LOCATION DRAINAGE STUDY

PROJECT ROUTE: IL 47 at Burlington Road
LIMITS: 750ft NW to 750ft SE of IL 47 (Burlington), & 1000ft S to 1000ft N of Burlington (IL47)
MUNICIPALITY/COUNTY: Kane County
JOB NUMBER: CMM-8003(829) Local Area Section No. 07-00357-00-CH

PREPARED FOR: District One
Bureau of Programming
Hydraulics Section

DATE: July 2011

PREPARED BY: Burns & McDonnell
1431 Opus Place
Suite 400
Downers Grove, IL 60515
# TABLE OF CONTENTS

## 1-00 EXISTING DRAINAGE SYSTEM
- 1-01 IDENTIFIED DRAINAGE PROBLEMS
- 1-02 IDENTIFIED BASE FLOODPLAINS
- 1-03 MAJOR DRAINAGE FEATURES

## 2-00 PROPOSED DRAINAGE SYSTEM
- 2-01 DESIGN CRITERIA
- 2-02 OUTLET EVALUATION
- 2-03 STORM WATER DETENTION ANALYSIS
- 2-04 RIGHT OF WAY ANALYSIS
- 2-05 DRAINAGE ALTERNATIVES
- 2-06 LOCAL AND OTHER AGENCY COORDINATION
- 2-07 PROPOSED DRAINAGE PLAN

## 3-00 FLOODPLAIN ENCROACHMENT EVALUATION

## 4-00 ILLINOIS DEPARTMENT OF NATURAL RESOURCES OFFICE OF WATER RESOURCES (IDNR-OWR) PERMIT

## 5-00 Appendix A: Source Data Reviewed
- Appendix B: Exhibits
- Appendix C: Correspondence
- Appendix D: Supporting Documents
- Appendix E: Erosion and Sediment Control
- Appendix F: Water Quality/BMP White Paper
LOCATION DRAINAGE STUDY CHECKLIST

Project Route: IL 47 at Burlington Rod

Limits: 750ft Northwest to 750ft Southeast of IL 47 on Burlington; 1000ft South to 1000ft North of Burlington on IL 47

Municipality/County: Kane County

Job Number: CMM – 803(829)

1-00 EXISTING DRAINAGE SYSTEM (see Exhibit 1-00a, General Location Drainage Map; Exhibit 1-00b, Existing Drainage Plan)

1-01 IDENTIFIED DRAINAGE PROBLEMS (see Appendix C)

☒ Yes ☐ No

1-01.1 Description: Flooding record of IL 47 at Burlington in February of 2009 described 1 inch of flooding on all pavement at the Intersection. IDOT also stated that the ditches and culverts are in need of cleaning.

Responsibility ☒ IDOT ☐ Others (explain)

Action (describe recommendation below)
No action is proposed at this time. The regrading of ditches and replacement of culverts will address this issue.

☐ Incorporate into the Study as data base
(See Section 2-05 and/or Section 2-07)

☐ Refer to others
☐ Bureau of Maintenance
☐ Local Agency

1-02 IDENTIFIED BASE FLOODPLAINS (see Exhibit 1-02a Flood Boundary and Floodway Map or Flood Insurance Rate Map and Section 3-00)
The Flood Boundary and Floodway Map for the County of Kane was examined for identified base floodplains which were either traversed by or adjacent to IL 47 at Burlington Road.

Floodplains ☐ Yes ☒ No

Floodways ☐ Yes ☒ No
1-03 MAJOR DRAINAGE FEATURES (see Exhibit 1-00a)

1-03.2 Major Culvert Crossings

Location: Station 98+90

Structure No.: N/A

Hydraulic Report Prepared by N/A

Waterway Information Table Available: ☑ Yes (Exhibit 1-03.1a) ☐ No

Narrative Summary:

While this 3 foot wide by 2 foot high box culvert is not considered a major drainage feature in existing conditions, the proposed culvert (2-2.5 foot wide by 2 foot high) has a cross sectional area greater than 7 feet, and is thus considered a major drainage feature. The reason for the increase in size is to reduce the 50 year headwater elevation and reduce the amount of right of way needed for the detention facilities on the upstream ditches. Information on overtopping, freeboard clearance, etc. is included in the Small Culvert Waterway Information Table in Appendix B, as well as in the calculations in Appendix D.

Location: Station 105+90

Structure No.: N/A

Hydraulic Report Prepared by N/A

Waterway Information Table Available: ☑ Yes (Exhibit 1-03.1a) ☐ No

Narrative Summary:

This existing culvert is a 3 foot wide by 4 foot high box culvert, and as such is considered a major drainage feature. Information on overtopping, freeboard clearance, etc. is included in the Small Culvert Waterway Information Table in Appendix B, as well as in the calculations in Appendix D.

2-00 PROPOSED DRAINAGE SYSTEM (☑ Exhibit 2-00a, Proposed Drainage Plan)

2-01 DESIGN CRITERIA (☑ Exhibit 2-01a - Typical Existing Cross Section. ☑ Exhibit 2-01b - Typical Proposed Cross Sections)

☐ Construction ☑ Reconstruction ☐ Rehabilitation
The intersection is to be reconstructed as a roundabout. The termini of the project are 750 feet northwest to 750 feet southeast of Illinois Route 47 on Burlington Road, and 1000 feet north to 1000 feet south of Burlington Road on Illinois Route 47.

1. Proposed storm sewer conveyance systems will be designed for a 10 year storm frequency with a velocity between 900mm/sec (3 ft/sec) and 3000mm/sec (10 ft/sec). For storm sewers oversized for detention minimum velocity is 2 ft/sec.

  ☑ Yes ☐ No ☐ N/A

Justification for non-compliance:

2. Proposed ditches will be designed for a 50 year storm frequency and desirable ditch grades will be no less than 0.5%.

  ☐ Yes ☑ No ☐ N/A

Justification for non-compliance: Ditches will be designed for a 50 year storm frequency. Ditch grades will be a minimum of 0.3% to accommodate detention within the ditches.

3. The roadway edge of pavement at the low grade point in a floodplain area for highways with a DHV of 100 or more shall be a minimum of three feet above design headwater elevation.

  ☐ Yes ☐ No ☑ N/A

Justification for non-compliance:

4. It is required that a minimum clearance of two (2) feet be established between the design high water and the low beam elevation of bridge structures. The bottom of the bridge super structure shall not be below the all-time high water elevation for the new freeway and expressway construction.

  ☐ Yes ☐ No ☑ N/A

Justification for non-compliance:

5. The waterway openings of bridges and culverts will be designed for a 50 year storm frequency.

  ☑ Yes ☐ No ☐ N/A

Justification for non-compliance:

6. The vertical alignment for curbed pavements will have a minimum grade of 0.3% and a drainage maximum "K" value of 51 (167 English Unit).

  ☑ Yes ☐ No ☐ N/A

Justification for non-compliance: Flat terrain makes minimum profile expensive. Substandard profile section is superelevated as much as 6%. All curbed pavements have a slope exceeding 0.2%. Some uncurbed sections have a flatter longitudinal slope but feature significant superelevation.

A drainage design exception is not required at this stage based on the proposed scope of
work. If the scope of work is changed during the P.S. & E. stage, the appropriate drainage design exemption approval, if any, will be processed through the Hydraulics Section by the District’s Bureau of Design.
2-02 OUTLET EVALUATION

Unless otherwise noted below, the various outlets within the limits of the subject improvement were determined to be suitable for continued use under proposed conditions without modifications or the provision of storm water detention.

Unsuitable outlets:  ☒ Yes  ☐ No

Location:
- Outlet #1, at Station 105+90 in IL 47
- Outlet #2, at the East Quadrant Farm Entrance on the East side of Burlington Road.
- Outlet #3, at the South Quadrant Farm Entrance on the West side of Burlington Road.

Source:

Evaluation:
- Outlet #1 has a minimal amount of cover over top of it. This outlet will require the provision of storm water detention in order to maintain existing discharges. Further, the existing culvert will need to be extended to accommodate the proposed roadway width in its vicinity.

- Outlet #2 is currently a corrugated metal pipe which is in disrepair. This outlet will also require the provision of storm water detention in order to maintain existing discharges. Further, the farm entrance will be replaced as part of the project, so the pipe will need to be replaced.

- Outlet #3 is currently a corrugated metal pipe which is in disrepair. This outlet will also require the provision of storm water detention in order to maintain existing discharges. Further, the farm entrance will be replaced as part of the project, so the pipe will need to be replaced.

Recommendation:
- Outlet #1 – the culvert under IL 47 will be replaced to provide adequate cover over the structure, and also extended to accommodate the roadway widening in its vicinity. In addition, required detention will be provided upstream of the culvert in an oversized ditch restricted in flow by a ditch check.

- Outlet #2 – the culvert under the East Quadrant Farm Entrance will be replaced with a reinforced concrete pipe to provide adequate capacity and strength. Required detention will be provided upstream of the culvert in an oversized ditch restricted in flow by a ditch check.

- Outlet #3 – the culvert under the South Quadrant Farm Entrance will be replaced with a reinforced concrete pipe to provide adequate capacity and strength. Required detention will be provided upstream of the culvert in oversized ditches both upstream and downstream of IL 47. Each of these ditches will be restricted in flow by a ditch check.

Sensitive outlets:  ☐ Yes  ☒ No
Outlet #1 – This outlet is not considered sensitive because it discharges to an open field which does not have any flooding concerns. There are no structures in the vicinity downstream of this outfall.

Outlet #2 – This outlet is not considered sensitive because it discharges to a roadside ditch which does not have any flooding concerns. There are no structures in the vicinity downstream of this outfall.

Outlet #3 – This outlet is not considered sensitive because it discharges to a roadside ditch which does not have any flooding concerns. There are no structures in the immediate vicinity downstream of this outfall.

2-03 STORM WATER DETENTION ANALYSIS

This project has been reviewed in accordance with Drainage Manual, Section 1-303.03 “Storm Water Storage”.

2-03.1 Evaluation

☐ No storm water detention required

☒ Storm water detention required

Unsuitable outlets (see Section 2-02)

Location: Detention is required as part of this project for all of the outlets identified in Section 2-02, Outlets 1, 2, and 3.
2-.03.2 Recommendation

Detention Ponds  □ Yes  ☑ No

Storage Pipes  □ Yes  ☑ No

Oversizing storm sewers/ditches  ☑ Yes  □ No

For Outlet #1 at Station 105+90:

\[ 470 \text{ Cu. Yds.} \] 50 year storm frequency

Oversizing storm sewers/ditches location:

Upstream of IL 47 in the North Quadrant from Station 624+25 to Station 629+00 (See Ditch Design Cross Section Key Map in Appendix D) Proposed cross sections are also located in Appendix D. The required and actual release rate is 7.16 cfs.

Control structure schematics (see Exhibit 2-03.2a)

☑ Yes  □ No

Detailed evaluation and supporting calculations are included in Appendix D.

☑ Yes  □ No

For Outlet #2 at East Quadrant Farm Entrance on east side of Burlington Road:

\[ 40 \text{ Cu. Yds.} \] 50 year storm frequency

Oversizing storm sewers/ditches location:

In the East Quadrant from Station 612+50 to Station 614+66 (See Ditch Design Cross Section Key Map in Appendix D) Proposed Cross Sections are also located in Appendix D. The required and actual release rate in the 50 year storm is 3.9 cfs.

Control structure schematics (see Exhibit 2-03.2a)

☑ Yes  □ No

Detailed evaluation and supporting calculations are included in Appendix D.

☑ Yes  □ No

For Outlet #3 at South Quadrant Farm Entrance on west side of Burlington Road:

\[ 174 \text{ Cu. Yds.} \] 50 year storm frequency
Oversizing storm sewers/ditches location:

The required storage is provided upstream of IL 47 in the West Quadrant from Station 630+00 to Station 637+00 (See Ditch Design Cross Section Key Map in Appendix D) and downstream of IL 47 in the South Quadrant from Station 600+00 to 607+00. Proposed cross sections are also located in Appendix D. The required and actual release rate for Subarea 3-1 is 3.1 cfs; Subarea 3-2 is 8.6 cfs; Subarea 3-3 is 2.80 cfs; and Subarea 3-4 is 3.40 cfs.

Control structure schematics (see Exhibit 2-03.2a)

☐ Yes  ☐ No

Detailed evaluation and supporting calculations are included in Appendix D.

☐ Yes  ☐ No
2-04 RIGHT OF WAY ANALYSIS

☑ Yes ☐ No Additional right of way is required to accommodate the proposed drainage system.

Location: The limits of the proposed right of way are identified by station and offset in the Intersection Design Study. The first page of the IDS, containing all of the proposed right-of-way information, is included as Exhibit 2-04a. The right of way requirements are based entirely on the need to provide detention.

☐ Yes ☐ No A drainage easement(s) is required to accommodate the proposed drainage system.

2-05 DRAINAGE ALTERNATIVES

N/A

2-06 LOCAL AND OTHER AGENCY COORDINATION (see Appendix C)

☑ Yes ☐ No Local ordinances considered

☐ Yes ☐ No Joint participation

☐ Yes ☐ No Sewer separation

☐ Yes ☐ No Jurisdictional transfer

☐ Yes ☐ No Letter of intent required/processed/approved

☑ Yes ☐ No Coordination completed and comments provided.

Kane County Division of Transportation was consulted with respect to compliance with the Kane County Stormwater Ordinance. An email summarizing differences in methodologies was sent to Kane County, and per their direction, all stormwater facilities were designed using IDOT methodologies. The email citing concurrence with this direction is included in Appendix C. In addition, the Village of Campton Hills’ Stormwater Ordinance was consulted. They have adopted Kane County’s Ordinance. IDOT Coordination and emails from the Bureau of Local Roads are also included in Appendix C.

Comments:

Kane County Division of Transportation was consulted with respect to compliance with the Kane County Stormwater Ordinance. An email summarizing differences in methodologies was sent to Kane County, and per their direction, all stormwater facilities were designed using IDOT methodologies. The email citing concurrence with this direction is included in Appendix C. In addition, the Village of Campton Hills’ Stormwater Ordinance was consulted. They have adopted Kane County’s Ordinance. IDOT Coordination and emails from the Bureau of Local Roads are also included in Appendix C.
2-07 PROPOSED DRAINAGE PLAN

2-07.1 Roadway Drainage

☐ Yes  ☒ No  Utilize Existing Drainage System

Limits:

Comments:

☐ Yes  ☒ No  Utilize existing storm sewers with minor extensions and/or adjustment of existing drainage structures

Limits:

Comments:

☐ Yes  ☒ No  Utilize existing combined sewers with minor extensions and/or adjustment of existing drainage structures

Limits:

Comments:

☒ Yes  ☐ No  Regrade/reestablish existing ditches

Limits: Throughout the intersection area, as shown in the proposed ditch cross sections and Key Map included in Appendix D.

Comments: Proposed ditches will also serve as detention areas to compensate for the additional runoff created by the additional impervious areas attributed to the construction of the project.

☐ Yes  ☐ No  Regrade/reestablish existing swales

Limits:

Comments:

☐ Yes  ☐ No  Replace/relocate existing storm sewers

Limits and sizes:

Comments:

☐ Yes  ☐ No  Replace/relocate existing combined sewers

Limits and sizes:

Comments:

☐ Yes  ☐ No  Abandon existing storm sewers

Limits and sizes:

Comments:
☐ Yes  ☒ No  Abandon existing combined sewers

Limits and sizes:

Comments:

☒ Yes  ☐ No  Regrade/reestablish/maintain existing outlets

Limits and sizes: Existing outlet locations will be maintained, with some improvements to the structures themselves, as described in Section 02-02. These outlets are depicted in the Existing Drainage Plan (Exhibit 1-00b), as well as the Proposed Drainage Plan (Exhibit 2-00a)

Comments:

☒ Yes  ☐ No  Maintain/replace/extend existing cross road culverts

Limits and sizes: Existing culvert at Station 98+90 under IL 47 is to be replaced with two 2.5 feet wide by 2 feet high box culverts; existing culvert at Station 105+90 under IL 47 is to be replaced with a 4 feet wide by 2 feet high box culvert. Both of the farm entrance culverts on either side of Burlington at approximately Station 23+00 are to be replaced with a 15 inch culvert.

Comments:

☒ Yes  ☐ No  Construct new storm sewers

Limits and sizes: Within the roundabout area, as depicted in Exhibit 2-07.1. All proposed sewers will be 12". Calculations for this area were based on a Hydraflow model which was prepared for the sewer with the largest tributary area. This model is included in Appendix D. It should be noted that the proposed storm sewer will be constructed as shown in the interim condition, and then construction of the ultimate build out will require cutting back the storm sewers and relocating the interim conditions inlets to the proposed conditions locations, and hooking the interim storm sewer into the relocated inlets in the new Curb and gutter in the ultimate build out condition.

Comments:

☐ Yes  ☒ No  Construct new combined sewers

Limits and sizes:

Comments:

☐ Yes  ☒ No  Construct special drainage structures

Limits and types:

Comments:

☐ Yes  ☒ No  Construct new ditches (standard ditches desired)
2-07.2 Proposed Action for Major Drainage Features (include hydraulic data such as waterway opening, clearance, freeboard, backwater, permitting requirements, etc.)

Replacement of culverts at Station 98+90 and 105+90 as discussed in Section 2-07.2. See also the Small Culvert Waterway Information Tables included as Exhibits 1-03.1a and 1-03.1b, as well as the calculations located in Appendix D.

3-00 FLOODPLAIN ENCROACHMENT EVALUATION

The proposed project has been reviewed in accordance with Executive Order 11988 “Floodplain Management”; Section 26-7.05(d) "Assessment and Documentation of Floodplain Encroachments" as contained in the Illinois Department of Transportation, Bureau of Design and Environment Manual; Drainage Manual; and 17 Illinois Administration Code 3708 “Floodway Construction in Northeastern Illinois.”

☒ No Potential Floodplain Encroachment

4-00 ILLINOIS DEPARTMENT OF NATURAL RESOURCES OFFICE OF WATER RESOURCES (IDNR-OWR) PERMIT

☐ Required ☒ Not Required
Appendix A: Source Data Reviewed

USGS Maps* - Quadrangle Map and/or Hydrologic Atlas - See Exhibit 1-00

Survey notes*

Scoping Report**

Proposed Geometrics** (location, originator, date)

* On file in the Hydraulics Section
** On file in the Project and Environmental Studies Section
*** Transmitted to the Bureau of Design
Appendix B: Exhibits

General Location Drainage Map, Exhibit 1-00a

Existing Drainage Plan, Exhibit 1-00b

Flood Insurance Rate Map, Exhibit 1-02a

Station 98+90 Small Culvert Waterway Information Table, Exhibit 1-03.1a

Station 105+90 Small Culvert Waterway Information Table, Exhibit 1-03.1b

Proposed Interim Conditions Drainage Plan, Exhibit 2-00a

Proposed Build Out Conditions Drainage Plan, Exhibit 2-00b

Typical Existing Cross Sections, Exhibit 2-01a

Typical Proposed Cross Sections, Exhibit 2-01b

Control Structure Schematic, Exhibit 2-03.2a

Proposed IDS, Exhibit 2-04a

Proposed Inlet and Storm Sewer Layout - Interim, Exhibit 2-07.1a

Proposed Inlet and Storm Sewer Layout – Proposed, Exhibit 2-07.1b
5-00 Appendix C: Correspondence

Drainage Evaluation Meeting Minutes

IDOT Flooding records

IDOT Local Roads Coordination

Kane County Direction for methodology
Appendix D: Supporting Documents

Calculations

Ditch design with Final Build Out Key Map

Proposed Ditch Cross Sections in each quadrant stationed as per Key Map
## 5-00 Appendix E: Erosion and Sediment Control Data References

<table>
<thead>
<tr>
<th>REQUIRED DATA</th>
<th>LDS Exhibits</th>
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Stormwater runoff generated in the project area will be directed to roadside ditches, and discharged at a rate less than or equal to the existing condition. Roadside ditches will be planted with deep rooted native vegetation to encourage infiltration as the runoff is conveyed through the site. Detention will be provided to attenuate the flows leaving the site and to encourage deposition of sediments within the roadside ditches before the runoff leaves the site.

During construction, a sedimentation and erosion control plan will be put in place and maintained on a regular basis to prevent erosion and discourage sedimentation off site. This plan will be developed as part of Phase 2 of this project.
EXHIBIT 1-03.1A

SMALL CULVERT WATERWAY INFORMATION TABLE

Route: IL Route 47  Computed By: DEB  Date: 5/2011
Section: 07-00357-00-CH  Checked By:  Rev. Date:
County: Kane
Station: 98+90

Existing Structure Number:

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10 Year Velocity through Existing Culvert: 4.8 ft/sec
10 Year Velocity through Proposed Culvert: 4.8 ft/sec

Scope of Work

**Existing Culvert**
Type: 3 ft wide by 2 ft high rc box culvert
Length: 54 feet
U/S Flowline: 1000.73
D/S Flowline: 1000.21

**Proposed Culvert**
Type: 2-2.5 ft wide by 2 ft high rc box culvert
Length: 130 feet
U/S Flowline: 1000.94
D/S Flowline: 1000.18
EXHIBIT 1-03.1B

SMALL CULVERT WATERWAY INFORMATION TABLE

Route: IL Route 47  Computed By: DEB  Date: 5/2011
Section: 07-00357-00-CH  Checked By:  Rev. Date:
County: Kane
Station: 105+90

Existing Structure Number:

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10 Year Velocity through Existing Culvert: 2.68 ft/sec
10 Year Velocity through Proposed Culvert: 2.91 ft/sec

Scope of Work

**Existing Culvert**

Type: 3 foot wide by 4 foot high rc box culvert
Length: 61 feet
U/S Flowline: 998.61
D/S Flowline: 997.54

**Proposed Culvert**

Type: 4 feet wide by 2 feet high rc box culvert
Length: 90 feet
U/S Flowline: 998.9
D/S Flowline: 997.3