

Executive Summary

City of Allen Park

City of Dearborn Heights

City of Ecorse

City of Inkster

City of Lincoln Park

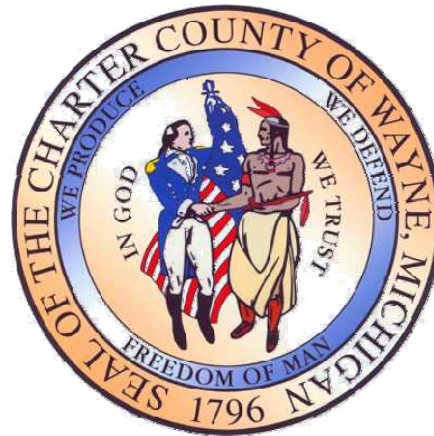
City of Melvindale

City of Taylor

City of Romulus

City of Westland

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Final—April 2008

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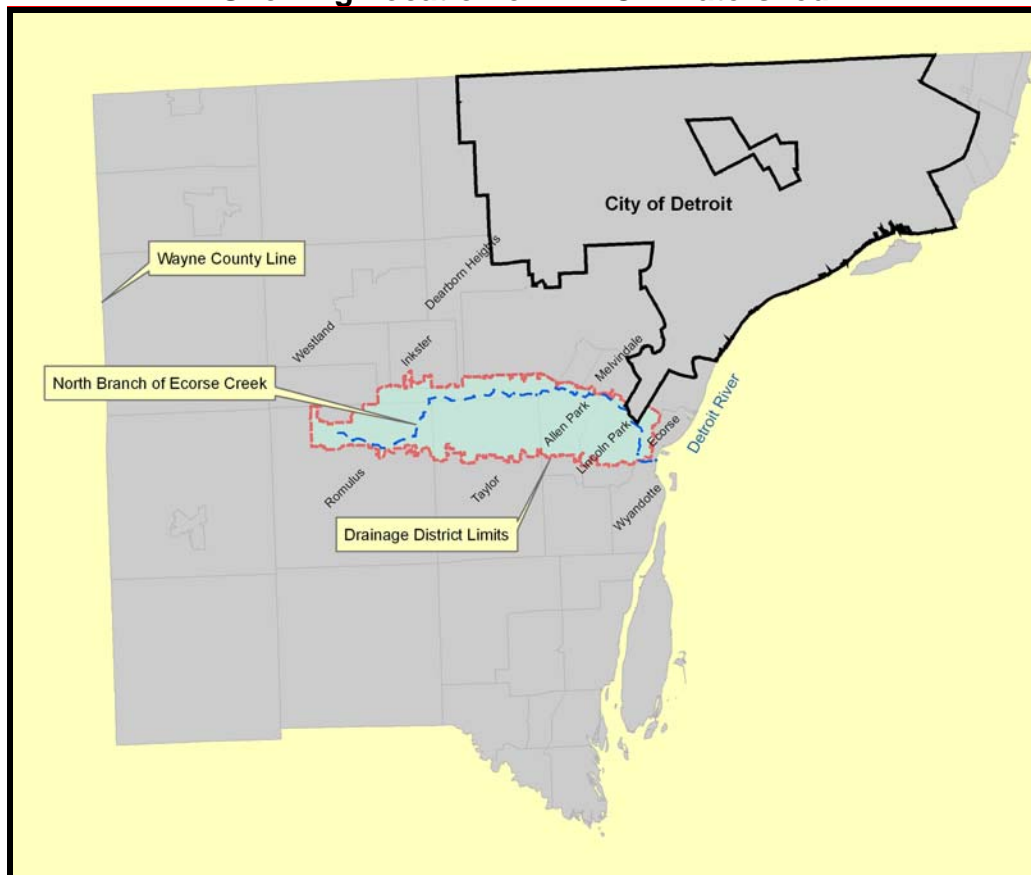
EXECUTIVE SUMMARY

Introduction

The North Branch of the Ecorse Creek Drain (NBECD) is located in Wayne County (metropolitan Detroit area), Michigan. The NBECD is nearly 17 miles long and serves as the primary storm water conveyance channel for a 19,200 acre urbanized watershed. Figure 1 shows the location and the limits of the watershed. The following is a list of the nine (9) cities in the NBECD watershed and their population as of the 2000 U.S. Census:

- Ecorse (population 11,229)
- Allen Park (population 29,376)
- Dearborn Heights (population 58,264)
- Inkster (population 30,115)
- Romulus (population 22,979)
- Lincoln Park (population 40,008)
- Melvindale (population 10,735)
- Taylor (population 65,868)
- Westland (population 86,602)

Figure 1
Map of Wayne County, Michigan
Showing Location of NBECD Watershed



The NBECD is the primary storm water conveyance system for 52,450 properties located within these cities. This includes approximately 48,700 residential properties, 2,980 commercial properties and 770 industrial properties. The watershed also includes three (3) MDOT highways (I-94, I-75, and M-39) and many local roads and railroads.

Flooding along the NBECD has occurred repeatedly over the last 40 years. In a large flood event, it is estimated the NBECD flooding impacts up to 9,100 properties. Repetitive flood damage to property and sewage backups into homes and businesses occur. Flooding of freeways and streets takes place and impacts many people traveling through the area, creating a chaotic atmosphere for the entire region. Flooding along the NBECD has in the past prompted Presidential declarations of disaster in the region. Figures 2 through 4 show pictures of flooding that have occurred at various times along the NBECD.

The flooding that happened in May 2004 prompted the City of Dearborn Heights to petition the Wayne County Drain Commissioner for flood relief. The County Drain Commissioner, in accordance with Public Act 40 of 1956 (Michigan Drain Code), oversees improvement projects for established county drains. The NBECD was established as a county drain in the mid-1800s. The first drainage improvements along the NBECD were made in 1863. Currently, the NBECD is an excavated trapezoidal open drainage channel that was last comprehensively improved in the early 1950's.

In response to the petition for flood relief and in accordance with the Michigan Drain Code, a Board of Determination was convened in December 2004 and heard overwhelming testimony from property owners regarding flooding problems. The Board understood that severe flooding problems exist and that flood relief is necessary. The Board ordered the Wayne County Drain Commissioner to move forward with a flood control project. In response, the Drain Commissioner ordered a flood control study to be completed and a recommendation for a flood control project to be developed. This report is the conclusion of the flood control study and provides a summary of the study and an outline of the recommended flood control project.

Figure 2
Flooding along NBECD – 1979



Figure 3
Southfield Service Drive Flooding – May 2004



**Figure 4
Jackson Avenue Flooding – May 2004**



Flood Control Study Summary

To complete the flood control study, the Wayne County Drain Commissioner, who is also Director of the Wayne County Department of Environment (WCDOE), assembled the Flood Control Study Team, the Technical Committee, and the Policy Committee.

The Flood Control Study Team included an engineering consultant team, headed by Spicer Group, Inc. of Saginaw, MI, and WCDOE engineering and management staff.

The team has completed the seven (7) tasks as listed below:

- Task 1 – Condition Survey
- Task 2 – Hydrologic and Hydraulic Model Development
- Task 3 – Baseline Modeling
- Task 4 – Initial Screening of Mitigation Measures
- Task 5 – Initial Modeling of Mitigation Alternative
- Task 6 – Detail Modeling and Evaluation of Viable Mitigation Alternatives
- Task 7 – Development of Recommended Flood Control Project

Reports describing the effort and conclusion for each task are complete. These reports outline the technical analysis and policy framework by which the flood control study was conducted.

The WCDOE Director facilitated the formation of the Technical Committee and Policy Committee. The committees consisted of representatives from each of the nine (9) municipalities in the NBECD watershed as well as the Michigan Department of Transportation (MDOT), the United States Army Corp of Engineers (USACE), and the members of the Flood Control Study Team.

The purpose of the Technical Committee was to assist in the development and review of flood mitigation alternatives, provide information regarding local conditions, and provide input regarding impacts to local infrastructure. Members of this committee included technical representatives for each of the municipalities and agencies.

The purpose of the Policy Committee was to provide input to WCDOE regarding local acceptability, to advise the WCDOE in the development of flood mitigation alternatives, and to share information with councils, constituents, or other members of the organization. The Policy Committee included local mayors, managers, and decision makers.

The flood control study evaluated 20 flood mitigation alternatives. In the process of evaluating alternatives, twelve (12) meetings with the Policy and Technical Committees were conducted. Discussions regarding the level of flood protection and locally acceptable alternatives were conducted and viable alternatives were established. The Policy Committee members completed a scoring and ranking of the viable alternatives and the top ranked alternative was selected as the recommended flood control project. The following paragraphs summarize the flood control study.

Task 1 – Condition Survey

The objective of Task 1 was to identify existing field conditions along the NBECD and collect data necessary to develop a computer model of the NBECD. The condition survey consisted of visually inspecting the 17 mile long NBECD and was completed in April of 2005. Conclusions of the condition survey include the following:

- The NBECD is primarily a man-made trapezoidal channel.
- The NBECD has 81 drain crossings (bridges and culverts).

- The NBECD has very little base flow and a relatively flat grade.
- Large scale bank erosion and meandering does not exist along the NBECD.
- The majority of the drain traverses through urbanized areas; therefore, a substantial number of buildings and landscaping are in close proximity to the NBECD.
- The conveyance capacity of the drain has been diminished due to obstructions, debris and sediment accumulation in the drain.

Task 2 – Hydrologic and Hydraulic Model Development

The objective of Task 2 was to develop hydrologic and hydraulic computer models to simulate the NBECD. The hydrologic model simulates the storm water runoff process and considers land use, soils, and rainfall. The hydraulic model simulates water surface elevations in the NBECD and considers the channel geometry and physical features.

The computer models developed in Task 2 represent the existing conditions along the NBECD. The computer models were calibrated to the May 2004 storm event and were then used to simulate the extent of flooding along the NBECD for various rainfall amounts, including the 2, 10, and 100 year design storm events. The results of the modeling predict wide scale flooding along the NBECD for each of these design storm events.

Task 3 – Baseline Model Development

The objective of Task 3 was to establish a baseline condition model. The baseline condition model provided a common reference that could be used for comparing flood mitigation alternatives. This provided a way to determine the magnitude of flood reduction each alternative provides and compare flood reduction between alternatives. The baseline condition assumptions are as follows:

- Future land use (built out) conditions exist throughout the NBECD watershed.
- Future built out of currently undeveloped land was completed in accordance with the Wayne County Storm Water Ordinance, including on-site detention requirements.

- The existing drain crossings were free of sediment and obstructions.
- Point specific large scale obstructions did not exist in the channel.

These assumptions were made to ensure that modeling results and comparisons were not skewed by point specific items that could be relatively easily corrected (such as sediment removal) and to ensure that future development was considered in the development of the flood control project.

The baseline condition model was run and the results were compared with the existing conditions model results to understand the impacts of the baseline condition assumptions. The predicted extent of flooding for baseline conditions was very similar to that of existing conditions.

Task 4 – Development and Screening of Flood Mitigation Alternatives

The objective of Task 4 was to identify and screen flood mitigation measures. The basic criteria for flood mitigation measures were to (a) reduce peak flood flow rates, (b) reduce runoff volumes, (c) increase flood conveyance, and/or (d) detain flood flows. Any and all ideas for potential flood mitigation measures were considered. Ideas were obtained from the Flood Control Study Team, Technical Committee, and Policy Committee. Potential measures were screened to determine which measures are viable. The screening criteria included (a) local acceptability, (b) ability to implement, (c) level of service, (d) engineering viability, and (e) environmental impacts. Key conclusions include the following:

- The minimum acceptable level of service for flood control is the 10 year design.
- Managerial storm water best management practices are encouraged but the Drain Commissioner, on behalf of NBECD, does not have the ability to implement all.
- Viable mitigation measures include various channel improvements, crossing improvements, storm water detention, diversions, tunnels and floodplain management.
- An alternative that includes only acquisition of flood prone property is not acceptable (too many properties and too costly of an alternative).

- A “no action” alternative is unacceptable (too many occurrences of large scale flooding in urbanized areas).
- Discharge of the NBECD storm water into adjacent municipal storm, combined or sanitary sewer systems is not acceptable (no additional capacity, increased flow to treatment facilities and possible sewage overflows).
- Reconstruction of the NBECD as a concrete lined channel is not acceptable (too expensive and not environmentally acceptable).
- Enclosure of the NBECD is not acceptable (too expensive and not environmentally acceptable).
- Diversion of storm water to the Huron River (proposed in the 1970’s) is not acceptable (too expensive and adverse environmental impacts).

Task 5 – Initial Modeling and Evaluation of Flood Mitigation Alternatives

The objective of Task 5 was to determine viable flood mitigation alternatives that would be evaluated in more detail. Viable mitigation measures determined in Task 4 were compiled into overall flood mitigation alternatives. Computer modeling and initial evaluation of 13 flood mitigation alternatives was completed and reviewed with the committees. Alternatives were examined and classified as either viable or non-viable. The determination of viable and non-viable alternatives considered factors such as (a) level of flood reduction; (b) constructability; (c) local acceptability; and (d) cost effectiveness. At the conclusion of Task 5, four (4) alternative approaches for flood mitigation were considered viable and were to be evaluated in further detail. The alternative approaches include:

- Alternative 5 & 10 – “Storm Water Detention Intensive” alternative
- Alternative 8 – “Greenway” alternative
- Alternative 12 – “Tunnel to Rouge River” alternative
- Alternative 13 – “Tunnel to Lower NBECD” alternative

Task 6 – Detailed Evaluation of Flood Mitigation Alternatives

The objective of Task 6 was to evaluate the viable flood mitigation alternatives in detail and identify a recommended approach for the flood control along the NBECD. The Greenway Alternative for flood mitigation was ultimately recommended by the Policy

Committee. The recommendation was made after completing the following for each alternative:

- Detailed computer modeling and flood mapping
- Preparation of planning level cost estimates
- Preparation of preliminary property and easement acquisition requirements
- Review of each alternative with Technical and Policy Committees
- Development of a scoring matrix that considered short term, long term and funding of each alternative
- Scoring/ranking of each alternative by the Policy Committee
- Selection of the top scored/ranked alternative as the recommended approach

Task 7 – Development of Recommended Flood Control Project

The objective of Task 7 was the detailed development of the recommended flood control project. Upon selection of the Greenway Alternative, meetings were conducted with each of the nine (9) cities and MDOT to review the recommended flood mitigation alternative and obtain input related to potential conflicts, drain crossing replacement, channel alignment, land acquisition and storm water detention. Based on input, several updates were made and the recommended flood control project was developed. The following paragraphs outline the scope of this project.

Flood Control Project Summary

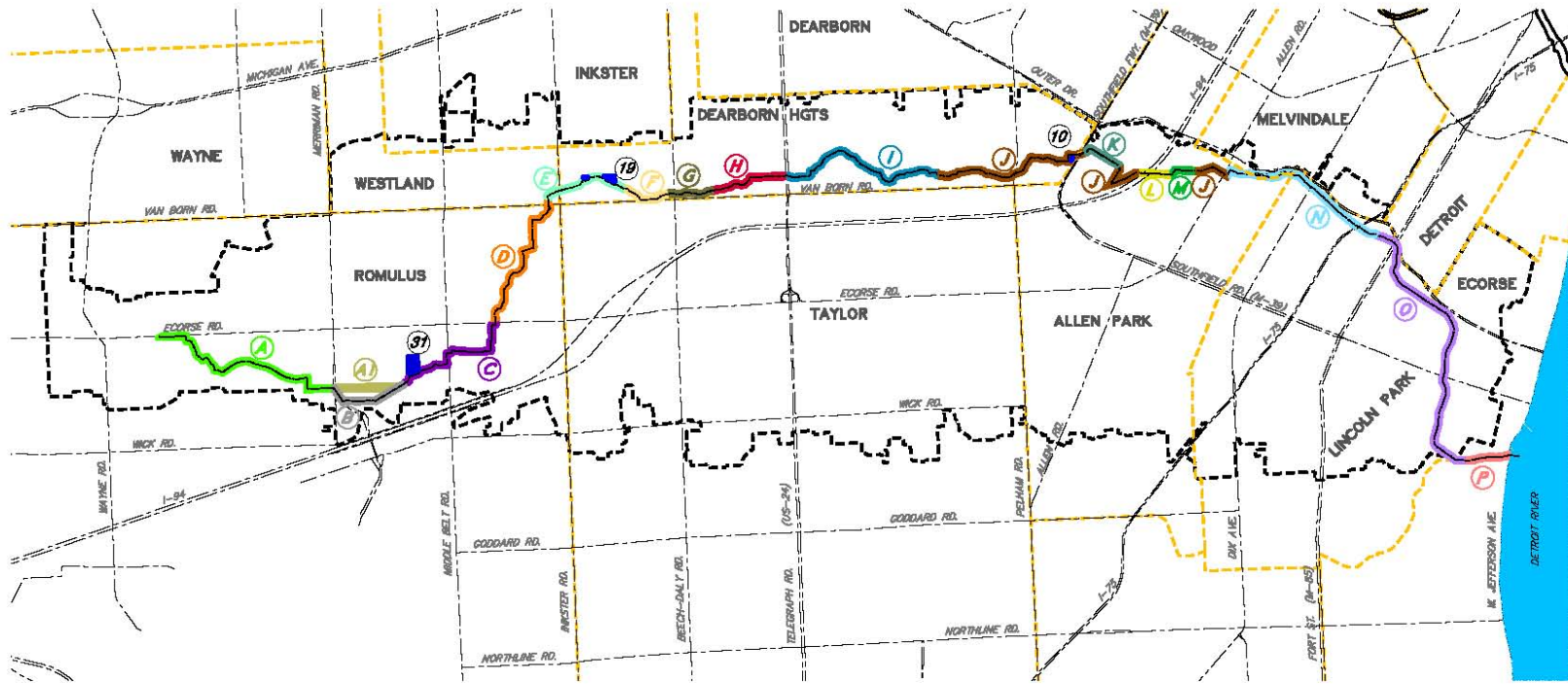
The recommended flood control project, referred to as the “Greenway Alternative” generally consists of reconstructing the open channel, replacing undersized bridges and culverts, installing a parallel drain enclosure near Merriman Road, and constructing three (3) regional storm water detention basins. Figure 5 provides a general schematic of the components of the recommended flood control project.

Figure 5

NORTH BRANCH OF THE ECORSE CREEK DRAIN FLOOD CONTROL PROJECT COMPONENT MAP



COUNTY EXECUTIVE: ROBERT A. FICANO
DRAIN COMMISSIONER: KURT L. HEISE



LEGEND

- (A) - 4' BOTTOM CHANNEL WIDTH
- (A) - PARALLEL DRAIN ENCLOSURE
- (B) - EXISTING DRAIN ENCLOSURE CLEANOUT
- (C) - 6' BOTTOM CHANNEL WIDTH
- (D) - 8' BOTTOM CHANNEL WIDTH
- (E) - 25' BOTTOM GREENWAY CHANNEL WIDTH
- (F) - 50' TO 35' BOTTOM GREENWAY CHANNEL WIDTH
- (G) - 65' BOTTOM GREENWAY CHANNEL WIDTH
- (H) - 70' BOTTOM GREENWAY CHANNEL WIDTH
- (I) - 74' BOTTOM GREENWAY CHANNEL WIDTH
- (J) - 92' BOTTOM GREENWAY CHANNEL WIDTH
- (K) - 87' BOTTOM CHANNEL WIDTH
- (L) - 109' BOTTOM CHANNEL WIDTH
- (M) - 132' BOTTOM GREENWAY CHANNEL WIDTH
- (N) - 45' BOTTOM GREENWAY CHANNEL WIDTH
- (O) - 64' BOTTOM CHANNEL WIDTH
- (P) - 80' BOTTOM CHANNEL WIDTH
- MUNICIPAL BOUNDARY
- DRAINAGE DISTRICT BOUNDARY
- (12) - STORM WATER DETENTION BASINS



Channel Improvements

A key conclusion of the flood control study is that the existing NBECD channel does not provide adequate conveyance capacity to prevent wide-scale flooding primarily because it is too small. It had been established and designed as an agricultural drain, long before urbanization took place.

The flood control project includes channel improvements along the entire length of the NBECD. Channel improvements include constructing a vegetated trapezoidal channel and a two-shelf vegetated greenway channel. Figures 6 and 7 depict the general characteristics of the channel. The drain bottom widths are shown on Figure 5.

Figure 6
Vegetated Trapezoidal Channel

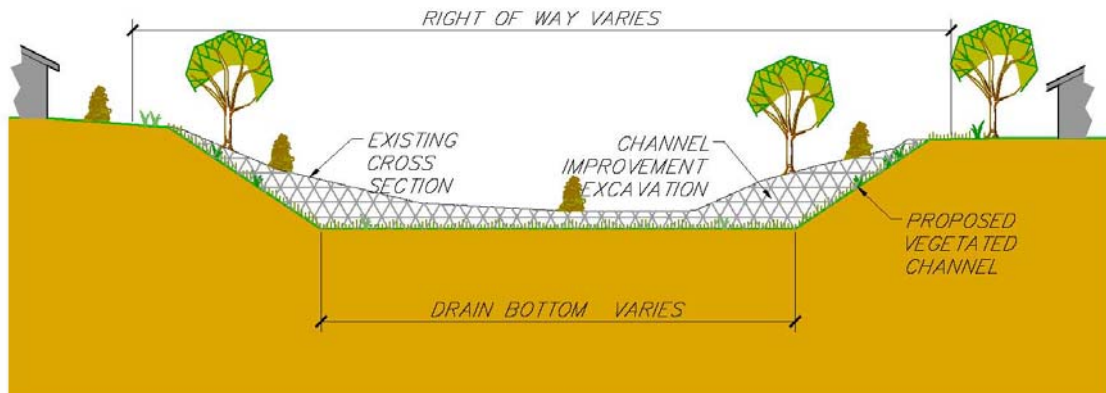
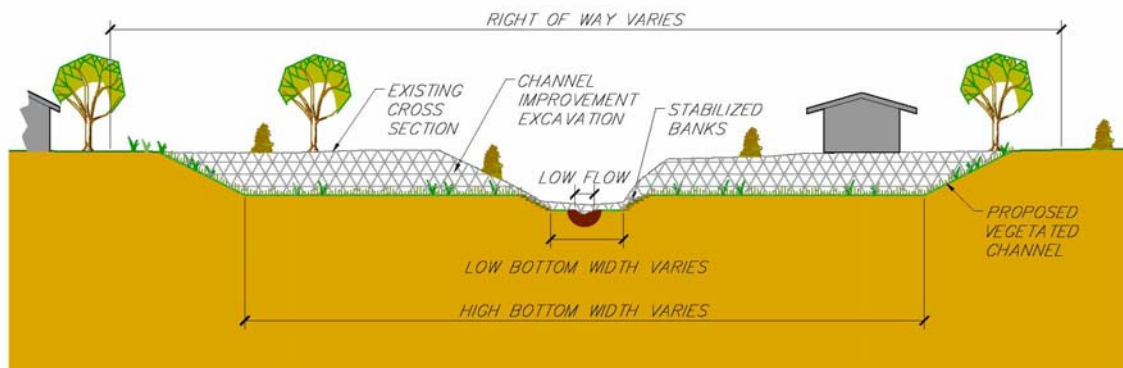


Figure 7
Vegetated Greenway Channel



Drain Crossings Improvements

Drain crossings are bridges or culverts over the NBECD. There are 81 drain crossings consisting of 50 public roads, 8 railroads, 13 footbridges, 9 private drives and one long enclosure. A conclusion of the flood control study is a majority of the crossings must be enlarged and improved to mitigate flooding. The required improvements for each crossing vary based on location. The required drain crossing improvements are summarized as follows:

- 12 existing crossings will remain but will receive maintenance or modification
- 13 crossings will be removed and not replaced
- 53 crossings will be removed and replaced
- 5 new crossings will be installed in areas of drain re-alignment

Storm Water Detention Basins

Storm water detention facilities collect and temporarily store (detain) excess storm water then release it back into the drain slowly. Many potential storm water detention sites were considered in the flood control study; however, as time progressed, several of the sites were included in development plans and had to be removed from consideration. Three (3) remaining basin sites were selected including a large storm water detention facility (Detention Site No. 31) located north of Smith Road between Middlebelt and Merriman Roads in the City of Romulus. This basin is required to be a deep, dry basin with dewatering pumps. A dry basin is required by the FAA due to its proximity to Detroit Metropolitan Wayne County Airport (Detroit Metro Airport). The other two basins (Detention Sites No. 19 and No. 10) are located the City of Dearborn Heights near Inkster Road and Southfield Freeway, respectively. These are smaller and shallower basins that will dewater by gravity.

Drain Enclosure at Merriman Road

A portion of the NBECD near Merriman Road in the City of Romulus is currently enclosed. Since this reach of the NBECD is currently enclosed primarily to provide parking near Metro Airport, it is recommended to keep this enclosure in place and install

a new parallel enclosure to increase the conveyance capacity. The new parallel enclosure would be located along Smith Road.

Drain Relocation in Allen Park

A large-scale relocation of the drain in the City of Allen Park is proposed. This is to reduce the number of homes that must be acquired, and accommodate a sanitary sewer overflow improvement project currently being planned by Allen Park. A storm sewer will be placed in the existing drain to service existing storm water outfalls.

Spoil Deposition

The flood control project is estimated to produce 1.3 million cubic yards of spoils (excavated soil) that must be properly disposed. Two (2) sites have been identified, the Beverly and German Drain sites, located in the City of Taylor.

Utility Relocations

Initial review of utilities confirm that relocation of existing utilities, including public and private utilities, such as gas, water, sewer, pipelines, cable, telephone, fiber optic, electric and streets, will be required.

Predicted Flood Reduction

The recommended flood control project eliminates large scale flooding of the NBECD for the 2 and 10 year design storm, and substantially reduces flooding for the 100 year design storm. Figures 8 and 9 show the expected flood reduction for the 10 and 100 year design storms. The flood reduction shown is directly attributed to the existing inadequacies of the NBECD and does not consider localized problems that may occur due to inadequacies of tributary drains (storm sewers). The areas shown in blue on Figures 8 and 9 represent where NBECD flooding is eliminated. The areas shown in red will still experience flooding; however, they will also experience reduced street flooding depths, flooding duration, flooding severity and flooding frequency.

Figure 8
Predicted Flood Reduction with Implementation of Flood Control Project for 10 Year Design Storm

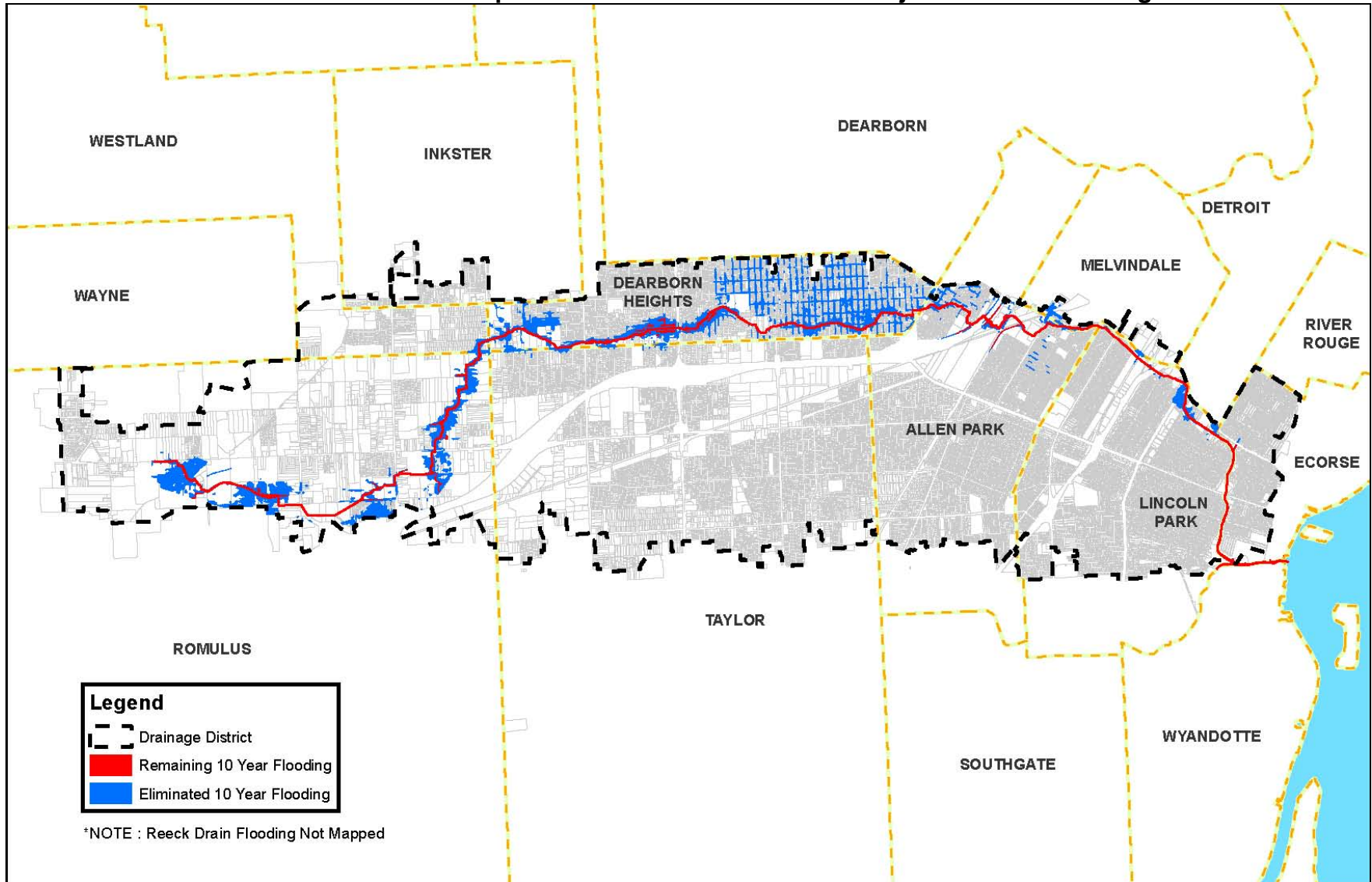
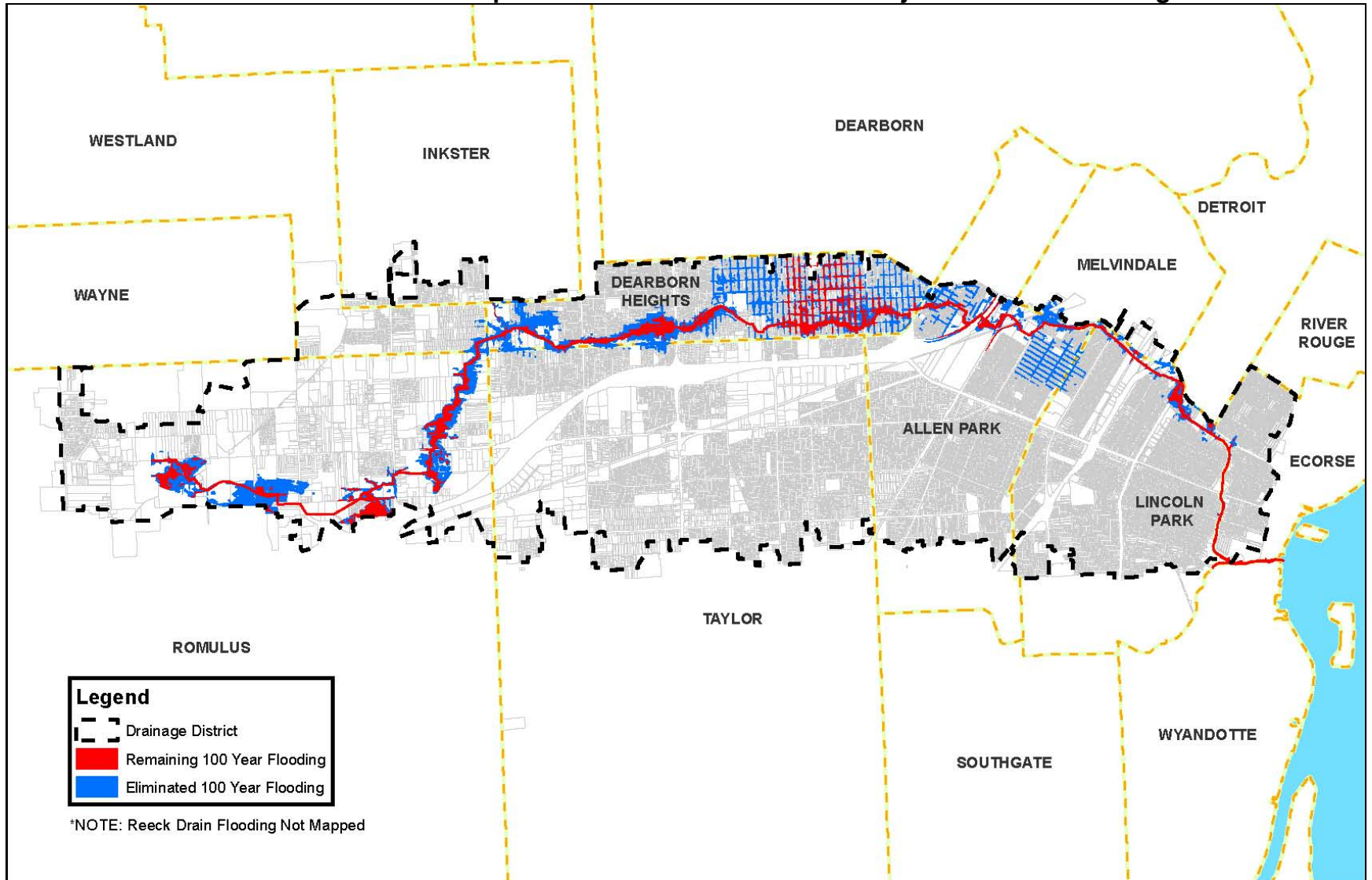


Figure 9
Predicted Flood Reduction with Implementation of Flood Control Project for 100 Year Design Storm



Planning Level Cost Estimate

The current planning level cost estimate of the flood control project is \$239,000,000. This includes construction, engineering, and right-of-way acquisition. Inflation, future price fluctuations, state or federal assistance, and project financing have not been considered. Table 1 provides a summary of the planning level cost estimate.

Table 1
Planning Level Cost Estimate for NBECD Flood Control Project

Planning Level Cost Estimate	
Channel Improvements	\$46 million
Drain Crossing Improvements	\$85 million
Storm Water Detention Facilities	\$6 million
Right-of-Way Acquisition	\$47 million
Professional Services	\$33 million
Contingencies	\$22 million
Planning Level Cost Estimate	\$239 million

Special Assessments

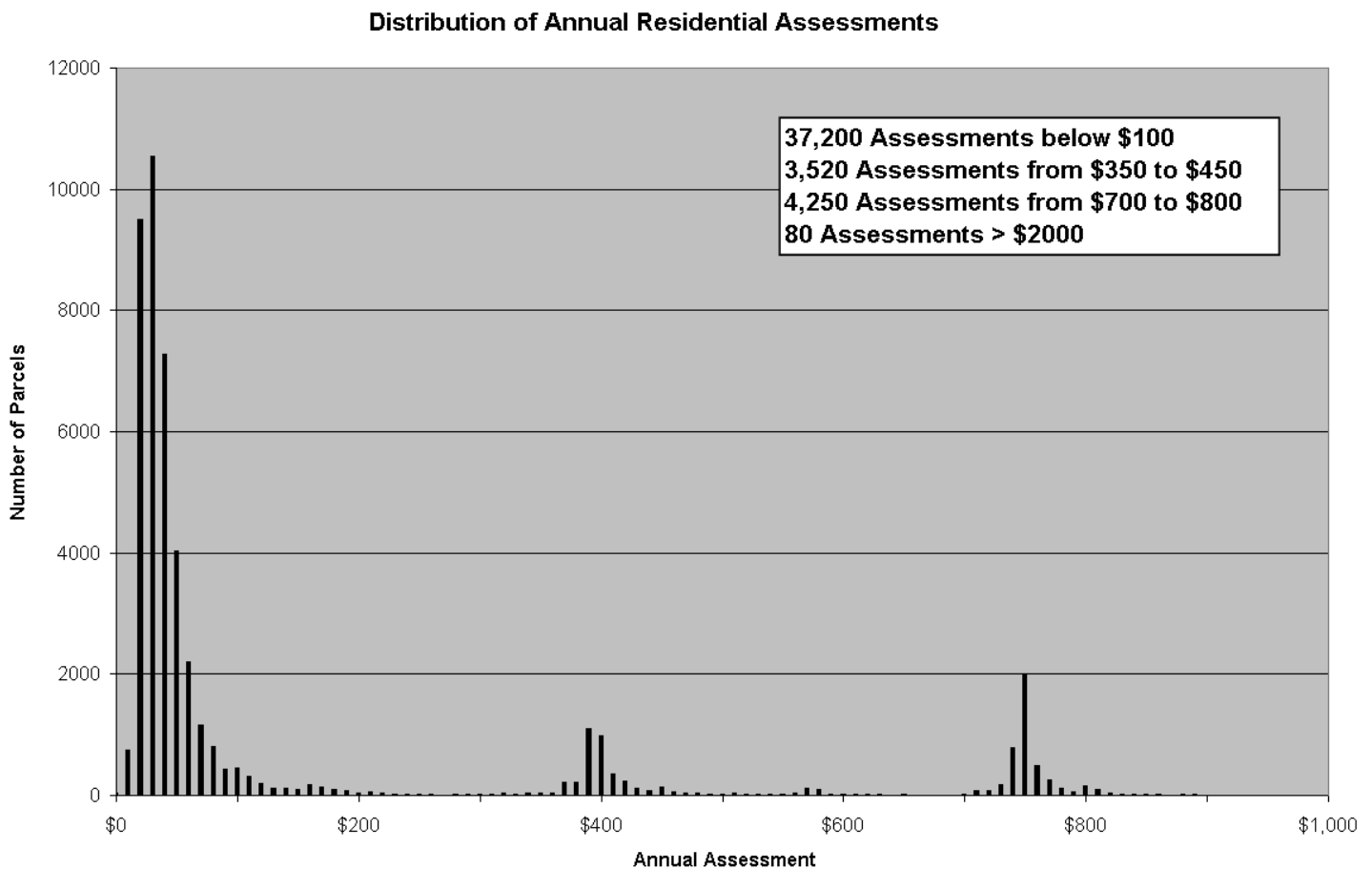
The primary funding mechanisms for the flood control project are (a) assessments to the NBECD Drainage District and (b) obtaining grants or funding. Project costs that are not granted or funded will be assessed to the NBECD Drainage District, in accordance with the Michigan Drain Code.

The NBECD Drainage District (watershed) includes all properties that contribute storm water runoff to the NBECD. Figures 5, 8 and 9 all show the limits of the NBECD Drainage District or watershed. The NBECD watershed is approximately 19,200 acres. The entities within the watershed subject to special assessment include:

- Approximately 50,000 private properties
- Nine (9) municipalities
- Wayne County
- Michigan Department of Transportation
- Four (4) railroad companies

The typical annual assessment for a residential property within the drainage district was estimated assuming no sources of grant funding. The estimated assessment is based on property owners paying for 67% of cost over a period of 30 years and local and state government paying the remainder. The apportioning of cost is based upon calculation of benefits received. In general, these factors tend to apportion the highest cost to large acreage properties that currently flood and the lowest cost to small acreage properties that do not currently flood. The apportionment of cost to each individual property will vary based on the property land use, acreage, location, and estimated flood reduction. The most common annual residential assessment is predicted to be \$30.00. Figure 10 shows the range of the annual assessments for residential properties.

Figure 10
Summary of Annual Residential Property Owners Assessment



Preliminary Project Schedule

The preliminary project schedule to complete the NBECD flood control project is 10 years. The schedule assumes the project will be administered by the WCDOE in accordance with the Michigan Drain Code. Table 2 shows the preliminary project schedule which includes project management, right-of-way acquisition, and engineering design to occur simultaneously. This is recommended to accelerate the project schedule and minimize project costs. Extension of the schedule will result in cost increases.

**Table 2
NBECD Flood Control Project Implementation Schedule**

Phase	Year									
	1	2	3	4	5	6	7	8	9	10
Project Management & Administration	■	■	■	■	■	■	■	■	■	■
Right-of-way Acquisition	■	■	■							
Engineering Design	■	■	■							
Construction Bidding				■						
Project Financing				■						
Construction					■	■	■	■	■	■