Technical Memorandum No. 1

Conceptual Drainage Study

City of Gibson, Illinois

Date: June 29, 2023

To: Dan Dickey, Mayor, City of Gibson, Illinois

From: Will Gray, PE, Donohue

Jeff McKean, Donohue

Re: Conceptual Drainage Study

INTRODUCTION

The City of Gibson (City) has experienced catastrophic flooding in recent years. Because of this, increased recurring interval of flood events and the damages caused by the flooding, the City wishes to investigate feasible conceptual level storm water controls to mitigate the impact of these flood events and their respective cost opinions.

Based on discussions with the City's staff at the project kick-off meeting and site visit on April 19, 2023, review of watersheds in the area, review of previous drainage studies, and review of the City's Subdivision Ordinance, Donohue offers the following.

EXISTING CONDITIONS

The City's existing storm water collection and conveyance system consists of storm sewer pipes ranging in size from 12 inches to 60 inches in diameter, a stormwater detention pond in the northeast corner of the City (Railside Northeast Detention Pond), and two stormwater detention ditches in the northern portion of the City (Railside East Detention Ditch and Railside West Detention Ditch).

The City's stormwater collection and conveyance system is divided into two zones, the north zone, and the south zone. The Canadian National Railroad transverses diagonally through the City and separates these zones. In addition, the Norfolk Southern Railroad transverses north and south on the western portion of the City.

Stormwater runoff for the north zone generally flows from the east portion of the City to the west, eventually discharging to Drummer Creek. Currently, it appears that runoff enters the City from outside the corporate limits in at least two areas. The northeast corner, north of the Railside Development, where flows enter the Railside Northeast Detention Pond and outlets to the west via an existing storm sewer pipe. Then the runoff outlets this pipe and flows overland to the Railside East and West Detention Ditches. These ditches ultimately discharge to the west to Drummer Creek via a 24-inch overflow pipe. The second area is from the east, in the vicinity of US Route 54 and the Canadian National Railroad, where runoff

flows via open ditches. Once the runoff crosses Lawrence Street, it continues to flow southwest in open ditches parallel to the railroad tracks to an open ditch mid-way between E. 14th Street and E. 13th Street. Then the runoff flows west to N. Melvin Street and enters a 48-inch storm sewer pipe. This storm sewer pipe eventually increases to 60-inches and discharges to Drummer Creek on the west side of the City.

Stormwater runoff for the south zone generally flows from the north portion of the City south of the Canadian National Railroad and from the east portion of the City west of US Route 54 south to a small tributary of Drummer Creek.

The existing watershed sub-basins for the City and surrounding area are shown in **Figure 1**. This figure also shows the FEMA Floodplain boundaries around the City. The 100-year flood zone extends into only a small portion of the City.

The City's existing storm water collection and conveyance system (storm sewers and detention ponds) are shown in **Figures 2A and 2B**.

PROBLEM / CONCERN AREAS

1. Flooding Areas:

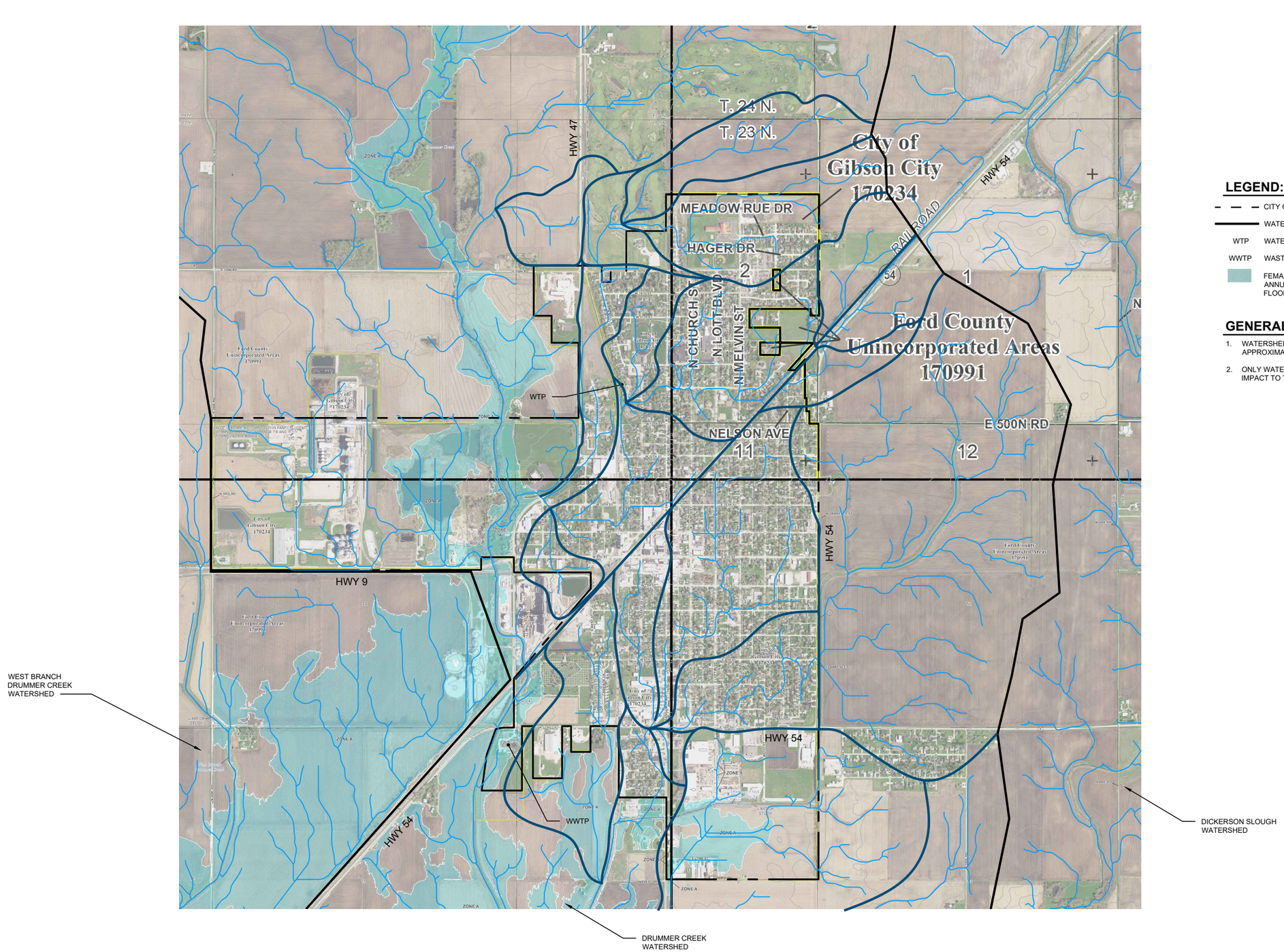
   Flooding areas and other problem areas were discussed with the City at the project kick off meeting and are shown in **Figures 3A and 3B**. These flooding concern areas generally include:

   a. The Railside Development area north of Nineteenth Street.
   b. The area on the northerly side of the Canadian National Railroad tracks west of Lawrence Street between 15th Street and 16th Street to the area around McMillian Park.
   c. The area south of the Water Treatment Plant.
   d. The area of Falcon Drive.
   e. The area bound by Lawrence Street, Sixth Street, Wood Street, and Fourth Street.

2. Maintenance Items:

   General stormwater collection and conveyance system maintenance concerns were discussed with the City at the project kick off meeting and are listed below:

   a. Accumulation of debris in ex. Storm sewer system.
   b. Broken storm sewer pipes.
   c. Possible accumulation of debris in the conflict structure on the ex. 54-inch storm sewer pipe.
   d. Beaver dams, in both the open ditches and the storm sewers
   e. Existing culvers that have an accumulation of debris and / or smashed ends.
   f. Accumulation of vegetation and / or debris in open ditch lines.



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LEGEND:

- CITY CORPORATE LIMITS
- WATERSHED BOUNDARY LINE
- WTP — WATER TREATMENT PLANT
- WWTP — WASTE WATER TREATMENT PLANT
- FEMA FLOOD HAZARD AREA - ZONE A; 1% ANNUAL CHANCE OF FLOODING (I.E. 100-YR FLOOD ZONE).

GENERAL NOTES:

1. WATERSHED AND SUB-BASIN BOUNDARIES ARE APPROXIMATE.
2. ONLY WATERSHED SUB-BASINS WITH DIRECT IMPACT TO THE CITY ARE DELINEATED.

MAP SOURCE : 2016 NAIP AERIAL IMAGERY, 2022 USGS ELEVATION DATA

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CITY OF GIBSON, IL
CONCEPTUAL DRAINAGE STUDY

FIGURE 1
GIBSON CITY STORM WATERSHED AND SUB-BASIN MAP

DONOHUE 06/21/2023

Sheet No. 1

Drawing No. XX

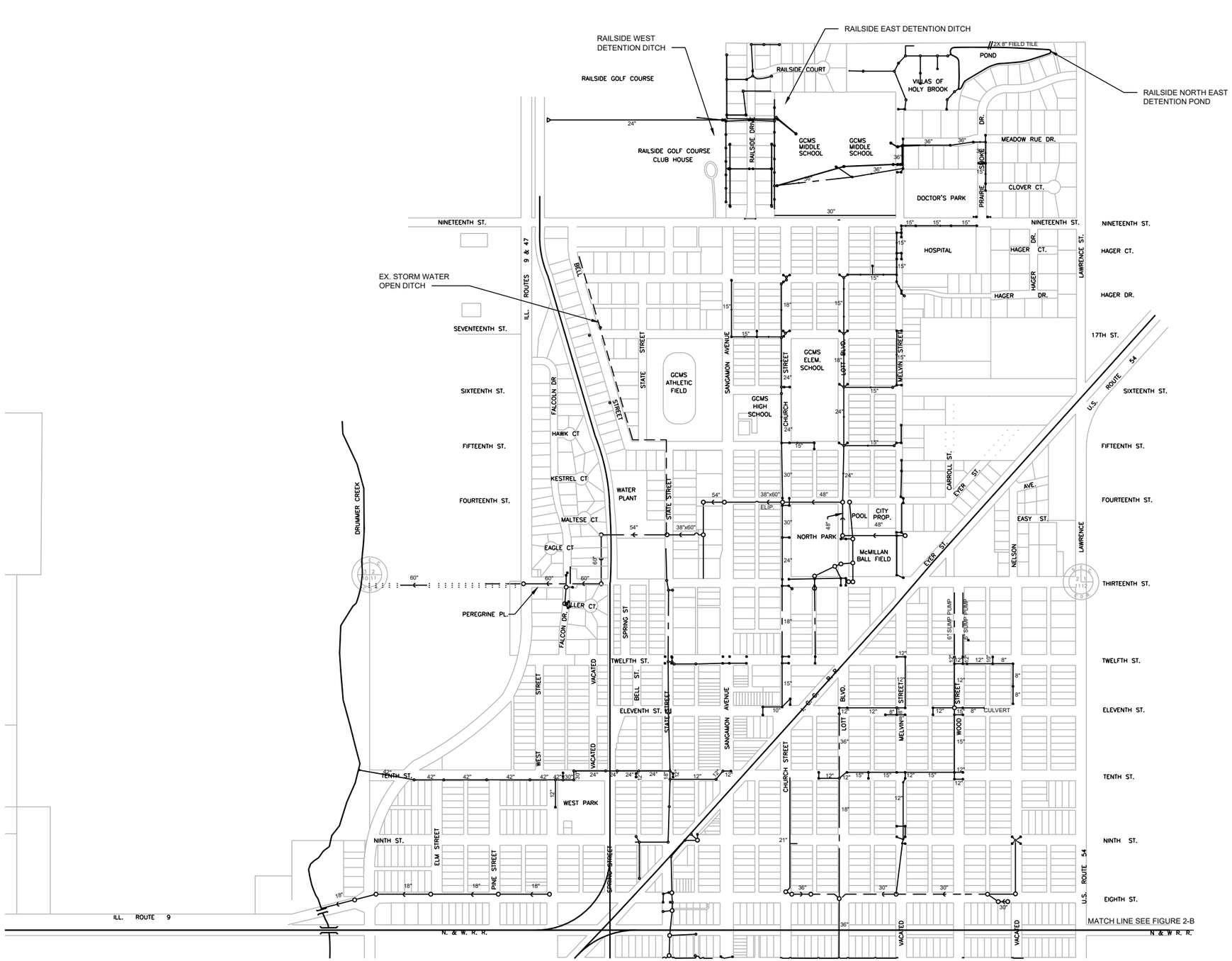

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FIGURE 2-A
GIBSON CITY EXISTING STORM SEWER MAP

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Sheet No. 2

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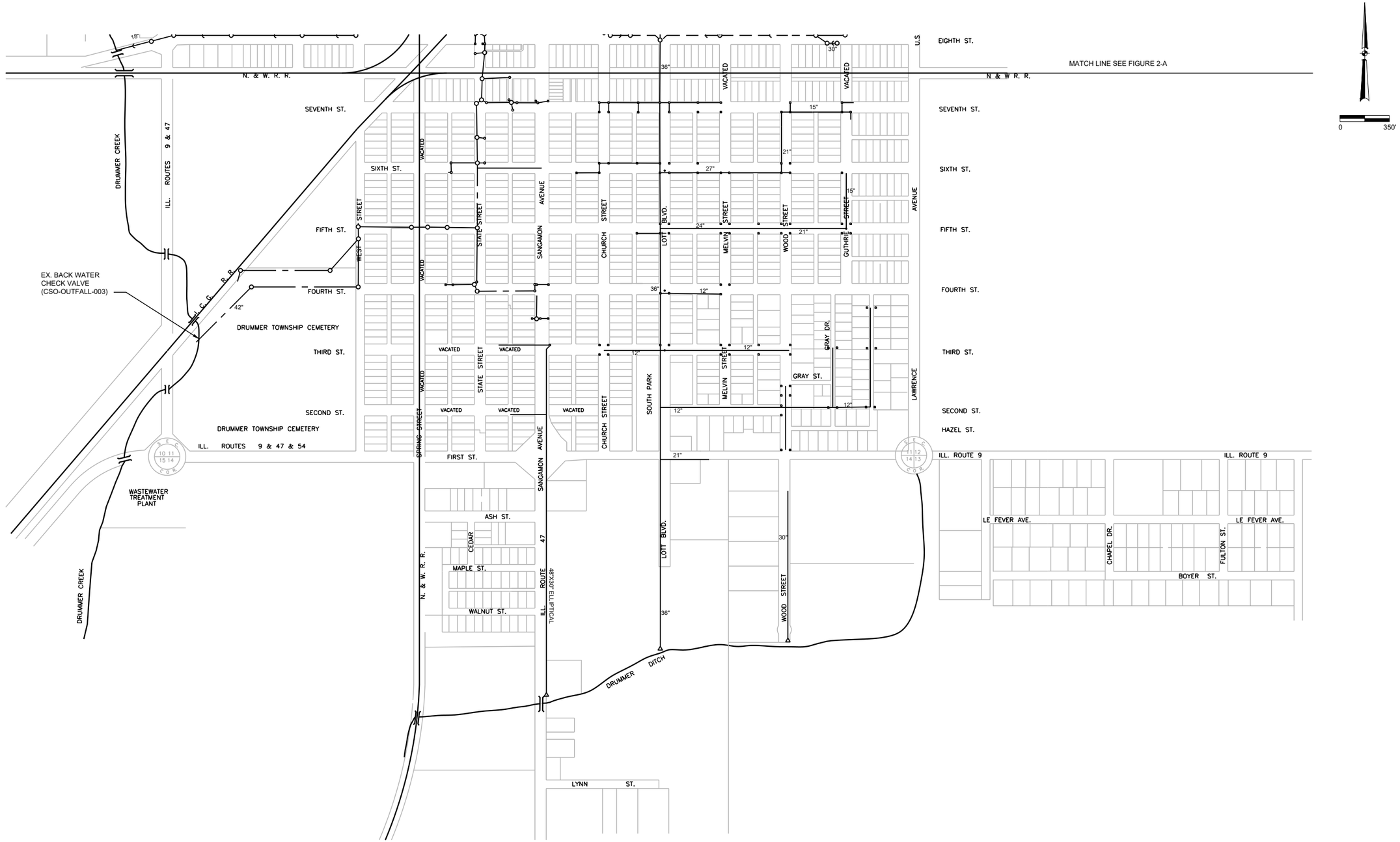

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FIGURE 2-B
GIBSON CITY EXISTING STORM SEWER MAP

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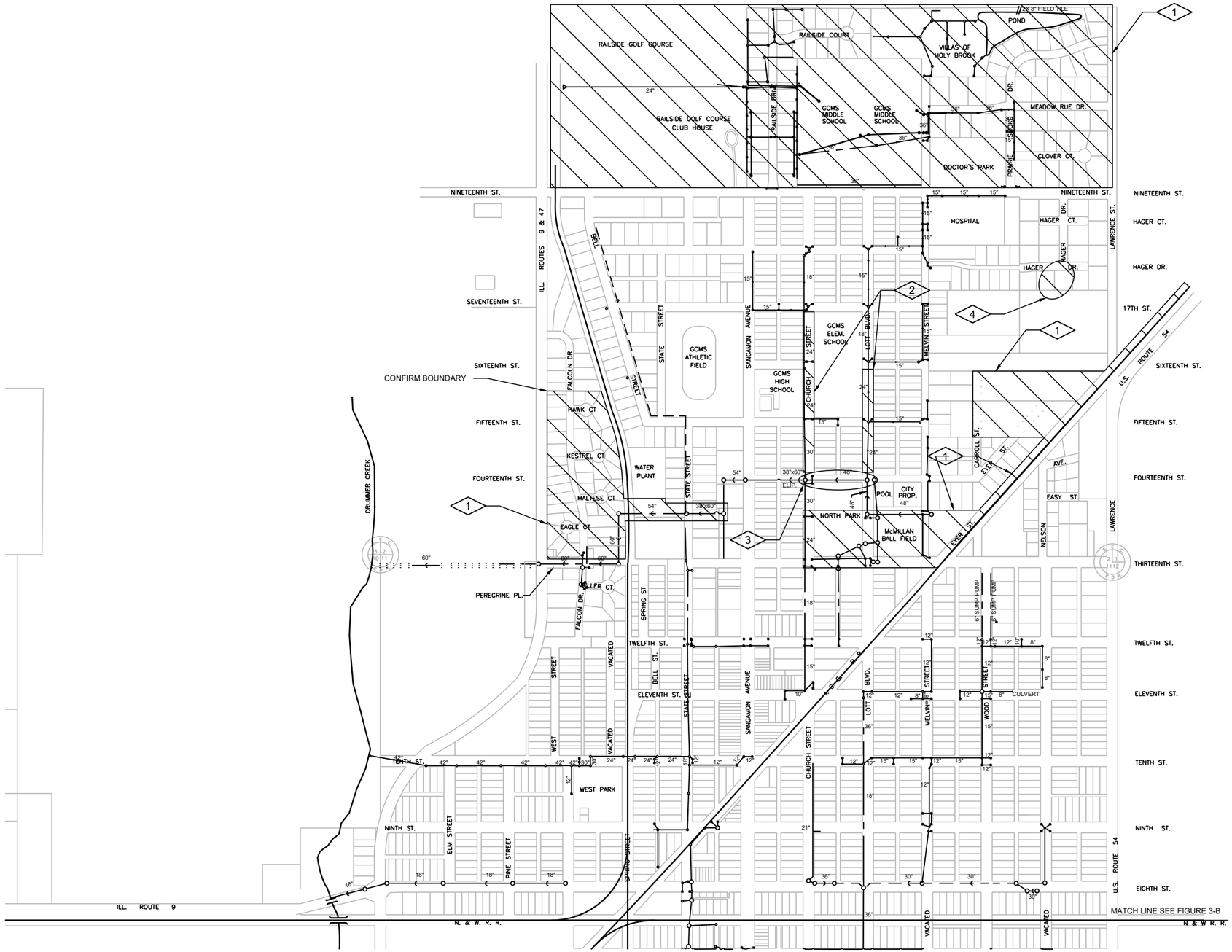

PLAN NOTES:

1. FLOODING PROBLEM AREA
2. PER THE CITY, THE 24" STORM SEWERS DO NOT PROPERLY DRAIN.
3. EX. CONFLICT STRUCTURE ON THE 54" STORM SEWER WHERE A CONFLICT OCCURS WITH AN EX. SANITARY SEWER AND EXISTING WATER MAIN.
4. CURRENTLY EXPOSED/DAMAGED DRAINAGE PIPE.

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FIGURE 3-A
CURRENT FLOODING AND PROBLEM AREAS

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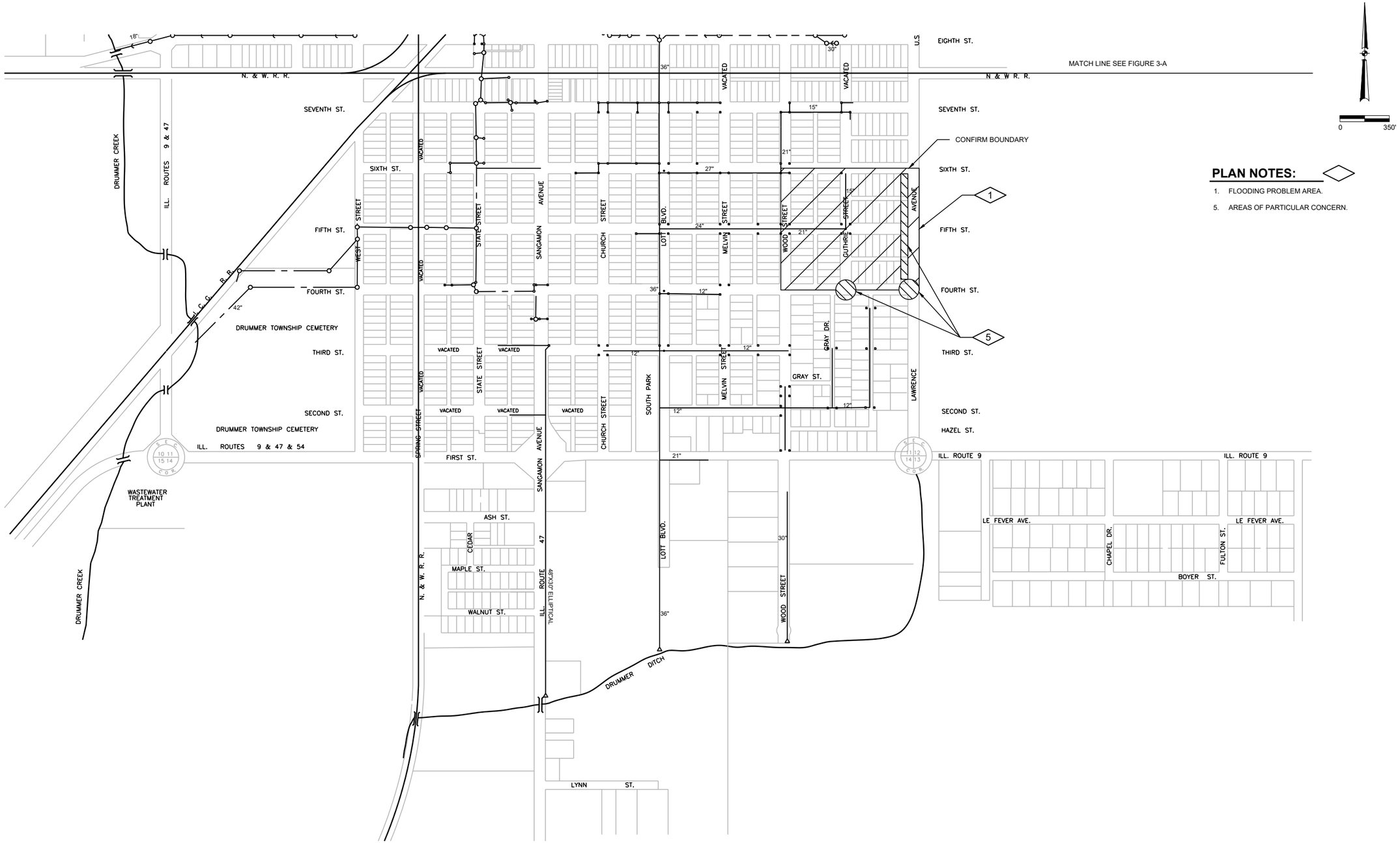
Sheet No. 4

Drawing No. XX



PLAN NOTES:

1. FLOODING PROBLEM AREA.
5. AREAS OF PARTICULAR CONCERN.

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FIGURE 3-B
CURRENT FLOODING AND PROBLEM AREAS

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3. Administrative:
   a. Subdivision Ordinance:

   Donohue has reviewed the City's Subdivision Ordinance in relation to stormwater system requirements for a proposed development. Upon review of the Subdivision Ordinance, the following are items of concern that should be updated:

      i. There is not a definition of "pre-existing conditions" for the calculation of pre-development run-off volumes.
      ii. Design storm requirements are not consistent and use return intervals that are not customary (i.e. 3-yr and 15-yr).
      iii. Language to require developer install all critical stormwater infrastructure upfront and not to piecemeal appears to be lacking.
      iv. Section 34-5-57 Applicability, stipulates that a waiver from the storm water management requirements "may" be granted for smaller developments. This should be revised to remove said waiver.
      v. Minimum size of culverts is not defined.
      vi. Storm sewer sizing requirements are not defined.
   b. The City needs to hire additional staff to assist with continued maintenance activities.
   c. There is not a hydraulic model of the storm sewer network for the whole City.

RECOMMENDATIONS

1. Flooding Areas:

   Recommended improvements to address Flooding areas and other problem areas that were discussed with the City at the project kick off meeting are shown in **Figures 4A, 4B, and 4C.** These recommended improvements are described as follows:

   <u>General:</u>
   a. Install backwater check valves on all storm sewer outfall discharge pipes.

   <u>North Drainage Zone – Railside Area:</u>
   a. Install the proposed 36-inch storm sewer pipe to intercept the flow from the Railside Northeast Detention Pond to divert the run-off from the Railside East Detention Ditch to the Railside West Detention Ditch and ultimately to the Drummer Creek. To be completed this summer by the developer.
   b. Expand the Railside East Detention Ditch to the north as originally designed. To be completed this summer by the developer.
   c. Install a 42-inch overflow pipe from the Railside East Detention Ditch to the Railside West Detention Ditch.
   d. Investigate the location of the storm sewer outfall pipe(s) to the Railside East Detention Ditch from the area North of E. 19th Street between Lawrence Street and N. Melvin Street and possibly reroute to the Railside West Detention Ditch.

PLAN NOTES:

1. INSTALL 36" CONNECTING PIPE (BY OTHERS).
2. INSTALL 42" OVERFLOW PIPE FROM EAST DITCH TO WEST DITCH.
3. INSTALL BACKWATER CHECK VALVE(S)
4. REROUTE STORM SEWERS TO WEST DITCH.
5. INVESTIGATE THE GRADE OF THESE STORM SEWERS.
6. WIDEN DITCH WITH A TWO-STAGE DITCH.
7. POSSIBLY ENLARGE THE WEST DITCH.
8. POSSIBLY INSTALL OVERFLOW PIPE.
9. POSSIBLY CONSTRUCT ADDITIONAL DETENTION POND IN AREA OF DRIVING RANGE WITH AN OVERFLOW AND DRAIN PIPE TO THE RAIL-ROAD TRACKS.
10. INSTALL DIVERSION STORM SEWER.
11. INTERCEPT RUN OFF.
12. RESHAPE/GRADE DITCHES FOR POSITIVE DRAINAGE, DEEPEN DITCHES, CONSTRUCT BERM ON BACK SIDE OF DITCHES TO CONTAIN RUN OFF, AND REPLACE CULVERTS.
13. INVESTIGATE EXISTING CONFLICT STRUCTURE AND POSSIBLY REROUTE THE EXISTING WATER MAIN (AT A MINIMUM).
14. EXPAND RAIL SIDE EAST DETENTION DITCH TO THE NORTH (BY OTHERS).
15. POSSIBLY INSTALL AN ADDITIONAL OVERFLOW PIPE WEST ACROSS THE GOLF COURSE, RAIL-ROAD TRACKS AND STATE ROADE 47, THEN WIDEN THE DOWN STREAM DITCH.
16. REPAIR COLLAPSE CULVERT (BY THE RAILROAD)
17. INVESTIGATE THE ISSUES RELATING TO THE EXISTING DAMAGED DRAIN PIPE THAT IS EXPOSED.

PRIORITIES:

1. HIGHEST PRIORITY TO BE COMPLETED WITHIN NEXT 5 YEARS.
2. SECONDARY PRIORITY TO BE COMPLETED WITHIN 5 TO 10 YEARS.
3. AS NEEDED.

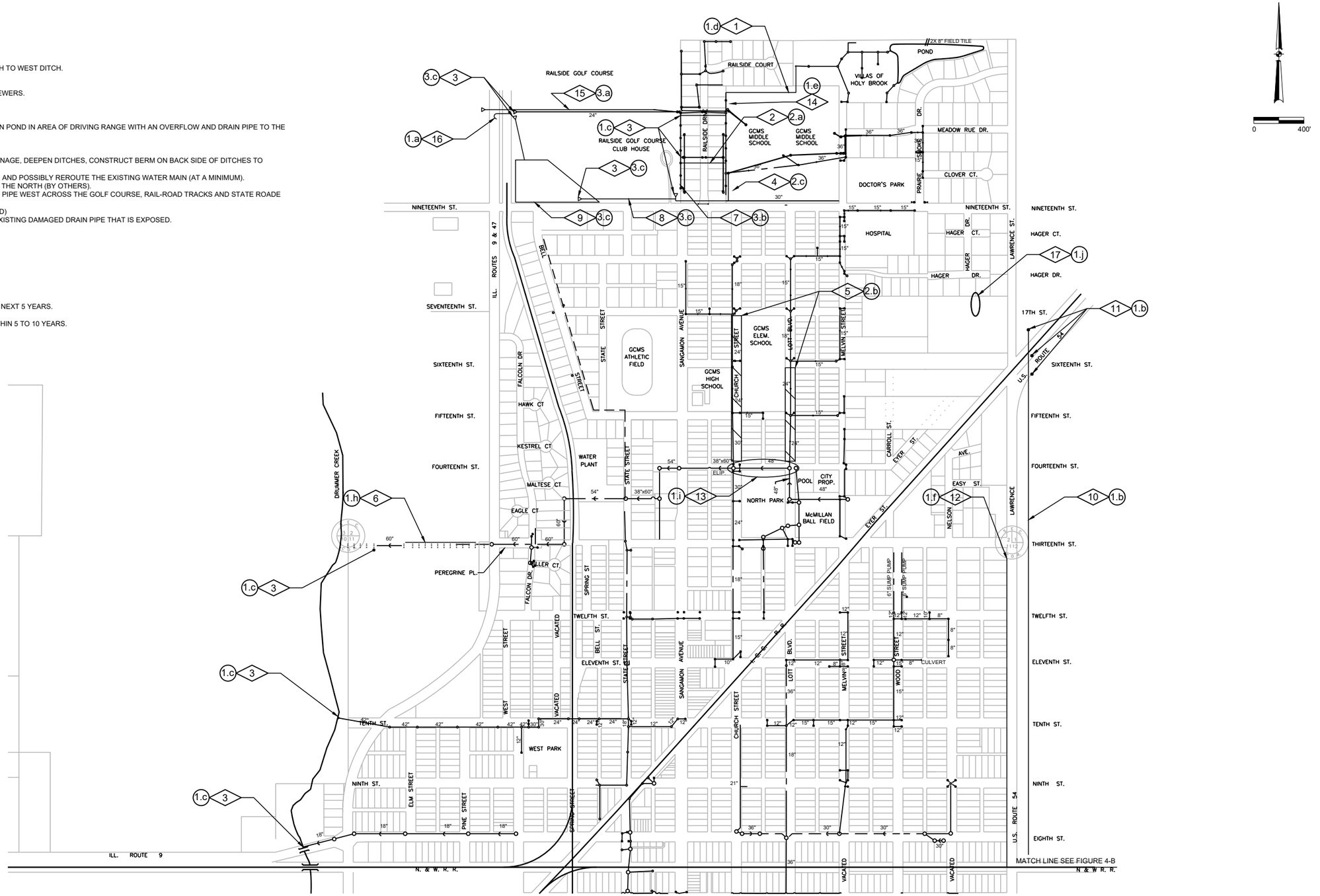

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FIGURE 4-A
RECOMMENDED IMPROVEMENTS

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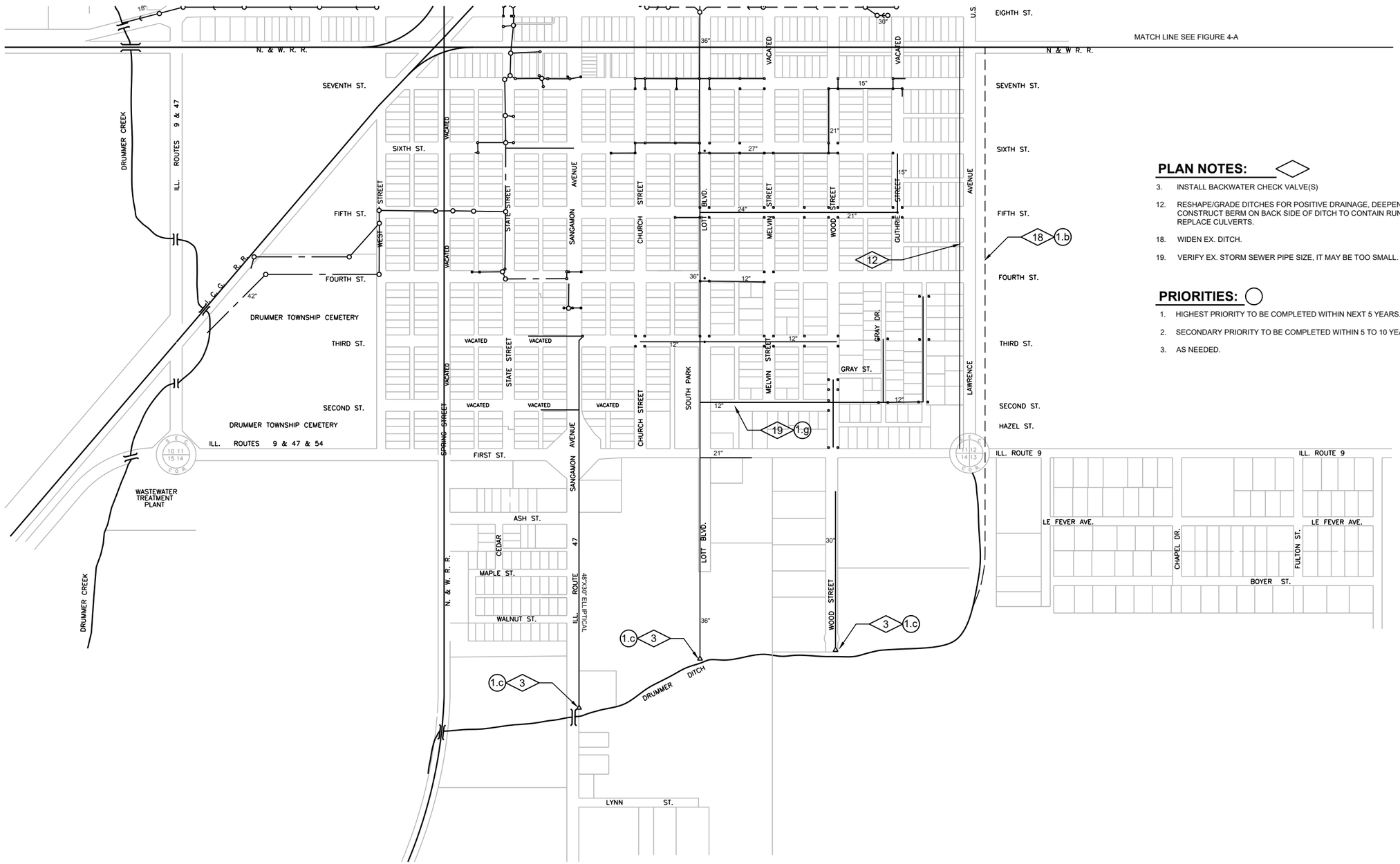
Sheet No. 6

Drawing No. XX



PLAN NOTES:

3. INSTALL BACKWATER CHECK VALVE(S)
12. RESHAPE/GRADE DITCHES FOR POSITIVE DRAINAGE, DEEPEN DITCHES CONSTRUCT BERM ON BACK SIDE OF DITCH TO CONTAIN RUNOFF, AND REPLACE CULVERTS.
18. WIDEN EX. DITCH.
19. VERIFY EX. STORM SEWER PIPE SIZE, IT MAY BE TOO SMALL.

PRIORITIES:

1. HIGHEST PRIORITY TO BE COMPLETED WITHIN NEXT 5 YEARS.
2. SECONDARY PRIORITY TO BE COMPLETED WITHIN 5 TO 10 YEARS.
3. AS NEEDED.

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FIGURE 4-B
RECOMMENDED IMPROVEMENTS

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Sheet No. 7

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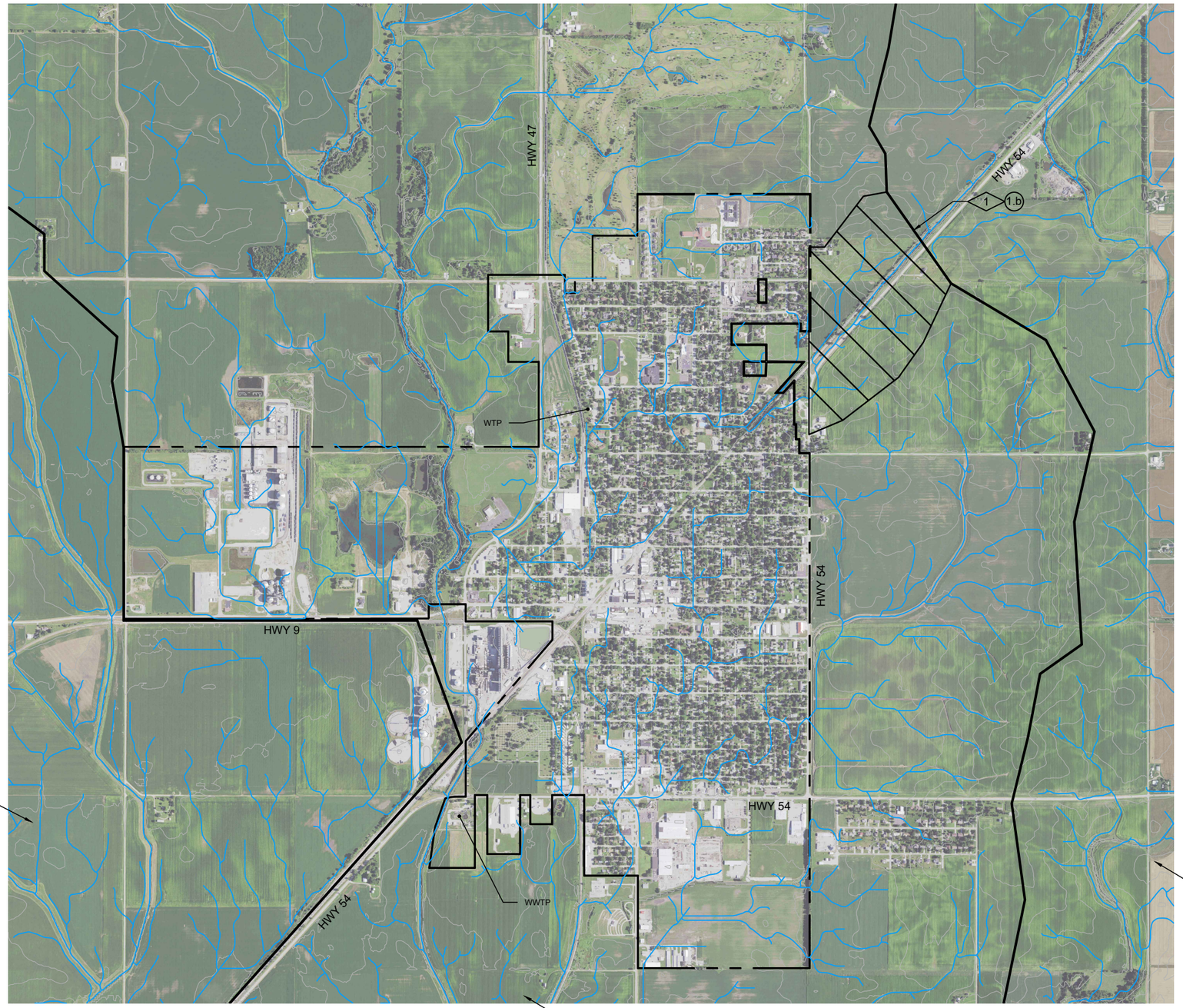

WEST BRANCH DRUMMER CREEK WATERSHED

DICKERSON SLOUGH WATERSHED

DRUMMER CREEK WATERSHED

0 900'

PLAN NOTES:

1. POSSIBLY DIVERT STORM WATER RUNOFF FROM THESE WATERSHED SUB-BASINS (APPROX. 90 ACRES)

LEGEND:

- CITY CORPORATE LIMITS
- WATERSHED BOUNDARY LINE
- WTP WATER TREATMENT PLANT
- WWTP WASTE WATER TREATMENT PLANT

PRIORITIES:

1. HIGHEST PRIORITY TO BE COMPLETED WITHIN NEXT 5 YEARS.
2. SECONDARY PRIORITY TO BE COMPLETED WITHIN 5 TO 10 YEARS.
3. AS NEEDED.

MAP SOURCE : 2016 NAIP AERIAL IMAGERY, 2022 USGS ELEVATION DATA

GIBSON CITY EST. 1871

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FIGURE 4-C
GIBSON CITY WATERSHED RECOMMENDED IMPROVEMENT MAP

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e. Enlarge the Railside West Detention Pond into the southeast corner of the Railside golf course property. Coordination with the golf course owner will be required.
f. Install an overflow pipe from the Railside West Detention Ditch flowing west to a possibly new detention pond located in the southwest corner of the Railside Golf Course in their driving range area. Coordination with the golf course owner will be required.
g. Install an additional overflow pipe from the Railside West Detention Ditch to the west across the golf course, railroad tracks, Illinois Routes 9 and 47, and widen the downstream ditch. Coordination would be required with the owner of the golf course, IDOT, Norfolk Southern Railroad, and the Sangamon & Drummer Drainage District Commissioners.
h. Replace or repair the collapsed culvert crossing under the Norfolk Southern Railroad. Coordination with the railroad company will be required.

North Drainage Zone:

a. Investigate the grade of the existing 24-inch storm sewers along Church Street and Lot Boulevard and develop solutions to provide adequate drainage.
b. Investigate the existing conflict structure to verify its sizing and to remove and reroute the existing water main.
c. Widen the existing ditch line for additional storage with a two-stage ditch along the existing open ditch west of Illinois Routes 9 and 47 that receives the outfall from the 60-inch storm sewer.
d. Intercept stormwater run-off in the area of US Route 54, Canadian National Railroad, and Lawrence Street and divert to the south via a new storm sewer pipe. Based on cursory calculations, this storm sewer pipe should be approximately 48-inches in diameter. This storm sewer pipe would discharge into an existing open ditch along the east side of US Route 54. This open ditch would need to be widened. This project will divert stormwater runoff from the adjacent fields, the railroad tracks, and US Route 54. The City will need to coordinate with the Canadian National Railroad, IDOT, and the Sangamon & Drummer Drainage District Commissioners for implementation and cost partnerships.
e. Investigate the issues relating to the existing drain pipe that is exposed in the area south of Hagar Drive and west of Lawrence Street.

South Drainage Zone:

a. Along the west side of US Route 54: reshape/regrade the ditches for positive drainage, deepen ditches, construct a berm on the back side of ditches, to contain run-off and replace culverts. The City will need to coordinate with IDOT for implementation.
b. Verify the size of the existing storm sewer on Second Street east of Lot Boulevard as it is most likely too small given the contributing flow area. Based on cursory calculations, this storm sewer should be closer to 24-inches in diameter instead of 12-inches as shown on the storm sewer atlas map.

2. Maintenance Items:

Following are general stormwater collection and conveyance system maintenance recommendations to address concerns that were discussed with the City are listed below:

a. Continue to inspect and clean existing storm sewers, inlets, catch basins, open grates, and manholes on a periodic basis.
b. Continue to televise existing storm sewers to check for various pipe breaks, defects, blockages, debris build-up, and other issues. It is recommended that the entire storm sewer system be televised every five years. To accomplish this task, it is suggested that one fifth of the storm sewer system be televised each year.
c. After each heavy rain event, inspect the conflict structure on the existing 54-inch pipe for accumulation of debris.
d. Periodically inspect the storm sewer system for beaver dams and remove any that are found.
e. Remove and / or clean out existing culvers that have an accumulation of debris and / or smashed ends.
f. Periodically regrade open ditches and clean out any accumulated vegetation, tree branches, and other debris.
g. Maintenance of open ditches outside the jurisdiction of the City (i.e. Drummer Creek and its tributaries). Coordinate with the Sangamon & Drummer Drainage District Commissioners to have these ditches/creeks dredged and cleared to remove accumulated sediments, vegetation, beaver dams, and other blockages. It is recommended that the Sangamon & Drummer Drainage District Commissioners investigate the addition of field drainage tiles discharging to these ditches/creeks to limit installation of future new field tiles.

3. Administrative:
   a. Subdivision Ordinance:
      i. Define Pre-existing conditions to be that of greenfield condition.
      ii. Define design storm (return interval (5, 10 and 100 year) and duration (time of concentration, 1-hr, and 24-hrs)).
      iii. Add language requiring developer install all critical stormwater infrastructure upfront and not to piecemeal it.
      iv. Add language stipulating that any new development at an existing site will require updates to the property to meet current codes.
      v. It is recommended that Section 34-5-57 be revised removing the ability to grant a waiver of smaller developments from complying with the storm water management requirements.
      vi. Add minimum size of culverts.
      vii. Add storm sewer sizing requirements.
   b. Hire additional staff to assist with continued maintenance activities.
   c. Develop a hydraulic model of the storm sewer network for the whole City and include Drummer Ditch as during periods of high water this ditch will directly affect the efficiency of the City's storm sewer system to drain.

4. Implementation of Recommendations:

   The proposed recommendations have been prioritized for implementation into the following categories:

   1. Priority 1: Highest priority to be completed within the next 5 years.
   2. Priority 2: Secondary priority to be completed within 5 to 10 years.
   3. Priority 3: As needed, to be determined by the effectiveness of implementing the above referenced projects.

The administrative and maintenance items described in the sections above shall be implemented on a continual and on-going basis.

Refer to Table 1 for a matrix of the proposed recommendations prioritized, including estimated project costs, where the projects can be well defined.

TABLE 1: Recommended Project Implementation

PRIORITY	RECOMMENDED PROJECT DESCRIPTION	PARTNERSHIPS	ESTIMATED COSTS (1)
Priority 1			
1.a	Replace or repair the collapsed culvert crossing under the Norfolk Southern Railroad.	City and Norfolk Southern RR	$280,000
1.b	Intercept stormwater run-off in the area of US Route 54, Canadian National Railroad, and Lawrence Street and divert to the south via a new storm sewer pipe. Based on cursory calculations, this storm sewer pipe should be approximately 48-inches in diameter. This storm sewer pipe would discharge into an existing open ditch along the east side of US Route 54. This open ditch would need to be widened.	City, Canadian National RR, IDOT, and Sangamon & Drummer Drainage District Commissioners	$3,150,000
1.c	Install backwater check valves on all storm sewer outfall discharge pipes.		$860,000
1.d	Install the proposed 36-inch storm sewer pipe to intercept the flow from the Railside Northeast Detention Pond to divert the run-off from the Railside East Detention Ditch to the Railside West Detention Ditch and ultimately to the Drummer Creek.	Sole responsibility of the developer.	NA
1.e	Expand the Railside East Detention Ditch to the north as originally designed.	Sole responsibility of the developer.	NA
1.f	Along the west side of US Route 54: reshape/regrade the ditches for positive drainage, deepen ditches, and construct a berm on the back side of ditches to contain run-off and replace culverts.	City and IDOT	NA
1.g	Verify the size of the existing storm sewer on Second Street east of Lot Boulevard as it is most likely too small given the contributing flow area. Based on cursory calculations, this storm sewer should be closer to 24-inches in diameter instead of 12-inches as shown on the storm sewer atlas map.		$715,000
1.h	Widen the existing ditch line for additional storage with a two-stage ditch along the existing open ditch west of Illinois Routes 9 and 47 that receives the outfall from the 60-inch storm sewer.	City and Sangamon & Drummer Drainage District Commissioners	$310,000

PRIORITY	RECOMMENDED PROJECT DESCRIPTION	PARTNERSHIPS	ESTIMATED COSTS (1)
Priority 1 (Continued)			
1.i	Investigate the existing conflict structure to verify its sizing and to remove and reroute the existing water main.		$140,000
1.j	Investigate the issues relating to the existing drain pipe that is exposed in the area south of Hagar Drive and west of Lawrence Street.		NA
Priority 2			
2.a	Install a 42-inch overflow pipe from the Railside East Detention Ditch to the Railside West Detention Ditch.	City and Railside Subdivision Developer	$205,000
2.b	Investigate the grade of the existing 24-inch storm sewers along Church Street and Lot Boulevard and develop solutions to provide adequate drainage.		NA
2.c	Investigate the location of the storm sewer outfall pipe(s) to the Railside East Detention Ditch from the area North of E. 19th Street between Lawrence Street and N. Melvin Street and possibly reroute to the Railside West Detention Ditch.		NA
Priority 3			
3.a	Install an additional overflow pipe from the Railside West Detention Ditch to the west across the golf course, railroad tracks, Illinois Routes 9 and 47, and widen the downstream ditch.	City, Norfolk Southern RR, IDOT, Sangamon & Drummer Drainage District Commissioners, Developer of the Railside Subdivision, and the Owner of the Railside Golf Course.	NA
3.b	Enlarge the Railside West Detention Pond into the southeast corner of the Railside golf course property.	City and the Owner of the Railside Golf Course.	NA
3.c	Install an overflow pipe from the Railside West Detention Ditch flowing west to a possibly new detention pond located in the southwest corner of the Railside Golf Course in their driving range area.	City, the Owner of the Railside Golf Course, and Sangamon & Drummer Drainage District Commissioners.	NA

Note:

1. Estimated costs are shown where the project is well defined.