

## Appendices



# Crystal Lake 2007 Flooding Analysis

City of Crystal Lake

April 1, 2008

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Introduction ..... 1

Severity of Rainfall ..... 1

Complaints ..... 1

    Surface Flooding ..... 2

    Subgrade Structure Flooding..... 2

    Sanitary Sewer Backup ..... 2

Analysis of Flooding Complaints..... 2

    Priority 1: Cove Pond Subwatershed..... 3

    Priority 2: North Shore Residential Area..... 4

    Priority 3: West End Residential Area..... 4

    Priority 4: South Lake Sanitary Sewer ..... 5

    Priority 5: Detention Pond Maintenance ..... 5

Recommendations ..... 6

Appendix 1: List of Flooding Complaints..... 7

## Introduction

The Crystal Lake area experienced some of the heaviest rain fall totals in its recorded history in the summer of 2007. As a result of heavy rain totals, several areas in the City experienced flooding. Some flooding situations were isolated incidents that could be tied to a specific problem, such as maintenance needed on a drainage structure. However, there were some occurrences of flooding that were larger in scale, affecting many different properties and were part of a system wide inadequacy for storm water management.

As the City was preparing for its fiscal year 2009 budget, funds were identified and set aside to study the City's flooding issues. With the funds, the City will retain a storm water engineering consultant to study the flooding issues and to make recommendations on how to mitigate future flooding. In order to effectively study the flooding issues, the consultant will be provided some guidance on what exactly to study. This report will analyze the complaints that the City received and will recommend a prioritization so that the most problematic areas will be addressed first.

## Severity of Rainfall

In the three month period of June through August of 2007, Crystal Lake received at least 22.03 inches of rain. 10.83 inches of that rain was received in August alone, with two separate days of rainfall totals of over two inches in 24 hours. The average rainfall for August in Crystal Lake is 4.21 inches. The average five year recurrence interval for 30 days is 9.53 inches of rain, which is more than what Crystal Lake received in August. The average five hundred year recurrence interval for 60 days is 20.77 inches of rain, which is about the amount of rain that Crystal Lake received in three months, or about 90 days.



Flooding on North Shore Drive

## Complaints

The City received over 120 complaints during August of 2007, when the flooding issues were the most severe. These types of complaints can be broken down into three different issues: surface flooding, subgrade structure flooding, and sanitary sewer backups. A table of complaints is included in the appendix for reference.

### ***Surface Flooding***

Surface flooding is the most common and problematic form of flooding, affecting the most residents. This summer's surface flooding was so severe that North Shore Drive was closed and a temporary detour route to Woodland Drive had to be installed. This flooding incident cost the City a considerable amount in terms of manpower, equipment costs, and materials. This form of flooding was the most severe because of the potential of injury to the public, the increased area for insect breeding, and the property damage that the water can cause. Most of the flooding experienced in 2007 based on the number complaints was surface flooding.



Construction of the North Shore Detour

### ***Subgrade Structure Flooding***

Subgrade structure flooding was the second most common flooding problem in 2007. The result of subgrade structure flooding is standing water in basements, which can cost a homeowner a significant amount in damages and inconvenience. While the overall danger to the public is not very great, it can be very disruptive to the homeowner that experiences it. This type of flooding is most commonly caused by issues with a sump pump. Usually the sump pump malfunctioned, there was a power outage with now battery backup, or the pump was not designed to handle the volumes of water that were required of it during this heavy rain fall period.

### ***Sanitary Sewer Backup***

The City received several complaints about sanitary sewer backup during this period of flooding. Similar to subgrade structure flooding, this can cause significant damage to a residential basement. This poses the same overall risk to the public as subgrade structure flooding. However, it appears that the area immediately southeast of Crystal Lake Main Beach experienced a significantly higher rate of sanitary sewer backup issues.

### **Analysis of Flooding Complaints**

The flooding complaints were mapped using GIS tools to accurately show where flooding issues were most severe and to identify and prioritize areas for further study. When complaints were plotted on a map, trends emerged, and more effective analysis and prioritization was accomplished. Some problems are systemic, which will require a much more extensive study, while others are maintenance related, such as instances of detention pond flooding. Not surprisingly, most of the complaints were focused around Crystal Lake.

This area has long been known to have issues with drainage, and the elevated rain totals exacerbated the problems.

When prioritizing drainage complaints, several factors were considered. Emphasis was placed on the number of complaints in a compact geographical area, the area affected by the problems, as well as systemic drainage issues. The City received many flooding complaints and therefore must prioritize the complaint areas. The City will focus on areas where there is a benefit to many of Crystal Lake's citizens as possible.

### ***Priority 1: Cove Pond Subwatershed***

The area that drains into cove pond, which is a subwatershed to the Crystal Lake Watershed, was significantly affected by the large amount of rainfall. This area alone is a significant part of the City, including several residential neighborhoods and part of the Virginia Street commercial corridor. Normally, there is a significant amount of water that flows through this area, and it alone contributes about seventeen percent of the lake's total water volume.

Cove Pond was reconstructed in the late 1980's as a way to help with the flooding issues that were in the area, and to help filter the water before it drained to Crystal Lake. The Cove Pond watershed is over 640 acres.



Flooding Complaints in the Cove Pond  
Subwatershed

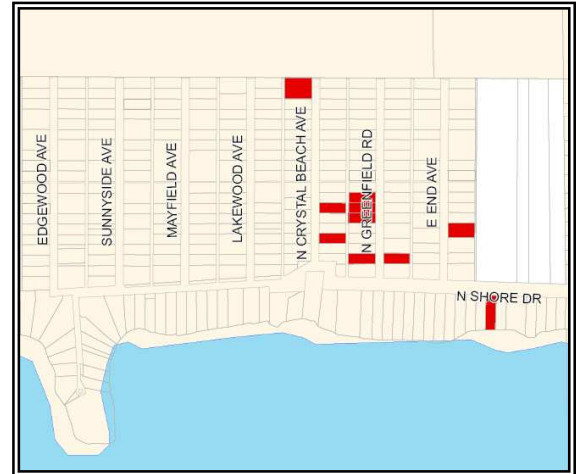
There have long been issues documented with the drainage in this area. There are well known issues with flooding in back yards along Oriole Trail, and the residents of Woodland Drive have been very vocal in their displeasure with the drainage in their neighborhood. The parcel known as the Hahn property is also known as being very flood prone. All of these areas experienced significant flooding issues in 2007, including the flooding of several streets and private property.

This area was chosen as the highest priority due to receiving the highest number of complaints; twenty-nine were received in all. Over one-hundred residents would benefit from an area wide drainage improvement that would mitigate flooding issues in the area.

**Priority 2: North Shore Residential Area**

The residential area directly north of Crystal Lake is known as the North Shore. It is a residential area that was historically vacation homes, but is now a full time residential area. At the time it was annexed into the City, City utilities were extended to the area, but no significant drainage improvements were made. Most of its storm water drains directly into Crystal Lake, either through runoff or antiquated and inadequate storm sewer pipe.

The flooding issues in this area are well known and documented. The soils in this area are poorly suited to aid drainage, and are almost marshy in some areas. There are several vacant parcels of land that are known to have regularly standing water. A drainage study was completed in the mid-1990's, however, its recommendations were not implemented. This warrants further study. Many of the complaints were regarding standing surface water, rather than basement flooding or sewer backups. A total of ten recorded complaints were received by the City. There is also the possibility to increase the quality of storm water which this area contributes to Crystal Lake.

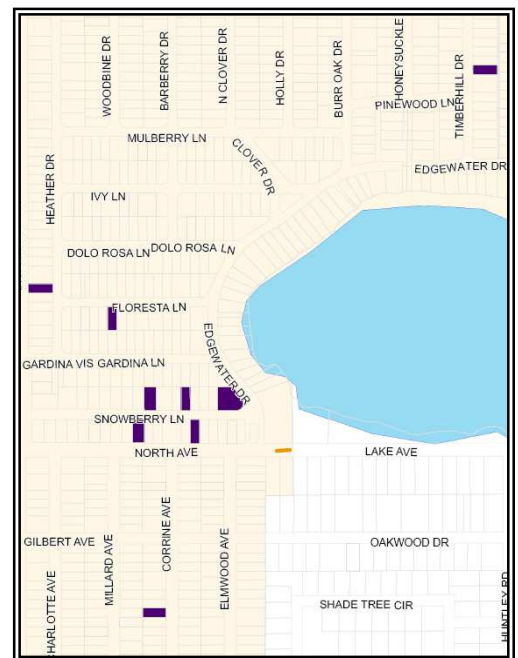


Flooding Complaints in the North Shore Area

**Priority 3: West End Residential Area**

The residential area known as the West End is similar in nature to the North Shore. It was an area that was primarily vacation homes and since has been converted to a full-time residential neighborhood. There is no comprehensive drainage system for this area. For the most part, storm water collects in isolated pockets and percolates into the ground.

The City received eight complaints about flooding during the heavy summer 2007 rains. The breakdown of flooding types is split evenly between standing surface water and basement flooding. One instance of surface flooding was caused by one resident's overactive sump pump extracting so much water that it caused the standing surface water on a neighboring property.



Flooding Complaints in the West End Area

The need for a comprehensive drainage study for this area is not as critical because there are typically not the number of surface drainage issues that the North Shore experiences.

**Priority 4: South Lake Sanitary Sewer**

An additional problem was discovered when analyzing the data. There were ten complaints regarding sanitary sewer backups in the area bounded by Broadway Avenue, Meridian Street, Country Club Road, and Riverside Drive, with an additional complaint from a residence on nearby Edgebrook Drive. This would seem to indicate that there is some problem with the sanitary sewer capacity in this area that is compounded by the high level the lake. While a storm water



Flooding Complaints in the South Lake Area

drainage analysis is most likely not warranted, it is a significant problem that should be further studied by Public Works.

**Priority 5: Detention Pond Maintenance**

Developers in Crystal Lake have used detention and retention ponds throughout the City to help manage storm water in accordance with City ordinances. Once the development was completed most storm water management facilities are then dedicated to a homeowner's association (HOA) for perpetual maintenance. Most, if not all, covenants that establish HOAs contain language that states if the drainage facilities were not maintained, the City can make any necessary repairs and recoup the costs from the HOA.

Several of the flooding complaints were related to detention ponds. The following subdivisions/areas experience flooding issues due to detention ponds:

- Bentwood Estates
- Skyridge Club Apartments
- Ken Bird Park
- Hunter's South
- Crystal Ridge
- Indian Hills Trails
- Hunter's Ridge



## **Recommendations**

- 1. The City should consider retaining a consultant to study the flooding issues*

The Engineering Division should oversee the selection of a qualified storm water consultant to further analyze the storm water issues that were discussed above. The Engineering Division should direct the consultant to examine the selected drainage issues as prioritized in this report and as the budget allows.

- 2. The City should investigate sanitary sewer backups in the residential neighborhoods south of the lake.*

One of the more interesting findings of the flooding complaint analysis was the number of sanitary sewer backups that were concentrated in the area south of Crystal Lake. An investigation should be initiated to determine if this rash of flooding was caused by the heavy rains, and if this can be prevented in the future.

- 3. The City should perform routine inspections of private detention ponds.*

The City has relied upon the associations to properly maintain these detention ponds. However, this approach may not be effective, as seen from the number of detention ponds that overflowed with the heavy rain events in the summer of 2007. While the detention ponds are not owned by the City, when they do not function properly, residents typically complain to the City. If the City has knowledge of a potential problem with detention pond operation, the City can notify the appropriate association, which may remedy the issue before it becomes a problem.

## Appendix 1: List of Flooding Complaints

Name	Address	Location	Complaint Type
<b>North Shore Area</b>			
Mr Guzy	100 Crystal Beach Ave	same	Standing water in yard
Chris Caldarella	153 Crystal Beach	same	
Amy Westfall	87 Crystal Beach	same	Water in basement
Larry Hanks	144 N. Greenfield	same	Standing water in yard
Aldo Santos	148 N. Greenfield	same	Standing water in yard
Barbara McDonald	152 Greenfield	same	Standing water in yard
Kathy Wondorf	170 N. Greenfield	same	Standing water in yard
Rich & Beck Coduto	171 N. Greenfield	same	Standing water in yard
Joe Pollack	159 East End	same	Standing water in yard
Melinda Wolf	947 North Shore Dr	same	Water in CrawI Space
<b>Cove Pond Watershed (including Oriole Trail Rear Yards)</b>			
Rieber	59 Sycamore	City property behind his	Standing water in yard
Resident	632 Green Oaks Dr	same	Standing water in yard
John Labaj	???	State Farm property detention area	
Ralph Anti	131 North Virginia	same	Standing water in yard
Ralph Anti	132 North Virginia	Hahn Property pond	Standing water in yard
Ralph DiGregor	490 W. Crystal Lake Ave.	same	
Jay (Black Diamond Plumbing)	490 W CL Ave	same	San. Sew er backup
Christine	486 W. Crystal Lake Avenue	same	Basement Flooding
Jim Berna	468 W. CL Avenue	same	Basement Flooding
Mike Thinnes	820 North Shore Drive	same	Basement Flooding
Barb Harter	854 North Shore	same	Standing water in yard
Resident	???	803 North Shore	Standing water in yard
Resident	???	811 North Shore	Standing water in yard
Michelle Coss	807 North Shore Drive	808 Northshore	Standing water in yard
Mark DeBrovick	811 Northshore	816 Northshore	Standing water in yard
Margie	794 Northshore	same	Standing water in yard
Gary Clarke	780 North Shore Dr	same	Standing water in yard
Michelle Coss	807 North Shore Drive	same	Standing water in yard
Tyler Larocca	785 North Shore Drive	same	Flooded basement
Linda Kamysz	740 Woodland	same	Street Flooding close to house
Robert McIntyre	700 Woodland	same	
Michael Kane	701 Woodland Drive	same	Flooded House
Jack Spurr	610 Woodland	same	
Randy Bow e	505 W. Crystal Lake Ave	Oriole Trail Rear Yards	Standing water in yard
Mr. O'Brien	489 West Crystal Lake Ave	Oriole Trail Rear Yards	Standing water in yard
Pat Reid	25 S. Virginia	same	Basement Flooding
Mary Villarreal	15 S Oriole Tr	Oriole Trail Rear Yards	Water coming in through drain
Mellisa McConnell	25 S. Oriole Trail	same	Basement Flooding
Lynn Dohrey	591 Woodland Drive	same	Standing water in yard
<b>West End</b>			
Rosemarie Leech	364 Corrine Ave	same	Sanitary backup into basement
Dennis Whitlock	1338 North Avenue	same	Yard flooding due to neighbor pumping
Don Jarva	1370 North Avenue	same	Overactive sump pump
Bernie Boyle	1324 Snow berry	same	Standing water in yard
Jeff Judd	1344 Snow berry	same	Standing water in yard
Tom	1364 Snow berry	same	Standing water in yard
Daw n Cardw ell	1381 Floresta	same	Basement, Yard flooding
Wade Koch	57 Timberhill	same	Sanitary backup into basement
Michael Todd	188 Heather	same	Standing water in yard

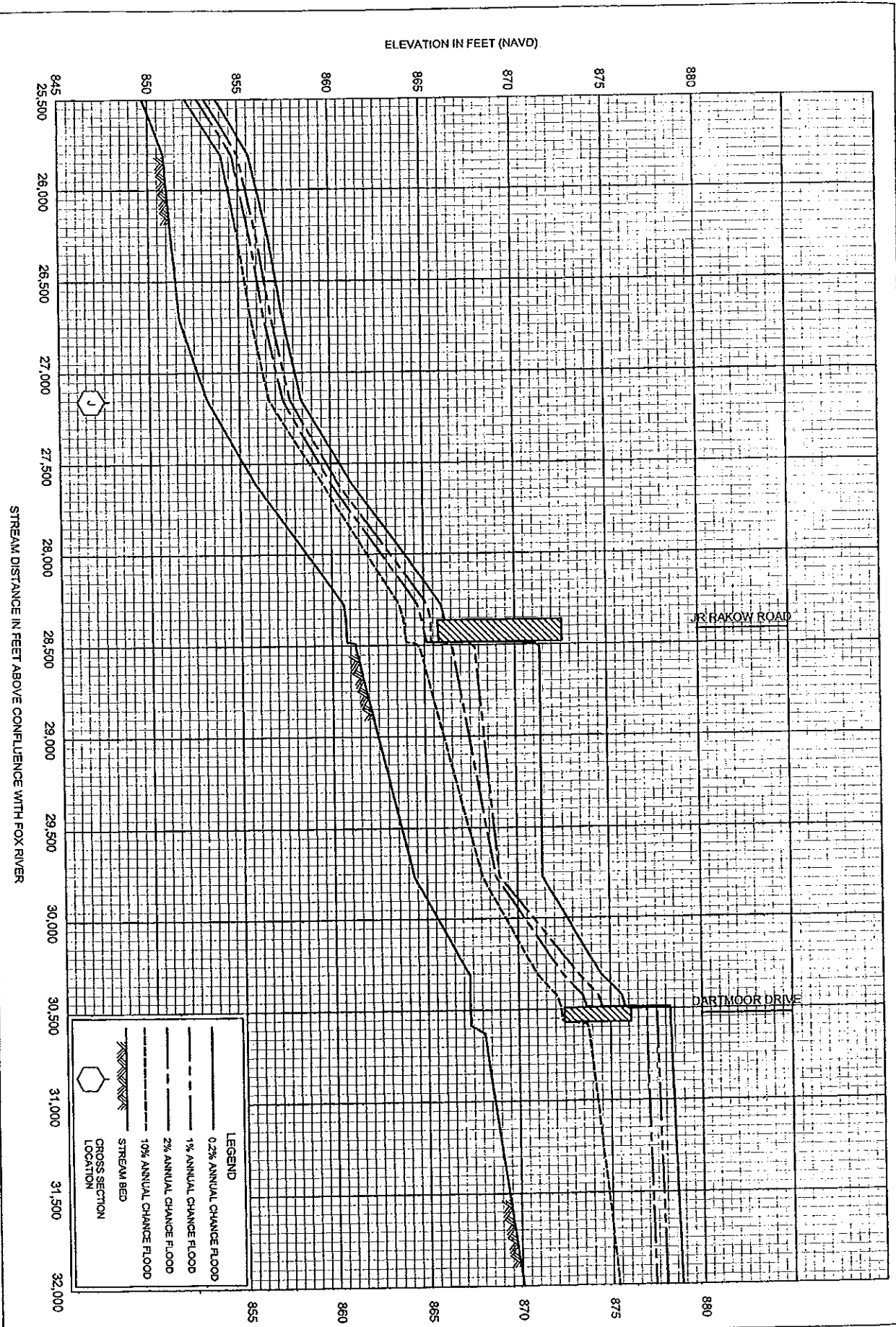
CITY OF CRYSTAL LAKE  
2007 FLOODING ANALYSIS

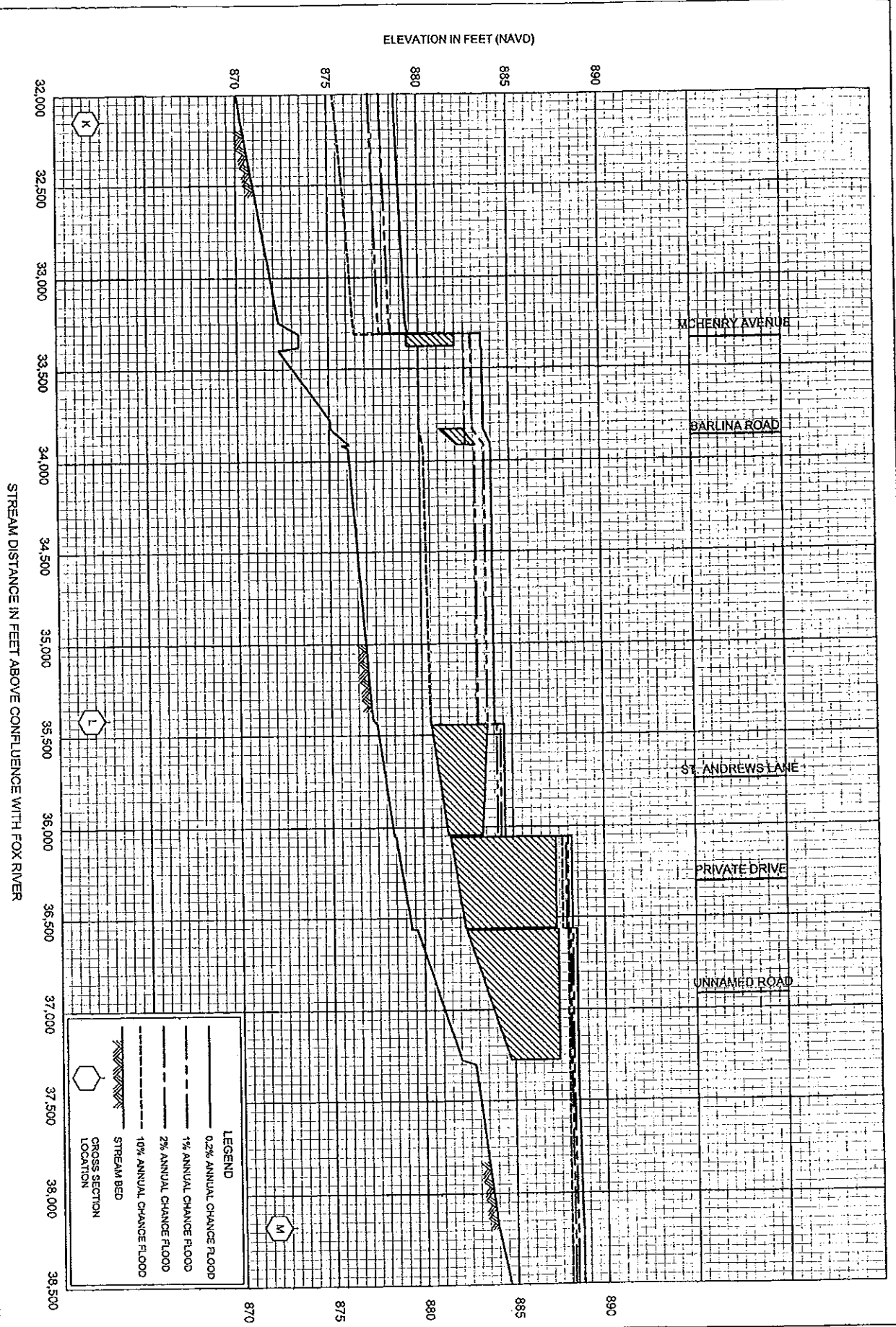
Name	Address	Location	Complaint Type
<b>South Lake</b>			
Judy Zembowski	901 Broadway	same	Flooded basement
Terry Blum	471 Meridian	same	
Judy/Amy	481 Meridian	same	Basement Flooding
Don Jarva	491 Meridian	same	San. Sewer Backup
Lynn Thillman	460 Melrose Gate 10	same	San. Sewer Backup
Sally Davidson	460 Cumberland	same	Basement Flooding
Lois Edward	779 Broadway	same	Drain Backup?
John Edwards	779 Broadway	same	San. Sewer Backup
Ms. Johnson	440 Riverside Dr	same	Basement Flooding
Ed Wedeking	500 Riverside	same	Standing water In yard
Bob Fugate	496 Edgebrook	same	Basement Flooding
David W. Skjerven	615 Edgebrook	same	Standing water in yard?
<b>Other</b>			
Jennifer	90 Talcott	Across from Hannah Bearsley School	Standing Water in yard/street
Gary Komosa	60 Katherine Ct	same	Water coming in through drain
???	???	95 Oak Street	
Christine Kernes	???	122 Marian Pkwy	
???	???	45 S. Williams	
Carl	???	Skyridge Apartments	
Julie Marchek	Ackman	Pond west of Skyridge on Ackman	Pond Overflowing
Glen Anderl	1246 Knollwood	same	Steady river of water from underneath?
Resident	640 Coventry	same	Sanitary Sewer Backup
Mary McFarland	625 Bedford	same	Standing water in yard
Scott Benson	816 Glendale	same	Water in basement
Mr. George Nejmeh	675 Tamarisk	same	Flooded basement
Robert Arwood	479 Brook Drive	same	Basement Flooding
Rick	257 Dole	same	Overactive sump pump
Mary Ottendorf	211 Sunset Terr	same	Drain not draining
???	???	32 S Walkup (Park District Entrance)	Standing water in street
Steve Young	166 Maple Street	same	Water in basement
Tom Eibel	1799 Deerhaven	Ken Bird Park	Clogged Drain causing flooding
Beth - park District	1799 Deerhaven	Ken Bird Park	Clogged Drain causing flooding
Rebecca Baker	1198 Village Road	Same	Flooding in basement
Melody	Harper & Williamsburg	Hunter's South Detention Pond	Clogged pipes
Paula	Williamsburg	Hunter's South Detention Pond	Clogged pipes
Stephanie Prescar	980 Ridgewood Lane	same	Flooded basement, driveway
Brian w/ Greenstone Landscaping	801 Wedgewood	same	Standing water in yard
???	???	7209 Huntley Road	
Charles K. Ebann	Wedgewood HOA	499 Huntley	Pumping water to neighboring property
Dan McKnight	370 E Prairie St	same	Standing water in yard
PJ Peterson	365 E. Terra Cotta Avenue	same	Standing water in parking lot
Lee Jensen Co.	101 W. Terra Cotta	same	
???	???	333 Woodstock Street	
Debbie Pera	54 E Terra Cotta	same	Flooding in basement
Reginia Jamison	504 Spring Ridge Drive	Crystal Ridge retention basin	pond was holding water
???	???	IHT detention pond	
???	???	Talcott Subdivision	
Carrie Murphy	1210 Country Club Rd	NOT IN THE CITY - LAKEWOOD	Sewer backup
Lena Kalemba	346 Cumberland	NOT IN THE CITY - LAKEWOOD	Basement Flooding
Chuck Turner	1215 Broadway	NOT IN THE CITY - LAKEWOOD	Flooded house

CITY OF CRYSTAL LAKE  
2007 FLOODING ANALYSIS

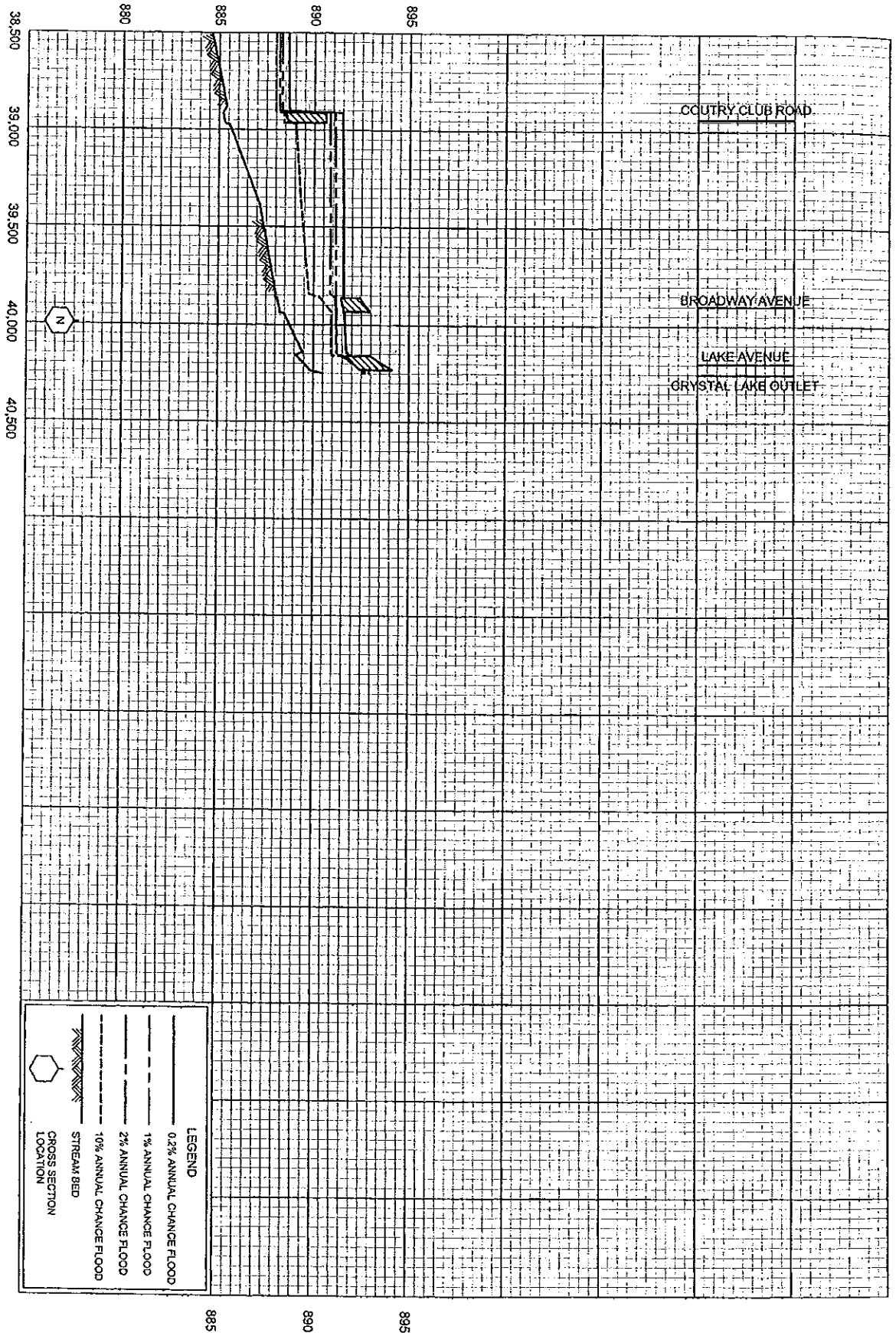
<i>Name</i>	<i>Address</i>	<i>Location</i>	<i>Complaint Type</i>
<b>Road Flooding Areas</b>			
???	???	30-46 McHenry Ave: Low area near Library	
???	???	Intersections of McHenry and Union	
???	???	Intersection of McHenry and Oriole Trail	
???	???	Street in front of 93 Elmhurst	
???	???	Intersection of Route 14 and Keith/Devonshire	
???	???	Street in front of 358 College	
???	???	Street in front of 333/344 Woodstock Street	
???	???	Street in front of 91 Oak Street	
???	???	Street in front of 1291 North Avenue	
???	???	Ridge Ave	
???	???	Highland & Edgebrook	
Linda Potas	???	Intersection of Huntley and Autumn	
Cindy Urcart	???	Kent Street & Crystal Lake Avenue	Water standing in road
Luanne Slavin	???	Union & Mary Ln	Clogged storm drains?
???	???	Green Oaks Drive area	
Mark BeBrovick	811 North Shore	North Shore Drive	
Randy Welton		Oakwood Lane (Randy Welton)	Water standing in road
???	???	Fairview and Crystal Lake Avenue	
???	???	Oriole Trail and Crystal Lake Avenue	
???	???	Uteg & College	
Caroline Schofield	1520 Crandon Ct	Hunters Ridge and Crandon	Water standing in road
Rich Teise	1544 Crandon Pl	Hunters Ridge and Crandon	Water standing in road
Resident	288 Peterson Pkwy	Peterson Pkwy and Route 176	Sink hole formed near here and filled w/w ater







ELEVATION IN FEET (NAVD)



**LEGEND**

- 0.2% ANNUAL CHANGE FLOOD
- 1% ANNUAL CHANGE FLOOD
- 2% ANNUAL CHANGE FLOOD
- 10% ANNUAL CHANGE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH FOX RIVER











Appendix C Conceptual Cost Estimates						
			<b>Area 1C</b>			
			Pine Relief		Pine Pumping	
			Sewer		Station	
<b>Alternative</b>			10		11	
<b>Item</b>	<b>Units</b>	<b>Unit Cost</b>	<b>Amount</b>	<b>Total</b>	<b>Amount</b>	<b>Total</b>
<b>Easements</b>	LS	5000	3	15000	3	15000
<b>Clearing</b>	acres	2000	0.25	500	0.25	500
<b>Excavation and Disposal</b>	CY	20	1000	20000	1000	20000
<b>Granular Import and Placement</b>	CY	20	100	2000	100	2000
<b>New Manhole Installed</b>	LS	2500	2	5000	2	5000
<b>Culvert 7x2 (2)</b>	LF	250		0		0
<b>Storm Sewer</b>	LF	50	400	20000	400	20000
<b>New Field Tiles (4"-12")</b>	LF	10	200	2000	200	2000
<b>Utility Replace</b>	LF	25	300	7500	300	7500
<b>Soil Erosion Control</b>	LS	Varies	5000	5000	5000	5000
<b>Pavement Repair</b>	LS	15000	2	30000	2	30000
<b>New Pavement</b>						
<b>Surface Course 1.5"</b>	Ton	60	0		0	
<b>Binder 1.5"</b>	Ton	50	0		0	
<b>Bit. Agg. 8"</b>	Ton	40	0		0	
<b>CA6 3"</b>	Ton	20	0		0	
<b>Pavement Removal</b>	SY	25	0		0	
<b>Restoration and Seeding</b>	SF	0.25	10000	2500	10000	2500
<b>Pumping Station</b>	LS	25000			1	25000
<b>Sub-Total</b>				109500		134500
<b>Contingency</b>		20%		21900		26900
<b>Total Construction</b>				131400		161400
<b>Engineering</b>		12%		15768		19368
<b>Wetland Delineation</b>	LS	3000		1000		1000
<b>Floodplain BFE</b>	LS	0		0		0
<b>Permits (COE, IEPA, IDNR)</b>	LS	5000		3000		3000
(1) Does not include compensatory storage						



Appendix C Conceptual Cost Estimates								
			Area 3					
			Floresta		Snowberry		Snowberry	
			Drain Tile		Pumping		to Lake	
Alternative			1		2		3	
Item	Units	Unit Cost	Amount	Total	Amount	Total	Amount	Total
Easements	LS	5000	3	15000	3	15000	3	15000
Clearing	acres	2000	0.25	500	0.25	500	0.25	500
Excavation and Disposal	CY	20	1000	20000	3000	60000	2000	40000
Granular Import and Placement	CY	20	200	4000	1000	20000	500	10000
New Manhole Installed	LS	2500	3	7500	2	5000	12	30000
Culvert 7x2 (2)	LF	250		0	1	250	1	250
Storm Sewer	LF	50		0	0	0	0	0
New Field Tiles (4"-12")	LF	10	1000	10000	300	3000	300	3000
Utility Replace	LF	25	300	7500	300	7500	300	7500
Soil Erosion Control	LS	Varies	5000	5000	15000	15000	15000	15000
Pavement Repair	LS	15000	2	30000	2	30000	2	30000
New Pavement								
Surface Course 1.5"	Ton	60						
Binder 1.5"	Ton	50						
Bit. Agg. 8"	Ton	40						
CA6 3"	Ton	20						
Pavement Removal	SY	25						
Restoration and Seeding	SF	0.25	10000	2500	10000	2500	10000	2500
Pumping Station	LS	25000			1			
<b>Sub-Total</b>				102000		158750		153750
<b>Contingency</b>		20%		20400		31750		30750
<b>Total Construction</b>				122400		190500		184500
<b>Engineering</b>		12%		14688		22860		22140
<b>Wetland Delineation</b>	LS	3000		3000		3000		3000
<b>Floodplain BFE</b>	LS	0		0		0		0
<b>Permits (COE, IEPA, IDNR)</b>	LS	5000		5000		5000		5000
(1) Does not include compensatory storage								

Appendix C Conceptual Cost Estimates						
			Area 4		Lake Outlet and Crystal Creek	
			Repair/Replace		Increase	
			Area 4 Storm		Lake Outlet	
			Sewers		Capacity	
Alternative			3		1	
Item	Units	Unit Cost	Amount	Total	Amount	Total
Easements	LS	5000	4	20000	0	0
Clearing	acres	2000	1	2000	0.5	1000
Excavation and Disposal	CY	20	15000	300000	1500	30000
Granular Import and Placement	CY	20	500	10000	500	10000
New Manhole Installed	LS	2500	10	25000	1	2500
Culvert 7x2 (2)	LF	250	1700	425000	100	25000
Storm Sewer	LF	50	1000	50000	0	0
New Field Tiles (4"-12")	LF	10	500	5000	0	0
Utility Replace	LF	25	1000	25000	300	7500
Soil Erosion Control	LS	Varies	15000	15000	15000	15000
Pavement Repair	LS	15000	4	60000	2	0
<b>New Pavement</b>						
Surface Course 1.5"	Ton	60				
Binder 1.5"	Ton	50				
Bit. Agg. 8"	Ton	40				
CA6 3"	Ton	20				
Pavement Removal	SY	25				
Restoration and Seeding	SF	0.25	40000	10000	10000	2500
Pumping Station	LS	25000				
<b>Sub-Total</b>				947000		93500
<b>Contingency</b>		20%		189400		18700
<b>Total Construction</b>				1136400		112200
<b>Engineering</b>		12%		136368		13464
Wetland Delineation	LS	3000		3000		3000
Floodplain BFE	LS	0		0		0
Permits (COE, IEPA, IDNR)	LS	5000		5000		5000
(1) Does not include compensatory storage						