City of Chicago
Department of Transportation

Albany Park
Stormwater Diversion Tunnel
Chicago’s New Flood Mitigation Asset

Stantec
Agenda

1. Area History
2. Project Overview
3. Hydraulic Modeling
4. Construction
5. Media Coverage
Area History Timeline

North Branch of the Chicago River (NBCR)
Pre-Dam 1901

NBCR and Creation of the North Shore Channel (NSC)
Post-Dam 1929

NBCR and NSC Today
Pre-Dam (1901)

Area History

PETERSON

FOSTER

WESTERN

LAWRENCE

MONTROSE
Post-Dam (1929)

North Branch Dam
Installed for Grade Control

Area History

1901
FOSTER

1929
PETSON

1929
LAWRENCE

1929
MONTROSE

1929
WESTERN
September 2008 Storm – 7.3 Inches (48 hrs)
April 2013 Storm – 5.5 Inches (24 hrs)
Proposed Project

INLET

TUNNEL

5,800 ft Long, 18-ft Diameter

OUTLET
Inlet Site – Plan View
Inlet Structure – Profile View

Note: Elevations shown are in CCD
Outlet Site – Plan View
Outlet Structure – Profile View

Note: Elevations shown are in CCD
Permitting and Stakeholder Engagement

• Permitting Challenges
  • Fish Entrainment
  • Endangered Fish Species
  • Water Quality Impacts
  • Recreation Impacts

• Obtained Multiple Permits
  (USACE, IEPA, IDNR, MWRDGC, City of Chicago DOB & OUC, NCCSWCD, and more….)

• Stakeholder Engagement Meetings
• Public Workshops
Hydraulic Modeling

Riverine Modeling (1-D Unsteady)  
HEC-RAS

Computational Fluid Dynamics (3-D Unsteady)  
Flow-3D
Riverine Modeling (1-D Unsteady)

Used HEC-RAS (v4.1) Developed by the USACE Hydrologic Engineering Center

- Used to:
  - Provide the initial sizing and elevations of the tunnel inlet and outlet structures
  - Assess the impacts the project will have on water levels and flows within the NBCR and NSC
HEC-RAS (1-D Unsteady Flow)

• Model combined two existing HEC-RAS models at the North Branch Dam:
  
  • NBCR Portion
    • Detailed Watershed Plan Model (MWRDGC - 2011)
  
  • NSC Portion
    • The Chicago Area Waterway System Model (USACE - 2010)
  
• Evaluated the 2-, 10- and 100-yr events

• Flow through the tunnel was modeled as lidded cross sections with fixed weirs and artificial gates at both ends of the diversion
100-yr Water Surface Profiles (Animated)
100-yr Water Surface Profiles

NBCR Flow Upstream of Diversion = 4,450 cfs

2,360 cfs Diverted Through Tunnel
(53% NBCR Flow)

North Branch Dam
(Grade Control)
10-yr Water Surface Profiles

NBCR Flow Upstream of Diversion = 2,300 cfs

1,370 cfs Diverted Through Tunnel
(60% NBCR Flow)

North Branch Dam
(Grade Control)
2-yr Water Surface Profiles

NBCR Flow Upstream of Diversion = 1,360 cfs

North Branch Dam (Grade Control)

580 cfs Diverted Through Tunnel (43% NBCR Flow)
Computational Fluid Dynamics (CFD)

Used Flow-3D (v11) Developed by Flow Science, Inc.

Used to assess:

- The head loss through the inlet and outlet structures
- Discharge capacities of both structures
- The approach conditions to the inlet structure (Fish Entrainment)
- The departure conditions from the outlet structure (Scour Protection)
Inlet Structure CFD Model
Inlet Structure

CFD Results – Velocities

Hydraulic Modeling

Inlet Structure

Drop Shaft

Inlet Structure

Drop Shaft

SECTION A

4000 cfs

Foster Avenue Bridge Pier

N

N

0.0

Velocity Magnitude (ft/s) 10.0+

Trash Rack

Fixed Weir

+10.1 CCD

-5.7 CCD

SECTION A
Outlet Structure CFD Results – Velocities

**PLAN**

- **Outlet Structure**
  - 2,000 cfs
  - 290 cfs
  - 2,290 cfs

**SECTION A**

- **Outlet Structure**
- **Drop Shaft**
- **Tunnel**
- **Fixed Weir**
  - -0.2 CCD
- **Invert of Structure**
  - -4.7 CCD

**Velocity Magnitude (ft/s)**

- 0.0
- 10.0+
Inlet and Outlet Structure
CFD Results
Head Loss Estimates

Outlet Structure

Inlet Structure

\[ HL = K \cdot Q^2 \]

\( K = 3.97 \times 10^{-7} \)

Orifice \( C_d = 0.61^* \)

*Based on 18' Square Gate Opening within HECRAS Model of Intake Structure Drop Shaft

\[ HL = K \cdot Q^2 \]

\( K = 4.24 \times 10^{-7} \)

Orifice \( C_d = 0.59^* \)

*Based on 18' Square Gate Opening within HECRAS Model of Outlet Structure Drop Shaft
Construction Timeline

- Ground Breaking: May 21, 2015
- Rock Blasting at Shafts: November 2016 - May 2017
- TBM Assembly begins at Site: March 2017
- TBM Break Through: September 7, 2017
Construction Timeline

Ground Breaking
May 21, 2015

Rock Blasting at Shafts
November 2016 - May 2017

TBM Assembly begins at Site
March 2017

TBM Break Through
September 7, 2017
Start of Rock Blasting at Outlet – November 2016
Shaft to Bottom
Tunnel Blasting
Construction Timeline

Ground Breaking
May 21, 2015

Rock Blasting at Shafts
November 2016 - May 2017

TBM Assembly begins at Site
March 2017

TBM Break Through
September 7, 2017
TBM Assembly Begins at Site
TBM Assembly Begins at Site
Construction Timeline

- Ground Breaking: May 21, 2015
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TBM Break Through
Construction Timeline

- TBM Break Through: September 7, 2017
- Tunnel Lining Completion: January 2018
- Facility is Operational: Planned for April 25, 2017
- Park Restoration Completed: Planned for Summer 2018
Completion of Tunnel Lining
Construction Timeline

- **TBM Break Through**
  - September 7, 2017

- **Tunnel Lining Completion**
  - January 2018

- **Facility is Operational**
  - Planned for April 25, 2017

- **Park Restoration Completed**
  - Planned for Summer 2018
Albany Park Tunnel in the News...

- WEF Stormwater Institute
  *Worldwater Stormwater Management Magazine Autumn 2016 Edition*

- Online News Media
  *Chicago Tribune, Chicago SunTimes, DNAInfo*

- Television Coverage
  *CBS, ABC*
Project Designer:
Stantec Consulting Services, Inc.

Construction Management Team:
WSP, USA
Globetrotters Engineering Corporation

Contractor:
Kenny Construction

Questions?