Rebuttal of Expert Report Entitled, *Analysis of Flood Magnitude and Severity for Land Surrounding the Consent Decree Area, Robert Brace Farm, Waterford, Erie County, Pennsylvania*, Prepared by Dwayne R. Edwards, In Regard to Case United States v. Robert Brace and Robert Brace Farms, Inc., Civ. No. 90-229, W.D. Pa.

Expert Rebuttal Report Prepared for Robert Brace and Robert Brace Farms, Inc.

Prepared For:
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Prepared by:
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February 21, 2018

INTRODUCTION

1. I, Andrew R. Johnson, PE, CPESC, have been designated as an expert witness for the defendants in the case of ***United States v. Brace et. Al.*, 17-cv-06, W.D. Pa**. I submit this report in rebuttal to the expert report prepared and submitted by Dwayne R. Edwards, Ph.D., P.E. of Lexington, KY on behalf of the United States in this matter.

QUALIFICATIONS

2. As set forth in my curriculum vitae provided to the plaintiff on December 15, 2017, I hold a Professional Engineer (PE) license in Pennsylvania, New York, West Virginia and Ohio. I also hold an international certification as a Certified Professional in Erosion & Sediment Control (CPESC).

3. I hold a B.S. in Civil/Environmental Engineering (2003) and an M.S. in Environmental & Water Resources Engineering (2005) from SUNY-ESF / Syracuse University.

4. I was a teaching assistant for a graduate level course at SUNY-ESF called *Open Channel Hydraulics* in the fall semester of 2003.

5. During graduate school, I received funding through the New York State Research Foundation to conduct original research on brownfield remediation. This work culminated in a thesis published by ProQuest Publishing in 2005 entitled, *Assessing the Performance of a Salix-Based Evapotranspiration (ET) Cover Using the Simultaneous Heat and Water (SHAW) Model*.

6. I have 13 years of experience working on a wide range of engineering projects with a focus on environmental and water resources. This includes 8 years working at a large engineering consulting firm from 2005-2012. Then owning and operating my own business for the past 5 years (2013 – Present) called EcoStrategies Engineering & Surveying, PLLC.

SUMMARY OF OPINIONS

7. I reviewed the Expert Report Prepared for the United States Department of Justice by Dwayne R. Edwards entitled *Analysis of Potential Flood Magnitude and Severity for Land Surrounding the Consent Decree Area, Robert Brace Farm, Waterford, Erie County, Pennsylvania*, dated December 18, 2017 (hereinafter referred to as the "Edwards 2017 Flood Report").

8. I am aware of and understand the hydrologic flow direction of the historical integrated farm drainage network as presented on "Figure 5 – Integrated Drainage Network" of the EcoStrategies report entitled, *Wetland Evaluation Report – Homestead, Murphy, and Marsh Farms, Waterford Borough, Erie County, Pennsylvania*, dated August 5, 2015 (hereinafter referred to as the "EcoStrategies 2015 Report"). Prior to 1984, the water used to flow from south to north and the surrounding fields appeared to be dry and free drain via gravity across the farm ditch network and eventually exit under the Sharp Road culvert. There available imagery showed no areas of standing water prior to the 1996 Consent Decree remediation work. The drainage ditches are shown as blue lines with arrows showing the flow direction, which are connected to multiple culverts and a subsurface network of drain tiles within the adjoining farmlands. Figure 6 from the EcoStrategies 2015 Report is another photo (pre-1984) showing dry farmland in areas that are now wet. Based on my conversations with the defendant, the historical 1975 and 1983 imagery (Figure 5), and site visits on September 4, 2014 and April 1, 2015 it was apparent that changes to the hydrology had impacted portions of the previously farmable land, especially the Consent Decree Area (CDA).

9. The Edwards 2017 Flood Report states under Section III – Standards, paragraph 7 that the methodologies utilized conform to "generally-accepted" hydrologic and water resources engineering industry standards for flood modeling and analysis. I agree with this statement. Under Section IV – Summary of Opinion, paragraph 9, it states that all conclusions and opinions described are offered to a reasonable degree of certainty based on industry standards, best

available methods, and best available data. I believe the best method for analyzing these localized water damage or flood issues stemming from natural phenomenon and manmade alterations (e.g. beaver dams, clogged culverts, unmaintained ditches, submerged and altered drain tile networks, etc.) would be to conduct a traditional ground survey that captures critical site features (existing and historical) using a Total Station, which provides sub-inch elevation accuracy (versus LIDAR data that is typically sub-foot accuracy on the vertical and 3-feet on the horizontal) and the ability to collect detailed soil and groundwater data, drainage tile invert elevations, all culvert inverts, past and present ditches, surrounding site features, and any other details or discoveries linked to the water problems in certain areas. I recognize that this additional data was not collected and therefore not available to Mr. Edwards, but a professional ground survey would be the best method and the most accurate method to build a digital elevation model (DEM) for this type of project and then determine the true extent of impacts into the adjacent farm areas throughout. This could then be integrated with other LIDAR data.

10. If EcoStrategies did not receive the report in December 2017 (i.e. the middle of winter when everything is covered in snow) and had more time (i.e. more than 1-2 months to respond), we could have worked with the defendant and the United States to collect more data and evidence to determine how far (scientifically) the surface and subsurface flooding may actually extend into adjacent upland areas. The study should include a historical analysis or forensic study and a discussion about how the land changed over time and quantify those impacts. A more detailed scientific flood study for this particular project may include but not be limited to 1) detailed ground survey by a Professional Land Surveyor (PLS) of all drainage ditch elevations, culvert inverts, drain tile inverts, etc. 2) scoping study of critical drain tile networks for "blockages"; 3) "potholing" areas of the farm field on a grid system that are said by the defendant to be flooded (surface and/or subsurface) to check for soil mottling (or graying of the soil caused by flooding or high water table), check for the presence of any perched groundwater, investigate subsurface erosion, and inspect and analyze drain tile networks in the adjacent upland areas. Any

discoveries would be surveyed with sub-inch elevation accuracy and a more extensive analysis could be conducted.

11. The Edwards 2017 report focused on upland areas outside the CDA and on the south side of Lane Road. It only discusses two beaver dams and the Sharp/Greenlee Road Culvert and Lane Road culvert. It does not discuss a total of 5 beaver dams (noted by Randy Brace) and two additional culverts along Lane Road (i.e. east of the one on Lane Road that was modeled). The study also focused only on adjacent uplands on the *south* side of Lane Road, when Randy Brace testified that areas also had water damage as shown in blue highlighter (see attached Deposition Exhibit RA 1) on the north side of Lane Road. It is worth viewing the soil map on an orthoimage (see Figure 4 – Soil Map) to match up the areas that Randy drew in blue highlighter with the corresponding soil types in these areas. The areas Randy shows as being impacted are the poorly draining soil types (i.e. Freemont "FrA" and Canandaigua "Cc" soils) which are poorly drained silt loam soils that typically rely on tile drains to keep them dry enough to be farmable. These areas are highlighted in yellow on Figure 4. Conversely, the adjacent soil types onsite are just the opposite (i.e. Chenango "CnB" and "CnC" soils). These are well draining gravel soils that are prime soils for farming. The Chenango gravel areas are basically the knolls in the farm fields, which is a common characteristic of these soil types.

12. If the two additional culverts that were not modeled along Lane road were clogged and not allowed to be maintained, the drain tiles on the adjacent "Fr" soil types would not function properly and may cause water damage to crops. Same with a beaver dam created along the edge of the Marsh property (see Randy's X mark) that is adjacent to the "Fr" soils on the Homestead Farm.

13. The Edwards 2017 Flood Report relies on LIDAR data which does not offer the best accuracy in terms of elevation data, but it is second best to a traditional ground survey using a Total Station. The LIDAR data does not view the actual point cloud but a raster terrain model created by

processing the actual LIDAR data, so it's once removed and because it was a statewide survey project it is probably fairly course. This data is helpful for generalized flood modeling projects, but not for extracting precise spot elevations and historical alterations caused by natural phenomenon and manmade features. We could not locate the accuracy report for the LIDAR-derived raster terrain used to create the Digital Elevation Model (DEM) data in the Edwards 2017 Report, referenced under Section V – Methodology. However, we assume it has the same or similar error to other PASDA LIDAR-derived raster terrain model data sets, which is typically sub-foot on the vertical and 3-feet horizontal. For this project, the main drainage networks that flow south to north are relatively flat to begin with and not knowing the detailed slopes, historical impacts from the Consent Decree Restoration Plan, and design details of the drainage tile network, etc. this further adds to the uncertainty and potential error propagation in trying to quantify the true extent of water damage to farmable areas. Therefore, the study has its limitations.

14. The Edwards 2017 Report is geared more toward generalized flood analysis and the scenarios considered do not factor in all of the changes over time, which are difficult to model, such as all of the beaver dams (5 stated by the Randy Brace), clogged culverts and ditches that could not be maintained, the impact of the 1996 Consent Decree Restoration Plan that removed drainage tile, plugged agricultural ditches with a check dam, and allowed sediment and vegetation to fill in ditches over time. It is also worth noting that if drain tiles are not functional and subsurface erosion occurs, it is plausible over time that sediment may settle out within segments of the drain tiles at different locations, plugging parts of the network and creating pockets of perched groundwater at higher elevations, especially in "Fr" and "Cc" soil types. It is very difficult to model the impacts of all of these factors over time based solely on one 2015 LIDAR snapshot in time using a statewide terrain modeling program with levels of generalization that are difficult to quantify due to the extensive level of data processing involved in its production.

15. When EcoStrategies was contracted for this project in 2015, we recognized that the drainage tile

network and historical drainage alterations (manmade and natural) that were made over time were convoluted. So at the time we did not feel it was necessary to spend a significant amount of time and money on sophisticated hydrologic modeling and predictive scenarios. We observed that the United States government had already spent a significant amount of time and money to study the *existing* conditions and focused on the *current* wetland areas, while there was no root cause study showing (with factual evidence) how the actual historical chain of events unfolded and how the land and water subsequently changed over time. We felt that the real pictures and documentary evidence (permits) added more value to the project versus predictive modeling. Therefore, our time and effort was spent 1) interviewing the defendant to understand the background and his claims regarding how the land changed over time, 2) obtaining and reviewing authentic historical aerial photos showing *actual* land use changes that occurred over time (in an effort to verify the claims made by the defendant), and 3) conducting an elevation survey of the Sharp Road and Lane Road culverts to measure invert elevations and verify the defendants claim that the Sharp Road culvert installation created a dam that backed up water (causing a backflow condition) in the farm ditches and thus submerged drain tiles.

16. The purpose of The EcoStrategies report was completely different from the Edwards 2017 Report. The purpose of the report was to review historical documents, conduct a hydrologic elevation survey of the Sharp/Greenlee culvert and Lane Road Culvert, and evaluate the wetland areas. The goal of the report was "*to provide an understanding of the land use history, explain the agricultural exemption, and describe the past and present conditions of the hydrology and wetlands on the property*". By doing so, the defendant and his counsel believed that the evidence would show that the existing wetland areas of concern were already a part of a commenced farming operation and they have a right to return the property to its pre-1984 condition via the Consent Order. Based on the available evidence, the areas that are currently wet with standing water used to be dry prior to 1984 when the drainage ditches were functional.

17. Our approach was to first ask the farmers who routinely work in the field every day to show us

the wet areas, as they have observed it routinely for several decades, and then couple that information with supporting scientific evidence such as historical aerial photos and the recent crop yield maps. The historical images are summarized in the EcoStrategies report, and the Centerra Report maps present low crop yield (red areas) and high crop yield (green areas) in the form of "heat maps". The Centerra Report concludes that the main cause of low crop yields areas on these properties is linked to high soil moisture. The report states that the farm equipment utilizes a moisture monitoring sensor for real time moisture data collection, which is a helpful tool for this study to help quantify the *actual* extent of water damage as it relates to crop yield.

18. At the time of the EcoStrategies 2015 Report, it was my understanding that the key point the defendant was trying to make is that he already invested in the drainage ditches and had an agricultural exemption under the Food Security Act of 1985[1] and regulatory exclusion under the Clean Water Act[2] in place with the USDA ASCS who approved the 43.4-acre CDA and the southeast portion of the Marsh farm tract north of Lane Road as "Commenced Converted Wetlands" and it should have been recognized. This documentation is provided in the EcoStrategies 2015 Report. The defendant claims that his commenced conversion to farmland in the CDA south of Lane Road and north of Lane Road should have never been stopped and therefore he has a right to restore it to the pre-1984 condition, which is presented on Figures 2, 5, and 8 (showing the May 11, 1983 USDA aerial photo) and Figure 6 (defendant's personal aerial photo). When viewing this evidence, one can clearly see functional drainage ditches and a well-drained farm site with no areas of ponding or standing water. By not allowing the defendant to maintain the entire integrated drainage network the site was transformed hydrologically over several decades into what it is today. Figure 7 (2006 aerial photo) is a good

[1] P.L. 99-198 (99 Stat. 1354, 1507-1508) (Dec. 23, 1985)) (16 U.S.C. 3822(a)(1) – "The Food Security Act of 1985" ('FSA')," specifically, FSA Secs. 1221 and 1222(a)(1); 7 CFR 12.5(d)(1)(i), 52 FR 35194, 35203 (Sept. 17, 1987); 7 CFR 12.5(d)(3), 52 FR 35194, 35203; 7 CFR 12.5(d)(5)(iv), 52 FR 35194, 35203-35204.

[2] U.S. Army Corps of Engineers, Regulatory Guidance Letter (RGL 90-7), "SUBJECT: Clarification of the Phrase 'Normal Circumstances' as it Pertains to Cropped Wetlands (Sept. 26, 1990; exp. Dec. 31, 1993), Sec. 5.d.; 33 CFR 328.3(a)(8) and 40 CFR 230.3, 58 FR 45008, 45031-45033, 45036-45037 (Aug. 25, 1993); 7 CFR 12.5(d) (5) (iii), 52 FR 35194, 35204; RGL 90-7, Sec. 5.e; 58 FR 45033-45034, Sec. V.G.; 7 CFR

representation of what the land looks like today (along with current site photos from the plaintiff and defendant) showing ponding and areas of standing water that were otherwise dry and well-drained prior to 1984. The full extent of impacts into the adjacent farm areas is unknown. The incorrect installation of the Sharp Road culvert (i.e. installing it 1.75 feet higher in elevation than the "uphill/upstream" Lane Road culvert 1,800 feet away) further exacerbated the farm drainage problem.

19. EcoStrategies stands by the conclusion of our 2015 Report, which states that the defendant should be allowed to pursue his original farming goals and return the property to its pre-1984 condition via the Consent Order. Our job was to provide, collect and observe the factual evidence in the form of authentic photographs, ASCS documentation, and an elevation survey of the two culverts, and provide a professional opinion of the results and conclusions. The Edwards 2017 Flood Report focuses on assessing only surface flooding in farmable areas outside the CDA on the south side of Lane road. The Edwards Report does not conflict with the stated purpose and conclusions of the EcoStrategies 2015 Report. Therefore, the purpose, scope and conclusions for the two reports are different. We believe the EcoStrategies 2015 Report provides factual evidence to understand the real background of how the drainage and standing water changed over time versus only studying current conditions and predictive scenarios.

Disclaimer

20. This response was provided using an objective and scientific approach based on factual evidence. EcoStrategies understands that there may be other information that was not discovered or brought to our attention during this evaluation. EcoStrategies reserves the right to revise our observations outlined in this response letter if additional evidence or information becomes available. This document was prepared for the defendant's attorney in an effort to help resolve the court case. EcoStrategies disavows any liability for the use of this document by others.

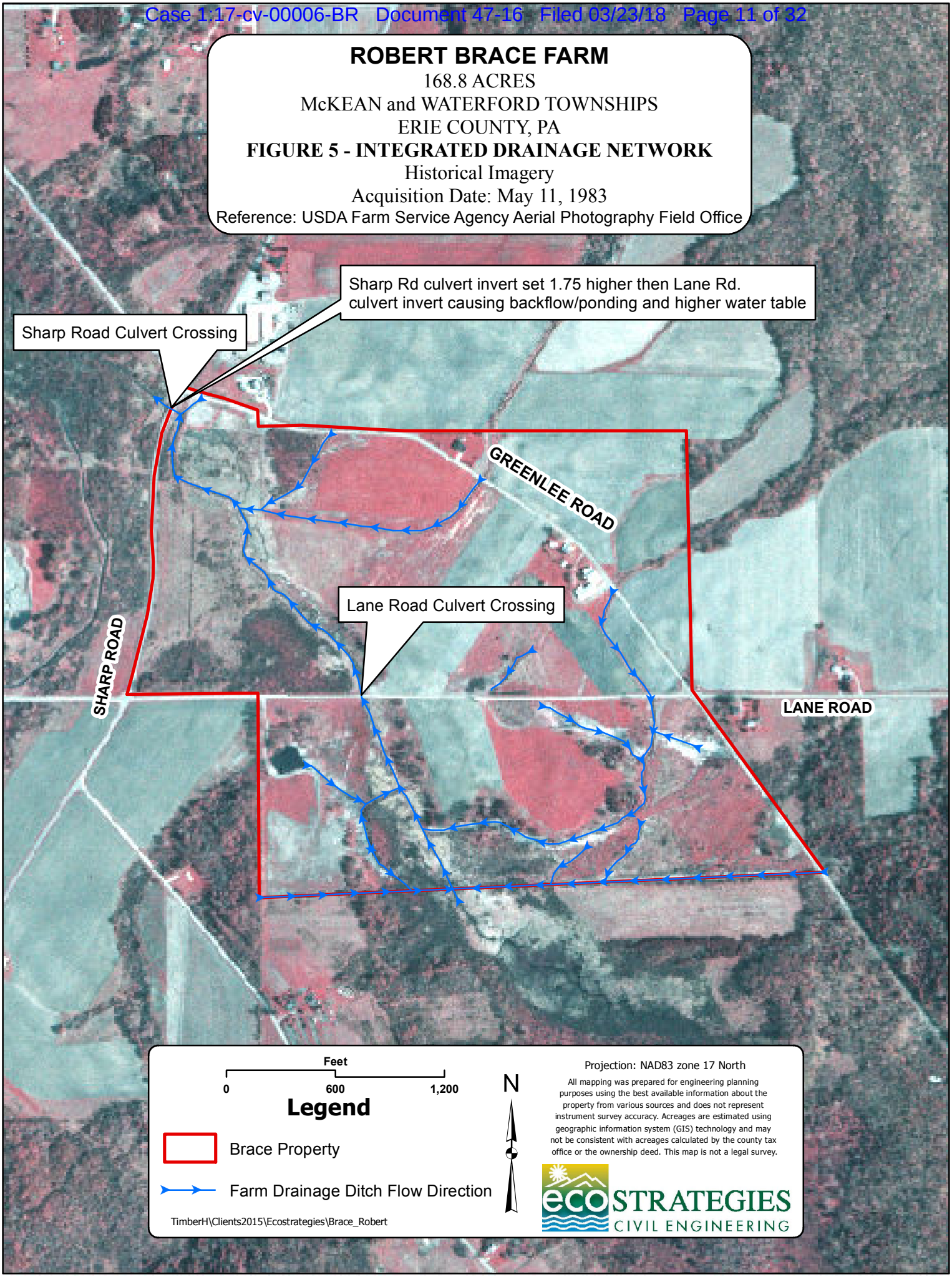
Attachments

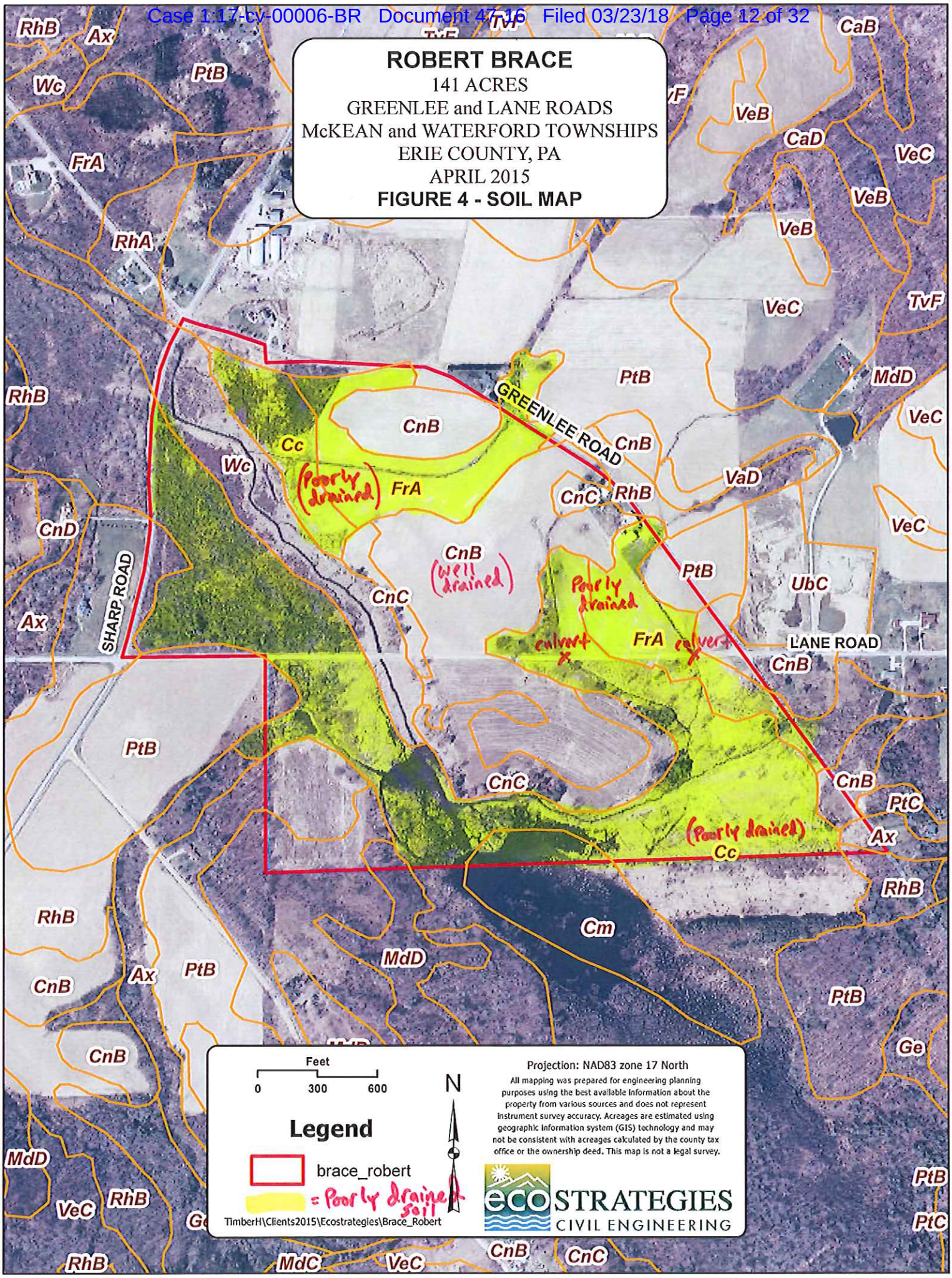
ROBERT BRACE FARM

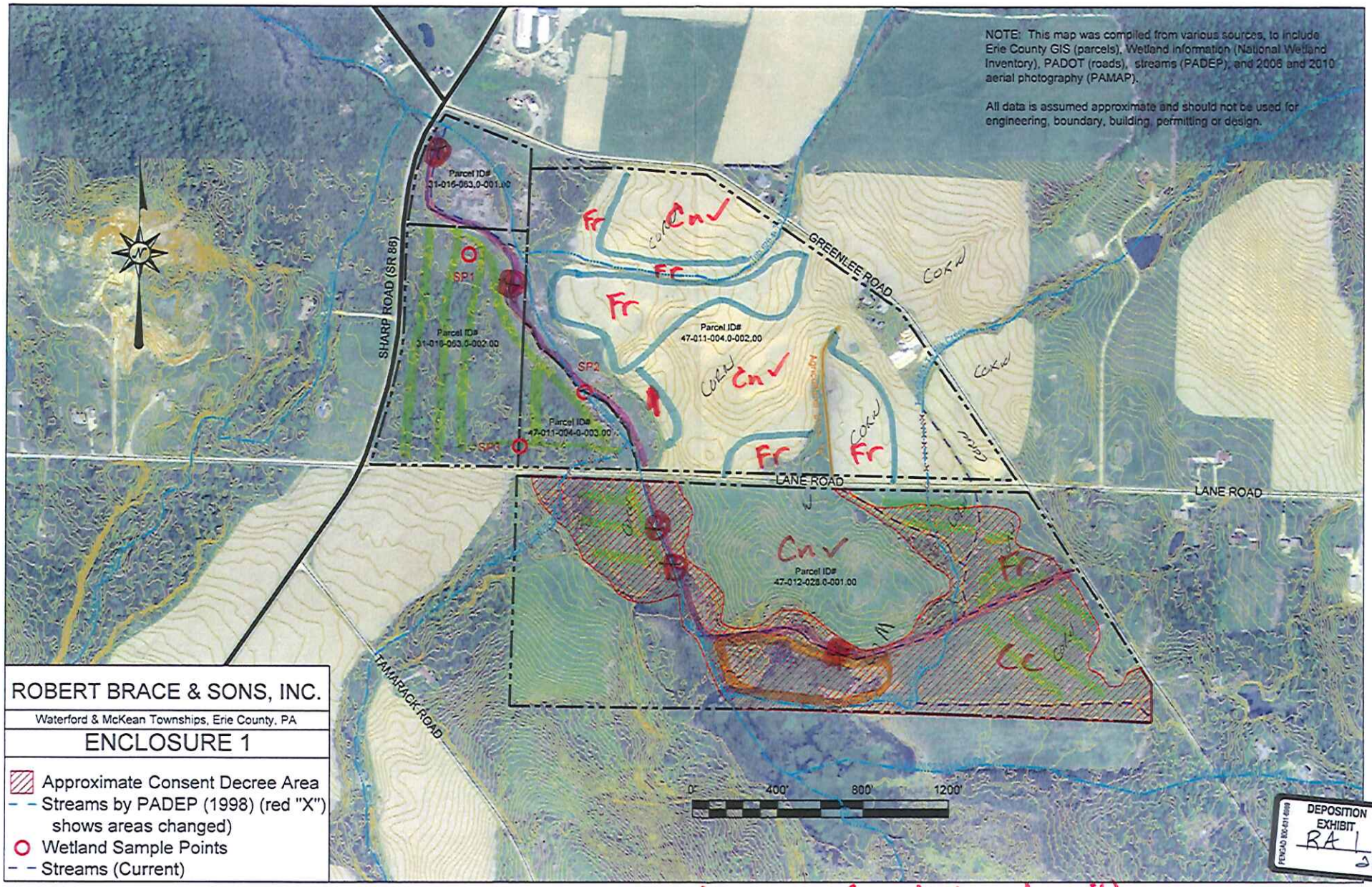
168.8 ACRES
McKEAN and WATERFORD TOWNSHIPS
ERIE COUNTY, PA

FIGURE 5 - INTEGRATED DRAINAGE NETWORK

Historical Imagery
Acquisition Date: May 11, 1983
Reference: USDA Farm Service Agency Aerial Photography Field Office




ROBERT BRACE
141 ACRES
GREENLEE and LANE ROADS
McKEAN and WATERFORD TOWNSHIPS
ERIE COUNTY, PA
APRIL 2015
FIGURE 4 - SOIL MAP
GREENLEE ROAD
LANE ROAD
SHARP ROAD
(Poorly drained)
FrA
CnB
(well drained)
Poorly drained
culvert
culvert
(Poorly drained)
Cc
RhB
Ax
Wc
PtB
CaB
VeB
CaD
VeC
TvF
MdD
VaD
CnC
UbC
PtC
Cm
Ge
Feet
0
300
600
N
Legend
brace_robert
= Poorly drained soil
Projection: NAD83 zone 17 North
All mapping was prepared for engineering planning purposes using the best available information about the property from various sources and does not represent instrument survey accuracy. Acreages are estimated using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. This map is not a legal survey.
TimberH\Clients2015\Ecostrategies\Brace_Robert
ecoSTRATEGIES
CIVIL ENGINEERING



● Randy Brace's "X" for Beave Dam

Fr = Freemont Silt Loam (poorly drained soil)
Cc = Canandaigua Silt Loam (poorly drained soil)
Cn = Chenango Gravel (well drained soil)

Crop Yield Maps:

Homestead 12 (2013-2017)

Homestead 15 (2013-2017)

Homestead 18 (2014-2017)

Homestead 19 (2013-2017)

Homestead 26 (2017)

CENTERRA CO-OP

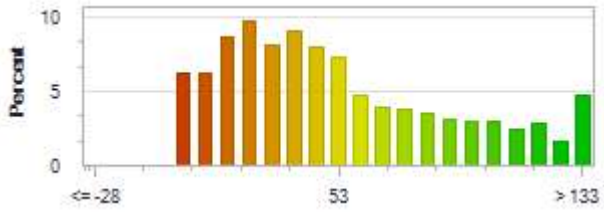
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2013
Farm: HOMESTEAD **Area:** 7.76
Field: HOMESTEAD 12
Crop Name: Corn

Harvest Summary

Total Yield (dry):	425.10 bu
Harvested Area:	7.95 acre
Crop Zone Area:	7.76 acre
Average Moisture:	32.98 %
Average Yield:	53.50 bu/acre
Avg Yld by Crp Zn Area:	54.78 bu/acre
Harvest Ended Date:	Sep 30, 2013

Yield Distribution %



Powered by MapShots AgStudio"

CENTERRA CO-OP

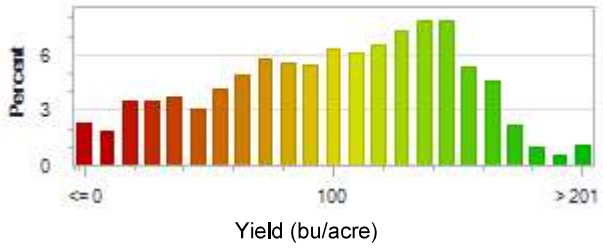
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2014
Farm: HOMESTEAD **Area:** 8.50
Field: HOMESTEAD 12
Crop Name: Corn

Harvest Summary

Total Yield (dry):	856.81 bu
Harvested Area:	8.48 acre
Crop Zone Area:	8.50 acre
Average Moisture:	31.79 %
Average Yield:	101.02 bu/acre
Avg Yld by Crp Zn Area:	100.80 bu/acre
Harvest Ended Date:	Oct 17, 2014

Yield Distribution %



CENTERRA CO-OP

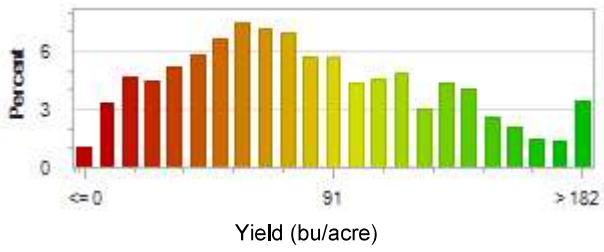
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2015
Farm: HOMESTEAD **Area:** 8.50
Field: HOMESTEAD 12
Crop Name: Corn

Harvest Summary

Total Yield (dry):	702.67 bu
Harvested Area:	8.52 acre
Crop Zone Area:	8.50 acre
Average Moisture:	29.78 %
Average Yield:	82.44 bu/acre
Avg Yld by Crp Zn Area:	82.67 bu/acre
Harvest Ended Date:	Sep 24, 2015

Yield Distribution %



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CENTERRA CO-OP

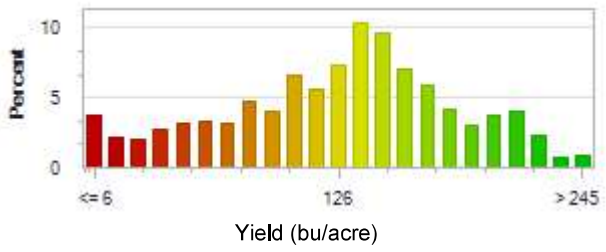
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2017
Farm: HOMESTEAD **Area:** 8.49
Field: HOMESTEAD 12
Crop Name: Corn

Harvest Summary

Total Yield (dry):	1,105.31 bu
Harvested Area:	8.67 acre
Crop Zone Area:	8.49 acre
Average Moisture:	25.12 %
Average Yield:	127.42 bu/acre
Avg Yld by Crp Zn Area:	130.19 bu/acre
Harvest Ended Date:	Oct 2, 2017

Yield Distribution %



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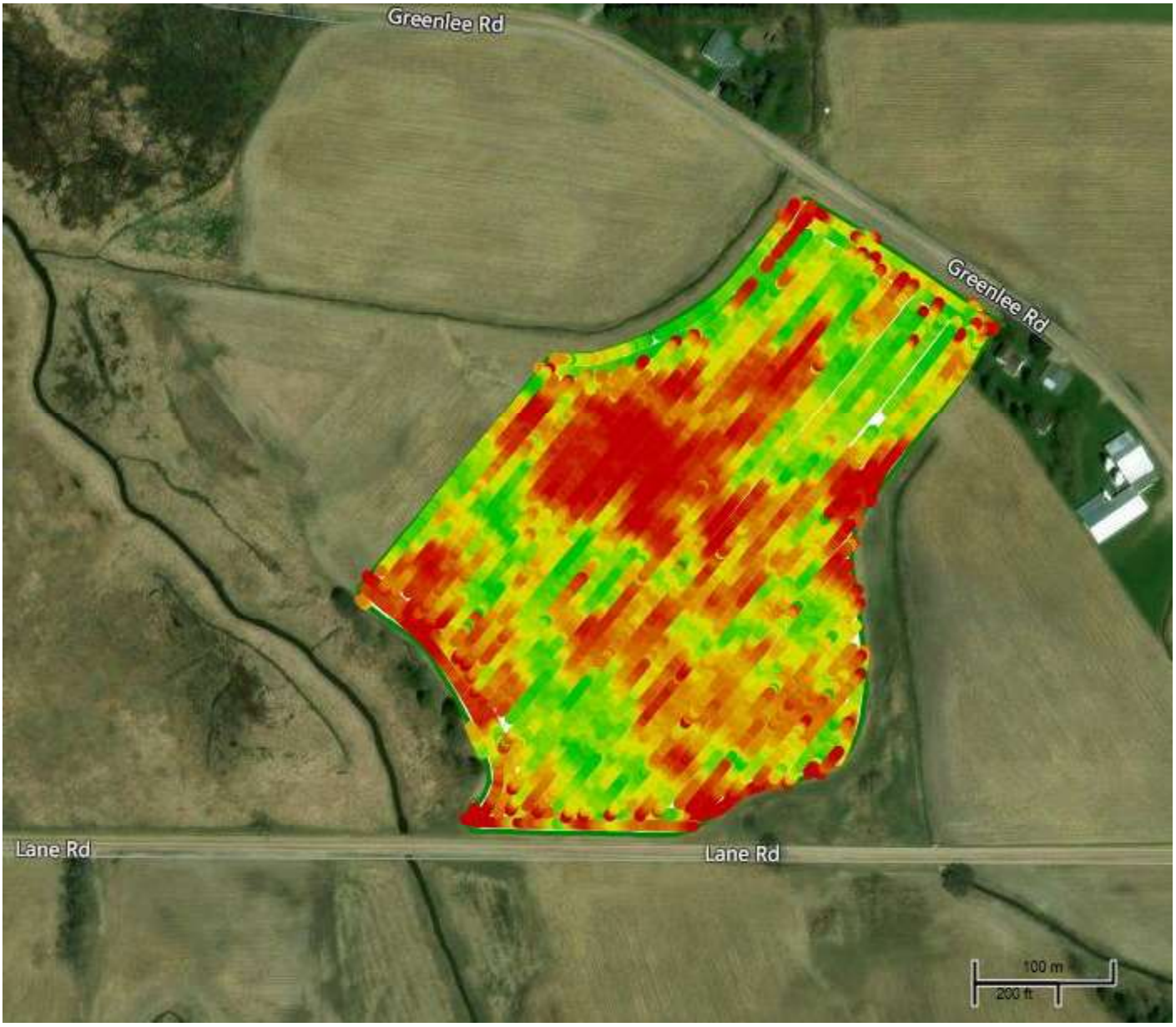
CENTERRA CO-OP

Yield Map

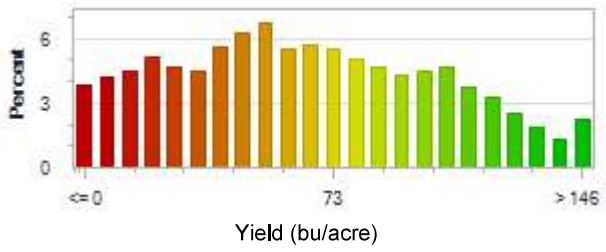
ROBERT BRACE AND SONS **Crop Year:** 2013
Farm: HOMESTEAD **Area:** 15.99
Field: HOMESTEAD 15
Crop Name: Corn



Harvest Summary

Total Yield (dry):	1,061.18 bu
Harvested Area:	16.27 acre
Crop Zone Area:	15.99 acre
Average Moisture:	34.54 %
Average Yield:	65.24 bu/acre
Avg Yld by Crp Zn Area:	66.37 bu/acre
Harvest Ended Date:	Sep 30, 2013

Yield Distribution %



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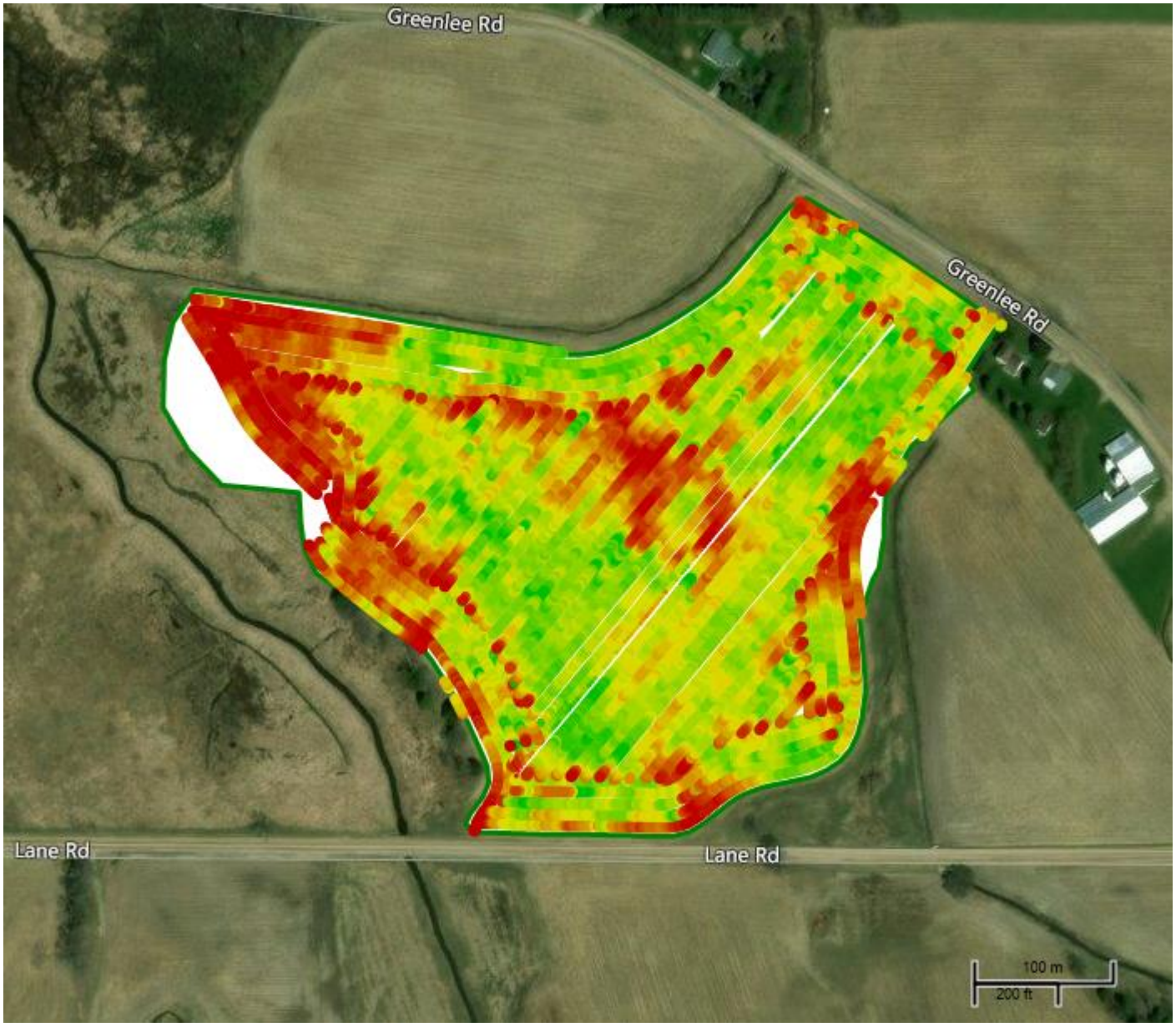
CENTERRA CO-OP

Yield Map

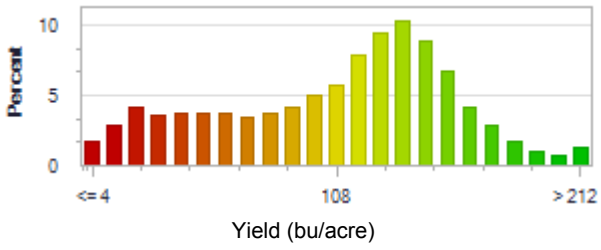
ROBERT BRACE AND SONS **Crop Year:** 2014
Farm: HOMESTEAD **Area:** 20.89
Field: HOMESTEAD 15
Crop Name: Corn



Harvest Summary

Total Yield (dry):	2,233.27 bu
Harvested Area:	20.28 acre
Crop Zone Area:	20.89 acre
Average Moisture:	33.65 %
Average Yield:	110.15 bu/acre
Avg Yld by Crp Zn Area:	106.91 bu/acre
Harvest Ended Date:	Oct 17, 2014

Yield Distribution %



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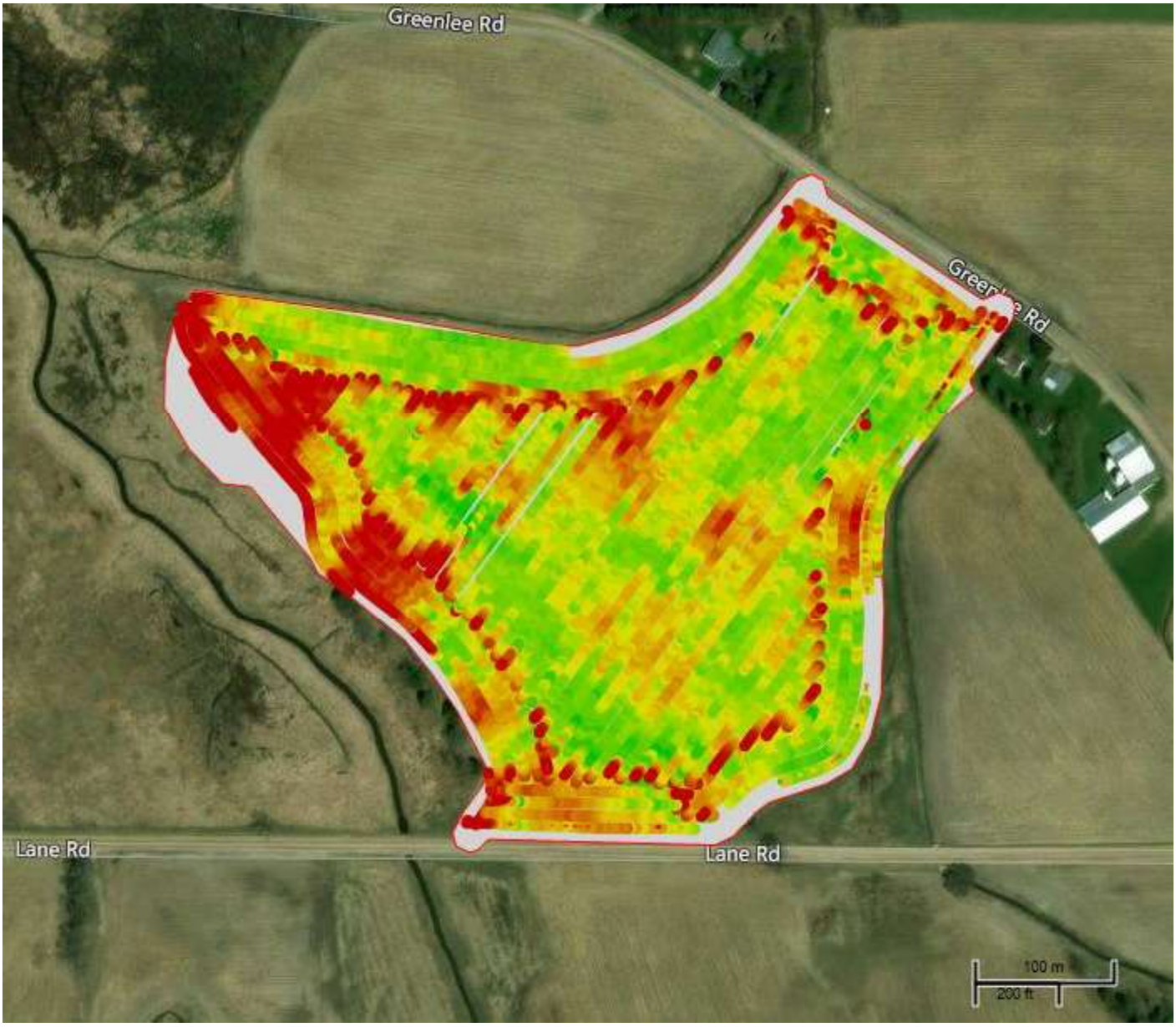
CENTERRA CO-OP

Yield Map

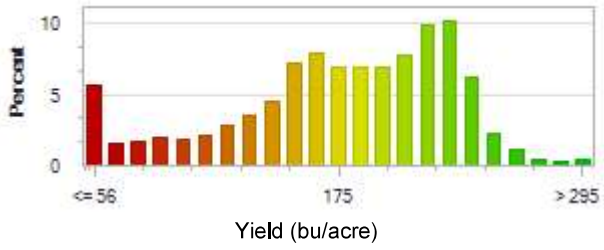
ROBERT BRACE AND SONS **Crop Year:** 2016
Farm: HOMESTEAD **Area:** 22.23
Field: HOMESTEAD 15
Crop Name: Corn



Harvest Summary

Total Yield (dry):	3,717.24 bu
Harvested Area:	20.80 acre
Crop Zone Area:	22.23 acre
Average Moisture:	21.76 %
Average Yield:	178.72 bu/acre
Avg Yld by Crp Zn Area:	167.22 bu/acre
Harvest Ended Date:	Oct 5, 2016

Yield Distribution %



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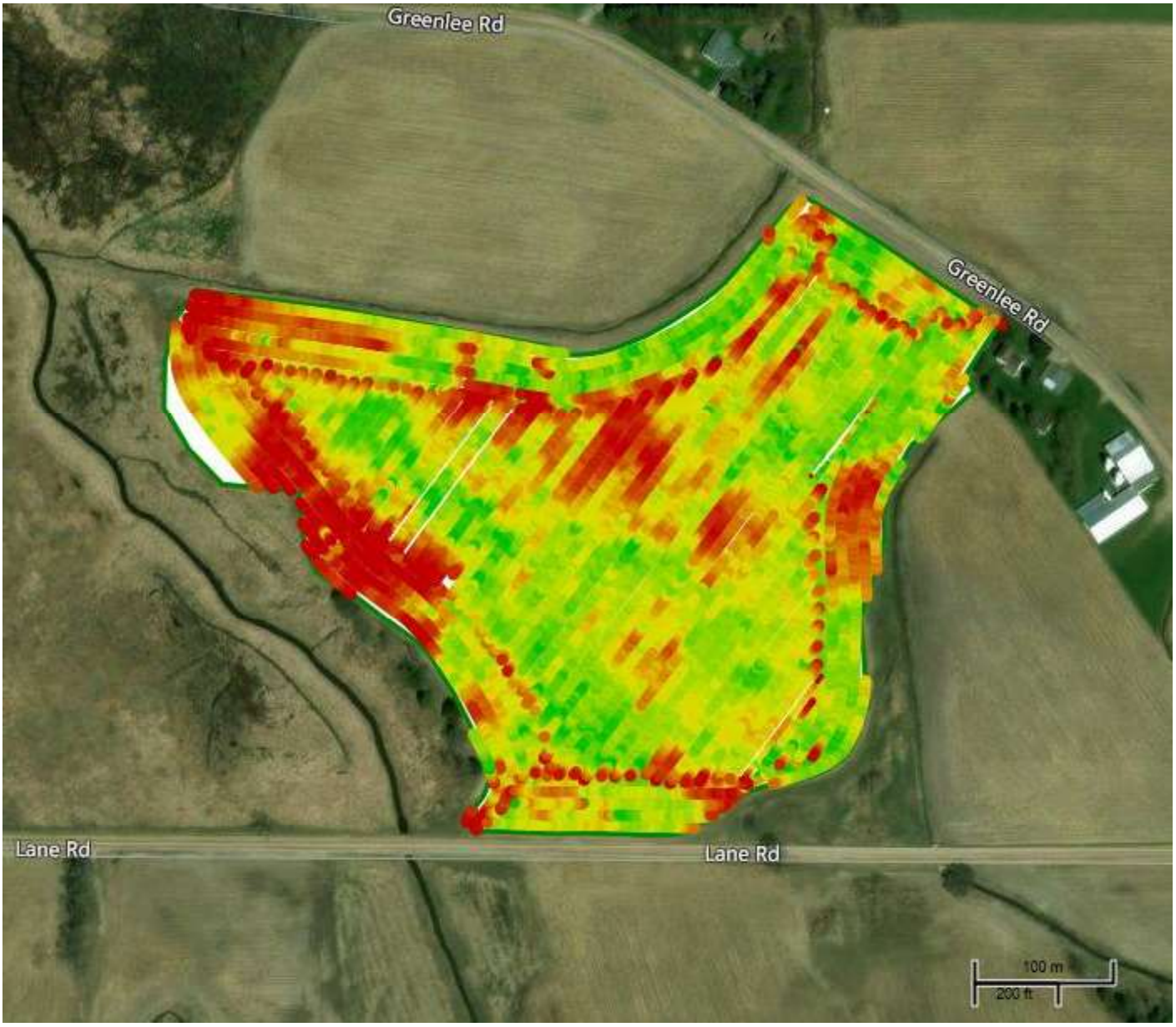
CENTERRA CO-OP

Yield Map

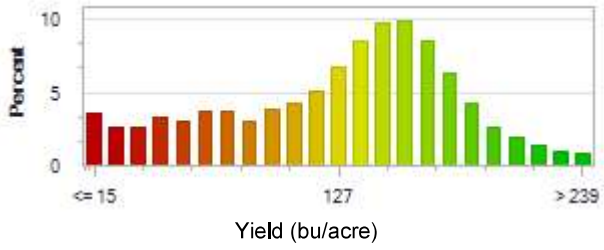
ROBERT BRACE AND SONS **Crop Year:** 2017
Farm: HOMESTEAD **Area:** 20.87
Field: HOMESTEAD 15
Crop Name: Corn



Harvest Summary

Total Yield (dry):	2,672.31 bu
Harvested Area:	20.95 acre
Crop Zone Area:	20.87 acre
Average Moisture:	27.52 %
Average Yield:	127.55 bu/acre
Avg Yld by Crp Zn Area:	128.05 bu/acre
Harvest Ended Date:	Oct 17, 2017

Yield Distribution %



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CENTERRA CO-OP

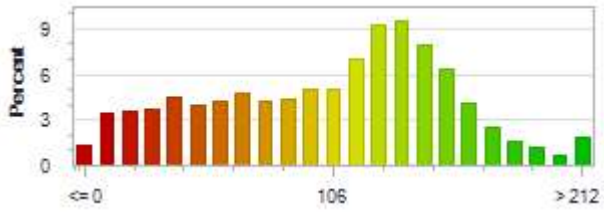
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2014
Farm: HOMESTEAD **Area:** 6.96
Field: HOMESTEAD 18
Crop Name: Corn

Harvest Summary

Total Yield (dry):	1,413.16 bu
Harvested Area:	13.25 acre
Crop Zone Area:	6.96 acre
Average Moisture:	34.63 %
Average Yield:	106.62 bu/acre
Avg Yld by Crp Zn Area:	203.04 bu/acre
Harvest Ended Date:	Oct 17, 2014

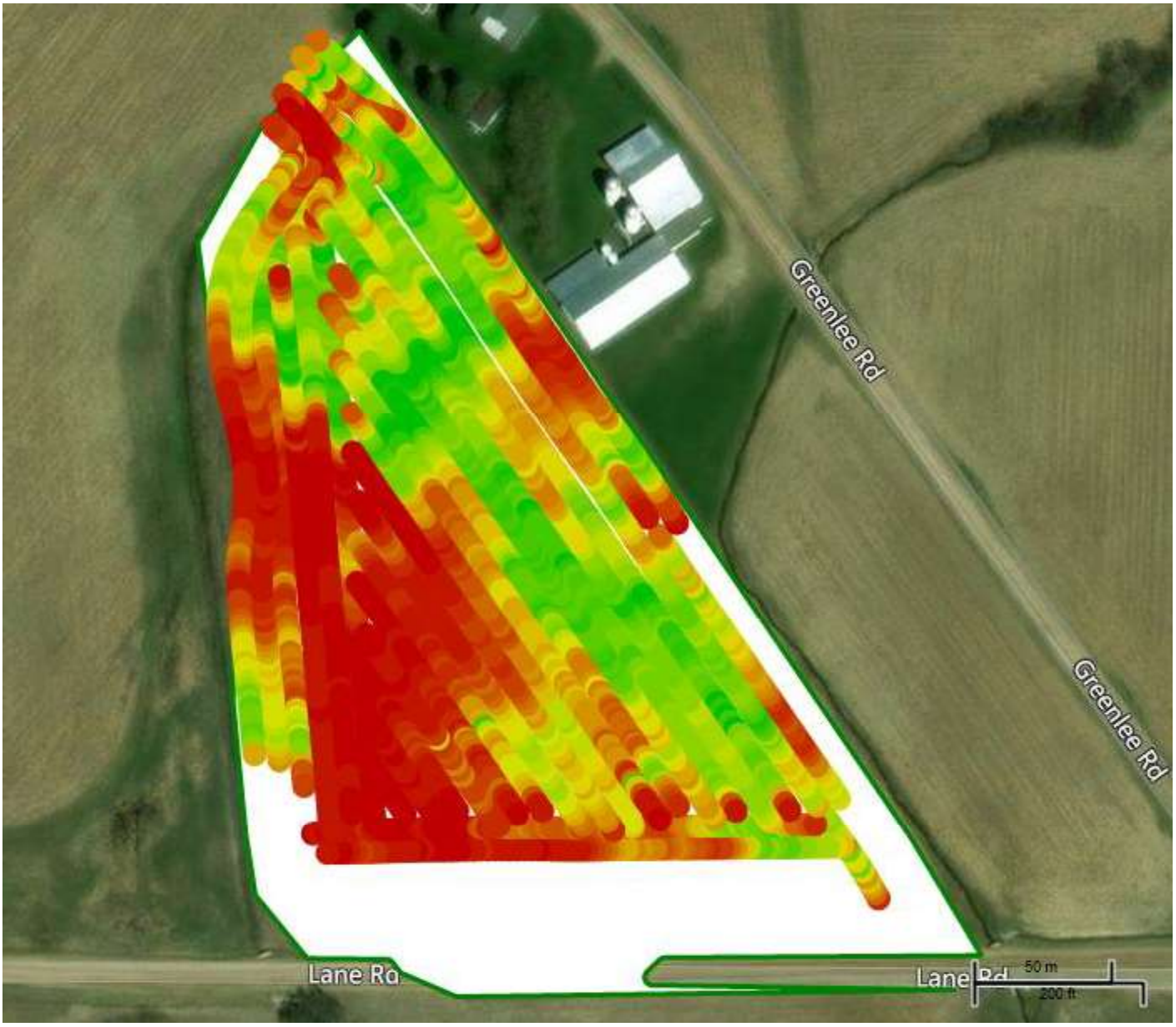
Yield Distribution %



CENTERRA CO-OP

Yield Map

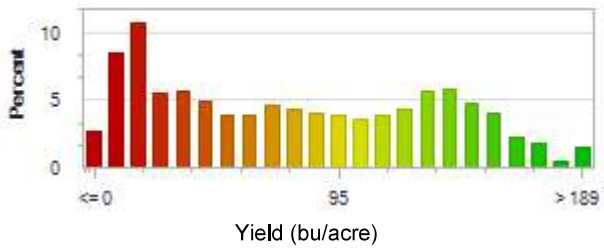
ROBERT BRACE AND SONS **Crop Year:** 2015
Farm: HOMESTEAD **Area:** 7.13
Field: HOMESTEAD 18
Crop Name: Corn



Harvest Summary

Total Yield (dry):	447.85 bu
Harvested Area:	5.68 acre
Crop Zone Area:	7.13 acre
Average Moisture:	28.85 %
Average Yield:	78.85 bu/acre
Avg Yld by Crp Zn Area:	62.81 bu/acre
Harvest Ended Date:	Sep 23, 2015

Yield Distribution %



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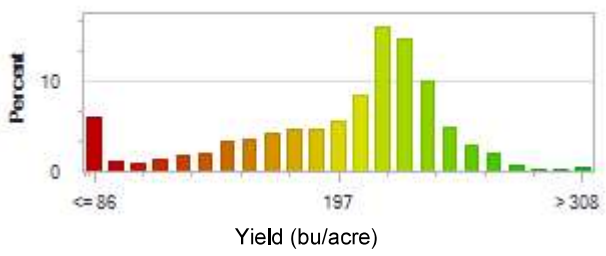
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2016
Farm: HOMESTEAD **Area:** 7.23
Field: HOMESTEAD 18
Crop Name: Corn

Harvest Summary

Total Yield (dry):	1,407.92 bu
Harvested Area:	6.98 acre
Crop Zone Area:	7.23 acre
Average Moisture:	22.58 %
Average Yield:	201.83 bu/acre
Avg Yld by Crp Zn Area:	194.73 bu/acre
Harvest Ended Date:	Oct 5, 2016

Yield Distribution %



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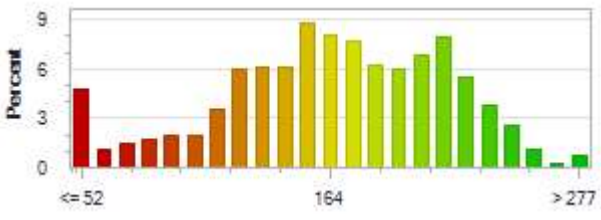
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2017
Farm: HOMESTEAD **Area:** 7.12
Field: HOMESTEAD 18
Crop Name: Corn

Harvest Summary

Total Yield (dry):	1,168.91 bu
Harvested Area:	7.01 acre
Crop Zone Area:	7.12 acre
Average Moisture:	23.79 %
Average Yield:	166.66 bu/acre
Avg Yld by Crp Zn Area:	164.17 bu/acre
Harvest Ended Date:	Oct 17, 2017

Yield Distribution %



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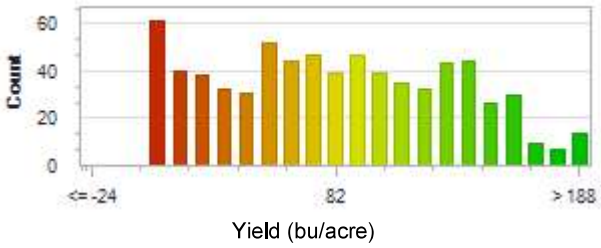
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2013
Farm: HOMESTEAD **Area:** 1.55
Field: HOMESTEAD 19
Crop Name: Corn

Harvest Summary

Total Yield (dry):	123.24 bu
Harvested Area:	1.44 acre
Crop Zone Area:	1.55 acre
Average Moisture:	31.16 %
Average Yield:	85.57 bu/acre
Avg Yld by Crp Zn Area:	79.51 bu/acre
Harvest Ended Date:	Sep 29, 2013

Yield Distribution %



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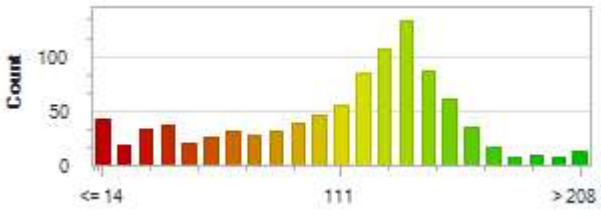
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2014
Farm: HOMESTEAD **Area:** 2.08
Field: HOMESTEAD 19
Crop Name: Corn

Harvest Summary

Total Yield (dry):	231.38 bu
Harvested Area:	1.99 acre
Crop Zone Area:	2.08 acre
Average Moisture:	32.44 %
Average Yield:	116.32 bu/acre
Avg Yld by Crp Zn Area:	111.24 bu/acre
Harvest Ended Date:	Oct 15, 2014

Yield Distribution %



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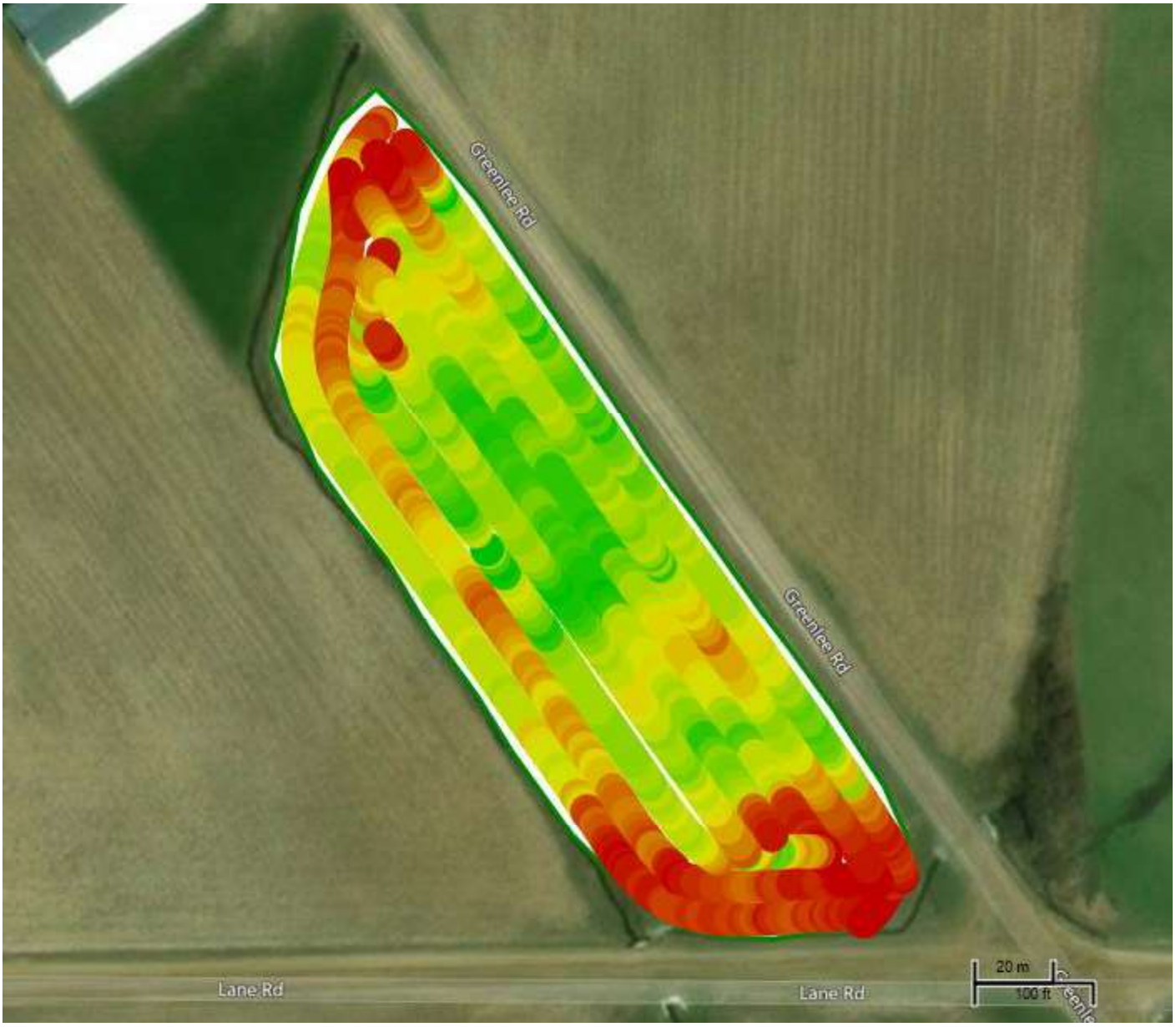
CENTERRA CO-OP

Yield Map

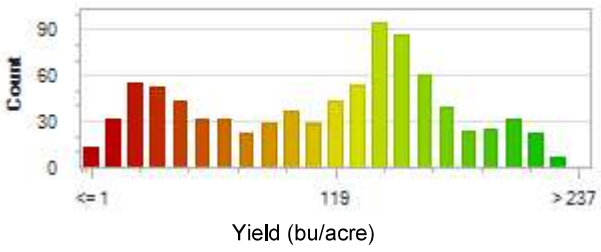
ROBERT BRACE AND SONS **Crop Year:** 2015
Farm: HOMESTEAD **Area:** 2.08
Field: HOMESTEAD 19
Crop Name: Corn



Harvest Summary

Total Yield (dry):	242.49 bu
Harvested Area:	1.98 acre
Crop Zone Area:	2.08 acre
Average Moisture:	26.44 %
Average Yield:	122.25 bu/acre
Avg Yld by Crp Zn Area:	116.58 bu/acre
Harvest Ended Date:	Sep 23, 2015

Yield Distribution %



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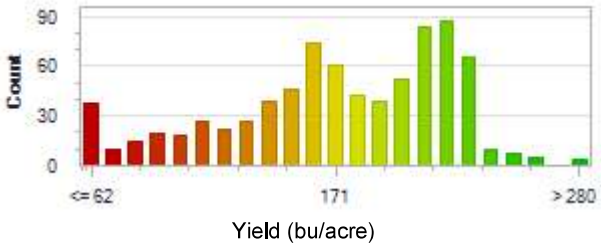
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2016
Farm: HOMESTEAD **Area:** 2.08
Field: HOMESTEAD 19
Crop Name: Corn

Harvest Summary

Total Yield (dry):	369.28 bu
Harvested Area:	2.06 acre
Crop Zone Area:	2.08 acre
Average Moisture:	21.99 %
Average Yield:	179.66 bu/acre
Avg Yld by Crp Zn Area:	177.54 bu/acre
Harvest Ended Date:	Oct 5, 2016

Yield Distribution %



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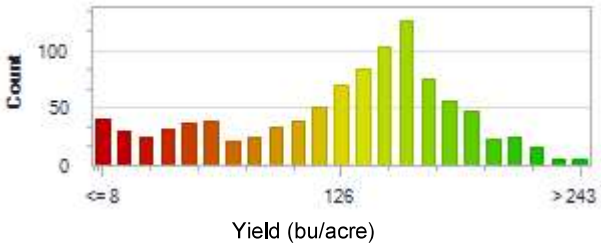
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2017
Farm: HOMESTEAD **Area:** 2.08
Field: HOMESTEAD 19
Crop Name: Corn

Harvest Summary

Total Yield (dry):	275.12 bu
Harvested Area:	2.06 acre
Crop Zone Area:	2.08 acre
Average Moisture:	27.43 %
Average Yield:	133.72 bu/acre
Avg Yld by Crp Zn Area:	132.27 bu/acre
Harvest Ended Date:	Oct 2, 2017

Yield Distribution %



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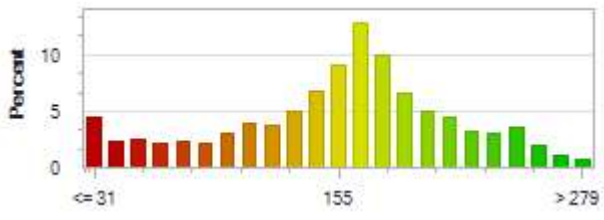
Yield Map

ROBERT BRACE AND SONS **Crop Year:** 2017
Farm: HOMESTEAD **Area:** 6.65
Field: HOMESTEAD 26
Crop Name: Corn

Harvest Summary

Total Yield (dry):	1,075.78 bu
Harvested Area:	6.83 acre
Crop Zone Area:	6.65 acre
Average Moisture:	26.51 %
Average Yield:	157.62 bu/acre
Avg Yld by Crp Zn Area:	161.77 bu/acre
Harvest Ended Date:	Oct 18, 2017

Yield Distribution %



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