Ridgewood Subdivision

South East Storm Water Drainage Investigation

Village of Western Springs - August, 2016

Prepared by:

JAMES J. BENES & ASSOCIATES, INC.
CONSULTING ENGINEERS

Village of Western Springs
Ridgewood Subdivision - Southeast Storm Water Drainage Investigation

Drainage Education

This document is provided to assist readers in understanding some of the terms and concepts contained in this study. It is not intended to be comprehensive.

1. Rainfall Events - Rainfall events are a function of nature. Rainfall events are a function of the depth of the rain and the duration in that the rainfall depth accumulates. Engineers and Scientists have studied the intensity and duration of rainfall events and classified them by probability of their occurrence in any given year. When you hear the term 100 year storm event, there is an annual 1% probability (a one percent chance) of a rainfall with a specified depth in a specific time duration occurring. For example a 100 year event can consists of 0.91 inches of rain in 4.8 minutes or, 3.56 inches of rain in 1 hour, or 7.58 inches of rain in 24 hours.
2. CFS- Flow rate in Cubic Feet per Second; 1 cfs is equivalent to 7.48 gallons per second or 448 gallons per minute.
3. Acre-feet – A unit of volume, 1 acre foot of storage is the volume of storm water stored on 1 acre of land one foot in depth. Practically speaking, it's approximately a football field size area with 1 foot of water depth.
4. Detention - Temporary storage of storm water runoff and releasing it at a prescribed rate. A detention or storage basin is the location where storm water is temporarily stored.
5. Bulletin 70 Rainfall Data – Statistical data produced by the study of rainfall events in Illinois by the Illinois State Water Survey. Bulletin 70 provides industry standard data for use in analysis.
6. Elevation – A height measurement in feet; i.e. 670 is one foot higher than 669
7. Overland Flow Route – All storm drainage systems are subject to events that cause restrictions in capacities, natural, manmade or accidental. Overland flow routes are existing or manmade locations to attempt to limit storm water damages in urban areas.
8. High Water Elevation – The height in elevation to which storm water ponds, either naturally or manmade.
9. Overflow Weir – A low area in a berm, wall, curb, side yard etc. that permits storm water to flow from a ponding water area once the ponding reaches the weir elevation.
10. Catchment – low areas that collect storm water runoff, there usually many catchment areas in a watershed.
11. High Water Elevation – The elevation to which storm water ponds, can be manmade (detention basin) or a low lying area.
12. Quartile – Categorization of a rainfall event distribution determined by when the maximum amount of rainfall occurred in the first, second, third or fourth quarter of the storm.

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Study Purpose

1.2 Study Scope

1.3 Study Process

1.4 History of Development and Storm Drainage Requirements

1.4.1 Village's Storm Drainage Policy

1.4.2 Village's Criteria and Guidelines for Storm Water Infrastructure Design

1.5 Background Documents

1.5.1 Previous Studies

1.6 Hydraulic and Hydrology Methodology

2.0 EXISTING CONDITIONS

2.1 Overview of the Drainage System

2.2 Data Collection

2.2.1 Flooding Complaints / Input from Residents

2.2.2 Site Reconnaissance

2.3 Minor and Major Drainage Systems

2.3.1 Primary Overland Flow Routes

2.3.2 Ponding Areas

2.4 Existing Storm Water Management Facilities

2.5 Hydrology and Hydraulic Modeling

2.5.1 Model Development

2.5.2 Model Verification

2.5.3 Storm Sewer Analysis

2.6 Review of Drainage Focus Areas

2.6.1 906/904 Linden Court Overland

2.6.2 Linden Court Cul-de-sac

TABLE OF CONTENTS (Continued)

2.6.3 903/905 Linden Court Overland

2.6.4 Ridgewood Oaks Detention Basin

2.6.5 Inlet Box and 18” sewer outlet

2.6.6 921 / 923 Lawn Circle Overland

2.6.7 Lawn Circle Cul-de-sac

2.6.8 922 / 924 Lawn Circle Overland

2.6.9 Catchment Area A5

2.7.0 Catchment Area A6

2.7.1 5712 Lawn Drive

3.0 INVESTIGATION OF POTENTIAL REMEDIAL MEASURES

3.1 Areas of Investigation

3.1.1 Issues outside Village Jurisdiction

3.1.2 Near Term Storm Water Projects

3.1.3 Long Term Storm Water Projects

3.2 Overview of Potential Additional Remedial Measures

3.2.1 Green Infrastructure Initiatives

3.2.2 Downspout and Sump Pump Improvements

3.3 Considerations for Future Development Improvements

4.0 SUMMARY AND RECOMMENDATIONS

LIST OF EXHIBITS

Exhibit A – Study Area Location Map

Exhibit B – Existing Drainage Patterns, Catchment Areas, Ponding and Storm Sewers

Exhibit C – Overall Storm Sewer Map

Exhibit D – Focus Areas

Exhibit E – Proposed Storm Sewer Improvements

Exhibit F – Ridgewood Oaks Detention Improvement

1.0 INTRODUCTION

1.1 Study Purpose - The purpose of this study is to evaluate existing drainage conditions at the south east corner of the Ridgewood Subdivision in the Village of Western Springs and to determine potential solutions for reducing both storm water ponding and frequency of concentrated overland storm water flows at 5 locations within the study area.

1.2 Study Scope - The study site contains 25.9 acres more or less, is bounded by Wolf Road on the east, Lawn Drive on the west, Timberview Estates on the south and Park Place on the north. The study location is identified in Exhibit A attached to this report.

1.3 Study Process - The study process includes identification of drainage facilities (pipes, swales, drainage structures, ponds, offsite contributing drainage areas, invert elevations and overland flow locations) from historic atlases, on site visual identification and field survey. Calculations of storm water runoff rates, detention and recommended storm sewer improvements were determined using storm water modeling software Hydraflow© - Hydrographs and Hydraflow© Storm Sewers. Technical data generated from the modeling software is not included in this report to maintain clarity and is available for review upon request.

1.4 History of Development and Storm Drainage Requirements

1.4.1 The Ridgewood Residential Subdivision was constructed in parts from 1957 through 1970 in what was then unincorporated Cook County. The subdivision was then annexed in 1973 by the Village of Western Springs. Based upon the subdivision records, it appears that the subdivision was developed from west to east and from north to south over the roughly 13 year period. It appears at the time of annexation the subdivision was not constructed to the Village's standards and no records were available that addressed this issue.

The Ridgewood Oaks Condominiums were constructed in what was unincorporated Cook County from 1974 to 1977 and annexed into the Village circa 1983. The Ridgewood Oaks Subdivision was required to upgrade (reconstruct) their roadway to the Village standard as part of a Special Service Area ("SSA"). The water and sewer utilities are serviced by LaGrange Highlands Sanitary District and therefore were not included in the required upgrade. The SSA appears to include the construction of a slight berm along the west side of Ridgewood Oaks, adjacent to the Ridgewood Subdivision, to increase detention on the Ridgewood Oaks property.

Engineering Plans titled Ridgewood Court, by Applied Engineering Company of Arlington Heights, Illinois and dated December 2, 1974 show a detention pond at the southwest corner of Ridgewood Oaks, adjacent to the Ridgewood subdivision. The detention pond grading plan identifies a high water level and top of berm elevation of 677.00. The utility plan shows the pond outlet pipe size as 6 inches. Design calculations for the pond, by Allied Engineering, and dated September, 1975 specify the pond annual 1% probability storm event release rate equal to 2.18 cubic feet per second ("cfs") and the provided volume of 0.59 acre-feet.

1.4.2 The Village of Western Springs uses Illinois Department of Transportation ("IDOT") accepted and recommended levels of service for design criteria (BLR38-2.02) for storm water drainage on Local Roadway Functional Classified Roadways. The criteria is an annual 10%

probability storm frequency for all Urban Pavements, Inlets and Storm Drains. This criteria is the generally accepted and applied engineering standard by drainage engineers with the State of Illinois. The recommended annual 10% probability storm event frequency has been used to design storm sewer elements in this report. Detention facility capacities utilize the annual 24 hour, 1% probability storm event.

1.5 Background Documents - Plans for the Wolf Road roadway improvements, United States Geological Survey ("USGS") topographical maps, Cook County contour mapping and Village atlas information were used in part for model data building and to analyze the existing drainage systems. Additional information on existing easements is currently under research by the Village and was not available at the time of the preparation of this document.

1.5.1 Previous Studies – A study was performed in circa 1991 by James J. Benes & Associates, Inc. ("JJB") on the then Timber Trails Golf Course relative to the tributary areas to the Ridgewood Subdivision. Only portions of the previous study could be located due to the age. A portion of the previous report was applicable to the current study for the Linden Court drainage between 904 and 906. No other studies could be located for the study area.

1.6 Hydraulic and Hydrology Methodology – This study uses the Illinois State Water Survey ("ISWS") Northeastern Illinois Bulletin 70 Rainfall Data of the appropriate quartile distribution. Existing and proposed storage was analyzed for the annual 50% probability, annual 10% probability, annual 2% probability and annual 1% probability storm events using hydrograph routing in the Hydraflow Hydrographs model. The storm sewer analysis used the Rational Method as implemented in the Hydraflow Storm Sewers model. Proposed storm sewers were sized for an annual 10% probability storm event.

2.0 EXISTING CONDITIONS

2.1 Overview of the Drainage System – Generally speaking the pre-development topography of the subdivision was utilized for the collection of storm water. The existing drainage system within the Ridgewood Subdivision consists of a series of differing pipe materials (reinforced concrete pipe ("RCP"), vitrified clay pipe ("VCP") and corrugated metal pipe ("CMP") along with concrete drainage structures and inlets. The system is constructed in Village Right of Way ("ROW") and within private property at various locations. Sewers constructed on private property are generally between existing homes and in the rear yards of existing homes. Drainage inlets are located sporadically throughout the subdivision both in the roadway and in some cases in rear yards. Generally speaking, some of the existing collection system lacks structures in critical locations to collect water in upstream areas to reduce large amounts of overland flow runoff. Overland flows typically occur in historically low topographical areas (predevelopment drainage paths).

2.2 Data Collection - Data consisting of Village of Western Springs sewer atlases, Cook County two feet contour mapping, storm sewer and site survey prepared by JJB, Federal Emergency Management Agency ("FEMA") Flood Insurance Study ("FIS") data for Flagg Creek, resident interviews and correspondence including video of localized flooding. The Village does have plans for the development of the Ridgewood Oaks Subdivision, titled Ridgewood Court, by

Applied Engineering Company of Arlington Heights, Illinois and dated December, 1974. All data utilized is based upon North American Vertical Datum 1988 ("NAVD").

2.2.1 Flooding Complaints/ Input from residents –Based upon the study area of the southeast corner of the Ridgewood Subdivision, several residents have provided descriptions, photos and video of overland flows and ponding water at various locations. During our various site investigations we also spoke with several local residents who have provided valuable insight and information.

2.2.2 Site Reconnaissance- Site field work was performed by our staff utilizing existing topography to map nuances of existing drainage patterns and to verify various data utilized in the study. Variations in local drainage patters can have significant impacts to localized drainage issues.

2.3 Minor and Major Drainage System – This study contains information relative to both the major and minor sewer systems. Major systems can be defined as mainline large sewers and overland flow routes. Minor systems are defined by this study as intermittent collection sewers roughly 10" to 18" in diameter, generally used to collect roadway and rear yard drainage and then convey flows to the major system which drains Flagg Creek.

2.3.1 Primary Overland Flow Routes – Primary overland flow routes are an integral part of every newer development drainage design. Storm events in excess of the drainage system design event need to be considered and adequate overland flow routes provided. Older development generally did not consider emergency overland flow routes but were created as necessity presented itself. In older developments overland flow routes were generally ignored and the Ridgewood Subdivision was apparently developed with this old development mentality. This same mentality was the basis for many developments occurring in floodplain and floodway which are now the subject of significant government regulation. Given the passing of time and experience gained, regulatory agencies and engineers currently require overland routes be designed and maintained as open spaces to permit large volumes of storm water to safely discharge without damaging building structures. With or without an "adequate storm water system design", overland flow conveyance routes are critical to reducing flooding damage.

2.3.2 Ponding Areas - The study area contains four locations where considerable water ponds during larger storm events: Linden Court cul-de-sac (Pond P1), Ridgewood Oaks detention area (Pond P2), Lawn Circle cul-de-sac (Pond 3), and Lawn Drive low area near 5712 Lawn Drive (Pond P4). There are likely other smaller isolated ponding areas that are not considered consequential by the scope of this study.

2.4 Existing Storm Water Management Facilities - Ridgewood Subdivision is drained by separate storm sewer systems which include collection structures primarily in the roadways and also through a few back and side yards. Each system flows westerly and eventually outlets into Flagg Creek, approximately 2,000 feet west of the study location. The total tributary area (less 6 ac. of Timberview Estates) is approximately 25.9 acres. 14.7 acres is drained through the existing 18" storm sewer between 5732 and 5804 Lawn Drive and 11.2 acres drain through the existing 21" storm sewer between 5704 and 5708 Lawn Drive. As a part of this study, the Timberview Estates 6 acres is considered not tributary to the Ridgewood Southeast Drainage

basin because the entire 6 acres can be collected and conveyed to Flagg Creek within the existing 36" storm sewer. This is discussed later in the report.

In addition to storm sewer, the Ridgewood Oaks Condominium complex south west corner has some detention storage. This storage area is drained through a 12" culvert extending west from the basin. The facility maintenance appears nonexistent and hence the existing storage is minimal as compared to its potential storage capacity.

To the west of the Ridgewood Oaks storage basin is a large concrete structure (inlet box) with a vertical grating headwall to assist in collecting trash allowing the 18" outfall pipe to function effectively. The large concrete structure is located in a small depression at the rear yard of 921 Lawn Circle. The depressional area is currently filled with debris approximately 18 inches in depth. It appears this area regularly attracts significant landscape debris and leaves from the adjoining properties.

2.5 Hydrology and Hydraulic Modeling

2.5.1 Model Development –

Hydrologic Input Parameters – This study establishes Stage Storage relationships used to compute storage volumes in the ponded areas. Hydraflow Hydrology was used to calculate the existing site runoff and ponding volume in Linden Court (Pond P1), ponding volume at the western edge of the Ridgewood Oaks condominium development (Pond P2), ponding volume in Lawn Circle (Pond P3) and ponding volume in the Lawn Drive low area at 5704 and 5706 Lawn Drive (Pond P4). The land area consists of approximately ¼ acre residential lots with a Soil Conservation Service (SCS) Curve Number ("CN") of 83. Soil Conservation Service Technical Release 55 (SCS TR-55) methodology was used for time of concentration determination. Basin input data including area (a), Curve Number (CN) and time of concentration (Tc) for each component of the drainage system are found in the report. Illinois State Water Service (ISWS) Bulletin 70 rainfall data for Northeast Illinois was used. Surveyed site and overflow elevations and also contour mapping were used to model storage basins at Linden Court, Ridgewood Oaks Basin, Lawn Circle and Lawn Drive storage areas. The existing storm sewers draining the roadway for Linden Court, Lawn Circle and Lawn Drive (18" storm sewer, 12" storm sewer and 21" storm sewer respectively) were used for each outlet orifice. The existing 18" storm sewer draining the storage area, pond P2, was used as the outlet orifice.

The hydrologic investigation included drainage improvement alternates to reduce overland flows throughout Ridgewood Subdivision and ultimately reduce ponding at Lawn Drive. The hydrologic model results included impacts from overland flows of each ponding area.

The alternates focused on providing a combination of upstream detention on the Ridgewood Oaks property and also upsizing the outlet sewer capacity at Lawn Drive. Five alternates were investigated.

Alternate 1 proposed adding an additional 30" storm sewer to drain the Lawn Drive low area. The existing 21" storm sewer would be maintained.

Alternate 2 proposed constructing a detention pond at the existing basin location on the Ridgewood Oaks property. A wall would be built to elevation 677.00 adjacent to the existing west fence to detain storm water. The existing detention area would be maintained with no additional excavation. The existing 12" outlet sewer (draining the detention pond) would be maintained.

Alternate 3 proposed constructing an upstream detention pond in the Ridgewood Oaks Subdivision (as in Alternate 2) and also construction of an additional 24 " storm sewer at Lawn Drive. The existing 12" outlet sewer (draining the detention pond) would be maintained. The proposed 24" storm sewer would be in addition to the existing 21" storm sewer at Lawn Drive.

Alternate 4 proposed replacing the existing 21" outlet pipe at Lawn Drive with one 36" storm sewer. This alternate does not include a detention pond upstream.

Alternate 5 proposed constructing an upstream detention pond in the Ridgewood Oaks Subdivision (as in Alternate 2) but replacing the 12" storm sewer outlet pipe with an 18" storm sewer outlet pipe.

Alternate 6 proposed constructing a detention pond at the existing basin location on the Ridgewood Oaks property in accordance with the Ridgewood Court design plans dated 1974. A wall would be built to elevation 677.00 adjacent to the existing west fence to retain storm water. The existing detention area would be maintained with no additional excavation. The existing 12" outlet sewer (draining the detention pond) would be replaced with a 25' 6"RCP sewer as specified in the Ridgewood Court plans.

The modeling results from **Alternate 1** indicate that adding an additional pipe (30" pipe) at Lawn Drive produces a significant reduction in overland flow and ponding volume at the Lawn Drive low area. Implementing this improvement would require additional storm sewer construction west of Lawn Drive to Flagg Creek. This analysis only included constructing an additional 30" storm sewer in addition to the 21" sewer at Lawn Drive. Additional analysis of the storm sewer system to Flagg Creek would most likely result in providing additional capacity via sewer replacement all the way to Flagg Creek (approximately 2,000 feet). In addition, complete replacement of the storm sewer system from Lawn Drive west to Flagg Creek would require locating the sewer in the Village of Western Springs roadway right of way since the existing sewer is located within home side yards at many locations.

The modeling results from **Alternate 2** indicate that providing upstream detention at the existing Ridgewood Oaks detention area would reduce overland flow throughout Ridgewood and provide some reduction in ponding at Lawn Drive.

The modeling results from **Alternate 3** indicate that providing an upstream detention pond *and* constructing an additional 24" storm sewer on Lawn Drive (in addition to the existing 21" storm sewer at Lawn Drive) would provide a significant reduction in overland flows and ponding volume on Lawn Drive. Again, this alternate would require additional Lawn Drive outlet capacity. Providing detention in Ridgewood Oaks would moderately reduce overland flows

through Ridgewood. Constructing an additional 24” outlet pipe at Lawn Drive, would also require providing additional storm sewer capacity to Flagg Creek.

The modeling results from **Alternate 4** indicate that replacing the existing 21” storm sewer at Lawn Drive with a 36” storm sewer produces a significant reduction in overland flow and ponding volume at the Lawn Drive low area. Implementing this improvement would require additional storm sewer construction west of Lawn Drive to Flagg Creek. This analysis only included replacing the existing 21” storm sewer with a 36” storm sewer. Additional analysis of the storm sewer system to Flagg Creek would most likely result in providing additional capacity via sewer replacement all the way to Flagg Creek (approximately 2,000 feet). In addition, complete replacement of the storm sewer system from Lawn Drive west to Flagg Creek would require locating the sewer in the Village of Western Springs roadway right of way since the existing sewer is located within home side yards at many locations.

The modeling results from **Alternate 5** indicate that providing upstream detention in Ridgewood Oaks and upsizing the pond outlet pipe from 12” (**Alternate 2**) to 18” does not provide additional reduction in overland flows or ponding depth at Lawn Drive. Constructing a 12” or 18” outlet for the detention pond yields the same result due to the existing Lawn Drive 21” outlet capacity being maintained.

The modeling results from **Alternate 6** indicate that providing upstream detention at the existing Ridgewood Oaks detention area in accordance with the Ridgewood Oaks plans from 1974 would reduce overland flow throughout Ridgewood and provide some reduction in ponding at Lawn Drive.

2.5.2 Model Verification – The base storm water model comparison to empirical data provided by residents was the best available information. After comparison of model results with the empirical information it appears the model provides reasonable accurate results.

2.5.3 Storm Sewer Analysis- Area topographic contour mapping, survey data and field investigation were used to determine drainage areas to storm structures. A suburban residential runoff coefficient “C” value of 0.45 was used. The storm sewer model includes two major outfalls from the study area. An 18” diameter sewer between 5732 and 5804 Lawn Drive and a 21” outfall between 5704 and 5706 Lawn Drive. For analysis, both discharges are assumed with no tail water impact from Flagg Creek.

Area A1 includes a south storm sewer system which runs north under Timberview Lane and discharges to an open ditch. The ditch flows north into a 14” PVC and then runs west through a 36” sewer out letting to the Timber Trails west detention basin. The Area A1 36” storm sewer outlet pipe was originally designed to handle approximately 16 acres of upstream area that includes 6 acres of the Timberview Estates (Unincorporated Cook County) and 10 acres of the previously existing Timber Trails Golf Course. Since the development of the Timber Trails Golf Course property, 10 acres of tributary area have been removed from the 36” storm sewer tributary area. The 14” PVC collecting the ditch flow currently has an annual 10% probability storm capacity.

Area A2, Area A3 and Area A6 are all drained by a storm sewer system which outlets to an 18" storm sewer at Lawn Drive just south of Lawn Circle. The majority of the system sewers have a capacity between the 1-year and 3-year event. The 18" storm sewer outlet has approximately 1-year capacity. Areas A2, A3 and A6 do contribute to the Lawn Drive low area storm water flows by surcharging during rainfall events that exceed the 18" sewer capacity.

Area A4, Area A5 and Area A7 are all drained by the same storm sewer system which outlets to a 21" storm sewer at Lawn Drive south of Lawn Court. The system sewers have a capacity between the 1-year and 10-year event. The 21" storm sewer outlet has approximately 1-year capacity. Areas A4, A5 and A7 are directly tributary to the Lawn Drive low area.

2.6 Review of Drainage Focus Areas

2.6.1 904/906 Linden Court Overland Flow – Homeowners are experiencing periodic overland flows between 904 and 906 Linden Court. Prior to the construction of the 36" storm sewer in 1994 by the Village of Western Springs, all storm water flows discharged through the Linden Court yards that backed up to the golf course and Timberview Estates. Previous investigations have concluded that inadvertent storm sewer blockages caused by debris accumulation is the primary cause for the overland flow occurrences. The modeling performed confirms that the existing 36" storm sewer has sufficient capacity to convey an annual 1% probability storm event from the Timberview Estates area. Overland flows from Timberview Estates contribute to increased overland flows downstream and should be minimized. It is our understanding the periodic overland surface flows are not adequately collected by the existing manhole structures, likely the result of long term settlement of ground elevations. This can be remediated with grading. It is not reasonable to completely eliminate this overland flow as this is the natural water route and it should be maintained.

2.6.2 Linden Court Cul-de-sac – The Linden Court Cul-de-sac is immediately downstream of 904/906 Linden Court overflow and experiences periodic temporary storm water ponding. Storm water is collected in 4 inlets which are sufficient to collect storm water runoff for the tributary area assuming the upstream Timberview Estates drainage is captured by the existing 36" storm sewer. The storm sewer system that collects runoff from the cul-de-sac provides an annual 10% probability capacity. There are several factors that can impact the system and cause it to operate at a lower capacity, resulting in ponding in the cul-de-sac. The factors potentially affecting service are exceedances of the annual 10% probability event, debris covering storm inlets, the downstream storm sewer outfall near the inlet box becomes plugged with debris or the submergence of the outfall creating a hydraulic back pressure on the system.

2.6.3 903/905 Linden Court Overland - When the ponding exceeds the capacity of the cul-de-sac storage, storm water flows overland between 903 and 905 Linden Court north and west to the Ridgewood Oaks property. Periodically, depending on the circumstances, ponding rises high enough to cause overland flow between 905 and 907 Linden Court in addition to 903/905 Linden Court.

2.6.4 Ridgewood Oaks Detention Basin – The Ridgewood Oaks detention basin original design has been confirmed by design plans and calculations obtained from Metropolitan Water Reclamation District of Greater Chicago. Per the Ridgewood Court plans dated December 1974,

the detention pond was designed with a 25 foot long 6” CMP outlet pipe and a top of berm elevation of 677.00. No overflow weir is shown on the Ridgewood Court detention pond plan. The design High Water Elevation for the pond was 677.00 and 0.57 acre-feet of storage were to be provided. The current basin holds little storm water due to erosion and the lack of maintenance. When storm water collects in the basin and fills what little storage exists, runoff then spills west through the fence and into the inlet box structure. The current 12” outlet pipe (restrictor) in the Ridgewood Oaks basin is of a poor design and frequently clogs and causes a quick buildup of storm water causing erosion and unintended discharges from the basin. The Ridgewood Oaks development storm sewer collection system was not included in this analysis as there have been no reports of concerns or issues with this storm sewer system.

2.6.5 Inlet Box and 18” Storm Sewer Outlet – The inlet box and its 18” storm sewer outfall accept storm water from the Linden Court cul-de-sac storm sewer, the Ridgewood Oaks detention basin and the adjacent Ridgewood Subdivision residential tributary area. The inlet box is situated in a low area overgrown with bushes, and various plant materials likely planted or left unattended to minimize erosion in the storm water collection area. The inlet box is protected by a metal vertical rack designed to collect debris and prevent the outlet pipe from clogging. It appears to be working well although needs routine maintenance. There is no clear point of access to perform maintenance.

2.6.6 921/923 Lawn Circle Overland – When the inlet box behind 921/923 Lawn Circle experiences excessive storm water flows or becomes obstructed with debris, storm water is directed northwest through the common side yards of 921/923 Lawn Circle. The excess storm water moves through an area between the homes that is commonly known as an overland overflow route. The route is well defined and contains the storm water runoff such that no damage to the existing structures occurs during the overflow event. Typically overland flow routes are protected via a recorded permanent easement impressed upon each property.

2.6.7 Lawn Circle cul-de-sac – The Lawn Circle cul-de-sac is drained via a single storm inlet in the cul-de-sac via a 10” storm sewer connected to a 15” storm sewer constructed between 922 and 924 Lawn Circle, then draining west between 5707 and 5715 Lawn Drive. Based upon the upstream tributary area, the 10” storm sewer is undersized and should be replaced with a larger pipe only after the downstream sewer capacities have been increased to accept the additional storm water. Storm water in the cul-de-sac ponds to an approximate depth of 3 inches.

2.6.8 922 Lawn Circle / 924 Lawn Circle Overland – When the Lawn Circle cul-de-sac ponding exceeds the capacity to store storm water, the storm water overflows between 922 and 924 Lawn Circle. The emergency overland flow route is well defined and contains the storm water conveyance such that no damage to existing structures occurs during the overflow event. It should be noted that the home at 5707 Lawn Drive has made significant effective investments in retaining walls, swales, inlets and pipe to maintain overland conveyance and to direct flows around the building structure.

2.6.9 Catchment Area A5 – Catchment area A5 consists of 6.7 acres of single family residential development primarily tributary to Lawn Court. There are no storm sewers or inlets to collect runoff at the east end of the roadway where much of the storm water is generated. The collection system consists of single inlet structures at the north and south curb lines where the

Lawn Court meets the Lawn Drive. As a result the vast majority of storm water flows bypass the inlets and travel downstream to 5712 Lawn Drive where the storm water is either collected or becomes surcharged overland flow.

2.7.0 Catchment Area A6 – Catchment area A6 represents 2.7 acres of residential development in which storm water runoff is collected in inlets at both the Linden Court and Lawn Circle intersections with Lawn Drive. It is likely during small storm events that the system adequately conveys storm water through the 18" sewer that extends through the side yards of 5732 and 5804 Lawn Drive. During larger storm events, the 18" sewer is unable to convey additional storm water and the resulting runoff continues to flow north on the Lawn Drive pavement adding additional storm water to the 5712 Lawn Drive area.

2.7.1 5712 Lawn Drive – 5712 Lawn Drive is situated at the downstream end of the study area. The home was constructed in the center of the historical drainage swale that served and continues to serve the entire south east drainage basin of the Ridgewood Subdivision. All runoff that is not collected in storm sewers becomes overland flow and drains through both the north and south side yards of 5712 Lawn Drive. Since the construction of the Ridgewood Subdivision in the 1960's, there have been no significant changes in drainage patterns except for the removal of approximately 10 tributary acres of the Timber Trails Golf Course and 6 tributary acres of Timberview Estates (for a total of 16 acres) by the Village installation of the 36" storm sewer at the south end of the Ridgewood Subdivision circa 1992. The overland flow route of the 5712 Lawn Drive property is a significant drainage feature of the Ridgewood Subdivision and needs to be maintained. Recently the owner of 5712 Lawn Drive improved drainage conveyance on both the south and north sides of the residence increasing the level of protection provided to the structure.

3.0 INVESTIGATION OF POTENTIAL REMEDIAL MEASURES

3.1 Areas of Investigation

3.1.1 Issues outside Village Jurisdiction – The Timberview Lane unincorporated area ("Timberview Estates") is under Lyons Township Road District jurisdiction. Work to improve storm water collection in this location will require cooperation and participation of the township. Wolf Road is under the jurisdiction of the Cook County Department of Transportation and Highways. During the onsite drainage investigation it was noted that there are several areas along Wolf Road (5708, 5712, 5740, 5836 and 5842) that have the potential to contribute storm water flows that are designed to be drained in the Wolf Road storm sewer. Each of these locations have reversed pitched driveways and periodically may require maintenance grading to assure storm water is appropriately collected by the County's separate storm water system.

3.1.2 Near Term Storm Water Projects – Two areas have been classified by this study as "Near Term Projects". These projects will require final design and construction. The classification is not a function of importance but rather a function of providing a reasonable approach to funding and constructing beneficial improvements. These improvements would provide some benefit to the southeast drainage basin and do not require significant and costly downstream outfall

improvements. The outfall improvements are classified as “long term” projects due to their substantial funding requirements.

Project #1 is to solve item 2.6.1 above and consists of increasing the size of the 14” storm sewer to a 21” storm sewer with the addition of a sloped inlet box to assist in maintaining flow capacity when debris collects. In addition, the general area needs grading work to ensure proper collection of storm water runoff. This work will require coordination with Lyons Township Highway Department. The reduction of storm water overflows from the Timberview Estates area will reduce storm water through the Ridgewood Subdivision southeast drainage basin. The estimated probable construction cost of project #1 is $25,000.

Project #2 Re-establishment of detention as part of the Ridgewood Oaks Condominium development. This project would consist of constructing a barrier wall to contain storm water runoff from the Ridgewood Condominium development. The detention basin would have a design discharge rate to limit the release rate on the inlet box structure and the 18” storm sewer outfall. We estimate 0.40 acre-feet of storm water storage can be provided on the Ridgewood Oaks Condominium site without removal of trees or excavation. The estimated probable construction cost of project #2 will depend on the type of construction. To maximize the storage volume and minimize maintenance, the recommended construction is a concrete or steel sheet pile retaining wall (similar to a golf course lake perimeter wall). The estimated probable construction cost of a new concrete retaining wall is $ 250,000 to $350,000.

3.1.3 Long Term Storm Water Projects – Long term projects consist of the final design and construction of trunk storm sewers from Flagg Creek to Lawn Drive. After trunk sewers are installed, additional sewer work and localized storm water collection (inlets, manholes and catch basins) consistent with current standards can be installed to provide additional collection and conveyance of storm water to Flagg Creek. This would significantly reduce overland flow occurrences but it is unrealistic to expect complete elimination due to the unpredictable nature of future storm events. It is important that all overland flow conveyance paths be maintained to protect structures (homes) during extreme storm events that are in excess of sewer capacity. The construction of trunk sewers is somewhat complicated. Many of the sewers in Ridgewood were first constructed, with the homes built much later adjacent to the sewers, leaving little room for equipment and larger diameter pipes. Typically storm sewers are constructed in parkways or under roadways; both methods have pros and cons. In either case, installation of new sewers to service the Ridgewood Subdivision in general will be costly. The estimated probable construction cost to extend two new sewers from Flagg Creek to Lawn Drive under existing pavement to service the southeast basin is $ 600,000. The estimated probable cost for construction of the southeast local sewer collection system is $ 300,000.

3.2 Overview of Potential Additional Remedial Measures

3.2.1 Green Infrastructure Initiatives - Promote rain barrel program, parkway infiltration/raingardens, private rain gardens, oversized storm sewers for inline detention, pavement modifications for on street ponding storage, require permeable pavers systems for all new or replacement paved surfaces, require onsite storm water storage as a standard (threshold and volume standards would need to be established), acquire property and create detention.

The village can implement a stormwater management campaign to promote actions for homeowners to reduce stormwater runoff. Homeowners can use rain barrels to collect storm water which can be used to water landscaping (a process often called water harvesting). Homeowners can also create and plant rain gardens to increase water infiltration, evaporation and transpiration. These improvements are proven ways to reduce storm water runoff and provides residents an option to individually contribute and improve drainage within the Ridgewood Subdivision community.

The village can plant infiltration/rain gardens in parkways to reduce runoff and add landscape beautification to the community.

Roadway improvements can include reducing current street widths from 30 feet to 24 feet where appropriate and oversizing storm sewers for inline detention.

The village can investigate constructing a detention pond at Ridgewood Park. This concept while having benefit, would likely not be desirable given the impact to the facility and neighborhood.

As a final measure, the village can offer to acquire property to preserve, maintain or re-establish historical overland flow paths.

The village can also amend the existing storm water management ordinance or development code to require all roof and sump pump discharge to be directed to a stormwater storage system located on the homeowner property. The stormwater storage system can be a french drain / dry well, rain garden or manufactured chamber.

3.2.2 Downspout and Sump Discharges - Downspouts and sump pumps could be disconnected from the village storm sewers. These discharges could flow overland from the houses to local inlets or conveyed through rain gardens or drywells. This action will increase infiltration and increase the time of concentration thus reducing flow rate and volume to the storm sewer system.

3.3 Consideration for Future Development Improvements – Future developments would be designed with current stormwater standards. Proposed developments would be required to comply with the Cook County Watershed Management Ordinance.

4.0 SUMMARY AND RECOMMENDATIONS

The following summary of recommended improvements is organized from most beneficial to least beneficial in reducing storm water impacts at the 5712 Lawn Drive overland flow area. Given cost of improvements it should be understood that each improvement implemented will, over time, incrementally benefit the entire water shed not just the Lawn Drive low area through storm water collection, temporary storage, encouraging plant uptake, improving infiltration and

evaporation all of which reduce storm water flows and provide a variety of environmental benefits.

Ridgewood Subdivision drainage can be improved by providing a combination of Village Near Term improvements, Long Term Improvements and local resident participation in implementing green stormwater initiatives.

Near Term Improvements:

RIDGEWOOD OAKS BASIN: Reinstating the detention pond at the southwest quadrant of Ridgewood Oaks Condominium Subdivision. A proposed detention wall would be constructed adjacent to the existing west fence. The pond discharge rate would be designed to restrict release discharge to the inlet box structure and existing 18" storm sewer. Overflow discharge rates downstream of Ridgewood Oaks, through Ridgewood subdivision, including runoff to 5712 Lawn Drive, would be reduced.

TIMBERVIEW ESTATES STORMWATER COLLECTION: Replacing the existing 14" PVC pipe (which collects runoff from Timberview Estates), with a 21" RCP and sloped inlet box. Also included would be re-grading the area at the open lid manhole to direct runoff to the existing 36" RCP. These actions will reduce overland flow to 906/904 Linden Court which periodically contributes to downstream flooding.

Long Term Improvements:

TRUNK SEWER UPSIZING: Upsizing trunk and collection sewers from Flagg Creek to Lawn Drive. Proposed sewer would have a minimum capacity of the annual 10% probability storm frequency. Overland flows throughout Ridgewood Subdivision, including runoff to 5712 Lawn Drive would be significantly reduced due to providing increased storm sewer conveyance capacity to Flagg Creek. Overland flows would not be completely eliminated and overland flow paths should be maintained to accommodate rainfall events in excess of sewer capacity. Providing adequate overflow paths is imperative to protecting building structures from flood damage.

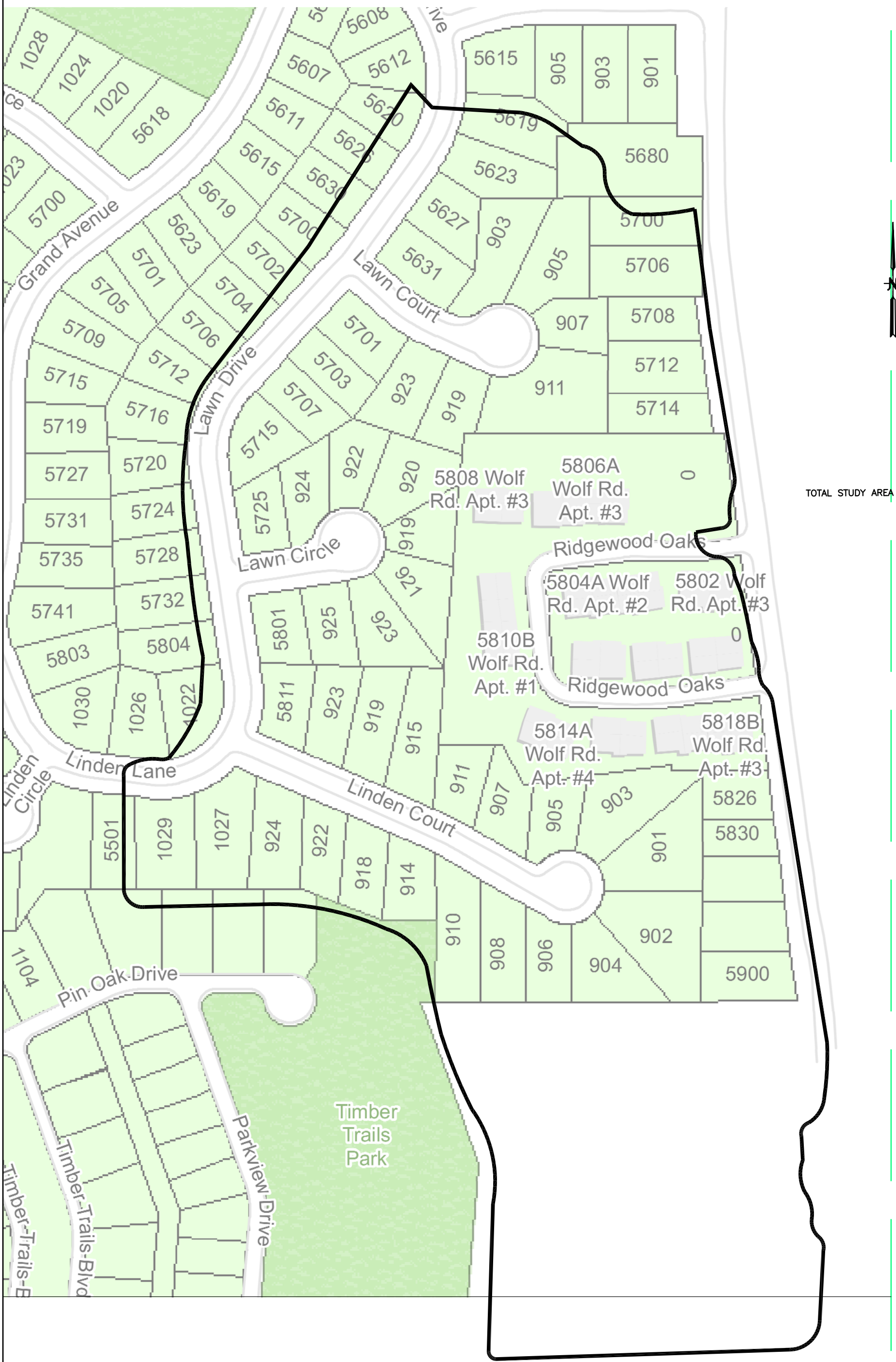
GREEN INITIATIVES FOR STORM WATER:

Implement a green initiatives campaign,
Encouraging the use of rain barrels,
Rain garden implementation,
Storage chambers and dry wells promoting groundwater infiltration.

Acknowledgement:

This report was prepared by Lynn Kroll, P.E., CFM and Jeff Ziegler, Vice President of James J. Benes & Associates, Inc. in August, 2016 for the Village of Western Springs. We would like express our sincere appreciation for the contributions of Director Supert, Manager Higgins and Trustees Allen and Hanson of the Public Works and Water Committee and various residents for contributing critical information and input to the report.

EXHIBIT A
DRAINAGE STUDY BOUNDARY

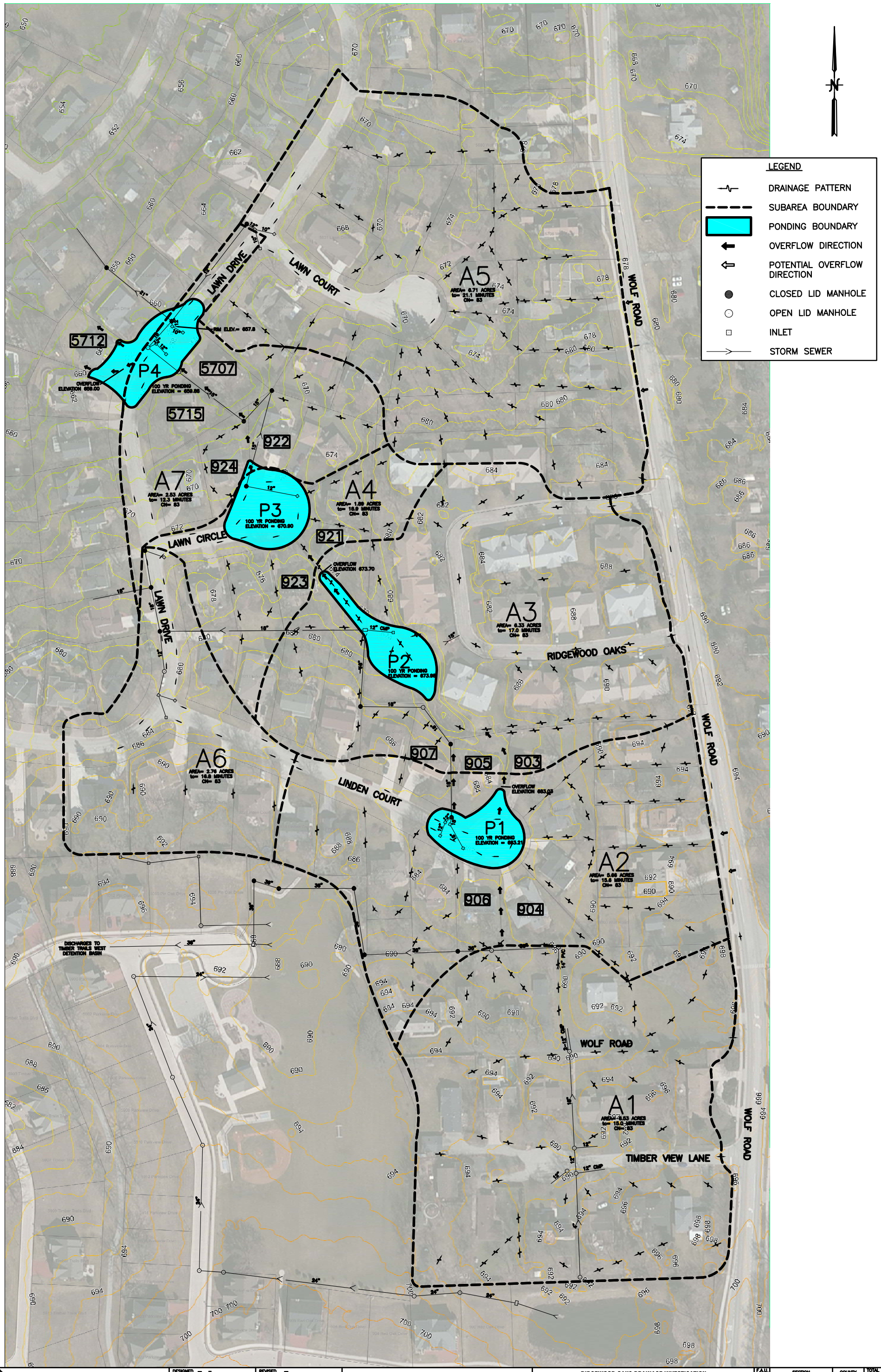


TOTAL STUDY AREA = 32.4 ACRES

JAMES J. BENES & ASSOCIATES, INC. 950 Warrenville Road, Suite 101, Lisle, Illinois 60532 Tel. (630) 719-7570 · Fax (630) 719-7589	DESIGNED – –	REVISED –	VILLAGE OF WESTERN SPRINGS EXHIBIT A	RIDGEWOOD OAKS DRAINAGE INVESTIGATION STUDY AREA LOCATION MAP	F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	DRAWN – TLA	REVISED –			–	–	COOK	1	1
	CHECKED – LAK	REVISED –					CONTRACT NO.		
	DATE – 6/23/16	REVISED –		SCALE: 1" = 150' SHEET NO. OF SHEETS STA. TO STA.		ILLINOIS FED. AID PROJECT			

EXHIBIT B

EXISTING DRAINAGE PATTERNS, CATCHMENT AREAS, PONDING AND STORM SEWERS



JAMES J. BENES & ASSOCIATES, INC.
950 Warrenville Road, Suite 101, Lisle, Illinois 60532
Tel. (630) 719-7570 · Fax (630) 719-7589

DESIGNED	–	REVISED	–
DRAWN	– TLA	REVISED	–
CHECKED	– LAK	REVISED	–
DATE	– 6/23/16	REVISED	–

VILLAGE OF WESTERN SPRINGS
EXHIBIT B

RIDGEWOOD OAKS DRAINAGE INVESTIGATION
EXISTING DRAINAGE

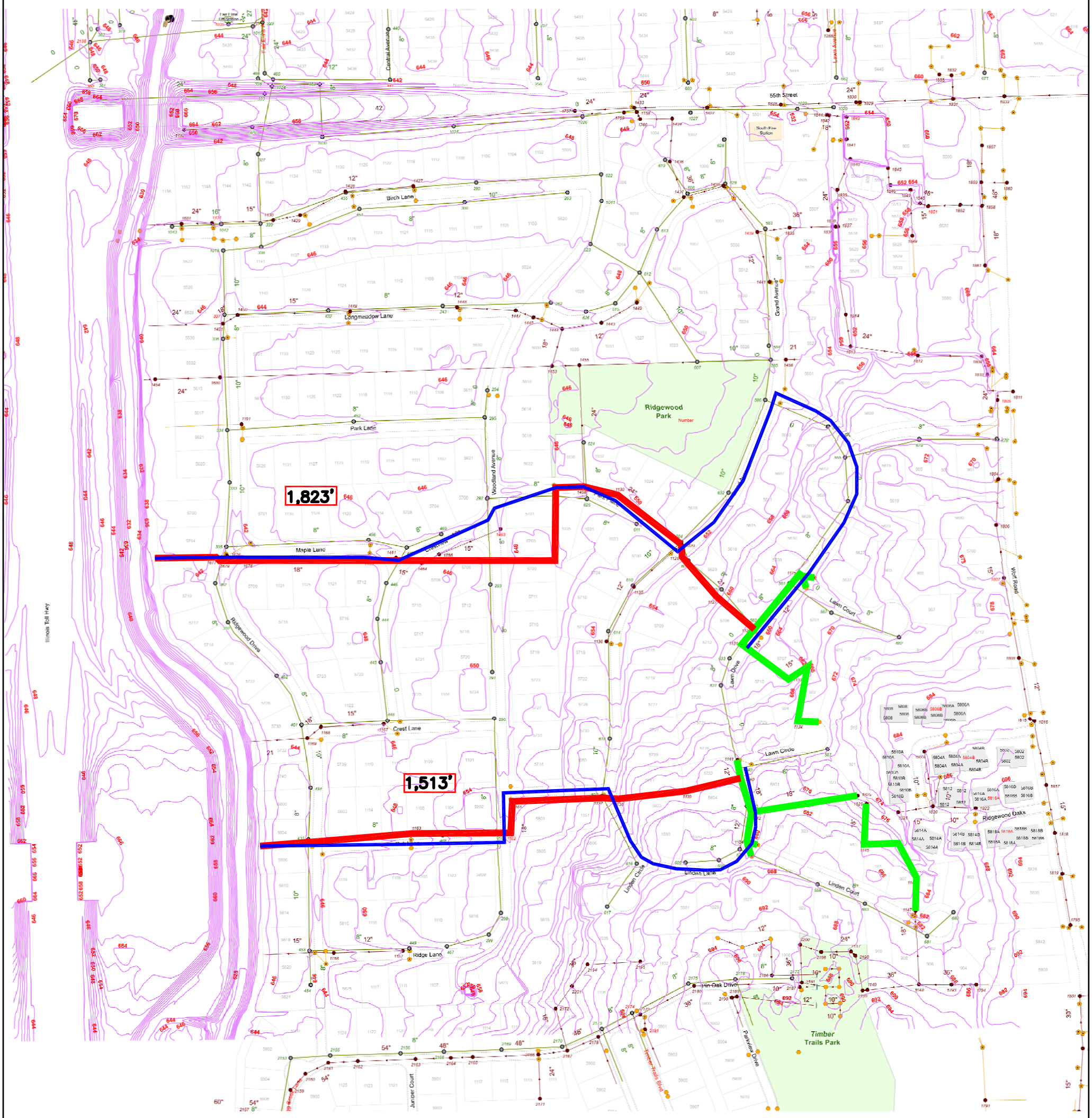
SCALE: 1" = 150' | SHEET NO. OF SHEETS | STA. TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
–	–	COOK	1	1

CONTRACT NO.

ILLINOIS FED. AID PROJECT

EXHIBIT C
OVERALL STORM SEWER MAP



Pipe	Manholes	Inlets	Outfalls
<all other values>	<all other values>	Catch Basin	Outfalls
Combined	Combined	Inlet	Lift Station
Relief	Relief	Laterals	CSO
Storm	Storm		

Study Area

Downstream Storm Sewers

Sewer In R.O.W.

Coordinate System: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 984,250.0000
False Northing: 0.0000
Central Meridian: -88.3333
Scale Factor: 1.0000
Latitude Of Origin: 36.6667
Units: Foot US

Date: 7/5/2016 Time: 9:58:51 AM
User Name: cdiercadi

JAMES J. BENES & ASSOCIATES, INC.
950 Warrenville Road, Suite 101, Lisle, Illinois 60532
Tel. (630) 719-7570 · Fax (630) 719-7589

DESIGNED	–	REVISED	–
DRAWN	TLA	REVISED	–
CHECKED	LAK	REVISED	–
DATE	6/23/16	REVISED	–

VILLAGE OF WESTERN SPRINGS
EXHIBIT C

RIDGEWOOD OAKS DRAINAGE INVESTIGATION
STORM SEWER MAP

SCALE: 1" = 300' | SHEET NO. OF SHEETS | STA. TO STA.

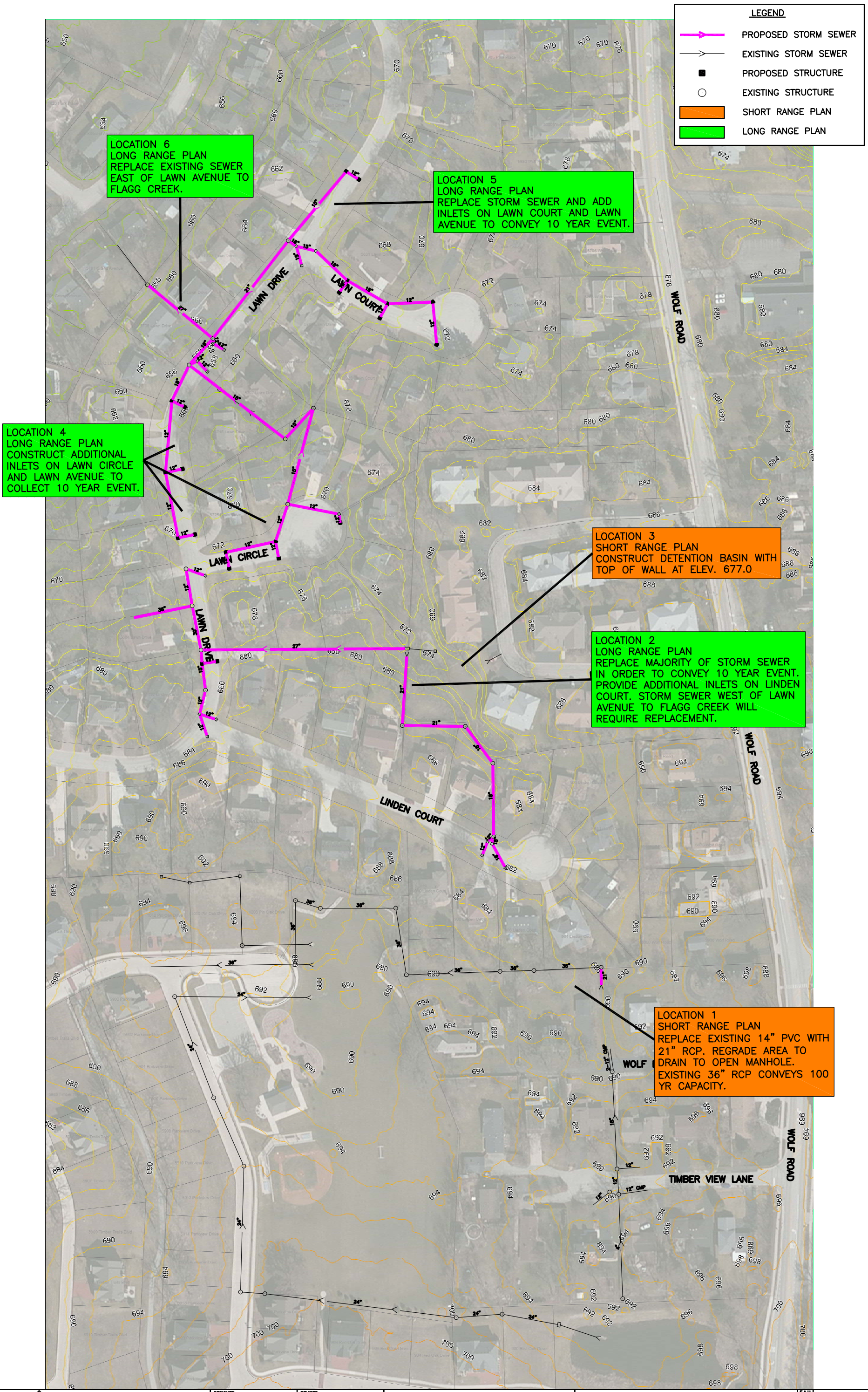
F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
–	–	COOK	1	1

CONTRACT NO.

ILLINOIS FED. AID PROJECT

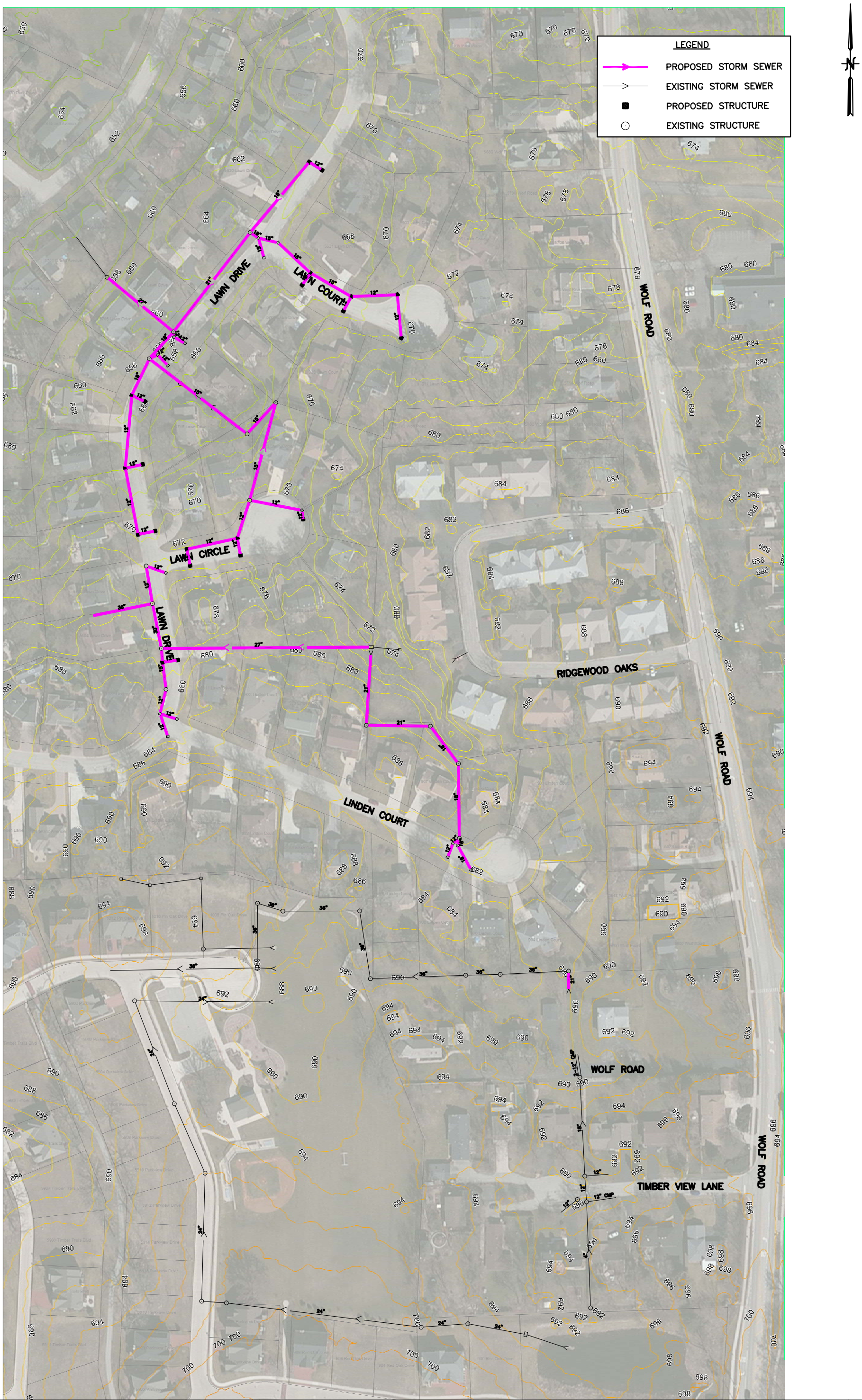
EXHIBIT D

RIDGEWOOD DRAINAGE IMPROVEMENTS / FOCUS AREAS



JAMES J. BENES & ASSOCIATES, INC. 950 Warrenville Road, Suite 101, Lisle, Illinois 60532 Tel. (630) 719-7570 · Fax (630) 719-7589	DESIGNED – –	REVISED –	VILLAGE OF WESTERN SPRINGS EXHIBIT D	RIDGEWOOD OAKS DRAINAGE INVESTIGATION RIDGEWOOD DRAINAGE IMPROVEMENTS / FOCUS AREAS	F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	DRAWN – TLA	REVISED –			–	–	COOK	1	1
	CHECKED – LAK	REVISED –						CONTRACT NO.	
	DATE – 6/23/16	REVISED –		SCALE: 1" = 150' SHEET NO. OF SHEETS STA. TO STA.			ILLINOIS FED. AID PROJECT		

EXHIBIT E
PROPOSED STORM SEWER IMPROVEMENTS



JAMES J. BENES & ASSOCIATES, INC.
950 Warrenville Road, Suite 101, Lisle, Illinois 60532
Tel. (630) 719-7570 · Fax (630) 719-7589

DESIGNED	–	REVISED	–
DRAWN	TLA	REVISED	–
CHECKED	LAK	REVISED	–
DATE	6/23/16	REVISED	–

VILLAGE OF WESTERN SPRINGS
EXHIBIT E

RIDGEWOOD OAKS DRAINAGE INVESTIGATION
PROPOSED STORM SEWER IMPROVEMENTS

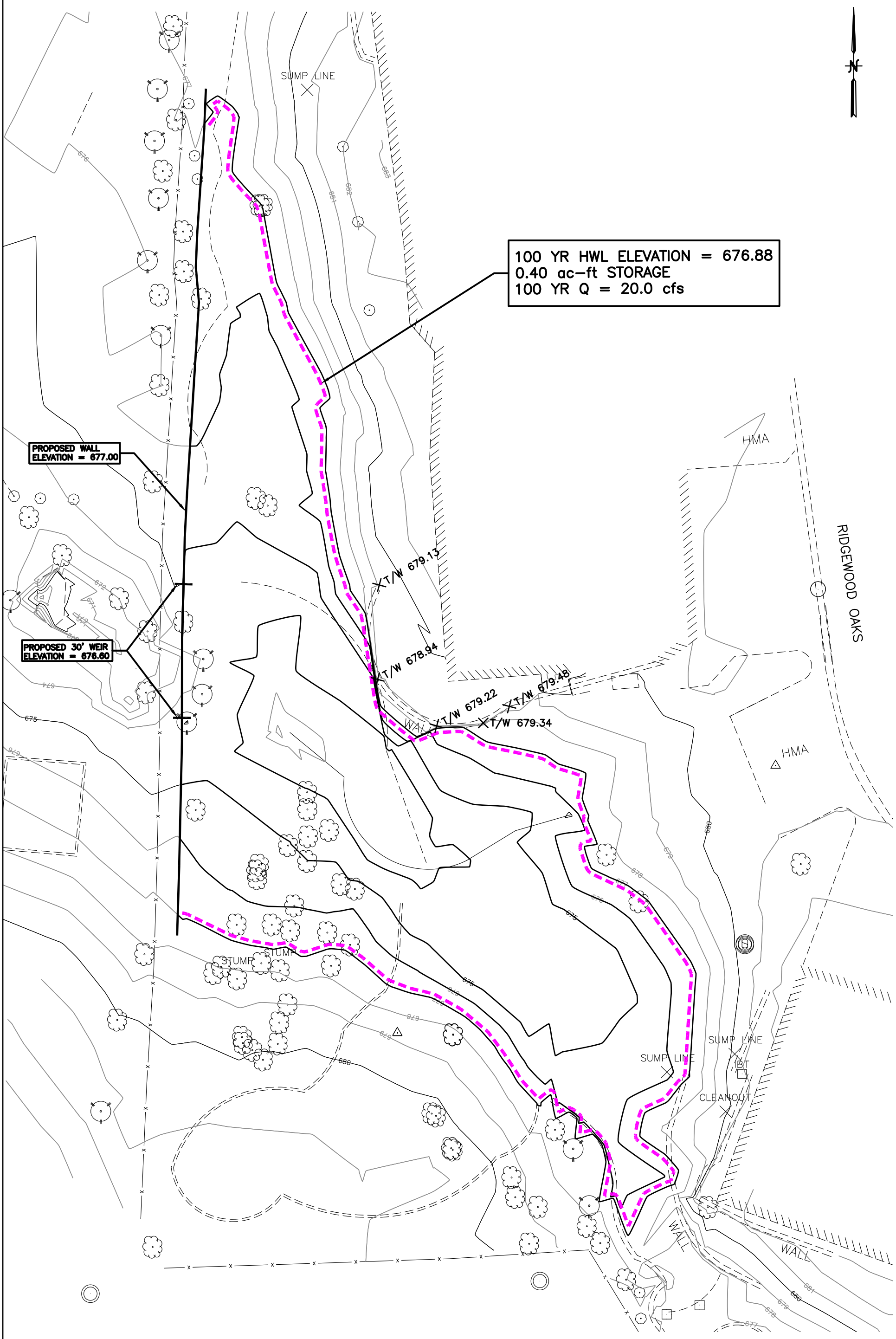
SCALE: 1" = 150' | SHEET NO. OF SHEETS | STA. TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
–	–	COOK	1	1

CONTRACT NO.

ILLINOIS FED. AID PROJECT

EXHIBIT F
RIDGEWOOD OAKS DETENTION IMPROVEMENT



JAMES J. BENES & ASSOCIATES, INC.
950 Warrenville Road, Suite 101, Lisle, Illinois 60532
Tel. (630) 719-7570 · Fax (630) 719-7589

DESIGNED	–	REVISED	–
DRAWN	– TLA	REVISED	–
CHECKED	– LAK	REVISED	–
DATE	– 6/23/16	REVISED	–

VILLAGE OF WESTERN SPRINGS
EXHIBIT F

RIDGEWOOD OAKS DRAINAGE INVESTIGATION
DETENTION IMPROVEMENT

SCALE: 1" = 20' | SHEET NO. OF SHEETS | STA. TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
–	–	COOK	1	1

CONTRACT NO.

ILLINOIS FED. AID PROJECT