SALT CREEK / DUPAGE RIVER WORK GROUP

STREAM DISSOLVED OXYGEN IMPROVEMENT FEASIBILITY STUDY

FOR

SALT CREEK AND EAST BRANCH OF THE DUPAGE RIVER

DRAFT

EXISTING CONDITIONS DOCUMENT

DECEMBER, 23 2005

Prepared by:

HDR Engineering, Inc.
8550 W. Bryn Mawr Ave., Suite 900
Chicago, IL 606031
Job No. 31566

In Association with:

Cochran & Wilken, Inc.
Consulting Engineers & Scientists

Huff & Huff
incorporated

inter-fluve, inc.

TABLE OF CONTENTS

APPENDIX A – FEATURES EXHIBITS (2 SEPARATE FILES)

APPENDIX B – RESERVOIR SEDIMENT STUDIES (SEPARATE FILE)

LIST OF TABLES

LIST OF FIGURES

1.0 EXECUTIVE SUMMARY

The Executive Summary will be completed for Final Draft Feasibility Study.

Please note that this document is the first in a series of documents that will form the Feasibility Study for Improving Stream Dissolved Oxygen in Salt Creek and East Branch of the DuPage River. This document focuses on characterizing existing conditions, and forms the basis for identification of appropriate alternatives and feasibility assessments in later document.

The general table of contents for the full Feasibility Study is as follows:

2.0 EXISTING CONDITIONS

2.1 Introduction

Between 1992 and 1998, Salt Creek and the East Branch of the DuPage River were listed on the Section 303(d) List of Impaired Waters by the State of Illinois. Since then, Total Maximum Daily Loadings (TMDLs) for each of these streams have been prepared by the State of Illinois and approved by USEPA in October 2004. The TMDLs developed for the East Branch of the DuPage River and Salt Creek include discussion of the potential for improving stream dissolved oxygen (DO) by removing existing dams on the streams and/or by constructing and operating in-stream aeration equipment.

The TMDL Report for Salt Creek[1] identifies the Oak Meadows Golf Course dam, the Old Oak Brook dam, and the Fullersburg Woods Dam at Graue Mill. The Old Oak Brook and Fullersburg Woods dams are of particular interest, since they are adjacent to areas where stream DO is expected to be low. In addition, the Salt Creek TMDL identifies impoundments such as George St. Reservoir, Mt. Emblem Cemetery Pond, Veteran's Park Pond, Lake Kadijah, and Itasca Golf Course Pond.

The TMDL Report for the East Branch of the DuPage River[2] identifies the dam at Crescent Boulevard as a potential site where dam removal or aeration of the impoundment would benefit stream DO. Another controlling structure mentioned in that TMDL is at the confluence of Prentiss Creek with the East Branch.

The goal of this study is to determine the feasibility and benefits of the removal or modification of dams, and of the construction and operation of in-stream aeration projects on Salt Creek and the East Branch of the DuPage River to meet the water quality standard for dissolved oxygen. .

This study will identify:

- dam owners and nearby landowners affected by stream improvement projects, along with their interest in accommodating such a project, and a description of the social impacts of stream improvement projects,
- adjacent associated construction needed as part of stream improvement projects (e.g., upstream and downstream stream bank improvements that would be necessary due to altered water levels, adjacent equipment, electrical feed, equipment access for maintenance, etc),
- the appropriate project for specific dam sites, i.e., complete removal, 'bridging,' or some other modification that meets project goals while addressing applicable concerns,
- potential sites where stream aeration equipment would provide an opportunity to raise stream DO to levels where water quality standards would be consistently met,
- applicability of alternative technologies available to provide stream aeration, such as:
    - Mechanical

---

[1] CH2MHILL, Total Maximum Daily Loads for Salt Creek, Final Report, October 2004.

[2] CH2MHILL, Total Maximum Daily Loads for the East Branch of the DuPage River, Final Report, October 2004.

  - Diffused Air
  - Side-stream Elevated Pool Aeration (SEPA)
  - Pure Oxygen Injection (either in-stream or side-stream)
- criteria for selecting technologies appropriate for various sites where stream aeration will resolve water quality issues,
- permitting authorities and required permits and regulatory issues,
- financial impacts, including project capital costs (including sediment removal and disposal costs) and operation and maintenance needs and costs associated with stream improvement projects,
- environmental impact on water quality and stream habitat, in addition to secondary impacts and other community issues such as adjacent land use,
- potential sources of funding for projects, including federal, state, local and private entities,
- other aspects of stream improvement projects that may impact the feasibility of such a project.

2.2 Existing Stream Characteristics

Before evaluating alternatives for improving the DO on both the East Branch of the DuPage River and Salt Creek, it is important to understand the existing stream characteristics. Factors such as stream depth, canopy cover, sediment accumulation, stream bank erosion, riparian zone composition, wetlands, stream slope, and bank heights are all important during the alternative development and evaluation process.

To aid in understanding of the existing stream conditions, reconnaissance of portions of both rivers was completed in October 2005. The reconnaissance focused primarily on the segments previously identified with low DO levels. The Illinois EPA Qualitative Stream Habitat Assessment (SHAP) Procedure was utilized to describe each stream segment based on the observations collected during the reconnaissance. The SHAP index includes factors for:

- Bottom substrate
- Deposition
- Substrate Stability
- Instream cover
- Pool Substrate Characterization
- Pool Quality
- Pool Variability
- Canopy Cover
- Bank Vegetation
- Top of Bank Land Use
- Flow-Related refugia
- Channel Alteration

- Channel Sinuosity
- Width/Depth Ratio
- Hydrologic Diversity

Based on the subjective evaluation, each segment is rated as:

Table 2.1 SHAP Rating

Rating	SHAP Index
Excellent	(≥ 142)
Good	(141 to 100)
Fair	(99 t0 59)
Poor	(< 59)

Both streams can be characterized as urban streams, with low gradients. Channelization is extensive on both streams, although it is more prevalent on the East Branch. Canopy cover in the assessed stretches is limited due to development, resulting in higher summer stream temperatures and establishment of rooted vegetation. Contributions from point sources, including municipal wastewater treatment plant effluents is also significant on both streams, contributing to nitrogen and phosphorus levels which contribute to plant and algal growth.

Channelization, lack of canopy cover, effluent dominated low flows and other factors all contribute to the vegetative growth and subsequent lower early morning DO levels.

2.2.1 Salt Creek

The total drainage area in the Salt Creek Basin is 148.5 square miles, extending through Cook and DuPage County, Illinois. There are 32 suburban municipalities within the drainage basin. Salt Creek empties into the Des Plaines River. There are nineteen sewage treatment plants in the basin, with seven on Salt Creek proper. In addition to the sewage treatment plants, the following combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs) are present within the basin as included in the Salt Creek TMDL report.

Table 2.2 CSO and SSO Locations

Community	#	Discharge Location
CSOs		
Bellwood	8	Addison Creek
Addison	2	Salt Creek
Villa Park	5	Salt Creek
Western Springs	2	Salt Creek
LaGrange Park	3	Salt Creek
Brookfield	7	Salt Creek

Table 2.2 CSO and SSO Locations

Community	#	Discharge Location
SSOs		
Elmhurst	12	Salt Creek
Villa Park	1	Salt Creek

The IEPA rates the water quality as “fair” in Salt Creek, with non-point source pollution, channelization and habitat changes identified as the primary sources of the “fair” quality.

Selected published flows for Salt Creek are listed below:

Table 2.3 Salt Creek Flows

Location	7-Day 10-Year, Low Flow, cfs	Harmonic Mean, cfs
Above Elmhurst	36	55
Below Elmhurst	45	74
Western Springs	38	81
Above Addison Creek	36.5	84
Entering Des Plaines	37	100

Sources: Singh, K.P. and G.S. Ramanurthy, “Harmonic Mean Flows in Illinois Streams” ISWS and Contract Report 521, Dec. 1991.

Singh, K.P. and G.S. Ramanurthy, “7-Day, 10-Year Low Flows in Northeastern Illinois, ISWS Contract Report 545, January 1993.

A diel DO study on Salt Creek by the IEPA in 1995 revealed DO levels below 5 mg/L between RM 20 and RM 12, or for approximately an eight mile stretch, and again in the last three stream miles. The first stretch extends from North Avenue to the Fullersburg Woods Dam in Hinsdale. The final stretch is from Maple Avenue between LaGrange Park and Brookfield, downstream of the Addison Creek merger with Salt Creek. Addison Creek’s poor water quality contributes significantly to the low DO readings in the last three miles of Salt Creek.

The slope of Salt Creek in the critical stretches is relatively flat, with many reaches having a drop of less than 1 foot per 1,000 feet. The steepest drop occurs between River Mile 17.5 and 16.8, where a drop of 4 ft occurs over a 3,000 ft stretch, between below Route 83 and above Butterfield Road (Salt Creek TMDL Report). Slope is critical as the stream velocity is influenced by the slope, and stream re-aeration is influenced by the velocity. In stretches where re-aeration is low (due to flat terrain), maintaining minimum dissolved oxygen levels becomes more difficult.

A reconnaissance of Salt Creek was completed on October 13, 2005, during a period of low-flow conditions, from the Addison North Wastewater Treatment Plan (RM 22.6) to

Graue Mill (RM 10.7). Figures 2.1 to 2.8 in Appendix A present a description of the findings. A description of each segment is provided below:

Addison N WWTP (RM 22.6) to Addison S WWTP (RM 20.9)

This 1.7 mile stretch has a SHAP score of 60, or fair aquatic habitat. Water depth ranged from 0.6 ft to 2.0 ft, with predominantly a silty-sand substrate until below Lake Street (RM 21.7) where the depth increased to 3.1 to 3.5 ft. The substrate in this pool area is predominantly silt. A concrete "curb" dam is present at RM 22.1, just upstream of Lake Street, and log jams are backing up flow at Lake Street.

Wildlife observed in this stretch included great blue heron, mallards, king fisher, and beaver. Good floodplain habitat existed through much of the reach, with shallow bank heights and moderate stream bank erosion. The creek has some meanders in this stretch. North of Lake Street, the riparian zones were wooded with fair to good canopy cover.

Addison South WWTP (RM 20.9) to North Avenue (RM 19.5)

This 1.4 mile stretch has water depths ranging from 0.3 ft where stream bottoms vary from firm clay to silty sand, to pools up to 5 ft deep with firm clay bottoms. Immediately below the Addison South WWTP the water depth was 1 foot, with a gravel bottom. A log jam in this location had an accumulation of duckweed. Stream banks were approximately 5 ft high with virtually no adjoining wetland areas. Just above North Avenue, soft sediment, 6 inches in depth was present on the inside of the bend, decreasing to 2 inches of soft sediment in the center. Canopy cover in this stretch was relatively good.

The SHAP score improved in this stretch to 96; however, still in the "fair" habitat range. This stretch had fair canopy cover, several riffle run complexes and undeveloped riparian zones. This stretch was relatively unchannelized and had good stream sinuosity and habitat diversity. Salt Creek passes through the Cricket Creek Forest Preserve north of North Avenue.

North Avenue (RM 19.5) to Route 83 (RM 18.1)

This 1.4 mile reach includes some long channelized segments and passes a large quarry. A turbid discharge was present adjacent to the quarry. Below the railroad bridge (RM 18.9) to Illinois Route 83 there is a good series riffles and the drop in elevation is more pronounced than the remainder of the creek. There is an oxbow cutoff just above St. Charles Road (RM 18.3). South of North Avenue the water depth starts out between 2 and 3 feet, with up to 4 inches of soft sediment, diminishing to 1 inch of soft sediment in the channelized section without canopy adjacent to the quarry.

The SHAP score in this reach declined to 91, still in the "fair" habitat range. Wildlife observed included great blue heron, king fisher, mallards, and beaver. Instream habitat was fair north and south of the gravel operation. Although the stream was more channelized than the previous stretch, habitat diversity and canopy cover were good, outside of the stretch adjacent to the quarry.

Illinois Route 83 (RM 18.1) to Illinois Route 56 (RM 16.1)

The riffles continue below Illinois Route 83 in 1 to 2 feet of water over a gravel substrate. A large CSO outfall is present at RM 17.9 and two WWTP outfalls (Salt Creek and Elmhurst) are present at RM 17.8 and 17.9, respectively. Water depth generally continues between 1 and 2 ft with a firm bottom. An additional riffle exists at approximately RM 17.2 and two sheet pile dams exist at RM 16.9 (by Jackson Street). Salt Creek narrows above this dam. Below the dam, water depth increases to an average 2.8 ft with 1 inch of sandy silt sediment over stiff clay.

Evidence of beaver and muskrat activity is present below this dam for the next 0.5 miles. Salt Creek above Illinois Route 56 (Butterfield Road) opens into a long wide area, 1 to 2 feet in depth with virtually no canopy cover. The stream velocity is negligible, and rooted vegetation has taken hold in the bottom. This vegetation may have a negative impact on DO during the evening hours due to respiration. Sediment depths are 3 to 4 inches along both shorelines. Closer toward Illinois Route 56, the vegetation in the stream begins to subside, and stream bank heights increase to 10 ft on the west bank and 15 ft on the east bank.

The SHAP score for this stretch, 78, remains in the “fair” range for habitat. The habitat diversity (riffle/run/pool), canopy cover and instream habitat are good in the northern half of this stretch. The southern portion is more channelized with poor canopy cover and poorly vegetated riparian zones.

Illinois Route 56 (RM 16.1) to Interstate Route 88 (RM 14.3)

This 1.8 mile stretch is through developed property in Oak Brook. Below Illinois Route 56, the wide stream run continues, ranging in depth of 1 to 2 feet with a silty gravel substrate. The canopy improves below Illinois Route 38 (RM 15.7), and the creek narrows, and deepens to 2.5 to 3.3 feet. Velocities noticeably increase and the substrate changes to cobbles and sand. Stream bank stabilization has been installed below Illinois Route 38 but further downstream serious bank erosion exists.

Salt Creek turns east at RM 15.1, and deepens to 6 to 7.3 feet. This pool, heavily channelized, has a sand and gravel substrate. As Salt Creek approaches Interstate Route 88 it becomes shallower (4 ft).

The SHAP for this segment declines to 69, still in the “fair” habitat range. Similar to the last stretch, stream habitat quality is greater on the north end. Below Illinois Route 38, the stream has fair canopy cover and wooded riparian zones providing filtration. Near Interstate Route 88, the instream habitat decreased as Salt Creek becomes a large pool with little habitat diversity.

Interstate Route 88 (RM 14.3) to Fullersburg Woods Dam (RM 10.7)

This 3.6 mile stretch has water depth varying from 1 foot to 6 feet. The northern part of this section flows through Oak Brook and Butler National Golf Courses. Between Interstate Route 88 and Cermak Road, Salt Creek is 2.5 feet deep with a mud bottom 2 to 6 feet deep with gravel substrates. As Salt Creek enters the golf course, it deepens to 3 to 6 feet in depth, and the banks are lined with caged rocks. The bottom is generally firm. The stream then enters the Fullersburg Woods Forest Preserve south of 31st Street. The Old Oak Brook Dam is located below 31st Street at RM 12.5. This section has soft sediment to the north and hard clay to the east/south. Serious bank erosion was noted south of 31st Street (RM 12.3). The last 1.5 mile portion of Salt Creek assessed is a long pool with clay bottoms upstream transitioning to softer sediments downstream near Fullersburg Woods Dam (RM 10.7). The last 100 yards of this segment had 1 foot of sediment under five feel of water.

The SHAP for this segment was 55, indicating poor habitat quality. The section had poor habitat diversity, scattered canopy and was mostly deep pools. However, areas with good riparian zones were present south of Butler National Golf Course and within the forest preserves. It should be noted that the only instream wetlands were noted at the south end of this section.

Although the field reconnaissance did not continue from RM 10.7 to RM 0, this reach of Salt Creek is included as part of this Feasibility Study.

2.2.2 East Branch DuPage River

The East Branch of the DuPage River (East Branch) originates near Bloomingdale, Illinois. The East Branch flows approximately 25 miles through DuPage County and the north part of Will County before merging with the West Branch of the DuPage River (West Branch).3 The stream becomes the DuPage River at the confluence west of Bolingbrook, Illinois. The East Branch drainage area is approximately 79 square miles.4

The IEPA has assessed the East Branch as partial support for four of the five segments (GBL 05, GBL 10, GBL 08, and GBL 11) used to evaluate the East Branch.5 Segment GBL 02 has been assessed as full support and is the last segment of the East Branch before the confluence with the West Branch. Causes of the less than full use support assessment include dissolved oxygen, chlorides, total nitrogen as N, habitat and flow alterations, dissolved and suspended solids, phosphorous, sedimentation/siltation, algal growth, and fecal coliform. The sources contributing to impairment include municipal point sources, runoff and storm sewers, development, stream modifications, and upstream impoundments.

Eight sewage treatment plants (STPs) discharge to the East Branch watershed and one industrial user. These point source dischargers are presented in Table 2.4. No combined sewer or sanitary sewer data were available that suggested significant loads originated

---

[3] Healy, R., River Mileages and Drainage Areas for Illinois Streams- Volume 2, Illinois River Basin, USGS, 1979.
[4] CH2MHILL, Total Maximum Daily Loads for the East Branch of the DuPage River, Final Report, October 2004.
[5] IEPA, Illinois Water Quality Report 2004, IEPA/BOW/04-006, May 2004.

from these sources. The sewer network data obtained as part of the East Branch TMDL Report indicated several sewer termination points on the East Branch.

Table 2.4 East Branch Point Source Discharges

Discharger	Receiving Stream	River Mile, mi
Elmhurst Chicago Stone	East Branch	Not Provided
Citizens Utility Company #2 – STP	East Branch	2.8
Quarry discharge	East Branch	4.4
Bolingbrook STP #1	East Branch	5.5
DuPage County Woodridge STP	East Branch	7.5
Downers Grove SD WTC	East Branch (via pipe)	11.5
Glenbard WW Auth - Glenbard	East Branch	15.9
Glenbard WW Auth – Lombard	East Branch	18.8
Glendale Heights STP	Armitage Creek	21.2
Bloomingdale-Reeves WRF	East Branch	23.7

Selected published flows for the East Branch are listed below.

Table 2.5 East Branch Flows

Location	7-Day 10-Year Low Flow, cfs	Harmonic Mean Flow, cfs
Crescent Boulevard	4.0	13
Above Glenbard WW Auth - Glenbard	3.6	33
Below Downers Grove SD	23.6	54
Above Woodridge	25.6	61
Before confluence	38.0	78

Sources: Singh, K.P. and G.S. Ramanurthy, “Harmonic Mean Flows in Illinois Streams” ISWS and Contract Report 521, Dec. 1991.

Singh, K.P. and G.S. Ramanurthy, “7-Day, 10-Year Low Flows in Northeastern Illinois, ISWS Contract Report 545, January 1993.

Dissolved oxygen sampling was previously conducted on the East Branch to identify segments with DO impairment. Data were collected from the Lisle sampling station and during a diel DO study in June and September, 1997. Based on the data, low DO was observed beginning at approximately RM 8 to RM 24. A reconnaissance conducted on October 14, 2005 included most of this reach. The reconnaissance was started at St. Charles Road (RM 19.9) and ended at RM 5.7 where a public boat access was available.

Generally, the East Branch has been highly channelized through developed areas of DuPage County. The stream banks are approximately 3 to 6 feet high for most of the stream length, with the exception of the few areas where the channel flows into a detention pond or wide stream reach. Stream flow velocity is generally slow moving with a few sections where the flow is restricted due to structures. Figures Appendix A present a description of the findings, and specific information for the observed segments is presented below.

St. Charles Road (RM 19.9) to Crescent Boulevard (RM 18.8)

This 1.1-mile segment is the Churchill Woods Forest Preserve. The streambanks are generally undeveloped with the exception of the picnic areas and parking within the forest preserve. The Churchill Woods Forest Preserve segment of the East Branch is an impoundment area created by the spillway (i.e., Churchill Woods Dam) at Crescent Boulevard.

The East Branch within the Churchill Downs Forest Preserve is approximately 500 feet wide and has created a series of islands within the center of the flow pattern. Water depth ranges from one to four feet with the deeper portions immediately upstream of the impoundment. The stream channel substrate leading to the open water habitat is silty sand which turns to soft sediment in the open water areas. The depth of the soft sediment is greater than 2 feet deep in most areas.

Streambank stabilization has been conducted in several areas along the banks in the forest preserve area. There is good riparian habitat in this area. The combined SHAP score for this segment and the next segment is 90 indicating fair habitat quality. Mallards and shorebirds were observed in this area as were recreational fisherman.

Crescent Boulevard (RM 18.8) to Illinois Route 53 (RM 17.4)

This segment of the East Branch is immediately downstream of the impoundment area in the Churchill Woods Forest Preserve. Similar to most of the East Branch, this segment is channelized, with Interstate Route 355 on the east side and a golf course and residential development on the west side. There is poor streambank riparian habitat with little canopy cover. The SHAP score for this segment is 90 (fair quality) and includes the previous 1.1 mile segment of the East Branch.

The water depth in this segment ranged from 6 inches to 2 feet. Two rock dams were observed near the upstream end of this segment with a riffle area downstream of the second rock dam. A second riffle area was observed at the downstream end of this segment near Illinois Route 53. The substrate was generally silty/sandy gravel with cobbles and boulders in the riffle areas.

The Glenbard WW Authority STP discharges to the East Branch at RM 18.8, just on the south side of Crescent Boulevard. Immediately downstream of the STP outfall is concrete channel which outlets to the East Branch from the east. The channel was covered with vegetation growing through the concrete. A sewer outlet was also observed at RM 17.8 originating from under Roslyn Road on the west side of the East Branch.

Illinois Route 53 (RM 17.4) to Illinois Route 56 (RM 14.8)

This 2.6-mile segment of the East Branch has residential development on both the east and west side of the East Branch. Interstate Route 355 parallels the east side of stream at the north side of the segment. The Western Springs Golf Course is located at the south end of the segment and north of Illinois Route 56.

Five wet detention basins have been constructed along this segment of the East Branch. Due to the proximity of the ponds to the East Branch channel, the East Branch streamflow has created a direct hydraulic connection between the stream channel and some of the ponds. The main stream flow now flows through the detention pond immediately north of Illinois Route 38 and the detention pond between RM 16.3 and RM 16.5.

Water depth in this segment varies between less than 6-inches deep to 4 feet deep. The deeper portions are within the detention ponds and immediately downstream of the log jam located in the channel just north of Illinois Route 38 (RM 16.9). Beaver activity was noted along this segment. Water depths were shallow in the channel areas partially abandoned due to the flow alteration into the detention ponds. Substrate consisted of sand and gravel with some silt for the most of the channel areas. The pond areas consisted of soft sediment up to 1.5 feet deep.

The SHAP score for this segment is 89 indicating fair quality. Poor canopy cover along the segment reduces the potential for good habitat quality in addition to the channelized stream. Beaver activity was observed along with mallards and a kingfisher.

A structure which blocked approximately half the stream channel was encountered at RM 16.6. The center portion of the structure had collapsed allowing the stream flow to continue. A riffle area was observed immediately downstream of the structure and near Illinois Route 56. The Glenbard WW Authority – Glenbard STP is located along this segment at RM 15.9.

Illinois Route 56 (RM 14.8) to Interstate Route 88 (RM 12.3)

This 2.5-mile segment of the East Branch includes residential development west of the East Branch and the undeveloped areas of the Morton Arboretum. Illinois Route 53 parallels the East Branch on the west bank from Illinois Route 56 (RM 14.8) to RM 13.0 where the East Branch crosses Illinois Route 53. The East Branch channel is within the Morton Arboretum property for most of this segment.

The East Branch south of Illinois Route 56 is in a poorly defined channel and is approximately 300 to 400 feet wide in some areas. Water depth is less than 6 inches in most places with up to 18 inches of soft sediment. Mussels were found in this area of the stream. Downstream, the stream has been channelized with fair canopy cover. Water depth varied between 6 inches and 4 feet with substrate consisting of sandy silt and gravel.

The SHAP score was 83 indicating fair habitat. Trash and debris was noted throughout the segment, likely due to the proximity to Illinois Route 53. A large log jam was encountered at approximately RM 13.8. Several riffles occurred just upstream of Interstate Route 88. A great blue heron was observed along this segment.

Interstate Route 88 (RM 12.3) to Maple Avenue (RM 10.8)

This 1.5-mile segment of the East Branch is a combination of residential areas and open space, mainly the Lisle Community Park. Downstream of Interstate Route 88 is a rock dam with water depths of 3 feet to 4 feet on either side of the dam. The remainder of the segment ranges in depth from 6 inches to 2 feet. The substrate is generally sand, gravel and cobble. An outfall pipe was observed on the downstream side of the railroad bridge at RM 11.4 on the east bank. (This is assumed to be the Downers Grove SD outfall.)

The SHAP score for this segment is 81. There is poor canopy cover due to stream width and development along the stream banks.

Maple Avenue (RM 10.8) to Hobson Road (RM 8.7)

This 2.1-mile segment of the East Branch has been developed residentially and includes the River Bend Golf Course and the Seven Bridges Golf Course. Water depth ranges from 6 inches to 4 feet deep near the downstream end of the segment. Substrate is sand and gravel with silt. An old bridge structure is located on the upstream side of the Hobson Road bridge, which restricts flow in this area.

The SHAP score for this segment is 89, indicating fair habitat quality. Very little canopy was available. Riffles had been created in the segment within the Seven Bridges Golf Course and several large boulders have been placed within the stream. Mussels were observed downstream of the riffles.

Hobson Road (RM 8.7) to Take Out Point (RM 5.7)

This 3-mile segment of the East Branch is generally undeveloped and is within the Green Valley Forest Preserve. However, a large amount of trash was observed in this segment, especially near the bridges. Water depths range from 6 inches to 4 feet with substrate consisting of fine sediment and gravel. A log jam was encountered at RM 7.2.

The DuPage County Woodridge STP is located at RM 7.5 and discharges to a side stream of the East Branch. An outfall was not visible from the East Branch. A quarry operation is also located at the downstream end of this segment. Two outlet pipes with no flow were observed and a submerged inlet pipe to the facility.

The SHAP score for this segment is 96, which indicates fair habitat quality. This approaches a good habitat quality (SHAP score 141 to 100). There is poor canopy cover along this segment of the East Branch and several areas of bank erosion were observed.

2.3 Dam Site Investigations

Five dams are being assessed in this investigation for the potential to remove or otherwise modify their configuration to provide an increase in dissolved oxygen. Names, locations, and river miles (based on the GIS model) of the structures are listed below in the table.

Table 2.6 Summary of Dams

Stream	River Mile	Name	Bounding Bridges	Nearest Town
Salt Creek	22.9	Oak Meadows Golf Course Dam	D/S: I-290 U/S: Elizabeth Dr.	Wood Dale, IL
Salt Creek	12.5	Old Oakbrook Dam	D/S: Fullersburg Woods Forest Preserve Foot Bridge U/S Oak Brook Rd / 31st St	Oak Brook, IL
Salt Creek	10.7	Fullersburg Woods Dam (Graue Mill)	D/S: York Rd U/S: Fullersburg Woods Forest Preserve Foot Bridge	Hinsdale, IL
EB DuPage	8.75	Prentiss Creek / EB DuPage Dam(s)	D/S/: Hobson Rd. U/S: Summerhill Dr	Woodridge, IL
EB DuPage	18.9	Churchill Woods Dam	D/S Crescent Blvd. U/S: St. Charles Rd.	Lombard, IL

The River Miles reported in the above table and throughout this report were generated from a GIS model along Salt Creek and the East Branch of the DuPage River. This GIS model closely follows the existing stream centerlines, and as a result, is different than river miles published by others. The length of stream is very critical for evaluating water quality, so the most accurate representation of this parameter as generated by the GIS model is being used for this study.

2.3.1 Oak Meadows Golf Course Dam

Year Constructed: unknown

Owner: Forest Preserve District of DuPage County

Dimensions: 30’ (b/w abutment edges) / about 2’ of head at normal flow

Type: Run of the River, Gravity Dam

Purpose: Irrigation

The site was visited in early November and a survey of the dam and channel profile was conducted as well as a characterization of the amount of deposited material upstream of the dam. Joe Reents, the Oak Meadows Golf Course Superintendent was present on site. He indicated the structure was used historically for irrigation, but now the course has constructed a gravity fed pond to accomplish this task and no longer needs the dam for this purpose.

The Structure: The dam spillway appears to be an all concrete structure. The abutments are 2’ thick concrete walls with a mixture of materials used as fill. The dam appeared to be in a slightly degraded condition. The left abutment was clearly leaning downstream, and significant cracks have developed in the concrete (Figure 2.1). Previous measures had been taken to correct the problem using reinforcing steel tie rods, anchored to the upstream abutment wall. The same problem and mitigation measures occurred in the right abutment but the wall did not appear to be leaning.

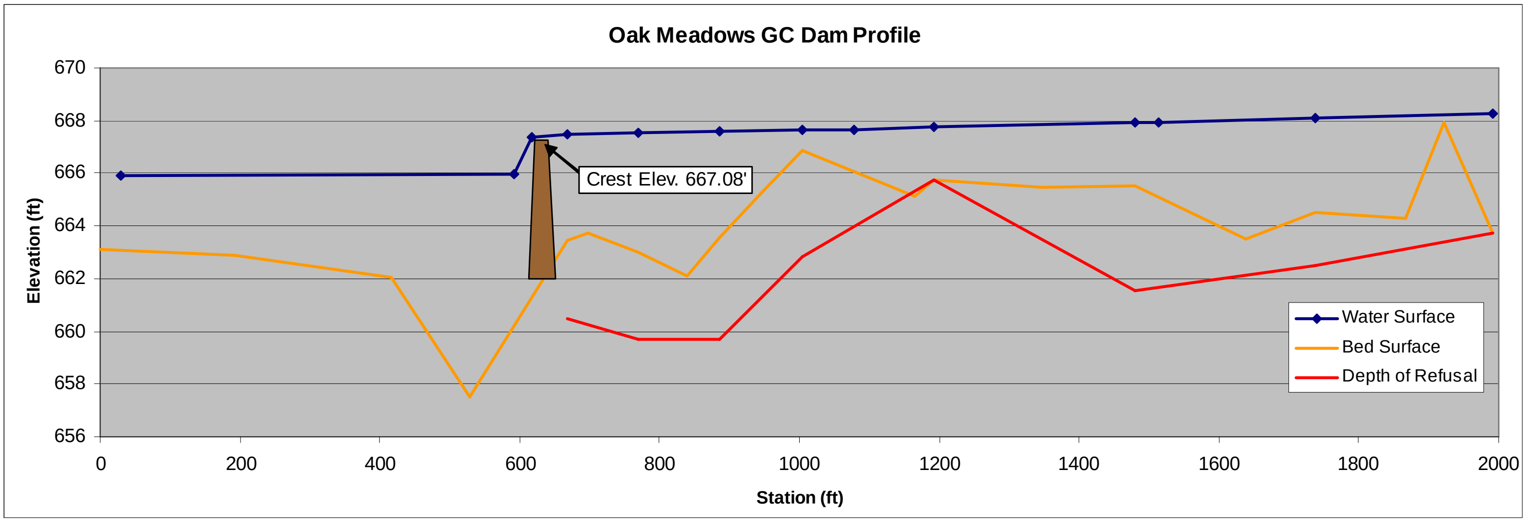
There is a 36” culvert pipe located on the left side of the structure which was clogged on the day of survey with debris. This pipe could provide the means to lower the water surface below the weir elevation of the structure, assuming the capacity was not exceeded by the discharge of the creek at the time.

Figure 2.1: Left abutment, significant crack

Figure 2.2: Mature tree compromising left training wall

Figure 2.3: View of left abutment and culvert, the steel gate can be seen in the upper right

Sediment: An investigation into the amount of sediment upstream of the dam indicated an average of about 2 feet of material in the channel. A total of nine cross sections were taken beginning just upstream of the dam and extending upstream. Detailed cross sections and locations can be seen in Appendix B. Below is a profile of the survey through the structure.



Sediment has accumulated in areas of low velocity within the stream and is not uniform in its distribution. All of the material consists of semi-consolidated fines. Storage of material within the small impoundment is still occurring as evidenced by the deposition of material in front of recently installed a-jack bank protection measures.

Hydraulic Impact: Although not specifically evaluated, because of the low elevation of the structure, the hydraulic impacts to storm water storage during flood events are expected to be minor. However, at low flows, the dam maintains a fairly constant pool elevation upstream of the structure that persists for quite a distance because of the low gradient.

2.3.2 Old Oak Brook Dam

Year Constructed: ca. 1920's

Owner: Village of Oak Brook

Dimensions: Primary Spillway = 65' / about 3' of head at normal flow

Type: Run of the River, Gravity Dam – with emergency spillway

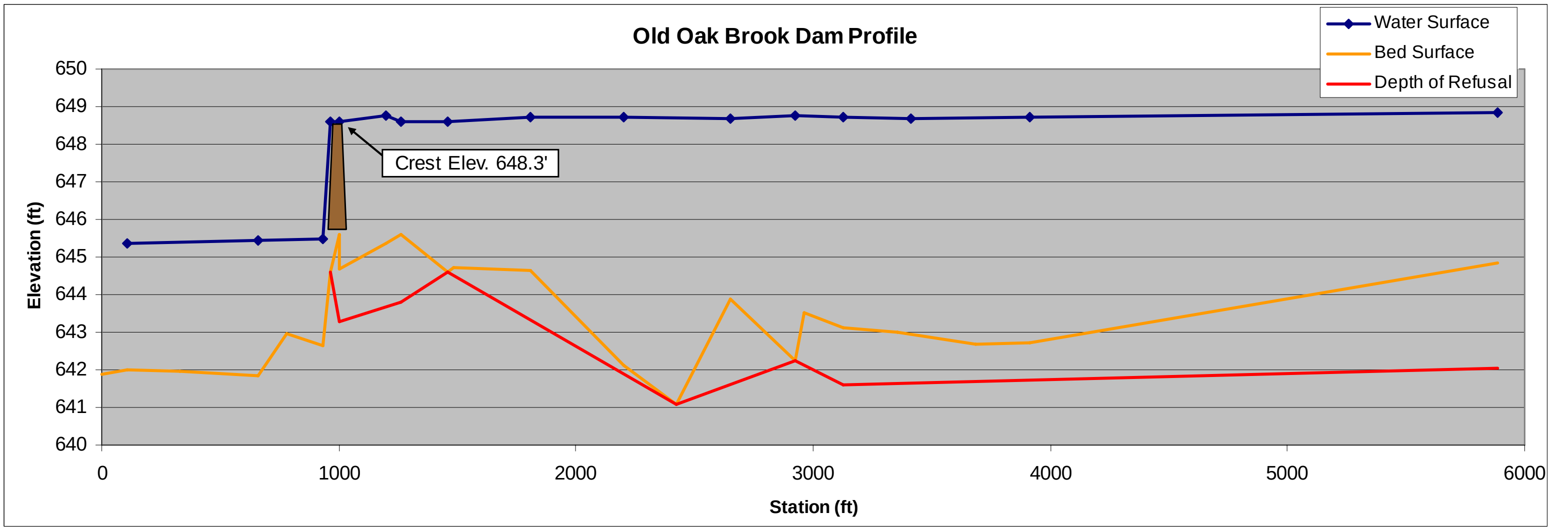
Purpose: Aesthetics

The Old Oak Brook Dam is reported to have been constructed by Paul Butler largely to maintain an aesthetic pool through his property holdings during low flow periods on Salt Creek. The dam has remained while the character of the landscape around it has changed dramatically. Hydraulic studies conducted by Christopher Burke Engineering in 1989 indicated that the dam provides little if any mitigation during flood events. Further, residents report that the dam frequently becomes submerged completely during flood events.

Removal of the structure was investigated in 1989 and discouraged due to unknown reasons. A documented letter from the Butler National Golf Course (upstream of the dam) did indicate a strong willingness to leave the dam in place and preserve water levels through the golf course, but no other discussion on the merits or detractions of removal was readily found. More detailed conversations on the topic with representatives from the Village of Oak Brook and other stakeholders will be pursued during this project.

The Structure: The original structure of the Oak Brook Dam has undergone major rehabilitation over the last 20 years. There are two main components to the Oak Brook Dam, the fixed elevation spillway and a gated "emergency" spillway section. The gated spillway section consists of two steel vertical slide gates, newly rehabilitated in 1992. The primary spillway consists of grouted stone with a concrete cap (no info on when the concrete cap was applied). The condition of the cap could not be determined on the day of the survey. Areas of the grouted stone spillway have eroded on the downstream face, leaving an irregular geometry. A report by STS Consultants indicated a concrete filled fabric-form mat had been applied to the upstream face of the structure in the early 1980's. The left and right training walls consist of grouted stone and reinforced concrete, overlain to a larger extent by concrete filled fabriform mats.

Sediment: Seven cross sections were sampled upstream of the dam to quantify the amount of sediment upstream (details are included in Appendix B). An average of about 1 foot of material was found upstream of the dam, with the largest accumulation just upstream of the left training wall. It is not known how often the sluice gates are opened on the structure but sediment upstream of this inlet was minimal, while downstream, fines had accumulated in the sluice gate channel. Most of the material immediately upstream of the dam was cohesive fines but it quickly coarsened to sands near the 31st St. bridge. There was not an excessive amount of material accumulated behind the dam.



Hydraulic Impacts: Hydraulic computations compiled by a number of studies indicate that the backwater effect of the dam stretches up to approximately 31st street during small flood events (<10 yr event) and 22nd street during events higher than a 10 yr event. The storage provided by the dam is minimal.

2.3.3 Fullersburg Woods Dam

Year Constructed: Initial construction ca. 1850; present configuration by CCC in 1934

Owner: Forest Preserve District of DuPage County

Dimensions: 132' (crest length) / 6.3' Height

Purpose: Power Generation

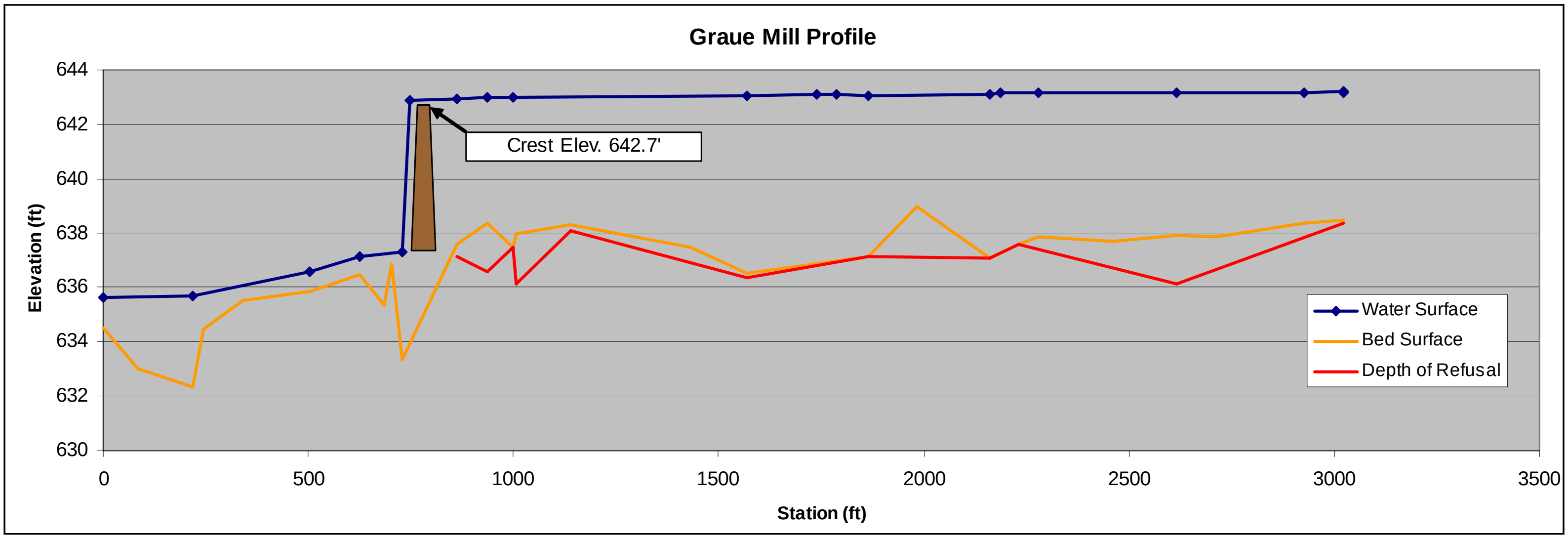
The Structure: There is no information on the original structure constructed in the 1850's at the site. The site was purchased by the DuPage Forest Preserve District in 1933 and in 1934 the Civilian Conservation Corps built the existing concrete structure that stands on the site today. They also constructed the Mill Race which powers the wheel at Graue Mill. In 1991, the Forest Preserve District retained Harza Engineering Company to design a dewatering gate on the North side of the dam which allows for periodic drawdown for maintenance and inspection.

The DuPage County Forest Preserve District gives a detailed and exhaustive accounting of the structure of the dam which is summarized below from a 1991 Maintenance Plan.

- *Concrete Spillway:* The concrete wall is 3' thick supported by a 23' wide concrete footing. A 9' sheet pile wall is installed 9.5' upstream of the concrete footing. The walls key into the earthen abutments on both sides. A 10' long concrete stilling basin prevents erosion on the downstream side of the dam

- *Earthen Abutments:* both abutments are built on a 19' thick layer of hard clay overlain by 10' of dense sand, 3 feet of hard clay, and finally 6' of topsoil on the North abutment, or 5 foot of topsoil over 2 feet of dense silt on the South. Tests for seepage conducted by Harza were negative for both abutments.
- *Millrace Channel and Sluice Gate:* the Mill Race is 10' wide by 210' long and powers the 18' wheel used at Graue Mill. Water control is provided by a sluice gate. Little if any capacity for dewatering exists in this channel.
- *Dewatering Slide Gates:* Three 7'w x 4'h stainless steel slide gates comprise the dewatering portion of the dam. The gates are housed in a reinforced concrete structure located on the North side of the dam.

Sediment: Eight cross sections were taken above the Graue Mill dam; detailed information can be viewed in Appendix B. There was generally 1-2' of deposition along the channel margins with often little to no deposition in the thalweg of the channel. This lack of material is likely due to the impact of a dredging project accomplished in the late 1990s. The channel regains its natural thalweg of coarse material approximately 1200' upstream of the dam. The material that is being transported by the stream is depositing in a point bar just downstream of the bend into the Fullersburg Woods property.



Hydraulic Impacts: The hydraulic impacts of the dam reach through the Forest Preserve District Property upstream but do not continue past 31st St. The removal of the dam would result in a little over 1.0 feet of reduced flood elevation through the 100 year event, according to previous calculations performed by the Forest Preserve District, prior to the new updated FEQ model. In terms of storm water storage, the reservoir provides little capacity and a general consensus among review reports indicates the dam has little value in flood mitigation. Detailed results of the FEQ modeling effort have not been evaluated at this time, though all indications suggest an expected minimal role of the dam in regional storm water mitigation.

2.3.4 EB DuPage / Prentiss Creek Dam(s)

Year Constructed: *1989*

Owner: Village of Woodridge

Dimensions: DuPage Structure: 20' wide at a weir elevation of 643.5'

Prentiss Creek Structure: 10.1' wide at an elevation of 646.0'

Purpose: Flood Control and Mitigation for the 7 Bridges Development

Information is still forthcoming on this relatively young structure. It includes the dams seen above, one across the EB DuPage River and the other across the mouth of Prentiss Creek. Further up Prentiss Creek, 3 grade control weirs provide additional storm water storage up to the intersection of highway 53.

The Structure: The dam is a gravity structure consisting of rock filled gabions covered by a concrete cap. There is no upstream control mechanism for regulating upstream pool elevations.

Sediment: There is little sediment being deposited within the EB DuPage River upstream of the dam, however there is a fair amount of fine material that has settled upstream of the Prentiss Creek structure. A total of 7 cross sections were evaluated through the Prentiss Creek backwaters.

Hydraulic Impacts: Details are forthcoming, however the project was designed to provide flood storage and compensatory mitigation for the associated development so there is most certainly an impact at a range of flood events.

2.3.5 Churchill Woods Dam

Year Constructed: Unknown. Significant improvements were made to the structure as part of the Crescent Blvd. re-design in 1983. Local residents state it was a WPA project, likely built in the 1930s for flood control.

Owner: Forest Preserve District of DuPage County

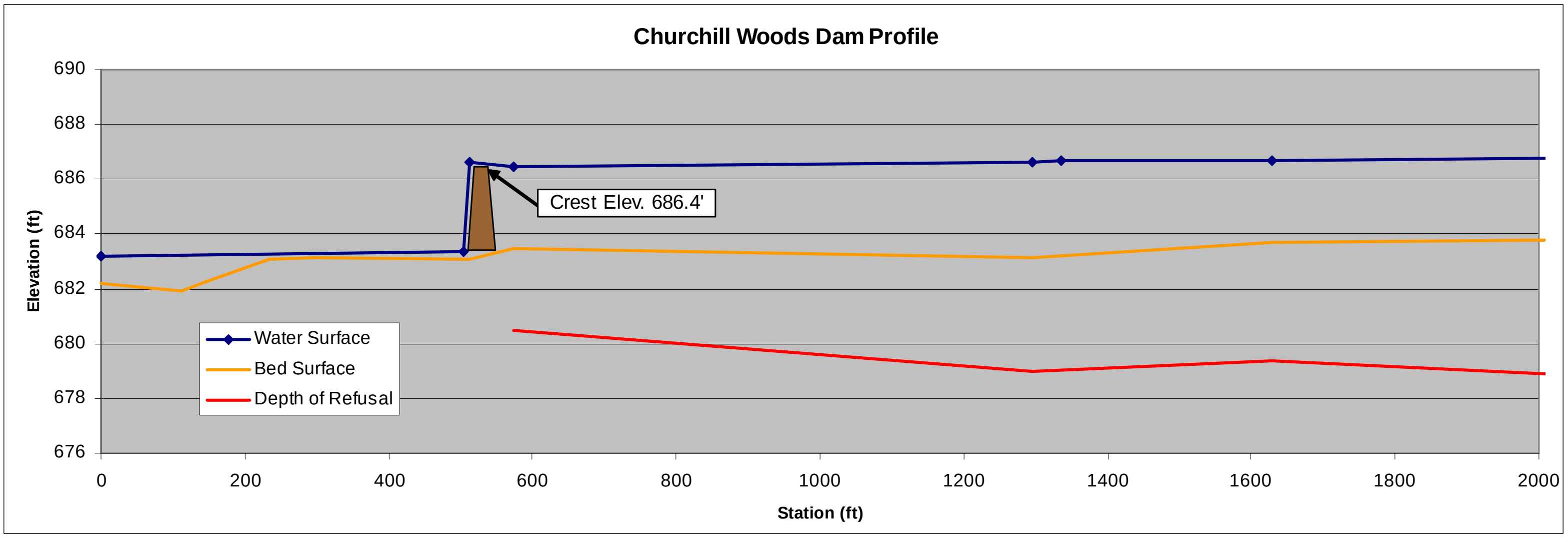
Dimensions: 50' Crest Length / about 3.5' of head at normal flow

Purpose: Flood Storage

The Churchill Woods Dam has the largest reservoir of those investigated in this study. As a result it also contains the most sediment, owing largely to its low gradient and wide and shallow channel path. Little historical documentation could be readily found relating to this dam. Residents in the area mentioned it was built during the WPA in the 1930's as a flood control project.

The Structure: The Churchill Dam is a concrete gravity dam that includes a dewatering gate on its West side. The dam appears to be in good condition, as do the associated 4 box culvert structures that take water under Crescent Blvd. The spillway and apron are in good shape and show signs of normal weathering and associated maintenance.

Sediment: The Churchill Dam reservoir contains a large amount of material. The profile shown below indicates nearly 3-4 feet of material consistently blanketing the bed of the reservoir. A number of areas had as much as 7-8' of deposited material. The sediment is made mainly of fine material (silts and clays) and is fairly consolidated in areas where it is greater than 3' in depth. A total of eight cross sections were surveyed and can be seen in detail in Appendix B. Coarse (small gravel) depositional features were found approximately 1000' upstream of the St Charles bridge, indicating this may be the extent of the delta formed as a result of the impoundment.



Hydraulic Impacts: The hydraulic impact of the Churchill Woods structure is unknown. It certainly provides some flood storage and the configuration of the dam, Crescent Blvd Bridge, and RR Bridge, likely provide a bottleneck at high flows that can back water into the reservoir at substantial elevations. However, little information exists on current studies of the structure, especially given the reduced capacity for storage in the reservoir. The search for hydraulic studies relating to this structure will continue.

2.4 Geomorphic Assessments

2.4.1 Overview of geomorphic principles

Streams are in constant dynamic equilibrium. Although imperceptible over years or decades, a stream in equilibrium moves within its floodplain both laterally and vertically over long time periods. A channel can be in balance with the hydrologic and sediment influences or can be in rapid transition as a result of changes in the watershed or within the stream corridor. Urban river systems are often in various states of disequilibrium. The development of Chicago area watersheds has significantly increased the intensity of land use and the imperviousness of the tributary areas. The impact of urbanization on stream systems is well documented and includes changes in the hydrology, water quality, sediment supply, and ecology. Other impacts include isolation from and reduction of available floodplain capacity and installation of road crossings and other lateral and vertical controls. Hence, urbanization can significantly increase stream instability due to:

- Increasing the erosive energy of the stream through channel straightening. Normally sinuous and low gradient streams become straight and often much steeper.
- Increasing velocity by increasing the discharge rates. Impervious cover, culverts, drain tiles and storm sewers all move water faster from land to stream.
- Decreasing in-stream channel roughness through the removal of riparian vegetation and in-stream woody debris.
- Decreasing the amount and character of the incoming bed load so there is more energy to move bed material than available bed material (by installing impervious cover and putting tributaries into storm sewers or armoring the channels).
- Changing the geotechnical loading characteristics of the banks by altering the level of baseflow, and periods / levels / timing of saturation.
- Changes in the riparian vegetation management. Deforestation and management of turfgrass are common and dramatically increase erosion by removing soil binding root systems.

Schumm (1984) describes the evolution of degraded channels in arid and central plains streams, and these basic principles apply to urban channels as well. The Schumm system classifies streams by their place along a continuum of channel evolution, typically initiated by channel incision (Figure 2.4), a process commonly occurring in urban and agricultural areas following channelization. As a stream's slope is increased through straightening (Stage II), the increased shear forces cause bed material to displace and a small nickpoint or waterfall develops at the downstream end of the reach. This nickpoint travels upstream until a stable, lower grade is reached. This process is followed by lateral bank erosion and formation of a new, inset floodplain (Stage III-IV). The former floodplain is abandoned during runoff events and flow is confined to the new channel and floodplain. The old floodplain surface becomes an upland terrace. The stream achieves ultimate stability at a new channel elevation (Stage V).

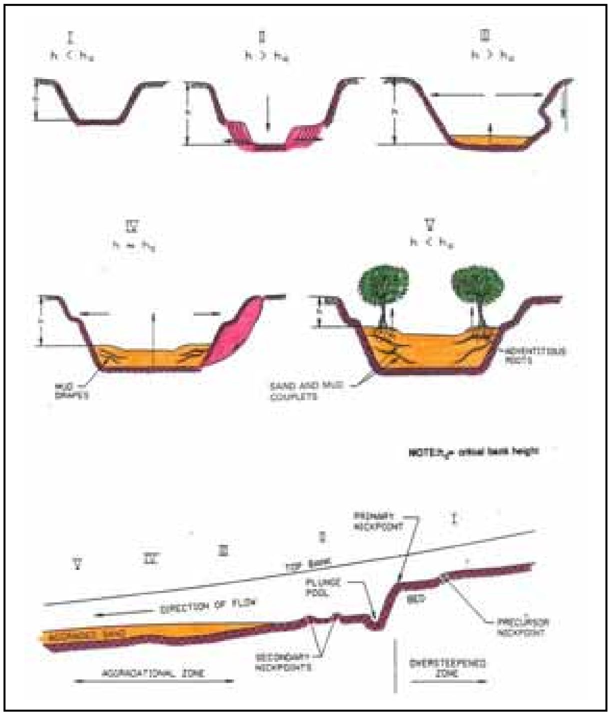


Figure 2.4. Channel evolution model

Bank erosion is part of the natural processes within a stable stream and is balanced by deposition of sediment on floodplains and bars. Erosion provides the needed bed material, allows recruitment of large woody debris, and encourages channel variability. However, ‘excess’ bank failure associated with unstable riverine systems and massive failures that threaten existing infrastructure can cause unacceptable environmental impacts and consequences to private and public resources. Bank failure can generally be attributed to 3 basic processes (Thorne et al., 1997): subarial wasting, hydraulic scour and mass failure. Subarial wasting is not considered to be the major driving force for Midwestern urban streambank instability and is not discussed further.

Hydraulic Scour

The common result of urbanization is a significant increase in bank erosion due to hydraulic scour of the channel bed / toe of the bank. When changes in landuse result in increased water velocity, streams begin to erode their bed and banks beyond the point of equilibrium. Excess hydraulic scour generally can be addressed in two ways, either by reducing channel velocity and thereby reducing erosive force, or by armoring the channel to resist the erosive force. Reduction of channel velocity can be accomplished either by increasing the area of the channel, increasing the capacity of the channel and/or floodplain, decreasing flow rates, or modifying slope through the use of grade controls.

Following incision, as noted in the Schumm model above, hydraulic scour combined with mass failure can lead to extreme bank erosion.

Mass Failure

Mass failure of the streambank is often the result of increased hydraulic scour, and/or change in riparian vegetation management associated with urbanization. There are numerous bank failure mechanisms due to various loading and resistant conditions, including differences in soil characteristics and vegetative reinforcement. Streambank soils can vary both vertically and horizontally, and can generally be classified as cohesive, non-cohesive, and composite (banks with layers of soil that have significantly different characteristics). Each of these types of streambanks presents different engineering challenges and different solutions. The equilibrium processes of scouring and deposition of soil layers within an alluvial valley can provide significant variability in the soil conditions within the valley. Hence, the type of bank material can change significantly along a stream length as the stream passes through different depositional eras.

Common measures to address mass failure of streambanks include:

- Decreasing the load by reducing bank height, reducing bank slope, improving drainage or planting stabilizing vegetation (to reduce pore pressure), and/or
- Increasing the resistance to failure by geosynthetic reinforcement or revegetation.

Sediment transport

Understanding sediment transport characteristics of a stream is very important in understanding the stream stability and characteristics. Alluvial stream within urbanizing watersheds frequently experience rapid channel enlargement. Channel response to urbanization has been described by Leopold, et al (1964), Hammer (1972), and numerous others. During the initial wave of construction, sediment loads reaching the stream from the watershed may be elevated 10 to 100 times compared to pre-construction loads, with the attendant destabilization and sometimes flooding damages. Typically, high sediment yields during the construction phase are followed by reduced yields once infrastructure and storm sewer systems are full built (Kondolf and Keller, 1991). However, as the fraction of the watershed covered by impervious materials increases, watershed hydrology shifts dramatically. Flow peaks become sharper, higher, and more frequent, while the sediment load reaching the channel changes. In the absence of bed control (e.g. bedrock outcrops in natural channels or hardened stream crossings in urbanized areas), channels typically respond by incising. When bank heights exceed a critical threshold for geotechnical stability, mass failure ensues and explosive channel widening occurs. Sediment supply changes such as local and upstream bank failure, upstream modifications etc., and transport capacity changes (channel widening, meander cutoffs, construction of additional crossings, etc.) can make a reach aggrading, in equilibrium, and degrading over time. Sediment transport continuity describes the ability of a stream reach to transport the sediment that it receives from upstream sources. A stream reach is considered to be in equilibrium if it can transport the sediment it receives within the reach and from upstream sources to downstream reaches. A reach is considered to be degrading if its transport capacity exceeds the sediment supply and aggrading if the supply exceeds the transport capacity.

Almost all geomorphic disturbance in urban streams can be attributed to human causes. The human induced impacts to Salt Creek and the East Branch of the DuPage River are as follows, and are discussed in the paragraphs below:

- Tributary manipulation (piping, ditching)
- Channelization
- Hard armoring
- Dams
- Road crossings
- Berms
- Direct discharge/hydrologic change
- Floodplain filling
- Riparian canopy removal
- Impervious surface coverage
- Floodplain pond construction

2.4.2 Salt Creek

From a geomorphic perspective, Salt Creek is an extremely disturbed system, with channel features typical of those found in large, fully built-out metropolitan areas. When the Chicago metropolitan area expanded, small tributary streams were either put into pipes and buried or were confined to narrow, straightened ditches. Floodplains for these headwater channels, as well as the main channel, were either filled in or separated from waterways by large berms that concentrate flood flows into a deep narrow channel. Floodplain and drainage surfaces were covered by pavement and water is now directed into sewers and pipes that discharge directly into creeks. Where rainfall once seeped slowly into soils and traveled as groundwater into channels, storm water is now quickly diverted into artificial waterways and enters the stream as runoff at a higher rate of flow. These processes lower base flows and increase flood flows, making Salt Creek a flashy stream, particularly in the upper reaches.

The ditching, dredging and straightening of channels is termed *channelization*. The result of these hydrologic changes in Salt Creek, combined with channelization, resulted in dramatic geomorphic change. Channelization is perhaps the most common form of channel disturbance throughout Salt Creek, and its effects vary. Where wide ditches have been excavated, shear stress on the banks is relatively low, and banks are stable. Because these reaches lack sufficient energy to transport sediment through the reach, many of these over-widened stretches have aggradation problems, whereby fines such as silt and sand are deposited. Because channelization increases the slope of a stream by forcing water to travel a much shorter distance, the other result of channelization is incision. The newly created steeper slope is unstable given the hydraulic conditions, and begins to headcut upstream until a much lower slope is achieved. This often results in deep incision upstream and aggradation downstream.

The headwaters of Salt Creek have incised in steps, with road crossings sometimes serving as grade controls, preventing further incision. Road crossings, whether bridges or culverts, can often be the cause of incision. In some cases, however rock is placed under bridges to prevent scour of bridge pilings or abutments, and these rock riffles often act as grade control, preventing downstream headcuts from migrating further upstream. Salt Creek from Algonquin Road upstream shows a stepped incision pattern, with the deepest incision being found upstream of Plum Grove Road. In some areas, the channel has incised more than 3.0 feet, and subsequent widening has created extremely large channel cross-sections. Landowners have experimented with various bank stabilization treatments including timber cribs, rock riprap, concrete rubble and sheet piling. All of these methods are hard engineering and prevent the channel from assuming a stable cross-section. Thus the erosional energy of the stream is translated downstream to other properties.

The many road crossings and dams on Salt Creek act to impound both low flow and high flows, potentially increasing flooding. The dam at RM 29.66 floods over 2.5 miles of channel, drowns the floodplain and backs water upstream for 3.5 miles, virtually eliminating any lotic habitat that may have existed. The dams on Salt Creek have also limited sediment transport by impounding sediment behind the dams. This creates a secondary situation downstream, whereby sediment-starved water erodes bed and banks and streams become armored, overwidened, and incised.

Floodplain encroachment and development is a major impact to Salt Creek, especially upstream of RM 10.0. This is typical of most urban streams, where parkland is preserved in the downstream reaches and the headwaters are fully developed. This is the reverse of what is required for streams to function geomorphically and ecologically. Because the headwaters are where hydrology and sediment transport originate, development of these areas degrades the stream in its first few miles. Residential development is the biggest impact to Salt Creek’s headwaters, and continues to confine the channel down to RM 22.0. Downstream of Highway 290, industrial impacts are persistent, and the floodplain is occupied by numerous detention basins. Between RM 20 and RM 30, there are 11 such large detention ponds adjacent to the stream channel. All of these encroachments limit the ability of the stream to meander, and make restoration impossible unless infrastructure is removed. If a restored stream is to be allowed to function geomorphically, it must be allowed to meander across its floodplain. This requires space, and the limits of meandering must be established. In most cases, however, the stream is bordered by infrastructure, and is then hard armored to prevent any meandering.

The riparian area of Salt Creek is largely wooded, but varies in width from 0 feet to 1000 feet. As with most urban rivers, streambanks and riparian areas in residential or light industrial neighborhoods are often armored and most trees are removed. The Forest Preserve system has retained the floodplain forest community in many reaches, and this has translated into some private property. Eight major parks and Golf courses along Salt

Creek represent a significant impact to the riparian corridor, as they have removed most if not all of the riparian trees from the streambanks. Often these reaches are accompanied by hard armoring, either by A-jacks or riprap.

Hard armoring of streambanks is prevalent along Salt Creek, and presents a major impact to the aquatic ecology and geomorphology of the stream. Hard armoring is sometimes required to protect infrastructure such as roads and buildings from eminent risk of failure due to eroding banks. However, much of the hard armoring encountered was in the form of riprap or A-jacks. It should be noted that A-jacks were not originally intended as a riverine bank stabilization method, and were first designed for ocean wave applications. A-jacks can withstand shear stresses from 40 to 150 pounds per square foot, equivalent in one study to water velocities of 22-45 feet per second. These values are an entire magnitude above those found in even moderately steep channels. In a low gradient stream such as Salt Creek, where velocities and shear stress are relatively low, this treatment may be wholly inappropriate. In addition, A-jacks prevent the movement of amphibians and other aquatic species. Animals such as turtles and frogs depend on banks for upland access, reproduction and breeding. A-jacks prevent any such use of banks. Installation of these practices was observed upstream of constricting road crossings and dams, on the inside of meander bands, and along banks that were not eroding, in some cases with a bankfull height of less than 3.0 feet. A-jacks have also been installed in long reaches of forest preserve land where no infrastructure is present.

Observation of stable reaches throughout Salt Creek point to the importance of woody vegetation for stability, and both artificially and naturally stable reaches repeatedly show that small diameter material such as cobble and gravel are often adequate to provide toe stability.

Invasive species such as buckthorn and garlic mustard have taken over many sections of floodplain forest, and can influence the geomorphology of the system by increasing floodplain roughness. Normally, floodplain forests have little understory vegetation, and flood flows can pass freely between large trees. Buckthorn and garlic mustard add significantly to floodplain roughness, basically filling in the spaces between trees. Eventually, this increased growth may force more water down the narrow channel width.

The lower reaches of Salt Creek, where the stream is allowed to meander slightly, resemble more stable stream channels, with regular riffle-pool sequences, large woody debris inputs, depositional bars and scour at meander bends.

2.4.3 East Branch DuPage River

The East Branch DuPage River is very similar to Salt Creek in that the upper reaches are often channelized and incised, long stable ditched sections are aggraded, dams impound long reaches, floodplains are encroached by residential development, golf courses and detention pond storage, and long reaches are channelized. The degree of channelization effects a much larger percentage of the East Branch as compared to Salt Creek. For example, the river is nearly completely straight from RM 7.0 to RM 14.0. Of the 25 miles assessed in this project, only the downstream 4.0 miles have any significant meanders remaining.

Floodplain encroachment, filling and berming have impacted most of the East Branch, separating the stream from residential or industrial development. Downstream of RM 8.7, the river is channelized and bordered by either forest, reed canary grass wetland, or abandoned quarry pits. Excellent opportunities for channel restoration exist downstream of RM 8.7, and from RM 20 to RM 23. Remnant meanders exist throughout the Arboretum property, and restoration of a meandering channel could be completed anywhere along RM 12.0 to RM 19.0

2.5 Summary

Both Salt Creek and East Branch of the DuPage River are highly distrurbed urban streams, with low channel gradients. Channelization is extensive on both streams, although it is more prevalent on the East Branch. Floodplains for the tributary streams and main channels were either filled in or separated from waterways by large berms that concentrate flood flows into a deep narrow channel. Floodplain and drainage surfaces were covered by pavement and water is now directed into sewers and pipes that discharge directly into creeks. Contributions from point sources, including municipal wastewater treatment plant effluents is also significant on both streams, contributing to nitrogen and phosphorus levels, which contribute to plant and algal growth. Additionally, canopy cover in general is limited due to development, resulting in higher summer stream temperatures and establishment of rooted vegetation. All of these attributes contribute to the low DO levels.

APPENDIX A – FEATURES EXHIBITS

- Salt Creek Features – Figures 2.1 to 2.8
- East Branch DuPage River Features