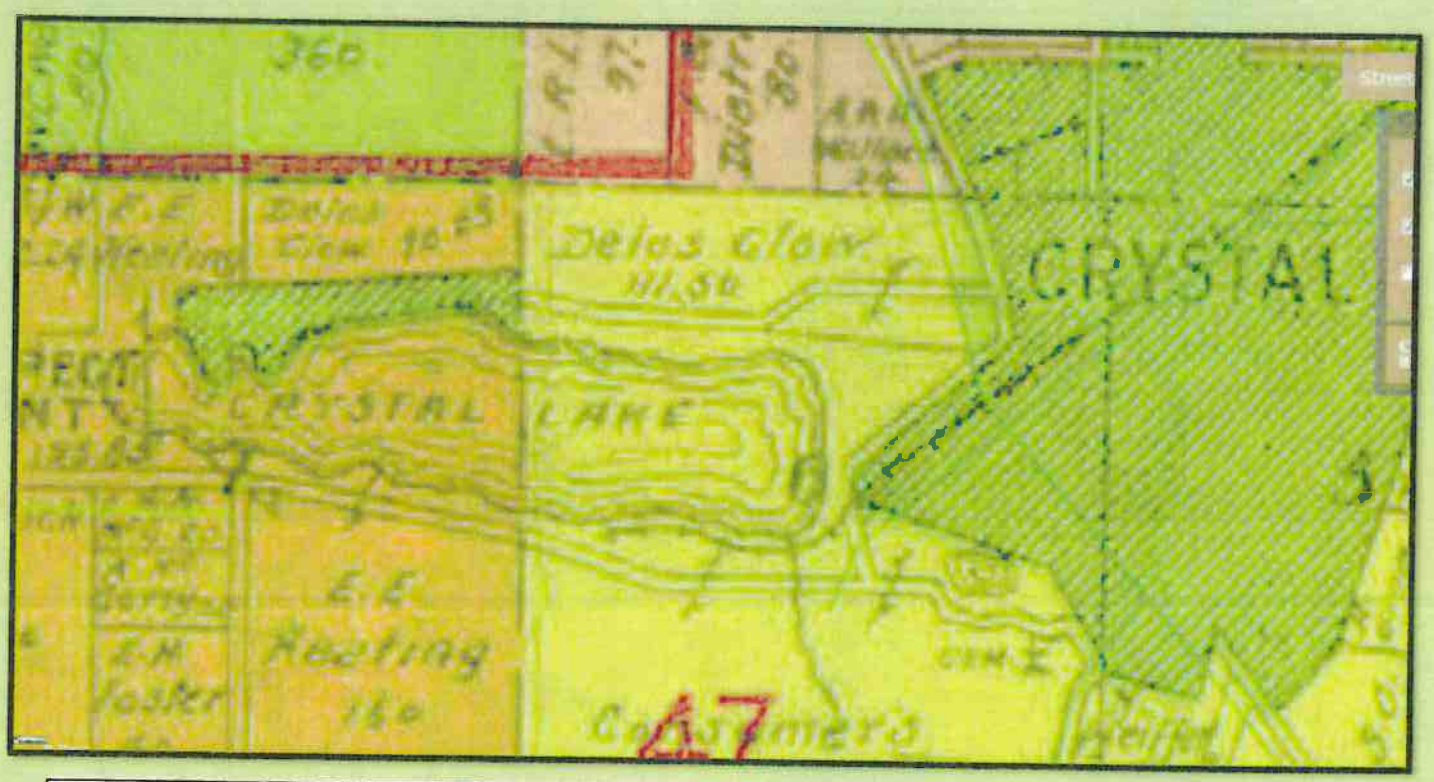
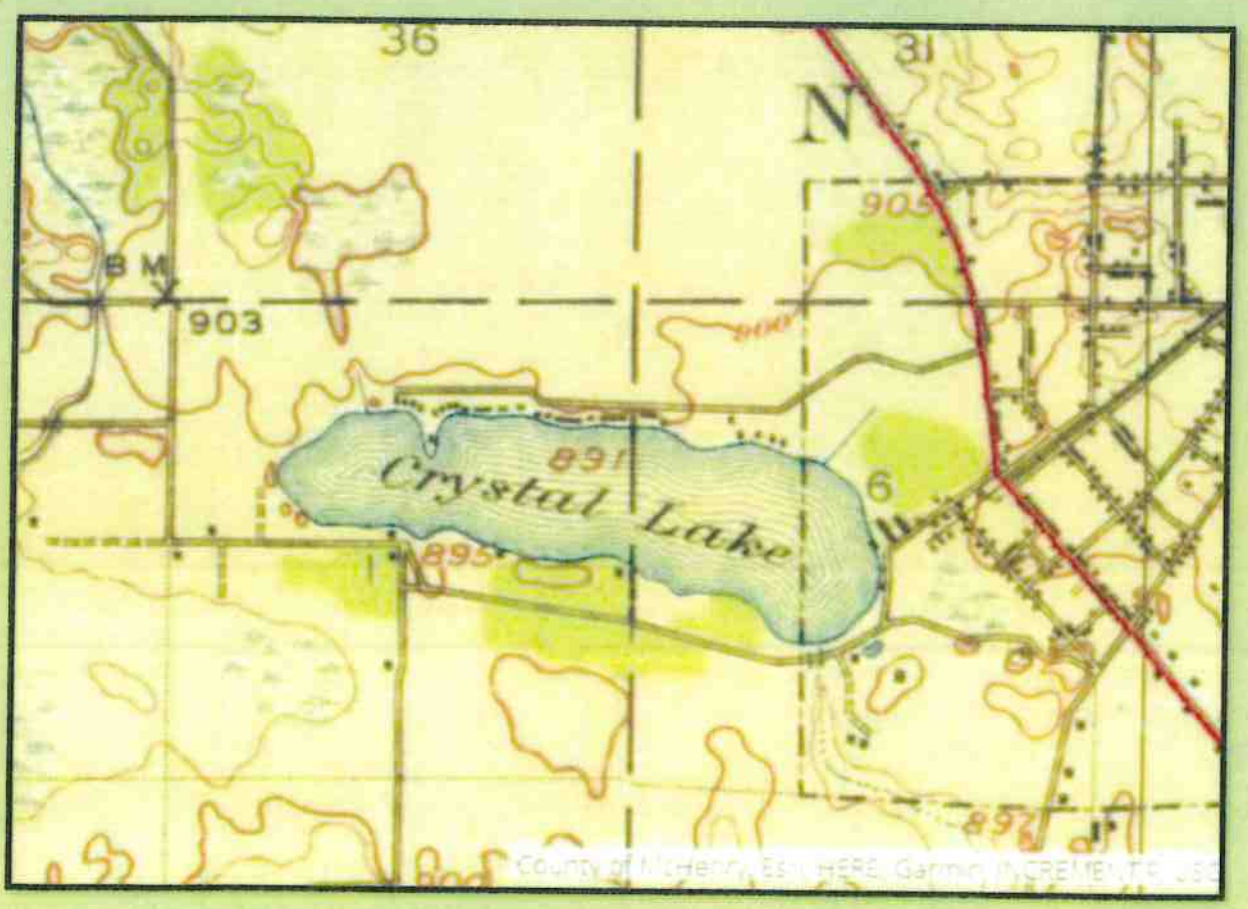
WETLAND MAPS

ETCHED AREAS DESIGNATED AS "TIMBER"

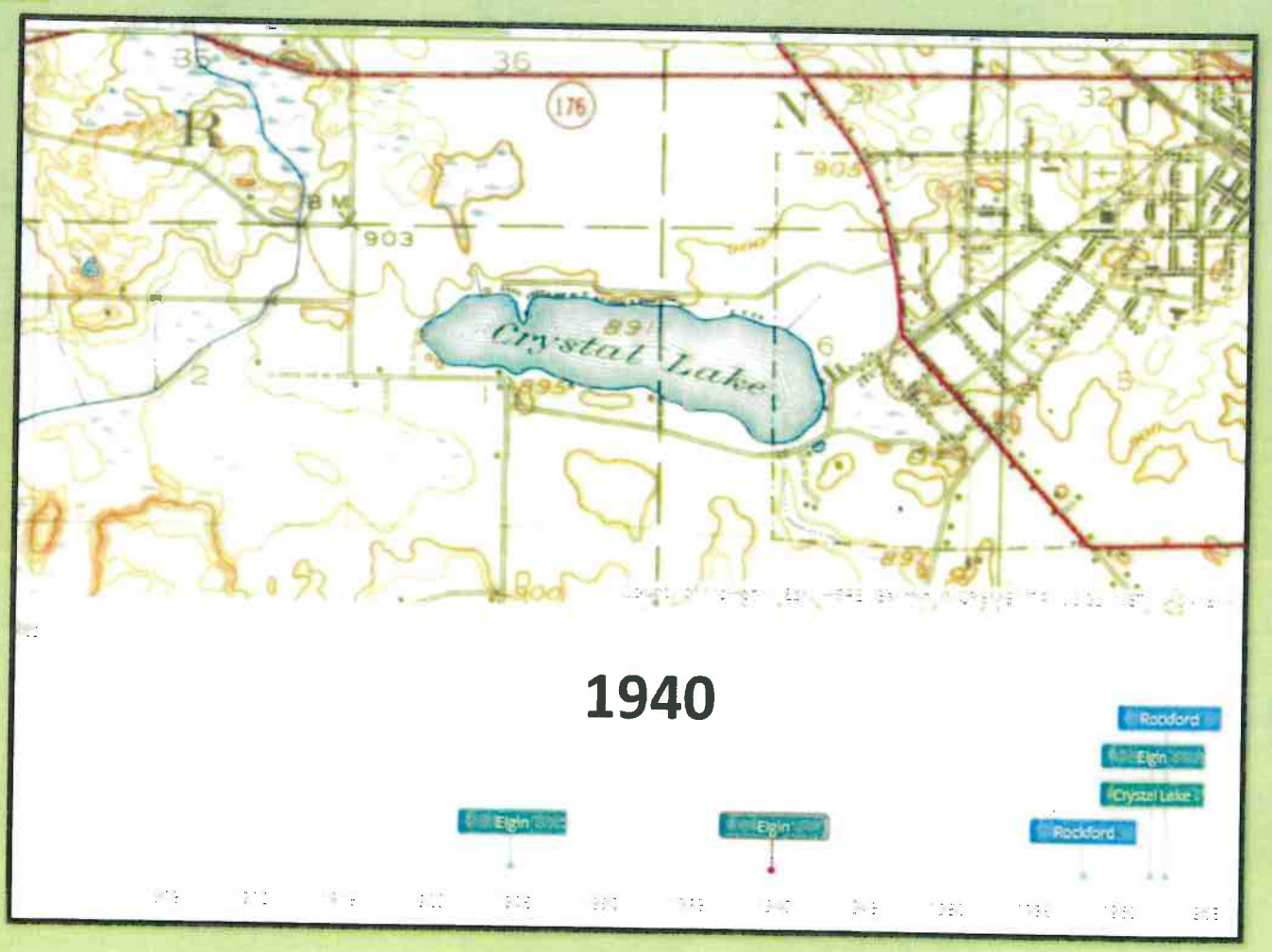


URBAN/RES DEVELOPMENT AREAS SHOW IN HATCHED GREEN
(CLDD BUILT ABOUT 6 YEARS EARLIER, THE DAM/WIER ABOUT 8 YEARS EARLIER)

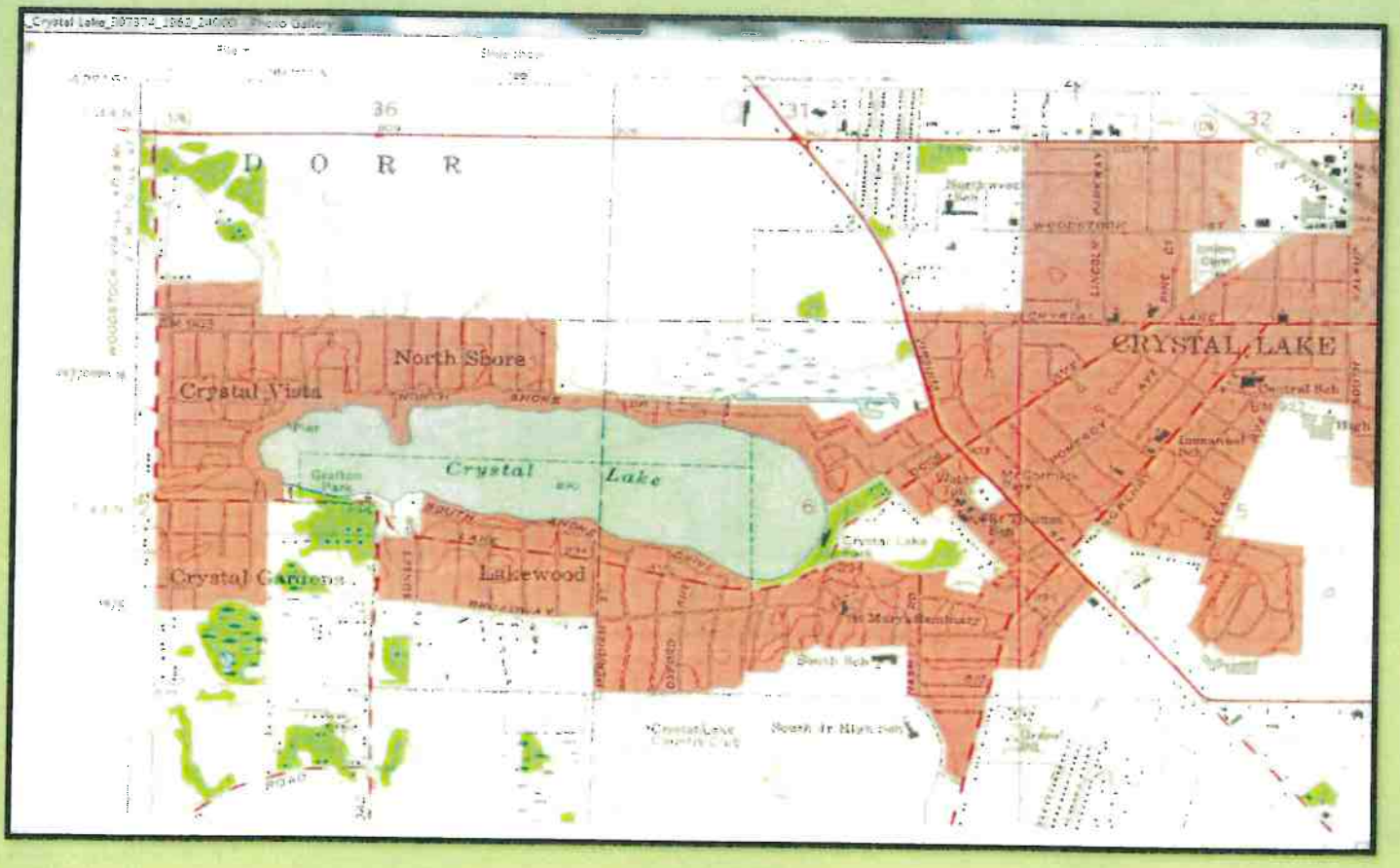
1923



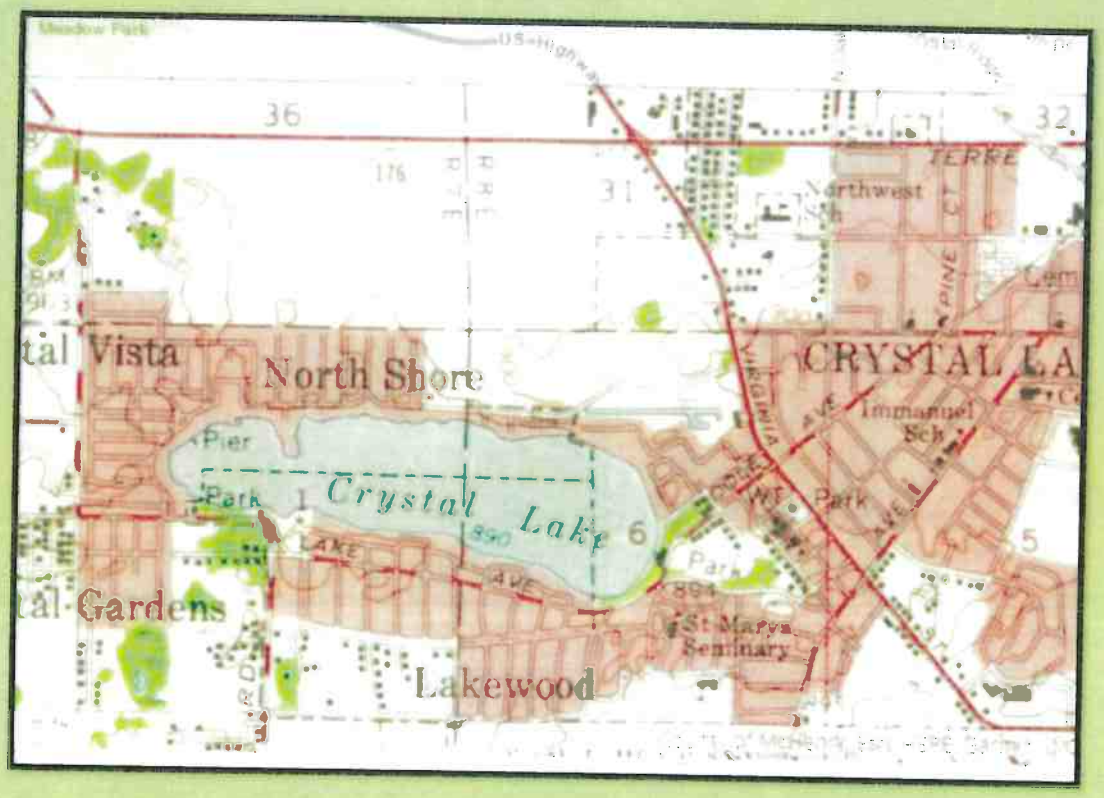
1925


36
176
R
903
Crystal Lake
Rockford
Elgin
Crystal Lake
Elgin
Elgin
Rockford

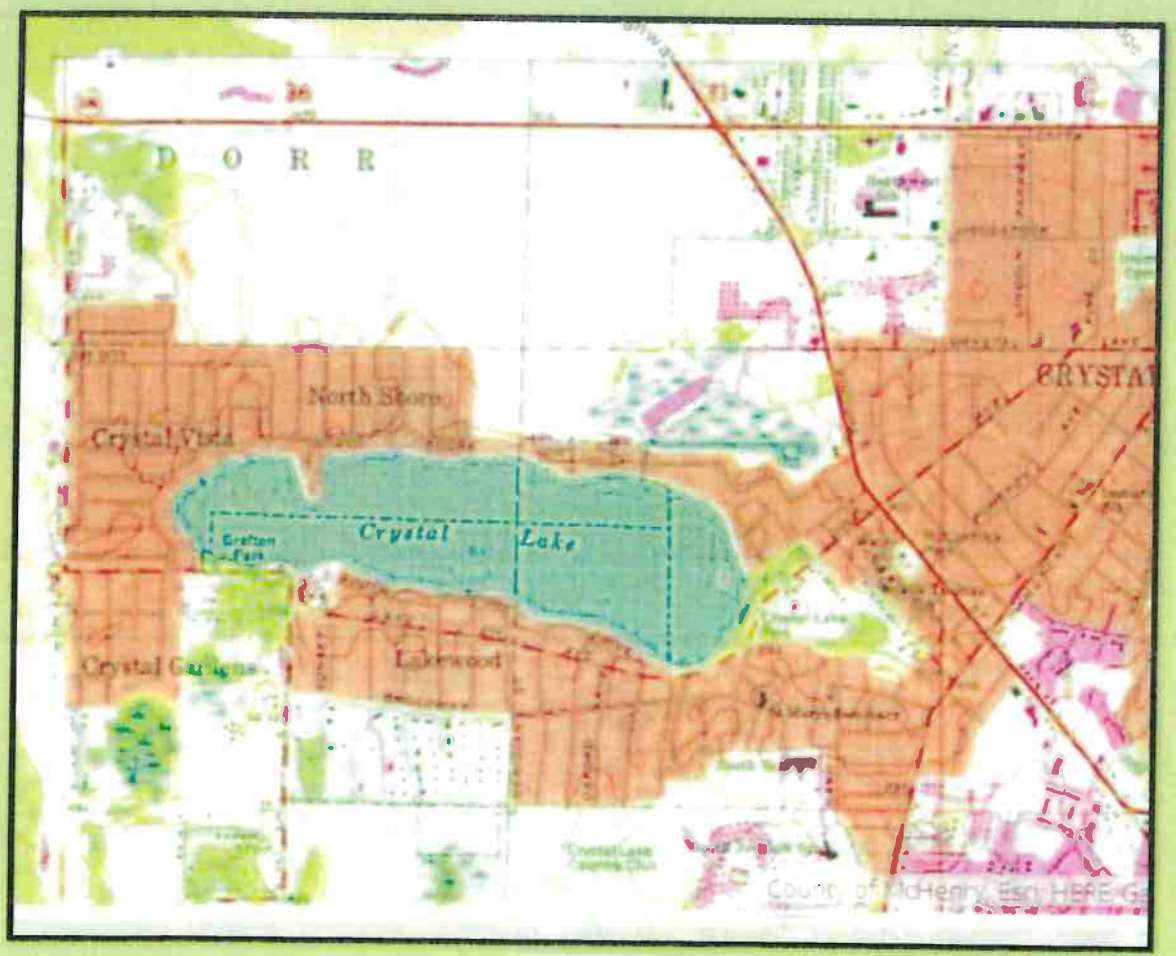
1940


D O R R
North Shore
Crystal Vista
Crystal Lake
Lakewood
CRYSTAL LAKE
Crystal Gardens

1962


36
32
31
TERRE
Northwest
PINE
Cem
tal Vista
North Shore
CRYSTAL LA
Immanuel
Sch
Pier
Park
Crystal Lake
LAKE
AVE
Park
Park
St Mary's
Seminary
tal Gardens
Lakewood

1972

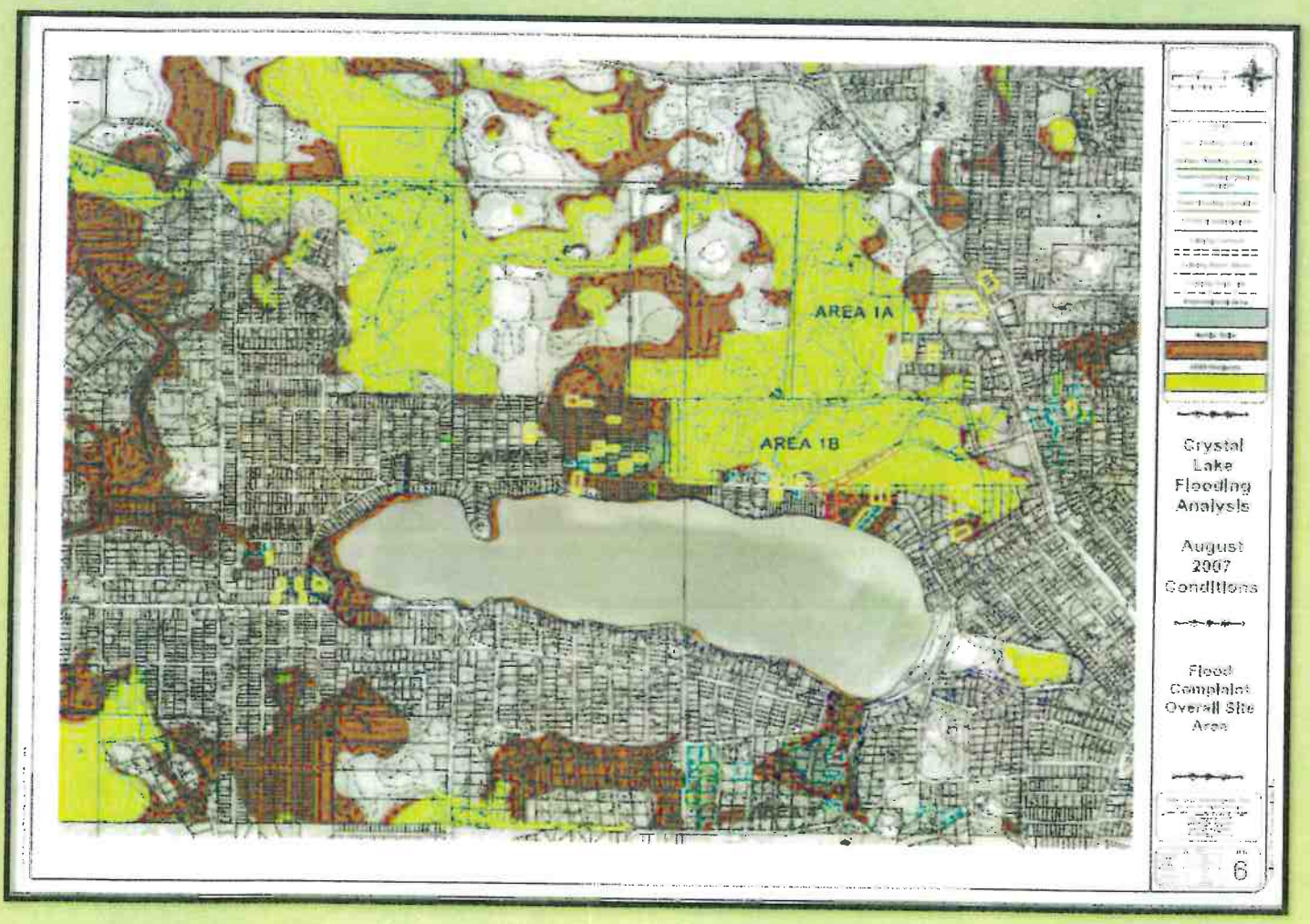

D O R R
North Shore
Crystal Vista
Crystal
Lake
Lakewood
CRYSTAL

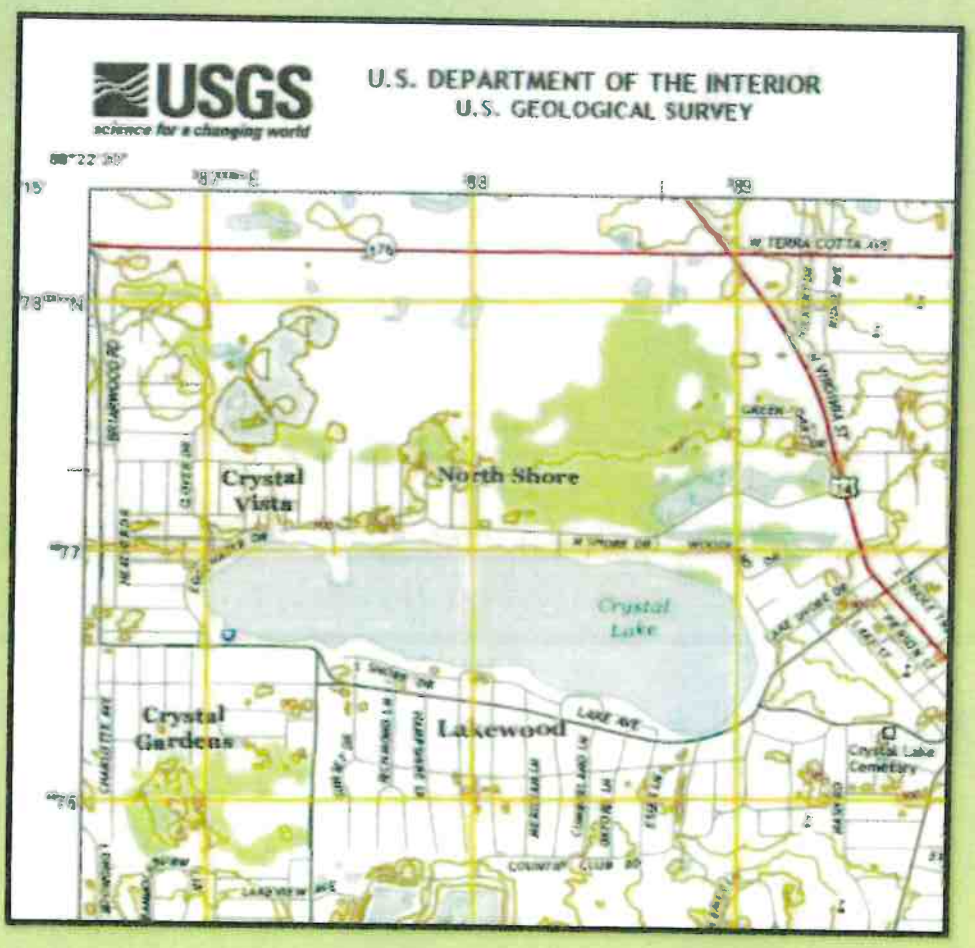
1980

1992

WETLAND AREAS SHOWN IN GEEN

2007

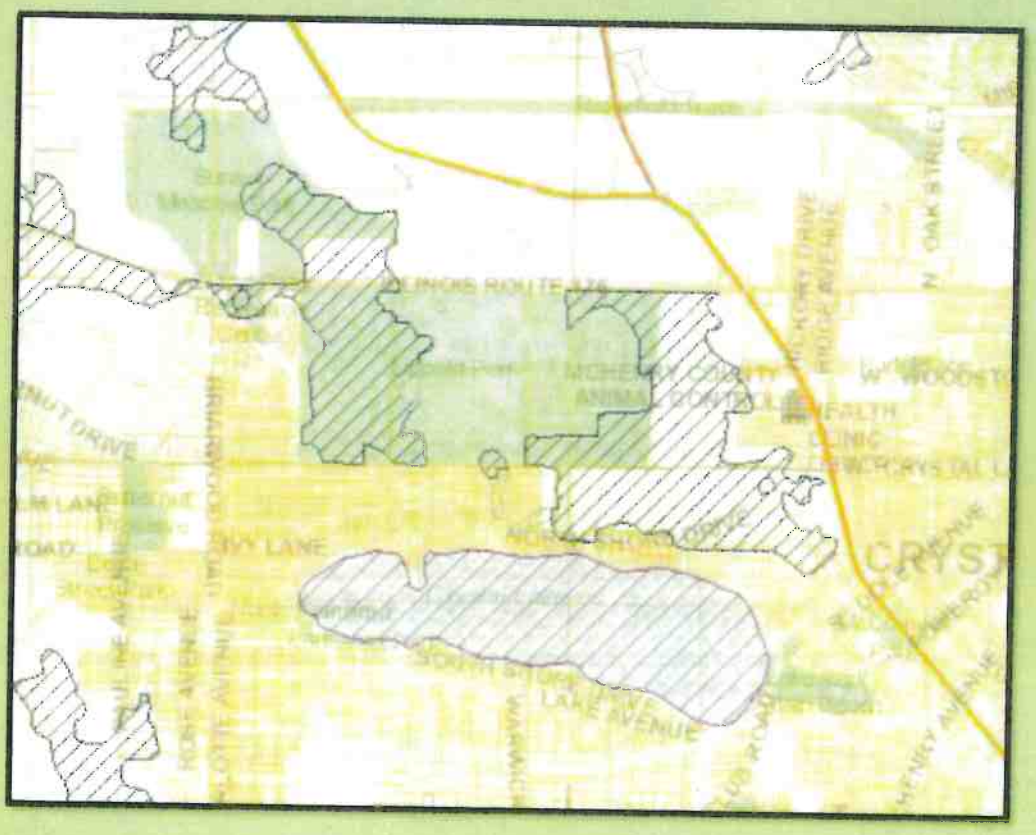

AREA 1A
AREA 1B
Crystal Lake Flooding Analysis
August 2007 Conditions
Flood Complaint Overall Site Area
6


USGS
science for a changing world
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
W TERRA COTTA AVE
Crystal Vista
North Shore
Crystal Lake
Crystal Gardens
Lakewood
Crystal Lake Cemetery

2015

2015 Aerial


176
BRIARWOOD RD
CLOVER DR
Crystal
Vista
North Shore
900
N SHORE DR
WOODL
GRE



2018

WETLAND SUMMARY

WETLAND EVOLUTION WAS LARGELY UNCHANGED UNTIL 1992 MAPS

SINCE THAT TIME THE EXPANSION HAS CONTINUED TO INCREASE

THE INCREASE OF ACRES OF WETLAND NORTH OF LAKE IS ESTIMATED AT 7-10 FOLD INCREASE IN ACRES OF WETLAND

PARTIAL SUMMARY

1917 CLDD PROVIDED A 1300 ACRE SPONGE 5 FEET DEEP NORTH OF LAKE

AGE, DAMAGE, AND LAKE PROTECTION EFFORTS RESULTED IN LOSS OF CLDD IN SOME AREAS IN THE SOUTHERN PORTION

RAIN AND LAKE LEVELS HIGH SINCE 1965, WORST IN 65-85 AND 07-17

RESIDENT FLOODING COMPLAINTS STARTED AROUND 1990 AND CONITNUE TODAY

WETLAND EXPANSION STARTED 1992 AND IS NOW AT 7-1O FOLD INCREASED FROM PRIOR 70 YEARS

THE AERIAL MAPS

1939


BXA-3-66
1939

Drain Tile Systems Used Widely for Farming

North of CL with the 1917 Drainage District Tile System

1958

1978

1988

DRAIN TILES AT LIPPOLD 1988

1993

1999

106

1999 ZOOM IN


176
RIVERSIDE
VISTA
JUANITA VISTA
TEAKWOOD
LANE
FIELD
ANDREA
LANE

2008

2010


ROUTE 176
RIVERA VISTA
WALTO VISTA
TEAKWOOD LANE
THORNWOOD LANE
BURR OAK DRIVE
EDGEWOOD AVENUE
MAYFIELD AVENUE
GREENFIELD ROAD
EASTEND AVENUE
NORTH SHORE DRIVE
OAK COURT
WOODLAND
DOLO ROSA
GREEN OAKS DRIVE
HICKORY DRIVE
RIDGE AVENUE
DEARBORN COURT

2018

AERIAL MAPS SUMMARY

FARMLAND AND WETLANDS ARE READILY VISIBLE

IMPACT OF DRAIN TILES IS VISIBLE

NEW WETLANDS AND RETURN OF PRIOR WETLANDS IS VISIBLE

1988 MARKS VISIBLE ALTERATIONS TO THE WETLAND/FARMLANDS IN LARGE AREAS UPSTREAM TO HIGH RISK AREAS

HISTORIC | ATHENA-GIS | FEMA CURRENT

FLOOD PLAIN CHANGES OVER TIME

BFE 982.6 HISTORIC

BFE 893.0 CURRENT

HEY ASSOC HAD SOME IDEAS AFTER THE 2007 FLOOD FOR AREAS NORTH OF THE LAKE (AREAS 1 AND 2)

Table 5 Alternative Comparison -- Area 1

Area 1A	Problems Addressed: High Groundwater	Minor Drainage Deficiency	Major Drainage Deficiency	Floodplain/ Floodway Reduction	Lots Served	Cost	Ecological Effects	Other Impacts
1. New [illegible] through Meyers					10	$[illegible]		
2. Repair existing field tile through Meyers property					4	$[illegible]		
3. New storm sewer through Meyers property					10	$[illegible]		
4. New overland drainage swale through Meyers property					10	$[illegible]		
5. New relief storm sewer to Crystal Creek watershed					4	NA	Lake Diversion	Increased Flooding
Area 1B								
6. New culvert under Northwood Drive					20	$[illegible]		
6A. New Open Channel From Meichan are to Lake					20	$70,300	Added Habitat	
6B. New sewer from Northwood to Lake					20	$[illegible]		
7. Re-route Northwood Drive					20	$[illegible]	Added Habitat	Better Traffic Control
6 or 7. Culvert from Woodlane Wetland to Lake					20	$[illegible]		
8. Add 6" to culverted lots	Not Effective							
9. Add storage at Cove Pond					20	$3,497,000	Trees and Wetland Lost	
Area 1C								
10. Pipe relief storm sewer at 992 - tie it to existing sewers					10	$132,000		
11. Storm water detaining station at 9[illegible] from Pine to Lake					10	$[illegible]		

Table 6 – Alternative Comparison – Area 2

Area 2	Problems Addressed: High Groundwater	Minor Drainage Deficiency	Major Drainage Deficiency	Floodplain/Floodway Reduction	Lots Served	Cost	Ecological Effects	Other Impacts
1. Replace existing Area 2 drainage					20	$200,000		Must Eliminate Septics
2. New Field tile across south property line of Esopole					20	$105,000		
3. Repair CLCD Lateral 1 and 1A (Test Line)					20	$114,000		
4. New overland flow route from CLPD detention					20	$63,000		

Table 7 Alternative Comparison – Area 3

Area 3	Problems Addressed: High Groundwater	Minor Drainage Deficiency	Major Drainage Deficiency	Flood-prone/ Flooding Reduction	Lots Served	Cost	Ecological Effects	Other Impacts
[illegible]					2	[illegible]	[illegible]	
[illegible]					2	[illegible]		
[illegible]					4	[illegible]		

Table 9 Alternative Comparison – Lake Outlet and Crystal Creek

Lake Outlet and Crystal Creek	Problems Addressed: High Groundwater	Minor Drainage Deficiency	Major Drainage Deficiency	Flood-prone/ Flooding Reduction	Lots Served	Cost	Ecological Effects	Other Impacts
[illegible]					[illegible]	[illegible]		
[illegible]					[illegible]	[illegible]		
[illegible]					[illegible]	[illegible]		
[illegible]					[illegible]	[illegible]		
[illegible]					[illegible]	[illegible]		

Table 8 Alternative Comparison – Area 4

Area 4	Problems Addressed: High Groundwater	Minor Drainage Deficiency	Major Drainage Deficiency	Flood-prone/ Flooding Reduction	Lots Served	Cost	Ecological Effects	Other Impacts
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]
Area 4					23	$1,177,000		[illegible]

Area 1	1	New Culverts Under North Shore Drive	$94,000
		New Open Channel From North Shore to Lake	$90,000
		New Culvert from Woodland Wetland to Lake	$32,000
		Total	$216,000
Area 1	1A	Re-route North Shore Drive	$551,000
Area 4	2	Analyze Flooding Solutions Below Lake	$35,000
Area 2	3	Replace Drainage along Greenfield and East End	$263,000
		New Lippold Tile	$104,000
		Divert CLPD Detention Outflow to Lippold Wetland	$63,000
		Total	$430,000
Area 1	4	Replace Field Tile for Hoyne	$104,000
Area 1	5	Relief Sewer for Pine Street and Oriole Trail	$132,000
		Add Pumping Station	$30,000
		Total	$162,000
Area 3	6	New Gravity Discharge from Snowberry to Lake	$186,000
		or Pumping Station from Snowberry to Lake	$191,000
Area 3	7	New Tile Drain to Kishwaukee from Floresta Lane	$123,000

EDITED LIST OF SOLUTIONS FOR CITY TO CONSIDER

NOW WHAT?

REVIEW THE DATA FOR DATA-DRIVEN SOLUTIONS

SUMMARY OF "DOG TAILS"

THE MOST SEVERE AND CHRONIC HIGH RISK AREAS FOR FLOODING AREA UPSTREAM OF THE LAKE

AREAS FURTHER UPSTREAM MAY HOLD BEST POTENTIAL FOR IMPACT ON REDUCED FLOODING TO DOWNSTREAM URBAN AREAS

OTHER FACTORS THAT IMPACT GROUNDWATER (ALTER THE SPONGE)

COMPACTION OF SOILS
CHRONIC FLOODING
HYDRIC SOILS
POOR DRAINING SOILS
CHANGING ELEVATIONS
FILLING DEPRESSIONS
HOME GUTTER/SUMP DISCHARGE

121

'NEW' HIGH GROUNDWATER IMPACT

LESS STORAGE

LESS FILTRATION

MORE UNFILTERED RUNOFF DOWNSTREAM

WIDESPREAD FLOODING

STRUCTURE DAMAGE

TREE LOSS

SUMMARY OF DRAIN TILES

DRAIN TILE SYSTEMS LOWER GROUNDWATER LEVELS

DRAIN TILE SYSTEMS CREATE A "SPONGE LAYER"

DRAIN TILE SYSTEMS REDUCE MANY OF THE IMPACTS FROM HIGH GROUNDWATER

LOSS OF DRAIN TILE SYSTEMS CREATE NEW OR RETURN OF PREVIOUS WETLANDS = LOSS OF SPONGE LAYER

SUMMARY OF LAKE HISTORY

CRYSTAL LAKE IS A LOW SPOT IN A SUPERFICIAL AQUIFER MOSTLY TO THE NORTH

ELEVATIONS, SOIL TYPES, AND DRAINAGE FACTORS INFLUENCE WATER BEHAVIOR

MANAGEMENT OF STORMWATER IS CRITICAL TO LAKE HEALTH

SUMMARY OF CLDD REVIEW

THE DRAINAGE DISTRICT BUILT IN 1917 WAS IN A CRITICAL LOCATION FOR WATER MOVEMENT CHANGE

THE DRAIN TILES FUNCTIONED TO CREATE A 1300 ACRE 'SPONGE' 4-5 FEET DEEP

THE AREA HAD A FLAT TERRAIN, VARYING DEPRESSIONS, HIGH GROUNDWATER RUNING S/SE, AND POOR SOILS ON THE SURFACE

THE CLDD AS BUILT SENT TOO MUCH FERTILIZER TO THE LAKE

SUMMARY OF RAIN DATA REVIEW

*PRE-1965 MANY DROUGHTS

*POST-1965 A SUSTAINED INCREASE IN ANNUAL RAIN AND RAIN EXTREMES

1965-1985 WORST 20 YEARS

UNTIL

2007-2017 WORST TEN YEARS IN RECORDED HISTORY

*VARIOUS WATERSHED CHANGES

*RESIDENT COMPLAINTS STARTED ~1990 AND CONTINUE TO TODAY

*COVE POND FLOODING STARTED 1993

*CITY WIDE FLOODING IN THE HIGH RISK AREAS IN 2007, 2013, 2017

WETLAND SUMMARY

WETLAND EVOLUTION WAS LARGELY UNCHANGED UNTIL 1992 MAPS

SINCE THAT TIME THE EXPANSION HAS CONTINUED TO INCREASE

THE INCREASE OF ACRES OF WETLAND NORTH OF LAKE IS ESTIMATED AT 7-10 FOLD INCREASE IN ACRES OF WETLAND

PARTIAL OVERALL SUMMARY

1917 CLDD PROVIDED A 1300 ACRE SPONGE 5 FEET DEEP NORTH OF LAKE

AGE, DAMAGE, AND LAKE PROTECTION EFFORTS RESULTED IN LOSS OF CLDD IN SOME AREAS IN THE SOUTHERN PORTION

RAIN AND LAKE LEVELS HIGH SINCE 1965, WORST IN 65-85 AND 07-17

RESIDENT FLOODING COMPLAINTS STARTED AROUND 1990 AND CONITNUE TODAY

WETLAND EXPANSION STARTED 1992 AND IS NOW AT 7-10 FOLD INCREASED FROM PRIOR 70 YEARS

AERIAL MAPS SUMMARY

FARMLAND AND WETLANDS ARE READILY VISIBLE

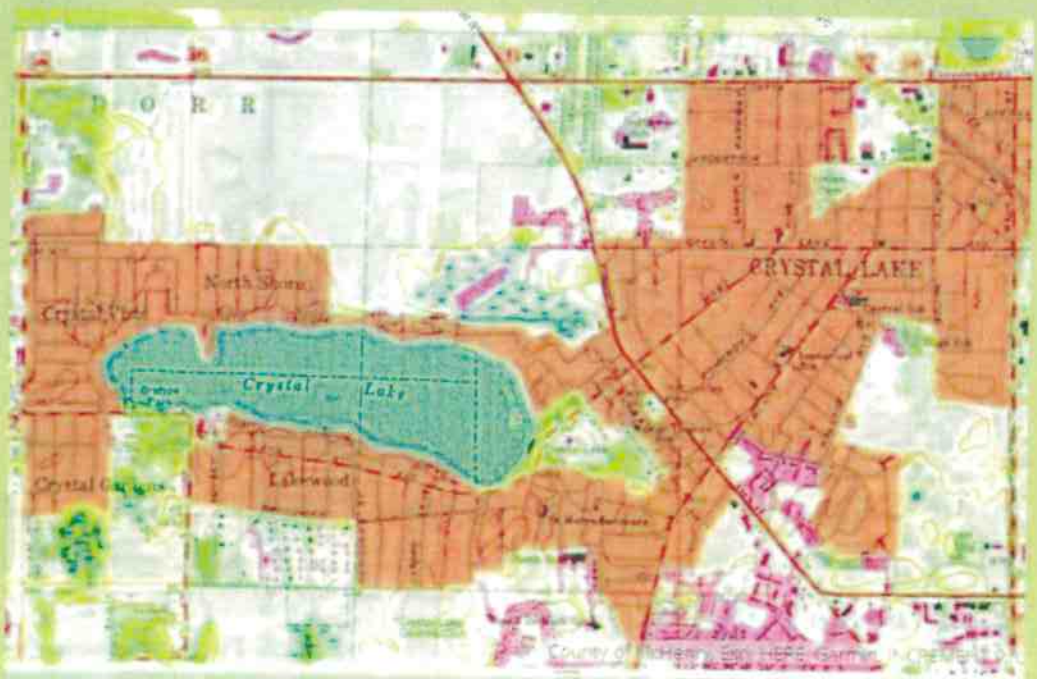
IMPACT OF DRAIN TILES IS VISIBLE

NEW WETLANDS AND RETURN OF PRIOR WETLANDS IS VISIBLE

1988 MARKS VISIBLE ALTERATIONS TO THE WETLAND/FARMLANDS IN LARGE AREAS UPSTREAM TO HIGH RISK AREAS

MANY HEY ASSOC IDEAS FROM 2007 FLOOD INVOLVED LOWERING GROUNDWATER WITH FIELD TILES IN THE HIGH RISK AREAS

130



1980 Wetlands (lime green) - largely unchanged since 1925

BEFORE 1992

SINCE 1992

NEXT?

THE SEARCH FOR FEASIBLE DATA DRIVEN SOLUTIONS

WITH THE GREATEST IMPACT ON AREAS UPSTREAM OF LAKE

SPECIAL THANKS TO MANY WHO ASSISTED IN THIS PRESENTATION

CLPD - ANN VIGER AND JASON HERBSTER

CITY OF CRYSTAL LAKE – MIKE MAGNUSON

CITY COUNCIL - HAIG HALEBLIAN

AND TO THE COUNTLESS RESIDENTS OF CRYSTAL LAKE WHO HAVE WRITTEN AND SPOKEN ABOUT THEIR FLOODING STORIES FOR OVER 30 YEARS

THOSE STORIES WERE THE INITIAL BASIS FOR ESTABLISHING A TIMELINE OF EVENTS THAT WITH FURTHER DATA RESEARCH CONFIRMS THOSE STORIES – AND THAT DATA WILL DRIVE THE MOST IMPACTFUL SOLUTIONS

Lippold Park
Then and Now

Gewalt Hamilton Associates, Inc
Bruce L. Shrake, P.E.
Thomas A. Rychlik, P.E.

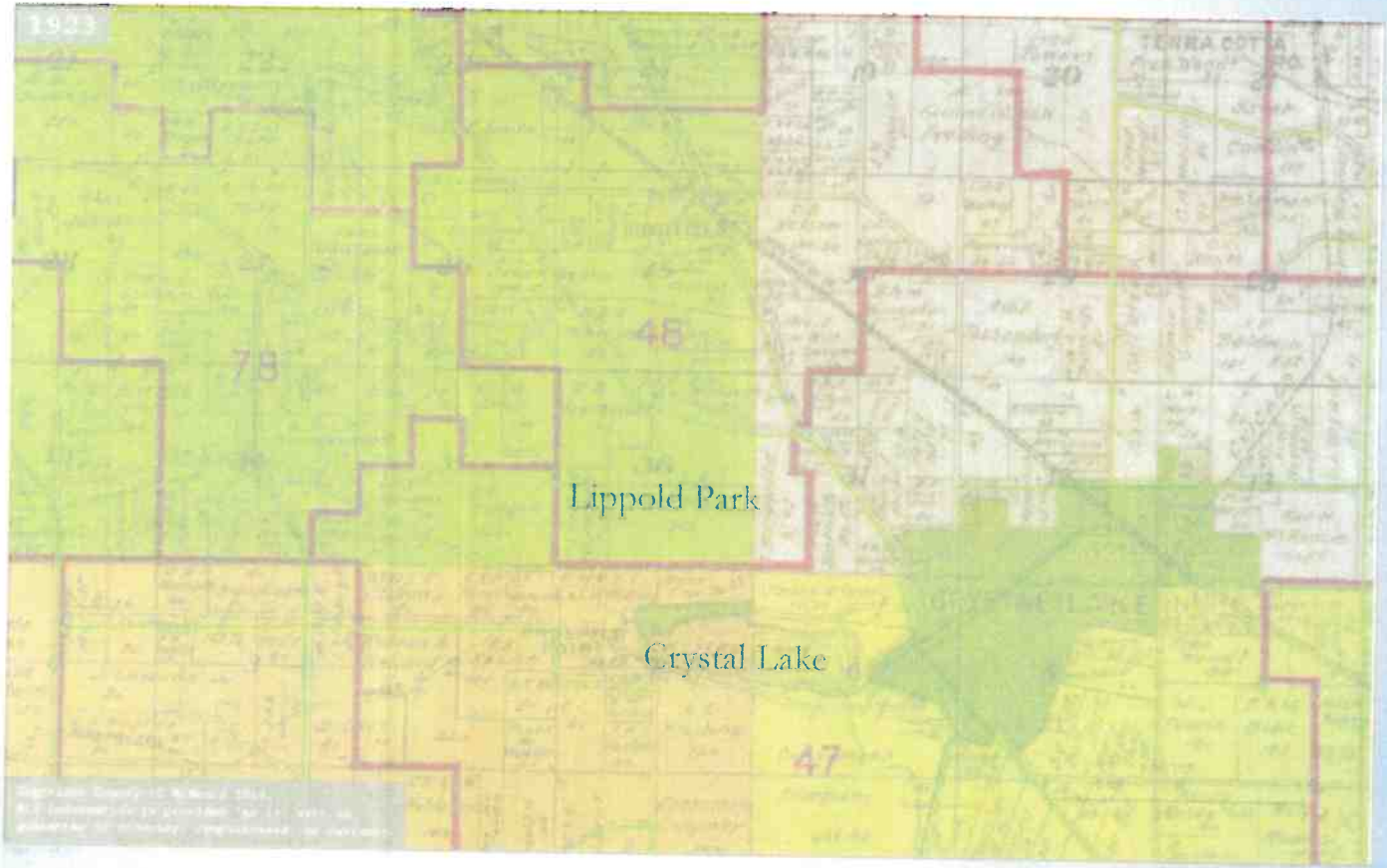
Hey and Associates, Inc
Vince Mosca

1914

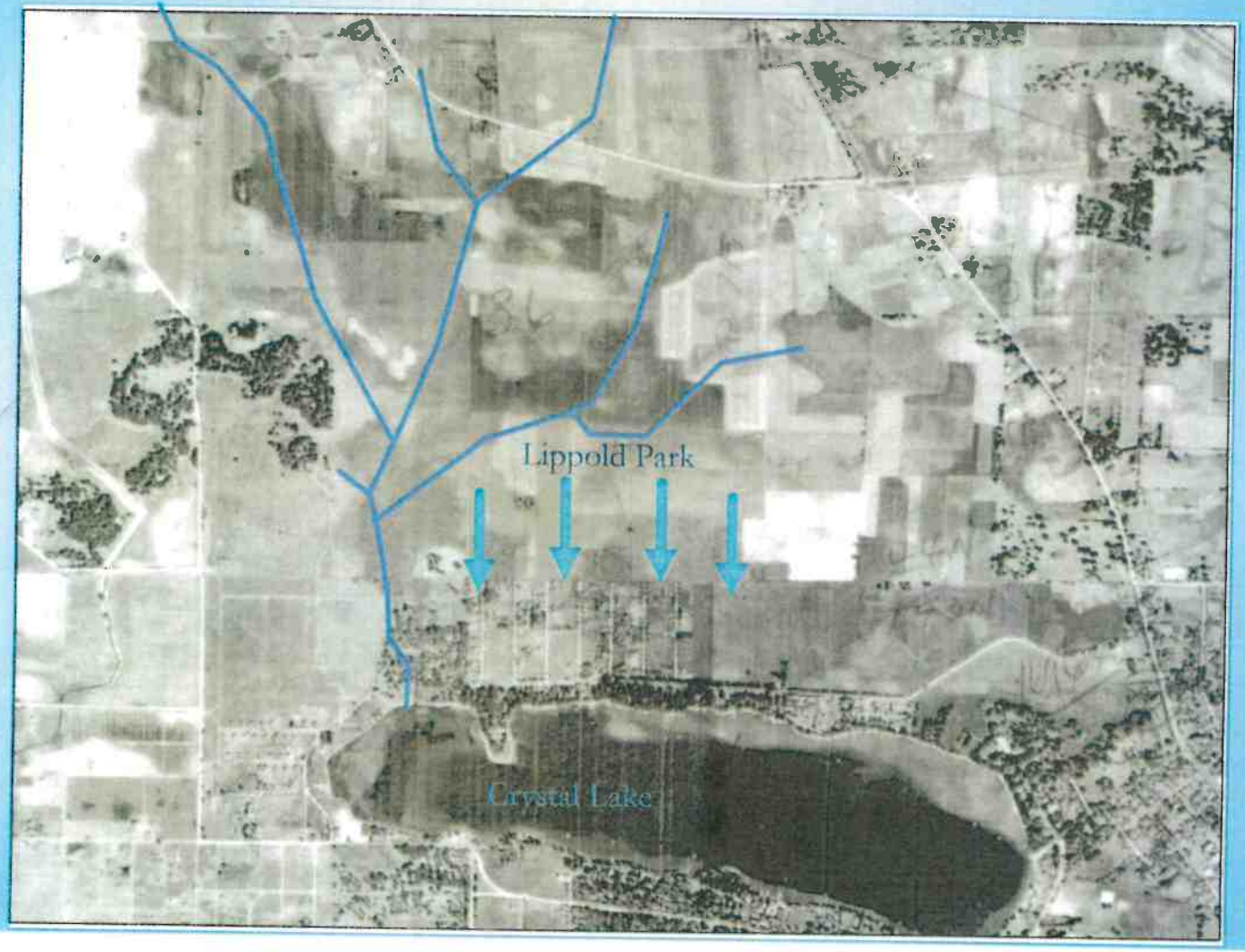

1914
Ridgefield
Lippold Park
Crystal Lake
Crystal Lake
N Cry
CHICAGO
Ch.
S.H.
S.H.

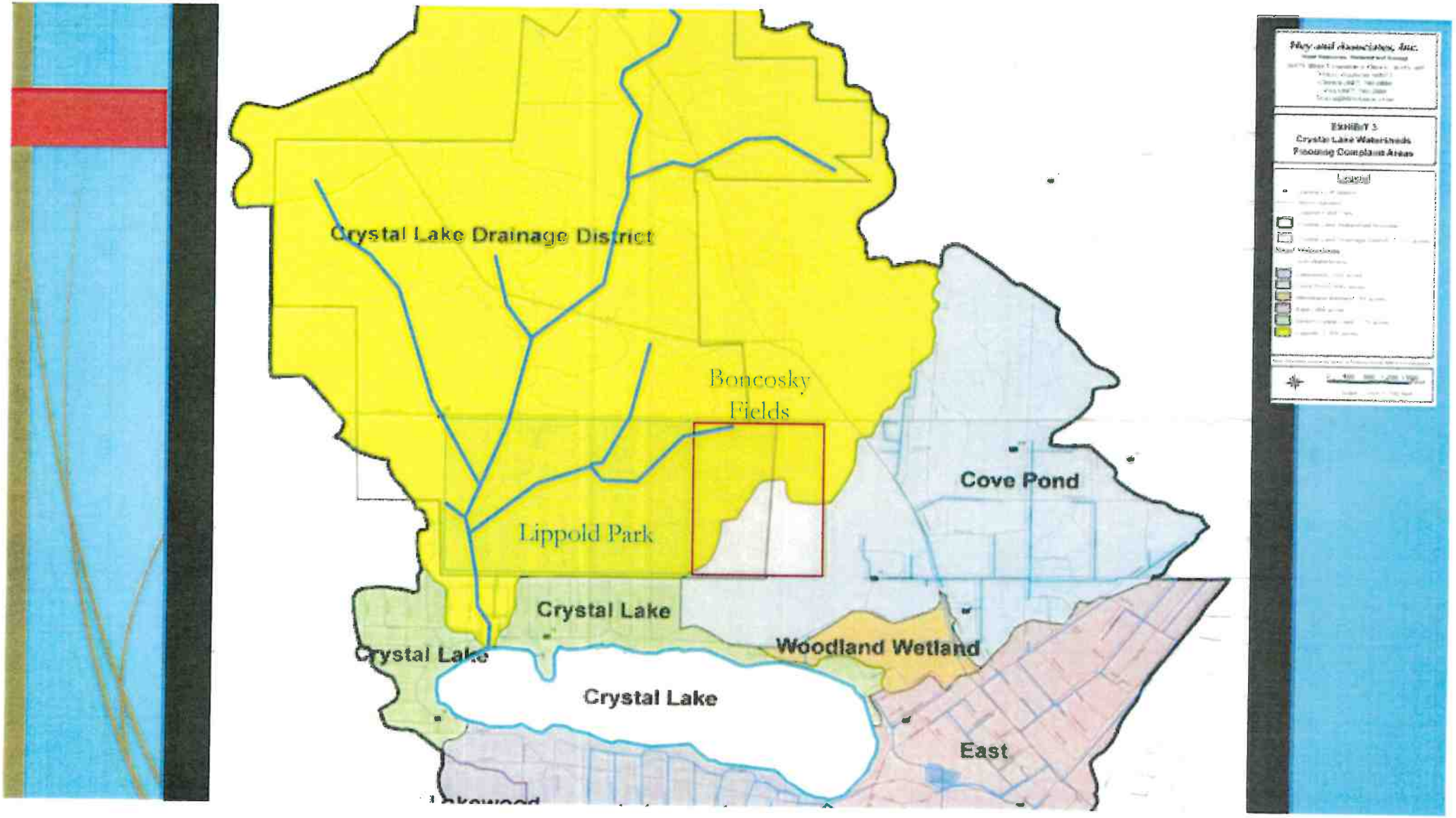
1923

Roughly 1917 - Crystal Lake Drainage District constructed
3 primary field tiles to promote farming.

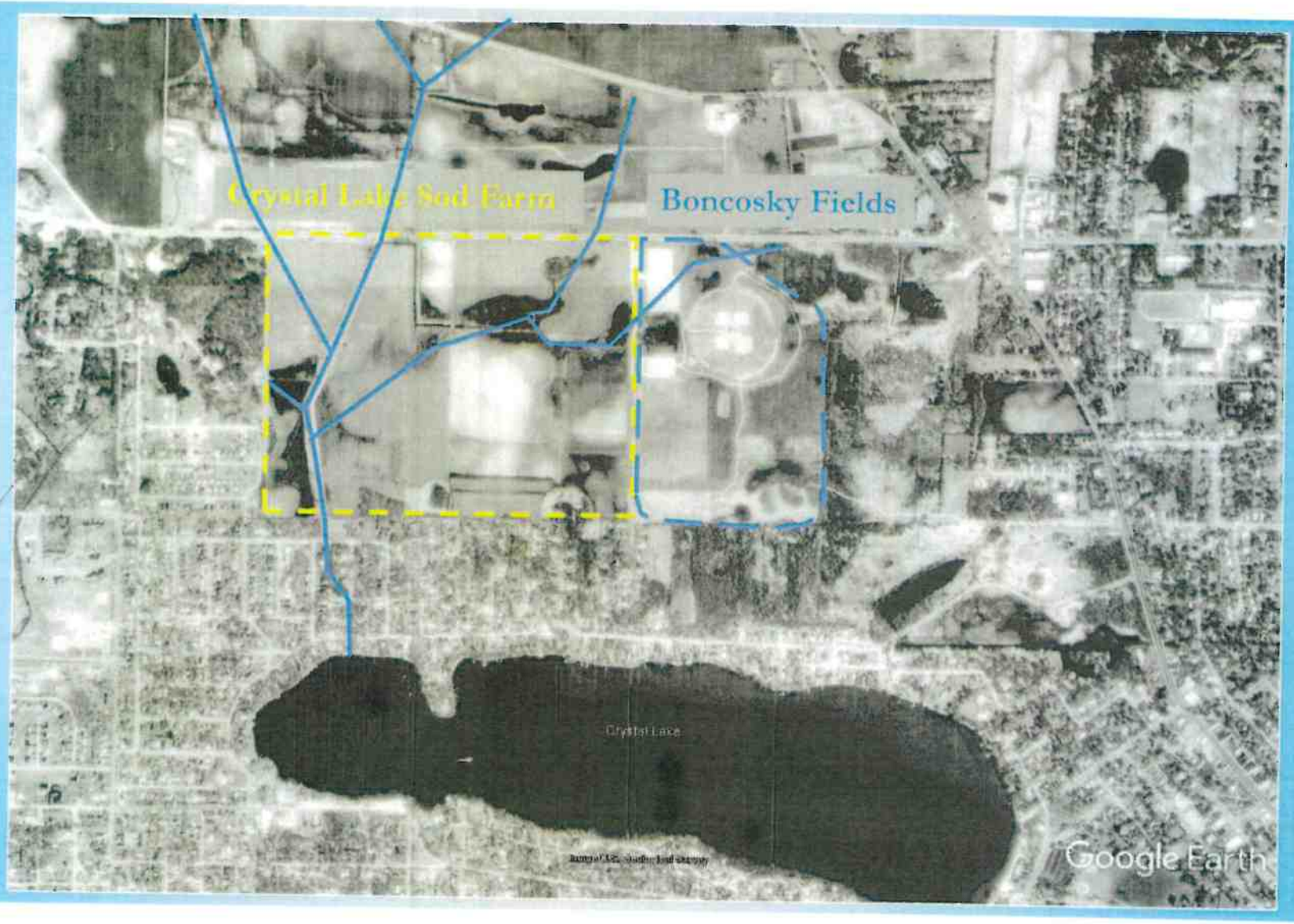


1939



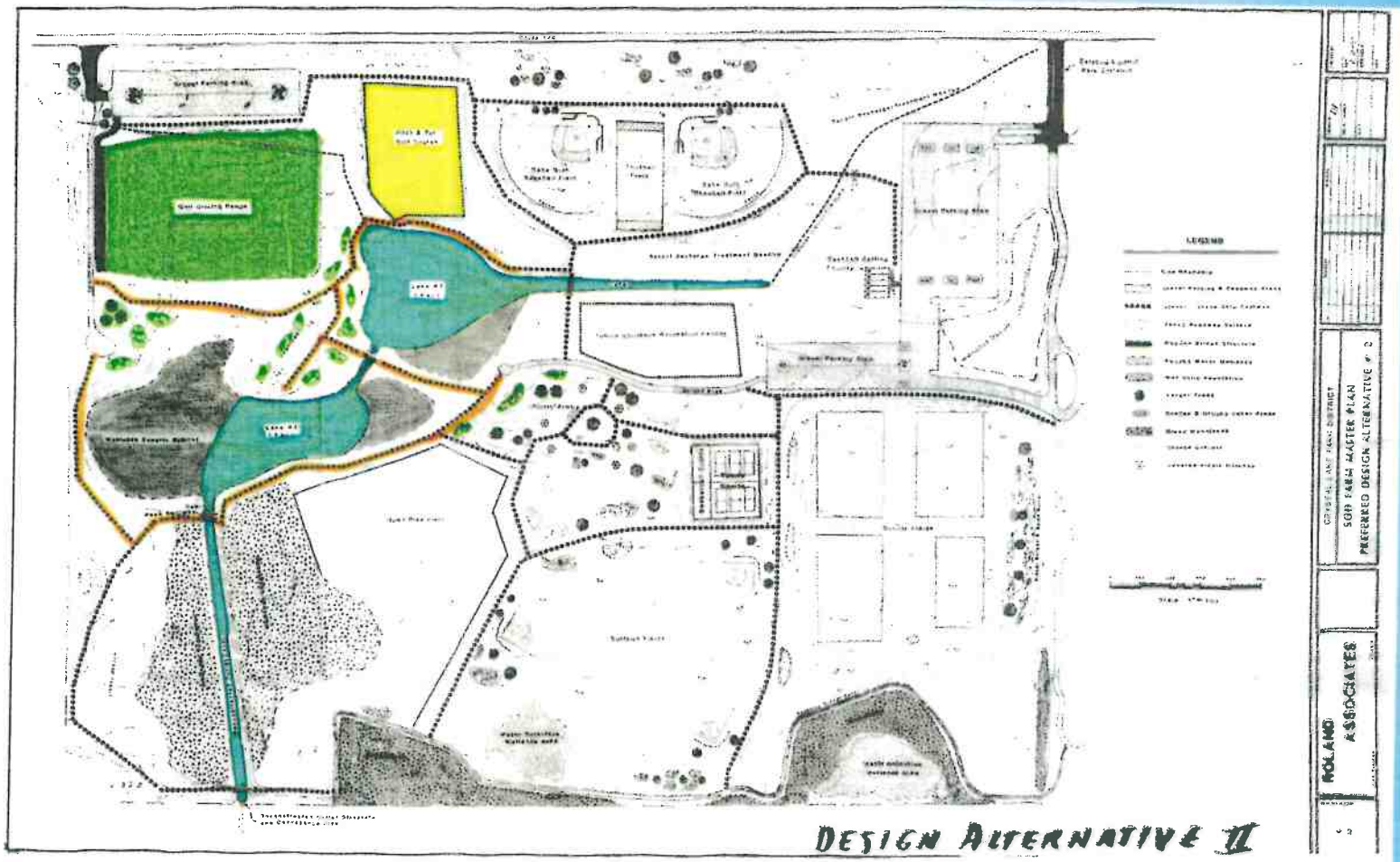

Crystal Lake Drainage District
Boncosky Fields
Lippold Park
Cove Pond
Crystal Lake
Crystal Lake
Woodland Wetland
Crystal Lake
East

1988

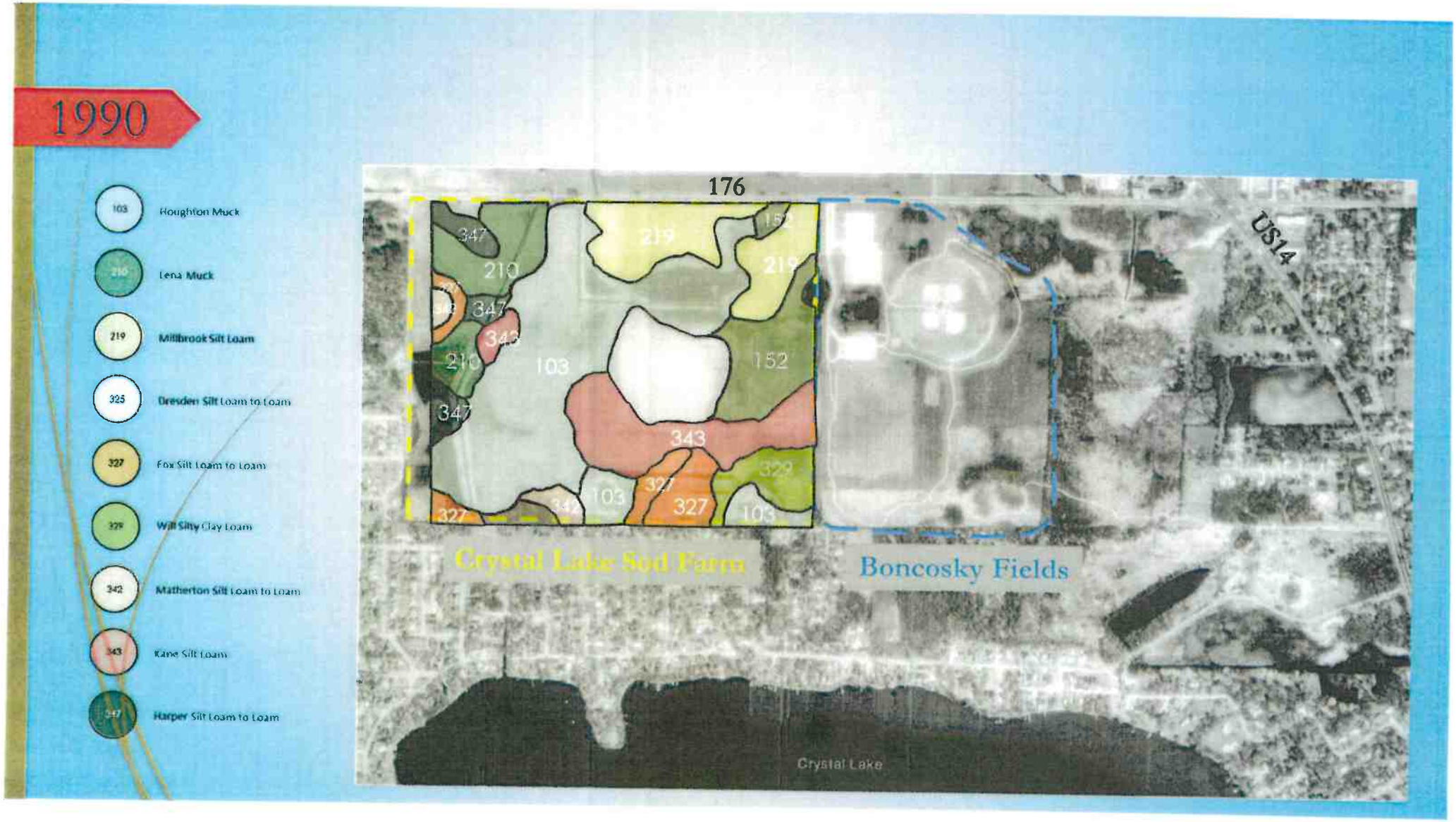

Crystal Lake Sod Farm
Boncosky Fields
Crystal Lake
Google Earth

Boncosky

1990

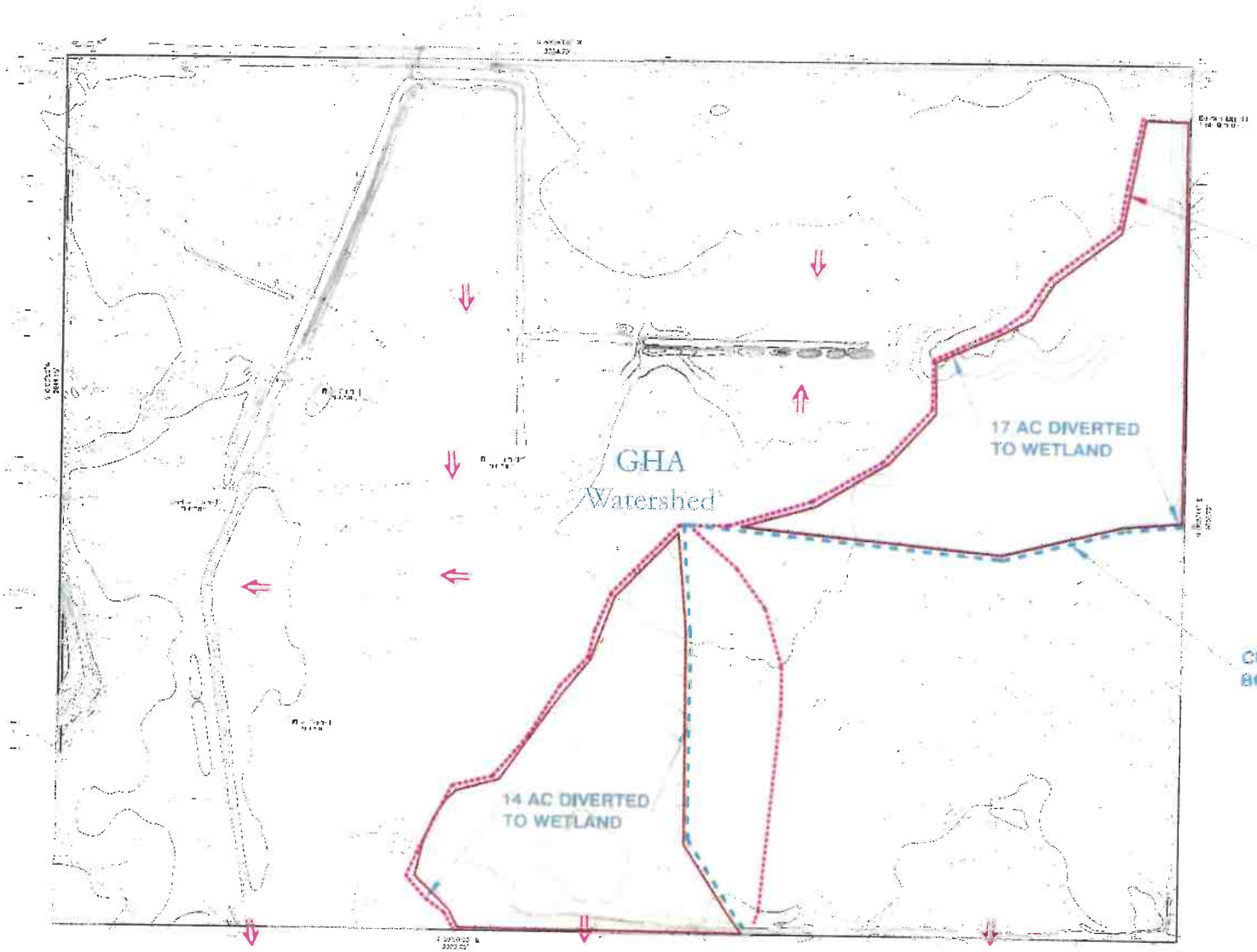


1990


176
103 Houghton Muck
210 Lena Muck
219 Millbrook Silt Loam
325 Dresden Silt Loam to Loam
327 Fox Silt Loam to Loam
329 Will Silty Clay Loam
342 Matherton Silt Loam to Loam
343 Kane Silt Loam
347 Harper Silt Loam to Loam
US14
Crystal Lake Sod Farm
Boncosky Fields
Crystal Lake

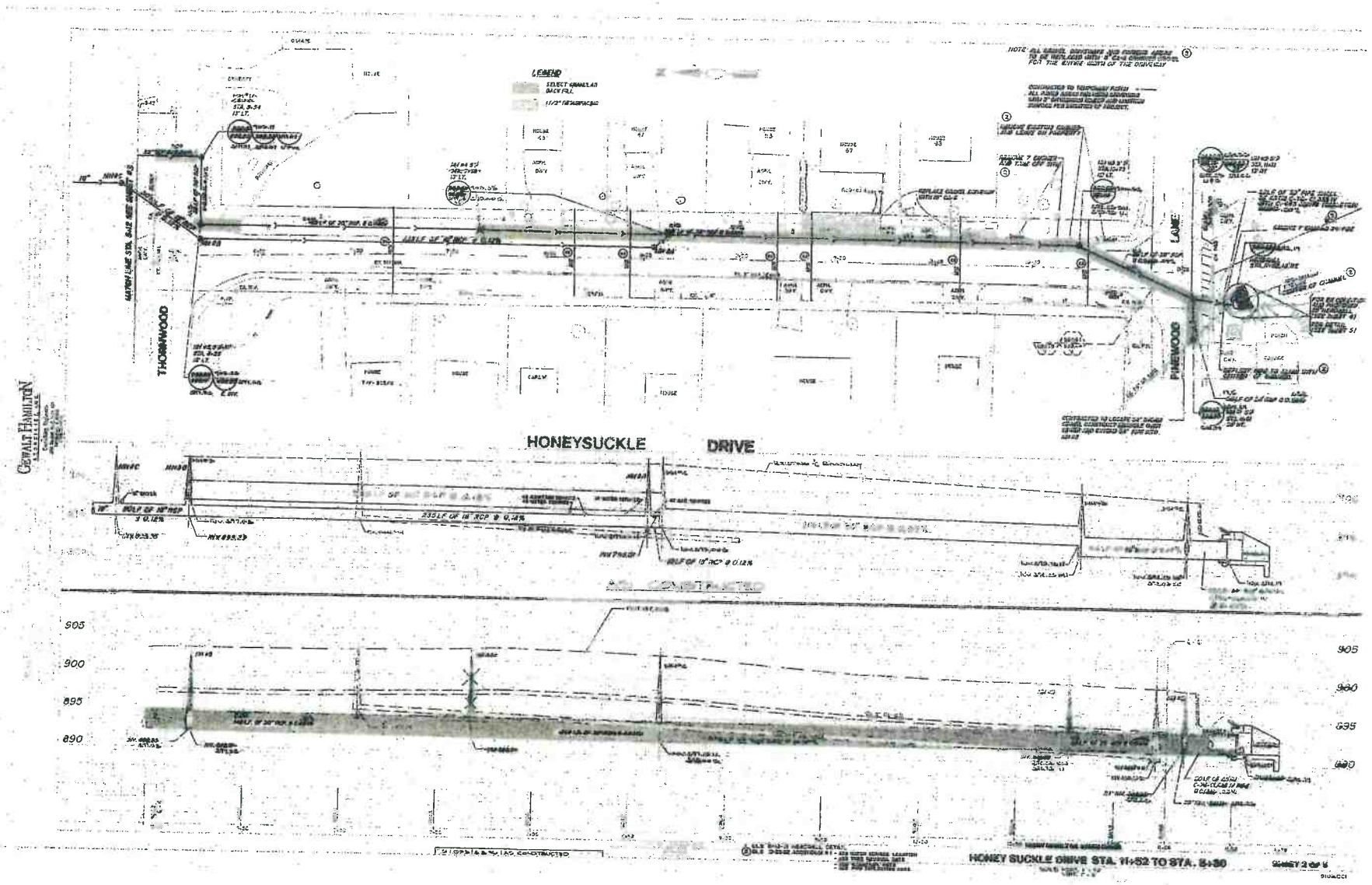

ILLINOIS ROUTE 176
BUENA VISTA
THORNWOOD LANE
LANE
AVENUE
AVENUE
AVENUE
AVENUE
EACH AVENUE
D ROAD
AVENUE

1990


GHA
Watershed
17 AC DIVERTED
TO WETLAND
14 AC DIVERTED
TO WETLAND
PRE-EXISTING DRAINAGE
BOUNDARY
CURRENT DRAINAGE
BOUNDARY

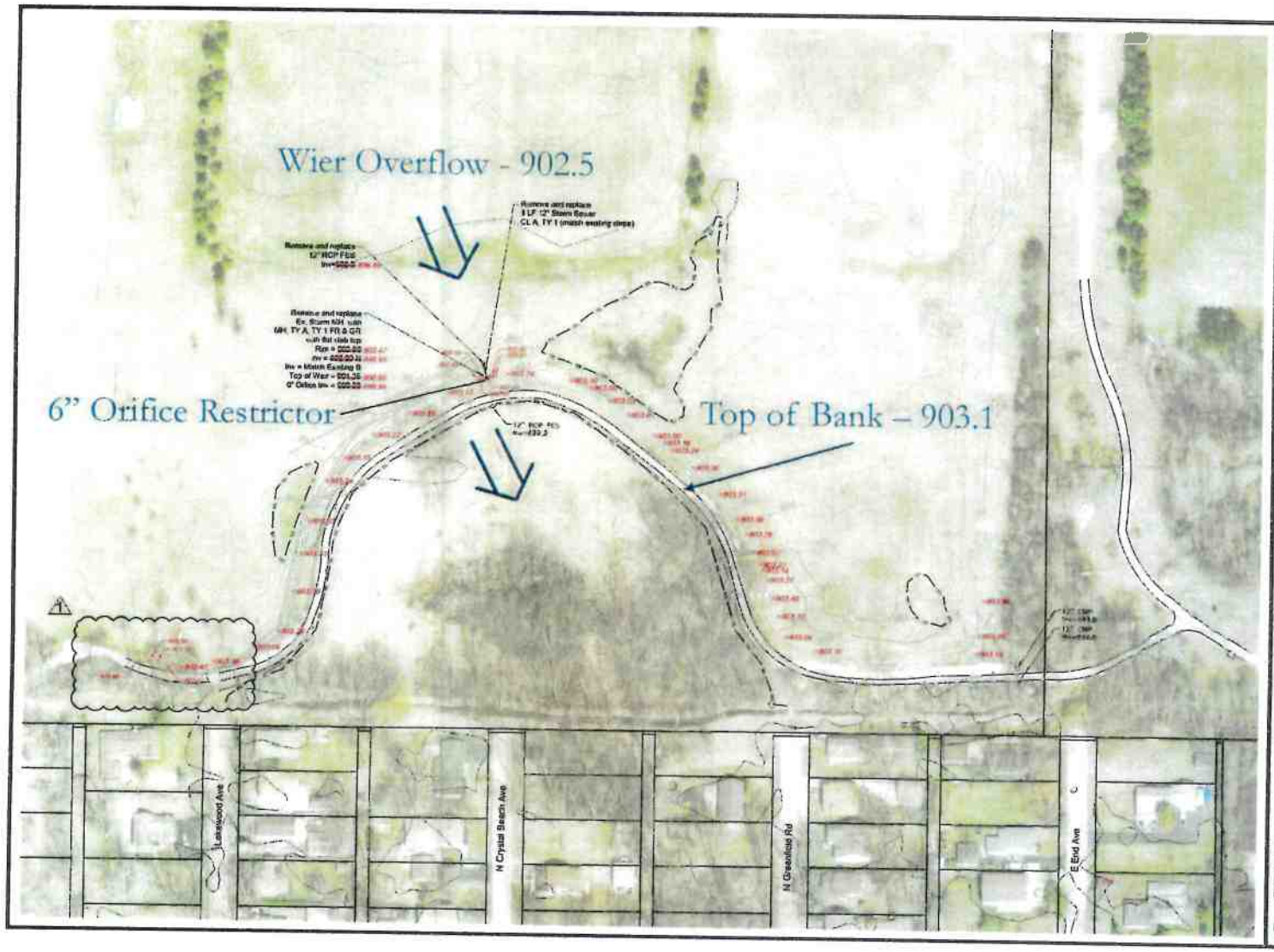

PRE-EXISTING DRAINAGE BOUNDARY
17 AC DIVERTED TO WETLAND
CURRENT DRAINAGE BOUNDARY
14 AC DIVERTED TO WETLAND

1992


HONEYSUCKLE DRIVE
THORNWOOD
PINEWOOD
LANE
LEGEND
905
900
895
890
HONEY SUCKLE DRIVE STA. 11+52 TO STA. 5+30


2008

2018



0 50 100
Scale in Feet

N

LEGEND

- Property Lines - GIS
- Existing 2 ft County Contours
- Existing 1 ft Surveyed Contours
- Proposed 1 ft Contours
- Existing Storm Sewer
- Proposed Storm Sewer
- Wetland Boundary
- Existing Storm Manhole (MH)
- Existing Flared End Section (FES)
- Proposed Storm Manhole (MH)
- Proposed Flared End Section (FES)
- Proposed Spot Elevation

NOTES:

Existing on-site wetlands are not to be disturbed.

Rosencor plate shall be ¼" thick aluminum plate. Contractor to provide shop drawings for restrictor plate and method of attachment for Owner review.

No	Description	Date
1	Additional Survey	05/09/18

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture
26573 West Commerce Drive, Suite 601
Volo, Illinois 60073
Office (847) 740-0888
Fax (847) 740-2888
Volohey@sbcglobal.net
Professional Design Firm
License No. 184.003429

Lippold Park Drainage Project

Crystal Lake, Illinois

Grading and Drainage Plan
Berm Project

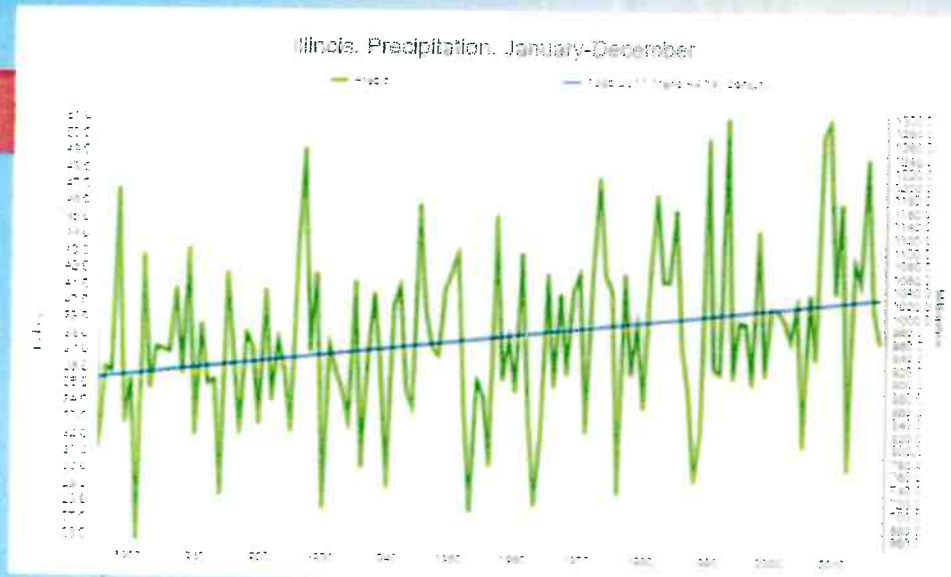
Project No.	18-0027	Sheet No.
Designed	RMJ	C3.0
Drawn	RMJ	
Checked	DAK	
Approved	DAK	
Date	04/16/2018	

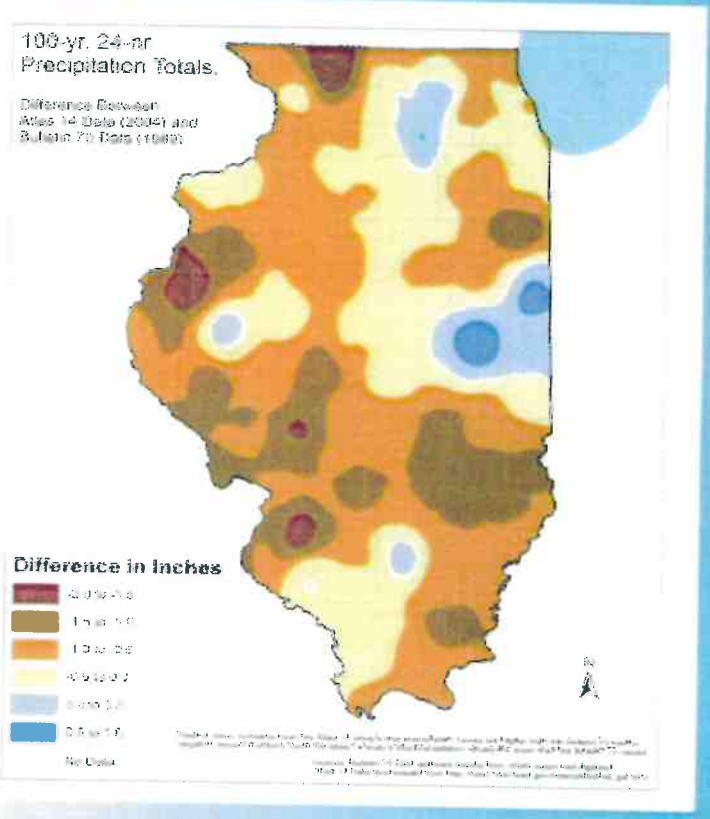
Record Drawings


2019
Overflow Wier
Constructed Berm

Improvements for Water Quality Protection

- Removed channelized sections of drainage ditch with multiple wetland complexes and trail network
- Eliminated "short circuiting" of runoff from north of 176 and sod farm
- Greatly reduced suspended muck soil particles from entering Crystal Lake proper
- Physical and biological treatment of non-point source pollution
- Work was not required by any regulatory agency





- Rainfall is "different" over the last few decades statewide
- Rainfall patterns have contributed to "nuisance" and major flooding frequencies

Relationship between Cove Pond and Lake Elevation

Questions


ILLINOIS ROUTE 176
BRIARWOOD ROAD
RIVERA VISTA
CORONADO VISTA
BUENA VISTA
N ALTO VISTA
FAIRWAY LANE
JUANITA VISTA
W ALTO VISTA
GOLF LANE
BUNKER AVENUE
N HEATHER DRIVE
COTTONWOOD LANE
TEAKWOOD LANE
CLOVER DRIVE
THORNWOOD LANE
WOODBINE DRIVE
BARBERRY DRIVE
HOLLY DRIVE
BURR OAK DRIVE
CEDAR DRIVE
TIMBER HILL LANE
EDGEWOOD AVENUE
SUNNYSIDE AVENUE
MAYFIELD AVENUE
LAKEWOOD AVENUE
CRYSTAL BEACH AVENUE
GREENFIELD ROAD
EAST END AVENUE
S HEATHER DRIVE
MULBERRY LANE
IVY LANE
DOLO ROSA VISTA
EDGEWATER DRIVE
NORTH SHORE DRIVE
NORTH SHORE DRIVE
BALDWIN AVENUE
CRANDALL AVENUE
OAK COURT
WOODLAND DRIVE


PRE-EXISTING DRAINAGE BOUNDARY
17 AC DIVERTED TO WETLAND
CURRENT DRAINAGE BOUNDARY
14 AC DIVERTED TO WETLAND