

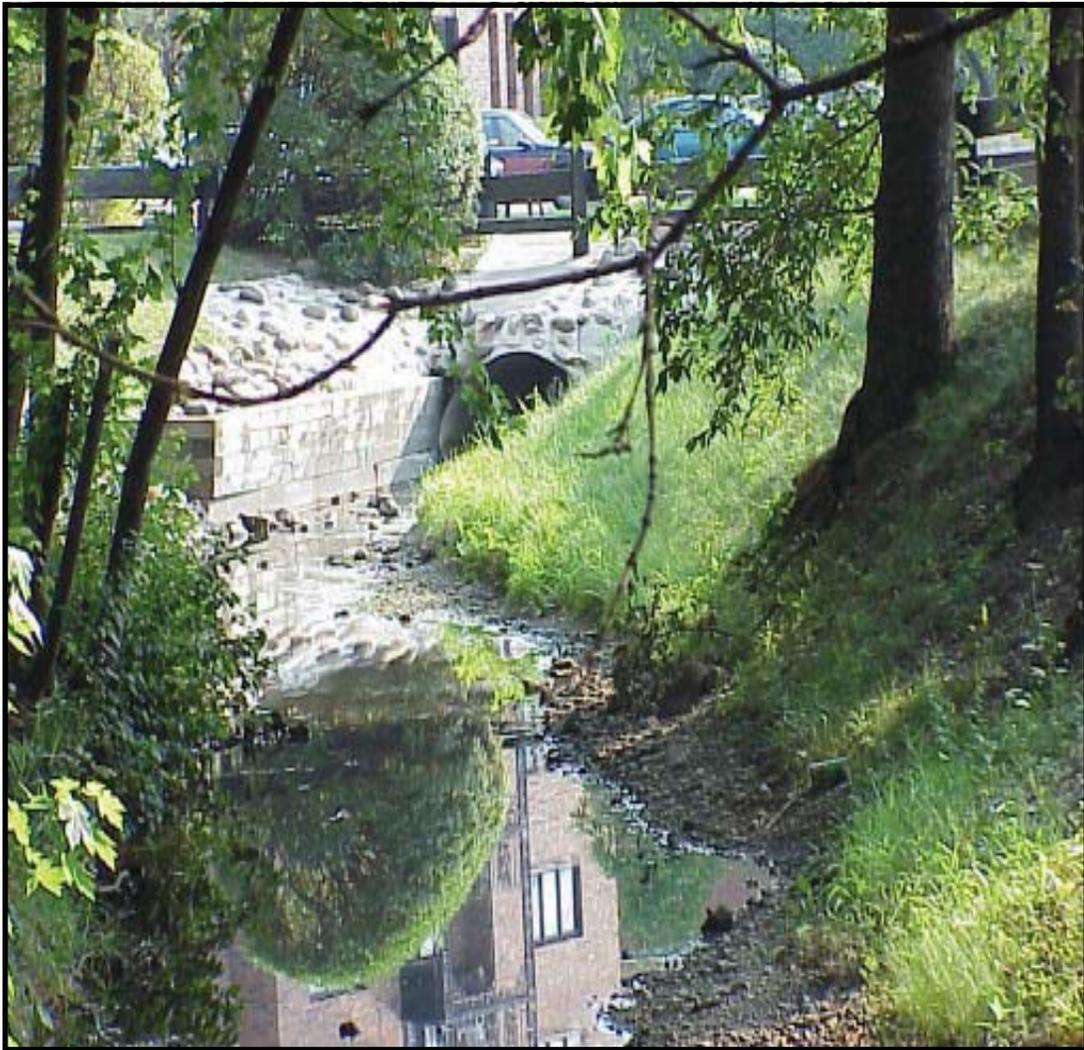


Farmers/Prairie Creek

Strategic Planning Study

Cook County, IL

September 2009



Prairie Creek. Upstream of Landings Lane

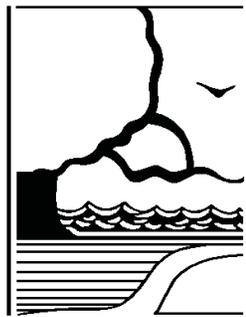


FARMERS/PRAIRIE CREEK

STRATEGIC PLANNING STUDY

Cook County, Illinois

September 2009



**Illinois Department of Natural Resources
Office of Water Resources
One Natural Resources Way
Springfield, Illinois 62702-1271**

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FARMERS/PRAIRIE CREEK

STRATEGIC PLANNING STUDY

COOK COUNTY

ABSTRACT

Historically, structures in the Farmers/Prairie Creek watershed have suffered flood damages from two distinct sources: Des Plaines River backwater and flooding from storms that exceed the channel capacity of Farmers/Prairie Creek. Completion of the Rand Park Flood Control and Multi-Use Trail Project (Levee 50) will greatly reduce the risk of Des Plaines River backwater flooding along Farmers and Prairie Creek for floods up to the 100-year¹ frequency flood event. However, the Rand Park Flood Control and Multi-Use Trail Project does not reduce the risk of flood damages from flooding along Farmers and Prairie Creeks. Accordingly, this engineering study was conducted as part of the U.S. Army Corps of Engineers' Des Plaines River Phase 2 study to investigate the feasibility of flood damage reduction alternatives for Farmers and Prairie Creeks. This study incorporates operation of the Rand Park Flood Control Project (Levee 50), and is based on 2004 watershed characteristics, construction costs and property values.

Incorporation of the Rand Park Flood Control Project gate and pump station operation plan into the study means that flood control gates on Farmers Creek close when Des Plaines River Stages exceed elevation 624.0 (approximately a 1-year frequency flood elevation on the Des Plaines River). Gates remain closed and pump operations up to 250 cfs control water surface elevations on Farmers Creek as long as Des Plaines River flood elevations remain higher than flood elevations on Farmers Creek. Based on this operation plan, gates on Farmers Creek are closed (and pumps on) for the 1, 2, 5, 10, and 25-year frequency events and gates are open (and pumps off) for the 50, and 100-year frequency events on Farmers Creek. The Rand Park Pump Station Operation Plan is included in Appendix 3 of this report.

The estimated Farmers/Prairie Creek 100-year frequency¹ floodplain inundation area is illustrated on Exhibit 2. Appendix 3 provides a listing of the 100-year frequency Farmers/Prairie Creek flood elevations at cross section locations in the watershed.

¹An X-year event is defined as a 1/X probability of occurring within any given year.

As shown in Exhibit 1, the study area consists of portions of the city of Des Plaines, the city of Park Ridge, the village of Glenview, the village of Niles, and unincorporated Maine Township in Cook County. The study area is predominantly residential with some commercial and industrial development.

Flooding from Farmers and Prairie Creeks causes \$144,531 of total average annual flood damages. There are 96 structures in the 100-year frequency floodplain. The damages include \$120,442 in average annual structural and contents damages and \$24,089 in average annual indirect flood damages including average annual traffic damage estimates. These damage estimates do not include risk or uncertainty computations. Exhibit 4 identifies the distribution of flood damages in the watershed including: Lake Mary Anne Estates on Farmers Creek, Upper and Lower Farmers Creek, and Upper and Lower Prairie Creek.

The flood damage reduction alternatives developed and evaluated include:

STORAGE IMPROVEMENTS

- Alternative S1 - Dude Ranch Pond Expansion With Lake Mary Anne Pump Station
- Alternative S2 - Good Avenue Pond
- Alternative S3 - Lutheran General Hospital Pond
- Alternative S4 - Lutheran General Hospital Pond and High School Reservoir
- Alternative S5 - High School Reservoir
- Alternative S6 - Belleau Lake Expansion
- Alternative S7 - Lake Mary Anne Pump Station
- Alternative S8 - Belleau Lake Lowered
- Alternative S9 - Dude Ranch Pond With Lake Mary Anne Pump Station, Good Avenue Pond, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered
- Alternative S10 - Good Avenue Pond, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered
- Alternative S11 - Dude Ranch Pond With Lake Mary Anne Pump Station, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered
- Alternative S12 - Dude Ranch Pond Expansion

CONVEYANCE IMPROVEMENTS

- Alternative C1 - Upstream Dempster Storm Sewer Diversion To Tollway
- Alternative C2 - Downstream Dempster Storm Sewer Diversion To Tollway
- Alternative C3 - Dempster Storm Sewer Diversion To Potter Road
- Alternative C4 - Additional Dee Road Pipe

Alternative C5 - Pipe From Lutheran General Hospital Pond Along Ballard To Potter Road

Alternative C6 - Replace Rancho Lane Culverts

Alternative C7 - Replace Rancho Lane Culverts and Additional Dee Road Pipe

Alternative C8 - Confluence to Belleau Lake Conveyance

OTHER IMPROVEMENTS

Alternative L1 - Parkview Lane Culvert

COMBINATION IMPROVEMENTS

Alternative D1 - Combine Alternatives C2, C6 and S11

Alternative D2 - Combine Alternatives C2 and S11

Alternative D3 - Combine Alternatives C6 and S11

Alternative D4 - Combine Alternatives C7 and S11

Alternative D5 - Combine Alternatives C2 and S8

Alternative D6 - Combine Alternatives C7 and S4

Alternative D7 - Combine Alternatives C4 and S11

Alternative D8 - Combine Alternatives C8 and S8

Alternative D9 - Combine Alternatives C7, C8 and S11

Alternative D10 - Combine Alternatives C6, C8 and S11

Alternative D11 - Combine Alternatives C6, C8, S2, S5 and S8

Alternative D12 - Prairie Creek Channel Improvement and Confluence Reservoir

Alternative D13 - Prairie Creek Culvert/Swale and Confluence Reservoir

Non-structural mitigation measures including such options as acquisition and demolition of flood prone structures, relocation of flood prone structures, elevating flood prone structures, flood insurance, and/or floodproofing of flood prone structures are also considered as a potential flood damage reduction alternative in the report.

Based on the history of recurring Farmers and Prairie Creek flooding and flood damages in the watershed, it is anticipated that substantial flooding and flood damages will continue to occur in Des Plaines, Park Ridge and unincorporated Maine Township unless measures are implemented to prevent such damages. Exhibit 2 illustrates how the Farmers and Prairie Creek floodplains impact each of these communities.

Table 33 provides a break down of estimated project and construction costs as well as what portion of each alternative's construction costs could be covered by the capitalized value of the flood damage reduction benefits potentially produced by that alternative. The capitalized value of the flood damage reduction benefits exceed the costs to

construct addition flood water storage capacity at the Dude Ranch (alternative S1 and S12), Good Avenue Pond (Alternative S2), Lutheran General Hospital Pond (Alternative S3), and at Belleau Lake (Alternative S8). Combined storage alternatives (Alternatives S9 and S11) and some of the combined storage and conveyance alternatives (Alternatives D3, D4 and D7), have capitalized flood damage reduction benefits that exceed 75% of the costs to construct these improvements.

To reduce the risk of flood damages in the watershed, Cook County MWRDGC and/or the city of Des Plaines and/or the city of Park Ridge should:

1. Work with the Illinois Department of Natural Resources, Office of Water Resources to further plan and implement additional flood storage capacity modifications at Belleau Lake, Dude Ranch, Good Avenue Pond, Lutheran General Hospital pond, or a combinations of these sites where the capitalized value of the flood damage reduction benefits exceed 75% the costs to construct addition flood water storage capacity. Such work would be completed in accordance with the terms of a local project sponsorship agreement outlined in this report;
2. Work with the Illinois Department of Natural Resources, Office of Water Resources to further plan and implement combined storage and conveyance alternatives at Rancho Lane and/or Dee Road where the capitalized value of the flood damage reduction benefits exceed 75% the costs to construct the improvements. Such work would be completed in accordance with the terms of a local project sponsorship agreement outlined in this report;
3. Install a flap gate on the downstream (east) end of the 15-inch culvert under Parkview Lane near Busse Highway, and consider raising portions of Parkview Lane and Busse Highway to provide additional freeboard protection against Farmers Creek flooding;
4. Encourage the purchase of National Flood Insurance and enforce local floodplain ordinances in accordance with National Flood Insurance Program guidelines to prevent future floodway encroachments (including temporary storage of equipment and materials), diminish future flood damage potential, and minimize floodplain development in the watershed;
5. Actively remove debris and logs from the Farmers and Prairie Creek to minimize the potential for temporary flood profile increases due to log and debris jams in the channel.

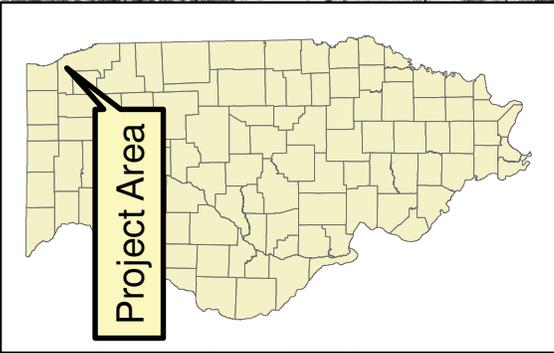
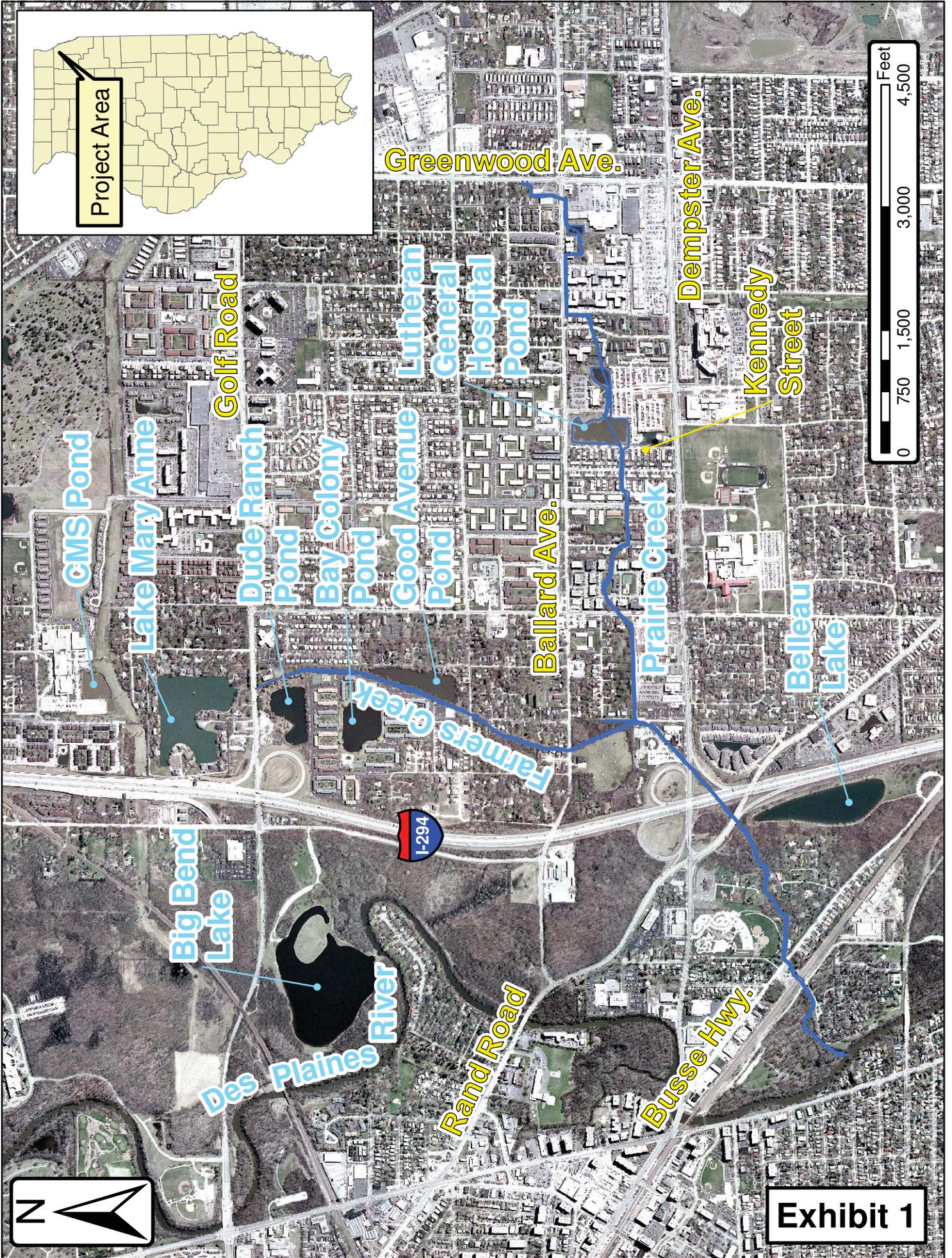


Exhibit 1

**Farmer / Prairie Creek:
Existing 100-YR Flood
Inundation Map**
(5-YR Des Plaines River Tailwater)

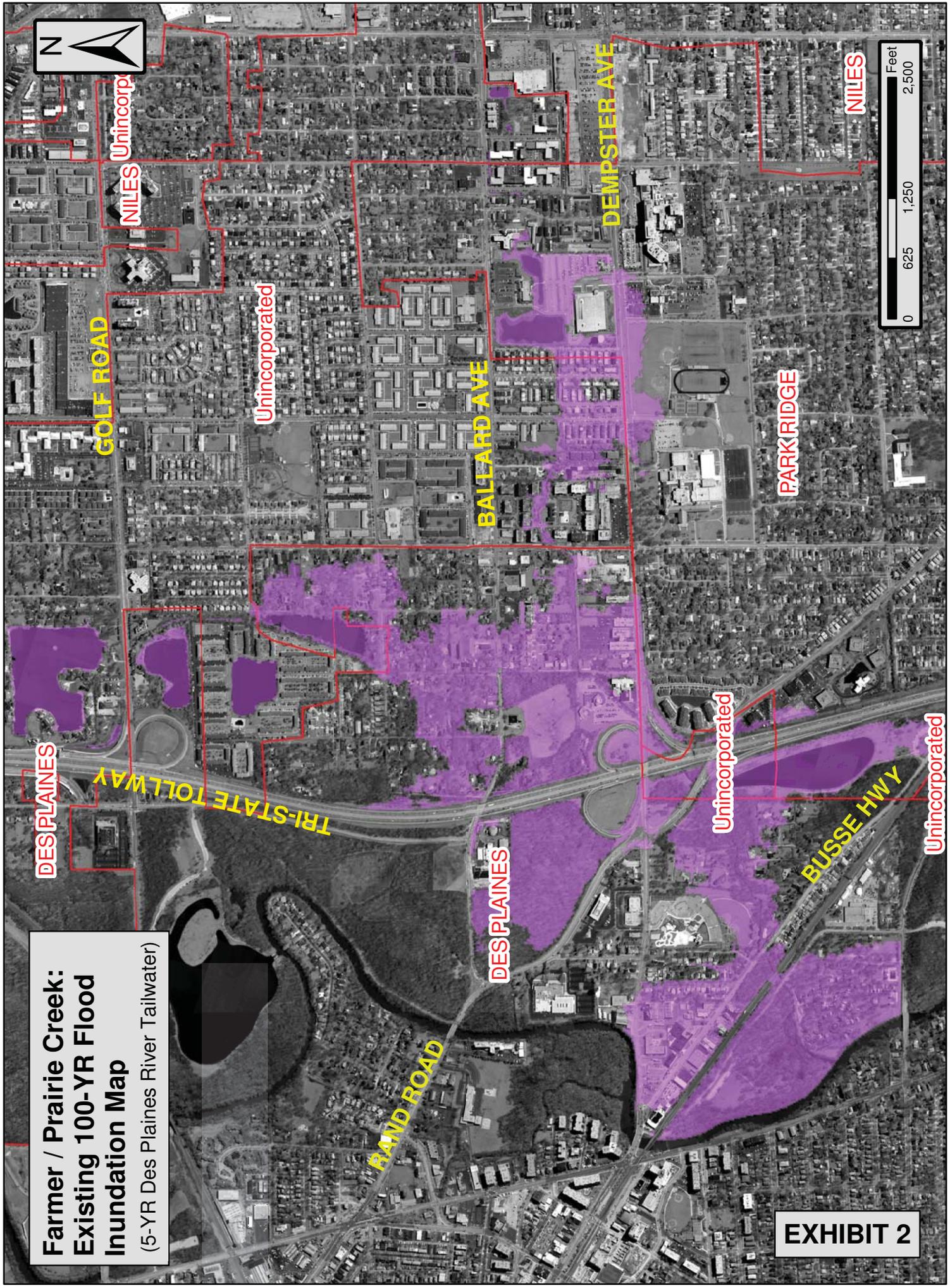


EXHIBIT 2

PURPOSE AND AUTHORITY

This report highlights the results of a strategic planning study conducted to:

1. Investigate the extent of existing (2004) overbank flood damages up to and including the 100-year frequency event, in the Farmers and Prairie Creek watershed using hydrologic, hydraulic and economic computer models and considering the Rand Park Flood Control Project operational;
2. Prepare updated 100-year frequency² floodplain inundation mapping for Farmers and Prairie Creeks; and
3. Develop and assess the economic feasibility of potential flood damage reduction alternatives in the watershed for further project planning.

This study and report was prepared under the authorization granted to the Illinois Department of Natural Resources under the Flood Control Act of 1945, as amended.

SCOPE

The scope of this study included the following elements:

- Conducting an engineering reconnaissance of the Farmers and Prairie Creek watershed and flood prone areas in Des Plaines, Maine Township, Niles, and Park Ridge, Illinois;
- Conducting detailed field surveys of Farmers and Prairie Creek;
- Conducting detailed first floor and low entry elevation structure surveys for flood prone properties in Des Plaines, Maine Township, Niles, and Park Ridge, Illinois;
- Preparing maps and related drawings;
- Developing computer models to estimate flood discharge rates and corresponding water surface elevations at various locations in the watershed;
- Developing computer models to determine structural and content damages of structures in the floodplain;
- Estimating values of flood prone buildings;
- Defining potential structural and non-structural flood control improvements;
- Determining the costs, benefits and the economic feasibility of potential structural flood damage reduction improvements;
- Investigating archaeological and biological resources in the vicinity for assessment of potential impacts of the various structural flood damage reduction improvements;
- Estimating the impacts to cultural resources, wetlands, and threatened and endangered species;
- Preparing a project report.

²An X-year event is defined as a 1/X probability of occurring within any given year.

PREVIOUS STUDIES

Previous studies relating to flooding within the Farmers and Prairie Creek watershed include:

U.S. Army Corps of Engineers, Inventory and Analysis of Urban Water Damage Problems, Farmers and Prairie Creeks, Cook County, Illinois, August 1988.

This study report was conducted as part of a request by the IDNR, Office of Water Resources (formerly IDOT, Division of Water Resources) to gather data on the severity and frequency of urban flooding in the watershed.

U.S. Army Corps of Engineers, Flood Damage Reduction Study Reconnaissance Report (Draft), Upper Des Plaines River, Illinois, February 1989.

This study was initiated to determine flooding problems in the upper Des Plaines River basin, possible solutions and justification to continue with a feasibility phase study.

Harza Environmental Services, Inc., Farmers/Prairie Creek Strategic Planning Study (Draft), Des Plaines, Maine Township, Park Ridge, Niles, August, 1991.

This study assessed flood problems in Farmers/Prairie Creek watershed and developed alternatives for providing flood damage reduction.

Illinois Department of Natural Resources, Office of Water Resources, Executive Summary - Des Plaines River, Rand Park Flood Control For Des Plaines and Park Ridge, Cook County, Illinois, August, 1997.

This study was conducted to investigate the causes and extent of existing Des Plaines River overbank flood problems and to formulate structural methods of reducing Des Plaines River flood damages.

WATERSHED ASSESSMENT

Farmers Creek drains a nearly fully urbanized watershed and has a drainage area of 4.4 square miles at its confluence with the Des Plaines River. Prairie Creek is the primary tributary to Farmers Creek and flow into Farmers Creek about 1000 feet upstream of Dempster Avenue. Features of the Farmers and Prairie Creek watershed such as primary roadways and existing ponds are illustrated on Exhibit 1. The Farmers and Prairie Creek watershed boundary and drainage subbasins boundaries for the watershed are delineated on Exhibit 3.

The Farmers Creek watershed consists of mostly single family homes with supporting

infrastructure and commercial development. Farmers Creek extends 10,200 feet from the Des Plaines River in Des Plaines, Illinois to Golf Road in Maine Township. The average slope of the creek is about 5.7 feet per mile. Farmers Creek passes by Belleau Lake (Tollway borrow lake) immediately downstream of the Tri-State Tollway. Only out of channel flood flows are able to utilize flood storage available at Belleau Lake. Farmers Creek also flows adjacent to Good Avenue Pond between East Emerson Street and East Church Street in Des Plaines. Due to several openings in the channel bank between Farmers Creek and Good Avenue Pond, the pond provides on-line storage for Farmers Creek flows. Immediately downstream of Golf Road near the headwaters of Farmers Creek, the creek flows past Dude Ranch Pond. Currently, this former trout farm pond is not directly connected to, or available for, Farmers Creek flood water storage. Inflows to Farmers Creek at Golf Road are provided by three sources, runoff from the Tri-State Tollway (from the west), outflows from Lake Mary Anne (immediately upstream from the north), and high flows from the Golf Road interceptor sewer (from the east). At its confluence with Farmers Creek, the 10 foot diameter Golf Road interceptor drains just over 1 square mile of the watershed. Where the headwaters of Farmers Creek pass under Golf Road from Lake Mary Anne and the Tollway, the Golf Road interceptor enters a junction chamber on the south side of Golf Road where interceptor flows are restricted into an 8 foot diameter sewer flowing into Big Bend Lake and the Des Plaines River. High flows from the Golf Road interceptor in excess of 550cfs are diverted into Farmers Creek downstream of Golf Road via a 48-inch pipe. A gate on the downstream end of the Golf Road interceptor sewer pipe prevents Des Plaines River flood waters from back flowing into Farmers Creek.

As part of the Rand Park Flood Control and Multi-Use Trail project, 3800 feet of the Union Pacific Railroad embankment across Farmers Creek, just upstream of the confluence with the Des Plaines River, was modified with a clay blanket to allow the embankment to serve as Des Plaines River levee. As part of this modification, seven, 8 foot by 8 foot sluice gates were constructed across Farmers Creek immediately upstream of the Union Pacific Railroad in conjunction with a 250 cfs pump station. The operation plan for this facility calls for the gates on Farmers Creek to shut when Des Plaines River stages reach or exceed elevation 624.0. The pump station is intended to handle Farmers Creek discharges during coincident events on Des Plaines River and Farmers and Prairie Creeks. The gates are never intended to act as a dam on Farmers Creek and pool water on Farmers Creek in excess of stages on the Des Plaines River. If this condition starts to occur, the gates on Farmers Creek will be opened to restore gravity flow of Farmers Creek to the Des Plaines River.

The Prairie Creek watershed is almost fully developed, consisting of commercial, single

family residential and multi-family residential units. Prairie Creek drains just over 2 square miles as it flows east to west, and serves parts of Des Plaines and Maine Townships, Park Ridge, Niles and Glenwood. From its confluence with Farmers Creek to Greenwood Avenue, the creek extends for about 8,000 feet with at an average slope of 5.1 feet per mile. As a result of development, the natural creek channel has been modified extensively with storm sewer outfalls, paved channels, online detention basins and many culvert crossings. Many of these unique hydraulic structures are discussed further in Appendix 3. Immediately upstream of Kennedy Lane and directly north of Lutheran General Hospital, Prairie Creek passes through 2 on-line detention ponds on the Lutheran General Hospital campus. A large Dempster Avenue storm sewer draining almost 0.6 square miles feeds into Prairie Creek immediately downstream of Lutheran General Hospital Pond at Kennedy Lane. Prairie Creek flows through another detention pond just downstream of Ballard Road and Greenwood Avenue. An extensive storm sewer system makes up the headwaters of Prairie Creek above Greenwood Avenue.

HYDROLOGY

RAINFALL

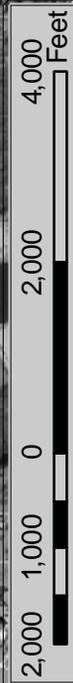
Precipitation data used in the model for various storm frequencies and durations was acquired from the Illinois State Water Survey (ISWS) publication "Frequency Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois" (Circular 172). Due to the small size of the watershed, first quartile Huff point rainfall distributions were used for the 6-hour duration storm events modeled. Table 1 shows the rainfall depths used in the hydrologic modeling for each storm frequency event analyzed in the study.

TABLE 1: RAINFALL DEPTHS FOR 6-HOUR DURATION STORM

Storm Frequency, Years	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
Strom Rainfall, Inches	1.88	2.27	2.85	3.35	4.23	4.85	5.68

MODELING

Detailed field survey information, detailed storm sewer mapping, and Des Plaines River watershed LiDAR surveying was used to develop a HEC-1 hydrology model for the Farmers and Prairie Creek watershed. Table 2 presents a summary of the baseline condition discharges for the watershed.



Farmers/Prairie Creek Subbasins

SUBBASIN	Description
	Tributary to Farmer Creek
	Tributary to Golf Road Interceptor
	Tributary to P rairie Creek
	Tributary to Dempster Sewer
	Farmers/Prairie Creek

Central Road

Golf Road

Dempster Street

Tri-State Tollway

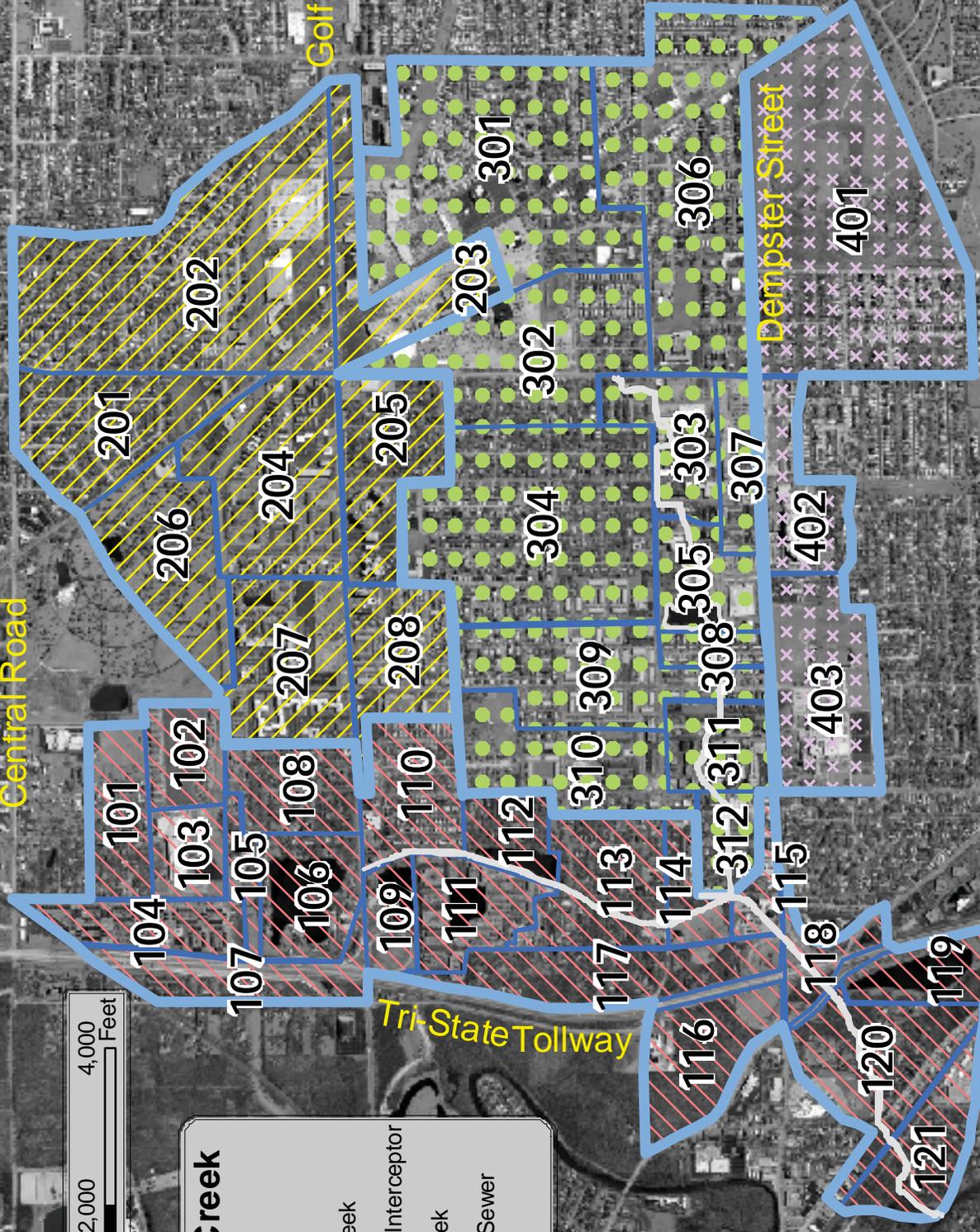


EXHIBIT 3

The hydrologic computer program HEC-1, developed by the U.S. Army Corps of Engineers, was used to calculate peak flow rates for a range of storm events at various points within the watershed based on delineated drainage areas and land uses in the watershed. To calculate the rate and volume of runoff, parameters including drainage area, SCS (Soil Conservation Service) curve number using antecedent moisture condition II, and time of concentration were calculated for each subbasin. Appendix 2 includes all subbasin parameters for the watershed, SCS curve number determination tables, lag calculations used in the hydrologic model, HEC-1 model schematic and the input file for the HEC-1 model. The equations used to calculate the lag were taken from page 15-7 of the National Resource Conservation Service’s “National Engineering Handbook, Section 4, Hydrology, 1969.”

TABLE 2: SUMMARY OF BASELINE DISCHARGES (CFS)

Reach	Creek	Node	1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Greenwood to Luther	Prairie	pkside	19	22	33	39	51	65	76
Luther to Kennedy	Prairie	lghin2	47	61	75	83	105	123	140
Kennedy to Howard	Prairie	athwrd	60	82	110	133	166	218	265
Howard to Potter	Prairie	atpotr	93	133	172	193	251	338	443
Potter to Confluence	Prairie	prairi	94	127	161	184	253	336	444
Golf to Emerson	Farmers	atemrs	17	23	38	43	48	53	58
Emerson to Church	Farmers	atgood	19	27	43	49	56	62	69
Church to Ballard	Farmers	atblrd	20	26	35	48	58	71	87
Ballard to Confluence	Farmers	praire	22	29	40	50	68	84	104
Confluence to Dempster	Farmers	atdemp	120	163	210	247	328	429	563
Dempster to Rand	Farmers	atrand	146	199	251	291	372	475	615
Rand to Busse Hwy.	Farmers	Atbuse	148	204	260	287	356	446	576
Busse Hwy to Des Plaines	Farmers	despln	170	225	258	261	267	439	575

Exhibit 3 shows the subbasin watershed boundaries. All "100" series subbasins are directly tributary to Farmers Creek. All "200" series subbasins are directly tributary to the Golf Road Interceptor Sewer system to Big Bend Lake and the Des Plaines River. All interceptor flows in excess of 550 cfs enter Farmers Creek at Golf Road. All "300" series subbasins are directly tributary to Prairie Creek and all "400" series subbasins are tributary to the Dempster Avenue Storm Sewer system entering Prairie Creek just downstream of Kennedy Lane below the Lutheran General Hospital Pond.

The HEC-1 model includes detention storage at the CMS pond, Lake Mary Anne, Bay Colony Pond, Good Avenue Pond and Belleau Lake on Farmers Creek, and detention storage on Prairie Creek at Lutheran General Hospital Pond and in a small pond just downstream of Ballard Road (see Exhibit 1 for storage locations). The HEC-1 model also includes all areas tributary to the Golf Road interceptor sewer that discharges to both Big Bend Lake and Farmers Creek. The model provides for a high flow diversion from the Golf Road storm interceptor sewer into Farmers Creek when interceptor sewer discharges exceed 550 cfs. Such a flow diversion into Farmers Creek occurs at roughly a 50-year frequency storm event.

A critical duration analysis of the Farmers and Prairie Creek watershed was performed to determine existing conditions peak flow rates at various locations in the watershed. Table 3 shows the peak flow rates in the watershed resulting from storms of various durations. Based on these results, the 6-hour storm was selected as the critical duration storm for the entire watershed. The 6-hour duration storm produced the greatest peak discharges in those reaches suffering the greatest flood damage, specifically in the vicinity of the confluence of Farmers and Prairie Creeks and in the lower reaches of Prairie Creek.

Elevation-discharge-area tables required for the channel routing reaches were calculated using an iterative procedure between HEC-1 and HEC-RAS. HEC-RAS is a step backwater computer program developed by the U.S. Army Corps of Engineers which calculates water surface profiles for various discharges. A series of assumed starting discharges were input into the HEC-RAS program and then the resulting elevation-volume data for the various routing reaches, and elevation-discharge data were input into the HEC-1 model. Discharges from this HEC-1 model were then put back into the HEC-RAS model, replacing the initial starting discharges, and new elevation-volume and elevation-discharge data was obtained. This process was continued until successive iterations resulted in approximately equivalent elevation-volume data for the various routing reaches and similar elevation-discharge relationships existed in both the hydrologic and hydraulic models.

TABLE 3: CRITICAL DURATION DETERMINATION

(Peak Flow Rates - Farmers Prairie 100-Year)			
<u>LOCATION</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>
MOUTH	299	575	638
BUSSE (u/s face)	391	576	623
RAND (u/s face)	593	615	609
DEMPSTER (u/s face)	529	563	560
FARMERS (u/s confl)	140	104	98
BALLARD (u/s face)	120	87	83
CHURCH (u/s face)	107	69	72
EMERSON (u/s face)	110	58	63
PRAIRIE (u/s confl)	353	444	430
POTTER (u/s face)	335	443	425
HOWARD (u/s face)	189	256	305
KENNEDY @ LGH Pond	152	140	150
PARKSIDE (u/s face)	96	76	70
KNIGHT (u/s face)	101	77	70

HYDRAULICS

HEC-RAS MODEL

The Hydraulic Engineering Center's River Analysis System (HEC-RAS Version 3.1.3), created by the US Army Corps of Engineers, was used to develop base condition flood profiles on Farmers and Prairie Creeks. The base conditions model has 7 profiles including the 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year frequency events. The results of the hydraulic model are provided in Appendix 3. Appendix 3 also includes baseline water surface profiles, complex hydraulic structures discussion, and Rand Park Pump Station operation plan.

Farmers Creek is divided into 2 model reaches, Lower and Upper (see Exhibit 4). The Lower reach starts at the mouth to the Des Plaines River and stretches upstream to the confluence with Prairie Creek at Prairie Avenue, just east of the Greek Orthodox Church on Dempster Avenue. The Lower Reach of Farmers Creek is approximately 5180 feet long and contains 56 cross-sections and 10 stream crossing structures including the closure gates at the Rand Park pump station. The Upper reach starts at the confluence with Prairie Creek and heads upstream to just south of Golf Road. The Upper Reach of Farmers Creek is approximately 4580 feet long with 58 cross-sections and 8 stream crossing structures.

Starting water surface elevations for Farmers Creek at the mouth to the Des Plaines River were set to the Des Plaines River 5-year frequency profile elevation as required by the Des Plaines River Phase II Corps of Engineers study guidelines. However, incorporation of the Rand Park Flood Control Project gate and pump station operation plan into the HEC-RAS model just downstream of Busse Highway, governs most water surface profile elevations in the lower reaches of the model. The flood control gates on Farmers Creek close when Des Plaines River Stages exceed elevation 624.0 (approximately a 1-year frequency flood elevation on the Des Plaines River). Gates remain closed and pump operations control water surface elevations on Farmers Creek as long as Des Plaines River flood elevations remain higher than flood elevations on Farmers Creek. The Rand Park Pump Station Operation Plan is included in Appendix 3 of this report. Based on this operation plan, gates are closed (and pumps on) for the 1, 2, 5, 10, and 25-year frequency events in the baseline HEC-RAS model. A separate HEC-RAS model is used to evaluate 50, and 100-year frequency events on Farmers Creek when baseline conditions warrant open gate (no Des Plaines River flood control) conditions. Hydraulic conditions for each alternative flood damage reduction measure considered as part of this study were evaluated to determine which gate operation condition applied to each potential flood control measure for each frequency event.

Prairie Creek is modeled as a single reach which starts at the confluence with Farmers Creek and stretches to Greenwood Avenue. Prairie Creek contains 138 cross-sections over approximately 7800 feet and contains 20 stream crossing structures.

Hydraulic modeling of the Farmers and Prairie Creek watershed includes several complex hydraulic structures. These include: culvert and bridge sedimentation, hydraulically long culverts, atypically-shaped stream crossing structures, inline reservoirs, and 90-degree channel bends. The discussion in Appendix 3 explains the complex characteristics of the urban drainage system represented in the Farmers and Prairie Creek model. Flood flow debris has historically collected at various structures on Farmers and Prairie Creek causing additional restrictions and temporarily increased flood profile elevations. Due to the varied and inconsistent nature of the debris problem from event to event in the watershed, the HEC-RAS model does not account for temporary accumulation of debris at structures.

MANNING’S N-VALUES

Table 4 lists typical n-values used in the HEC-RAS model. These values were based on field inspections and commonly used values. Some reaches required minor n-value changes to calibrate the flows based on area precipitation and staff gage data.

TABLE 4: TYPICAL MANNING’S N-VALUES

	Left Bank	Channel	Right Bank
Normal Section	0.06	0.04	0.06
High Roughness	1.0	0.06	1.0
Low Roughness	0.04	0.02	0.04

INEFFECTIVE FLOW AREAS AND BLOCKED OBSTRUCTIONS

As part of developing the HEC-RAS model, buildings that obstructed flow were entered as permanent ineffective flow areas. This approach allowed the HEC-RAS model to properly model storage between the cross-sections while ensuring that these areas do not convey flow.

Ineffective flow limits were also used to maintain conveyance channels upstream and downstream of culverts and bridges. Such limits prevent the model from overestimating the expansion and contraction losses associated with restrictive structures in the channel.

Ineffective flow boundaries were used extensively downstream of Kennedy Avenue on Prairie Creek to represent blocked flow conditions caused by several large apartment buildings. Additionally, LiDAR contours in this same reach suggest that a significant portion of floodplain flow is capable of being conveyed down Dempster Avenue in the left overbank. Accordingly, a conveyance channel along Dempster Avenue was defined in the model by using temporary ineffective boundaries which would allow flow in this conveyance area as long as the flood profile elevation exceeded 638.4 feet, the crown of Kennedy Avenue. This approach greatly reduced calculated water surface elevations in this reach, more closely modeling recorded highwater mark information.

CALIBRATION

A calibration procedure was conducted to ensure that the computer models adequately represented the actual conditions present within the watershed. In November 1991 eight staff gages were installed at various locations along Farmers and Prairie Creeks by the Office of Water Resources. High water marks obtained from the August 22, 2002 storm event were used to verify the hydraulic model. Rainfall information for the August 22, 2002 event was obtained from a 15 minute recording rain gage located near the CMS pond site on upper Farmers Creek. High water marks obtained from the August 13-14, 1987 storm event were also used to verify the hydraulic model for a larger storm event based on rainfall information taken from a gage at O’Hare airport. A comparison of the recorded highwater mark elevations to those high water elevations predicted by the HEC-RAS model are shown in Table 5.

TABLE 5: CALIBRATION DATA AUGUST 22, 2002 STORM

Highwater Mark Location	HEC-RAS Station	Mark Elevation	HEC-RAS Elevation	Difference (FT)
Farmers at Busse Highway	1538	627.78	627.18	-0.60
Farmers/Prairie confluence	5135	629.38	629.46	0.08
Farmers at Church St.	7495	629.96	630.09	0.13
Farmers at Emerson St.	8955	631.96	631.86	-0.10
Prairie at Potter Road	21433	632.21	631.79	-0.42
Prairie at Robin Dr.	23422	638.36	638.46	0.10

TABLE 5 CONTINUED: CALIBRATION DATA AUGUST 13-14, 1987 STORM

Highwater Mark Location	HEC-RAS Station	Mark Elevation	HEC-RAS Elevation	Difference (FT)
Farmers/Prairie confluence	5300	632.7	633.2	0.50
Prairie at Rancho Ln.	22333	637.4	637.57	0.17
Prairie at Township Town Hall	25217	642.2	642.08	-0.12

Through the calibration process it was determined that discrepancies between recorded flood elevations and those flood elevations predicted by hydrologic and hydraulic modeling were a result of excessive discharges from several of the watershed subbasins. Accordingly, the HEC-1 model was adjusted to reflect additional storage potential in the subbasins based on a better definition of available storage potential in each basin. The calibrated baseline HEC-1 and HEC-RAS models adequately predict flows and water surface elevations.

FLOOD PROBLEM AND ECONOMICS

Even though construction of the Rand Park Flood Control and Multi-Use Trail Project greatly reduces the risk of Des Plaines River backwater flooding in the Farmers Creek watershed, significant flood damage potential within the study area remains due to a substantial overbank flooding potential from Farmers and Prairie Creeks. Encroachment into the floodplain by previous urban development coupled with inadequate channel capacity to carry the flashy runoff from this heavily urbanized watershed, produces structural flood damages beginning at the 2-year frequency flood event (see Table 6).

There are several types of possible damages related to overbank flooding; direct damages, indirect damages, and intangible damages. Direct damages (structural and contents) occur to public, residential, commercial, and industrial property. Direct damages were calculated as follows: Commercial and residential structures located within the floodplain were analyzed by field surveys to determine the type of structures, first floor and low entry elevations. All potentially flood-prone structures identified in the watershed were assigned structural and content values based on 2004 Cook County Assessor tax values. These values were compared to sales figures in the study area for validation purposes. Contents for residential units were calculated at 50% of current structure value per the Apartment and Condominium Personal Property Cost Guide by E.H. Boeckh published by Insurance Company of Illinois. Contents values for commercial structures were estimated as 90% of the structure value. Confirmation of contents values for commercial structures were also determined from interviews.

Traffic disruption damages, damage to utilities, increased public service (police/public works) costs, evacuation and cleanup costs, and others are called indirect damages. Indirect average annual damages, including traffic damages were computed as 20% of the direct average annual damages for Farmers/Prairie Creek.

A third category of damages, called intangible damages, include loss of life, health hazard and psychological threat to residents. No estimate of intangible damages was made in this study. Total damages discussed in this report are the sum of direct damages and indirect damages.

TABLE 6: BASELINE FLOOD DAMAGES

FREQUENCY (YEARS)	NUMBER OF STRUCTURES	STRUCTURE DAMAGES	CONTENTS DAMAGES	TOTAL DAMAGES
100	96	\$2,019,630	\$1,731,410	\$3,751,040
50	64	\$697,805	\$878,600	\$1,576,405
25	38	\$340,368	\$231,552	\$571,920
10	11	\$49,784	\$23,593	\$73,377
5	2	\$17,677	\$8,647	\$26,324
2	1	\$10,865	\$5,432	\$16,297
1	0	\$0	\$0	\$0

Direct Average Annual Flood Damages = \$120,442.
 Indirect Average Annual Flood Damages = \$ 24,089.
 Total Average Annual Flood Damages = \$144,531.

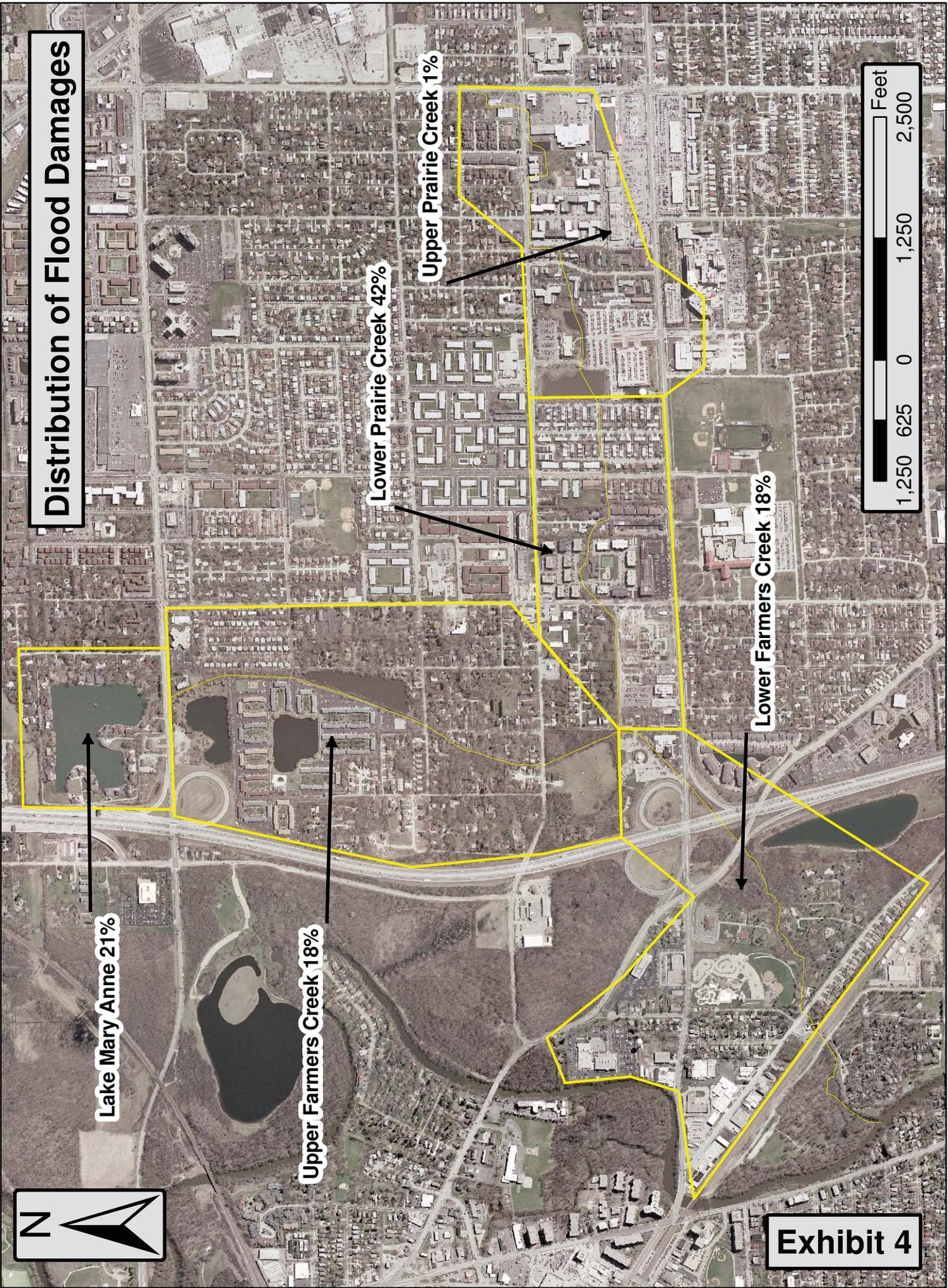
Property value information for year 2004, combined with flood damage versus depth of flooding tables from the Federal Insurance Administration and from the Corps of Engineers, provided flood damage-elevation information for each structure. The flood damage versus depth of flooding tables and plots, are shown in Appendix 1.

Exhibit 5 illustrates how sample flood damage-elevation information was combined with frequency-elevation data from the HEC-RAS model output to produce a frequency-damage relationship for each structure. Based on this frequency-damage relationship,

average annual damages under existing conditions were calculated for flooding in the watershed.

Table 6 shows average annual damages under baseline existing conditions for flooding from Farmers and Prairie Creeks overbank flooding. Farmers and Prairie Creeks flooding causes \$144,531 of total average annual flood damages. There are 96 structures in the 100-year frequency floodplain based on structure surveys in the watershed. The damages include \$120,442 in average annual direct structural damages and contents damages and \$24,089 in average annual indirect flood damages.

Distribution of Flood Damages



Lake Mary Anne 21%

Upper Farmers Creek 18%

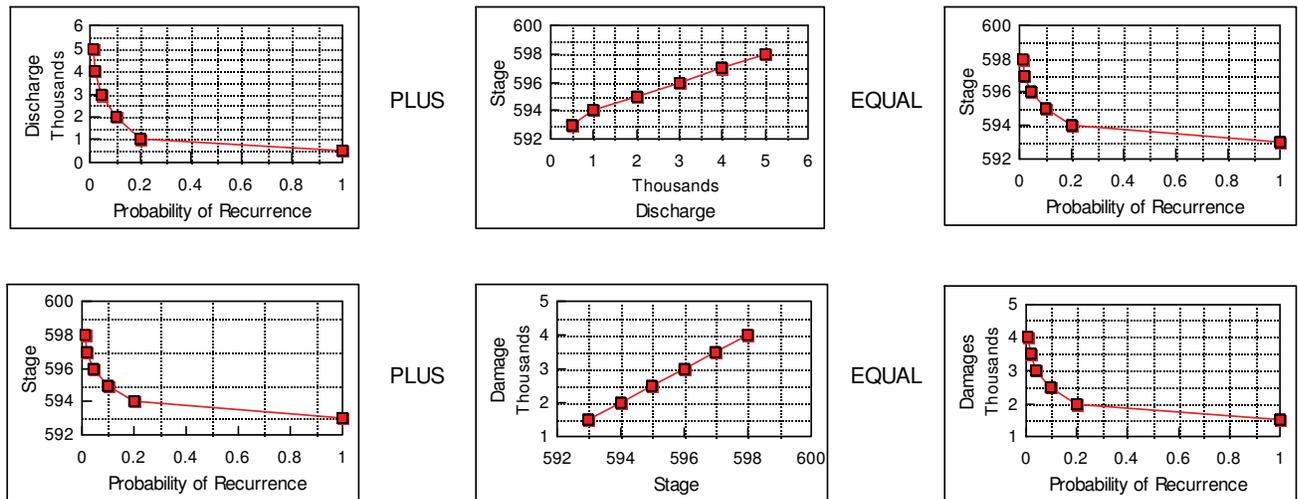
Lower Prairie Creek 42%

Upper Prairie Creek 1%

Lower Farmers Creek 18%

Exhibit 4

EXHIBIT 5: SAMPLE FLOOD DAMAGE COMPUTATION CURVES



Exhibits 4 and Table 7 show the distribution of the flood damages in the watershed. Structural damages are 56% residential, 23% commercial, and 21% public. These damages provide a basis for estimating the benefits generated from various potential flood control alternatives.

As each potential flood damage reduction alternative was developed, a new assessment of flood damages (direct and indirect) in the watershed was prepared and annualized. Benefits for each alternative were calculated as the reduction in average annual flood damages associated with each alternative from the baseline average annual damages.

Implementation costs, including land rights and annual maintenance costs, were determined for each alternative using 2004 construction unit prices from the Illinois Department of Transportation previous bid tabulations and/or previous Office of Water Resources bid tabulations. Detailed implementation cost estimates for each structural alternative considered in the study are included in the Flood Damage Reduction Alternatives section of this report. Alternative costs were estimated using 2004 construction unit prices to allow an even comparison with anticipated project benefits that were based on 2004 assessed property values. Project engineering (including environmental permits) costs and construction supervision costs associated with the project alternatives investigated were estimated at 20% and 7.5% of the project construction costs respectively.

TABLE 7: DISTRIBUTION OF FLOOD DAMAGES

	LOCATIONS	AVE. ANNUAL DAMAGES	STRUCTURES DAMAGED	% OF DAMAGE	% OF STRUCTURES
Lower Farmers	Des Plaines River - Confluence of Farmers/ Prairie Creeks	\$26,405	23	18%	24%
Upper Farmers	Confluence of Farmers/ Prairie Creeks - Golf Road	\$25,836	16	18%	17%
Lake Mary Ann	Lake Mary Anne	\$30,319	8	21%	8%
Lower Prairie	Confluence of Farmers/ Prairie Creeks - Kennedy Street	\$60,160	48	42%	50%
Upper Prairie	Kennedy Street - Greenwood Avenue	\$1,811	1	1%	1%

Land rights costs used to determine flood damage reduction alternative cost estimates were based on a comparable property sales analysis conducted in the vicinity. The land cost was determined to be \$1.00 per square foot for a permanent flood easement. For the purpose of this strategic level of study, land cost was waived for land that was already held in the public ownership. The land cost for other land was determined to be \$5.00 per square foot.

These project implementation costs for each alternative were annualized over a 50-year project life at an interest rate of 5 3/8%. As summarized in Table 8, average annual benefits “B” were compared to average annual project costs “C” to determine economic feasibility (B/C ratio > 1.0) for each alternative.

DAMAGE RESULTS TABLE 8

	PLAN DESCRIPTION	DAMAGES										ECONOMICS				
		1-YR \$	2-YR \$	5-YR \$	10-YR \$	25-YR \$	50-YR \$	100-YR \$	TOTAL AAD (DIRECT+INDIRECT)	AAB	EST. TOTAL COST (INCL. LAND RIGHTS)	O&M	AAC (INCL. O&M)	B/C		
BASELINE	BASELINE MODEL WITH RAND PARK PUMP STATION	\$0	\$16,297	\$26,324	\$73,377	\$571,920	\$1,576,405	\$3,751,040	96	\$144,531						
STORAGE IMPROVEMENTS																
ALTERNATIVE S1	DUDE RANCH EXPANSION WITH LMA PUMPS	\$0	\$0	\$0	\$30,107	\$333,942	\$1,379,398	\$3,098,634	82	\$99,524	\$45,007	\$3,000	\$43,065	1.05		
ALTERNATIVE S2	STORAGE AT GOOD AVENUE POND	\$0	\$16,297	\$23,132	\$66,171	\$421,279	\$1,531,827	\$3,453,511	89	\$129,684	\$14,847	\$900	\$17,172	0.66		
ALTERNATIVE S3	LGH SAG PIPE & DEWATER	\$0	\$16,297	\$26,324	\$62,156	\$276,658	\$1,478,614	\$3,467,527	91	\$122,418	\$22,113	\$2,300	\$35,117	0.63		
ALTERNATIVE S4	LGH SAG PIPE & DEWATER + HIGH SCHOOL WITH 24"	\$0	\$16,297	\$23,132	\$35,971	\$129,810	\$401,161	\$1,621,590	59	\$59,468	\$85,063	\$17,000	\$181,143	0.47		
ALTERNATIVE S5	HS FOND & 24-INCH RESTRICTOR	\$0	\$16,297	\$23,132	\$35,898	\$144,682	\$1,067,633	\$1,660,084	59	\$72,865	\$71,666	\$14,700	\$146,026	0.49		
ALTERNATIVE S6	BELLEAU LAKE ENLARGED	\$0	\$16,297	\$23,132	\$57,328	\$370,864	\$1,456,919	\$3,332,026	88	\$122,880	\$21,651	\$6,800	\$47,908	0.45		
ALTERNATIVE S7	LMA PUMP TO EXISTING DUDE RANCH POND	\$0	\$0	\$3,192	\$43,937	\$492,997	\$1,423,530	\$3,382,106	89	\$115,149	\$29,382	\$2,700	\$36,909	0.80		
ALTERNATIVE S8	EXISTING BELLEAU LAKE LOWERED NO EXPANSION	\$0	\$16,297	\$23,132	\$57,433	\$398,593	\$1,546,694	\$3,446,766	89	\$127,903	\$16,628	\$700	\$5,628	2.95		
ALTERNATIVE S9	COMBINE S1, S2, S4, S8	\$0	\$0	\$0	\$0	\$24,189	\$109,079	\$1,109,030	50	\$23,087	\$121,444	\$3,832,000	\$242,582	0.50		
ALTERNATIVE S10	COMBINE S2, S4, S8	\$0	\$16,297	\$23,132	\$29,440	\$103,031	\$266,823	\$1,490,560	49	\$52,779	\$91,752	\$17,900	\$203,844	0.45		
ALTERNATIVE S11	COMBINE S1, S4, S8	\$0	\$0	\$0	\$0	\$24,249	\$89,473	\$1,118,327	50	\$22,904	\$121,627	\$20,100	\$225,409	0.54		
ALTERNATIVE S12	DUDE RANCH EXPANSION NO LMA PUMPS	\$0	\$16,297	\$23,132	\$65,990	\$411,980	\$1,526,102	\$3,452,465	89	\$129,099	\$15,432	\$1,000	\$26,453	0.68		

TABLE 8	PLAN DESCRIPTION	DAMAGES										ECONOMICS						
		1-YR \$	2-YR \$	5-YR \$	10-YR \$	25-YR \$	50-YR \$	100-YR \$	TOTAL AAD (DIRECT+INDIRECT)	AAB	EST. TOTAL COST (INCL. LAND RIGHTS)	O&M	AAC (INCL. O&M)	B/C				
CONTINUED																		
BASELINE	BASELINE MODEL WITH RAND PARK PUMP STATION	\$0	\$16,297	\$26,324	\$73,377	\$571,920	\$1,576,405	\$3,751,040	\$144,531									
COMBINATION IMPROVEMENTS																		
ALTERNATIVE D1	COMBINE C2, C6, S11	\$0	\$0	\$0	\$0	\$6,464	\$55,022	\$929,839	\$18,038	\$126,493	\$5,863,000	\$37,900	\$377,840	0.33				
ALTERNATIVE D2	COMBINE C2, S11	\$0	\$0	\$0	\$0	\$37,789	\$227,382	\$1,200,648	\$27,519	\$117,012	\$5,749,000	\$37,400	\$370,731	0.32				
ALTERNATIVE D3	COMBINE C6, S11	\$0	\$0	\$0	\$0	\$21,559	\$100,794	\$923,175	\$19,466	\$125,065	\$3,654,000	\$20,500	\$232,361	0.54				
ALTERNATIVE D4	COMBINE C7, S11	\$0	\$0	\$0	\$0	\$6,544	\$51,129	\$904,135	\$17,509	\$127,022	\$3,883,000	\$22,200	\$247,339	0.51				
ALTERNATIVE D5	COMBINE C2, S8	\$0	\$0	\$23,132	\$32,622	\$139,366	\$1,435,386	\$2,007,281	\$85,164	\$59,367	\$2,347,000	\$18,400	\$154,481	0.38				
ALTERNATIVE D6	COMBINE C7, S4	\$0	\$16,297	\$23,132	\$36,045	\$112,542	\$946,350	\$1,394,595	\$64,374	\$80,157	\$3,173,000	\$19,100	\$203,072	0.39				
ALTERNATIVE D7	COMBINE C4, S11	\$0	\$0	\$0	\$0	\$6,544	\$75,547	\$1,032,897	\$20,266	\$124,265	\$3,770,000	\$21,800	\$240,387	0.52				
ALTERNATIVE D8	COMBINE C8, S8	\$0	\$0	\$23,132	\$54,010	\$383,215	\$1,550,515	\$3,467,145	\$127,272	\$17,259	\$1,791,000	\$24,700	\$128,543	0.13				
ALTERNATIVE D9	COMBINE S11, C7 & C8	\$0	\$16,297	\$0	\$0	\$0	\$50,274	\$935,912	\$17,751	\$126,780	\$5,589,000	\$46,300	\$370,354	0.34				
ALTERNATIVE D10	COMBINE S11, C6 & C8	\$0	\$0	\$0	\$0	\$15,015	\$99,939	\$950,437	\$19,627	\$124,904	\$5,361,000	\$44,600	\$355,434	0.35				
ALTERNATIVE D11	COMBINE S2, S5, S8, C6, & C8	\$0	\$16,297	\$23,132	\$29,440	\$109,832	\$294,288	\$1,419,234	\$32,268	\$92,263	\$4,461,000	\$40,100	\$298,752	0.31				
OTHER ALTERNATIVES																		
ALTERNATIVE L1	PARKVIEW LANE CULVERT	\$0	\$16,297	\$26,324	\$73,377	\$492,495	\$1,264,694	\$3,403,740	\$128,856	\$15,675	\$7,800	\$60	\$512	30.60				
PREVIOUS ALTERNATIVES																		
ALTERNATIVE 2A-2																		
ALTERNATIVE 2E-2																		

ALTERNATIVE C2 - DOWNSTREAM DEMPSTER STORM SEWER DIVERSION TO TOLLWAY
ALTERNATIVE C4 - ADDITIONAL DEE ROAD PIPE
ALTERNATIVE C6 - REPLACE RANCHO LANE CULVERTS
ALTERNATIVE C7 - REPLACE RANCHO LANE CULVERTS AND ADDITIONAL DEE ROAD PIPE
ALTERNATIVE C8 - CONFLUENCE TO BELLEAU LAKE CONVEYANCE

FLOOD DAMAGE REDUCTION ALTERNATIVES

Conceptually, five flood damage reduction measures were considered:

- 1) Additional flood water storage in the watershed to reduce flood flows entering the flood damage areas;
- 2) Channel conveyance improvements on Farmers and Prairie Creek.
- 3) Other improvements to protect flood damage prone areas;
- 4) Combinations of additional flood storage and channel conveyance improvements on Farmers and Prairie Creek; and
- 5) Non-structural mitigation measures through structure modifications

The storage, conveyance, combination, and other structural concepts were further developed into 34 potential flood damage reduction alternatives for further investigation.

STORAGE IMPROVEMENTS

Alternative S1: Dude Ranch Pond Expansion With Lake Mary Anne Pump Station

Alternative S2: Good Avenue Pond

Alternative S3: Lutheran General Hospital Pond

Alternative S4: Lutheran General Hospital Pond and High School Reservoir

Alternative S5: High School Reservoir

Alternative S6: Belleau Lake Expansion

Alternative S7: Lake Mary Anne Pump Station

Alternative S8: Belleau Lake Lowered

Alternative S9: Dude Ranch Pond With Lake Mary Anne Pump Station, Good Avenue Pond, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered

Alternative S10: Good Avenue Pond, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered

Alternative S11: Dude Ranch Pond With Lake Mary Anne Pump Station, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered

Alternative S12: Dude Ranch Pond Expansion

CONVEYANCE IMPROVEMENTS

Eight conveyance improvements were investigated at part of the study and are listed below. Each of these conveyance alternatives investigated, would provide flood damage reduction benefits along Prairie Creek and sometimes along Upper

Farmers Creek, but would also increase discharges on Lower Prairie Creek and Farmers Creek resulting in increased downstream flood elevations and flood damages over baseline conditions in those reaches. Accordingly, each of the conveyance alternatives were considered unacceptable and not considered further in the study as stand alone alternatives. However, some conveyance alternative components were combined with flood storage alternative components to offset increased discharges and flood damages as combination improvement alternatives.

Conveyance alternatives investigated included:

Alternative C1: Upstream Dempster Storm Sewer Diversion To Tollway

Alternative C2: Downstream Dempster Storm Sewer Diversion To Tollway

Alternative C3: Dempster Storm Sewer Diversion To Potter Road

Alternative C4: Additional Dee Road Pipe

Alternative C5: Pipe From Lutheran General Hospital Pond Along Ballard To Potter Road

Alternative C6: Replace Rancho Lane Culverts

Alternative C7: Replace Rancho Lane Culverts and Additional Dee Road Pipe

Alternative C8: Confluence to Belleau Lake Conveyance

OTHER IMPROVEMENTS

Alternative L1: Parkview Lane Culvert

COMBINATION IMPROVEMENTS

Alternative D1: Combine Alternatives C2, C6 and S11

Alternative D2: Combine Alternatives C2 and S11

Alternative D3: Combine Alternatives C6 and S11

Alternative D4: Combine Alternatives C7 and S11

Alternative D5: Combine Alternatives C2 and S8

Alternative D6: Combine Alternatives C7 and S4

Alternative D7: Combine Alternatives C4 and S11

Alternative D8: Combine Alternatives C8 and S8

Alternative D9: Combine Alternatives C7, C8 and S11

Alternative D10: Combine Alternatives C6, C8 and S11

Alternative D11: Combine Alternatives C6, C8, S2, S5 and S8

Alternative D12: Combine Alternatives C2 and S8 and Rand Road Culvert

Alternative D13: Combine Alternatives S12 and D12

Alternative D14: Prairie Creek Channel Improvement and Confluence Reservoir

Alternative D15: Prairie Creek Culvert/Swale and Confluence Reservoir

This section of the report includes summaries of each of the alternatives investigated. These summaries describe and illustrate the potential flood damage reduction alternative, provide a cost estimate of the alternative (if feasible), and define the economics associated with each feasible alternative. As previously noted in the Flood Problem and Economics section of this report, alternative costs were estimated using 2004 construction unit prices to allow an even comparison with anticipated project benefits that were based on 2004 assessed property values.

STRUCTURE MODIFICATIONS

While the other flood damage reduction alternatives presented in this report cover structural measures that modify the channel and/or floodplain to reduce flood depths, another alternative includes non-structural flood mitigation and flood proofing measures. Such measures modify the individually flood damaged structures rather than the flood waters. Non-structural mitigation measures include such options as acquisition and demolition of flood prone structures, relocation of flood prone structures, elevating flood prone structures, flood insurance, and/or floodproofing of flood prone structures.

STORAGE IMPROVEMENTS

ALTERNATIVE S1 - DUDE RANCH POND EXPANSION WITH LAKE MARY ANNE PUMP STATION

The Dude Ranch Pond, a 5.4 acre pond located south of Golf Road and east of the Tri-State Tollway, would be enlarged, and connected to Farmers Creek as shown in Exhibit 6, to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class I dam structure constructed in the Farmers Creek channel just downstream of the existing pond. A 10 cfs pump station, with an 18-inch diameter discharge pipe, would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne downstream to the Dude Ranch Pond. This pump station would provide Lake Mary Anne greater outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching most floodprone structures. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be stored and controlled by the expanded Dude Ranch Pond site.

Added flood storage on Farmers Creek and in Lake Mary Anne created by this alternative would provide \$44,989 in average annual flood damage reduction benefits in the watershed, representing a 31% reduction in average annual flood damages. This alternative would benefit all 39 floodprone structures along Farmers Creek. Average annual flood damages along Lower Farmers Creek (below the confluence with Prairie Creek) would be reduced by 28%. Average annual flood damages along Farmers Creek above the confluence with Prairie Creek would be reduced by 13%. All 100-year frequency flood damages to 7 of the 8 floodprone structures around Lake Mary Anne would be eliminated by this alternative. Four Lower Prairie Creek structures would also benefit from this alternative due to lower discharges and flood elevations at the Farmers Creek and Prairie Creek confluence. This alternative would eliminate flood damages to 14 structures currently located in the 100-year frequency floodplain.

Project costs of this alternative are estimated at \$690,520 as detailed on Table 9. The benefit to cost ratio (B/C ratio) for this alternative is 1.04.

Exhibit 6: Alternative S1- Dude Ranch Pond Expansion With Lake Mary Anne Pump Station



Table 9: Alternative S1 - Dude Ranch Pond Expansion With Lake Mary Anne Pump Station Cost Estimate

Farmers/Prairie Creek							
Alternative S1 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Storage Excavation							
20200100	Excavation	3227	CY	\$11	\$35,174		
250****	Seeding/Mulching/Fertilizing	1.00	Acres	\$2,000	\$2,000		
Control Structure							
54200427	RCCP 48"	20	FT	\$140	\$2,800		
20500150	Earth Fill	110	CY	\$27	\$2,970		
28100107	Stone Riprap CL A4	65	SY	\$65	\$4,225		
50300225	Cast-in-place Conc. dissipator	15	CY	\$678	\$10,170		
50800205	Epoxy Coated Reinf. bars	2140	lbs.	\$2	\$4,280		
54215448	Cast-in-place Conc. Headwall	1	Each	\$3,500	\$3,500		
Pumps							
FR39051	Pumps (2 @ 5cfs)	1	Set (2)	\$65,730	\$65,730		
FR39057	Pump House w/ Access	1	Each	\$77,880	\$77,880		
552A0900	Jacked Pipe 18"	48	FT	\$400	\$19,200		
54200433	RCCP 18"	352	FT	\$48	\$16,896		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$51,413		
	Construction Cost				\$296,239		
	Engineering (20%) and Construction Supervision (7.5%)				\$81,466		
	Right-of-Way Cost*	312816	SQ FT	\$1	\$312,816		
	Total Project Cost				\$690,520		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$40,037		
	O&M (1%)				\$2,962		
	Alternative Average Annual Cost and O&M				\$42,999		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$99,524		
	Alternative Average Annual Benefits				\$45,007		
	Benefit Cost Ratio				1.05		
Flood Frequency (Years)	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	6	29	61	82
Structures Removed from Floodplain	0	1	2	5	9	3	14

* Estimated cost of securing a permanent flood easement.

ALTERNATIVE S2 - GOOD AVENUE POND

As shown in Exhibit 7, Good Avenue Pond is a 5.9 acre pond located between Church Street and Emerson Street, west of Good Avenue. The pond is hydraulically connected to Farmers Creek through a series of breaches in the east bank embankment of Farmers Creek between the creek and the pond. Storage in the pond is controlled by the culvert under Church Street. To increase the flood storage capacity of this pond, the existing Church Street box culvert inlet capacity would be modified by constructing a three foot high weir at the upstream end of the culvert wing walls. The weir would have a 2-foot diameter opening to pass low flows in the channel. At the elevation of the new weir, the flood storage capacity of the pond would be increased by 18 acre-feet to be used for more frequent events on Farmers Creek. This alternative would increase the retention time of storage used at the Good Avenue Pond. A levee constructed two foot high with 2:1 side slopes and a three foot top width would protect Good Avenue from higher flood stages in the pond. Storm sewers entering the pond would be gated to prevent stages in the pond from back flowing into the local sewers.

Added flood storage on Farmers Creek at Good Avenue Pond created by this alternative would provide \$14,847 in average annual flood damage reduction benefits in the watershed representing a 10% reduction in average annual flood damages. This alternative would benefit all 43 floodprone structures along Farmers Creek. Average annual flood damages along Lower Farmers Creek (below the confluence with Prairie Creek) would be reduced by 27%. Average annual flood damages along Farmers Creek above the confluence with Prairie Creek would be reduced by 11%. Eight Lower Prairie Creek (between Pond and the confluence with Farmers Creek) structures would also benefit from this alternative due to lower discharges and flood elevations at the Farmers Creek and Prairie Creek confluence. This alternative would eliminate flood damages to 7 structures currently located in the 100-year frequency floodplain.

Project costs of this alternative are estimated at \$291,328 as detailed on Table 10. The benefit to cost ratio (B/C ratio) for this alternative is 0.87.

Exhibit 7: Alternative S2 - Good Avenue Pond



Table 10: Alternative S2 - Good Avenue Pond Cost Estimate

Farmers/Prairie Creek								
Alternative S2 Cost Estimate Aug 04								
Line				Unit	Total			
Item	Item	Quantity	Unit	Price	Cost			
Culvert Structure								
54284500	Concrete Headwalls	1.2	CU YD	\$1,135	\$1,362			
20500150	Earth Fill for 2' high levee	540	CY	\$27	\$14,580			
Design	24" Tide Flex Valves	1.00	Each	\$6,500	\$6,500			
	Contingencies (15%) and Mobilization (6%) of subtotal				\$4,713			
	Construction Cost				\$27,154			
	Engineering (20%) and Construction Supervision (7.5%)				\$7,467			
	Right-of-Way Cost*	256707	SQ FT	\$1	\$256,707			
	Total Project Cost				\$291,329			
	Alternative Average Annual Cost (5.375% For 50 Years)				\$16,891			
	O&M (1%)				\$272			
	Alternative Average Annual Cost and O&M				\$17,163			
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531			
	Alternative Average Annual Damages (Direct and Indirect)				\$129,684			
	Alternative Average Annual Benefits				\$14,847			
	Benefit Cost Ratio				0.87			
Flood Frequency (Years)		1	2	5	10	25	50	100
Existing Damaged Structures		0	1	2	11	38	64	96
Alternative Damaged Structures		0	1	1	9	32	64	89
Structures Removed from Floodplain		0	0	1	2	6	0	7

* Estimated cost of securing a permanent flood easement.

ALTERNATIVE S3 - LUTHERAN GENERAL HOSPITAL POND

Normal water elevations in Lutheran General Hospital Pond, located on Prairie Creek between Dempster Avenue and Ballard Road east of Potter Road, would be lowered 4.4 feet to elevation 627 via a 5cfs pump station to increase flood storage. Normal Prairie Creek flows would bypass the pond via a siphon pipe that would be constructed under the existing pond. Flows in excess of a 2-year frequency event (30cfs), would exceed the capacity of the siphon pipe and flow over a weir and into the pond. Flows tributary to the pond from the north side of Ballard Road would be diverted in a pipe to a junction chamber at the upstream side of the siphon bypass pipe noted above.

Flood stages in the pond above elevation 631.3 would be able to gravity flow out of the pond. Flood water remaining in the pond below elevation 631.3 would be pumped out of the reservoir in about one day using a 5cfs pump station. This alternative would increase the flood storage at the site by approximately 10 acre-feet.

Added flood storage on Prairie Creek at the Lutheran General Hospital Pond created by this alternative would provide \$22,113 in average annual flood damage reduction benefits in the watershed representing a 15% reduction in average annual flood damages. Sixty percent of those flood damage reduction benefits would occur along Lower Prairie Creek between the Lutheran General Hospital Pond and Farmers Creek. This alternative would benefit all 48 floodprone structures along Lower Prairie Creek. All 43 floodprone structures along Farmers Creek would also benefit from this Prairie Creek storage alternative as average annual flood damages drop 15% along Farmers Creek. This alternative would eliminate flood damages for 5 structures currently located in the 100-year frequency floodplain.

Project costs of this alternative are estimated at \$565,574 as detailed on Table 11. The benefit to cost ratio (B/C ratio) for this alternative is 0.63.

Exhibit 8: Alternative S3 - Lutheran General Hospital Pond

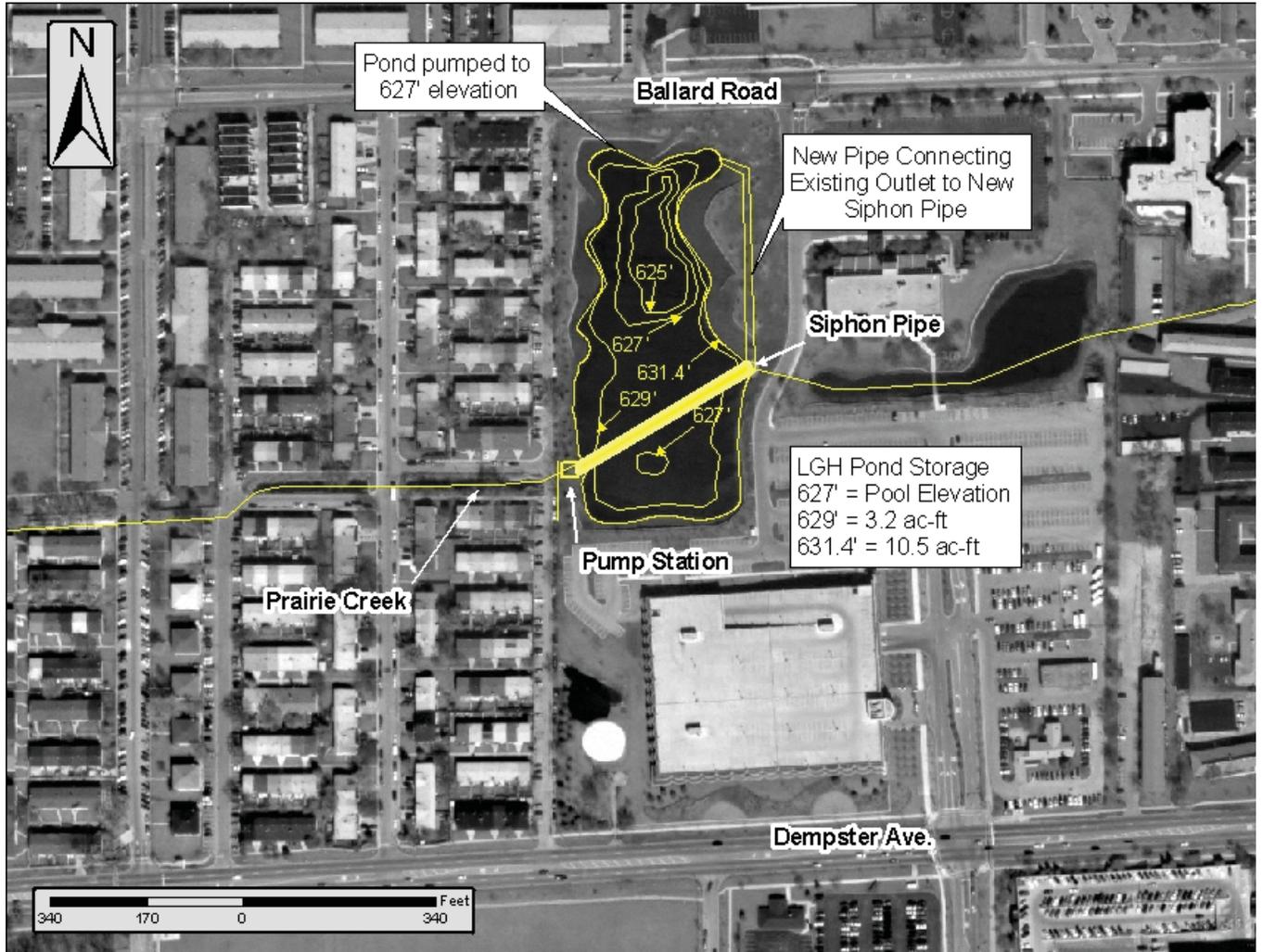


Table 11: Alternative S3 - Lutheran General Hospital Pond Cost Estimate

Farmer/Prairie Creek								
Alternative S3 Cost Estimate Aug 04								
Line				Unit	Total			
Item	Item	Quantity	Unit	Price	Cost			
Siphon Pipe								
54200451	RCCP Pipe Culvert 36"	375	FT	\$160	\$60,000			
Pump								
FR39051	Pumps	2	Each	\$21,910	\$43,820			
FR39057	Pump House w/ Access	1	Each	\$77,880	\$77,880			
Utilities								
82400800	Electric Line Relocation	0	FT	\$2	\$0			
55021800	Sewer Relocation	0	FT	\$25	\$0			
250****	Seeding/Mulching/Fertilizing	3	Acres	\$2,000	\$6,000			
	Contingencies (15%) and Mobilization (6%) of subtotal					\$39,417		
	Construction Cost					\$227,117		
	Engineering (20%) and Construction Supervision (7.5%)					\$62,457		
	Right-of-Way Cost*	276000	SQ FT	\$1	\$276,000			
	Total Project Cost					\$565,574		
	Alternative Average Annual Cost (5.375% For 50 Years)					\$32,792		
	O&M (1%)					\$2,271		
	Alternative Average Annual Cost and O&M					\$35,064		
	Baseline Average Annual Damages (Direct and Indirect)					\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)					\$122,418		
	Alternative Average Annual Benefits					\$22,113		
	Benefit Cost Ratio					0.63		
Flood Frequency (Years)		1	2	5	10	25	50	100
Existing Damaged Structures		0	1	2	11	38	64	96
Alternative Damaged Structures		0	1	2	9	26	59	91
Structures Removed from Floodplain		0	0	0	2	12	5	5

* Estimated cost of securing a permanent flood easement.

ALTERNATIVE S4 - LUTHERAN GENERAL HOSPITAL POND AND HIGH SCHOOL RESERVOIR

This alternative combines the Lutheran General Hospital Pond Alternative, S3, with an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local storm water runoff. Three soccer fields would still fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir is not only intended to reduce peak flows contributed by the Dempster Avenue storm sewer, but to provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Added flood storage on Prairie Creek at the Lutheran General Hospital Pond and on the high school property created by this alternative would provide \$85,063 in average annual flood damage reduction benefits, representing a 59% reduction in average annual flood damages. Sixty percent of those flood damage reduction benefits would occur along Lower Prairie Creek between the Lutheran General Hospital Pond and Farmers Creek. This alternative would benefit all 48 floodprone structures along Lower Prairie Creek by reducing average annual flood damages 84% overall in that reach. All 43 floodprone structures along Farmers Creek would also benefit from this Prairie Creek storage alternative as average annual flood damages drop 63% along Lower Farmers Creek and 65% along Upper Farmers Creek. This alternative would eliminate flood damages for 37 structures currently located in the 100-year frequency floodplain.

Project costs of this alternative are estimated at \$2,831,063 as detailed on Table 12. The benefit to cost ratio (B/C ratio) for this alternative is 0.47.

Exhibit 9: Alternative S4 - Lutheran General Hospital Pond and High School Reservoir

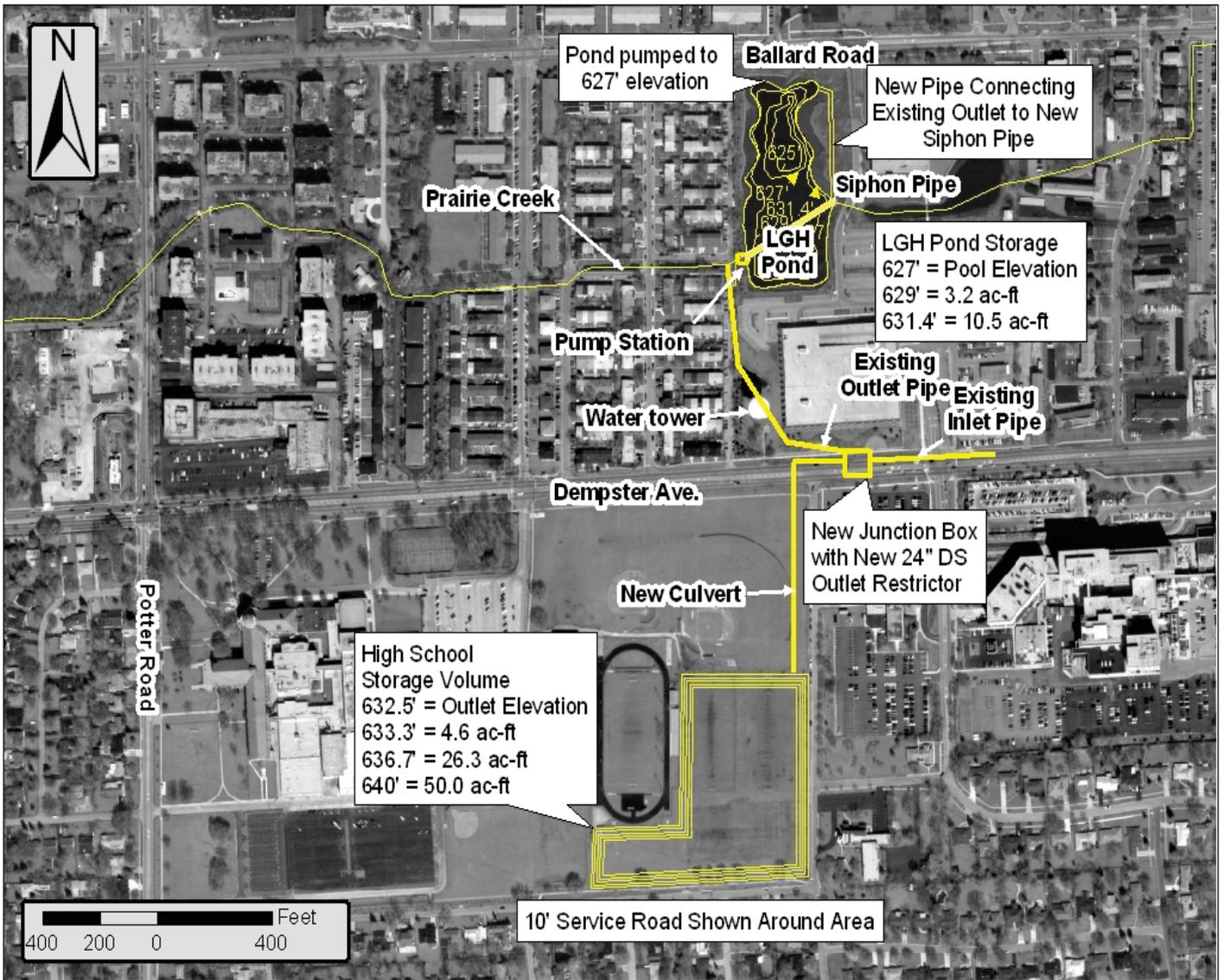


Table 12: Alternative S4 - Lutheran General Hospital and High School
Reservoir Cost Estimate

Farmer/Prairie Creek							
Alternative S4 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S3	Lutheran General Project	1	Each	\$227,117	\$227,117		
Alt. S5	High School Project	1	Each	\$1,472,885	\$1,472,885		
	Construction Cost				\$1,700,002		
	Engineering (20%) and Construction Supervision (7.5%)				\$467,500		
Alt. S3	Right-of-Way Cost LGH*	276000	SQ FT	\$1	\$276,000		
Alt. S5	Right-of-Way Cost HS*	387561	SQ FT	\$1	\$387,561		
	Total Project Cost				\$2,831,063		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$164,147		
	O&M (1%)				\$17,000		
	Alternative Average Annual Cost and O&M				\$181,147		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$59,468		
	Alternative Average Annual Benefits				\$85,063		
	Benefit Cost Ratio				0.47		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	3	16	29	59
Structures Removed from Floodplain	0	0	1	8	22	35	37

* Estimated cost of securing a permanent flood easement.

ALTERNATIVE S5 - HIGH SCHOOL RESERVOIR

This alternative provides an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local storm water runoff. Three soccer fields would still fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new, gravity in and gravity out, High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. This Alternative is intended to greatly reduce peak flows contributed by the Dempster Avenue storm sewer and would control 15% of the Prairie Creek watershed.

Added flood storage on the high school property for the Dempster Avenue storm Sewer system tributary to Prairie Creek created by this alternative, would provide \$71,666 in average annual flood damage reduction benefits in the watershed representing a 50% reduction in average annual flood damages. Sixty-seven percent of those flood damage reduction benefits would occur along Lower Prairie Creek between the Lutheran General Hospital Pond and Farmers Creek. This alternative would benefit all 48 floodprone structures along Lower Prairie Creek by reducing average annual flood damages 80% overall in that reach. All 43 floodprone structures along Farmers Creek would also benefit from this Prairie Creek storage alternative as average annual flood damages drop 43% along Lower Farmers Creek and 43% along Upper Farmers Creek. This alternative would eliminate flood damages for 37 structures currently located in the 100-year frequency floodplain.

Project costs of this alternative are estimated at \$2,265,489 as detailed on Table 13. The benefit to cost ratio (B/C ratio) for this alternative is 0.49.

Exhibit 10: Alternative S5 - High School Reservoir

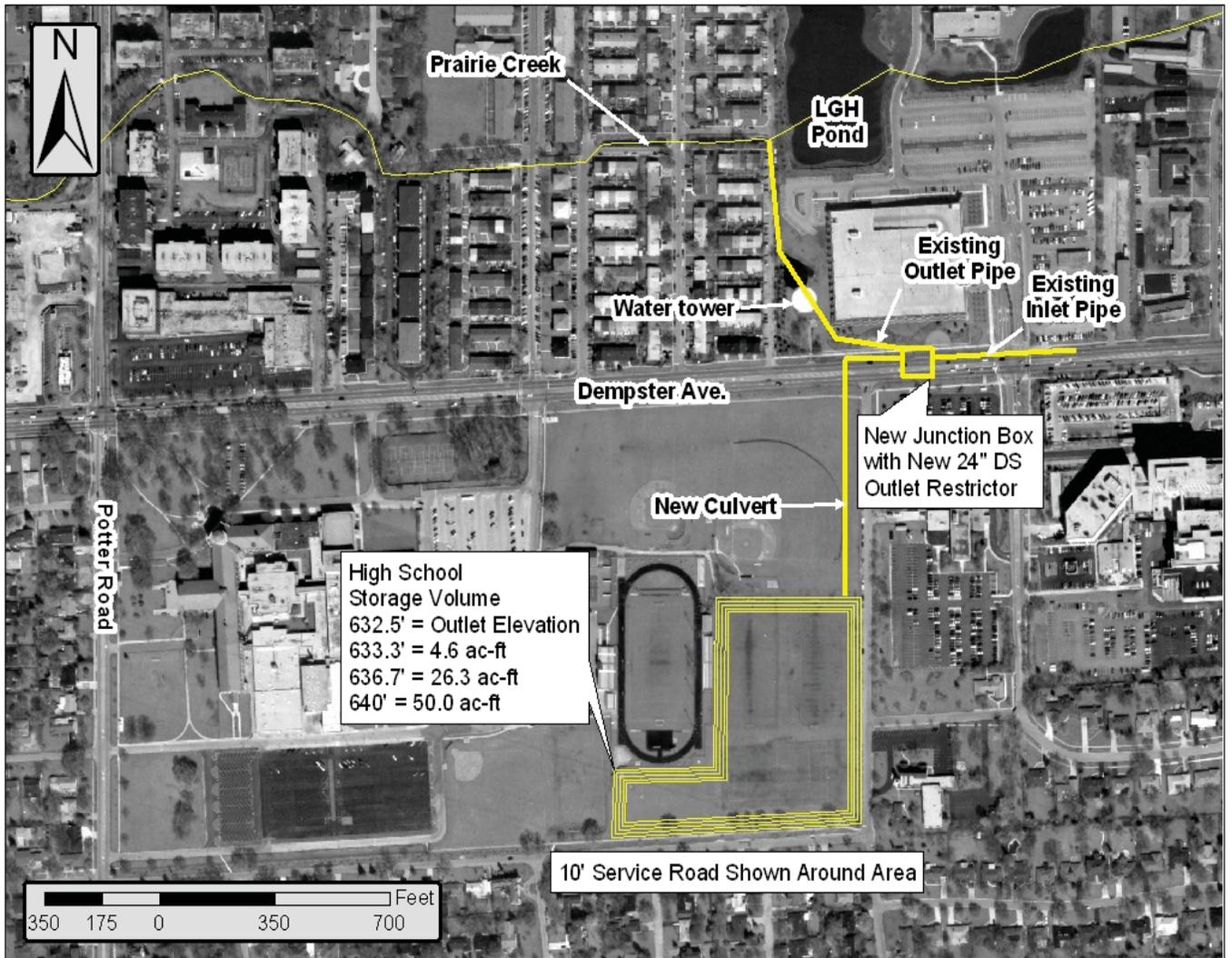


Table 13: Alternative S5 - High School Reservoir Cost Estimate

Farmer/Prairie Creek							
Alternative S5 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Culvert							
54213723	Precast Reinf. Conc. End	1	Each	\$3,000	\$3,000		
542A0265	Pipe Cul. Class A 1 60"	800	FT	\$200	\$160,000		
60248000	Junction Chamber N1	1	Each	\$12,000	\$12,000		
60221100	Manhole	1	Each	\$2,200	\$2,200		
20800150	Trench Backfill (Road)	72	CY	\$28	\$2,022		
44100100	Pavement Replacement	72	SQ YD	\$75	\$5,417		
250****	Seeding/Mulching/Fertilizing	0.17	Acres	\$2,000	\$344		
Restrictor							
542D0223	18" Concrete pipe	10	FT	\$24	\$240		
60218400	Manhole	1	Each	\$1,513	\$1,513		
Storage Excavation							
250****	Seeding/Mulching/Fertilizing	9.00	Acres	\$2,000	\$18,000		
20200100	Excavation	91057	CY	\$11	\$992,524		
Storm Sewer Control							
Design	18" Tide Flex Valves	4	Each	\$5,000	\$20,000		
Utilities							
82400800	Electric Line Relocation	0	FT	\$2	\$0		
55021800	Sewer Relocation	0	FT	\$25	\$0		
	Contingencies (15%) and Mobilization (6%) of subtotal					\$255,625	
	Construction Cost					\$1,472,885	
	Engineering (20%) and Construction Supervision (7.5%)					\$405,043	
	Right-of-Way Cost*	387561	SQ FT	\$1.00	\$387,561		
	Total Project Cost					\$2,265,489	
	Alternative Average Annual Cost (5.375% For 50 Years)					\$131,354	
	O&M (1%)					\$14,729	
	Alternative Average Annual Cost and O&M					\$146,083	
	Baseline Average Annual Damages (Direct and Indirect)					\$144,531	
	Alternative Average Annual Damages (Direct and Indirect)					\$72,865	
	Alternative Average Annual Benefits					\$71,666	
	Benefit Cost Ratio					0.49	
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	3	17	41	59
Structures Removed from Floodplain	0	0	1	8	21	23	37

* Estimated cost of securing a permanent flood easement.

ALTERNATIVE S6 - BELLEAU LAKE EXPANSION

Belleau Lake is an existing deep lake located south of Rand Road just west of the Tri-State Tollway that drains into Farmers Creek above elevation 626.0. Out-of-bank Farmers Creek flood flows are capable of flowing into the lake during a 10-year frequency event, at about elevation 628.0. Belleau Lake would be lowered and expanded to increase the storage on Farmers Creek. The lake would be expanded to the north and west across the existing creek. The resulting on-line lake would be lowered by gravity from elevation 626.2 to elevation 622.0, the downstream channel invert. Outflow from the lake would be governed by the conveyance capacity of Farmers Creek downstream of the lake. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. The lowered and expanded lake would be capable of providing up to 75 acre-feet of additional flood storage capacity at the 100-year frequency event.

Added flood storage on Farmers Creek created by this alternative, would provide \$21,651 in average annual flood damage reduction benefits in the watershed representing a 15% reduction in average annual flood damages. All 43 floodprone structures along Farmers Creek would slightly benefit from this storage alternative as average annual flood damages drop 43% along Lower Farmers Creek (below the confluence of Prairie Creek) and 21% along Upper Farmers Creek. Eight structures would realize lower flood damages along Lower Prairie Creek as average annual flood damages would be reduced by 8% in this reach. This alternative would eliminate flood damages for 8 structures currently located in the 100-year frequency floodplain.

Project costs of this alternative are estimated at \$708,602 as detailed on Table 14. The benefit to cost ratio (B/C ratio) for this alternative is 0.45.

Exhibit 11: Alternative S6 - Belleau Lake Expansion

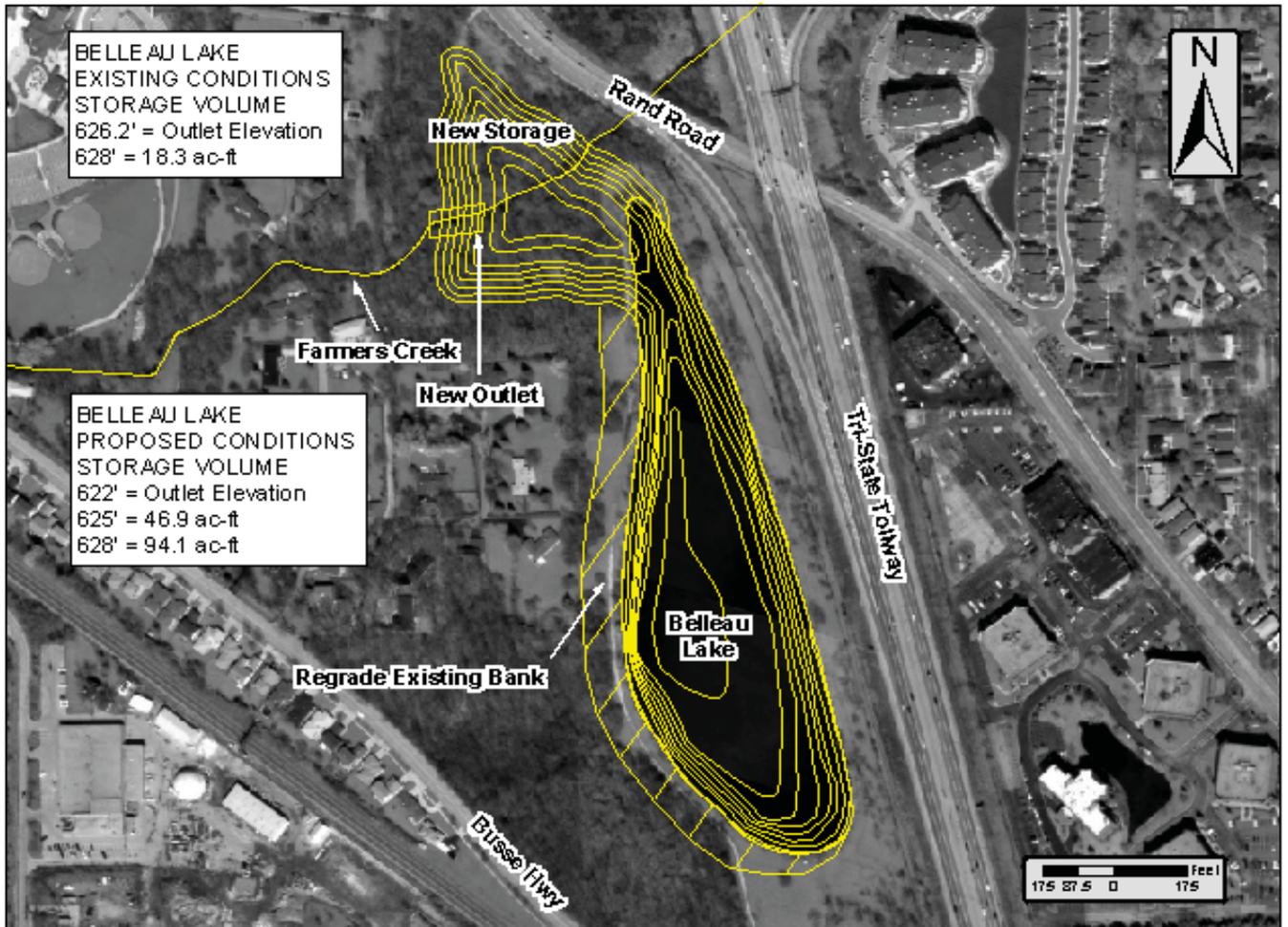


Table 14: Alternative S6 - Belleau Lake Expansion Cost Estimate

Farmer/Prairie Creek							
Alternative S6 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Culvert							
54200439	RCCP Pipe Culvert 24"	10	FT	\$50	\$500		
Storage Excavation							
250*****	Seeding/Mulching/Fertilizing	3	Acres	\$2,000	\$6,000		
20200100	Excavation	50683	CY	\$11	\$552,445		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$117,378		
	Construction Cost				\$676,323		
	Engineering (20%) and Construction Supervision (7.5%)				\$32,279		
	Right-of-Way Cost	207094	SQ FT	\$0.00*	\$0		
	Total Project Cost				\$708,602		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$41,085		
	O&M (1%)				\$6,763		
	Alternative Average Annual Cost and O&M				\$47,848		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$122,880		
	Alternative Average Annual Benefits				\$21,651		
	Benefit Cost Ratio				0.45		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	7	25	61	88
Structures Removed from Floodplain	0	0	1	4	13	3	8

* \$0.00 Assessed value because of current public ownership.

ALTERNATIVE S7 - LAKE MARY ANNE PUMP STATION

To maintain lower flood stages on Lake Mary Anne, the outlet of the lake would be supplemented by a 10 cfs pump station. This pump station would discharge into an 18-inch diameter discharge pipe, that would be routed, under Golf Road and over a 96-inch Golf Road interceptor pipe, to the Dude Rand Pond. Tollway runoff would no longer be connected to Lake Mary Anne and the existing 12-inch and 18-inch outlet pipes would remain gated. Discharge from the two-5cfs pumps at Lake Mary Anne would be pumped into the existing Dude Ranch Pond and routed through a 12-inch outlet pipe in the existing right overbank between the pond and the creek.

Added flood storage on Farmers Creek in Lake Mary Anne created by this alternative would provide \$29,382 in average annual flood damage reduction benefits in the watershed, representing a 20% reduction in average annual flood damages. Five Upper Farmers Creek structures would also benefit from this alternative. This alternative would eliminate flood damages to 7 of 8 structures currently located in the 100-year frequency floodplain around Lake Mary Anne.

Project costs of this alternative are estimated at \$589,942 including \$244,474 in estimated land rights costs, as detailed on Table 15. The benefit to cost ratio (B/C ratio) for this alternative is 0.80.

Exhibit 12: Alternative S7 - Lake Mary Anne Pump Station



Table 15: Alternative S7 - Lake Mary Anne Pump Station Cost Estimate

Farmer/Prairie Creek							
Alternative S7 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Culvert							
552A0900	Jacked Pipe 36"	48	FT	\$500	\$24,000		
54200451	RCCP 36"	352	FT	\$160	\$56,320		
FR39051	Pumps	1	Set (3)	\$65,730	\$65,730		
FR39057	Pump House w/ Access	1	Each	\$77,880	\$77,880		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$47,025		
	Construction Cost				\$270,955		
	Engineering (20%) and Construction Supervision (7.5%)				\$74,513		
	Right-of-Way Cost*	244474	SQ FT	\$1	\$244,474		
	Total Project Cost				\$589,942		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$34,205		
	O&M (1%)				\$2,710		
	Alternative Average Annual Cost and O&M				\$36,915		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$115,149		
	Alternative Average Annual Benefits				\$29,382		
	Benefit Cost Ratio				0.80		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	1	10	36	61	89
Structures Removed from Floodplain	0	1	1	1	2	3	7

* Estimated cost of securing a permanent flood easement.

ALTERNATIVE S8 - BELLEAU LAKE LOWERED

Belleau Lake is an existing deep lake located south of Rand Road just west of the Tri-State Tollway that drains into Farmers Creek above elevation 626.0. Out-of-bank Farmers Creek flood flows are capable of flowing into the lake during a 10-year frequency event, at about elevation 628.0. Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

Added flood storage on Farmers Creek created by this alternative, would provide \$16,628 in average annual flood damage reduction benefits in the watershed representing a 12% reduction in average annual flood damages. All 23 floodprone structures along Lower Farmers Creek would benefit from this storage alternative as average annual flood damages would be reduced by 34% along Lower Farmers Creek. This alternative would eliminate flood damages to 7 structures currently located in the 100-year frequency floodplain.

Project costs of this alternative are estimated at \$84,980 as detailed on Table 16. The benefit to cost ratio (B/C ratio) for this alternative is 2.95.

Exhibit 13: Alternative S8 - Belleau Lake Lowered



Table 16: Alternative S8 - Belleau Lake Lowered Cost Estimate

Farmer/Prairie Creek							
Alternative S8 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Culvert							
42300200	Concrete Spillway	770	SQ YD	\$38	\$29,260		
54200439	RCCP Pipe Culvert 24"	170	FT	\$50	\$8,500		
Storage Excavation							
Design	24" Tide Flex Valves	1	Each	\$6,500	\$6,500		
20200100	Excavation	993	CY	\$11	\$10,824		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$11,568		
	Construction Cost				\$66,651		
	Engineering (20%) and Construction Supervision (7.5%)				\$18,329		
	Right-of-Way Cost	719920	SQ FT	\$0.00*	\$0		
	Total Project Cost				\$84,980		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$4,927		
	O&M (1%)				\$700		
	Alternative Average Annual Cost and O&M				\$5,627		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$127,903		
	Alternative Average Annual Benefits				\$16,628		
	Benefit Cost Ratio				2.95		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	7	28	64	89
Structures Removed from Floodplain	0	0	1	4	10	0	7

* \$0.00 Assessed value because of current public ownership.

**ALTERNATIVE S9 - COMBINED STORAGE AT DUDE RANCH POND
EXPANSION WITH LAKE MARY ANNE PUMP STATION,
GOOD AVENUE POND, LUTHERAN GENERAL
HOSPITAL POND, HIGH SCHOOL RESERVOIR, AND
BELLEAU LAKE LOWERED**

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage alternatives including construction of a pump station at Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Church Street culvert at Good Avenue Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus and lowering of Belleau Lake. Each of the storage components of this alternative are described below.

The Dude Ranch Pond, located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class 1 dam structure constructed in the Farmers Creek channel just downstream of the pond. A 10 cfs pump station, with an 18-inch diameter discharge pipe, would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne into the Dude Ranch Pond. The two 5cfs pumps would substantially improve Lake Mary Anne's outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching all but one structure. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be controlled by the Dude Ranch Pond site.

Good Avenue Pond is located north of Church Street and west of Potter Road. Storage in the pond is controlled by the culvert under Church Street. To increase the flood storage capacity of this pond, the existing Church Street box culvert would be modified by adding a three foot high weir constructed at the upstream end of the culvert wing walls. The weir would have a 2-foot diameter opening to pass low flows in the channel. At the elevation of the new weir, the flood storage capacity of the pond would be increased by 18 acre-feet to be used for more frequent events on Farmers Creek. This alternative would increase the retention time of storage used at the Good Avenue Pond. A levee constructed two foot high with 2:1 side slopes and with a 3 foot top width would protect Good Avenue from higher flood stages in the pond. Storm sewers entering the

pond would be gated to prevent stages in the pond from back flowing into the local sewers.

Normal water elevations in Lutheran General Hospital Pond, located on Prairie Creek between Dempster Avenue and Ballard Road east of Potter Road, would be lowered 4.4 feet to elevation 627 via a 5cfs pump station to increase flood storage. Normal Prairie Creek flows would bypass the pond via a siphon pipe that would be constructed under the existing pond. Flows in excess of a 2-year frequency event (30cfs), would exceed the capacity of the siphon pipe and flow over a weir and into the pond. Flows tributary to the pond from the north side of Ballard Road would be diverted in a pipe to a junction chamber at the upstream side of the siphon bypass pipe noted above.

Flood stages in the pond above elevation 631.3 would be able to gravity flow out of the pond. Flood water remaining in the pond below elevation 631.3 would be pumped out of the reservoir in about one day using a 5cfs pump station. This alternative would increase the flood storage at the site by approximately 10 acre-feet.

An additional 50 acre-foot flood storage would be provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the reservoir on the high school property. In this alternative, the High School Reservoir would not only reduce peak flows contributed by the Dempster Avenue storm sewer, but provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow

normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

Combined additional flood storage at various sites in the watershed created by this alternative, would provide \$121,444 in average annual flood damage reduction benefits in the watershed representing an 84% reduction in average annual flood damages. This alternative would benefit all 96 floodprone structures in the watershed. Existing flood damages along Lower Farmers Creek would be reduced by 72%. Existing flood damages along Upper Farmers Creek would be reduced by 77%. Existing flood damages along Prairie Creek would be reduced by 87%. This alternative would eliminate flood damages to 46 structures currently impacted by the 100-year frequency floodplain, including 7 of the 8 floodprone structures around Lake Mary Anne.

Project costs of this alternative are estimated at \$3,832,341, including \$1,233,084 in estimated land rights costs, as detailed on Table 17. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is 0.50 due to many overlapping project benefits for the same floodprone structures.

Exhibit 14: Alternative S9 - Combined Storage at Dude Ranch Pond Expansion With Lake Mary Anne Pump Station, Good Avenue Pond, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered

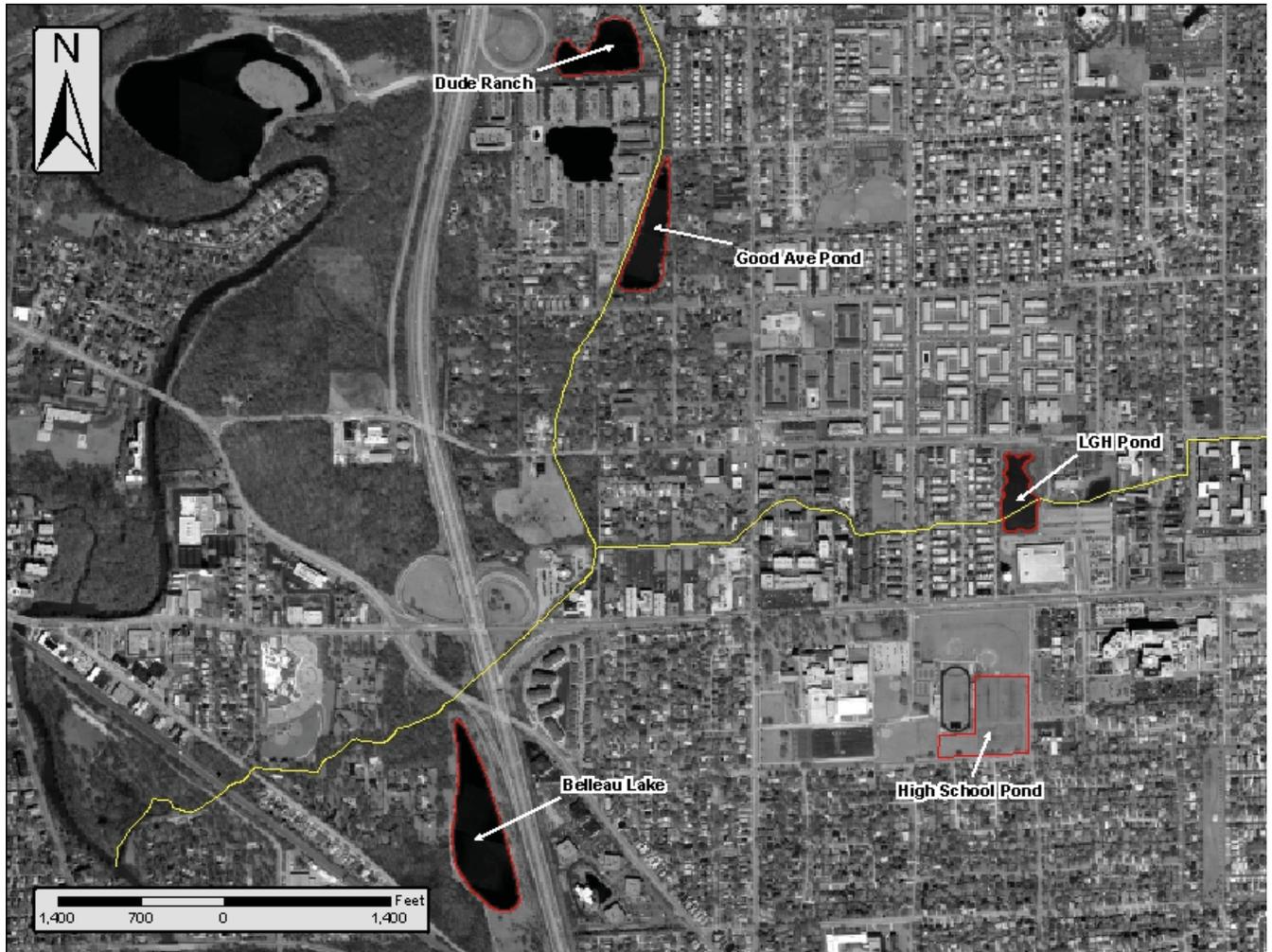


Table 17: Alternative S9 - Combined storage at Dude Ranch Pond Expansion With Lake Mary Anne Pump Station, Good Avenue Pond, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered Cost Estimate

Farmer/Prairie Creek							
Alternative S9 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825		
Alt. S2	Good Ave. Pond Alternative	1	Each	\$27,154	\$27,154		
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117		
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
	Construction Cost				\$2,038,633		
	Engineering (20%) and Construction Supervision (7.5%)				\$560,624		
	Right-of-Way Cost*	1233084	SQ FT	\$1	\$1,233,084		
	Right-of-Way Cost**	719920	SQ FT	\$0	\$0		
	Total Project Cost				\$3,832,341		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$222,201		
	O&M (1%)				\$20,386		
	Alternative Average Annual Cost and O&M (1%)				\$242,588		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$23,087		
	Alternative Average Annual Benefits				\$121,444		
	Benefit Cost Ratio				0.50		
Frequency	1	2	5	10	2	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	7	14	50
Structures Removed from Floodplain	0	1	2	11	31	50	46

* Estimated cost of securing a permanent flood easement.

**\$0.00 Assessed value because of current public ownership.

ALTERNATIVE S10 - COMBINED STORAGE AT GOOD AVENUE POND,
LUTHERAN GENERAL HOSPITAL POND, HIGH
SCHOOL RESERVOIR, AND BELLEAU LAKE LOWERED

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage alternatives including modifications to the Church Street culvert at Good Avenue Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus and modifications to Belleau Lake. Each of the storage components of this alternative are described below.

Good Avenue Pond is located north of Church Street and west of Potter Road. Storage in the pond is controlled by the culvert under Church Street. To increase the flood storage capacity of this pond, the existing Church Street box culvert would be modified to include a three foot high weir constructed at the upstream end of the culvert wing walls. The weir would have a 2-foot diameter opening to pass low flows in the channel. At the elevation of the new weir, the flood storage capacity of the pond would be increased by 18 acre-feet to be used for more frequent events on Farmers Creek. This alternative would increase the retention time of storage used at the Good Avenue Pond. A levee constructed two foot high with 2:1 side slopes and a three foot top width would protect Good Avenue from higher flood stages in the pond. Storm sewers entering the pond would be gated to prevent stages in the pond from back flowing in the local sewers.

Normal water elevations in Lutheran General Hospital Pond, located on Prairie Creek between Dempster Avenue and Ballard Road east of Potter Road, would be lowered 4.4 feet to elevation 627 via a 5cfs pump station to increase flood storage. Normal Prairie Creek flows would bypass the pond via a siphon pipe that would be constructed under the existing pond. Flows in excess of a 2-year frequency event (30cfs), would exceed the capacity of the siphon pipe and flow over a weir and into the pond. Flows tributary to the pond from the north side of Ballard Road would be diverted in a pipe to a junction chamber at the upstream side of the siphon bypass pipe noted above.

Flood stages in the pond above elevation 631.3 would be able to gravity flow out of the pond. Flood water remaining in the pond below elevation 631.3 would be pumped out of the reservoir in about one day using a 5cfs pump station. This alternative would increase the flood storage at the site by approximately 10 acre-feet.

An additional 50 acre-feet flood storage would be provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the reservoir on the high school property. In this alternative, the High School Reservoir would reduce peak flows contributed by the Dempster Avenue storm sewer, and would provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

Combined additional flood storage at various sites in the watershed created by this alternative, would provide \$91,752 in average annual flood damage reduction benefits in the watershed representing a 63% reduction in average annual flood damages. Existing flood damages along Lower Farmers Creek would be reduced by 76%. Existing flood damages along Upper Farmers Creek would be reduced by 71%. Existing flood damages along Prairie Creek would be reduced by 87%. This alternative would eliminate flood damages to 47 structures currently impacted by the 100-year frequency floodplain.

Project costs of this alternative are estimated at \$3,207,372, including \$920,268 in

estimated land rights costs, as detailed on Table 18. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is 0.45 due to many overlapping project benefits for the same floodprone structures.

Exhibit 15: Alternative S10 - Combined Storage at Good Avenue Pond, Lutheran General Hospital Pond, High School Reservoir and Belleau Lake Lowered

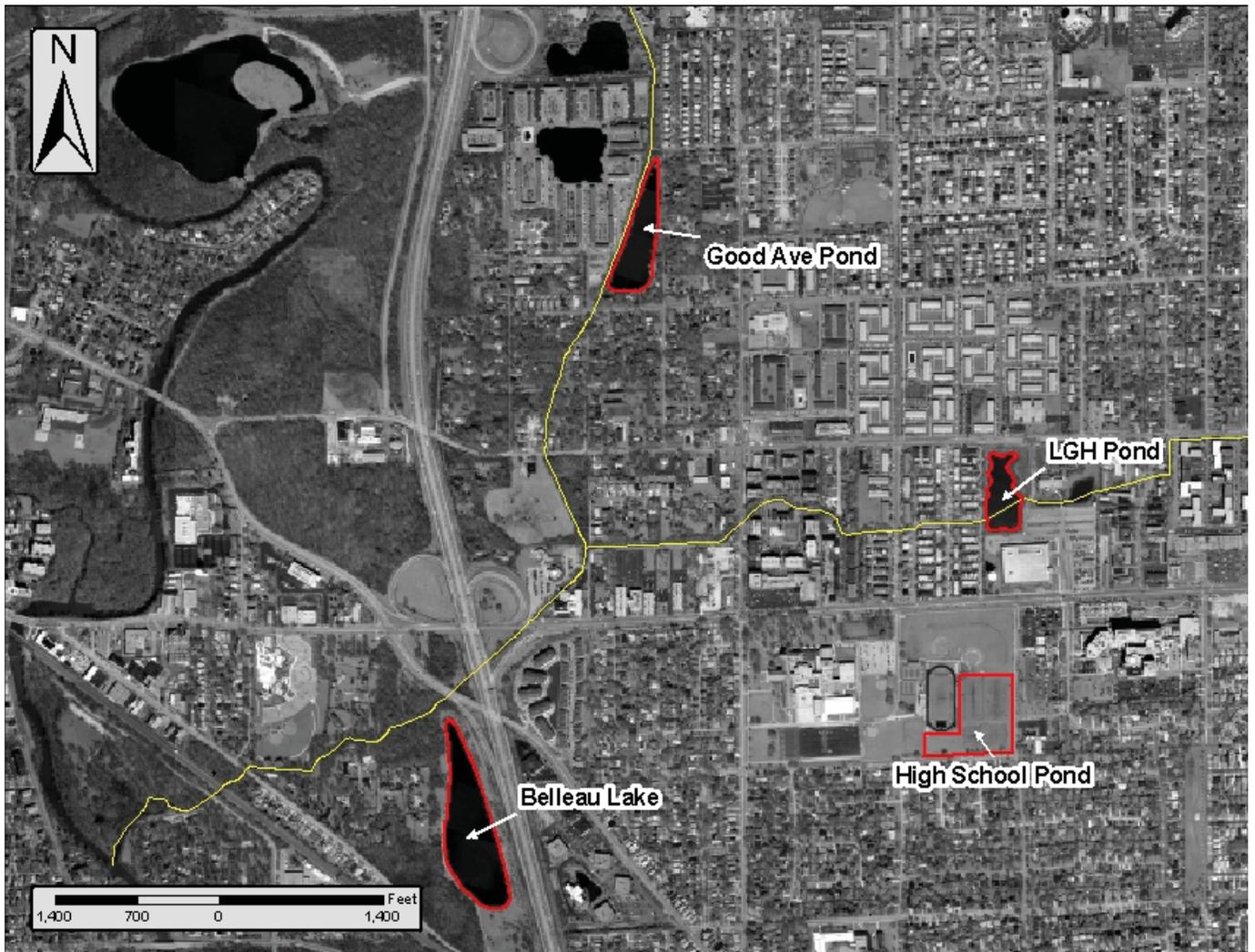


Table 18: Alternative S10 - Combined Storage at Good Avenue Pond, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered Cost Estimate

Farmer/Prairie Creek							
Alternative S10 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S2	Good Ave. Pond Alternative	1	Each	\$27,154	\$27,154		
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117		
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
	Construction Cost				\$1,793,807		
	Engineering (20%) and Construction Supervision (7.5%)				\$493,297		
	Right-of-Way Cost*	920268	SQ FT	\$1	\$920,268		
	Right-of-Way Cost**	719920	SQ FT	\$0	\$0		
	Total Project Cost				\$3,207,372		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$185,965		
	O&M (1%)				\$17,938		
	Alternative Average Annual Cost and O&M (1%)				\$203,903		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$52,779		
	Alternative Average Annual Benefits				\$91,752		
	Benefit Cost Ratio				0.45		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	1	9	18	49
Structures Removed from Floodplain	0	0	1	10	29	46	47

* Estimated cost of securing a permanent flood easement.

**\$0.00 Assessed value because of current public ownership.

ALTERNATIVE S11 - COMBINED STORAGE AT DUDE RANCH POND
EXPANSION WITH LAKE MARY ANNE PUMP STATION,
LUTHERAN GENERAL HOSPITAL POND, HIGH SCHOOL
RESERVOIR, AND BELLEAU LAKE LOWERED

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage alternatives including construction of a pump station at Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus and modifications to Belleau Lake. Each of the storage components of this alternative are described below.

The Dude Ranch Pond, located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class 1 dam structure constructed in the Farmers Creek channel just downstream of the pond. A 10 cfs pump station, with an 18-inch diameter discharge pipe, would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne into the Dude Ranch Pond. The two 5cfs pumps would substantially improve Lake Mary Anne's outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching most structures. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be controlled by the Dude Ranch Pond site.

Normal water elevations in Lutheran General Hospital Pond, located on Prairie Creek between Dempster Avenue and Ballard Road east of Potter Road, would be lowered 4.4 feet to elevation 627 via a 5cfs pump station to increase flood storage. Normal Prairie Creek flows would bypass the pond via a siphon pipe that would be constructed under the existing pond. Flows in excess of a 2-year frequency event (30cfs), would exceed the capacity of the siphon pipe and flow over a weir and into the pond. Flows tributary to the pond from the north side of Ballard Road would be diverted in a pipe to a junction chamber at the upstream side of the siphon bypass pipe noted above.

Flood stages in the pond above elevation 631.3 would be able to gravity flow out of the pond. Flood water remaining in the pond below elevation 631.3 would be pumped out of the reservoir in about one day using a 5cfs pump station. This alternative would increase

the flood storage at the site by approximately 10 acre-feet.

An additional 50 acre-feet flood storage would be provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the reservoir on the high school property. In this alternative, the High School Reservoir would not only reduce peak flows contributed by the Dempster Avenue storm sewer, but would provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

Combined additional flood storage at various sites in the watershed created by this alternative, would provide \$121,627 in average annual flood damage reduction benefits in the watershed representing a 84% reduction in average annual flood damages. Existing flood damages along Lower Farmers Creek would be reduced by 72%. Existing flood damages along Upper Farmers Creek would be reduced by 76%. Existing flood damages along Prairie Creek would be reduced by 87%. This alternative would eliminate flood damages to 46 structures currently impacted by the 100-year frequency

floodplain.

Project costs of this alternative are estimated at \$3,541,012, including \$976,377 in estimated land rights costs, as detailed on Table 19. Although this alternative eliminates most of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is 0.54 due to many overlapping project benefits for the same floodprone structures.

Exhibit 16: Alternative S11 - Combined Storage Dude Ranch Pond Expansion With Lake Mary Anne Pump Station, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered

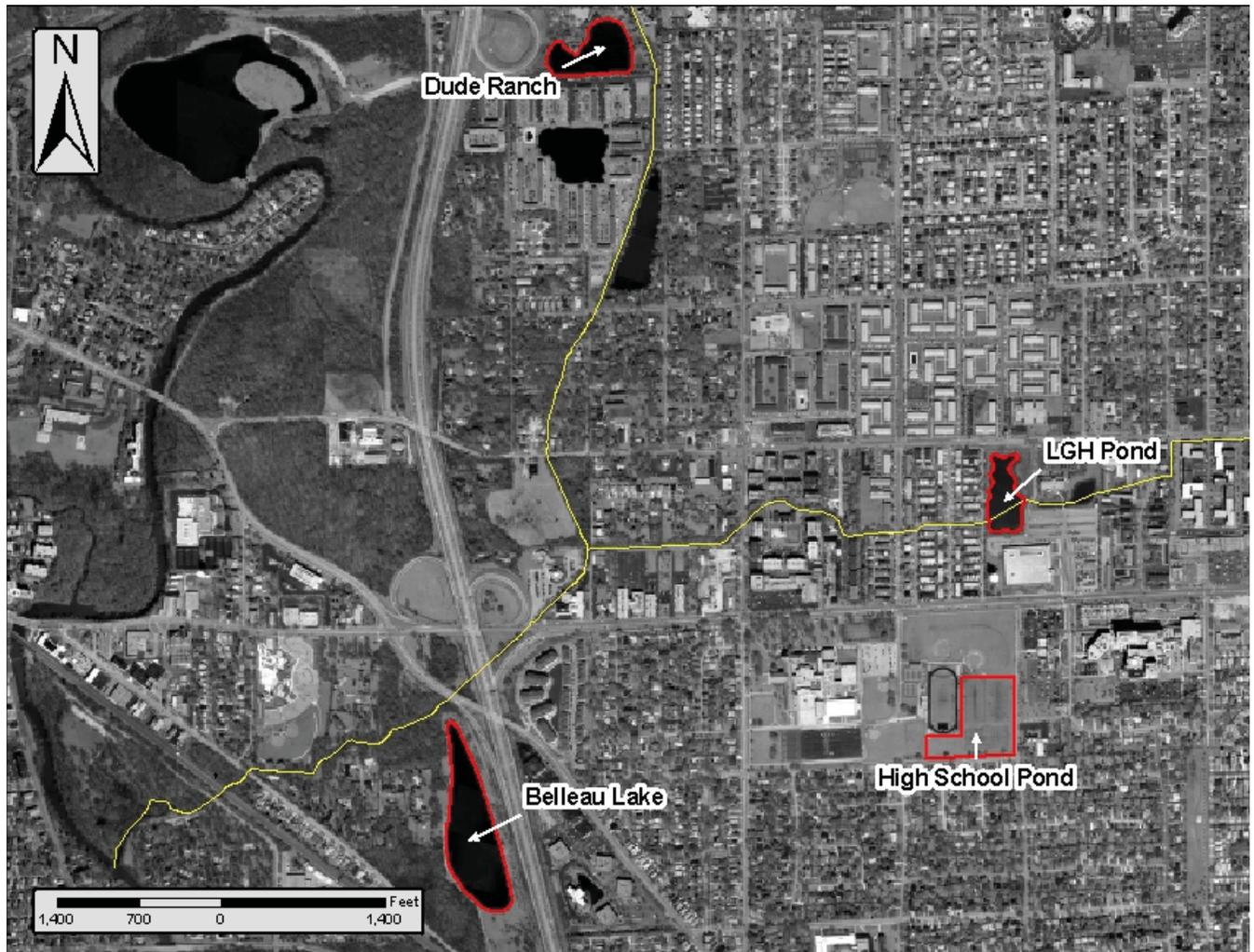


Table 19: Alternative S11 - Combined Storage at Dude Ranch Pond Expansion With Lake Mary Anne Pump Station, Lutheran General Hospital Pond, High School Reservoir, and Belleau Lake Lowered Cost Estimate

Farmers/Prairie Creek							
Alternative S11 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825		
Alt. S4	LGH with High School Alt.	1	Each	\$1,700,002	\$1,700,002		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
	Construction Cost				\$2,011,478		
	Engineering (20%) and Construction Supervision (7.5%)				\$553,157		
	Right-of-Way Cost*	976377	SQ FT	\$1	\$976,377		
	Right-of-Way Cost**	719920	SQ FT	\$0	\$0		
	Total Project Cost				\$3,541,012		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$205,310		
	O&M (1%)				\$20,115		
	Alternative Average Annual Cost and O&M (1%)				\$225,425		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$22,904		
	Alternative Average Annual Benefits				\$121,627		
	Benefit Cost Ratio				0.54		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	7	13	50
Structures Removed from Floodplain	0	1	2	11	31	51	46

* Estimated cost of securing a permanent flood easement.

**\$0.00 Assessed value because of current public ownership.

ALTERNATIVE S12 - DUDE RANCH POND EXPANSION

The Dude Ranch Pond, located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 12-inch diameter outlet pipe through a provisional Class 1 dam structure constructed in the Farmers Creek channel just downstream of the pond. Overflows from the existing IDOT Golf Road interceptor sewer would also be controlled by the expanded Dude Ranch Pond site.

Added flood storage on Farmers Creek created by this alternative would provide \$15,432 in average annual flood damage reduction benefits in the watershed, representing an 11% reduction in average annual flood damages. This alternative would benefit all 43 floodprone structures along Farmers Creek. Existing flood damages along Lower Farmers Creek would be reduced 29%. Existing flood damages along Upper Farmers Creek would be reduced 12%. This alternative would eliminate flood damages for 7 structures currently located in the 100-year frequency floodplain. Eight structures on Lower Prairie Creek would also be slightly benefitted.

Project costs of this alternative are estimated at \$438,126, including 312,816 in land rights costs, as detailed on Table 20. The benefit to cost ratio (B/C ratio) for this alternative is 0.58.

Exhibit 17: Alternative S12 - Dude Ranch Pond Expansion



Table 20: Alternative S12 - Dude Ranch Pond Expansion Cost Estimate

Farmers/Prairie Creek							
Alternative S12 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Storage Excavation							
20200100	Excavation	3227	CY	\$11	\$35,174		
250****	Seeding/Mulching/Fertilizing	1.00	Acres	\$2,000	\$2,000		
Control Structure							
54200427	RCCP 12"	20	FT	\$60	\$1,200		
20500150	Earth Fill	140	CY	\$27	\$3,780		
28100107	Stone Riprap CL A4	65	SY	\$65	\$4,225		
50300225	Cast-in-place Conc. dissipator	15	CY	\$678	\$10,170		
50800205	Epoxy Coated Reinf. bars	2140	lbs.	\$2	\$4,280		
54215436	Cast-in-place Conc. Headwall	1	Each	\$3,500	\$3,500		
54200433	RCCP 18"	352	FT	\$48	\$16,896		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$17,057		
	Construction Cost				\$98,283		
	Engineering (20%) and Construction Supervision (7.5%)				\$27,028		
	Right-of-Way Cost*	312816	SQ FT	\$1	\$312,816		
	Total Project Cost				\$438,126		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$25,403		
	O&M (1%)				\$983		
	Alternative Average Annual Cost and O&M (1%)				\$26,386		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$129,099		
	Alternative Average Annual Benefits				\$15,432		
	Benefit Cost Ratio				0.58		
Flood Frequency (Years)	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	10	38	64	96
Alternative Damaged Structures	0	1	1	9	30	64	89
Structures Removed from Floodplain	0	0	1	1	8	0	7

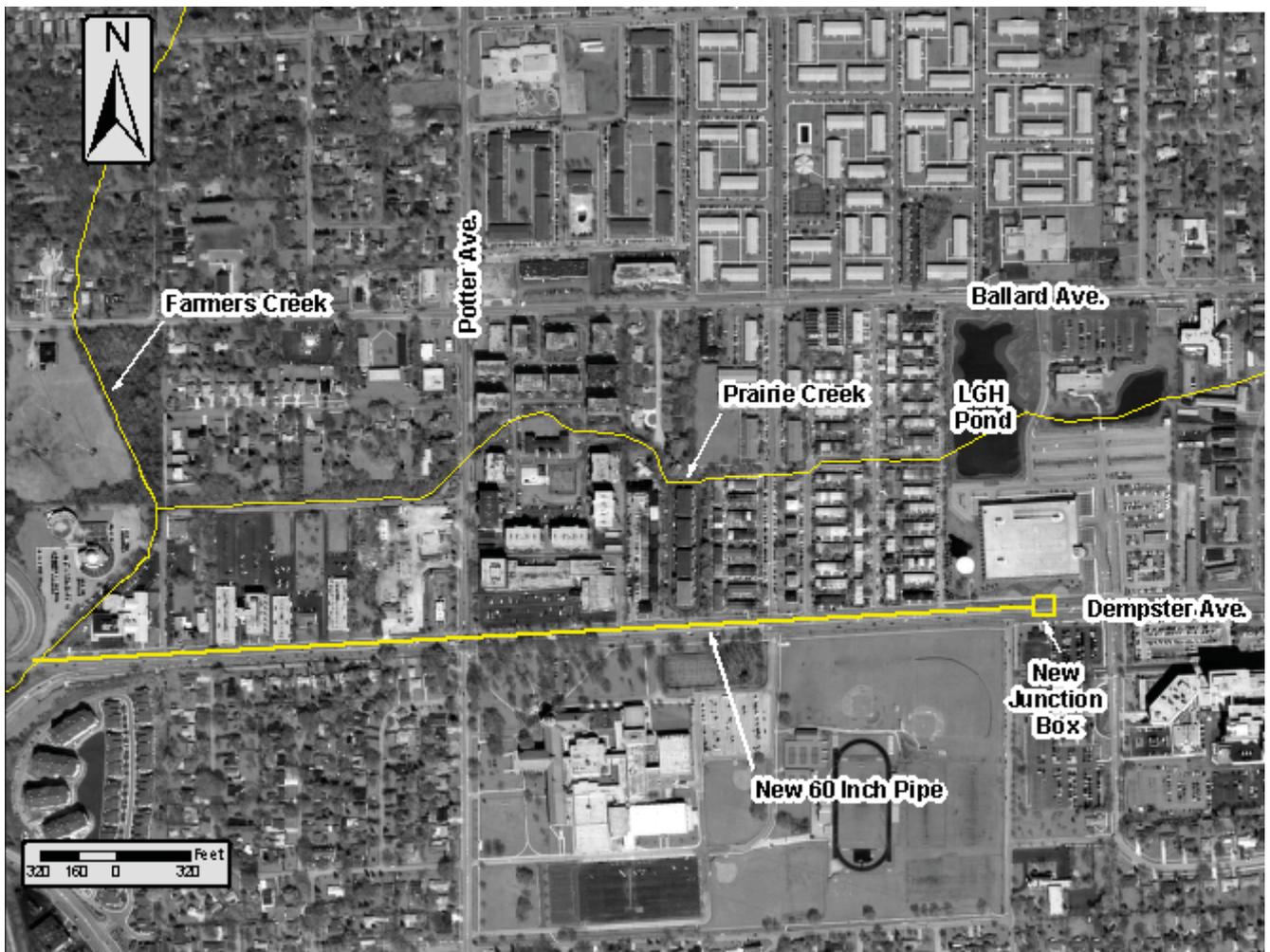
* Estimated cost of securing a permanent flood easement.

CONVEYANCE IMPROVEMENTS

ALTERNATIVE C1 - UPSTREAM DEMPSTER STORM SEWER DIVERSION TO TOLLWAY

A sixty inch pipe would be routed down Dempster Avenue to divert the existing Dempster Avenue storm sewer, that currently outlets into Prairie Creek downstream of Lutheran General Hospital, to a point on Farmers Creek just upstream of Dempster Avenue near the Tollway.

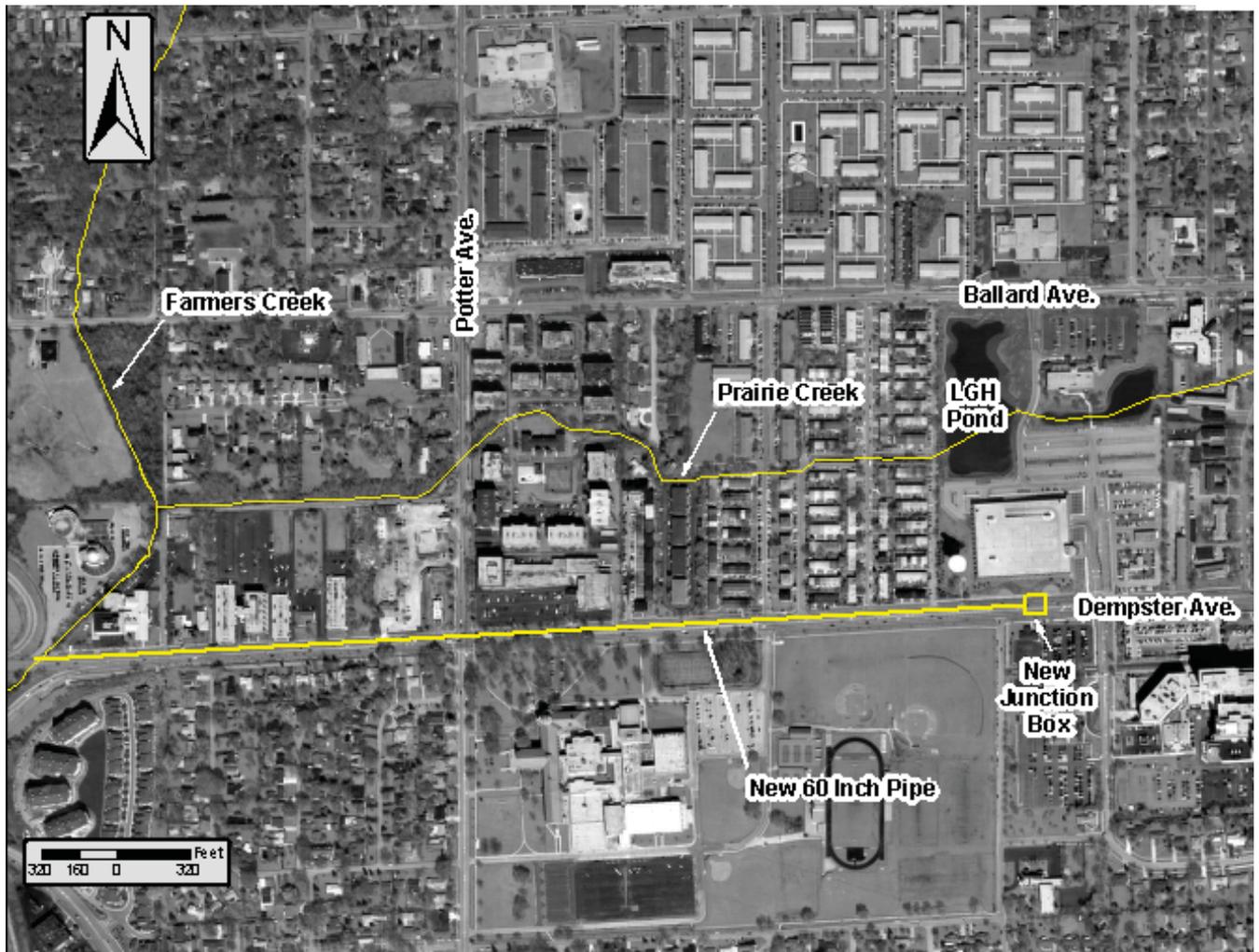
Exhibit 18: Alternative C1 - Upstream Dempster Storm Sewer Diversion to Tollway



ALTERNATIVE C2 - DOWNSTREAM DEMPSTER STORM SEWER DIVERSION TO TOLLWAY

A sixty inch pipe would be routed down Dempster Avenue to divert the existing Dempster Avenue storm sewer, that currently outlets into Prairie Creek downstream of Lutheran General Hospital, to a point on Farmers Creek just downstream of Dempster Avenue near the Tollway.

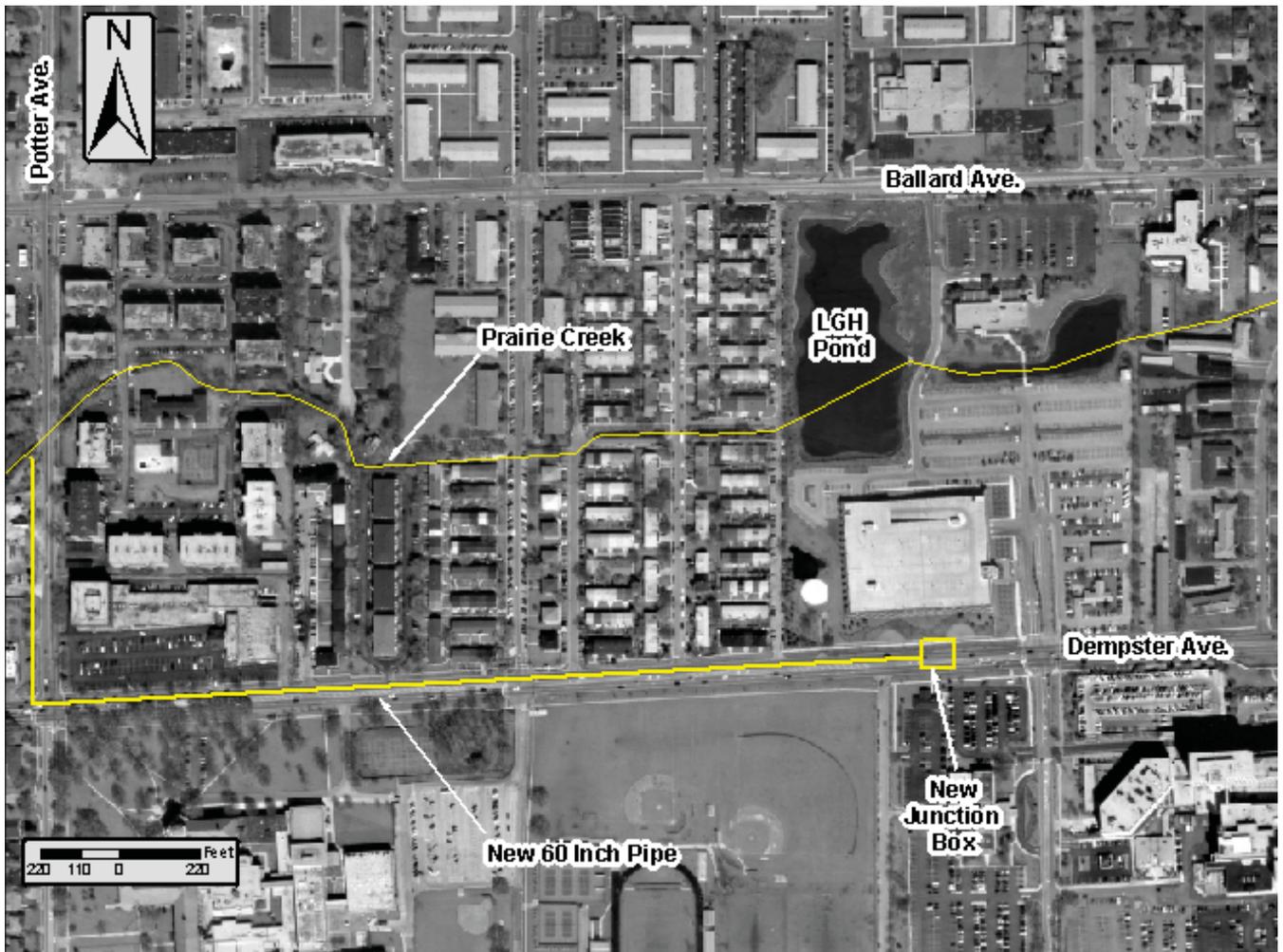
Exhibit 19: Alternative C2 - Downstream Dempster Storm Sewer Diversion to Tollway



ALTERNATIVE C3 - DEMPSTER STORM SEWER DIVERSION TO POTTER ROAD

A sixty inch pipe would be routed down Dempster Avenue to divert the existing Dempster Avenue storm sewer, that currently outlets into Prairie Creek downstream of Lutheran General Hospital, to a point on Prairie Creek below the bridge at Potter Road.

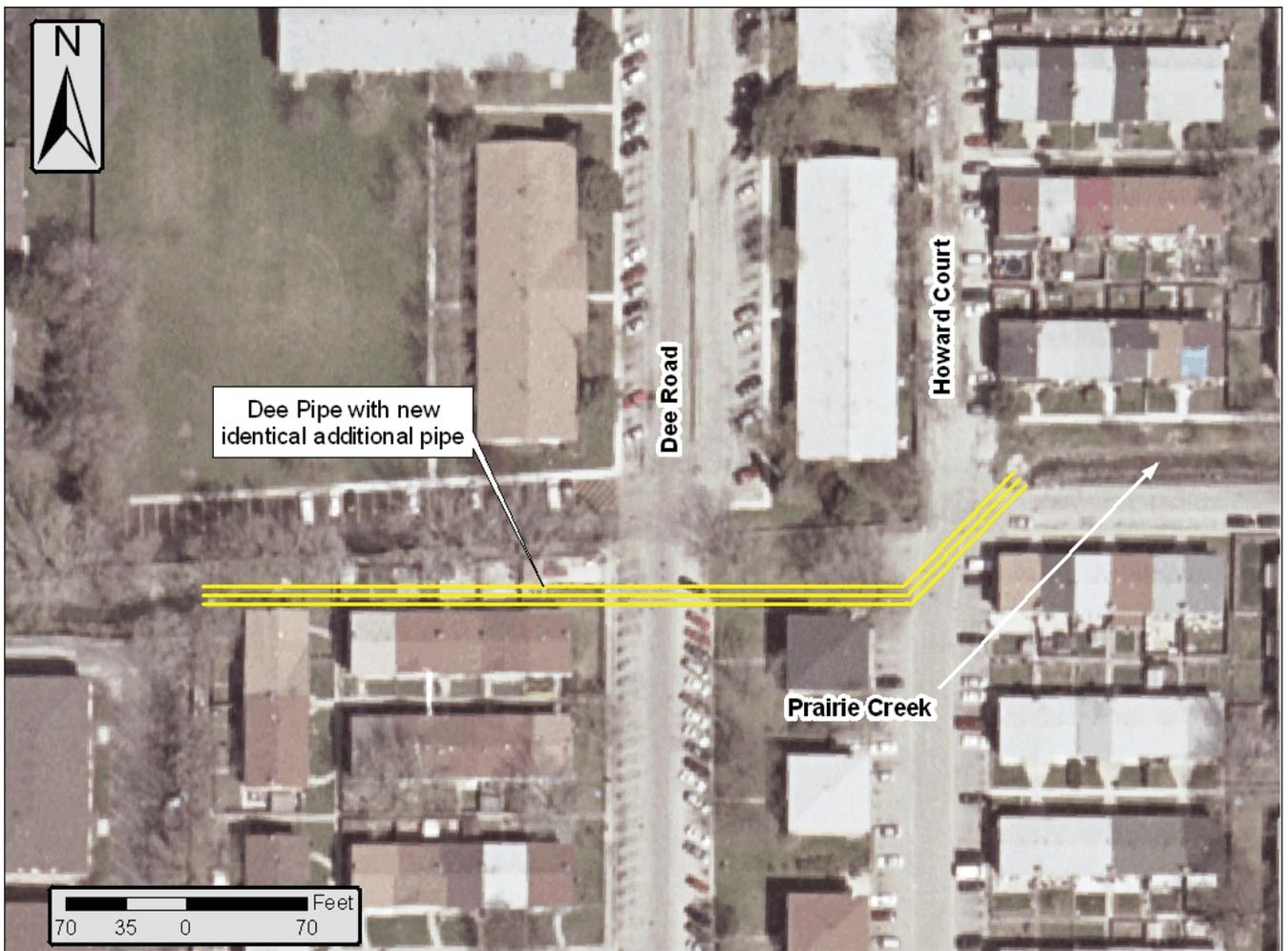
Exhibit 20: Alternative C3 - Dempster Storm Sewer Diversion to Potter Road



ALTERNATIVE C4 - ADDITIONAL DEE ROAD PIPE

The pipe at Dee Road is a sixty inch diameter pipe that carries the flow of Prairie Creek up to 62 cfs, for 503 feet and includes a 45 degree bend 93 feet into the pipe. The existing sixty inch diameter pipe would be supplemented with an additional sixty inch pipe. This additional pipe would be constructed adjacent to the existing pipe and would relieve an existing restriction to flow at Howard Court.

Exhibit 21: Alternative C4 - Additional Dee Road Pipe



ALTERNATIVE C5 - PIPE FROM LUTHERAN GENERAL HOSPITAL POND ALONG BALLARD ROAD TO POTTER ROAD

To convey the high flows that would normally flow overland out of Lutheran General Hospital pond, 2850 feet of 36 inch pipe would be routed down Ballard Avenue from the pond back to Prairie Creek downstream at Potter Road. The diversion pipe would remove up to 65 cfs from Prairie Creek between the Lutheran General Hospital and Potter Road.

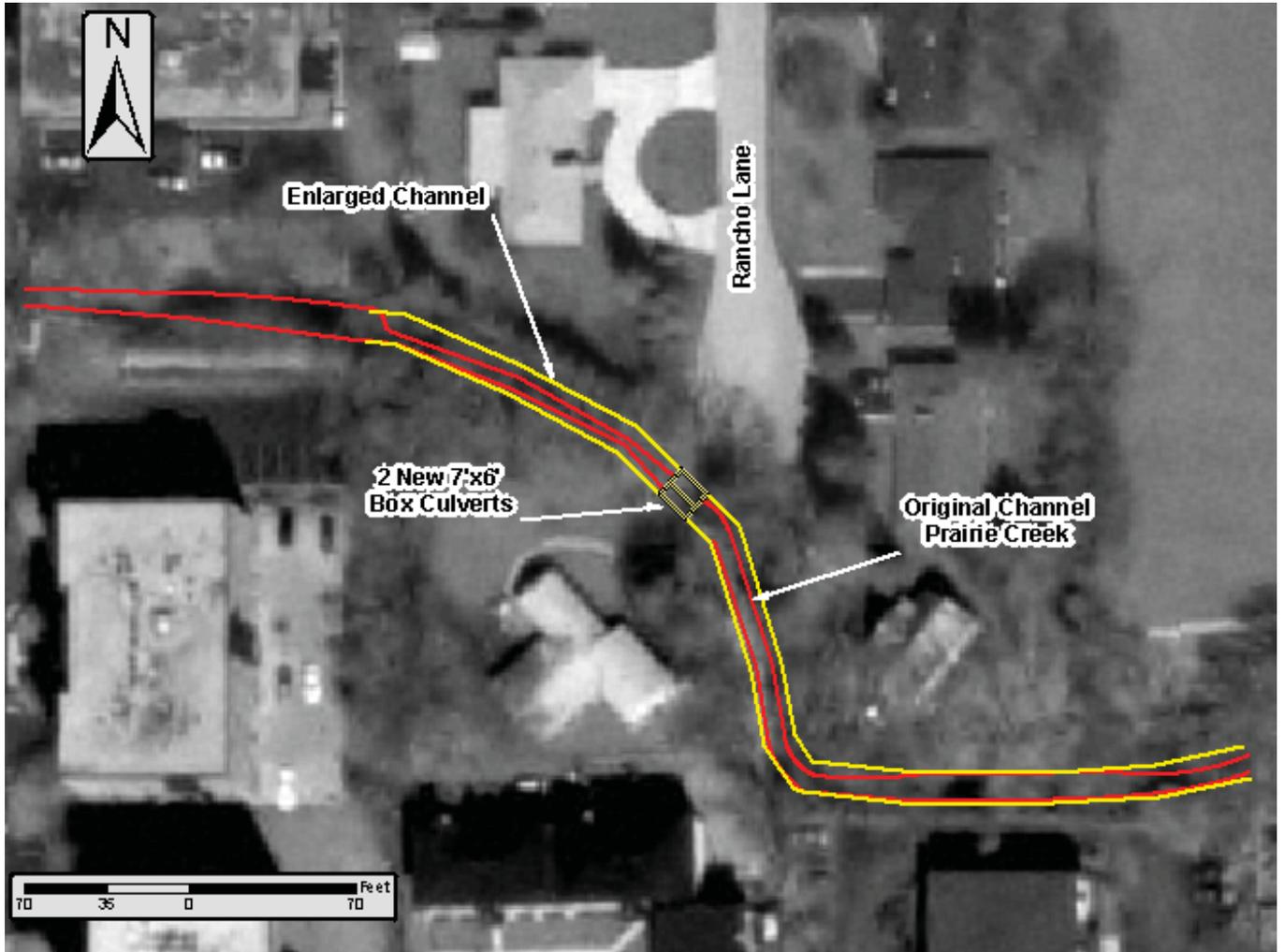
Exhibit 22: Alternative C5 - Pipe From Lutheran General Hospital Pond along Ballard to Potter Road



ALTERNATIVE C6 - REPLACE RANCHO LANE CULVERTS

The existing Rancho Lane Culverts would be replaced by two 7 by 6 foot box culverts. This would relieve the restriction in the flow in the current configuration. The channel above and below the culvert would be widened to make this reach of Prairie Creek match the approximate size of the creek upstream and downstream of this reach.

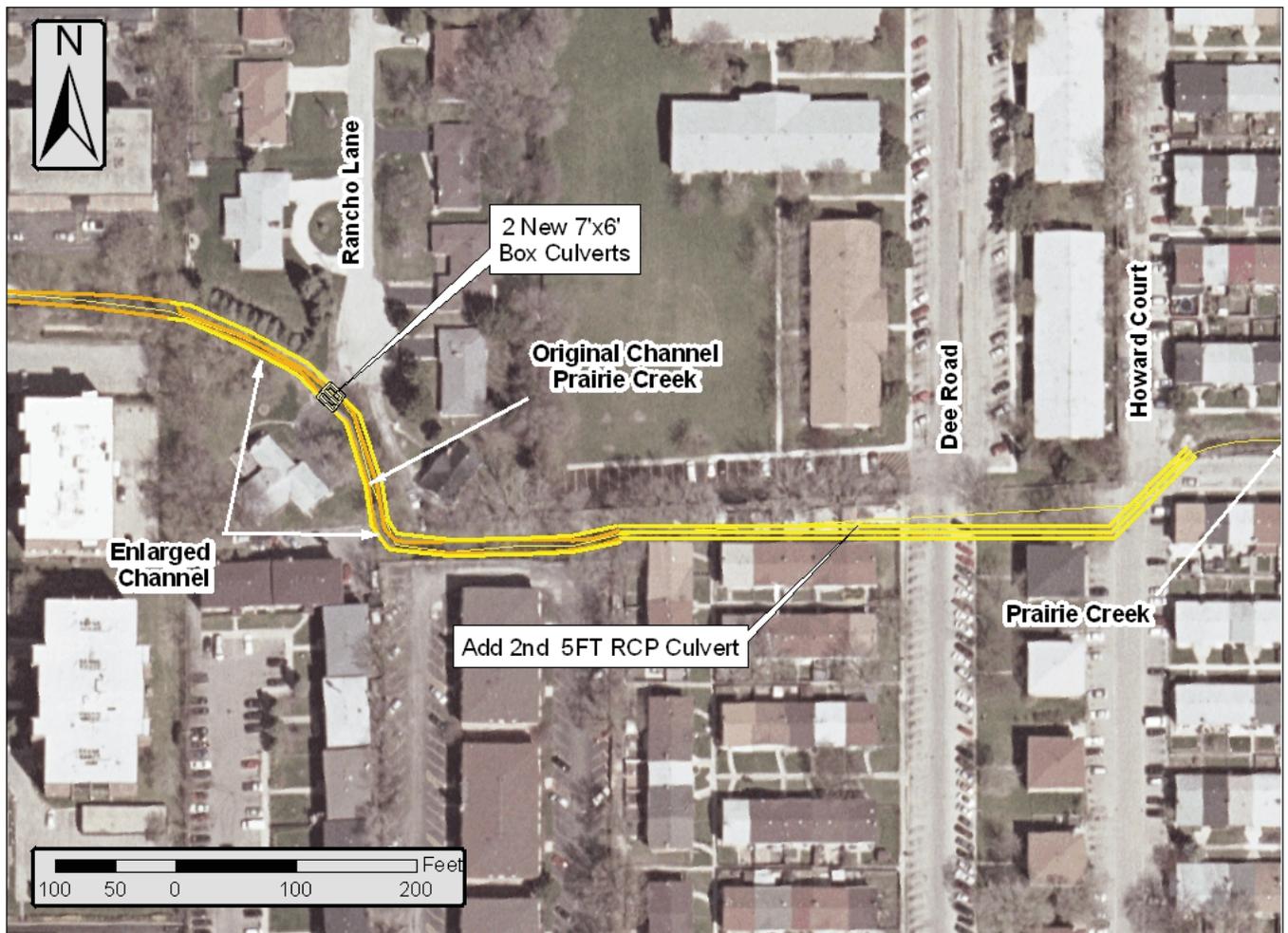
Exhibit 23: Alternative C6 - Replace Rancho Lane Culverts



ALTERNATIVE C7 - REPLACE RANCHO LANE CULVERTS AND ADDITIONAL DEE ROAD PIPE

The existing Rancho Lane Culvert would be replaced by two 7 by 6 foot box culverts and the channel above and below the culvert widened to match the Prairie Creek channel in this reach of Prairie Creek. The Dee Road culvert would be supplemented with an additional sixty inch culvert. This would relieve the restriction in the flow in the current configuration.

Exhibit 24: Alternative C7- Replace Rancho Lane Culvert and Additional Dee Road Pipe



ALTERNATIVE C8 - CONFLUENCE TO BELLEAU LAKE CONVEYANCE

Farmers Creek would be widened to 30 feet between the confluence of Farmers and Prairie Creeks and Belleau Lake. The Dempster Avenue bridge and a private bridge upstream of Dempster Avenue would be removed and replaced with twenty foot wide arch bridges. The Rand Road crossing of Farmers Creek would have an identical third barrel added to the existing double 10 foot by 10.5 foot box culvert structure.

Exhibit 25: Alternative C8 - Confluence to Belleau Lake Conveyance



OTHER IMPROVEMENTS

ALTERNATIVE L1- PARKVIEW LANE CULVERT

While the Rand Park pump station blocks most of the Farmers Creek flood waters from flowing northwest along Busse Highway west of Parkview Lane, an open 15-inch diameter culvert under Parkview Lane near Busse Highway still provides flood water access to that area. Survey of Parkview Lane and Busse Highway show that those streets are higher than the 100-year Farmers Creek elevation by a minimum of 0.2 foot. Addition of a fifteen inch tide flex valve to the downstream end of the culvert would keep flows from backing up through the culvert up to the 100-year event and provide \$15,675 in average annual benefits to Lower Farmers Creek. Extensive raising of Parkview Lane and Busse Highway would be necessary if more freeboard were desired.

Exhibit 26: Alternative L1 - Parkview Lane Culvert

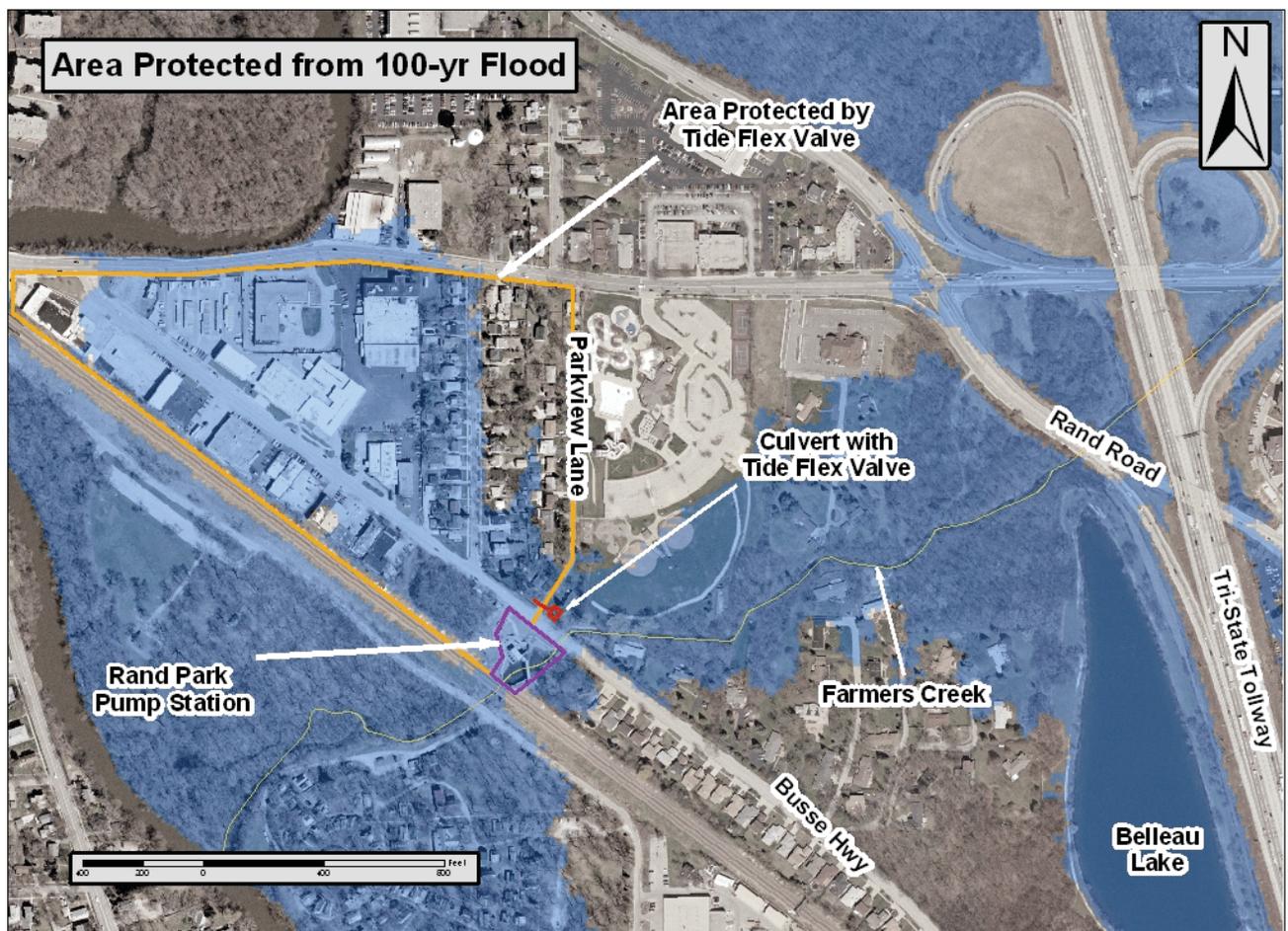


Table 21: Alternative L1 - Parkview Lane Culvert Cost Estimate

Farmer/Prairie Creek							
Alternative L1 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
54284500	Concrete Headwalls	0.5	CU YD	\$1,135	\$567		
Design	15" Tide Flex Valves	1	Each	\$4,500	\$4,500		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$1,064		
	Construction Cost				\$6,132		
	Engineering (20%) and Construction Supervision (7.5%)				\$1,686		
	Right-of-Way Cost*	100	SQ FT	\$0	\$0		
	Total Project Cost				\$7,817.68		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$453		
	O&M (1%)				\$61		
	Alternative Average Annual Cost and O&M (1%)				\$515		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$128,856		
	Alternative Average Annual Benefits				\$15,675		
	Benefit Cost Ratio				30.46		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	2	11	32	54	85
Structures Removed from Floodplain	0	0	0	0	6	10	11

* \$0.00 Assessed value because of current public ownership.

COMBINATION IMPROVEMENTS

ALTERNATIVE D1 - COMBINE STORAGE ALTERNATIVE S11 WITH A DEMPSTER STORM SEWER DIVERSION (C2) AND ENLARGED RANCHO LANE CULVERTS ON PRAIRIE CREEK (C6)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage and conveyance alternatives including construction of a pump station at Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus, modifications to Belleau Lake, diverting Dempster Avenue storm sewer flows to Farmers Creek, and replacing restrictive culverts at Rancho Lane on Prairie Creek. Each of the components of this alternative are described below.

The Dude Ranch Pond, a 5.4 acre pond located south of Golf Road and east of the Tri-State Tollway, would be enlarged, and connected to Farmers Creek to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class I dam structure constructed in the Farmers Creek channel just downstream of the existing pond. A 10cfs pump station, with an 18-inch diameter discharge pipe, would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne downstream to the Dude Ranch Pond. This pump station would provide Lake Mary Anne greater outlet capacity and prevent 100-year frequency event water levels in Lake Mary Anne from reaching most floodprone structures. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be stored and controlled by the expanded Dude Ranch Pond site.

The Lutheran General Hospital Pond Alternative, S3, would be supplemented with an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch

Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir is not only intended to reduce peak flows contributed by the Dempster Avenue storm sewer, but to provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

A 60-inch pipe would be routed down Dempster Avenue to divert the existing Dempster Avenue storm sewer, that currently outlets into Prairie Creek downstream of Lutheran General Hospital, to a point on Farmers Creek just downstream of Dempster Avenue near the Tollway.

The existing Rancho Lane Culverts would be replaced by two 7 by 6 foot box culverts. This would relieve the restriction in the flow in the current configuration. The channel above and below the culvert would be widened to make this reach of Prairie Creek match the approximate size of the creek upstream and downstream of this reach.

This combination of alternatives would create a project that would provide \$126,493 in average annual flood damage reduction benefits representing an 88% reduction in average annual flood damages in the watershed. The greatest portion of these benefits (46%) would be realized in the Lower Prairie Creek portion of the watershed. Existing flood damages along Lower Farmers Creek would be reduced 70%. Existing flood damages along Upper Farmers Creek would be reduced 74%. Existing flood damages along Prairie Creek would be reduced by 97%. This alternative would eliminate flood

damages for 59 structures currently located in the 100-year frequency floodplain, including most of the floodprone structures around Lake Mary Anne on Farmers Creek. Project costs of this alternative are estimated at \$5,862,513 including \$1,036,277 in estimated land rights costs, as detailed on Table 22. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is low (0.33) due to many overlapping project benefits for the same floodprone structures.

Exhibit 27: Alternative D1 - Combine Alternatives C2, C6 and S11



Table 22: Alternative D1 - Combine Alternatives C2, C6 and S11 Cost Estimate

Farmer/Prairie Creek					
Alternative D1 Cost Estimate Aug 04					
Line				Unit	Total
Item	Item	Quantity	Unit	Price	Cost
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651
54213723	Precast Reinf. Conc. End	1	Each	\$3,000	\$3,000
54010504	60" Concrete Pipe	4200	Ft	\$255	\$1,071,000
60248000	Junction Chamber N1	1	Each	\$12,000	\$12,000
60221100	Manhole	9	Each	\$2,200	\$19,800
20800150	Trench Backfill (Road)	2178	CY	\$28	\$60,978
44000100	Pavement Removal	3267	SQ	\$6	\$19,567
44100100	Pavement Replacement	3267	SQ	\$75	\$245,000
	C2 Contingencies (15%) and Mobilization (6%) of subtotal				\$300,582
54010706	Concrete Box Culvert 7X6	28	Ft	\$300	\$8,400
50300225	Concrete Structures	22	CU	\$550	\$12,100
50800105	Reinforcement bars	1070	Lbs	\$1	\$1,070
44000100	Pavement Removal	22	SQ	\$6	\$130
44100100	Pavement Replacement	22	SQ	\$75	\$1,633
20200100	Excavation	984	CY	\$11	\$10,726
250****	Seeding/Mulching/Fertilizin	0.28	Acres	\$2,000	\$550
	C6 Contingencies (15%) and Mobilization (6%) of subtotal				\$7,268
	Construction Cost				\$3,785,283
	Engineering (20%) and Construction Supervision (7.5%)				\$1,040,953
Alts. S1,S3,S5	Right-of-Way Cost*	976377	SQ FT	\$1	\$976,377
Alt. C6	Right-of-Way Cost	11980	SQ FT	\$5	\$59,900
Alts. S8, C2	Right-of-Way Cost**	749320	SQ FT	\$0	\$0
	Total Project Cost				\$5,862,513
	Alternative Average Annual Cost (5.375% For 50 Years)				\$339,912
	O&M (1%)				\$37,853
	Alternative Average Annual Cost and O&M (1%)				\$377,765
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531
	Alternative Average Annual Damages (Direct and Indirect)				\$18,038
	Alternative Average Annual Benefits				\$126,493
	Benefit Cost Ratio				0.33

Table 22 Continued: Alternative D1

Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	2	10	37
Structures Removed from Floodplain	0	1	2	11	36	54	59

* Estimated cost of securing a permanent flood easement on existing pond.

**\$0.00 Assessed value because of current public ownership.

ALTERNATIVE D2 - COMBINE STORAGE ALTERNATIVE S11 WITH A DEMPSTER STORM SEWER DIVERSION (C2)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage and conveyance alternatives including construction of a pump station at Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus, modifications to Belleau Lake, and diverting Dempster Avenue storm sewer flows to Farmers Creek. Each of the components of this alternative are described below.

The Dude Ranch Pond, a 5.4 acre pond located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek as to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class I dam structure constructed in the Farmers Creek channel just downstream of the existing pond. A pump station would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne to the Dude Ranch Pond. A 10 cfs pump station, with an 18-inch diameter discharge pipe, constructed at the existing outlet of Lake Mary Anne and pumping in to the Dude Ranch Pond, would provide Lake Mary Anne greater outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching most floodprone structures around the lake. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be stored and controlled by the expanded Dude Ranch Pond site.

The Lutheran General Hospital Pond Alternative, S3, would be supplemented with an additional 50 acre-feet of flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General

Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir is not only intended to reduce peak flows contributed by the Dempster Avenue storm sewer, but to provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

A sixty inch pipe would be routed down Dempster Avenue to divert the existing Dempster Avenue storm sewer, that currently outlets into Prairie Creek downstream of Lutheran General Hospital Pond, to a point on Farmers Creek just downstream of Dempster Avenue near the Tollway.

This combination of alternatives would create a project that would provide \$117,012 in average annual flood damage reduction benefits representing an 81% reduction in average annual flood damages in the watershed. The greatest portion of these benefits (42%) would be realized in the Lower Prairie Creek portion of the watershed (downstream of Lutheran General Hospital pond). Existing flood damages along Lower Farmers Creek would be reduced 75%. Existing flood damages along Upper Farmers Creek would be reduced 70%. Existing flood damages along Prairie Creek would be reduced by 81%. This alternative would eliminate flood damages for 43 structures currently located in the 100-year frequency floodplain, including most of the floodprone structures around Lake Mary Anne on Farmers Creek. Project costs of this alternative are estimated at \$5,749,219, including \$976,377 in estimated land rights costs, as detailed on Table 23. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is low (0.32) due to

many overlapping project benefits for the same floodprone structures.

Exhibit 28: Alternative D2 - Combine Alternatives C2 and S11

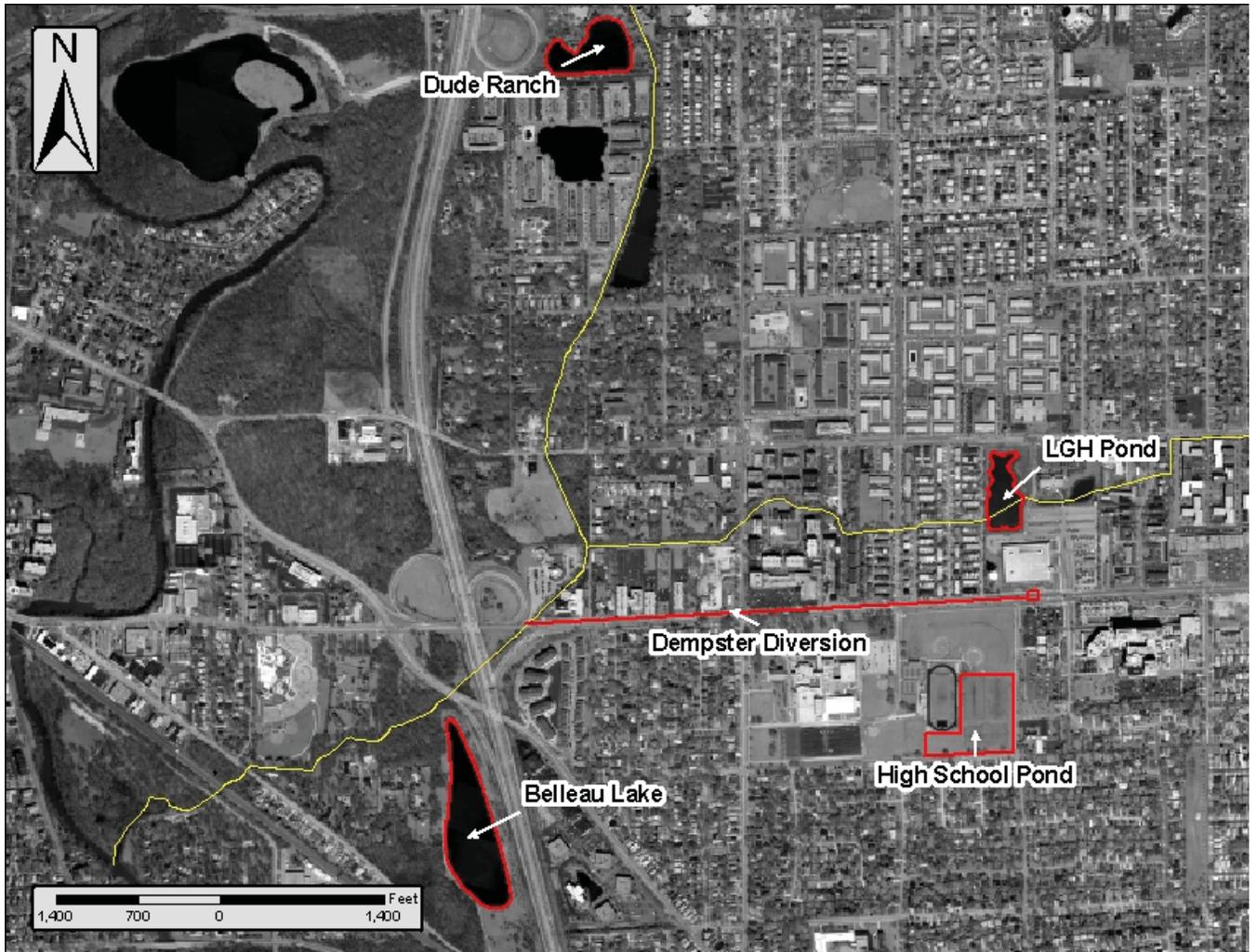


Table 23: Alternative D2 - Combine Alternatives C2 and S11 Cost Estimate

Farmer/Prairie Creek							
Alternative D2 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825		
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117		
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
54213723	Precast Reinf. Conc. End	1	Each	\$3,000	\$3,000		
54010504	60" Concrete Pipe	4200	Ft	\$255	\$1,071,000		
60248000	Junction Chamber N1	1	Each	\$12,000	\$12,000		
60221100	Manhole	9	Each	\$2,200	\$19,800		
20800150	Trench Backfill (Road)	2178	CY	\$28	\$60,978		
44000100	Pavement Removal	3267	SQ	\$6	\$19,567		
44100100	Pavement Replacement	3267	SQ	\$75	\$245,000		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$300,582		
	Construction Cost				\$3,743,406		
	Engineering (20%) and Construction Supervision (7.5%)				\$1,029,437		
Alts. S1,S3,S5	Right-of-Way Cost*	976377	SQ FT	\$1	\$976,377		
Alts. S8, C2	Right-of-Way Cost**	749320	SQ FT	\$0	\$0		
	Total Project Cost				\$5,749,219		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$333,343		
	O&M (1%)				\$37,434		
	Alternative Average Annual Cost and O&M (1%)				\$370,777		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$27,519		
	Alternative Average Annual Benefits				\$117,012		
	Benefit Cost Ratio				0.32		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	7	21	53
Structures Removed from Floodplain	0	1	2	11	31	43	43

* Estimated cost of securing a permanent flood easement on existing pond.

**\$0.00 Assessed value because of current public ownership.

ALTERNATIVE D3 - COMBINE STORAGE ALTERNATIVE S11 WITH ENLARGED CULVERTS AT RANCHO LANE ON PRAIRIE CREEK (C6)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage and conveyance alternatives including construction of a pump station at Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus, modifications to Belleau Lake, and culvert and channel improvements on Prairie Creek at Rancho Lane. Each of the components of this alternative are described below.

The Dude Ranch Pond, a 5.4 acre pond located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek as to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class I dam structure constructed in the Farmers Creek channel just downstream of the existing pond. A pump station would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne to the Dude Ranch Pond. A 10cfs pump station constructed at the existing outlet of Lake Mary Anne and pumping in to the Dude Ranch Pond, would provide Lake Mary Anne greater outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching most floodprone structures around the lake. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be stored and controlled by the expanded Dude Ranch Pond site.

The Lutheran General Hospital Pond Alternative, S3, would be supplemented with an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm

sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir is not only intended to reduce peak flows contributed by the Dempster Avenue storm sewer, but to provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

The existing Rancho Lane Culverts would be replaced by two 7 by 6 foot box culverts. This would relieve the restriction in the flow in the current configuration. The channel above and below the culvert would be widened to make this reach of Prairie Creek match the approximate size of the creek upstream and downstream of this reach.

This combination of alternatives would create a project that would provide \$125,065 in average annual flood damage reduction benefits representing an 87% reduction in average annual flood damages in the watershed. The greatest portion of these benefits (45%) would be realized in the Lower Prairie Creek portion of the watershed (downstream of Lutheran General Hospital pond). Existing flood damages along Lower Farmers Creek would be reduced 75%. Existing flood damages along Upper Farmers Creek would be reduced 70%. Existing flood damages along Prairie Creek would be reduced by 94%. This alternative would eliminate flood damages for 62 structures currently located in the 100-year frequency floodplain, including most of the floodprone structures around Lake Mary Anne on Farmers Creek. Project costs of this alternative are estimated at \$3,654,306, including \$1,036,277 in estimated land rights costs, as detailed on Table 24. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is 0.54 due to many overlapping project benefits for the same floodprone structures.

Exhibit 29: Alternative D3 - Combine Alternatives C6 and S11



Table 24: Alternative D3 - Combine Alternatives C6 and S11 Cost Estimate

Farmer/Prairie Creek							
Alternative D3 Cost Estimate							
Line				Unit	Total		
Item 12/00	Item	Quantity	Unit	Price	Cost		
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825		
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117		
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
54010706	PCBC 7X6	28	Ft	\$300	\$8,400		
50300225	Concrete Structures	22	CU	\$550	\$12,100		
50800105	Reinforcement bars	1070	Lbs	\$1	\$1,070		
44000100	Pavement Removal	22	SQ	\$6	\$130		
44100100	Pavement Replacement	22	SQ	\$75	\$1,633		
20200100	Excavation	984	CY	\$11	\$10,726		
250****	Seeding/Mulching/Fertilizin	0.28	Acres	\$2,000	\$550		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$7,268		
	Construction Cost				\$2,053,356		
	Engineering (20%) and Construction Supervision (7.5%)				\$564,673		
Alts. S1,S3,S5	Right-of-Way Cost*	976377	SQ FT	\$1	\$976,377		
Alt. C6	Right-of-Way Cost	11980	SQ FT	\$5	\$59,900		
Alt. S8	Right-of-Way Cost**	719920	SQ FT	\$0	\$0		
	Total Project Cost				\$3,654,306		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$211,879		
	O&M (1%)				\$20,534		
	Alternative Average Annual Cost and O&M (1%)				\$232,412		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$19,466		
	Alternative Average Annual Benefits				\$125,065		
	Benefit Cost Ratio				0.54		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	7	15	34
Structures Removed from Floodplain	0	1	2	11	31	49	62

*Estimated cost of securing a permanent flood easement on existing pond.

**0.00 Assessed value because of current public ownership.

ALTERNATIVE D4 - COMBINE STORAGE ALTERNATIVE S11 WITH ADDITIONAL CONVEYANCE AT RANCHO LANE AND DEE ROAD (C7)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage and conveyance alternatives including construction of a pump station at Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus, modifications to Belleau Lake, and culvert and channel improvements on Prairie Creek at Dee Road and Rancho Lane. Each of the components of this alternative are described below.

The Dude Ranch Pond, a 5.4 acre pond located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek as to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class I dam structure constructed in the Farmers Creek channel just downstream of the existing pond. A pump station would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne to the Dude Ranch Pond. A 10cfs pump station constructed at the existing outlet of Lake Mary Anne and pumping in to the Dude Ranch Pond, would provide Lake Mary Anne greater outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching floodprone structures. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be stored and controlled by the expanded Dude Ranch Pond site.

The Lutheran General Hospital Pond Alternative, S3, would be supplemented with an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm

sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir is not only intended to reduce peak flows contributed by the Dempster Avenue storm sewer, but to provide additional storage capacity for Lutheran General Hospital Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

The existing Rancho Lane Culverts would be replaced by two 7 by 6 foot box culverts. This would relieve the restriction in the flow in the current configuration. The channel above and below the culvert would be widened to make this reach of Prairie Creek match the approximate size of the creek upstream and downstream of this reach.

The Dee Pipe would be supplemented with an additional sixty inch pipe. This would relieve the restriction in the flow in the current configuration.

This combination of alternatives would create a project that would provide \$127,022 in average annual flood damage reduction benefits representing an 88% reduction in average annual flood damages in the watershed, the largest reduction of any of the alternatives investigated. The greatest portion of these benefits (46%) would be realized in the Lower Prairie Creek portion (between Lutheran General Hospital pond and Farmers Creek) of the watershed. Existing flood damages along Prairie Creek would be reduced by 97%. Existing flood damages along Lower Farmers Creek would be reduced 75%. Existing flood damages along Upper Farmers Creek would be reduced 70%. This alternative would eliminate flood damages for 62 structures currently located in the 100-year frequency floodplain, including most of the floodprone structures around Lake Mary Anne on Farmers Creek. Project costs of this alternative are estimated at

\$3,883,054 including \$1,047,827 in estimated land rights costs, as detailed on Table 25. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is less than 1.0 (0.51) due to many overlapping project benefits for the same floodprone structures.

Exhibit 30: Alternative D4 - Combine Alternatives C7 and S11

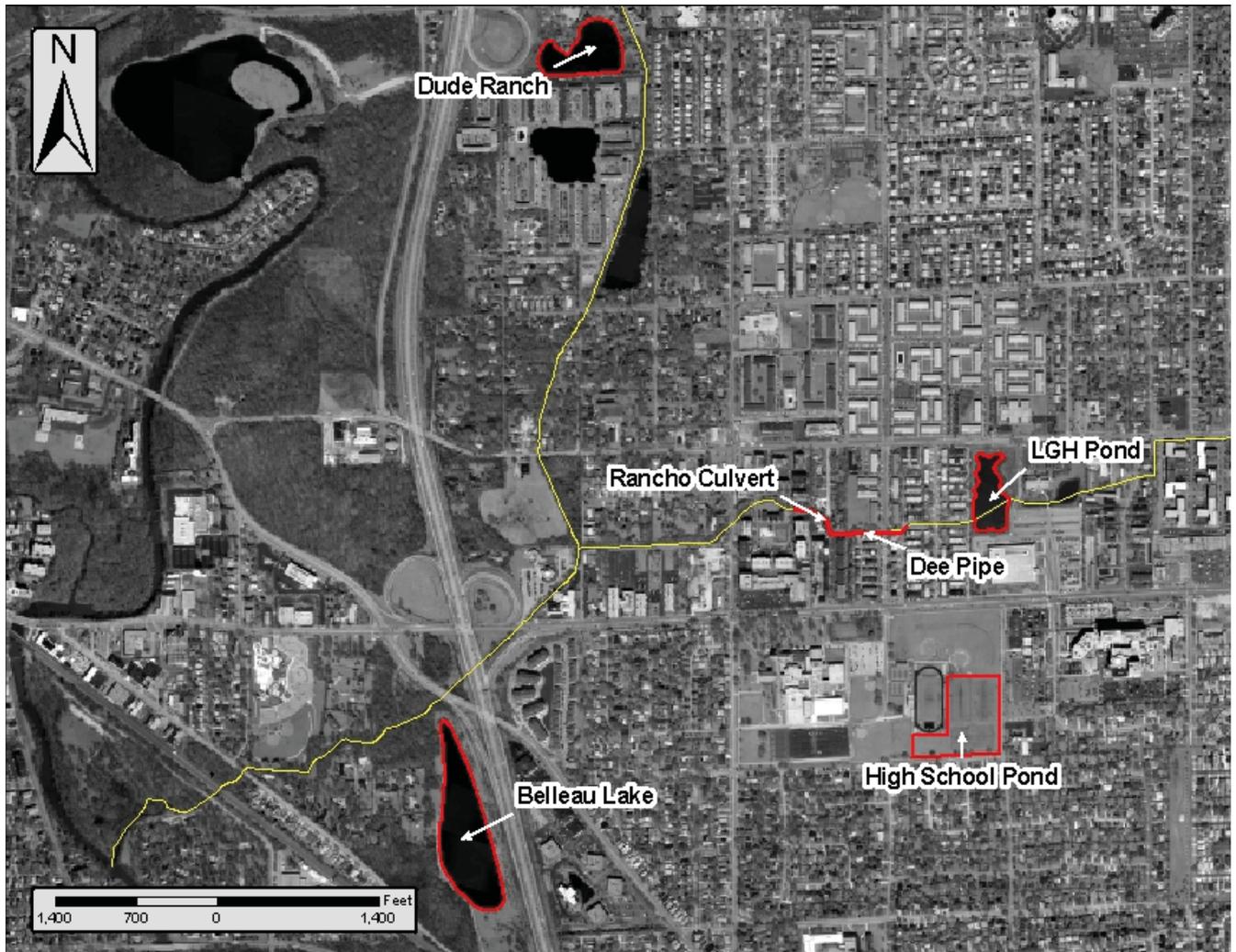


Table 25: Alternative D4 - Combine Alternatives C7 and S11 Cost Estimate

Farmer/Prairie Creek							
Alternative D4 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825		
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117		
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
54010706	PCBC 7X6	28	Ft	\$300	\$8,400		
50300225	Concrete Structures	22	CU	\$550	\$12,100		
50800105	Reinforcement bars	1070	Lbs	\$1	\$1,070		
44000100	Pavement Removal	154	SQ	\$6	\$922		
44100100	Pavement Replacement	154	SQ	\$75	\$11,550		
54010504	60" Concrete Pipe	500	Ft	\$255	\$127,500		
20800150	Trench Backfill (Road)	88	CY	\$28	\$2,468		
20200100	Excavation	984	CY	\$11	\$10,726		
250****	Seeding/Mulching/Fertilizi	0.33	Acres	\$2,000	\$660		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$36,833		
	Construction Cost				\$2,223,708		
	Engineering (20%) and Construction Supervision (7.5%)				\$611,520		
Alts. S1,S3,S5	Right-of-Way Cost*	976377	SQ FT	\$1	\$976,377		
Alts. C7	Right-of-Way Cost	14290	SQ FT	\$5	\$71,450		
	Right-of-Way Cost**	719920	SQ FT	\$0	\$0		
	Total Project Cost				\$3,883,054		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$225,142		
	O&M (1%)				\$22,237		
	Alternative Average Annual Cost and O&M (1%)				\$247,379		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$17,509		
	Alternative Average Annual Benefits				\$127,022		
	Benefit Cost Ratio				0.51		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	2	9	34
Structures Removed from Floodplain	0	1	2	11	36	55	62

*Estimated cost of securing a permanent flood easement on existing pond.

**0.00 Assessed value because of current public ownership.

ALTERNATIVE D5 - COMBINE STORAGE ALTERNATIVE S8 WITH DEMPSTER DIVERSION CONVEYANCE IMPROVEMENTS (C2)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine additional storage at Belleau Lake and conveyance improvements along Dempster Avenue to the upstream side of the Tollway. Each of these components are described below.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

A sixty inch pipe would be routed down Dempster Avenue to divert the existing Dempster Avenue storm sewer, that currently outlets into Prairie Creek downstream of Lutheran General Hospital Pond, to a point on Farmers Creek just downstream of Dempster Avenue near the Tollway. To prevent higher flows between Dempster and Belleau Lake from adversely flooding structures south of Rand Road and east of the Tollway, a Tideflex gate would be installed on an existing 54" x 36" culvert under Rand Road.

This combination of alternatives would create a project that would provide \$59,367 in average annual flood damage reduction benefits representing an 41% reduction in average annual flood damages in the watershed. The greatest portion of these benefits (76%) would be realized in the Lower Prairie Creek portion of the watershed. Existing flood damages along Prairie Creek would be reduced by 75%. Existing flood damages along Lower Farmers Creek would be reduced 32%. Existing flood damages along Upper Farmers Creek would be reduced 57%. This alternative would eliminate flood damages for 29 structures currently located in the 100-year frequency floodplain. Project costs of this alternative are estimated at \$2,347,184, as detailed on Table 26. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is 0.38 due to many overlapping project benefits for the same floodprone structures.

Exhibit 31: Alternative D5 - Combine Alternatives C2 and S8



Table 26: Alternative D5 - Combine Alternatives C2 and S8 Cost Estimate

Farmer/Prairie Creek							
Alternative D5 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
54213723	Precast Reinf. Conc. End	1	Each	\$3,000	\$3,000		
54010504	60" Concrete Pipe	4200	Ft	\$255	\$1,071,000		
60248000	Junction Chamber N1	1	Each	\$12,000	\$12,000		
60221100	Manhole	9	Each	\$2,200	\$19,800		
20800150	Trench Backfill (Road)	2178	CY	\$28	\$60,978		
44000100	Pavement Removal	3267	SQ	\$6	\$19,567		
44100100	Pavement Replacement	3267	SQ	\$75	\$245,000		
FR-416,129	Tideflex for 54" x 36" RCP	1	Each	\$35,000	\$35,000		
	C2 Contingencies (15%) and Mobilization (6%) of subtotal				\$307,932		
	Construction Cost				\$1,840,929		
	Engineering (20%) and Construction Supervision (7.5%)				\$506,255		
Alts. C2, S8	Right-of-Way Cost*	749320	SQ	\$0	\$0		
	Total Project Cost				\$2,347,184		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$136,091		
	O&M (1%)				\$18,409		
	Alternative Average Annual Cost and O&M (1%)				\$154,500		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$85,164		
	Alternative Average Annual Benefits				\$59,367		
	Benefit Cost Ratio				0.38		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	2	14	55	67
Structures Removed from Floodplain	0	0	1	9	24	9	29

* \$0.00 Assessed value because of current public ownership.

ALTERNATIVE D6 - COMBINE STORAGE ALTERNATIVE S4 WITH ADDITIONAL CONVEYANCE AT RANCHO LANE AND DEE ROAD (C7)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine additional storage at Lutheran General Hospital Pond and the Main Township High School athletic fields with conveyance improvements along Prairie Creek at Dee Road and Rancho Lane. Each of these components are described below.

The Lutheran General Hospital Pond Alternative, S3, would be supplemented with an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir would not only reduce peak flows contributed by the Dempster Avenue storm sewer, but provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

The existing Rancho Lane Culverts would be replaced by two 7 by 6 foot box culverts. This would relieve the restriction in the flow in the current configuration. The channel above and below the culvert would be widened to make this reach of Prairie Creek match the approximate size of the creek upstream and downstream of this reach. The Dee Pipe would be supplemented with an additional sixty inch pipe. This would relieve the restriction in the flow in the current configuration.

This combination of alternatives would create a project that would provide \$80,157 in

average annual flood damage reduction benefits representing an 55% reduction in average annual flood damages in the watershed. The greatest portion of these benefits (71%) would be realized in the Lower Prairie Creek portion of the watershed. Existing flood damages along Prairie Creek would be reduced by 94%. Existing flood damages along Lower Farmers Creek would be reduced 44%. Existing flood damages along Upper Farmers Creek would be reduced 41%. This alternative would eliminate flood damages for 52 structures currently located in the 100-year frequency floodplain. Project costs of this alternative are estimated at \$3,173,106, including \$735,011 in estimated land rights costs, as detailed on Table 27. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is low (0.39) due to many overlapping project benefits for the same floodprone structures.

Exhibit 32: Alternative D6 - Combine Alternatives C7 and S4

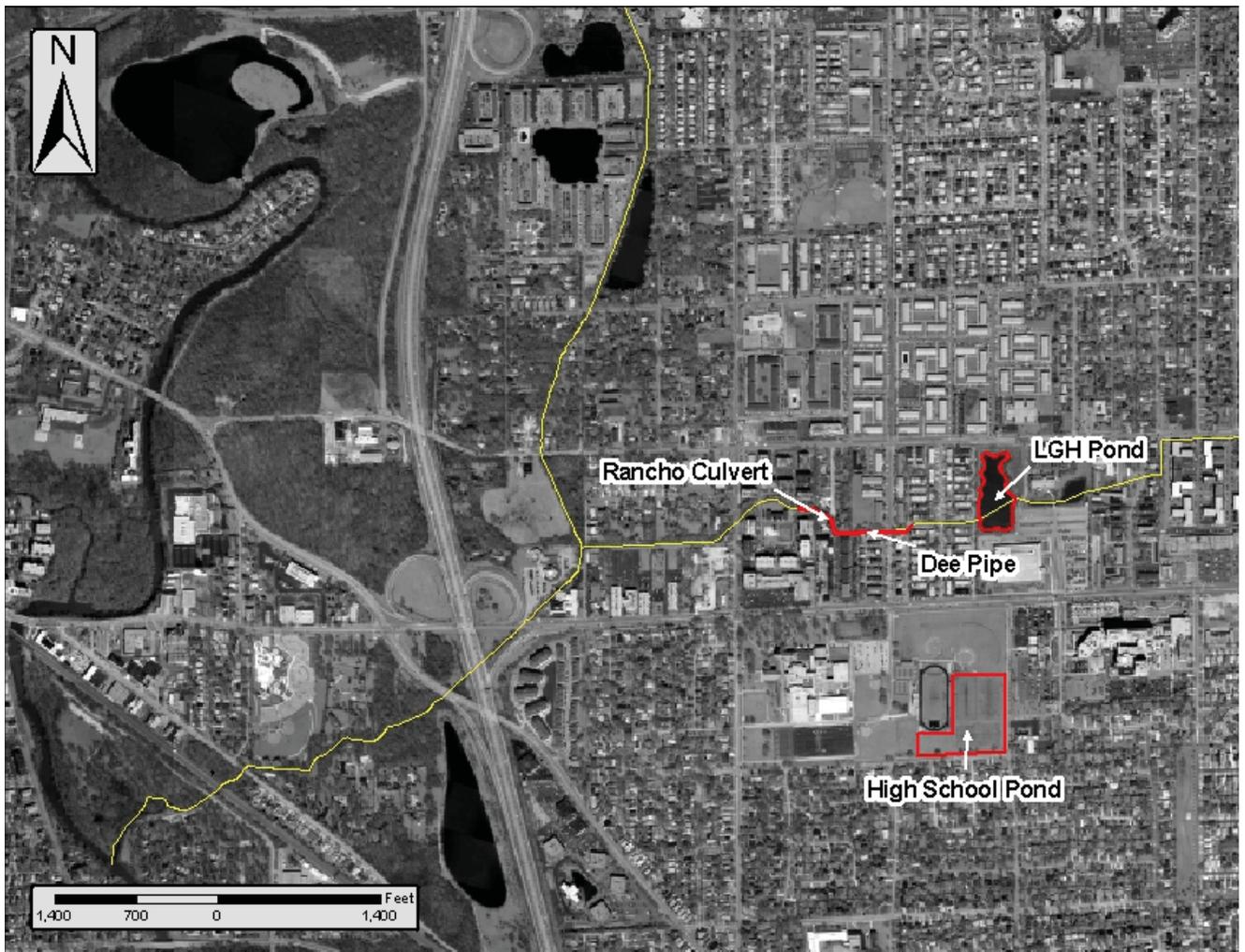


Table 27: Alternative D6 - Combine Alternatives C7 and S4 Cost Estimate

Farmer/Prairie Creek							
Alternative D6 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117		
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885		
54010706	PCBC 7X6	28	Ft	\$300	\$8,400		
50300225	Concrete Structures	22	CU YD	\$550	\$12,100		
50800105	Reinforcement bars	1070	Lbs	\$1	\$1,070		
44000100	Pavement Removal	154	SQ YD	\$6	\$922		
44100100	Pavement Replacement	154	SQ YD	\$75	\$11,550		
54010504	60" Concrete Pipe	500	Ft	\$255	\$127,500		
20800150	Trench Backfill (Road)	88	CY	\$28	\$2,468		
250****	Seeding/Mulching/Fertilizin	0.33	Acres	\$2,000	\$660		
20200100	Excavation	984	CY	\$11	\$10,726		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$36,833		
	Construction Cost				\$1,912,231		
	Engineering (20%) and Construction Supervision (7.5%)				\$525,864		
Alts. S3,S5	Right-of-Way Cost*	663561	SQ FT	\$1	\$663,561		
Alts. C4, C6	Right-of-Way Cost	14290	SQ FT	\$5	\$71,450		
	Total Project Cost				\$3,173,106		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$183,979		
	O&M (1%)				\$19,122		
	Alternative Average Annual Cost and O&M (1%)				\$203,101		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$64,374		
	Alternative Average Annual Benefits				\$80,157		
	Benefit Cost Ratio				0.39		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	3	11	30	44
Structures Removed from Floodplain	0	0	1	8	27	34	52

*Estimated cost of securing a permanent flood easement on existing pond.

ALTERNATIVE D7 - COMBINE ALTERNATIVE S11 WITH ADDITIONAL CONVEYANCE AT DEE ROAD (C4)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage and conveyance alternatives including construction of a pump station a Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus, modifications to Belleau Lake, and culvert improvements on Prairie Creek at Dee Road. Each of the components of this alternative are described below.

The Dude Ranch Pond, a 5.4 acre pond located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class I dam structure constructed in the Farmers Creek channel just downstream of the existing pond. A pump station would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne to the Dude Ranch Pond. A 10 cfs pump station, with an 18-inch diameter discharge pipe, constructed at the existing outlet of Lake Mary Anne and pumping in to the Dude Ranch Pond, would provide Lake Mary Anne greater outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching most floodprone structures around the lake. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be stored and controlled by the expanded Dude Ranch Pond site.

The Lutheran General Hospital Pond Alternative, S3, would be supplemented with an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General

Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir would not only reduce peak flows contributed by the Dempster Avenue storm sewer, but provide additional storage capacity for Lutheran General Hospital Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

The Dee Pipe would be supplemented with an additional sixty inch pipe. This would relieve the restriction in the flow in the current configuration.

This combination of alternatives would create a project that would provide \$124,265 in average annual flood damage reduction benefits representing an 86% reduction in average annual flood damages in the watershed. The greatest portion of these benefits (45%) would be realized in the Lower Prairie Creek portion of the watershed. Existing flood damages along Prairie Creek would be reduced by 92%. Existing flood damages along Lower Farmers Creek would be reduced 75%. Existing flood damages along Upper Farmers Creek would be reduced 70%. This alternative would eliminate flood damages for 57 structures currently located in the 100-year frequency floodplain, including most of the floodprone structures around Lake Mary Anne on Farmers Creek. Project costs of this alternative are estimated at \$3,769,755 including \$987,927 in estimated land rights costs, as detailed on Table 28. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is 0.52 due to many overlapping project benefits for the same floodprone structures.

Exhibit 33: Alternative D7 - Combine Alternatives C4 and S11



Table 28: Alternative D7 - Combine Alternatives C4 and S11 Cost Estimate

Farmer/Prairie Creek							
Alternative D7 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825		
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117		
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
54010504	60" Concrete Pipe	500	Ft	\$255	\$127,500		
20800150	Trench Backfill (Road)	88	CY	\$28	\$2,468		
44000100	Pavement Removal	132	SQ	\$6	\$792		
44100100	Pavement Replacement	132	SQ	\$75	\$9,917		
250****	Seeding/Mulching/Fertilizin	0.05	Acres	\$2,000	\$106		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$29,564		
	Construction Cost				\$2,181,826		
	Engineering (20%) and Construction Supervision (7.5%)				\$600,002		
Alts. S1,S3,S5	Right-of-Way Cost*	976377	SQ FT	\$1	\$976,377		
Alt. C4	Right-of-Way Cost	2310	SQ FT	\$5	\$11,550		
Alt. S8	Right-of-Way Cost**	719920	SQ FT	\$0	\$0		
	Total Project Cost				\$3,769,755		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$218,573		
	O&M (1%)				\$21,818		
	Alternative Average Annual Cost and O&M (1%)				\$240,391		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$20,266		
	Alternative Average Annual Benefits				\$124,265		
	Benefit Cost Ratio				0.52		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	2	14	39
Structures Removed from Floodplain	0	1	2	11	36	50	57

* Estimated cost of securing a permanent flood easement on existing pond.

**\$0.00 Assessed value because of current public ownership.

ALTERNATIVE D8 - COMBINE ALTERNATIVES C8 AND S8

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine additional storage at Belleau Lake with conveyance improvements along lower Farmers Creek. Each of these components are described below.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

Farmers Creek would be widened to 30 feet between the Farmers and Prairie Creeks confluence and Belleau Lake. The Dempster Avenue bridge and a private bridge upstream of Dempster Avenue would be removed and replaced with twenty foot wide Con Span bridges. The Rand Road crossing of Farmers Creek would have an identical third barrel added to the existing double 10 foot by 10.5 foot box culvert structure.

This combination of alternatives would create a project that would provide \$17,259 in average annual flood damage reduction benefits representing an 12% reduction in average annual flood damages in the watershed. Existing flood damages along Lower Farmers Creek would be reduced 37%. Existing flood damages along Upper Farmers Creek would be reduced 11%. This alternative would eliminate flood damages for 6 structures currently located in the 100-year frequency floodplain. Project costs of this alternative are estimated at \$1,791,065 including \$112,500 in estimated land rights costs, as detailed on Table 29. The benefit to cost ratio (B/C ratio) for this alternative is 0.13.

Exhibit 34: Alternative D8 - Combine Alternatives C8 and S8



Table 29: Alternative D8 - Combine Alternatives C8 and S8 Cost Estimate

Farmer/Prairie Creek							
Alternative D8 Cost Estimate Aug 04							
Line				Unit	Total		
Item	Item	Quantity	Unit	Price	Cost		
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651		
	Rebar Removal	31620	Lbs	\$0	\$6,324		
	Concrete Removal	527	CU	\$150	\$79,050		
	New Concrete	8786	Feet^	\$100	\$878,600		
20200100	Excavation	6044	CY	\$11	\$65,880		
250****	Seeding/Mulching/Fertilizing	1.55	Acres	\$2,000	\$3,097		
	Contingencies (15%) and Mobilization (6%) of subtotal				\$216,920		
	Construction Cost				\$1,316,521		
	Engineering (20%) and Construction Supervision (7.5%)				\$362,043		
Alt. S8	Right-of-Way Cost*	719920	SQ	\$0	\$0		
Alt. C8	Right-of-Way Cost	22500	SQ	\$5	\$112,500		
	Total Project Cost				\$1,791,065		
	Alternative Average Annual Cost (5.375% For 50 Years)				\$103,847		
	O&M (1%)**				\$24,747		
	Alternative Average Annual Cost and O&M (1%)				\$128,594		
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531		
	Alternative Average Annual Damages (Direct and Indirect)				\$127,272		
	Alternative Average Annual Benefits				\$17,259		
	Benefit Cost Ratio				0.13		
Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	6	28	64	90
Structures Removed from Floodplain	0	0	1	5	10	0	6

* \$0.00 Assessed value because of current public ownership.

**Does not include demolition charges for O&M on C8.

ALTERNATIVE D9 - COMBINE STORAGE ALTERNATIVE S11 WITH CONVEYANCE IMPROVEMENTS AT RANCHO LANE, DEE ROAD (C7) AND BETWEEN THE CONFLUENCE AND BELLEAU LAKE (C8)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage and conveyance alternatives including construction of a pump station at Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus, modifications to Belleau Lake, culvert improvements on Prairie Creek at Dee Road and Rancho Lane and Lower Farmers Creek conveyance improvements. Each of the components of this alternative are described below.

The Dude Ranch Pond, a 5.4 acre pond located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class I dam structure constructed in the Farmers Creek channel just downstream of the existing pond. A pump station would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne to the Dude Ranch Pond. A 10 cfs pump station, with an 18-inch diameter discharge pipe, constructed at the existing outlet of Lake Mary Anne and pumping in to the Dude Ranch Pond, would provide Lake Mary Anne greater outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching most floodprone structures. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be stored and controlled by the expanded Dude Ranch Pond site.

The Lutheran General Hospital Pond Alternative, S3, would be supplemented with an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General

Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir would not only reduce peak flows contributed by the Dempster Avenue storm sewer, but provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

Farmers Creek would be widened to 30 feet between the Farmers and Prairie Creeks confluence and Belleau Lake. The Dempster Avenue bridge and a private bridge upstream of Dempster Avenue would be removed and replaced with twenty foot wide Con Span bridges. The Rand Road crossing of Farmers Creek would have an identical third barrel added to the existing double 10 foot by 10.5 foot box culvert structure.

The existing Rancho Lane Culverts would be replaced by two 7 by 6 foot box culverts. This would relieve the restriction in the flow in the current configuration. The channel above and below the culvert would be widened to make this reach of Prairie Creek match the approximate size of the creek upstream and downstream of this reach. The Dee Pipe would be supplemented with an additional sixty inch pipe. This would relieve the restriction in the flow in the current configuration.

This combination of alternatives would create a project that would provide \$126,780 in average annual flood damage reduction benefits representing an 88% reduction in average annual flood damages in the watershed. The greatest portion of these benefits (46%) would be realized in the Lower Prairie Creek portion of the watershed. Existing flood damages along Prairie Creek would be reduced by 97%.

Existing flood damages along Lower Farmers Creek would be reduced 75%. Existing flood damages along Upper Farmers Creek would be reduced 70%. This alternative would eliminate flood damages for 62 structures currently located in the 100-year frequency floodplain, including most of the floodprone structures around Lake Mary Anne on Farmers Creek. Project costs of this alternative are estimated at \$5,589,000 including \$1,160,327 in estimated land rights costs, as detailed on Table 30. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is low (0.34) due to many overlapping project benefits for the same floodprone structures.

Exhibit 35: Alternative D9 - Combine Alternatives C7, C8 and S11



Table 30: Alternative D9 - Combine Alternatives C7, C8 and S11 Cost Estimate

Farmer/Prairie Creek					
Alternative D9 Cost Estimate Aug 04					
Line				Unit	Total
Item	Item	Quantity	Unit	Price	Cost
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651
54010706	PCBC 7X6	28	Ft	\$300	\$8,400
50300225	Concrete Structures	22	CU	\$550	\$12,100
50800105	Reinforcement bars	1070	Lbs	\$1	\$1,070
44000100	Pavement Removal	154	SQ	\$6	\$922
44100100	Pavement Replacement	154	SQ	\$75	\$11,550
54010504	60" Concrete Pipe	500	Ft	\$255	\$127,500
20800150	Trench Backfill (Road)	88	CY	\$28	\$2,468
20200100	Excavation	984	CY	\$11	\$10,726
250****	Seeding/Mulching/Fertilizin	0.33	Acres	\$2,000	\$660
	C7 Contingencies (15%) and Mobilization (6%) of subtotal				\$36,833
	Rebar Removal	31620	Lbs	\$0.20	\$6,324
	Concrete Removal	527	CU	\$150	\$79,050
	New Concrete	8786	Ft^2	\$100	\$878,600
20200100	Excavation	6044	CY	\$11	\$65,880
250****	Seeding/Mulching/Fertilizin	1.55	Acres	\$2,000	\$3,097
	C8 Contingencies (15%) and Mobilization (6%) of subtotal				\$216,920
	Construction Cost				\$3,473,578
	Engineering (20%) and Construction Supervision (7.5%)				\$955,234
Alts. S1,S3,S5	Right-of-Way Cost*	976377	SQ FT	\$1	\$976,377
Alts. C4,C6,C8	Right-of-Way Cost	36790	SQ FT	\$5	\$183,950
Alt. S8	Right-of-Way Cost**	719920	SQ FT	\$0	\$0
	Total Project Cost				\$5,589,139
	Alternative Average Annual Cost (5.375% For 50 Years)				\$324,062
	O&M (1%)***				\$46,260
	Alternative Average Annual Cost and O&M (1%)				\$370,321
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531
	Alternative Average Annual Damages (Direct and Indirect)				\$17,751
	Alternative Average Annual Benefits				\$126,780
	Benefit Cost Ratio				0.34

Table 30 Continued: Alternative D9

Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	0	9	34
Structures Removed from Floodplain	0	1	2	11	38	55	62

*Estimated cost of securing a permanent flood easement on existing pond.

**0.00 Assessed value because of current public ownership.

***Does not include demolition charges for O&M on C8.

ALTERNATIVE D10 - COMBINE STORAGE ALTERNATIVE S11 WITH CONVEYANCE IMPROVEMENTS AT RANCHO LANE AND BETWEEN THE CONFLUENCE AND BELLEAU LAKE

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage and conveyance alternatives including construction of a pump station at Lake Mary Anne, modifications to the Dude Ranch Pond, modifications to the Lutheran General Hospital Pond, construction of a new reservoir on the Maine Township High School campus, modifications to Belleau Lake, culvert improvements on Prairie Creek at Rancho Lane and Lower Farmers Creek conveyance improvements. Each of the components of this alternative are described below.

The Dude Ranch Pond, a 5.4 acre pond located south of Golf Road and east of the Tri-State Tollway, would be enlarged and connected to Farmers Creek to increase upper Farmers Creek storage by 30 acre-feet. Storage in the pond would be controlled by a new 48-inch diameter outlet pipe through a provisional Class I dam structure constructed in the Farmers Creek channel just downstream of the existing pond. A pump station would be constructed on the south shore of Lake Mary Anne to pump water from Lake Mary Anne to the Dude Ranch Pond. A 10 cfs pump station, with an 18-inch diameter discharge pipe, constructed at the existing outlet of Lake Mary Anne and pumping in to the Dude Ranch Pond, would provide Lake Mary Anne greater outlet capacity and prevent 100 year frequency event water levels in Lake Mary Anne from reaching most floodprone structures. The normal pool elevation of Lake Mary Anne would remain unchanged at 632.5. Overflows from the existing IDOT Golf Road interceptor sewer would also be stored and controlled by the expanded Dude Ranch Pond site.

The Lutheran General Hospital Pond Alternative, S3, would be supplemented with an additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new gravity in and gravity out High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General

Hospital property, north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. In this alternative, the High School Reservoir would not only reduce peak flows contributed by the Dempster Avenue storm sewer, but provide additional storage capacity for Lutheran General Pond when flood stages in that pond exceed elevation 636.0 by accounting for overland flow that would back up through the existing outlet pipe at the water tower and back through the junction box into the storage reservoir.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

Farmers Creek would be widened to 30 feet between the Farmers and Prairie Creeks confluence and Belleau Lake. The Dempster Avenue bridge and a private bridge upstream of Dempster Avenue would be removed and replaced with twenty foot wide Con Span bridges. The Rand Road crossing of Farmers Creek would have an identical third barrel added to the existing double 10 foot by 10.5 foot box culvert structure.

The existing Rancho Lane Culverts would be replaced by two 7 by 6 foot box culverts. This would relieve the restriction in the flow in the current configuration. The channel above and below the culvert would be widened to make this reach of Prairie Creek match the approximate size of the creek upstream and downstream of this reach.

This combination of alternatives would create a project that would provide \$124,903 in average annual flood damage reduction benefits representing an 86% reduction in average annual flood damages in the watershed. Existing flood damages along Prairie Creek would be reduced by 94%. Existing flood damages along Lower Farmers Creek would be reduced 75%. Existing flood damages along Upper Farmers Creek would be reduced 70%. This alternative would eliminate flood damages for 62 structures currently located in the 100-year frequency floodplain, including most of the floodprone structures

around Lake Mary Anne on Farmers Creek. Project costs of this alternative are estimated at \$5,360,560 including \$1,148,777 in estimated land rights costs, as detailed on Table 31. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is low (0.35) due to many overlapping project benefits for the same floodprone structures.

Exhibit 36: Alternative D10 - Combine Alternatives C6, C8 and S11



Table 31: Alternative D10 - Combine Alternatives C6, C8 and S11 Cost Estimate

Farmer/Prairie Creek					
Alternative D10 Cost Estimate Aug 04					
Line				Unit	Total
Item	Item	Quantity	Unit	Price	Cost
Alt. S1	Dude Ranch Alternative	1	Each	\$244,825	\$244,825
Alt. S3	LGH Alternative	1	Each	\$227,117	\$227,117
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651
54010706	PCBC 7X6	28	Ft	\$300	\$8,400
50300225	Concrete Structures	22	CU	\$550	\$12,100
50800105	Reinforcement bars	1070	Lbs	\$1	\$1,070
44000100	Pavement Removal	22	SQ	\$6	\$130
44100100	Pavement Replacement	22	SQ	\$75	\$1,633
20200100	Excavation	984	CY	\$11	\$10,726
250****	Seeding/Mulching/Fertilizin	0.33	Acres	\$2,000	\$660
	C6 Contingencies (15%) and Mobilization (6%) of subtotal				\$7,291
	Rebar Removal	31620	Lbs	\$0.20	\$6,324
	Concrete Removal	527	CU	\$150	\$79,050
	New Concrete	8786	Feet^	\$100	\$878,600
20200100	Excavation	6044	CY	\$11	\$65,880
250****	Seeding/Mulching/Fertilizin	1.55	Acres	\$2,000	\$3,097
	C8 Contingencies (15%) and Mobilization (6%) of subtotal				\$216,920
	Construction Cost				\$3,303,359
	Engineering (20%) and Construction Supervision (7.5%)				\$908,424
Alts. S1,S3,S5	Right-of-Way Cost*	976377	SQ FT	\$1	\$976,377
Alts. C6,C8	Right-of-Way Cost	34480	SQ FT	\$5	\$172,400
Alts. S8	Right-of-Way Cost**	719920	SQ FT	\$0	\$0
	Total Project Cost				\$5,360,560
	Alternative Average Annual Cost (5.375% For 50 Years)				\$310,809
	O&M (1%)***				\$44,595
	Alternative Average Annual Cost and O&M (1%)				\$355,403
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531
	Alternative Average Annual Damages (Direct and Indirect)				\$19,627
	Alternative Average Annual Benefits				\$124,904
	Benefit Cost Ratio				0.35

Table 31 Continued: Alternative D10

Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	0	0	0	5	15	34
Structures Removed from Floodplain	0	1	2	11	33	49	62

*Estimated cost of securing a permanent flood easement on existing pond.

**0.00 Assessed value because of current public ownership.

***Does not include demolition charges for O&M on C8.

ALTERNATIVE D11 - COMBINE STORAGE ALTERNATIVES AT GOOD AVENUE POND (S2), MAINE TOWNSHIP HIGH SCHOOL (S5) AND BELLEAU LAKE (S8) WITH CONVEYANCE IMPROVEMENTS AT RANCHO LANE (C6) AND CONFLUENCE TO BELLEAU LAKE (C8)

To achieve flood damage reduction benefits throughout the watershed, this alternative would combine various storage and conveyance alternatives including modifications to the Good Avenue Pond, construction of a new reservoir on the Maine Township High School campus, modifications to Belleau Lake, culvert improvements on Prairie Creek at Rancho Lane and Lower Farmers Creek conveyance improvements. Each of the components of this alternative are described below.

Good Avenue Pond is a 5.9 acre pond located between Church Street and West Emerson Street, west of Good Avenue and is hydraulically connected to Farmers Creek. Storage in the pond is controlled by the culvert under Church Street. To increase the flood storage capacity of this pond, the existing Church Street box culvert inlet capacity would be modified by constructing a three foot high weir at the upstream end of the culvert wing walls. The weir would have a 2-foot diameter opening to pass low flows in the channel. At the elevation of the new weir, the flood storage capacity of the pond would be increased by 18 acre-feet to be used for more frequent events on Farmers Creek. This alternative would increase the retention time of storage used at the Good Avenue Pond. A levee two foot high with 2:1 side slopes and a three foot top width would protect Good Avenue from high flood stages in the pond. Storm sewers entering the pond would be gated to prevent stages in the pond from back flowing into the local sewers.

An additional 50 acre-feet flood storage provided on the Maine Township East High School campus immediately south of the Lutheran General Hospital Pond and Dempster Avenue. Existing soccer fields located on the southeast corner of the Maine Township East High School campus, would be lowered up to 7.5 feet and the sides graded at a slope of 3:1 to create a new reservoir. These athletic fields currently provide some detention for local stormwater runoff. Three soccer fields would still fit in the bottom of the reservoir. A ten foot service road around the perimeter of the area would provide maintenance access to the reservoir. A 60-inch diameter culvert would be installed to connect the new, gravity in and gravity out, High School Reservoir to an existing 60-inch Dempster Avenue storm sewer, tributary to Prairie Creek, on the Lutheran General Hospital property north of Dempster Avenue. The existing Dempster Avenue storm sewer system would be restricted to a 24-inch diameter orifice to force excess storm

water in the sewer to back flow into the new 60-inch diameter culvert and flow to the reservoir on the high school property. This Alternative is intended to greatly reduce peak flows contributed by the Dempster Avenue storm sewer and would control 15% of the Prairie Creek watershed.

Belleau Lake would be lowered 4.2 feet by gravity through a 24-inch diameter outlet pipe at the invert of Farmers Creek at elevation 622.0. This pipe would be gated to allow normal flows to bypass the lake in Farmers Creek. Steep side slopes, exposed along the western edge of the lake by lowered water surface elevations, would be graded at 3:1 slopes for safety and stability. When stages in Farmers Creek reach elevation 626.0, excess flows would enter the lake over a spillway constructed between the lake and Farmers Creek. The lowered lake would be capable of providing up to 52 acre-feet of additional flood storage capacity at the 100-year frequency event.

Farmers Creek would be widened to 30 feet between the Farmers and Prairie Creeks confluence and Belleau Lake. The Dempster Avenue bridge and a private bridge upstream of Dempster Avenue would be removed and replaced with twenty foot wide Con Span bridges. The Rand Road crossing of Farmers Creek would have an identical third barrel added to the existing double 10 foot by 10.5 foot box culvert structure.

The existing Rancho Lane Culverts would be replaced by two 7 by 6 foot box culverts. This would relieve the restriction in the flow in the current configuration. The channel above and below the culvert would be widened to make this reach of Prairie Creek match the approximate size of the creek upstream and downstream of this reach.

This combination of alternatives would create a project that would provide \$92,263 in average annual flood damage reduction benefits representing an 64% reduction in average annual flood damages in the watershed. Existing flood damages along Prairie Creek would be reduced by 90%. Existing flood damages along Lower Farmers Creek would be reduced 73%. Existing flood damages along Upper Farmers Creek would be reduced 69%. This alternative would eliminate flood damages for 49 structures currently located in the 100-year frequency floodplain, including most of the floodprone structures around Lake Mary Anne on Farmers Creek. Project costs of this alternative are estimated at \$4,461,346 including \$816,668 in estimated land rights costs, as detailed on Table 32. Although this alternative eliminates many of the flood damages in the watershed, the benefit to cost ratio (B/C ratio) for this alternative is low (0.31) due to many overlapping project benefits for the same floodprone structures.

Exhibit 37: Alternative D11 - Combine Alternatives C6, C8, S2, S5 and S8

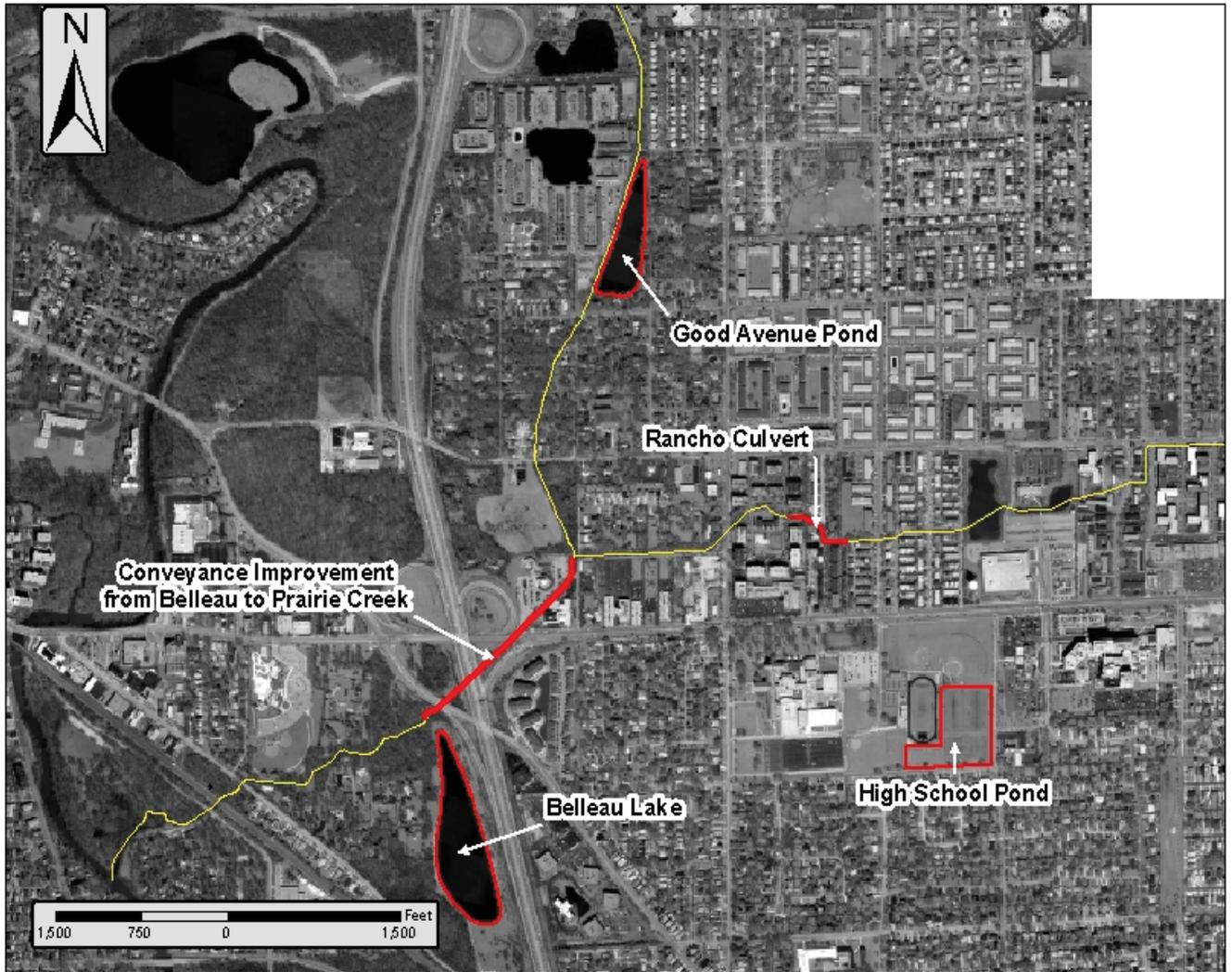


Table 32: Alternative D11 - Combine Alternatives C6, C8, S2, S5 and S8 Cost Estimate

Farmer/Prairie Creek					
Alternative D11 Cost Estimate Aug 04					
Line				Unit	Total
Item	Item	Quantity	Unit	Price	Cost
Alt. S2	Good Ave. Pond Alternative	1	Each	\$27,154	\$27,154
Alt. S5	High School Alternative	1	Each	\$1,472,885	\$1,472,885
Alt. S8	Belleau Lake Alternative	1	Each	\$66,651	\$66,651
54010706	PCBC 7X6	28	Ft	\$300	\$8,400
50300225	Concrete Structures	22	CU	\$550	\$12,100
50800105	Reinforcement bars	1070	Lbs	\$1	\$1,070
44000100	Pavement Removal	22	SQ	\$6	\$130
44100100	Pavement Replacement	22	SQ	\$75	\$1,633
20200100	Excavation	984	CY	\$11	\$10,726
250****	Seeding/Mulching/Fertilizin	0.33	Acres	\$2,000	\$660
	C6 Contingencies (15%) and Mobilization (6%) of subtotal				\$7,291
	Rebar Removal	31620	Lbs	\$0.20	\$6,324
	Concrete Removal	527	CU	\$150	\$79,050
	New Concrete	8786	Feet^	\$100	\$878,600
20200100	Excavation	6044	CY	\$11	\$65,880
250****	Seeding/Mulching/Fertilizin	1.55	Acres	\$2,000	\$3,097
	C8 Contingencies (15%) and Mobilization (6%) of subtotal				\$216,920
	Construction Cost				\$2,858,571
	Engineering (20%) and Construction Supervision (7.5%)				\$786,107
Alts. S2,S5	Right-of-Way Cost*	644268	SQ FT	\$1	\$644,268
Alts.C6,C8	Right-of-Way Cost	34480	SQ FT	\$5	\$172,400
Alts. S8	Right-of-Way Cost**	719920	SQ FT	\$0	\$0
	Total Project Cost				\$4,461,346
	Alternative Average Annual Cost (5.375% For 50 Years)				\$258,672
	O&M (1%)***				\$40,147
	Alternative Average Annual Cost and O&M (1%)				\$298,818
	Baseline Average Annual Damages (Direct and Indirect)				\$144,531
	Alternative Average Annual Damages (Direct and Indirect)				\$52,268
	Alternative Average Annual Benefits				\$92,263
	Benefit Cost Ratio				0.31

Table 32 Continued: Alternative D11

Frequency	1	2	5	10	25	50	100
Existing Damaged Structures	0	1	2	11	38	64	96
Alternative Damaged Structures	0	1	1	1	7	22	47
Structures Removed from Floodplain	0	0	1	10	31	42	49

*Estimated cost of securing a permanent flood easement on existing pond.

**0.00 Assessed value because of current public ownership.

***Does not include demolition charges for O&M for C8.

ALTERNATIVE D12: PRAIRIE CREEK CHANNEL IMPROVEMENTS AND CONFLUENCE RESERVOIR (FORMER ALTERNATIVE 2A-2)

This alternative consist of a 3700 foot long channel improvement along Prairie Creek downstream of Lutheran General Hospital Pond to the confluence of Farmers Creek and culvert replacements at Western, Knight and Simmons Streets. As illustrated in Exhibit 38, the channel improvement consists of a U-shaped concrete lined channel with an 8 foot wide bottom and 4 foot tall sides. A grass lined channel with 3 to 1 side slopes would begin above the concrete channel. This channel would have a top width of approximately 32 feet. The Potter Road crossing would be replaced with a 12 foot wide by 8 foot tall box culvert.

To compensate for the increased discharges generated by the channel improvement, two reservoirs would be constructed at the confluence of Prairie Creek and Farmers Creek. These reservoirs would work in tandem to prevent any increased flood stages on Farmers Creek downstream of the reservoirs. As illustrated in Exhibit 38, the reservoir located in the southwest corner of WJJD Radio property would provide 24 acre-feet of storage while the northeast reservoir would provide an additional 25 acre-feet of storage. These basins would be hydraulically connected by a 36-inch diameter concrete pipe. The bottom of the southwest reservoir would be at elevation 597 and the bottom of the northeast reservoir would be at elevation 595. The grass lined reservoirs would have 3 to 1 side slopes. The alternative is designed to so that floodwater would flow into the northeast reservoir over a 10-foot wide spillway with a crest elevation of 627.8 feet. A 3 cfs pump would dewater the reservoirs when downstream conditions allow.

To improve channel conveyance along Ballard Road in the upper portion of the Prairie Creek watershed, the alternative includes culvert replacements at Western, Knight and Simmons Streets. Existing structures at these crossing would be replaced with 10 foot wide by 5 foot tall box culverts.

Construction costs are estimated at \$5,052,000 and land rights costs are estimated to increase implementation costs by an additional \$1,735,000. Annual operation and maintenance costs are estimated at \$39,600. Assuming this alternative eliminates all damages in the Prairie Creek portion of the watershed (average annual benefits = \$64,240), the alternative yields a benefits to cost ratio of 0.15.

ALTERNATIVE D13: PRAIRIE CREEK CULVERT/SWALE AND CONFLUENCE RESERVOIR (FORMER ALTERNATIVE 2E-2)

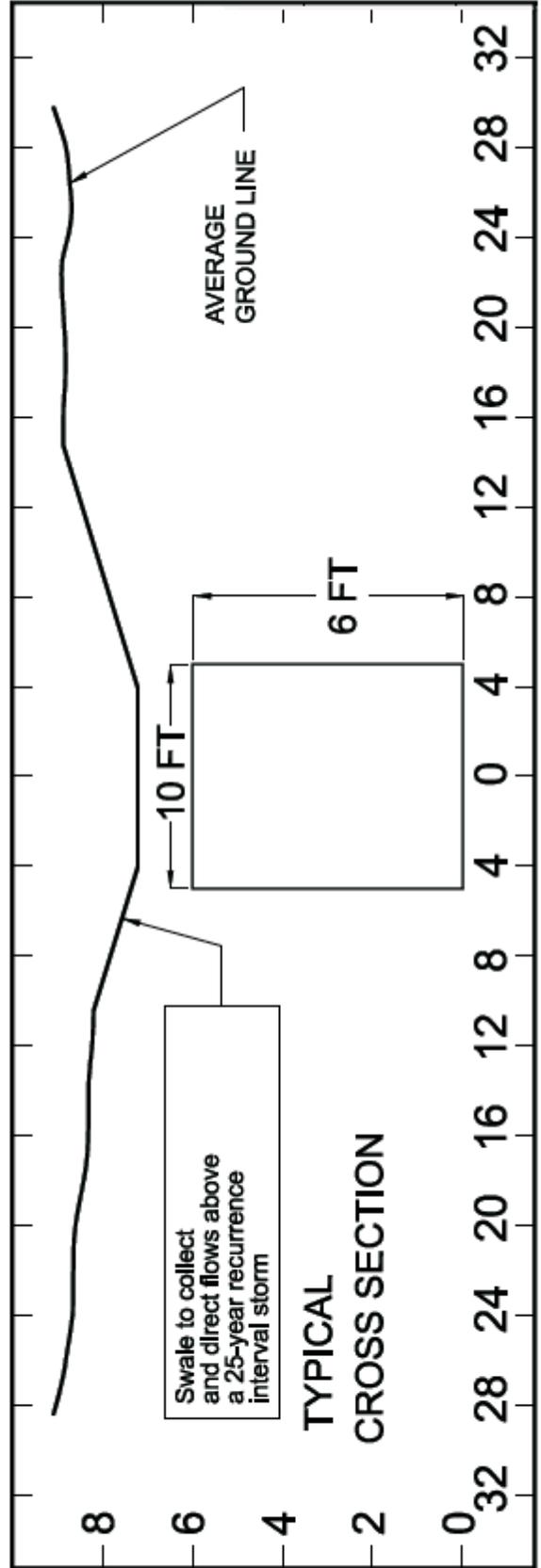
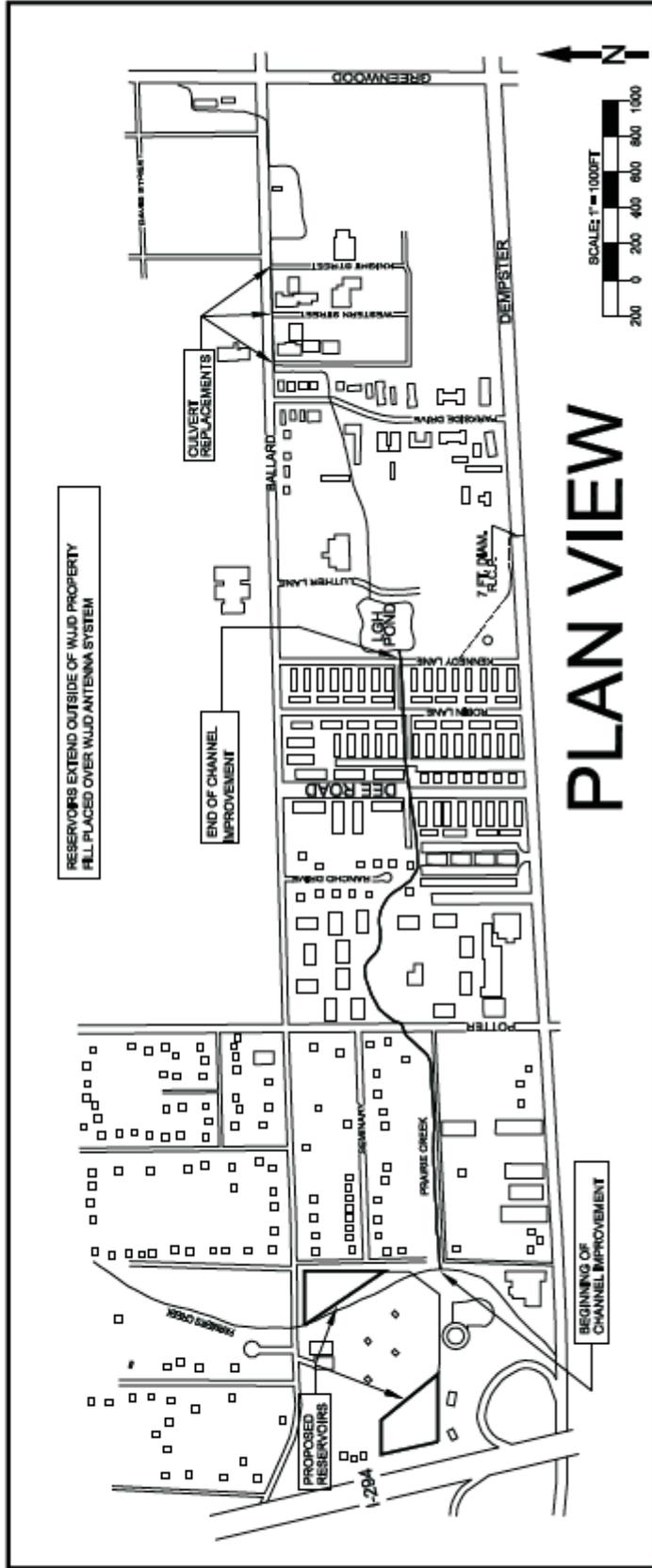
This alternative would consist of a 3700 foot long box culvert and channel improvement along Prairie Creek downstream of Lutheran General Hospital Pond to the confluence of Farmers Creek, and culvert replacements at Western, Knight and Simmons Streets. As illustrated in Exhibit 39, the channel improvement would consist of a 10 foot wide by 6 foot tall box culvert. This culvert would handle approximately a 25-year frequency discharge. A grass lined swale with 3 to 1 side slopes would begin above the box culvert.

To compensate for the increased discharges generated by the channel improvement, two reservoirs would be constructed at the confluence of Prairie Creek and Farmers Creek. These reservoirs would work in tandem to prevent any increased flood stages on Farmers Creek downstream of the reservoirs. As illustrated in Exhibit 39, the reservoir located in the southwest corner of WJJD Radio property would provide 26 acre-feet of storage while the northeast reservoir would provide an additional 25 acre-feet of storage. These basins would be hydraulically connected by a 36-inch diameter concrete pipe. The bottom of the southwest reservoir would be at elevation 597 and the bottom of the northeast reservoir would be at elevation 595. The grass lined reservoirs would have 3 to 1 side slopes. The alternative is designed to so that floodwater would flow into the northeast reservoir over a 10-foot wide spillway with a crest elevation of 627.8 feet. A 3 cfs pump would dewater the reservoirs when downstream conditions allow.

To improve channel conveyance along Ballard Road in the upper portion of the Prairie Creek watershed, the alternative includes culvert replacements at Western, Knight and Simmons Streets. Existing structures at these crossing would be replaced with 10 foot wide by 5 foot tall box culverts.

Construction costs are estimated at \$7,117,000 and land rights costs are estimated to increase implementation costs by an additional \$1,203,000. Annual operation and maintenance costs are estimated at \$55,800. Assuming this alternative eliminates all damages in the Prairie Creek portion of the watershed (average annual benefits = \$64,240), the alternative yields a benefits to cost ratio of 0.12.

ALTERNATIVE 2E-2



File Name: ALTERN2E.DWG

STRUCTURE MODIFICATIONS

The implementation of any non-structural flood mitigation measures to reduce flood damages in Farmers or Prairie Creek floodplain must be considered on a building by building basis. Implementation of any of these measures would require the approval and participation of each individual property owner of a floodprone building, and would not reduce flood discharges through the watershed. This section is intended to address the general feasibility of structure modifications to reduce flood damages.

The success of most of these non-structural flood mitigation measures depends on the structural condition of the building, local soil types, and the depth and speed at which flooding occurs. Therefore, implementation of any such non-structural mitigation measures should be done in consultation with an engineer who is knowledgeable in these areas. Additional information on non-structural mitigation can be obtained from the Illinois Department of Natural Resources, Office of Water Resources and/or the US Army Corps of Engineers.

Acquisition/Demolition

Acquisition and demolitions (also known as buy-outs) include removing the impacted structures and converting the property into public open space that can flood without adverse consequences. This approach is often used for buildings that are difficult to relocate, buildings located in the 10-year floodplain, and buildings that are located along the stream channel and/or in the stream floodway where flooding is frequent and/or likely to cause substantial damage (more than 50% of the structure value) to the building.

Eleven structures within the Farmers and Prairie Creek floodplain are impacted by the 10-year frequency flood event. Of these structures, 5 are detached garages, 5 are condominiums and one is a single family residence. None of the 11 structures located in the 10-year floodplain suffer average annual damages that are estimated to exceed 50% of the value of the structure.

Removal of buildings from the floodway may also improve floodway conveyance through a community and reduce flood profile elevations. Demolition of all structures (17 buildings) in the Prairie Creek Floodway within 150 feet of the south bank of the channel, between Rancho Lane and the Lutheran General Hospital pond, lowers flood elevations in that reach up to 0.16 feet. When multiple adjacent structures are acquired, demolished and the land converted to open space uses such as greenways or parks, a

community can realize additional recreation and environmental benefits beyond flood damage reduction.

Structure Relocation

Relocation of a floodprone building to higher ground above the floodplain is the surest way to reduce flood damages for that building, but is also very expensive. This measure involves raising a structurally sound building with jacks, disconnecting utilities and stabilizing the building, lowering the building onto a wheeled trailer(s), and carefully transporting the building to a new foundation at a new site. Costs for such measures will vary greatly by community, building characteristics, obstructions along the relocation route, the availability of vacant lots in the area, and current land values. The cost of vacant land outside the floodplain in this area may make this flood damage reduction measure cost prohibitive. Generally the costs will increase for heavier structures, such as those with stone or brick exteriors, and for large or irregularly shaped buildings. Additional costs include temporary housing costs, and temporary storage costs for the building contents. The economic feasibility of relocation as a flood damage reduction measure must be considered on a building by building basis

Structure Elevation

Elevation involves raising the floodprone building in place so that its lowest floor is well above the floodplain elevation. Elevation of a building should generally only be considered when the building is located in the floodplain fringe, away from higher flood velocity along or near the stream channel. This measure involves raising a structurally sound building with jacks, extending or relocating utilities and stabilizing the building, lowering the building onto a new or extended foundation, and building access to the building. Buildings can be elevated on several different types of foundations including continuous foundation walls (creating an enclosed space beneath the building capable of flooding through wall vents), piers or earthen fill. Elevating a building in place will allow the structure to remain a part of the existing tax base of a community. Access to an elevated building usually involves the addition of steps or ramps to the building entrance and may render the building inaccessible or unusable during a flood. Basements of an elevated building must be filled in or wet floodproofed.

Costs to elevate a building will vary greatly by building characteristics. Generally the costs will increase for heavier structures, such as those with stone or brick exteriors, and for large or irregularly shaped buildings. Costs to elevate a small frame house

(approximately 1000 square feet) up to 3.5 feet are estimated to be in a range of \$20,000-\$25,000. Costs to raise the same structure 3.5-7 feet are estimated to be in a range of \$25,000-\$30,000. Larger apartment buildings can be raised for approximately double the cost of elevating the small frame house. Eighty-five percent of the floodprone structures in the Farmers and Prairie Creek floodplain sustain less than one foot of flooding at the 100-year frequency event. Additional costs include temporary housing costs, and temporary storage costs for the building contents. This measure may be a viable option for several structures in the watershed, however, the economic feasibility of elevation as a flood damage reduction measure must be considered on a building by building basis.

Flood Insurance

Flood insurance is available to all property owners who reside in a community (city, village or county) participating in the National Flood Insurance Program, but is not available in a standard homeowners or renters policy. When flooding can not be prevented, flood insurance covers losses to buildings and building contents. In addition to mitigating flood losses, the Increased Cost of Compliance (ICC) provision in a standard flood insurance policy will help pay the cost to demolish, relocate, elevate or floodproof a substantially or repetitively damaged building up to \$30,000 (2008). This coverage is in addition to the building coverage for the repair of actual physical damage caused by flooding.

Dry Floodproofing

Dry floodproofing involves sealing a building to ensure that floodwaters do not damage the building or get inside the building. All areas below the flood protection elevation are made watertight including all doors, windows, vents and other building openings. Sewer lines must be fitted with cutoff or check valves to prevent backflow flooding in the building. Most dry floodproofing efforts involve constructing a new brick facing on the building with a sealant sandwiched between the old and new walls. While epoxy and polyurethane can be used to seal brick walls, these products tend to deteriorate over time and not withstand significant water pressure. To be effective dry floodproofing must include an interior drainage system to collect and pump out the floodwaters that leak through the sealant or around shields.

Due to dynamic and hydrostatic forces associated with flooding that can cause walls to collapse, dry floodproofing should only be considered on buildings constructed of

concrete block or brick veneer over wood frame where flood depths are shallow (less than 2 feet). Dry floodproofing is also not generally recommended on buildings with basements or crawl spaces where underseepage and buoyancy forces can result in uplift problems on the building. Dry floodproofing is also not generally recommended for buildings subject to flash floods where ample time is needed to install closure shields. Such measures may work well to protect finished and exposed subgrade areas of floodprone residential structures adjacent to Lake Mary Anne on Farmers Creek.

Wet Floodproofing

Wet floodproofing allows floodwaters inside a building while ensuring that there is minimal damage to the building and contents. Allowing water to enter the building helps offset dynamic and hydrostatic forces associated with flooding that can cause walls to collapse. This measure is only applicable to buildings constructed of material that are not subject to water damage such as concrete block walls. When a building is wet floodproofed, all vulnerable items, such as utilities, appliances and heating and cooling systems must be located above the flood protection elevation. In addition, all electrical outlets must be located above the flood protection elevation. Wet floodproofing is also not generally recommended for building subject to flash floods where ample time is needed to move contents to higher elevations.

ENVIRONMENTAL INVENTORY AND IMPACTS

Coordination with the U.S. Army Corps of Engineers and IDNR, Division of Resource Review & Coordination is necessary to ensure that federal and state laws relative to wetlands, threatened and endangered species, and cultural resources are followed. On November 28, 2001, the Department of Natural Resources, Office of Realty and Environmental Planning, issued environmental clearances (CERP) related to wetlands, threatened and endangered species and cultural resources for the entire Farmers and Prairie Creek watershed. These environmental clearances will need to be updated for any specific project selected for design and implementation.

Wetlands

No wetland impacts are anticipated by the construction, operation and maintenance of any potentially selected alternative defined herein. An exhibit illustrating known wetlands in the watershed, as identified on the National Wetland Inventory Map, is included in as Exhibit 40.

Endangered Species

Completion of any of these alternatives identified in this report are not anticipated to adversely impact any threatened or endangered species. Previous reviews by the U.S. Department of Interior, Fish and Wildlife Service and the Department of Natural Resources of portions of Farmers and Prairie Creek have indicated that no threatened or endangered species were known to occur in the watershed.

Cultural Resources

Based on a 1993, University of Illinois, Cultural Resources investigation on portions of Prairie Creek between Lutheran General Hospital Pond and the Farmers and Prairie Creek confluence, the Illinois Historic Preservation Agency determined that no historic properties, subject to protection under Section 106 of the National Historic Preservation Act of 1966 were present in the surveyed corridor. While further coordination should be completed with the Illinois Historic Preservation Agency for any flood damage reduction alternative selected, no historic properties, subject to protection under Section 106 of the National Historic Preservation Act of 1966, are known to exist in the watershed.



National Wetland Inventory Map

42°32'7"N
 87°52'48"W
 Map Extent
 87°50'21"W
 42°1'60"N



<http://nationalmap.gov/>
 Geographic Coordinate System (WGS84)

CONCLUSIONS

Farmers and Prairie Creeks flooding causes \$144,531 of total average annual flood damages. There are 96 structures located in the 100-year frequency floodplain. Based on the history of recurring Farmers and Prairie Creek flooding and flood damages in the watershed, it is anticipated that substantial flooding and flood damages will continue to occur in Des Plaines, Park Ridge and unincorporated Maine Township unless measures are implemented to prevent such damages.

PARKVIEW LANE (Alternative L1)

Based on the topography of Busse Highway west of Farmers Creek and survey information of the Parkview Lane culvert near Busse Highway, eleven structures are subject to flood damage risk at the 100-year frequency flood event due to the potential for Farmers Creek floodwater to backflow through a small culvert under Parkview Lane near Busse Highway. A flap gate placed on the downstream (east) end of this culvert would greatly reduce the flood damage risk for this area. Since estimated project construction costs (\$7,800) are less than allowable state bond funding limits (\$25,000), state participation in the implementation of this alternative is not possible.

STORAGE

Providing additional flood water storage capacity in the watershed adjacent to Farmers or Prairie Creeks would yield flood damage reduction benefits downstream of the flood storage site. This study evaluated additional flood water storage benefits at the Dude Ranch and Good Avenue Pond on Upper Farmers Creek, at Lutheran General Hospital Pond and on Maine Township East High School property in the Prairie Creek Watershed, and at Belleau Lake along Lower Farmers Creek.

Expanding the flood storage capacity of any one of the existing small ponds in the watershed (Dude Ranch Pond, Good Avenue Pond, Lutheran General Hospital Pond) would reduce flood damages below that pond by 10 to 15% (see Table 8). Creating additional flood storage capacity on Maine Township East High School property in the Prairie Creek Watershed (Alternative S5) would reduce flood damages in the watershed by almost 50% but requires substantial excavation at significant cost. Expanding the flood storage capacity of all of the existing small ponds in the watershed, plus creating additional flood storage capacity on Maine Township East High School property (Alternative S9) would collectively reduce flood damages in the watershed by a maximum of 84%.

Lowering the normal pool elevation of Belleau Lake 4 feet by installing a gravity outlet pipe just above the flowline elevation of Farmers Creek (Alternative S8), provides an economically feasible, and relatively inexpensive, means to provide flood damage reduction benefits (\$16,628) along Lower Farmers Creek. However, the additional expense (\$700,000) to expand Belleau Lake to the north is not warranted for the minimal (\$5023) flood damage reduction benefits that would be derived.

CHANNEL CONVEYANCE

Restrictive culverts under Dee Road and a private driveway off of Rancho Lane greatly contribute to flood damages along Prairie Creek. Improving the channel conveyance at either or both of these locations would provide flood damage reduction benefits along Prairie Creek. However, these improvements would also increase discharges on Lower Prairie Creek and Farmers Creek resulting in increased downstream flood elevations and flood damages over baseline conditions in those reaches. The study shows that each of the channel conveyance alternatives investigated would increase discharges on Lower Prairie Creek and Farmers Creek resulting in increased downstream flood elevations and flood damages over baseline conditions in those reaches. Accordingly, each of the stand alone channel conveyance alternatives were considered unacceptable unless combined with additional flood storage improvements to offset the increased discharge impacts. Unfortunately, the study also shows that combining improved channel conveyance and additional flood storage capacity provides flood damage reduction benefits to many of the same floodprone structures in the watershed thereby increasing project costs without substantially increasing flood damage reduction benefits (see Table 8 - Combination Improvements).

Table 33 provides a break down of estimated project and construction costs as well as potential state and local implementation partnering costs based on the capitalized value of the flood damage reduction benefits for each alternative in the study. This table shows what portion of each alternative's construction costs could be covered by the capitalized value of the flood damage reduction benefits potentially produced by that alternative. The capitalized value of the flood damage reduction benefits exceed the costs to construct addition flood water storage capacity at the Dude Ranch (alternative S1 and S12), Good Avenue Pond (Alterative S2), Lutheran General Hospital Pond (Alternative S3), and at Belleau Lake (Alternative S8).

Table 33 also shows that some of the combined storage alternatives (Alternatives S9 and S11) and some of the combined storage and conveyance alternatives (Alternatives D3, D4 and D7), have capitalized flood damage reduction benefits that exceed 75% of the

costs to construct these improvements. These alternatives may warrant further consideration for jointly (Federal, state and local) funded construction. Alternatives where the capitalized value of the flood damage reduction benefits do not exceed 75% of the costs to construct the improvements may not warrant further consideration for jointly funded construction.

To reduce the risk of flood damages in the watershed, Cook County MWRDGC and/or the city of Des Plaines and/or the city of Park Ridge should:

1. Work with the Illinois Department of Natural Resources, Office of Water Resources to further plan and implement additional flood storage capacity modifications at Belleau Lake, Dude Ranch, Good Avenue Pond, Lutheran General Hospital pond, or a combinations of these sites where the capitalized value of the flood damage reduction benefits exceed 75% the costs to construct addition flood water storage capacity. Such work would be completed in accordance with the terms of a local project sponsorship agreement outlined in this report;
2. Work with the Illinois Department of Natural Resources, Office of Water Resources to further plan and implement combined storage and conveyance alternatives at Rancho Lane and/or Dee Road where the capitalized value of the flood damage reduction benefits exceed 75% the costs to construct the improvements. Such work would be completed in accordance with the terms of a local project sponsorship agreement outlined in this report;
3. Install a flap gate on the downstream (east) end of the 15-inch culvert under Parkview Lane near Busse Highway, and consider raising portions of Parkview Lane and Busse Highway to provide additional freeboard protection against Farmers Creek flooding;
4. Encourage the purchase of National Flood Insurance and enforce local floodplain ordinances in accordance with National Flood Insurance Program guidelines to prevent future floodway encroachments (including temporary storage of equipment and materials), diminish future flood damage potential, and minimize floodplain development in the watershed;

5. Actively remove debris and logs from the Farmers and Prairie Creek to minimize the potential for temporary flood profile increases due to log and debris jams in the channel.

PROJECT SPONSORSHIP

Prior to implementation of a recommended alternative, a local sponsor must agree to participate in the project with the Department of Natural Resources, Office of Water Resources. Cook County MWRDGC and/or the city of Des Plaines and/or the city of Park Ridge could be such a project sponsor. A project sponsorship agreement could be prepared which specifies the duties of each project participant. As a local project sponsor, the local government(s) would agree to obtain all local permits necessary to construct the project, acquire all land rights required for the construction, operation and maintenance of the project, pay for any utility relocations required by the project, operate and maintain the project in a manner determined by the Office of Water Resources, pay any construction costs in excess of those supported by the Illinois Department of Natural Resources and maintain eligibility in the National Flood Insurance Program.

TABLE 33 Farmers and Prairie Creek Flood Damage Reduction Partnering Costs

PLAN DESCRIPTION	TOTAL AAD (DIRECT-INDIRECT)	Annual Benefits	TOTAL COST (INCL. LAND RIGHTS)	Construction Cost Estimate	Capitalized Benefits (2004) (state or federal potential funding)	Capitalized Benefits % of Construction Costs	Local Costs * (lands, construction)	State % of Project Costs	Local % of Project Costs
		\$144,531 Maximum		including engineering and construction supervision					
S1 DUDE RANCH EXPANSION WITH LMA PUMPS	\$99,524	\$45,007	\$691,000	\$377,705	\$775,984	100.0%	\$312,800	54.7%	45.3%
S2 STORAGE AT GOOD AVENUE POND	\$129,684	\$14,847	\$291,000	\$34,622	\$255,983	100.0%	\$256,700	11.8%	88.2%
S3 LGH SAG PIPE & DEWATER									
S7 LMA PUMP TO EXISTING DUDE RANCH POND	\$122,418	\$22,113	\$566,000	\$290,000	\$381,259	100.0%	\$276,000	51.2%	48.8%
S8 EXISTING BELLEAU LAKE	\$115,149	\$29,382	\$590,000	\$345,513	\$506,587	100.0%	\$244,500	58.6%	41.4%
S12 LOWERED NO EXPANSION LMA PUMPS	\$127,903	\$16,628	\$85,000	\$85,000	\$286,690	100.0%	0 **	100.0%	0.0%
S11 COMBINE S1, S4, S8	\$129,099	\$15,432	\$439,000	\$125,311	\$266,069	100.0%	\$312,800	28.7%	71.3%
S9 COMBINE S1, S2, S4, S8	\$22,904	\$121,627	\$3,541,000	\$2,564,635	\$2,097,020	81.8%	\$1,444,000	59.2%	40.8%
D7 COMBINE C4, S11	\$23,087	\$121,444	\$3,832,000	\$2,599,257	\$2,093,865	80.6%	\$1,738,500	54.6%	45.4%
S10 COMBINE S2, S4, S8	\$20,266	\$124,265	\$3,770,000	\$2,781,828	\$2,142,503	77.0%	\$1,627,300	56.8%	43.2%
D6 COMBINE C7, S4	\$52,779	\$91,752	\$3,207,000	\$2,287,104	\$1,581,933	69.2%	\$1,625,400	49.3%	50.7%
S6 BELLEAU LAKE ENLARGED	\$64,374	\$80,157	\$3,173,000	\$2,438,095	\$1,382,019	56.7%	\$1,791,100	43.6%	56.4%
D10 COMBINE S11, C6 & C8	\$122,880	\$21,651	\$709,000	\$708,602	\$373,294	52.7%	\$335,300	52.7%	47.3%
D9 COMBINE S11, C7 & C8	\$19,627	\$124,904	\$5,361,000	\$4,211,783	\$2,153,550	51.1%	\$3,207,000	40.2%	59.8%
D5 COMBINE C2, S8	\$17,751	\$126,780	\$5,589,000	\$4,428,812	\$2,185,865	49.4%	\$3,403,300	39.1%	60.9%
D11 COMBINE S2, S5, S8, C6, & C8	\$85,164	\$59,367	\$2,347,000	\$2,347,000	\$1,023,570	43.6%	\$1,323,600	43.6%	56.4%
2A-2 Prairie Creek U-Channel	\$52,268	\$92,263	\$4,461,000	\$3,644,678	\$1,590,743	43.6%	\$2,870,600	35.7%	64.3%
D8 COMBINE C8, S8	\$82,561	\$61,970	\$6,787,000	\$5,052,000	\$1,068,450	21.1%	\$5,718,600	15.7%	84.3%
2E-2 Prairie Creek Box Culvert	\$127,272	\$17,259	\$1,791,000	\$1,678,564	\$297,569	17.7%	\$1,493,500	16.6%	83.4%
L1 PARKVIEW LANE CULVERT	\$82,561	\$61,970	\$8,321,000	\$7,117,000	\$1,068,450	15.0%	\$7,251,600	12.9%	87.1%
	\$128,656	\$15,675	\$7,800	\$7,800	\$270,259	0 ***%	\$7,800	0 ***%	100.0%

* does not include utility reloc.
 ** already public right-of-way
 *** less than allowable bonds

- C2 - DOWNSTREAM DEMPSTER STORM SEWER DIVERSION TO TOLLWAY
- C4 - ADDITIONAL DEE ROAD PIPE
- C6 - REPLACE RANCHO LANE CULVERTS
- C7 - REPLACE RANCHO LANE CULVERTS AND ADDITIONAL DEE ROAD PIPE
- C8 - CONFLUENCE TO BELLEAU LAKE CONVEYANCE

REFERENCES

1. Huff, Floyd A., and James R. Angel. Frequency Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois, Illinois State Water Survey, Bulletin 70, 1989.
2. Huff, Floyd A. Time Distributions of Heavy Rainfall in Illinois. Illinois State Water Survey, Champaign, Circular 173, 1990.
3. Hydraulic Design of Highway Culverts, U.S. Department of Transportation, Federal Highway Administration, Hydraulic Design Series No. 5, 1989.
4. Flood Insurance Administration, Depth-Damage Tables.
5. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS, River Analysis System, Applications Guide, January 2001.
6. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1, Flood Hydrograph Package, User's Manual, July 1990.
7. Soil Conservation Service (SCS), Urban Hydrology for Small Watersheds, Tech. Release 55, Washington, DC, 1986.
8. National Resource Conservation Service (NRCS), National Engineering Handbook, Section 4, Hydrology, 1969.