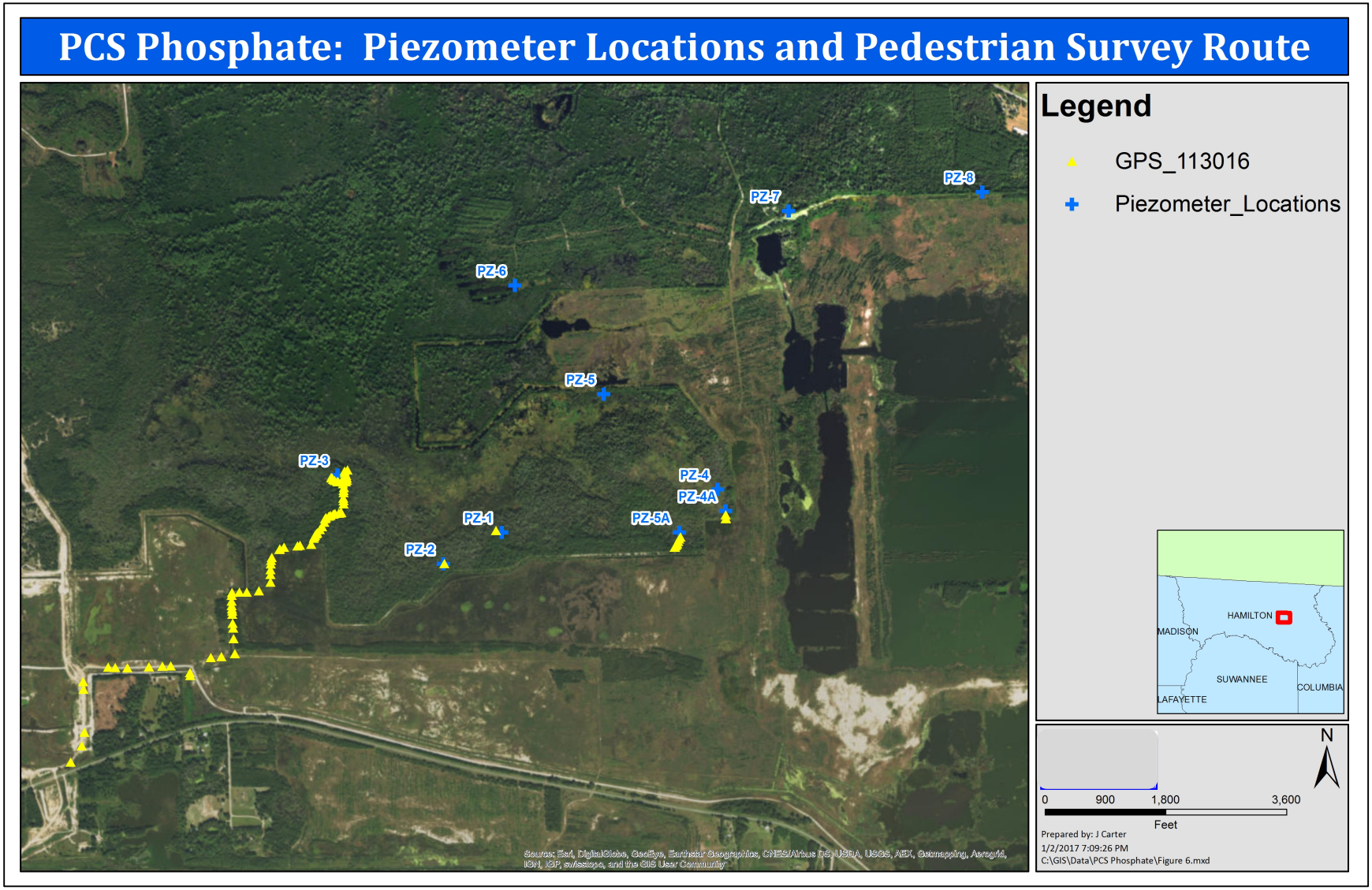


Figure 8
Percent Desirable Species PZ-1

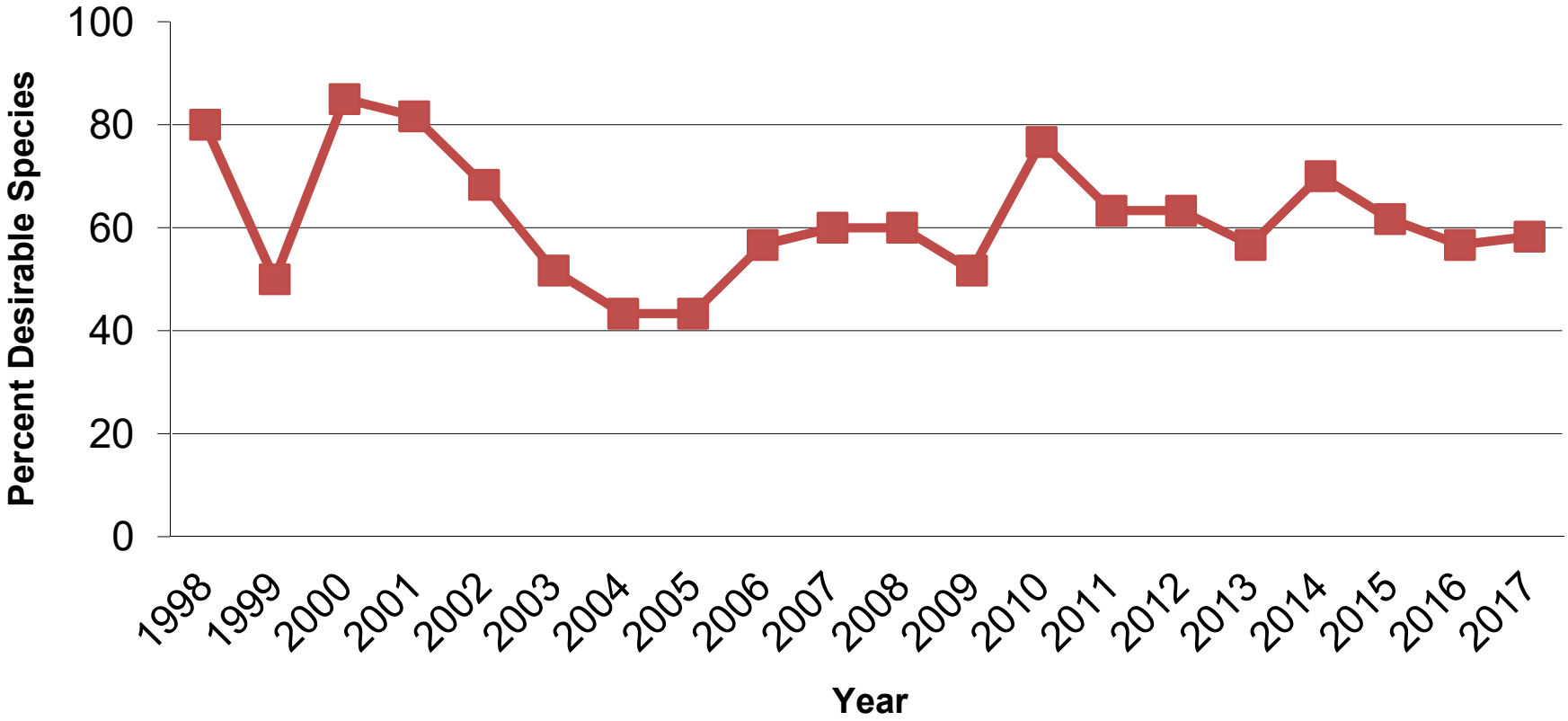


Figure 9
Percent Desirable Species PZ-2

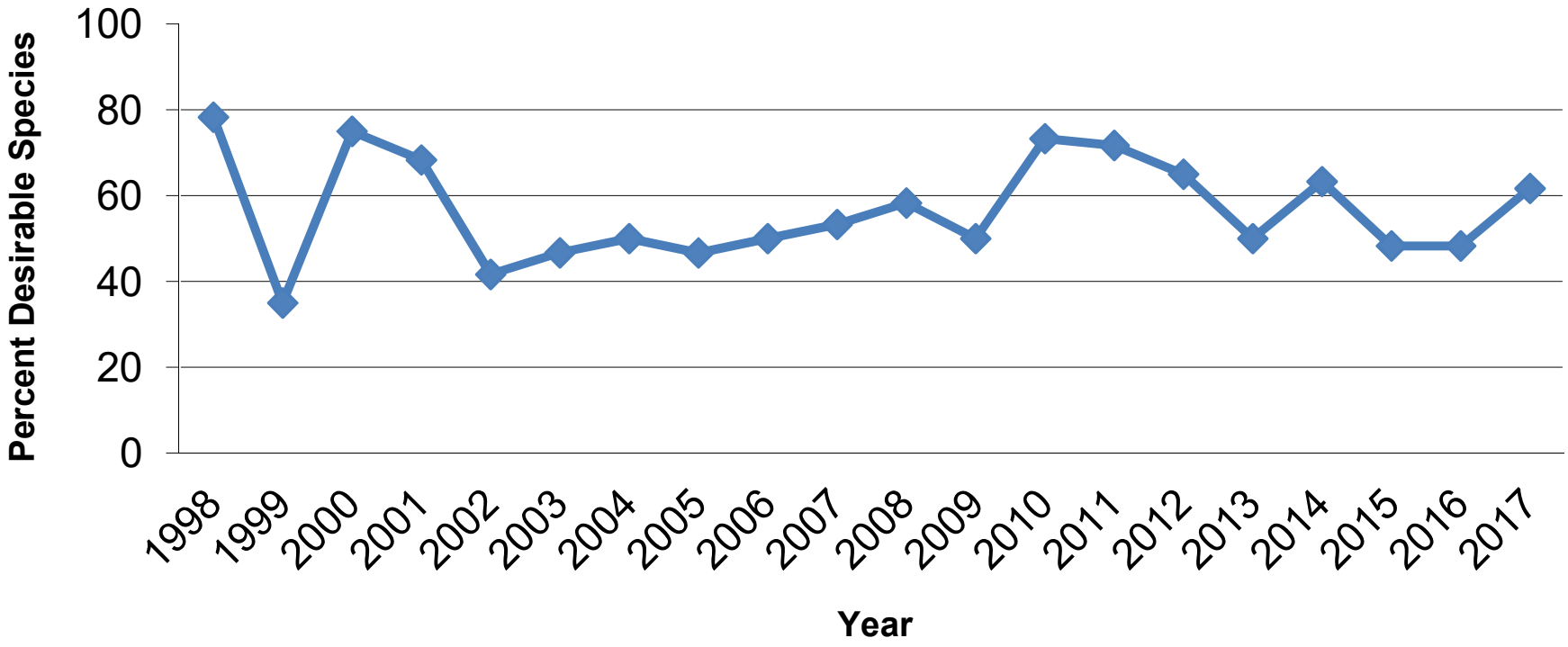


Figure 10
Percent Desirable Species PZ-3

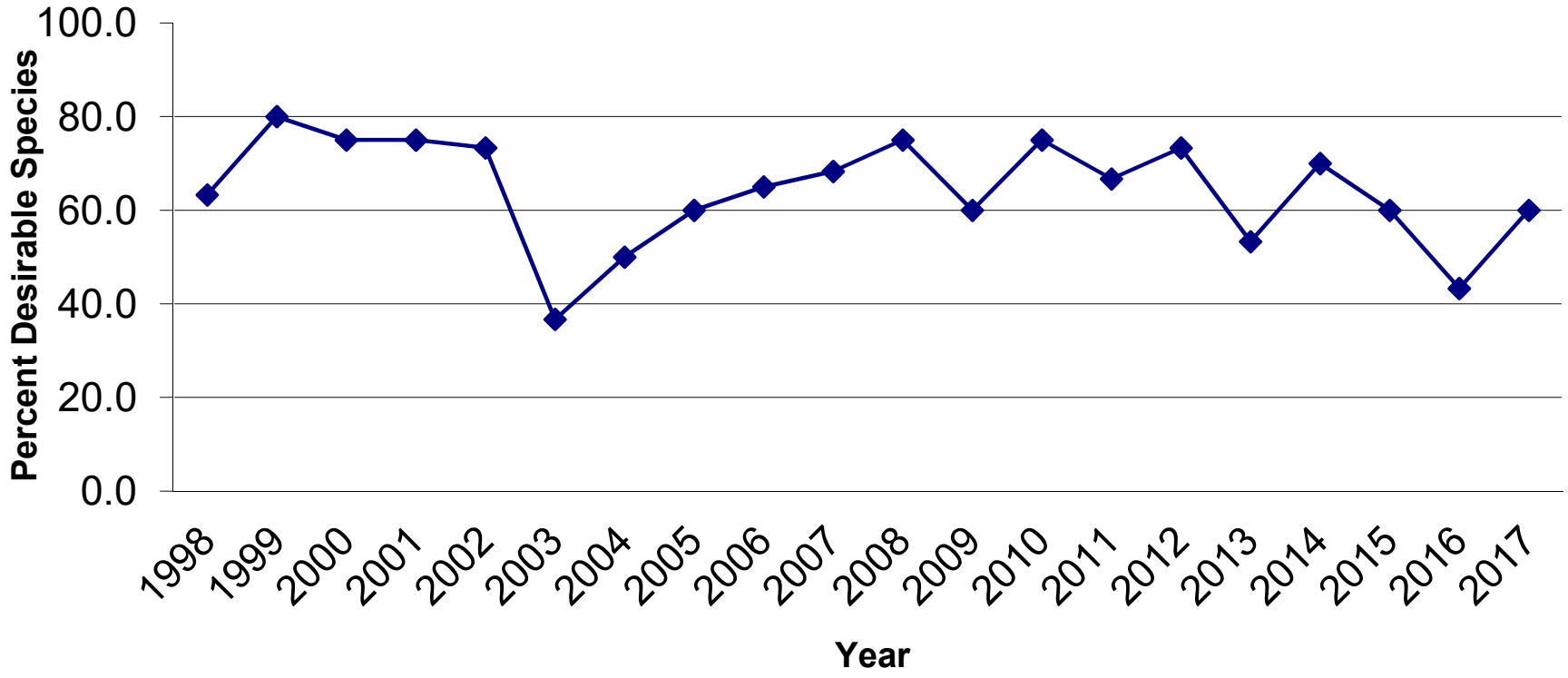


Figure 11
Percent Desirable Species PZ-4A

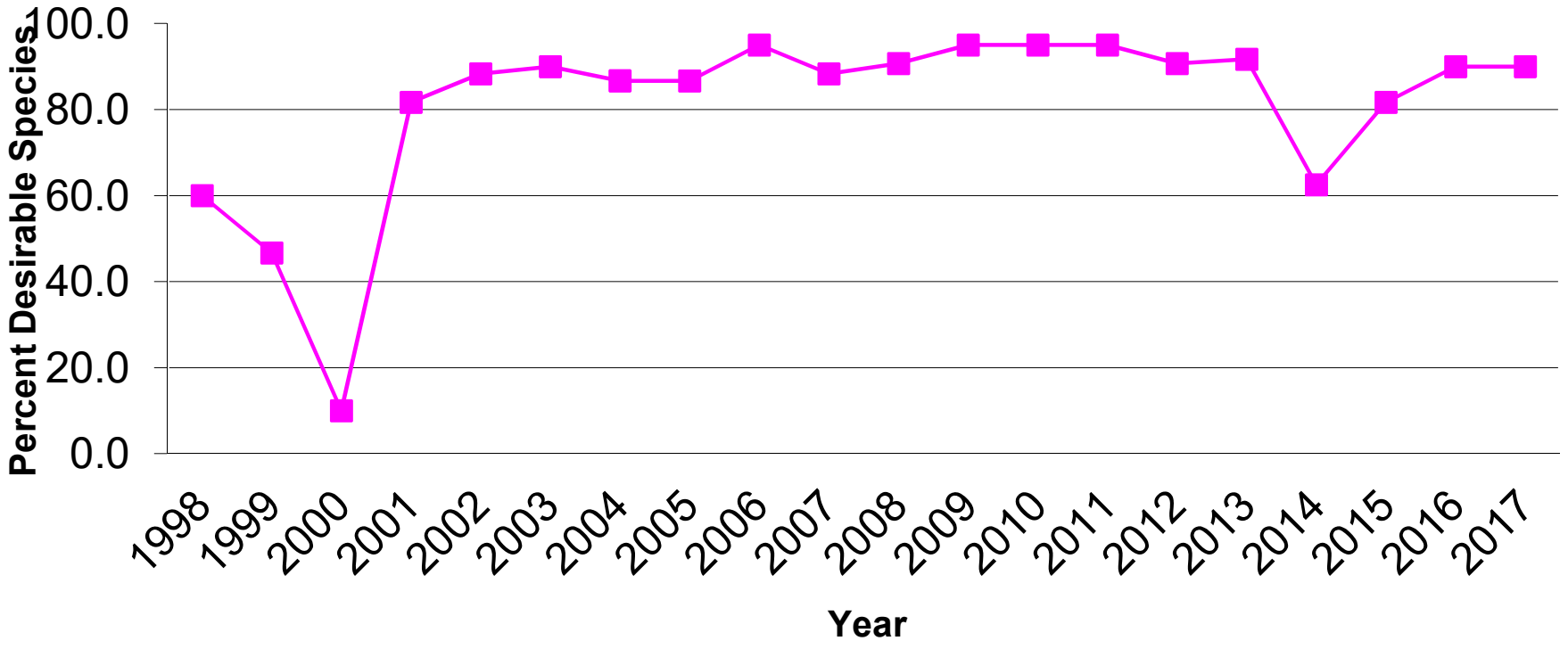


Figure 12
Percent Desirable Species PZ-5A

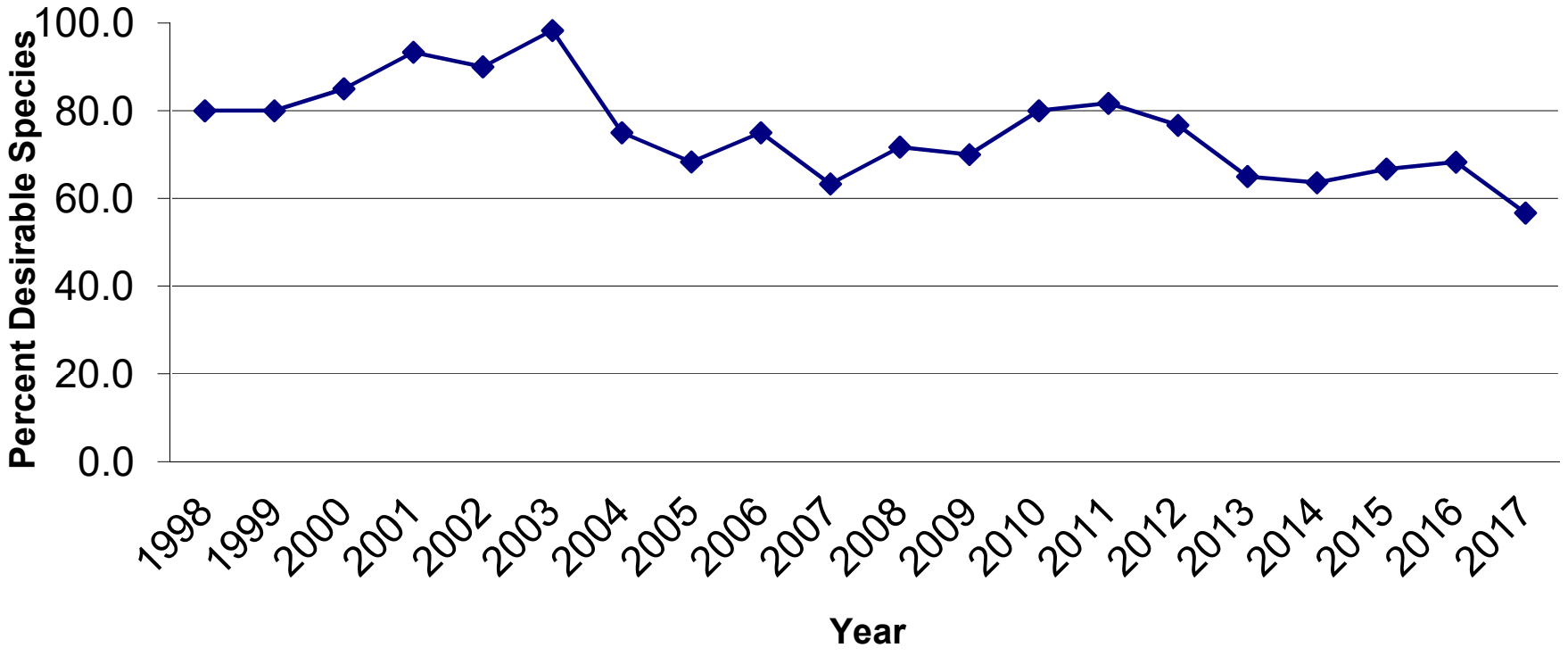


Figure 13
Percent Desirable Species PZ-6

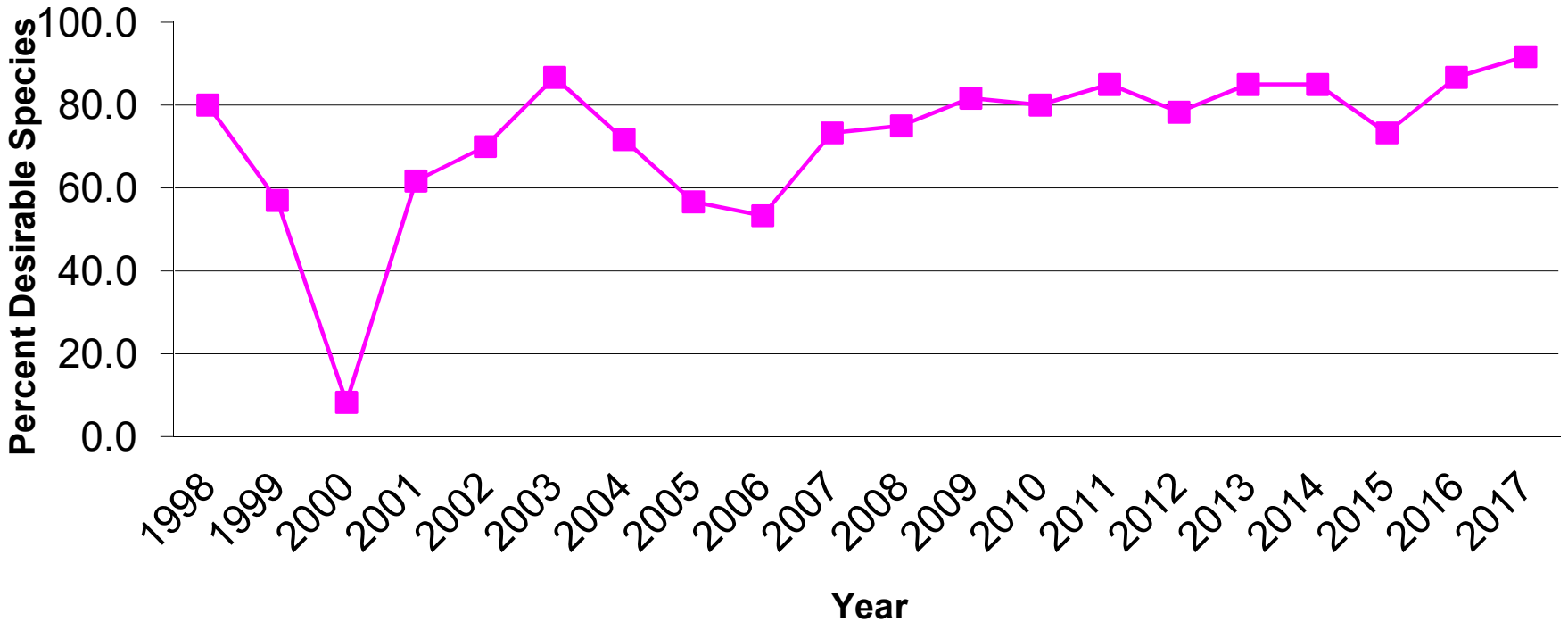


Figure 14
Percent Desirable Species PZ-7

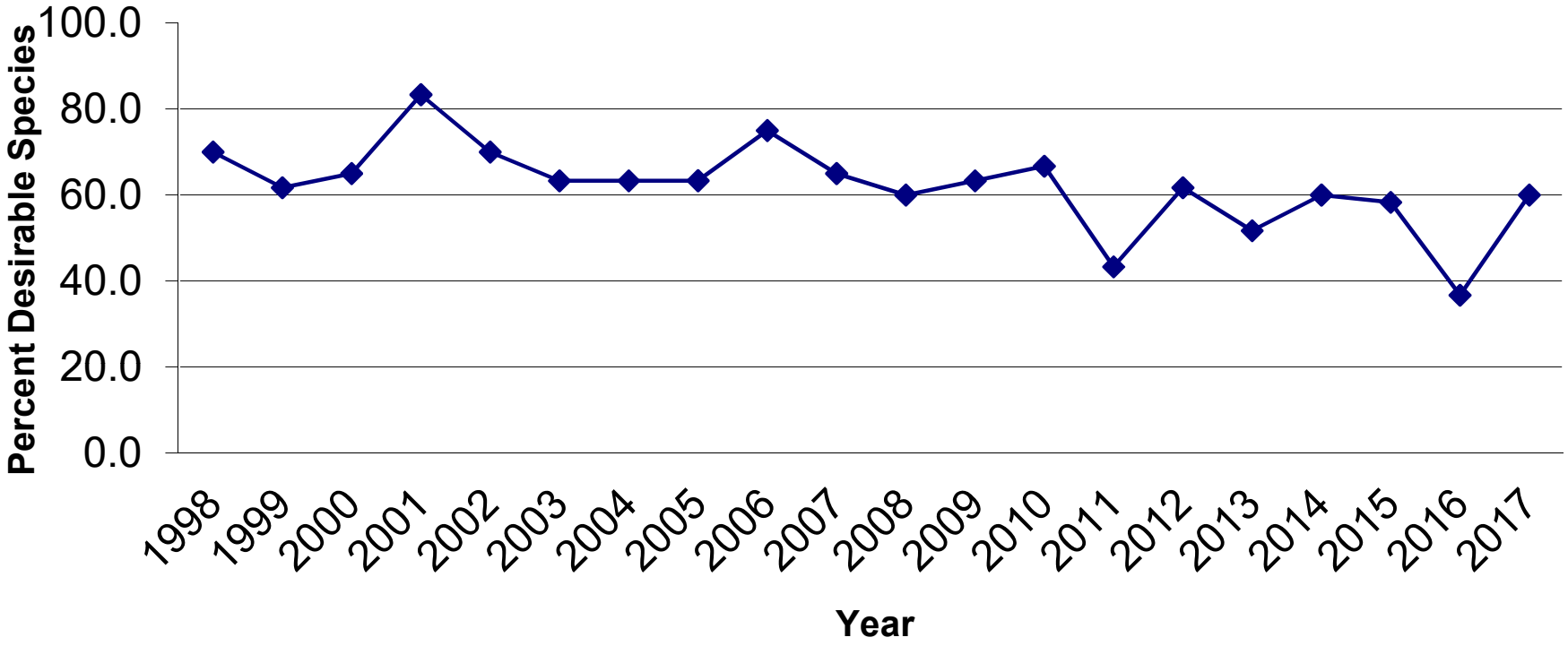


Figure 15
Percent Desirable Species PZ-8

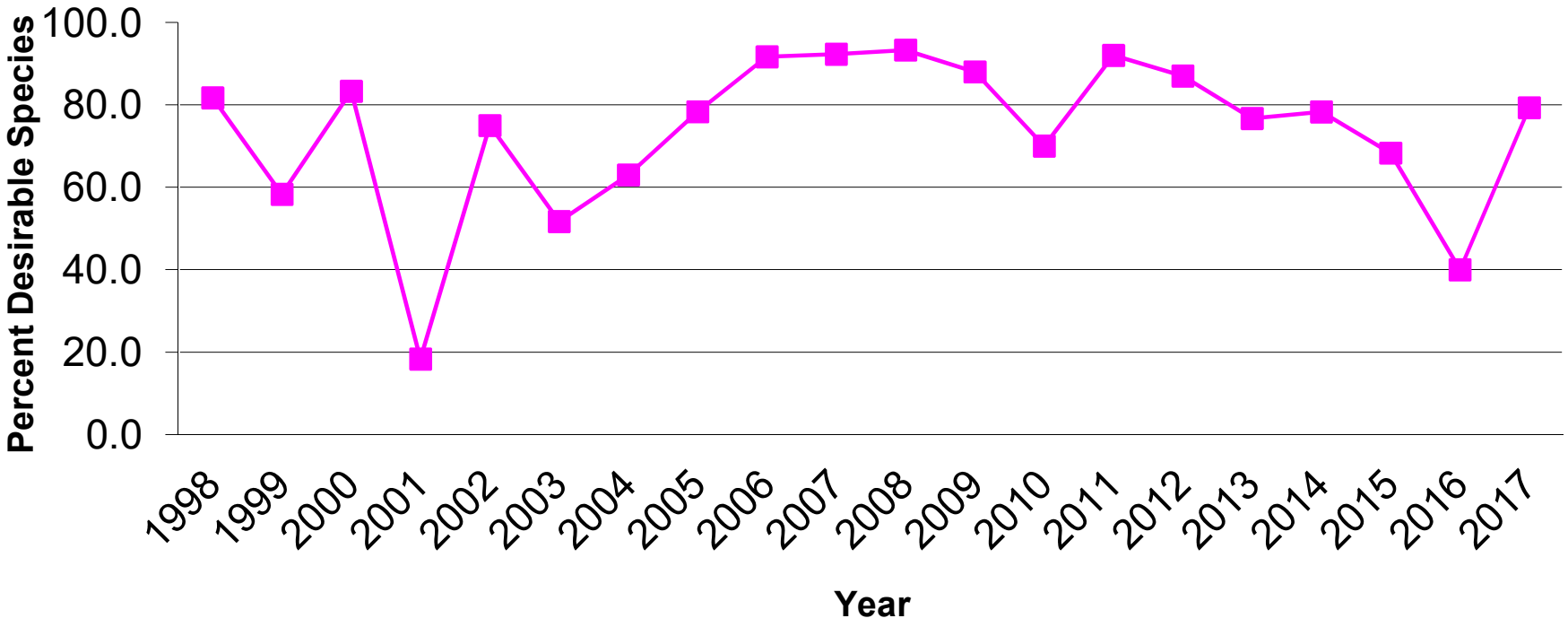


Figure 16
Rainfall 2017
Jasper, Florida

Source: Suwannee River Water Management District

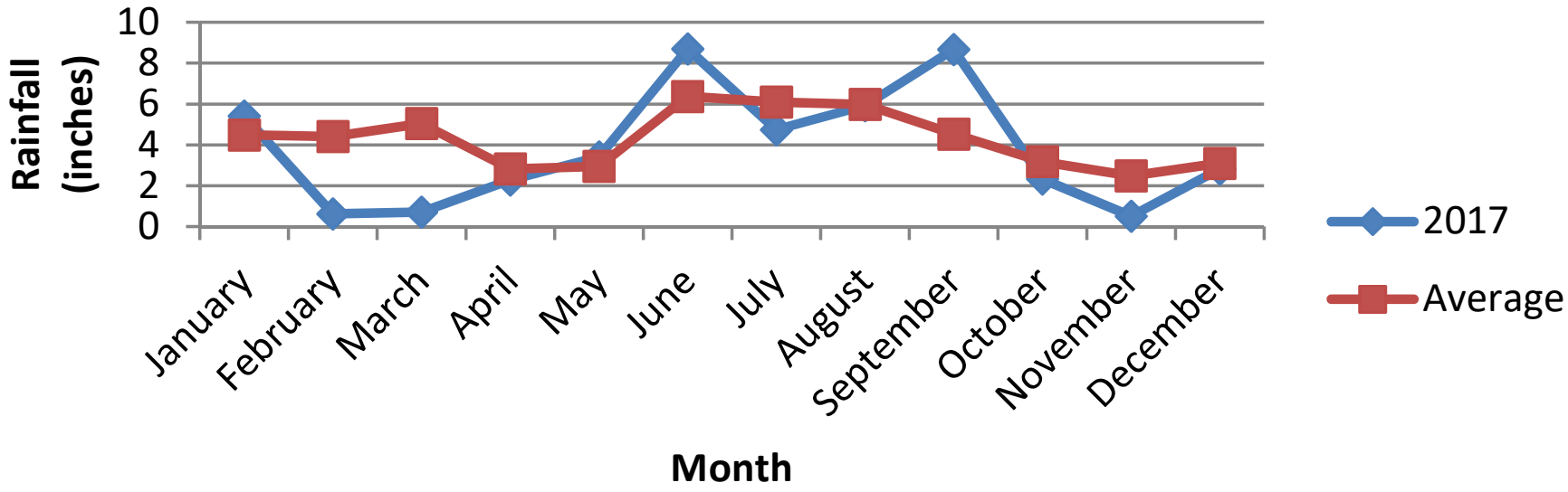
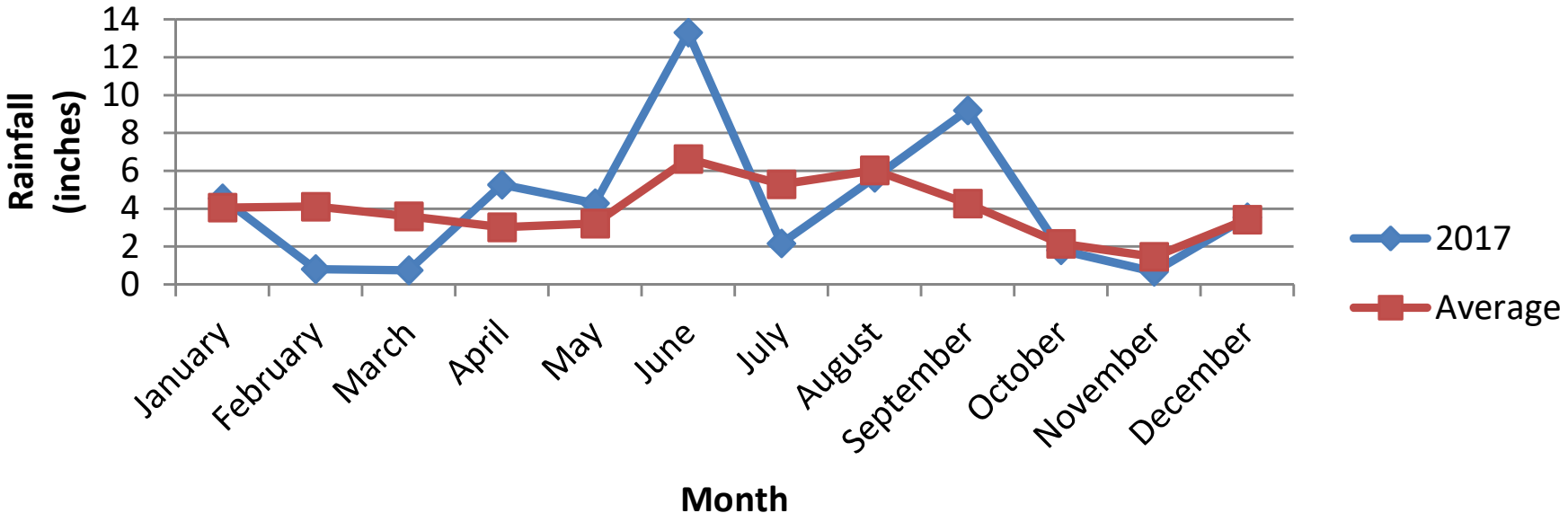


Figure 17
Rainfall 2017
White Springs, FL

Source: Suwannee River Water Management District



APPENDIX A
PHOTO PAGES

PHOTO 1: PZ-1

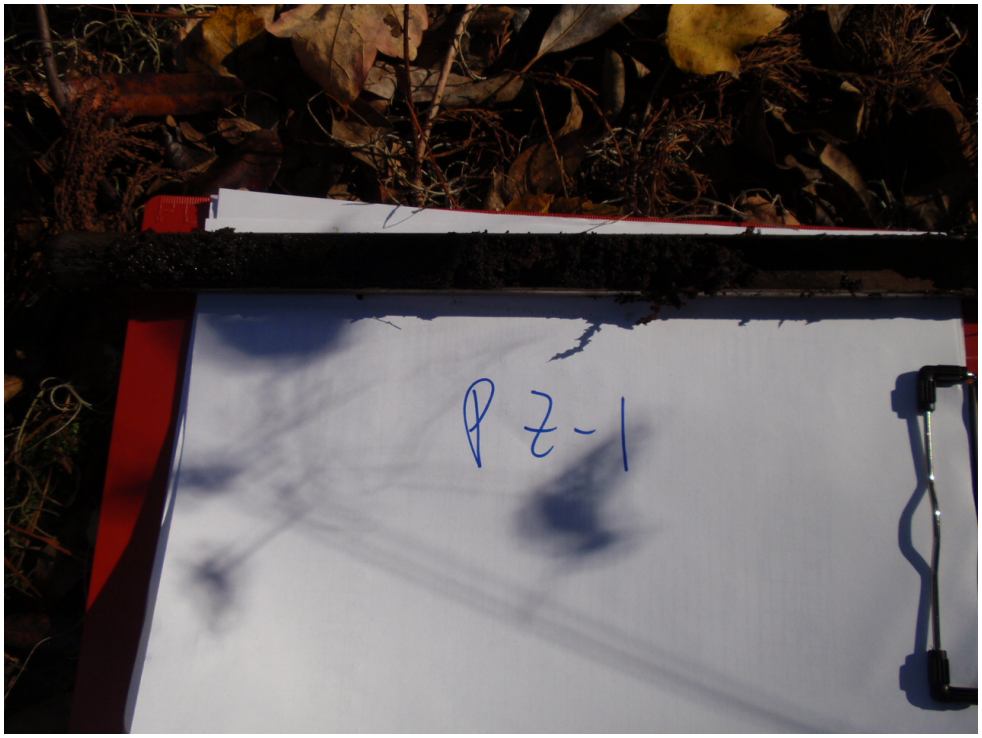


PHOTO 2: PZ-1 Soil

PHOTO 3: PZ-2

PHOTO 4: PZ-2 Soil

PHOTO 5: PZ-3

PHOTO 6: PZ-3 Soil

PHOTO 7: PZ-4A

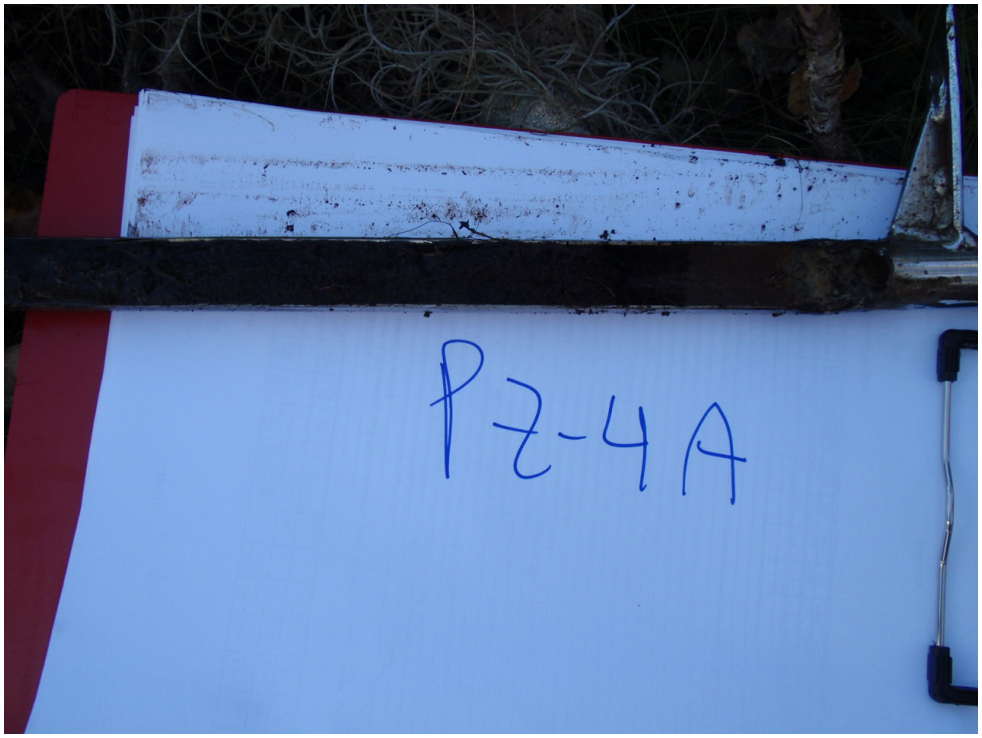


PHOTO 8: PZ-4A Soil

PHOTO 9: PZ-5A

PHOTO 10: PZ-5A Soil

PHOTO 7: PZ-6

PHOTO 8: PZ-6 Soil

PHOTO 9: PZ-7

PHOTO 10: PZ-7 Soil

PHOTO 7: PZ-8

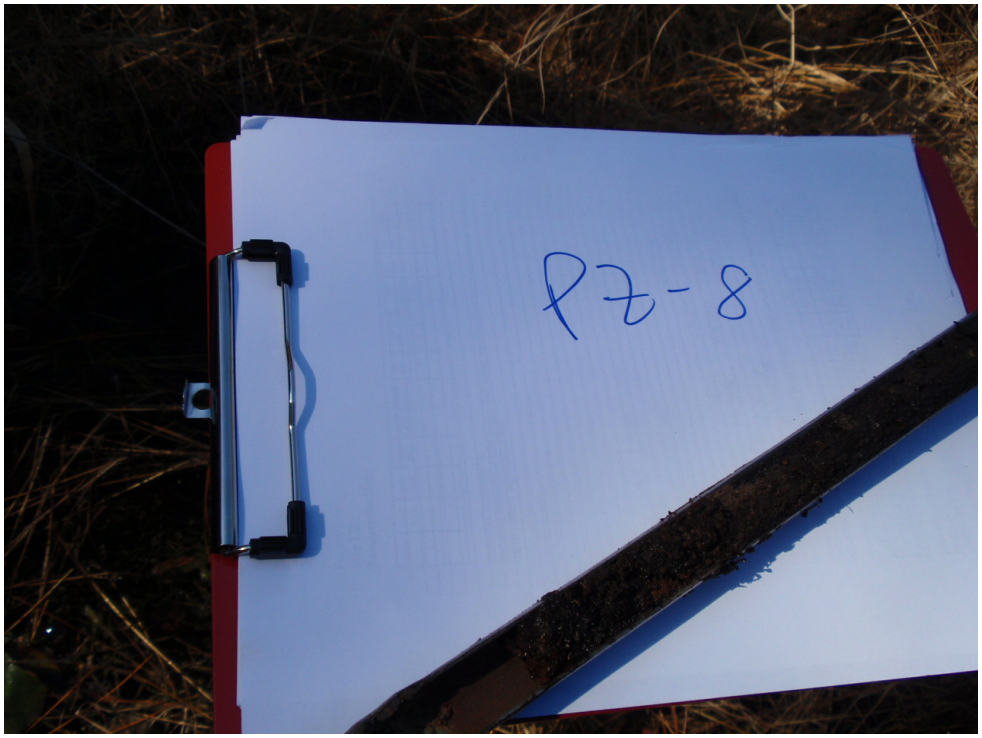


PHOTO 8: PZ-8 Soil

PHOTO 7: Extensive hog damage in PZ-6

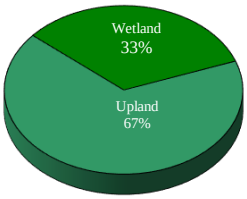
PotashCorp White Springs

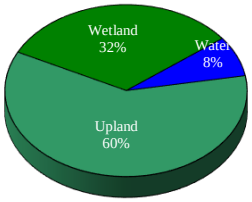
Fact Sheet for Hamilton County Mine
Year Ending December 31, 2017

Mining, Reclamation, and Land Use Information for Project Area

Land Form Summary (acres), including both mining operations areas and undisturbed areas

	Pre-Mining *(Before any operations)*	**Post-Reclamation** *(After all reclamation complete)*
Upland	66,474	59,908
Wetland	33,081	32,120
Water	33	7,560
Total	99,588	99,588





* Water less than 1%

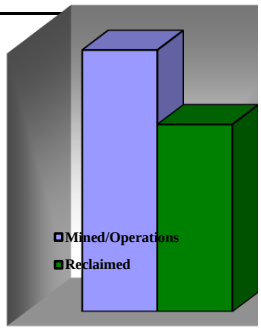
Mining and Mining Operations Summary (acres)

	Mining	**Mining Operations**	**Total**
Prior to 7/1/75 (before reclamation rules)	3,676	5,051	8,727
7/1/75 - 12/31/17	29,902	3,949	33,851
Future per CRP	20,551	1,682	22,233
		Total	64,811

Reclamation Status Summary as of 12/31/17 (acres)

	Mined/Operations	**Reclaimed**	
Subject to reclamation rules	33,851	24,060	72%
Pre-reclamation rules ("old lands")	8,727	2,901	33%
Total	42,314	26,961	64%

Mined Lands Only	**Mined**	**Reclaimed**	
Subject to reclamation rules	29,902	20,436	68%
Pre-reclamation rules ("old lands")	3,676	1,475	40%
Total	33,573	21,911	65%



Completed Reclamation Landforms as of 12/31/17 (acres)

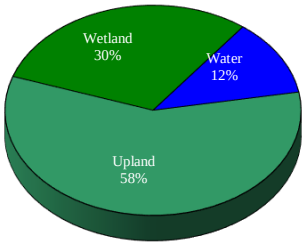
	Upland	**Wetland**	**Water**	**Sub-Total**
Subject to reclamation rules	12,951	6,287	4,822	24,060
Pre-reclamation rules ("old lands")	1,072	1,663	166	2,901
Total	14,023	7,950	4,988	26,961

Projected Future Reclamation per CRP

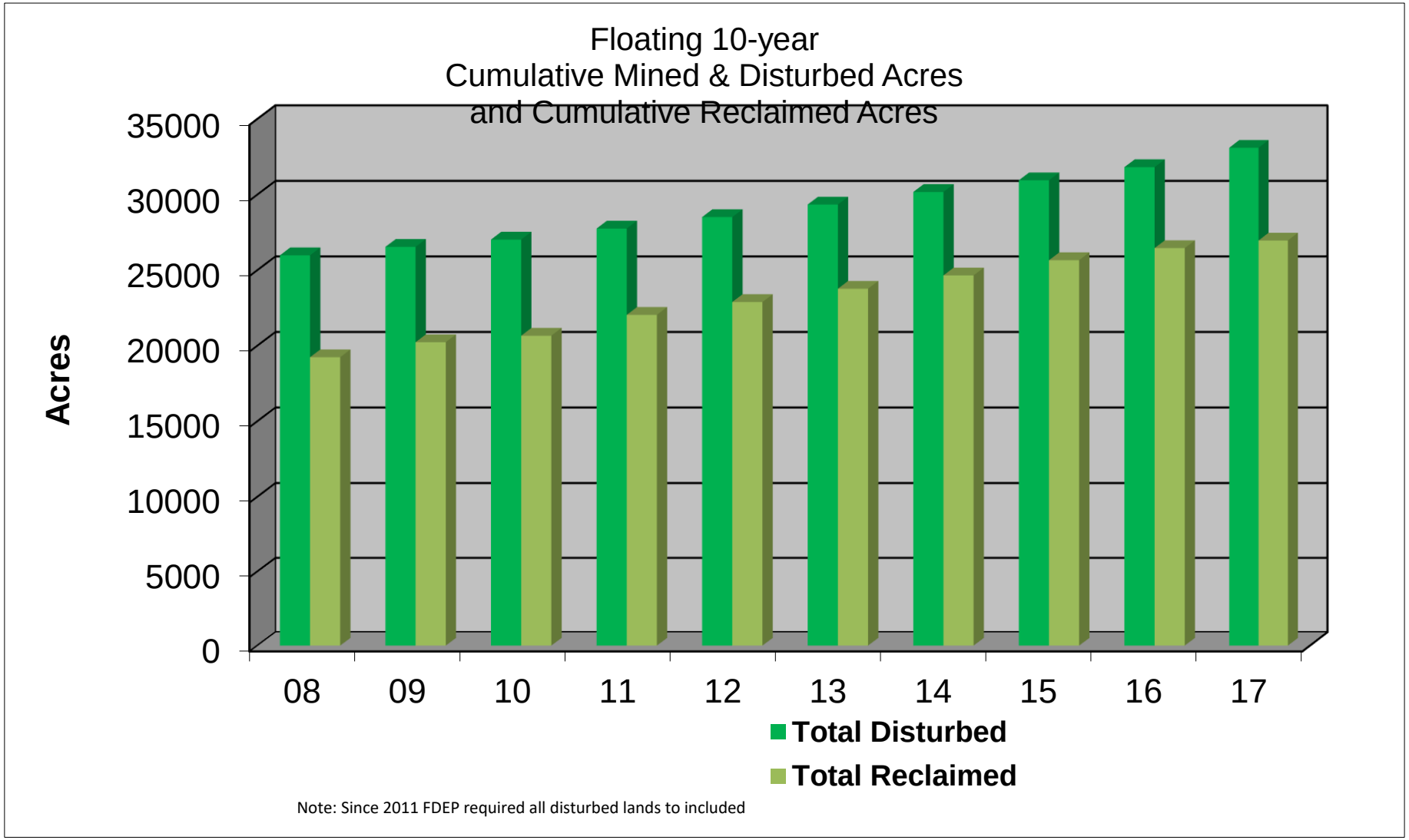
Upland	**Wetland**	**Water**	**Sub-Total**
23,018	11,314	2,572	36,904

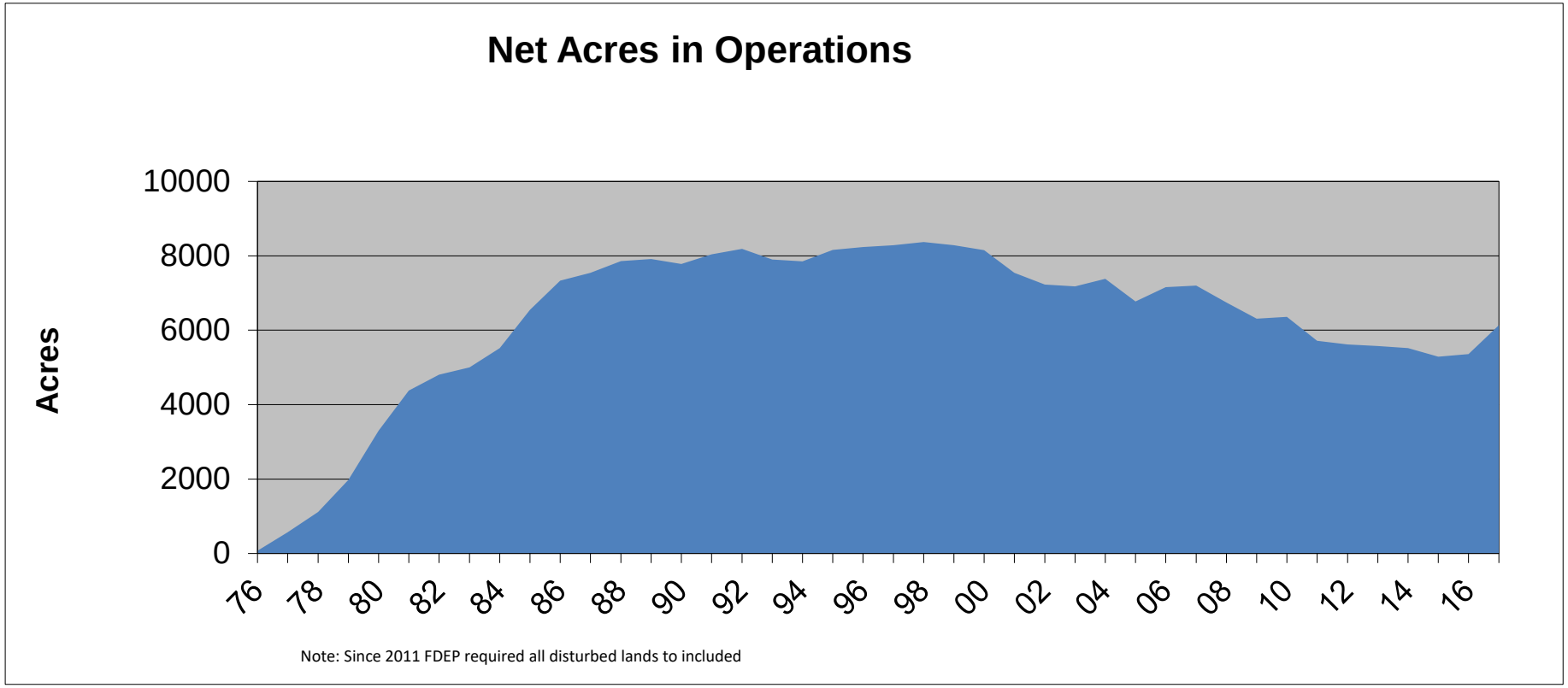
Total Completed and Projected Future Reclamation per CRP

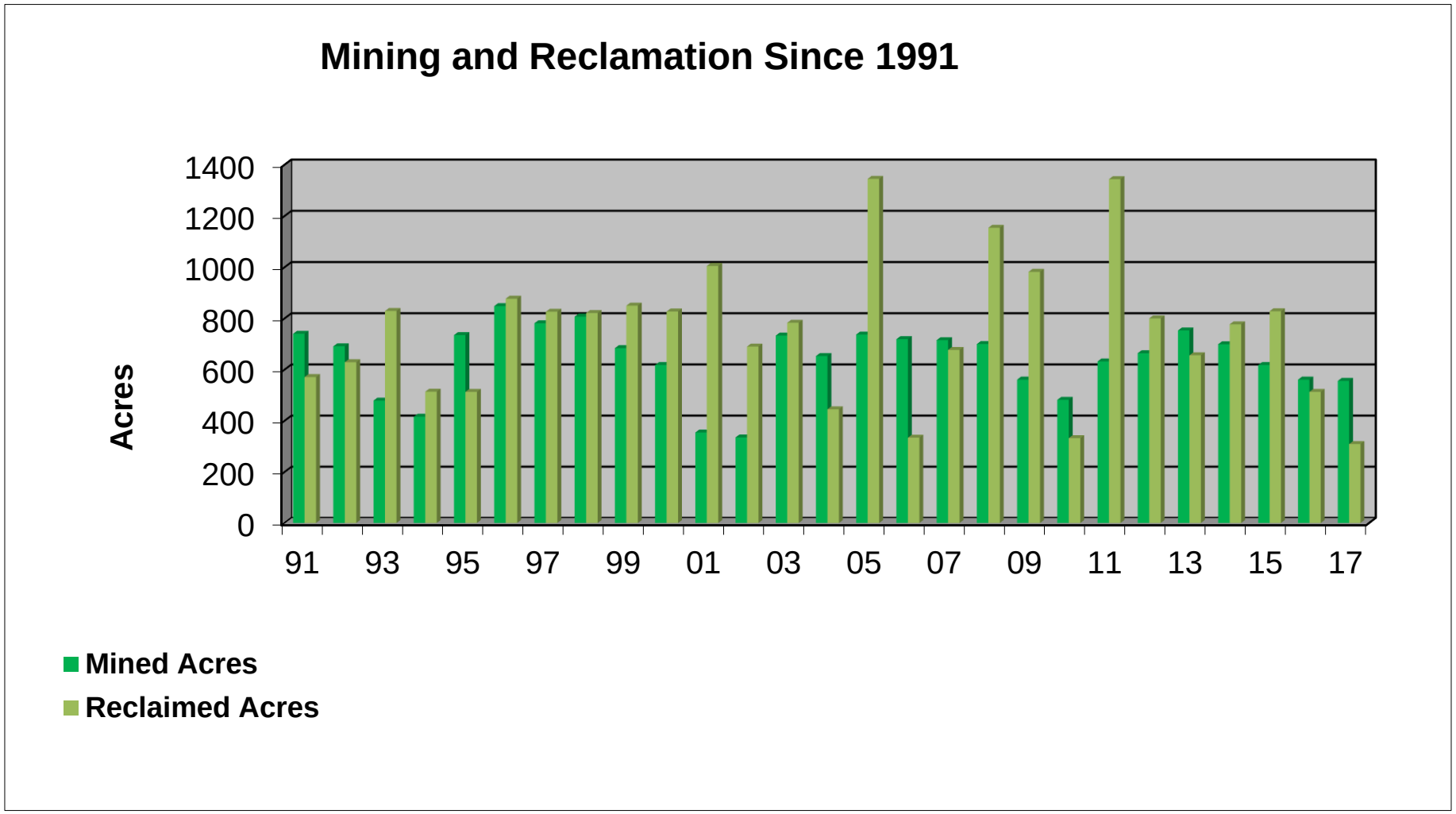
Upland	**Wetland**	**Water**	**Total**
37,041	19,264	7,560	63,865



Note: All future mining, mining operations, and reclamation information is as described in the Hamilton County Mine Conceptual Reclamation Plan Modification (PCS-HC-CRP(E)), as approved by Hamilton County and the Florida Department of Environmental Protection March 2017.


Floating 10-year
Cumulative Mined & Disturbed Acres
and Cumulative Reclaimed Acres
Acres
35000
30000
25000
20000
15000
10000
5000
0
08
09
10
11
12
13
14
15
16
17
Total Disturbed
Total Reclaimed
Note: Since 2011 FDEP required all disturbed lands to included


Net Acres in Operations
Acres
10000
8000
6000
4000
2000
0
76
78
80
82
84
86
88
90
92
94
96
98
00
02
04
06
08
10
12
14
16
Note: Since 2011 FDEP required all disturbed lands to included


Mining and Reclamation Since 1991
Acres
1400
1200
1000
800
600
400
200
0
91
93
95
97
99
01
03
05
07
09
11
13
15
17
Mined Acres
Reclaimed Acres

FINANCIAL RESPONSIBILITY

Demonstration of financial responsibility for reclamation of mined lands is required by Hamilton County and for a subset of wetland reclamation by FDEP.

Wetland Mitigation

We are required by the terms of our FDEP Wetland Resource Permit (0144913-003) & (0144913-021) to provide financial assurance for the cost of mitigation of certain wetland disturbance. The requirement pertains to wetlands disturbed but not yet mitigated, plus the projected obligation for the next three years. The obligation is updated each year in the annual reclamation/mitigation report to the FDEP, which was submitted on March 1, 2017. The amount of the FDEP obligation for this year is **$11,871,427**.

Hamilton County – Land Reclamation

We are required by the Hamilton County Mining Ordinance #2016-1 to provide financial assurance for lands that have been mined but not yet reclaimed. The acreages and calculations shown here are as of year-end 2017.

Financial Assurance for Hamilton County:		Year-End 2017 Calculation	
	Acres		
Non-CSA Reclamation:	2,915	@ $5,400 / acre	15,741,000
CSA Reclamation:	7,556	@ $1,250 / acre	9,445,000
		Deduct DEP Wetland Financial Assurance:	-11,871,427
		Net Added to Schedule A:	**$13,314,573**

FEES

A fee of five ($5.00) dollars per acre mined and unreclaimed through revegetation is included for 9,466 acres or $47,330. These acres can be found in the Fact Sheet for Hamilton County Mine year ending December 31, 2017 under the "Reclamation Status Summary as of 12/31/17 (acres)", i.e. 29,902 acres mined, 20,436 acres reclaimed (29,902 – 20,436=9,466). During the year 2017, PCS Phosphate-White Springs paid to the State of Florida $3,075,685.00 in Severance Tax.

CERTIFICATION OF OPERATOR

I certify that all mining and reclamation, except as may be noted, has been conducted in strict compliance with the Master Mining Plan, Special Permit and all conditions in this part pertaining thereto.

William Ponton
General Manager
PCS- Phosphate - White Springs