Public Facilities & Infrastructure Framework

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Introduction

The public facilities and infrastructure available to Hannibal residents contained in this framework include public safety, public potable water, public sanitary sewer, stormwater, and electrical service. Some of these services are provided by governmental jurisdictions and agencies other than Hannibal. Public facilities and infrastructure are an important foundation of quality of life in Hannibal, though largely taken for granted. Efficient facilities are vital to most daily activities and require regular maintenance and upgrading both to meet the demands of a growing population and to be sensitive to environmental resources.

The quality and availability of these services influence the type, timing, and density of development in the future. Conversely, development patterns can have a significant impact on the ability of a City to pay and maintain these services in the future. The primary purpose of the Public Facilities and Infrastructure Framework chapter is to define and plan for new public facilities and infrastructure systems to serve the community through 2030.

Public Facilities & Infrastructure Framework Structure

For the Comprehensive Plan Update, five types of public facilities and infrastructure services have been assessed in this Framework chapter, they include:

- **Public Safety includes police and fire services and is essential to maintaining daily health, safety, and welfare of the City's residents**
- **Public Potable Water encompasses water supply, treatment, storage and water delivery to residents**
- **Public Sanitary Sewer Service systems collect wastewater from all sources and convey it to the treatment facility for residents**
- **Stormwater Management encompasses managing runoff from rain events to control or mitigate conveyance, treatment, recharge, mitigation, reuse and management of events for residents**
- **Electrical Service encompasses the delivery of power through transmission lines, distribution lines, and substations to residents.**
- **The policies apply to future development within Hannibal today and should be used as a guide for determining "how," "when," and "where" future development should occur.**

Public Facilities and Infrastructure Policies

The policies below apply to future development within and surrounding Hannibal today and should be used as a guide for determining "how," "when," and "where" future development should occur. A *policy* is defined as a definite course or method of action selected to guide and to determine present and future decisions.

Thus, *Policies,* define ways to make Hannibal's desired future happen. Specifically, the Plan should be used by the City to implement stated community goals and help make decisions about land use, proposed ordinances, and programs.

Many of the policies use the words "should" and so forth. In general, these words should be read to describe the relative degree of emphasis to be given the policy, but not to establish a specific legal requirement. Because of the often general nature of the policies, some policies within this Plan may appear to conflict. Exercise of judgment is critical to a comprehensive policy plan, which seeks to provide general direction regarding the myriad of factors affecting growth and development in a community setting.

Policies

- **Adequately meet the City's current and future public service needs while assuring cost-effective public improvements.**
- **Safeguard public health, well-being, and prosperity by providing and maintaining facilities that enable the community to live in balance with the natural environment.**
- **Maintain adequate police and fire services, identify, and reserve sites for future public safety services.**
- **Support development which utilizes existing facilities and which minimizes the need for additional public facilities.**
- **Compact and denser development should help make the extension of utilities financially feasible. Where feasible, promote the maximum allowable densities within each land use category and educate the community on the effects of lower density development as not being cost supportive of city services.**
- **Requests for extension of service to rural residential areas should be reevaluated regularly to determine whether rural residential areas can be served efficiently.**
- **Residential development proposed on individual septic systems in areas planned for future public sewer, and proposed as lower-than-zoned density, should be encouraged to use a design which provides subsequent opportunity for increase density, such as through infill development and re-subdivision, as such time that public sewer become available.**
- **Identify areas where community facilities need upgrading, added capacity, or extensions. Priorities should be established according to need and recommendations of the Plan, and provided for as feasible in the Capital Improvements Program.**
- **Coordinate with federal, state, regional, and county authorities for maintained and enhancement the public water supply.**
- **Coordinate with federal, state, regional, and county authorities for maintenance and enhancing the public sanitary sewer system.**
- **Coordinate with neighboring communities and rural service providers to proactively ensure implementation and cost effective improvements.**
- **Phase the extension of utilities into new drainage basins based on projected plans, the Capital Improvements Program, and level of demand. Identify and prioritize future sanitary sewer improvements through the Capital Improvements Program.**
- **Subdivision applications and other development requests should be reviewed for adequacy of sewer and water infrastructure. Approvals may be deferred, phased in, or conditioned upon the availability of adequate infrastructure and treatment capacity.**
- **Future infrastructure development should promote infrastructure designed with the Environmental Management Principles and Guidelines outlined in this plan.**

Public Safety

Police and fire protection is provided to all residents of Hannibal. The availability of these two public services is essential to maintaining daily health, safety, and welfare of the City's residents.

City of Hannibal Police Department

The mission of the Hannibal Police Department is to, "Enhance the quality of life for our community now and in the future. We will achieve this goal by setting the highest standards of professionalism and by providing a progressive level of service and protection to the public." The City's Police Department Headquarters is located downtown at 777 Broadway. In addition, the Police Department operates out of two substations, the first located on Shawnee Trail and the second, opened in 2003 with the cooperation of the Hannibal Housing Authority, located at 1913 Hope Street. Currently, the Hannibal Police Department employs 38 sworn officers and 10 non-sworn staff, covering an area of 15.1 square miles and serving a population of more than 17,500. It is the largest municipal police department in Northeastern Missouri.

The Police Department is comprised of three Divisions: Administrative Services, Criminal Investigation, and Patrol Operations. The Administrative Services Division serves as the primary media contact for all major incidents or topics of general public interest; provides policy and procedural development; Capital Improvements Program development; assists in the preparation of department budgets; administers departmental training and hiring; and provides building and vehicle maintenance.

The Criminal Investigation Division is made up of three investigators and one supervisor. This Division investigates felony crimes, evidence control, narcotics investigations, crime scene investigations, and assists patrol officers when needed. The Patrol Operations Division is responsible for handling daily response to calls for service, traffic enforcement, animal investigation, and provides response to special events. In addition to police cars, the Patrol Operations Division also uses motorcycles and bicycles.

Hannibal's Police Department also provides community education in the form of DARE, a School Resource Officer Program, and fraud and scam community education classes. Finally, the Police Department is also engaged in Animal Control services.

Recommendations

The Police Department adequately serves the community from their present location.

City of Hannibal Fire Department

The Hannibal Fire Department is one of few paid departments in Northeast Missouri offering fire fighting, hazardous material response, Basic Life Support (BLS) Emergency Medical Service, Vehicle Extrication, and Search and Rescue operations. The Department is made up of 41-trained personnel, consisting of the following positions: one Fire Chief, one Deputy Chief, one Secretary, two Training Officers, three Assistant Chiefs, six Captains, sixteen Engineers, and eleven Fire Fighters.

Presently, the Hannibal Fire Department has three stations.

- **Station 1, which is the Department Headquarters, is located Downtown at 205 South 4th Street.**
- **Station 2 is located at Huckleberry Park, at 1383 30th Street.**
- **Station 3 is located along US 61 at 3300 Arapaho Street.**

The Hannibal Fire Department is currently undergoing renovations to Stations 1 & 3 and has obtained the former KHQA television studio building on Palmyra Road near the Hannibal Middle School. This building is being renovated and will become the headquarters of the Hannibal Fire Department as well as serve as a storage facility for specialty equipment.

Recommendations

The need for a fourth station further west of the City is growing, in order to meet response times, provide fire, and rescue efforts where they are most needed. Tentatively, the location for this fourth station may be positioned near Shinn Lane, but the station location is ultimately dictated by the number of miles between stations. The distance between stations cannot be more than 1.5 – 2 miles to provide sufficient fire protection and response times.

Public Potable Water Service

Water Supply Study Area Boundary

Within the study boundary area, there are two public potable water service providers: 1) City of Hannibal Board of Public Works (cross-hatched in blue), and 2) Ralls County Public Water Supply District No. 1 (cross-hatched in red). A territorial agreement was reached in 2003, which defined the service area boundaries and provided a mechanism for water supply to developments along the City limits. The service area boundaries are shown in Exhibit A. The territorial boundary does not match the City limits.

Water Supply

Both water service providers obtain their water from the Hannibal Filter Plant. This water treatment plant has a capacity of 7.5 MGD with average daily usage of 3.3 MGD and peak day usage of 5.0 MGD. Raw water is pumped from the Mississippi River to the water plant by a 10 MGD raw water pump station. Currently, there is an adequate water supply available for the large areas of undeveloped land within the study boundary area. However, this is highly dependent on the type of land development that will occur. As the study area begins to develop, future capacity improvements at the water plant to increase capacity to 10 MGD will need to be budgeted. Due to the source water being the Mississippi River, additional improvements to meet regulatory requirements for water quality will need to be addressed also. These are currently budgeted within the City's 5-year capital improvement plan. Coordination between the BPW and Ralls County PWSD No.1 will be required to meet some of the water quality regulatory challenges.

Water Storage and Distribution

All of the City's water mains are constructed of cast iron or ductile iron pipe. Some water mains are over a century old. The City currently has annual water main replacements budgeted as part of its 5-year capital improvement planning. The City will need to continue annual water main replacements to provide adequate water supply to its residents. As replacements are identified, upsizing of the water mains should be considered. The City water mains in the study boundary area are 6" to 12" in diameter and are ductile iron. The rural water district water mains in the study boundary area are 2" to 12" PVC. A large percentage of the rural water district water mains are undersized to provide fire protection according to City codes.

The City currently has 3,050,000 gallons of storage in the distribution system and another 8,400,000 gallons of storage at the water plant. The City's water storage facilities are adequate to meet normal and peak demands. The storage facilities have been properly maintained in the past or are in the process of undergoing major repairs or upgrades. The City currently has one 250,000 gallon elevated tank (Diemakers Tank) within the study boundary area fed from a booster pumping station.

The rural water district has one 150,000 gallon elevated tank and one 300,000 gallon elevated tank within the study boundary area. These two tanks are at the same hydraulic grade level as the City's 250,000 gallon Diemakers Tank. The two systems are not currently interconnected even though both water systems have large mains (12") near each other along US 36. While the combined total of 700,000 gallons of elevated water storage appears adequate for now (depending upon whether high water users would locate to the area), it does not function properly to serve the area as a whole. Either water provider can meet fire flows in the vicinity of their large mains, but neither can consistently meet the duration requirements for fire protection. This can be an impediment to growth within the study boundary area long-term.

Development Issues

The current policy of both water service providers is that as land develops, the land developers or the adjacent property owners bear the cost for the extension of the public water mains required to serve an area to meet both fire protection and domestic needs. Consequently, developers would need to consider the cost associated with the extension of public water mains in their development plans. Current City policy allows development to occur in more distant areas but leaves the cost burden and ultimate investment decision with the developer.

The City has implemented a relatively new program to reimburse a portion of the cost of the water mains for a development back to the developer. A portion of the tap fees for new customers in a development is returned to the original developer over time as development occurs. The total cost of the water main is not reimbursed, but this program does help offset some of the cost.

The Ralls County PWSD No. 1 has not traditionally provided a water system capable of meeting municipal fire protection requirements. In fact, the Missouri Department of Natural Resources (the governing regulatory agency) has not allowed fire hydrants to be installed on the rural water district's system in the past unless sufficient evidence showing the system to be capable of providing fire flows has been approved. Since many of the rural water districts mains are undersized to meet fire protection requirements, the rural water district will need to address these issues with their water system infrastructure as the City limits continue to overlap the water service territorial boundaries. This can be an impediment to growth within the study boundary area long-term.

Recommendations

In summary, fire protection seems to be a major issue in the study boundary area. Both water service providers must address this issue through the size of water distribution mains and elevated storage. The cost burden of water infrastructure on the developer is also a major issue in the study boundary area.

In order to address these development issues the following recommendations are offered:

1. **Both water service providers should continue to work together to address fire flow and provide service in the area. The territorial agreement provisions have been serving both service providers well and the public is directly benefiting. The two water service providers should continue to actively seek projects that benefit both entities such as the recent completion of the water main extension to the airport to provide fire flow.**

2. **Proposed improvements in the planning area are shown on Exhibit A. Many of these improvements consist of upgrading Ralls County PWSD No. 1 infrastructure to provide fire flow capability by providing larger water mains, looping water mains, and providing additional elevated water storage. The water district has a future phase of work identified to address these issues. It is anticipated that the future phase of work could begin within the next 5-7 years. For areas inside the city's service area, there may be opportunities to partner together with the water district for a cost share for those improvements that benefit water district customers living inside city limits. This partnership could open up significant new areas of development inside both water service areas and accomplish a goal of providing fire flow to the planning area.**

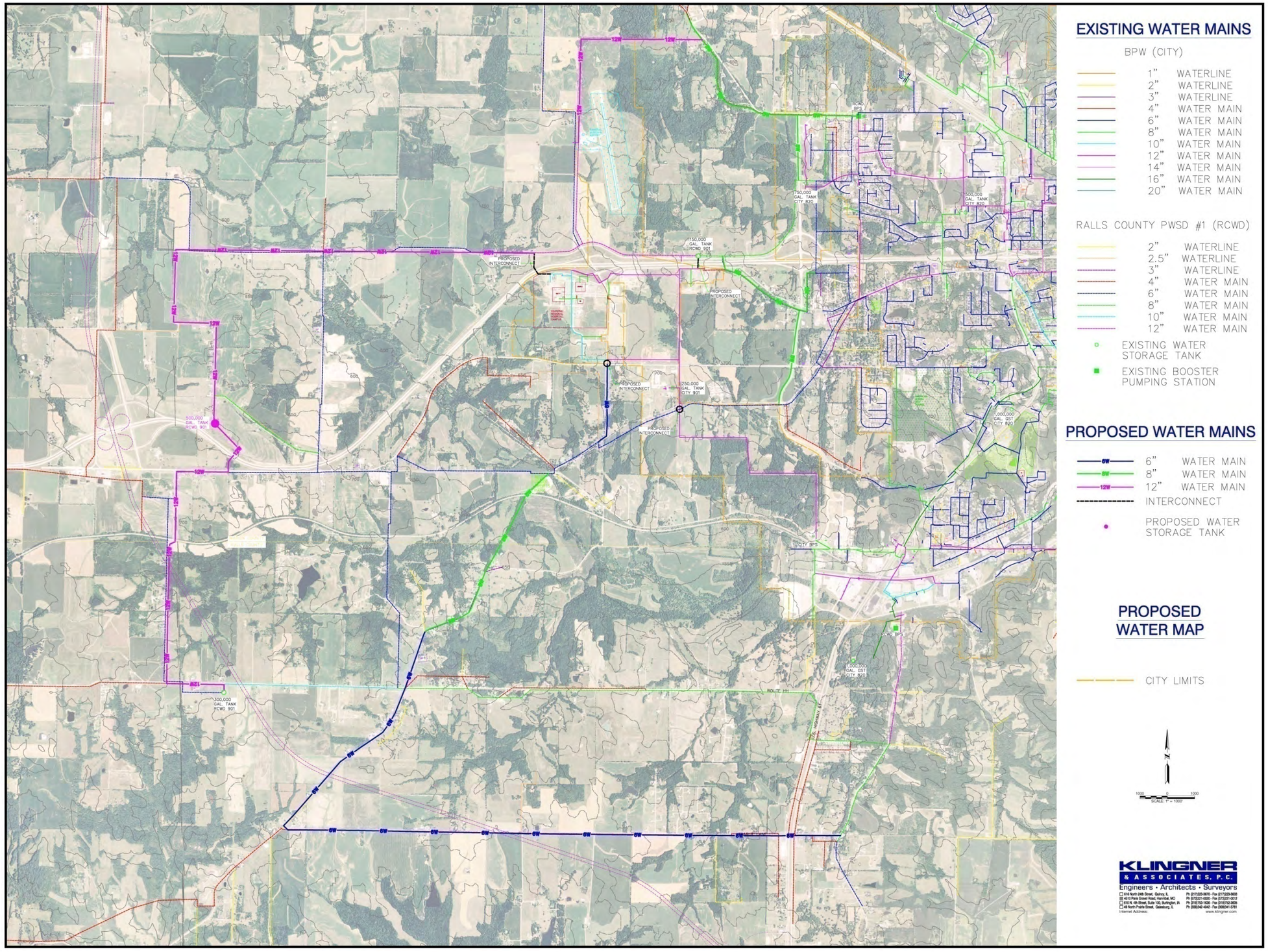
3. **Interconnections between the two water service providers should be pursued where it makes sense. These interconnections allow the storage of both water systems to function together to meet normal and peak demands as well as meet fire flow duration requirements. These interconnections can be bi-directionally metered to track the actual flow of water for billing purposes. Two particular interconnections should be pursued in the immediate future:**

    a. **Interconnection between the 150,000 gallon Ralls County PWSD No. 1 water tower with a 12" water main underneath US 36 to 12" BPW water main at Fiddlestiks restaurant. This interconnection is actually in place except for about an 80' length of 12" pipe under the outer road and a bi-directional metering station. This interconnection will immediately allow both the 150,000 gallon water tower (RCWD) and the 250,000 gallon water tower (BPW) to function together to meet fire flow durations.**

    b. **Interconnection between the 12" RCWD water main north of US 36 and west of Shinn Lane and the 10" BPW water main at the northwest corner of the Hannibal Regional Hospital campus. This interconnection will enhance the capability to meet fire flow durations and provide a redundant source of water to Hannibal Regional Hospital in the event there is a water service disruption.**

4. **The BPW and Ralls County PWSD No.1 should actively work together to address the regulatory challenges for water supply in the area. Ralls County PWSD No. 1 is the largest customer of the BPW and provides service to over 6,500 rural residents in**

Marion, Ralls, and Pike Counties in Missouri. Source water treatment challenges such as THM's and HAA's are potential issues that not only impact City customers, but are compounded at points farther out in the distribution system. The opportunity to cost share on improvements would provide benefits to both water service providers.


EXISTING WATER MAINS
BPW (CITY)
1" WATERLINE
2" WATERLINE
3" WATERLINE
4" WATER MAIN
6" WATER MAIN
8" WATER MAIN
10" WATER MAIN
12" WATER MAIN
14" WATER MAIN
16" WATER MAIN
20" WATER MAIN
RALLS COUNTY PWSD #1 (RCWD)
2" WATERLINE
2.5" WATERLINE
3" WATERLINE
4" WATER MAIN
6" WATER MAIN
8" WATER MAIN
10" WATER MAIN
12" WATER MAIN
EXISTING WATER STORAGE TANK
EXISTING BOOSTER PUMPING STATION
PROPOSED WATER MAINS
6" WATER MAIN
8" WATER MAIN
12" WATER MAIN
INTERCONNECT
PROPOSED WATER STORAGE TANK
PROPOSED WATER MAP
CITY LIMITS
KLINGNER & ASSOCIATES, P.C.
Engineers • Architects • Surveyors

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Public Sanitary Sewer Service

Sanitary Sewer Study Area

Within the study boundary area, existing public sanitary sewers range in size from 8" to 15". Within the community, existing public sanitary sewers range in size from 6" to 42". A large majority of the system is constructed of vitrified clay pipe (VCP). On Exhibit B the areas currently served by the existing public sanitary collection system are shaded in yellow. There are some obvious gaps in public sanitary sewer service within the study boundary area. Some of these gaps have individual residences or small subdivisions with large acre tracts that are on septic systems. Septic systems generally work fine for a period of time, but due to the presence of high water tables and restrictive soils in the area, this type of system can and often does result in significant maintenance and health issues. When the public sanitary sewers are extended, an effort is made to connect those residents on septic systems to the public sewer system.

There are also several other small subdivisions or developments with their own sewage collection and treatment systems. The four developments are shown on Exhibit B. The collection and treatment systems were designed to serve the developments with pressure sewers and recirculating sand filter treatment systems. Some expansion capability is possible to these individual systems.

Sanitary Sewer Collection

The existing sewer system in not overloaded in the study boundary area at the present time primarily because most of the study boundary area is still undeveloped except for the medical complex and a few small developments along US 36. However, sewer overflows related to capacity problems caused by infiltration and inflow of stormwater or groundwater into the sewer system is a large on-going problem throughout the city sewer system. The city has conducted numerous studies to determine problem areas, but solutions will likely take many years due to the cost.

There are currently 15 lift stations in the collection system monitored by operators or by a SCADA system. Currently most of these lift stations are operating only about 25% or less of the time. Based on this information there is existing capacity left in these lift stations for expansion of the collection system that flows to them.

Sanitary Sewer Treatment

There is one major wastewater treatment plant in or near the study area that can receive wastewater flows from the study area's watersheds. This facility is located on Warren Barrett Drive in Hannibal. The capacity of the Hannibal WWTP is 6 MGD for treatment but the pumps can send over 20 MGD through the plant. The average daily usage is 3.45 MGD and the peak day flow was 7.9 MGD. There are also four other small wastewater treatment facilities serving small developments just outside the existing city limits but within the study area boundary. They are:

1. **Clear Creek Development Re-circulating Sand Filter**
2. **Norwoods Lagoon and Re-circulating Sand Filter**
3. **Hilltop Development Re-circulating Sand Filter**
4. **Ideal Villa Re-circulating Sand Filter**

These are all relatively new facilities and serve small developments. Ralls County Public Water Supply District No. 1 operates the Norwoods and Ideal Villa facilities. The other two facilities are privately operated.

Development Issues

The most significant issue with the development of land tracts is being able to provide public sanitary sewer service. This is due to the following:

1. **Large cost to install gravity sewer mains and wastewater treatment plants**
2. **Environmental issues associated with obtaining government approval for new wastewater treatment plants**
3. **Public sentiment against constructing treatment facilities near residential or commercial developments**
4. **Providing adequate sewer facilities to rural residential areas**

Public funds (local) available for the design and construction of wastewater collection and treatment facilities to serve the study area are limited. State and Federal funds through the State Revolving Fund Loan program are readily available at attractive interest rates. Providing public sanitary sewer service to the study area will require a considerable amount of gravity sewers, lift stations and forcemains, which will be a significant capital expenditure. The key to development within the study area will be to obtain sufficient funding for the City to be able to install key infrastructure components such as lift stations or trunk sewers within each watershed.

Another key issue to the development of the study area is the capacity of the existing sewers and treatment facility to receive more flows. Solving the infiltration and inflow problems in the existing sewer collection system is a key to maintaining sewer service for all without negative health issues. If this problem remains unsolved, additional sewer flows from the developing study area will need to be directed elsewhere to possibly a new treatment facility.

Another issue that has and will complicate matters in the study area is when development occurs sporadically throughout the watershed. When development occurs in this manner, it becomes increasingly more difficult to bring sewer service to each individual area cost effectively. If a systemic development approach from the lower to the upper parts of the watershed can be developed, the funding of wastewater collection improvements becomes easier to achieve.

Installation of gravity sewers and treatment facilities are the most preferred, desirable and cost effective means for collecting and treating wastewater flows primarily due to health issues and system maintenance. However, due to permitting constraints with federal and state agencies as well as public opinion it is very difficult to construct new wastewater treatment facilities today. The only other alternative is to install a system of gravity sewers draining to lift stations that then pump sewage through forcemains to the existing treatment facility, which is expanded as necessary. This second approach to providing sanitary sewer service limits some development.

Principal Watersheds

The study area has seven principal watersheds:

1) **Downtown/Mississippi River (north downtown area)**
2) **Bear Creek (south and southwest of downtown area)**
3) **Mills Creek (south of downtown area tributary to Bear Creek)**
4) **Minnow Creek (west and northwest of downtown area tributary to Bear Creek)**
5) **St. Clair Creek (west and southwest of Minnow Creek tributary to Bear Creek)**
6) **Crooked Creek (southwest of the city limits tributary to Bear Creek)**
7) **Clear Creek (north and west edges of city limits)**

- ### Downtown/Mississippi River Watershed:

The Downtown/Mississippi River Watershed drains in an easterly direction toward the Mississippi River. The city already has some sewer collection system infrastructure in middle part of this area with the Bay Avenue lift station being fed by gravity mains for some subdivisions. There are some areas along the north side of Palmyra Road/Harrison Hill near the I-72 interchange that are still currently un-sewered as well as an area at Konder and Zeigler Streets. The City has evaluated providing sewer service to these areas in the past by encouraging residents in these areas to form sewer districts to fund improvements. The costs for sewer service to the Konder and Zeigler Street areas will be very expensive due to topography. This area does not have a high potential for growth due to the steep slopes and bluffs.

Infiltration and inflow (I/I) of stormwater into the downtown sewers has been a significant problem in the past. Many of these sewers are also very flat. If additional development were to occur in this area, the I/I problems need to be addressed to provide for capacity.

- ### Bear Creek Watershed:

The Bear Creek Watershed is the largest watershed in the immediate Hannibal area and rings the city along its western and southern portions. The east portion of this watershed (east of US 61) is highly developed now. The Hannibal WWTP is located along Warren Barrett Drive near the Grand Avenue intersection. All of the wastewater flow from Hannibal flows to this WWTP. There are several watersheds that drain into the Bear Creek Watershed as identified above. This watershed has a high potential for increased development primarily because it encompasses the only growth area the city has to the west of the community.

This watershed also has several small wastewater treatment facilities including the Hilltop Recirculating Sand Filter, the Norwoods Lagoon and Recirculating Sand Filter and the Ideal Villa Recirculating Sand Filter. These facilities were all built within the last 10 years to serve subdivision developments to the west and south of Hannibal that were too far from the

existing sewer system to be cost effective to connect to city sewer. All of these facilities are easily expandable to handle more wastewater flows if additional development occurs; however, city sewer service is still too far away in most cases (exception is Ideal Villa, which has city sewer), for it to be cost effective to extend the city sewer into these developments.

- ## Mills Creek Watershed:

The Mills Creek Watershed drains northerly into Bear Creek near State Route O. The northerly part of the watershed is highly developed. While development is occurring to the south, most of these residents are not in the city limits and have installed septic systems. If the city intends to eventually provide sewer service to the Mills Creek Watershed, an expensive gravity sewer main could be constructed to the south through the rocky areas along Route O and Mills Creek.

- ## Minnow Creek Watershed:

The Minnow Creek Watershed drains a significant portion of the northwestern portion of the city. The watershed is highly developed and most of the recent development within the city is occurring in this watershed. The majority of the sewer collection facilities in this watershed are gravity mains with one small lift station serving a minor subdivision on the extreme north part of the watershed. The topography is well suited to gravity feed and most of the infrastructure is already in place to serve most of the watershed. The extreme western edge of the watershed is currently undeveloped west of Veterans Road. The extension of a gravity sewer main into this area would be feasible.

This watershed also contains a significant amount of infiltration and inflow (I/I) of stormwater into the sewer system. As development occurs, the flow carrying capability of the existing gravity mains will become further strained. There are several large trunk mains (12", 15" and 18") that serve the Minnow Creek Watershed. The 12" along McMasters Avenue (US 61) is on the edge of adequacy to serve its connected service area due to I/I. The balance of the watershed has sufficient capacity to serve the entire watershed.

- ## St. Clair Creek Watershed:

The St. Clair Creek Watershed drains the western portion of the city to Bear Creek. This watershed is developing. Currently an 18" gravity trunk sewer runs the entire length of the watershed from northwest to southeast. The expanding medical facilities and high potential I-72 Business Park along I-72/US 36 are connected to this trunk sewer. This watershed has a high potential for increased growth since most of the available land near Hannibal is located in this watershed. Future sewer service to the airport and the industrial area north of the airport could be connected to the trunk sewer south of the highway either through the use of a lift station and forcemain or a gravity sewer.

- ## Crooked Creek Watershed:

The Crooked Creek Watershed is located south and west of Bear Creek several miles south of US 36 and west of the Bear Creek Dam. This watershed drains into Bear Creek. Currently there is little or no development in this watershed. Most development is small subdivisions or sporadic housing with septic systems. Currently this is not a high growth area. Providing sewer service to this area would be very expensive since no existing infrastructure is in the immediate area.

- ### Clear Creek Watershed:

  The Clear Creek Watershed is located primarily north of Route W and US 61. This area is partially developed primarily east of State Route 168. An existing gravity main and lift station with forcemain along State Route 168 provide sewer service to the eastern half of the watershed. There is some potential for growth along the west side of State Route 168 and the north side of US 61. These areas could be served by extending gravity mains from Route 168. As development occurs, the Clear Creek Lift Station may need increased capacity to service the area.

  There is one existing treatment facility located along Clear Creek Road and State Route W that serves a 135 lot subdivision. The Clear Creek Recirculating Sand Filter treatment system serves this development and is fed by a system of pressure sewer mains from each home. This system is about one year old and was constructed due to the high costs of connecting to the nearest sewer main located just east of Veterans School in the Minnow Creek Watershed. Areas around this facility are easily expandable to accept more wastewater flow if needed.

Recommendations

From a utility infrastructure standpoint, providing sanitary sewer service including wastewater collection and treatment facilities to the study area will be the largest obstacle to overcome in order for land development to occur. While there are some existing facilities in the study area indicating that sanitary sewer service can be provided, it will require significant funding either from developers, the city, or both to provide sanitary sewer service to the study area.

The following recommendations are offered to address sanitary sewers:

1. **Since the City's sewer mains will ultimately be the vehicle for most of the growth area's sewer collection system to access the regional wastewater treatment facility in Hannibal, the capacity of these sewers needs to be evaluated in more detail. This work is beyond the scope of what this plan entails. Since it is already known that infiltration and inflow (I & I) is a major issue in portions of the existing sewer collection system, these sewer mains are already experiencing capacity problems at times. Reducing I & I will ultimately provide more capacity for the future both in the sewer collection system and at the wastewater treatment facility. It will also lower operational costs for pumping and treating excess flows.**

2. **A potential sewer collection system framework is attached in Exhibit B. This framework shows how the sanitary sewer collection system may be laid out in the planning area to address growth as it occurs. The framework is based on the premise that the City provides regional interceptor sewers and lift stations and allows developers to build sewer extensions to access them. These regional interceptors open up growth opportunities both within and outside the current city limits. Both Ralls and Marion County have expressed that one of the key development issues they face is proper handling of sanitary sewer collection and treatment. More growth can occur if centralized sewers are available. The City should focus on infrastructure that is located immediately adjacent to developed areas now and work toward expanding it further**

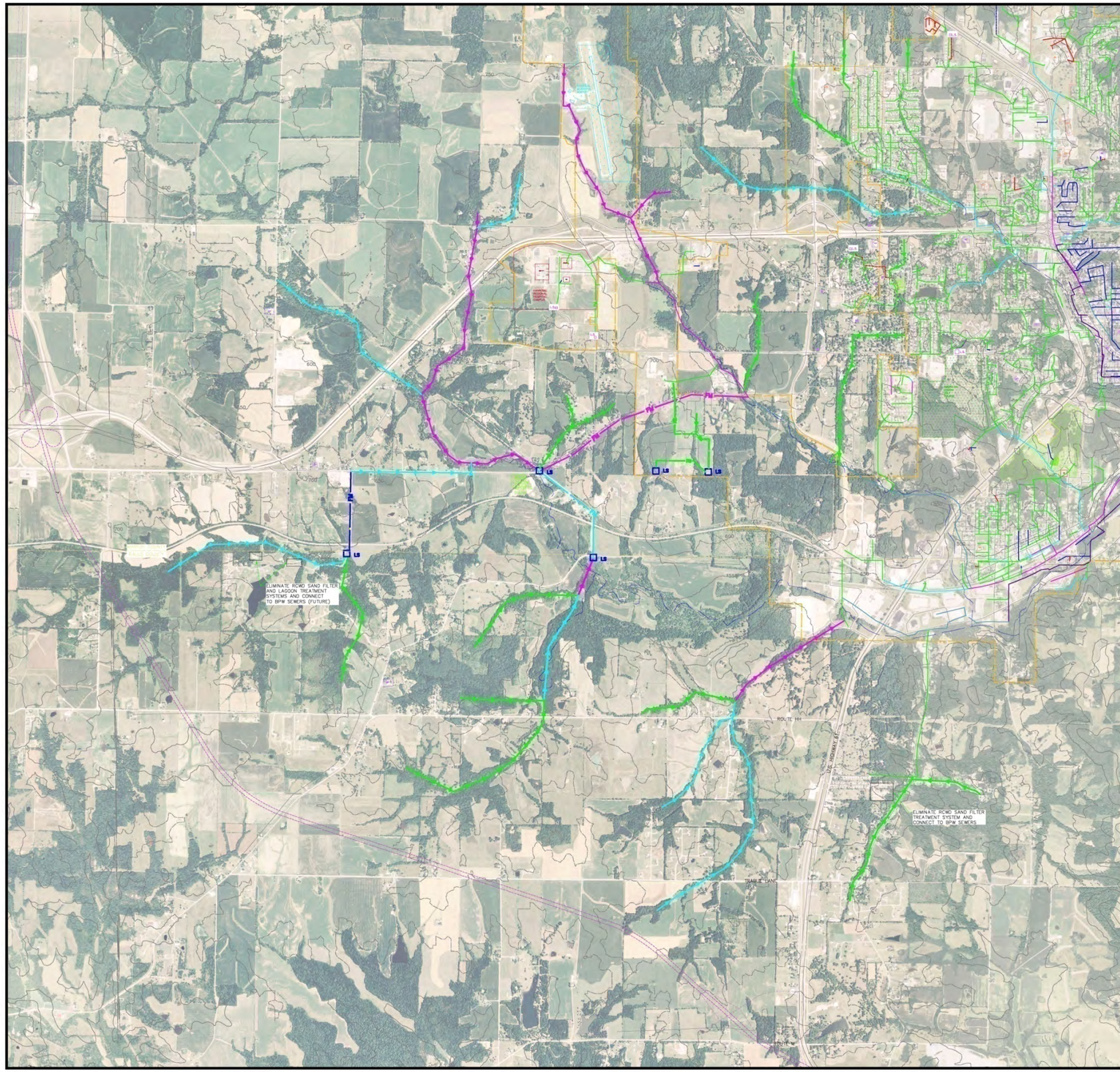
over time. Two immediate and key sewer infrastructure projects the City should consider are the following:

a. Extension of the St. Clair Creek 12" interceptor sewer underneath US 36 north to the airport complex. The City has had interest from outside industry and development to locate to this area. The airport appears poised to expand and grow also. This extension would open up a new development corridor.

b. Extension of interceptor sewers to the west side of Veteran's Road both near Veteran's Elementary School and near the US 36 interchange. The lack of sewer service has been a major obstacle to development along Veteran's Road. If the City could provide the access, development will follow.

3. There are several small wastewater treatment systems that are privately owned and operated or operated by Ralls County PWSD No. 1. Specifically, the Ideal Villa WWTF and the Norwoods Lagoon and recirculating sand filter wastewater treatment facilities could be shut down and interconnected with the expanded sewer collection system of the City once access is available. This eliminates point source pollution at 2 locations and allows the economy of scale to keep sewer rates lower for customers of the BPW and these individual systems. The Ideal Villa WWTF could be shut down now with minimal cost to connect to the BPW sewer collection system.

4. The BPW has recently started a program that reimburses developers a portion of the tap fees of customers that connect to a particular development back to the original developer. This does not completely offset the cost of the sewer infrastructure in the development.



EXISTING SEWERS

BPW (CITY)

GRAVITY SEWER

- 3" SEWER MAIN
- 4" SEWER MAIN
- 6" SEWER MAIN
- 8" SEWER MAIN
- 10" SEWER MAIN
- 12" SEWER MAIN
- 14" SEWER MAIN
- 15" SEWER MAIN
- 16" SEWER MAIN
- 18" SEWER MAIN
- 20" SEWER MAIN
- 21" SEWER MAIN
- 24" SEWER MAIN
- 30" SEWER MAIN
- 42" SEWER MAIN

FORCE MAIN

- 3" FORCE MAIN
- 4" FORCE MAIN
- 6" FORCE MAIN
- 12" FORCE MAIN

LS EXISTING LIFT STATION

PROPOSED GRAVITY SEWER

- 8" SEWER MAIN
- 10" SEWER MAIN
- 12" SEWER MAIN

PROPOSED FORCE MAIN

- FM 6" FORCE MAIN
- FM 8" FORCE MAIN
- FM 10" FORCE MAIN
- FM 12" FORCE MAIN

LS PROPOSED LIFT STATION

PROPOSED SEWER MAP

CITY LIMITS

N

1000 0 1000

SCALE: 1" = 1000'

KLINGNER & ASSOCIATES, P.C.

Engineers • Architects • Surveyors

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Stormwater Management

Stormwater Area Boundary

The study area has seven (7) principal drainage basins that ultimately flow to the Mississippi River, which are shown on Exhibit C:

1) **Downtown/Mississippi River (north downtown area)**
2) **Bear Creek (south and southwest of downtown area)**
3) **Mills Creek (south of downtown area tributary to Bear Creek)**
4) **Minnow Creek (West and northwest of downtown area tributary to Bear Creek)**
5) **St. Clair Creek (west and southwest of Minnow Creek tributary to Bear Creek)**
6) **Crooked Creek (southwest of the city limits tributary to Bear Creek)**
7) **Clear Creek (north and west edges of city limits)**

Watersheds General

The City of Hannibal recently completed a stormwater master plan that included directives and milestones to comply with the NPDES Phase II stormwater requirements. These requirements are to track and improve stormwater discharges by reducing stormwater runoff quantity and improving stormwater runoff quality. Best Management Practices or BMPs can improve stormwater quality by mitigating extreme pH values and assisting in the removal of sediment, petroleum based materials, biochemical oxygen demand (BOD), metals, bacteria, nutrients, toxic organic compounds and other substances that may be present in harmful concentrations. The City also needs to look at flooding, erosion and water pollution in order to protect lives, property and water quality. Key stormwater management issues currently facing the city include the following:

1) **Updating stormwater management ordinances and guidelines so that planners, designers and developers can begin using them. There are conflicts within existing ordinances.**
2) **Getting technical information (maps, studies, reports, policies, etc.) organized and available in electronic format form for quick distribution to city staff and outside professionals who will be able to use them for design and planning of stormwater improvements.**
3) **Getting information out to the public about the NPDES Phase II stormwater requirements and educating the public on what they can do to help implement BMPs.**
4) **Development of data on existing stormwater facilities that can be tracked and speed up reporting requirements for regulatory agencies and provide valuable information for planning and design.**
5) **Implementing the use of stream buffers as a means of:**
    a. **Reducing the risk of flooding**

b. **Preserving sensitive natural areas such as wetlands, steep slopes and 100-year floodplains.**

c. **Protecting and/or improving water quality.**

d. **Creating new multi-purpose community amenities such as greenway trails.**

6) **Striving to carry stormwater runoff in turf vegetative drainage swales where practical to encourage groundwater infiltration and removal of pollutants in lieu of enclosing the runoff in underground storm sewer pipes and conveyance systems.**

7) **Implementing cleanup of several streams in the area that have become partially filled or had conveyance capability reduced due to illegal dumping, deposition of construction waste such as large concrete slabs, etc. This type of problem has also caused erosion areas on some of these streams. This could possibly be done using volunteer groups.**

- ## Downtown/Mississippi River Watershed:

The Downtown/Mississippi River Watershed drains in a northerly and easterly direction toward the Mississippi River. The possibility of additional development in this watershed is small. No watershed studies or recommendations are planned in the near future for this watershed.

The remaining six (6) watersheds have not had any studies completed but should have a detailed evaluation and report with recommendations for sound management practices to preserve natural resources.

- ## Bear Creek Watershed:

The Bear Creek Watershed is the largest watershed within the study area. It has an earthen dam and spillway structure located just west of US 61 that was built in the 1960's as a flood control structure prior to the development of the West Side Industrial Park located along US 61 in the southwestern part of Hannibal. This dam has been very effective at regulating flows downstream and protecting life and property. The downstream portion of the watershed (primarily east of the Bear Creek Dam) is highly developed. It would be difficult and costly to implement large scale changes using stream buffers. However, the upstream portion of the watershed (primarily west of the Bear Creek Dam) can have BMP's built in to the development plans as development occurs.

Since several watersheds including the St. Clair Creek, Minnow Creek, Crooked Creek and Mills Creek Watersheds all flow into Bear Creek, proper management of these sub-watersheds may have more of an impact than implementing new management strategies on the existing watershed, especially in the downstream portion of the watershed.

- ## Mills Creek Watershed:

The Mills Creek Watershed drains from south to north along Route O just south of Hannibal. This watershed is highly developed at its downstream end near Bear Creek.

Some sporadic development has been occurring along Route O with small subdivisions and isolated housing units. One of the problems this watershed has is that significant dumping of junk and construction waste such as concrete slabs has been placed along the banks of the creek. This constricts conveyance capability and can also lead to downstream erosion issues. Clean up of this problem could possibly be done by volunteer groups, but it could also be costly if the City has to do it.

One of the key problems with this watershed is the lack of planning coordination between the City and Ralls County. Ralls County does not have any stormwater management requirements. As development occurs, additional water flow will create problems with flooding, erosion, water quality, etc. at the downstream (northern) end of the watershed.

- ## Minnow Creek Watershed:

The Minnow Creek Watershed drains from northern Veterans Road area southeast to Bear Creek near Route O. This watershed is highly developed east of Veterans Road and continues to have new development occur in and around the shopping areas just west of US 61. The extreme northwestern end of the watershed is largely undeveloped. One of the problems this watershed has is that significant dumping of junk and construction waste such as concrete slabs has been placed along the banks of the creek. This constricts conveyance capability and can also lead to downstream erosion issues. There are several areas of erosion that are threatening now or will threaten property in the near future as a result of problems along this stream. The primary problem area is from US 61 southeast to Bear Creek. Clean up of this problem could possibly be done by volunteer groups, but it could also be costly if the City has to do it.

The City can influence further development in the northwestern part of the watershed through the use of stream buffers. Strict enforcement of the existing stormwater ordinances is critical to controlling future flood problems in this watershed.

- ## St. Clair Creek:

The St. Clair Creek Watershed drains from near the airport southeast to Bear Creek at the West Side Industrial Park just east of US 61. This watershed is highly developed at the downstream (southeast) end. The upstream area (primarily northwest of US 61) is a developing area that extends out to Hannibal Regional Hospital and the airport. This watershed and stream are in relatively good shape as far as using natural drainage swales, buffer zones, etc. The existing swales and buffer zones need to be protected and then through the use of existing stormwater ordinances and development plans they can be extended to the far reaches of the watershed with little expense to the City.

- ## Crooked Creek:

The Crooked Creek Watershed extends from near the intersection of Trabue Lane and Route HH northeast to Bear Creek at a location just south of Paris Gravel Road. The lower part of this watershed is in the Bear Creek floodplain that retains water during storm events behind the Bear Creek Dam. Currently, this watershed is largely undeveloped. There are small housing developments and minor subdivisions along Route HH that contribute stormwater flow into this watershed. One of the key problems this watershed will face in the future is the lack of planning coordination between the City and Ralls County. Ralls County does not have any stormwater management requirements. As development occurs, additional water flow will create problems with flooding, erosion, water quality, etc. at the downstream (northern) end of the watershed.

- ## Clear Creek:

The Clear Creek Watershed extends from west of the airport north and east to the Mississippi River floodplain and ultimately to the Mississippi River. The existing drainage ways are in relatively good condition. This watershed is highly developed along Route 168

and continues to develop more in this area. Some recent development along Route W and US 61 is also occurring with residential and commercial business.

One of the key problems with this watershed is the lack of planning coordination between the City and Marion County. Marion County does not have any stormwater management requirements. As development occurs, additional water flow will create problems with flooding, erosion, water quality, etc. at the downstream (northern) end of the watershed.

Recommendations

There are no easy solutions to stormwater management as there are many different groups involved with differing priorities. The key issue is working together to achieve common goals. City and County officials working together for the good of residents in the area is a priority.

A limited planning envelope surrounding the city limits and encompassing the study area needs to be developed and coordinated with Ralls County and Marion County to address stormwater concerns. The term "limited" means that the planning envelope will only address one or two areas of concern such as stormwater runoff. The term "envelope" means a buffer zone of ½ to 1 mile where there is an intergovernmental agreement that allows the two governmental entities to agree on a set of development standards that specifically focus on stormwater. This could address concerns of the city while not imposing many requirements on the counties.

Additional recommendations include the following:

1. **The City should meet with local designers and other stakeholders to make some revisions to the existing stormwater management ordinances. There are many inconsistencies within the current ordinances that need to be addressed. The context of the ordinance could also evolve to allow for a more regional approach to stormwater management as compared to site specific stormwater management.**
2. **The use of regional stormwater attenuation or detention/retention basins should be evaluated by the City. The use of the Bear Creek dam and drainage basin as a regional detention basin could be evaluated to serve this function. There are opportunities along Minnow Creek as well. By using regional stormwater detention basins, the need for site specific detention basins would be reduced or in some cases eliminated. This provides more available land for development, reduces the costs to developers and reduces the City's cost for inspection and enforcement of maintenance issues. Site specific detention/retention basins may still be required in some cases to prevent downstream flooding of other developments. The City should consider having the Parks and Recreation Department and the Department of Public Works work together to provide some regional stormwater detention/retention when new parks are created. Stream buffer zones can be provided at these locations as well.**
3. **The City should consider stormwater management of existing developments by addressing flows from existing street pavements and city storm sewers. During 2008, a number of stormwater related flooding problems occurred in older developments within the City. The opportunity to construct the development correctly to handle stormwater passed many years ago but the problems persist. Because of the terrain in**

Hannibal, this will be a monumental task to address. The City has begun to address the problem by tackling smaller stormwater projects such as improving drainage along a portion of Market Street, correcting an erosion problem along Minnow Creek at Spruce Street and others. The current City public works budget does not support long term expenditures for these types of problems. Many of the existing developments in Hannibal do not have storm sewers or detention/retention basins. These problems will have to be addressed on an individual basis. One method of addressing funding for the identification and correction of these problems is through a Stormwater Utility. This function could fall either under the BPW or the Department of Public Works and could be funded through a tax added to utility bills or by some other method.

4. **The City should investigate the condition and conveyance capability of some of its streams that serve as conduits to convey stormwater collection toward the Mississippi River. The condition of Minnow Creek and Bear Creek in a number of locations is contributing to severe erosion problems at some locations along these streams. Some locations will put private property and life in peril in the coming years if they are not properly addressed. These streams need to be cleaned up and restored to have a more natural stream slope and natural stream banks with buffer zones if possible. This may require the need for additional right-of-way purchase or flow easements in some locations. The actual cleanup could be performed by the City with the aid of volunteer groups if they are educated on the benefits of proper stream management.**

5. **While the City's floodwall is not completely related to stormwater management it does serve an important function to protect the downtown area from Mississippi River flooding events. Most flooding that does occur in Hannibal now is from Mississippi River backwater along Bear Creek. Some developers have made a significant private investment in the Clemens Field ballpark. There is other public investment such as a new facility for the City's Department of Public Works in this area. The City should consider extending the floodwall along Bear Creek back to the wastewater treatment facility. This will protect a considerable amount of private and public infrastructure and property as well as open up possibilities for development along the Warren Barrett Drive transportation corridor. Pursuit of this endeavor through local and state legislators as well as the US Army Corps of Engineers and FEMA should be pursued by the City. The Hannibal Levee District has taxation/assessment authority, which was used to pay for the City's portion of the funding for the current floodwall. The City's portion of this cost has been paid in full so current assessments are captured only for operation and maintenance of the floodwall facilities. This District could be expanded, or a new District formed to serve the same purpose for paying for the expansion of the floodwall along Bear Creek.**

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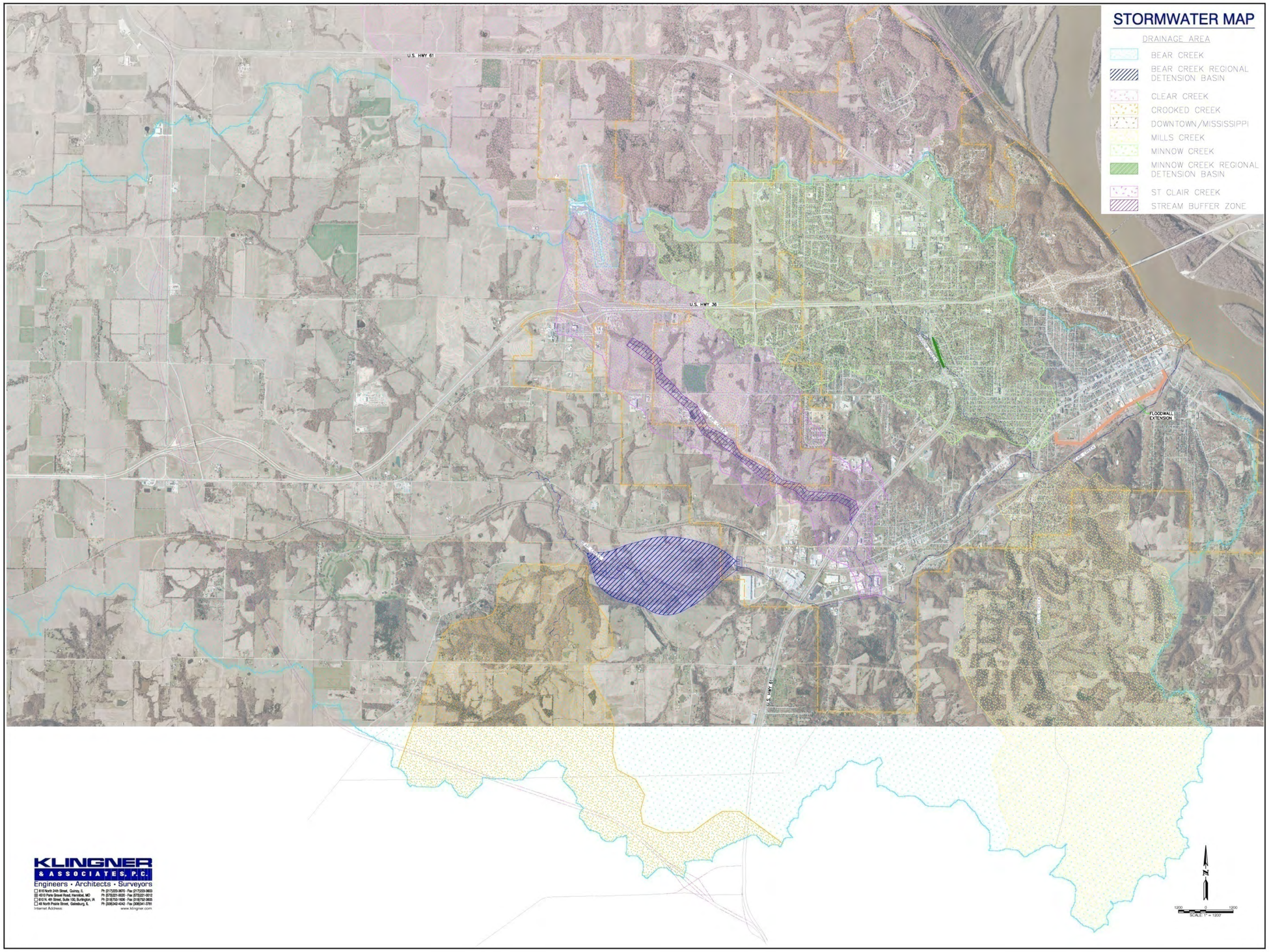
STORMWATER MAP
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BEAR CREEK REGIONAL DETENSION BASIN
CLEAR CREEK
CROOKED CREEK
DOWNTOWN/MISSISSIPPI
MILLS CREEK
MINNOW CREEK
MINNOW CREEK REGIONAL DETENSION BASIN
ST CLAIR CREEK
STREAM BUFFER ZONE
U.S. HWY 61
U.S. HWY 36
FLOODWALL EXTENSION
KLINGNER & ASSOCIATES, P.C.
Engineers • Architects • Surveyors
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Electrical Service

Electrical Service Area

Within the boundary of the study area three electric service providers and two wholesale providers have facilities. Exhibit D shows the Hannibal Board of Public Works service area shaded in cyan, which matches the city limits. The Missouri Rural Electric Co-op (MREC) service area is shaded yellow and the Ralls County Electric Co-op (RCEC) service area is shaded purple. These service providers have ironed out service areas in the past and will likely need to refine those service area boundaries in the future as the study area develops.

Electricity Supply

The City of Hannibal Board of Public Works buys all of their electric supply (80 MW) from Ameren Energy Services and has a peak demand of approximately 70 MW. The main feed to the city is from the south near the Mark Twain Cave on Route 79. The city has a primary substation at this location. The city is currently constructing an alternate supply route from the west through a 161KV transmission line to a new substation being built in northeast corner of the I-72 business park. With this improvement, the total capacity of the system will be 100 MW with two redundant 50 MW feed points. With these improvements, the city should be able to meet electric demands for the foreseeable future.

Portions of the study area are served by two rural electric cooperatives. Both purchase power from Northeast Power in Palmyra. MREC has been upgrading several lines near Hannibal in an effort to loop service for reliability. RCEC currently has no further plans to improve near Hannibal as they serve the southern fringe of the study area. Both rural providers have enough capacity for the foreseeable future.

Costs for purchased electric power are expected to increase dramatically for the foreseeable future due to rising energy costs worldwide.

The current capacity of MREC and RCEC for the area is not currently available based on information requested from them. They purchase power from Northeast Power in Palmyra, Missouri, and have been upgrading their facilities west and south of Hannibal.

Development Issues

The cost of purchased power and power equipment are key issues in the development of the study area. The Hannibal Board of Public Works service areas within the City limits offer some incentives for development. The BPW is limited to service only inside the City limits but does not charge for electric line extensions to residential developments within the service area unless the service is to be underground. They also offer a discount to industry if the industry has its own transformer. The rural electric utilities typically charge developers for extension of power service.

Recommendations

The current electric rates in the area have been some of the lowest in Missouri for several years. The recent end of long-term power purchase contracts from Ameren UE and others has demonstrated a sharp increase in electric wholesale rates in the area. These rate increases in turn are passed to the consumer. The cost to purchase power from wholesale providers coupled with the need for conservation of power to keep costs down are major issues in the development of the study area. Furthermore, in November 2008, Missouri voters approved the Missouri Clean Energy Initiative, which is intended to move the power producers of Missouri to a higher level of production using renewable resources. The initiative requires the state's three investor-owned electric utilities to get 15 percent of their electricity from renewable resources by 2021. While this initiative reduces the use of fossil fuels for production of electricity, alternative sources such as wind, hydroelectric and solar are currently more expensive and may remain that way for some extended time in the future. Energy rates are expected to rise dramatically in the future and this may become an impediment to growth in the community.

The electric capacity appears to be adequate for the future of the service area. The utility providers should continue to look for opportunities to realize savings in their operations and negotiate the most fair and equitable power purchase contracts available.

A local opportunity may exist to realize some savings through the use of hydroelectric power at the locks and dams on the Mississippi River. The City of Quincy is currently sponsoring a project to use low-head turbines at the dams at Canton, Quincy, and Saverton. Preliminary studies have shown that the generating capacity of these 3 facilities would provide power to 17,000 residential homes in the area. Two additional facilities at Clarksville and Winfield are also now being considered. They could potentially double the generating capacity. The City of Hannibal sits in the middle of these 5 facilities and could potentially purchase a portion of the power supply and take it through current transmission lines that cross the Mississippi River at the electric substation near Mark Twain Cave. This may be a viable local power source for supplementing the power they purchase from Ameren Energy Services.

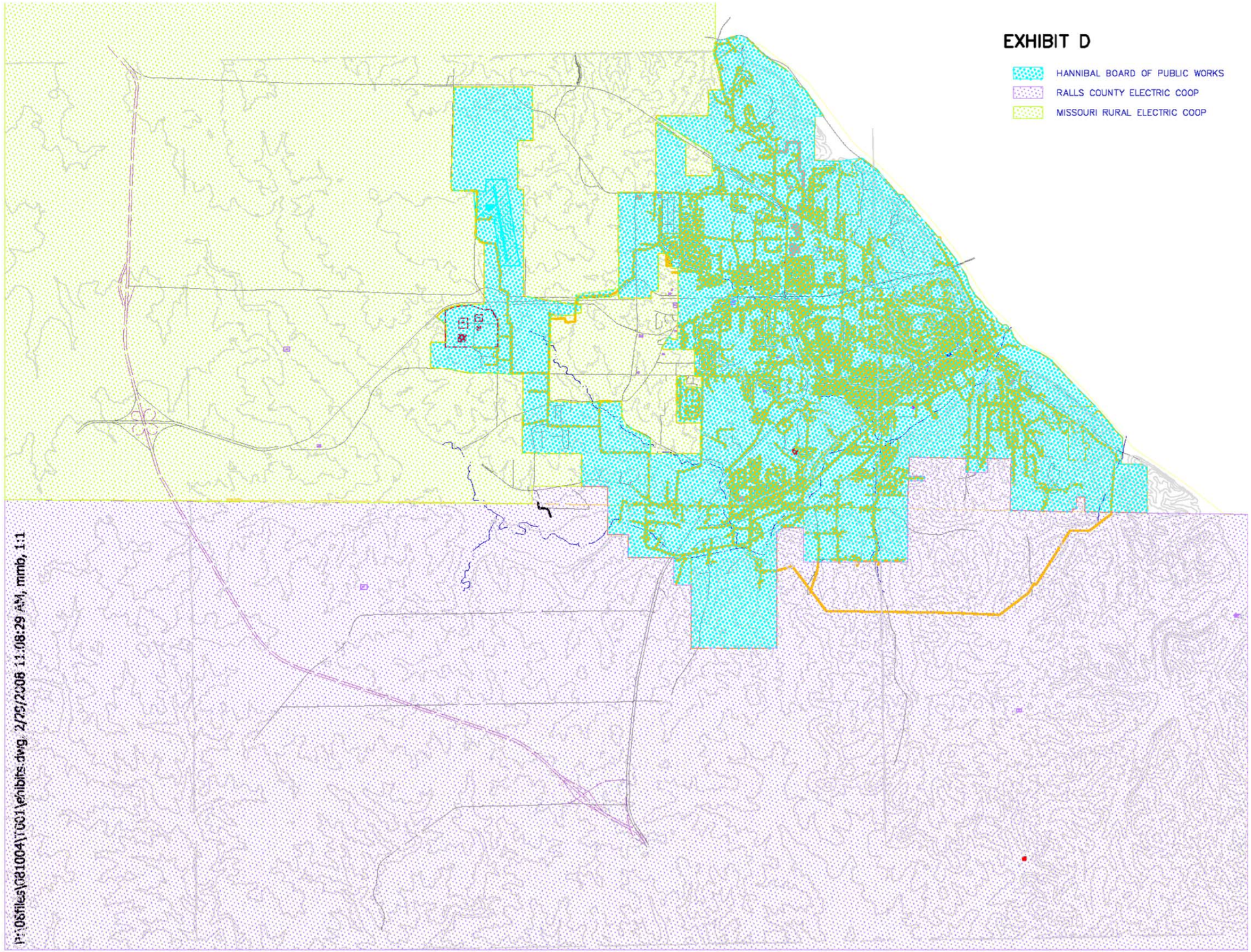
EXHIBIT D
HANNIBAL BOARD OF PUBLIC WORKS
RALLS COUNTY ELECTRIC COOP
MISSOURI RURAL ELECTRIC COOP
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