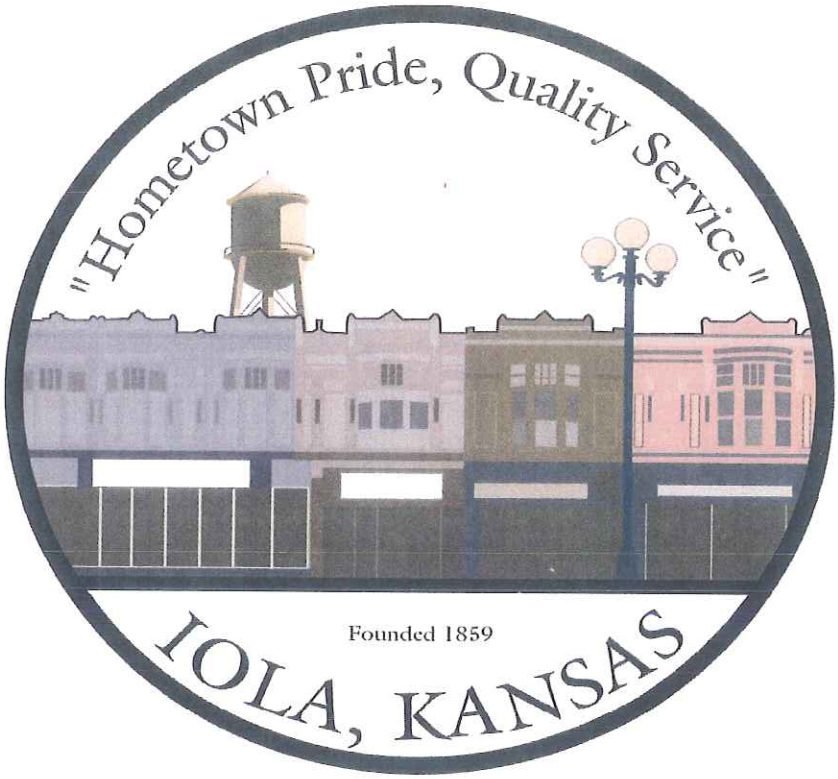
City of Iola, KS



WASTEWATER COLLECTION SYSTEM REVIEW AND ASSESSMENT

DESIGN MEMORANDUM

PROJECT NO. 08A54-003-3704
July 2011

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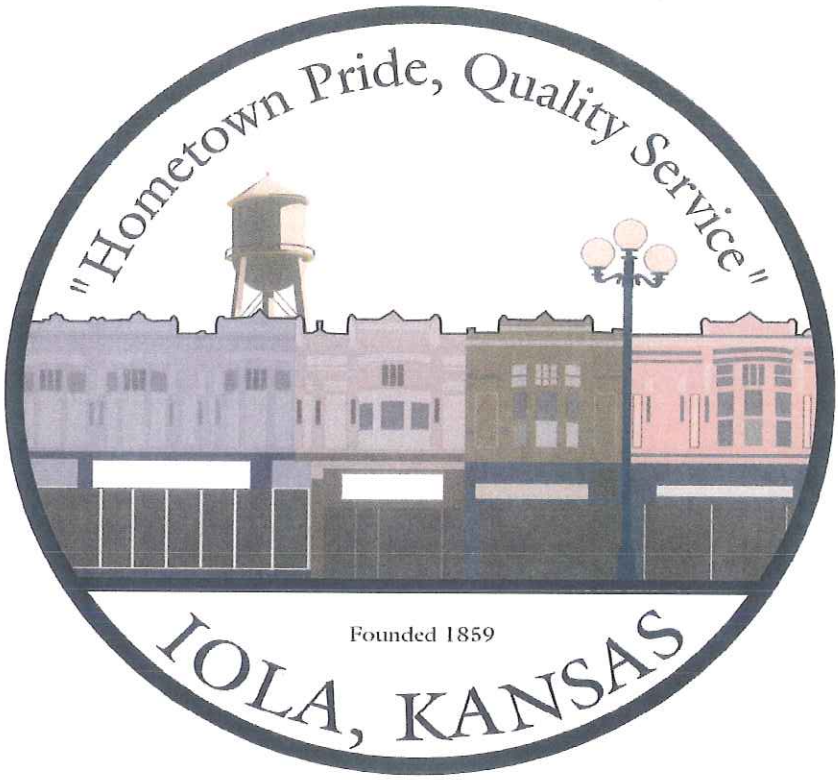

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DESIGN MEMORANDUM

PROJECT NO. 08A54-003-3704
July 2011

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SECTION 1
Wastewater Collection System Review and Assessment Overview

1.1 Introduction

The City of Iola has been providing wastewater collection and treatment since at least 1929. Major collection system additions include the Main Plant Pump Station which was completed as part of the wastewater treatment lagoon project in 1962. The Ohio Pump Station, located in the southeast corner of town, was completed around 1975 and has a service area that extends along the eastern edge of the City, north to near E. Miller Road and N. Kentucky Street. In 1980, the West Interceptor Sewer and Pump Station were constructed to provide wastewater service to the industrial area on the western side of Iola. Around that same time, the Main Plant Auxiliary Pump Station was also constructed to pump peak flows from major wet weather events that exceed the capacity of the Main Plant Pump. In 2008, major upgrades were completed at the Main Plant Pump Station and the lagoon system.

The Iola wastewater collection system includes a total of fourteen wastewater pump stations that have been constructed, reconstructed, and upgraded over the last 70 years. Current records of the gravity sewers of Iola show a total of over 60 miles of pipe and nearly 900 manholes and cleanouts.

The City retained Professional Engineering Consultants, P.A., in March of 2009 to provide engineering services for an assessment of the existing City of Iola Water Distribution and Wastewater Collection Systems. The initial engineering services converted the City's existing infrastructure data for both of the water distribution and wastewater collection utilities from an AutoCAD-based format to a graphical information system (GIS) format. Appendix A contains a revised map of the wastewater collection, pumping, and treatment systems generated from the GIS data.

This Design Memorandum presents the results and recommendations of the review and assessment of the wastewater collection system, which includes all pump stations, force mains, gravity sewers and manholes. A companion assessment was completed for the water distribution system and the findings of that effort were presented in a report titled "Phase II – Water Distribution System Review and Assessment, June 2010".

1.2 Background

1.2.1 Project Goals

Significant portions of the collection system are considered by City staff to be in a deteriorated condition, particularly the older sewers constructed of vitrified clay tile pipe. The situation is considered sufficient to require extensive rehabilitation and/or replacement in the next two decades to prevent sewer failures, wastewater back-ups into buildings, and potential environmental damage. Pump stations are also reported to have safety, capacity, and obsolete equipment concerns. Deterioration of manhole structures due to corrosive conditions in some portions of the collection system have been encountered.

This study is to review and assess the existing collection system and to provide a master plan for collection system rehabilitation with the following goals:

- Identify specific sewers, manholes and pump stations for rehabilitation/replacement and prioritize the needs.

- Provide cost estimates of recommended collection system work.

- Position the City of Iola to comply with anticipated federal regulations referred to as CMOM (Capacity, Management, Operations, and Maintenance)

1.2.2 Previous Collection System Rehabilitation and Repair

Rehabilitation of manholes was completed in the past several years by city staff who spray-applied a corrosion-resistant mortar on the interior of brick manholes. Approximately 500 manholes were coated. In 2009, 7 pre-cast concrete manholes that were severely deteriorated and receive wastewater from the Russell Stover Candies production facility were rehabilitated. Several severely deteriorated manholes discovered during the manhole inspection effort by City staff have also been rehabilitated. Within the past two years, the West Interceptor Pump Station pumps were given a major overhaul to restore them to their original pumping capacity. Pump stations damaged by the flood of 2007 and replaced or restored to service are discussed individually, in Section 4 of this Design Memorandum.

1.2.3 2007 Flood Impact

The Neosho River and several tributaries in the Iola area, including Elm Creek and Coon Creek, left their channels in a regional storm event in the first several days of July, 2007. As a result of the flood, five pump stations were damaged, the lagoons were totally underwater for several days, and sanitary sewers in the lower parts of town were completely full. A significant portion of the City was impacted by the flood waters including the loss of homes and businesses. Pump stations were restored to service as quickly as possible after flood waters receded. The lagoons were returned to service as soon as the Main Plant Pump Station was restored to service. At the current time, the City of Iola is continuing in their coordination efforts to complete final aid determinations for damages through the Kansas Division of Emergency Management.

1.2.4 CMOM

CMOM is an USEPA generated acronym for "Capacity, Management, Operations, and Maintenance". The USEPA gave notice of proposed rulemaking in 2001 for a regulatory program that would require municipalities to formalize a permanent program of systematic management and reporting procedures for their sewer infrastructure for the purpose of reducing and eliminating sanitary sewer overflows (SSOs). The proposed regulations would require municipalities to:

- Develop a formal program to manage, operate, and maintain sanitary sewer collection systems.
- Investigate areas of the collection system which have inadequate capacity to convey peak flow rates.
- Develop response procedures to sanitary sewer overflow (SSO) events.

The program has not been finalized into regulations. However, there has been greater activity on the part of the USEPA in the last two years with regard to SSO reductions. Regulations that will require the City of Iola to increase the efforts to implement a formal management system may still be promulgated in the future. For this reason, it is important that any efforts undertaken for this assessment be applicable to meeting requirements of the potential regulations, to the greatest extent possible. Other efforts not undertaken in this assessment, but which may be expected from CMOM implementation, may include flow monitoring and private sector inflow and infiltration source identification and elimination.

The work completed with this assessment is one of the first steps that might be required by the future regulations. The anticipated effort would be to perform an inventory of the infrastructure and an evaluation of the condition of the pump stations, sanitary sewers and manholes that could contribute to SSOs. Throughout this document, efforts considered to potentially apply when and if CMOM regulations are implemented are identified.

1.3 Overview: Current Review and Assessment

1.3.1 Field testing by engineer and City staff

In July of 2009, comprehensive inspections of twelve pump stations were conducted by City and PEC staff. Section 4 provides a summary of those finding and recommendations for pump station improvements. Two additional pump stations have been subsequently added to the system since the original inspections.

1.3.2 Television inspection and smoke testing

The scope of services for this assessment included an allowance for smoke testing of gravity sanitary sewers. For sewer smoke testing, a non-toxic smoke is blown into segments of sewers with the escaping smoke used to identify potential locations for inflow of storm water into the sanitary sewers. The City of Iola has conducted a limited amount of smoke testing in the recent past and is of the opinion, based on the multitude of locations at which smoke escaped, that funds identified for smoke testing would be better applied to the completion of closed-circuit television inspection of the interior of sewers. For this assessment, over 110,000 linear feet of sewer, including 52,000 linear feet of sewer pipe between 10-inches and 30-inches in diameter were televised. The total length of sewers televised represents approximately 35% of the total

length of sewers on record with the City of Iola. The findings of the televising effort are summarized in Section 5 of this Design Memorandum.

1.3.3 Manhole Inspections

A large majority of the existing manholes were inspected and their locations obtained using GPS equipment by City staff in the months of March through June of 2010. The results of those inspections and findings are summarized in Section 6 with a prioritized listing of manholes that should be rehabilitated.

1.4 Program Funding

Early in this project, PEC prepared a summary of probable project costs that was presented to the City staff. A copy of the table provided is included in Appendix B. The table lists all priority needs and shows three different approaches: minimum effort, an intermediate effort, and completion of all priority projects. A projection of future needs beyond those considered priority was also provided in the table. In follow-up discussions during March of 2010, it was confirmed that the City desired to move forward with the approach that addressed all priority work.

The City has secured two EPA grants totaling $768,000 that will be used to partially fund the collection system rehabilitation program. The EPA funds require a 45% match by the City. An amount of $628,000 for the required 45% local match to the grant would come from a combination of both utility fund reserves and an additional amount financed as an amendment to the existing low interest loan administered by KDHE.

SECTION 2
Data Acquisition

2.0 Data Acquisition

The initial task for this assessment was the gathering of existing records and sources of information for the sewers, manholes and pump stations. The following sources of information were utilized in the conduct of this review and assessment:

2.1 Construction Drawings

The City of Iola retains copies of the construction plans for many of the existing pump stations, force mains, and sewers. Those copies were obtained, scanned, and utilized for the assessment. Records for the major pump stations and force mains and for the more recently constructed (1975 to present) interceptor sewers were available.

2.2 City-Wide Comprehensive Plan

A comprehensive plan was adopted by the City Council in January of 2005. The plan had been prepared under the direction of the Planning Commission of the City of Iola and, as stated in the introductory section of that document, was intended to "guide policy and provide recommendations for future actions involving land development and land preservation." Specifically, the Plan identified the need to replace sanitary sewers to reduce infiltration into the sewers and states the benefits of gravity sewers over pump stations and force mains for any expansion of the wastewater collection system.

The following excerpt from page 25 of the City of Iola Comprehensive Plan – Crossroads of America, January 2005 addresses wastewater system planning:

> **"Wastewater System**
>
> The wastewater treatment plant is designed to service a population of 20,000 which is far in excess of what is projected for Iola in the year 2020. Industries that are high waste contributors are now required to pre-treat prior to dumping in the City system and, therefore, the plant capacity should more than meet the City's needs for the planning period.
>
> The wastewater collection system is in good shape with the exception of infiltration in some of the older mains. Infiltration is the entering of water into the system through broken pipes, bad joints, service connections or manholes. These are primarily located along Coon Creek and the City is replacing them as they are identified. This will be an ongoing process that will be applied to all old mains throughout the City. Future extensions of the sewage collection system should be gravity flow rather than lift stations and force mains when possible. Lift stations and force mains are not only more expensive to build, but they create an ongoing high maintenance cost for the City."

2.3 User Charge Assessment

In conjunction with wastewater treatment improvements, a Wastewater User Charge Assessment was completed in September of 2006. As part of that evaluation, estimated quantities and costs for pump stations, sewers, and manhole rehabilitation were developed and utilized to help formulate the rate structure so that the collection system could be improved and sufficiently funded over time. A recommendation for additional staff was also made. The additional personnel would perform periodic preventive maintenance, perform some of the rehabilitation and oversee a collection system sewer maintenance management program. Wages and other costs associated with additional personnel were accounted for in the user charge assessment.

2.4 Collection System Inventory Data

A record of municipal infrastructure of the City of Iola, including the sanitary sewer collection system, has been maintained by the City in an AutoCAD-based system that was converted to a graphical information system (GIS) data base as part of companion engineering services to this assessment of the collection system. Manhole locations established by City staff using GPS (global positioning system) equipment has been added to the data base. The new GIS maps produced from the data were used to further evaluate the collection system.

2.5 CMOM Requirements and Updated Guidelines

A scope item for services included in this assessment was consideration of future regulatory requirements for control of sanitary sewer overflows (SSOs), which is an Environmental Protection Agency (EPA) proposed program referred to as CMOM (Capacity, Management, Operations, and Maintenance). Initially proposed in 2001, the program has not been formalized by federal rulemaking and serves presently only as recommended guidelines from the regulatory agencies for management of wastewater collection systems.

In the most recent actions that occurred in early 2010, EPA sought stakeholder's input for the purpose of helping EPA determine whether and how to modify the NPDES regulations for SSOs. As of the writing of this Design Memorandum, no follow-up action has been taken by EPA regarding this matter. It is not possible to predict when regulations associated with SSOs may be promulgated.

2.6 Sewer Use Ordinance

The Iola City Code contains the sewer use regulations in Article IX. - Sewers and Sewage Disposal. The provisions of this article were originally adopted by ordinance in 1975. With regard to control of extraneous flow from private sector sources, Sec. 94-651 (b) states:

> "No person shall discharge or cause to be discharged any stormwater, surface water, groundwater, roof runoff, subsurface drainage, uncontaminated cooling water or unpolluted industrial process wastewaters to any sanitary sewer without approval from the city administrator."

This provision in the City code provides the legal basis to require that inflow and infiltration from private sources be reduced if future collection system investigations demonstrate the necessity. The collection system inspections conducted as part of this assessment did not address private sector contributions of extraneous flows.

2.7 Industrial Sewer User Permitting Program

The City of Iola administers an Industrial Discharge Permit program. Provisions of the program are outlined in Article IX. - Sewers and Sewage Disposal of the City Code. Discharge permit requirements, prohibited discharges, federal pretreatment standards, excessive and accidental discharges, and notification requirements are all covered under this ordinance.

In 2008, Russell Stover Candies, a major industrial customer previously not subject to federal pretreatment standards, became permitted under the provisions of the City Code. Due to the strength of the wastewater discharged to the Iola wastewater collection system and the identified significant impact on the wastewater treatment system, the industry met the definition of a Significant Industrial User and, therefore, was added to the Industrial Discharge Permit program.

2.8 Water Distribution System Assessment

An evaluation "Water System Distribution, System Review and Assessment, June 2010" of the Iola water distribution system was conducted as a companion study to this assessment. The information developed for population projections for the water system has also been used as a reference for projecting the needs of the wastewater collection system into the future. Section 3 of this Design Memorandum discusses future conditions.

SECTION 3
Future Conditions

3.1 Background Information

The primary source of information for future conditions considered for this assessment was the Water Distribution System Review and Assessment of June 2010. That assessment evaluated growth for the water distribution system through the year 2030. A growth rate of zero percent through the year 2020 and 0.5% from 2021 to 2030 was assumed. With this assumption, the population of Iola would increase from 5782 to 6078, or just under 300 persons (approximately a 5% increase), in the next 20 years.

The likely growth areas are shown in "Figure 3-1, System Growth Areas", adapted from the Water Distribution Review and Assessment report. Growth is shown to take place north and northeast of the developed areas of Iola. Potential growth areas are influenced by the flood plains of the Neosho River, Elm Creek, and Coon Creek.

3.2 Sanitary Sewer System

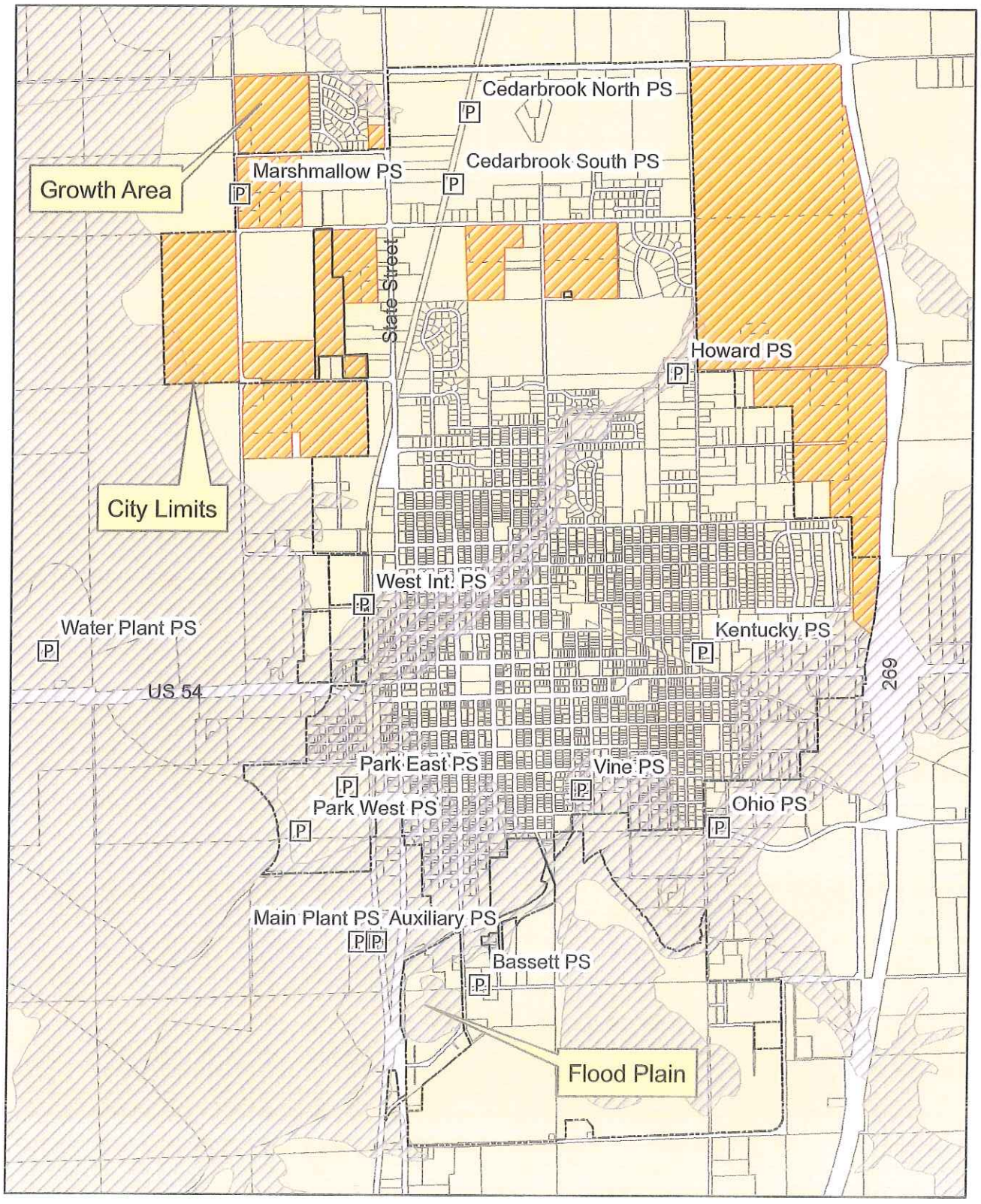
The existing wastewater pump stations are also shown on Figure 3-1 and include the Ohio and Howard Pump Stations serving the east and northeast part of the City, and the Marshmallow and West Interceptor Pump Stations in the northwest area of town. Four of the existing pump stations have the projected growth areas within their potential service areas. It is noted that the Howard Pump Station is tributary to the Ohio Pump Station which is tributary to the Main Plan Pump Station. The Marshmallow Pump Station discharges to sewers that drain to the West Interceptor Pump Station, which discharges directly to the Wastewater Lagoon System.

The scope of this assessment for evaluating capacity of the existing system is qualitative, not quantitative. As a result, the proposed growth for the next 20 years has not been used to recommend station capacity increases. Additionally, the magnitude of the peak flow from new sewers in developments, due to present-day materials and construction standards, is expected to be significantly less than peaks generated in areas that have been fully developed for decades. Additionally, the other aspects of this assessment which recommend rehabilitation of the sewers and manholes is anticipated to result in a reduction in the wet weather peak flows. This reduction of flows may be significantly more than the increase that could occur from a 5% population increase.

Based on current opinion of staff as to the capacity of each pump station and the potential growth areas, the Howard Pump Station should be closely monitored as growth in the area tributary to

Figure 3-1 System Growth Areas
City of Iola

NO SCALE



that station takes place. The three other stations in the areas of potential growth appear to have pumping capacity for some growth in the service areas of each station.

The capacity of the sewers depends on the diameter, the slope, and the roughness of the pipe material. A detailed evaluation of the sewer capacity is outside the scope of this assessment; consequently, specific flow ratings for sewers have not been determined. It is reported by staff that the existing sewers can become full and overflow at low manholes under extreme conditions. The intent of this Design Memorandum is to recommend rehabilitation of the collection system that will result in a reduction in the magnitude of peak flows.

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SECTION 4
Wastewater Pump Stations and Force Mains

4.1 General

The City of Iola currently operates and maintains twelve wastewater pump stations that range in pumping capacity from less than 100 gpm up to 4,600 gpm. Force mains conveying wastewater from the pump stations range from 4 to 24 inches in diameter with a total length of 24,000 feet. The pump stations, force mains, and connecting gravity sewers that form the framework of the infrastructure for conveying wastewater to the wastewater lagoon system, are shown in Figure 4-1, Pump Station, Force Mains, Connecting Sewers, and Service Areas. Ten of the pump stations are tributary to the Main Plant and Auxiliary PSs, which discharge directly to the lagoon system. The West Interceptor PS discharges directly to the lagoon system and receives a small amount of flow from three other pump stations.

Presently, the only flow measuring device for the entire collection system is located at the influent of the lagoon system. The meter is at a Parshall Flume which receives the discharge from the Main Plant, Main Plant Auxiliary, and West Interceptor Pump Stations.

All collection system pump stations have red, flashing lights that are activated automatically to indicate malfunctions at a pump station. However, the pump stations in the collection system are not presently outfitted with telemetry equipment to automatically notify operations staff when an alarm condition develops at a pump station. The Main Plant Pump Station is an exception because it has an automatic phone dialer to alert staff of alarm conditions. Alarm conditions are equipment and power malfunctions that should receive prompt operator attention to avoid possible overflows from the collection system, backups into the basements of buildings, and/or damage to collection system facilities.

In July of 2007, Iola and many other southeastern Kansas communities experienced a severe flooding event. Several pump stations in Iola were totally underwater, resulting in significant damage to many of these pump stations. The assessment of each pump station includes the extent of damage, repairs made, and possible long-term improvements needed to reduce flood-related damage.

Table 4-1, Wastewater Pump Station Inventory lists each of the pump stations, specific details related to that station, its associated force main, and a statement of the general condition of each station. The pump stations are listed roughly in order of capacity.

All pump stations were inspected and have been evaluated for the following items:

- Structural condition
- Operational issues
- Safety issues
- Electrical and standby power
- Pumps and piping configuration
- 2007 post-flood restoration
- Staff opinions of pumping capacity adequacy
- Force main condition
- Flow metering needs
- Future CMOM compliance

4.2 Force Mains

Force mains in the collection system represent a critical part which does not lend itself well to inspection. The condition of the force mains has been reported by operating staff to be generally in good condition, based on no known failures or other issues associated with the force mains. Inspection of the interior of force main piping is typically not attempted because the force mains would need to be drained and cannot be taken out of service for any length of time. An exterior and/or material condition inspection(s) were beyond the scope of this work and were not performed.

Depending on the terrain over which a force main extends, there may be air release valves at various points to automatically release gases. Gases will accumulate at high points and can cause restrictions to the flow of wastewater if not released. Under some circumstances, the restriction can significantly reduce the pumping rate. Periodic inspection and maintenance of air release valves is necessary to assure force mains retain their full conveyance capacity. An exterior and/or material condition inspection(s) were beyond the scope of this work and were not performed.

4.3 Pump Stations

Each pump station is discussed below. Photographs of each station are included in Appendix C.

4.3.1 Main Plant PS

General - This pump station is located southwest of the City of Iola at the site of the mechanical treatment plant that was decommissioned when the lagoon system was put into service in 1962. The pump station can be accessed from Nebraska Road, west from S. State Street. The pump station structure is reinforced concrete and configured in a drywell/wetwell arrangement. The wetwell is uncovered. A brick building over the drywell houses electrical equipment and controls. The station was recently upgraded (2008) by removal the original pumps, motors and

long drive shafts and installation of dry-pit submersible pumps in the drywell with pumping capacities equal to the original capacity of the old pumps that were replaced. The shutoff valves on the suction and discharge of the pumps and the discharge check valves were replaced as part of the recent improvements. A new level control system and alarm dialer were included in the improvements.

2007 Flood - The Main Plant PS was submerged in 2007 with the maximum water level reaching an elevation of nearly 3 feet above the floor of the electrical and control building located on top of the station. The pump station was restored to service after the flood waters receded. The improvements to replace the pumps, valves, and controls were completed along with lagoon improvements in 2008.

Pumps and Piping - The Main Plant PS is equipped with three pumps, two of which are rated for 1500 gpm @ 32' TDH and the third for 2000 gpm @ 38' TDH. All pumps, suction and discharge valves were installed new in 2008. The pump station firm capacity is 2,200 gpm with both of the smaller pumps in operation. The pumps are of the dry-pit submersible type. The station discharges to a 14" force main which extends to a connection with the 24" force main from the Auxiliary PS (wet weather) before discharging to the influent Parshall Flume structure at the wastewater lagoon site.

Existing Conditions - The structure for this pump station is cast-in-place concrete and is in very good condition. The building housing the electrical and control panels is brick with a concrete roof and is also in good condition. At the time the design of the upgrade to the station was being untaken, it was determined by the City that changing of the pumping capacity was not required. The Auxiliary PS was fully functional at that time and was available to pump peak wet weather flows in conjunction with the Main Plant PS.

A stand alone secondary power source to serve the pump stations at this site was considered during the design phase of the Main Plant PS upgrade. The Kansas Department of Health & Environment was in agreement that the location of the pump station next to the route of the main power feed from a wholesale supplier and from the City-owned power generating plant was sufficient to provide the required reliability for electrical power. A new pad-mounted transformer for the power feed to the station was installed as part of the station improvements. There is no standby generator at the site.

Pumping is controlled by a pressure transducer and float switches in the wetwell. A control system activates pumps based on wetwell levels. The levels for the operation of the two 1,500 gpm pumps are selected by the operations staff at the control system interface on the cover of the control panel. The operation of the 2,000 gpm pump is controlled by the float switches.

The Parshall Flume at the lagoon influent can be used to determine the pumping rate from the Main Plant PS.

Presently, there are no reported operation or safety concerns.

CMOM Issues - Reliability of this pump station to meet potential future CMOM requirements is addressed by having a reliable power source. The existing alarm dialer system was taken off line due to the frequency of false alarms being received by staff and should be restored to service and/or upgraded to more advanced technology now available. Reprogramming of the current system should resolve that matter so that alarm notification will help to maximize reliability to meet potential CMOM requirements.

With the Auxiliary PS intended to convey peak wet weather events, the capacity at this location is considered to be adequate. The improvements completed in 2008 provide improved protection from flood damage because the pumps are fully submersible and the electrical and control panels were installed as high as possible on the building's interior walls.

Identified Improvement Needs - There is no major work anticipated for this pump station following the 2008 upgrade. A separate letter report was previously prepared that addresses problems with the Auxiliary PS and possible modifications to the Main Plant PS to pump the peak wet weather flows that the Auxiliary PS was intended to convey. The letter report is included in Appendix D.

4.3.2 Main Plant Auxiliary PS

General - This pump station is located on the north side of the Main Plant Pump Station and was installed in 1978 to pump the peak flow rates that are generated during severe rainfall events which the Main Plant PS is not able to convey. Access to the Auxiliary PS site is along the same route for accessing the Main Plant PS. Possible replacement of the pump station with a pumping configuration that eliminates the below-ground steel chamber is being considered simultaneously with this study. See the letter report contained in Appendix D.

2007 Flood – The below ground chamber of this pump station filled with flood water in 2007. The water was pumped from the station and the motors and controls dried out. The pump station was returned to service. In 2008, a leak in the water line serving the station filled the below-ground chamber, requiring actions similar to what was needed following the 2007 flood to bring the station back into service. The station is considered to be highly unreliable by the operating staff. A manual on/off switch and alarm light were installed at ground-level near the entrance tube to reduce the need for entering the below-ground chamber.

Pumps and Piping– The Auxiliary PS has two equal sized pumps, both rated for 4,600 gpm @ 35' TDH. The firm capacity is therefore 4,600 gpm. City staff report that the capacity of the Auxiliary PS is sufficient to convey the peak flow rates reaching the pump station during wet weather periods. The existing pumps are close coupled centrifugal sewage pumps. The pumps and valves have had little use since being installed. The shut-off valves and the check valves are considered to be functional. This station has a 24" force main that discharges to the influent Parshall Flume structure at the lagoon site.

Existing Conditions – The pump station consists of a pre-manufactured steel chamber with a steel access tube. The station is about 20' deep and there is no a manlift provided. There has been some damage to the steel chamber and access tube from corrosion that must be addressed if the station were to remain in service. The electrical power source for the Auxiliary PS is shared with the Main Plant PS. The susceptibility of this station to be damaged by flooding and the safety concerns with entering a deep steel chamber containing electrical equipment are reasons why this station is being evaluated for removal from service. There is no standby generator at the site.

The 24" diameter force main extends to the Parshall Flume influent structure at the lagoon site. The 14" force main from the West PS is combined with the Auxiliary PS force main near the site of the Auxiliary PS. Flow metering of this pump station can take place at the Parshall Flume structure, however, the flow is combined with the flow from the West Interceptor PS.

The reliability of operation is considered low by City staff. They have concerns about safety because this is a below-ground steel chamber where persons entering and leaving must climb a 20' long ladder. The station is considered as a "confined space entry." The station has also been full of water twice, with damage to the pump motors and electrical gear.

CMOM Issues – This pump station was installed to convey peak flows from the collection system to the treatment lagoons. The function of the station serves to address the intent of the proposed CMOM regulations to reduce and eliminate sanitary sewer overflows. The pump station on/off control panel has a red beacon and a horn for alarm conditions. It is possible to tie the alarm function from the beacon light to the alarm dialer at the Main Plant PS. This should be considered. Reliability of the pump station power is similar to the Main Plant PS in that the power sources are the same.

Identified Improvement Needs - As mentioned under the Main Plant PS discussion, above, a separate letter report has been prepared to review replacement of the Auxiliary PS. See Appendix D for a copy of the letter report.

4.3.3 West Interceptor PS

General - The West Interceptor PS was constructed in 1978 with the West Interceptor Sewer to serve the northwest portion of Iola that consists mostly of industrial and commercial customers. The pump station is accessible from W. Lincoln Street, approximately 1 block west from N. State Street, then south along an access drive. The structure is reinforced concrete with a wetwell/drywell arrangement. The wetwell is uncovered. Rehabilitation of the self-priming wastewater pumps took place in the summer of 2010.

2007 Flood – The station was not damaged by flood waters in 2007.

Pumps and Piping – Each of the three pumps is rated at 1,700 gpm @ 42' TDH. The pump station firm capacity (two pumps in operation) is 2,250 gpm. A check valve is integral with the suction chamber of each pump. Discharge check valves and shutoff valves are installed vertically above the pumps. A 14" diameter force main extends south to the site of the Main Plant PS were it connects with the 24" force main from the Auxiliary PS.

Existing Conditions – The wetwell and drywell of this station are cast-in-place concrete and are in very good condition. The wetwell is uncovered and the drywell is accessed by stairway from the ground level. There are three self-priming pumps with suction pipes having an 18' vertical rise from the suction bell to the centerline of the pump suction pipe. Staff is of the opinion that the station will be able to meet peak inflow rates with the original capacity of the pumps as restored in 2010. Flow from the pump station can be monitored at the Parshall Flume influent structure at the lagoon system site.

The configuration of the wetwell and incoming sewers are such that under higher flow conditions, entrained air may cause the center pump to lose prime and therefore not pump wastewater when called into operation by the control system.

Operating staff has expressed no safety concerns for the West Int PS. The concerns with pump capacity were addressed by the recent pump rehabilitation work. Improvements to the wetwell inlet may reduce or eliminate the loss of prime of the center pump.

There is no standby generator at the site.

CMOM Issues – Reliability of the pump station for compliance with future CMOM requirements could be increased by including an alarm dialer or telemetry connection to notify operations and maintenance staff of problems and failures at the pump station. The pump station is able to provide the needed pumping capacity.

Identified Improvement Needs – Installation of a means to allow wastewater into the wetwell, without causing air binding of the center pump, should be provided. An influent trough is one solution to this problem. A flow meter should also be considered for installation in the discharge header. Alarm and telemetry connection to a central location should be considered.

4.3.4 Ohio PS

General - This station is located in the southeast portion of Iola and was constructed in 1975 in conjunction with the development of a poultry processing facility which is no longer in operation. The pump station is located at the intersection of S. Ohio and E. Rock Streets. The interceptor sewer tributary to the Ohio PS was extended north and receives wastewater generated from the northeast portion of Iola, including residential development at the far northeast part of the City. The pump station is a pre-manufactured, steel, below-ground structure with separate pre-cast concrete wetwell. The Ohio PS was upgraded in 1986 following a flood event. The upgrade included increasing the height of the entrance tube and a stairway for access.

2007 Flood – The station was not damaged by high waters in 2007. However, the flood waters did overtop the wetwell.

Pumps and Piping - Two of the three pumps are rated at 1,600 gpm @ 34' TDH. The third pump is rated for 2,250 gpm @ 46' TDH. The two smaller pumps operating together produce 2,250 gpm, the apparent firm pumping capacity. Each pump is provided with a suction shut off valve and a discharge check valve and shut off valve. A 14" diameter force main was constructed west from the Pump Station and discharges to a manhole located at the intersection of S. Cottonwood and E. Irwin Streets. The receiving interceptor sewer extends to the Main Plant PS.

Existing Conditions – The Ohio PS is a below-ground steel chamber housing the pumps and electrical controls. The steel structure is in poor condition due to deterioration from corrosion. The electrical gear and level controls are obsolete and can no longer be suppored with replacement parts. The pumps take suction from a cast-in-place concrete wetwell adjacent to the pump station. Due to the size of the wetwell compared to the current influent flow rate and due to the length of the interceptor conveying wastewater flow from the northeast corner of Iola, the contents of the wetwell are septic and create corrosive gases. As a result, the wetwell concrete is deteriorated. The manholes on the interceptor receiving the flow from the pump station have also been subjected to significant corrosion. See Section 6 of this Design Memorandum for specific recommendations for manhole rehabilitation.

There is no standby generator on site.

CMOM Issues – Reliability of the pump station for compliance with future CMOM requirements could be increased by including an alarm dialer or telemetry connection to notify operations and maintenance staff of problems and failures at the pump station. The inability to find replacement parts for electrical gear represents a major reliability concern.

Identified Improvement Needs – The operational problems mentioned are with station capacity being far greater than presently needed, the electrical and control components are obsolete, the steel structure is significantly deteriorated, and the station configuration requires entry into a confined space. Due to these significant operational, structural, age, and safety concerns, the station should be replaced. Protection of the wetwell structure by coating the interior surfaces with a high-build epoxy or polyurethane would protect the structure from further deterioration from corrosion if it can be re-used with a new pump station.

4.3.5 Vine Street PS

General - The Vine Street PS is reported to have been originally constructed in 1962 to replace a very old pump station that may have been installed with the original sewer system in the area. The station is a below-ground steel chamber with a circular brick wetwell. The station is located on the north side of E. Vine Street between S. Colborn and S. Oak Streets. In 1997, the station was refurbished and the current 2 speed motors were added to increase the pumping capacity.

2007 Flood – This station was reported to have not been damaged by the 2007 flood; however, the tributary sewers and the sewer receiving the pumped flow were all surcharged and overflowing.

Pumps and Piping – The two pumps each have two speed motors. Each pump is rated for 300 gpm @ 18' TDH at 870 rpm and approximately 400 gpm @ 32' TDH at 1170 rpm. The pumps are configured with suction shut off valves and discharge check valves and shut off valves. The 6" force main extends only 20' to discharge into the manhole south of the pump stations.

Existing Conditions – The pump station below-ground steel chamber is in relatively good condition. The wetwell appears to have been coated with a cementitious material over the brick some time in the past, and that material is now coming loose in chunks. Level control is provided by six float switch suspended in the wetwell.

The safety concerns expressed are for confined space entry into the pump station.

There is no standby generator on site.

When there is considerable stormwater in the sewers tributary to the pump station and in the sewers receiving pumped flow from the station, the pump station is unable to keep up and manholes tributary to the pump station may overflow. If the pump motors are selected for high speed, the receiving sewer is unable to take the flow from the Vine Street PS and the manhole lid may surcharge, resulting in pumped wastewater flowing to the local road ditch.

CMOM Issues – To meet future CMOM requirements, the station will need to be part of an overall solution to reduce the overflows from manholes tributary to the pump station. Alarm notification equipment should also be considered for addition.

Identified Improvement Needs – Extending and redirecting the force main discharge to a larger sewer capable of receiving the pumped flow should be considered. The influent peak rate to the pump station is unknown and because upstream manholes overflow under extreme conditions, an accurate value may not be obtained. The City has televised the sewers tributary to the Vine Street Pump Station to identify sources of extraneous flow that can be removed. A new force main extended to a sewer with capacity to receive the discharge must be considered and sized to handle a future flow. The future flow may come from larger capacity pumps deemed necessary after the sewer and manhole rehab work has been completed. Construction of a totally new wetwell and pump station will be required and will depend, as does the size of the recommended force main, on the findings of the sewer televising work.

4.3.6 Kentucky PS

General – This pump station is located 1 block north of US 56 Highway (East Street) on the east side of N. Kentucky Street. It is a pre-cast concrete structure, including the above ground building that houses the electrical and controls. The station is of the wetwell/drywell configuration. New pumps, piping and valves were installed in 1970. A new 8" force main was constructed with that project and conveys flow to a new discharge point. Level control is by a bubbler system.

2007 Flood – This station was reported to have not been damaged by the 2007 flood.

Pumps and Piping – The drywell houses two 5 horsepower, close-coupled, centrifugal wastewater pumps of unknown capacity. Each pump has a shut off valve on the suction side and a check valve and shutoff valve on the discharge side of the pump. The 8" force main extends 1025 feet to a flow splitter structure located in S. Fourth Street about 150' south of East Street. The flow splitter directs the flow east and west to two gravity sewers, which eventually drain to the Vine Street PS.

Existing Conditions – The above-ground structure and the dry well appear to be in relatively good condition. The wetwell exhibits signs of corrosion. Control of wetwell level and pump

operation is by an air bubbler system. The station capacity is considered to be adequate by City staff for current conditions; however a new hospital is being planned that will contribute to this station.

The above ground building houses the electrical and control equipment. The access hatch to the wetwell is in the floor of the building. This arrangement violates current electrical code for separation of sources of ignition (electrical equipment) from potential sources of explosive gases (wetwells). Access to the pumps in the dry well is by another hatch in the floor of the building. Personnel must descend a 20-foot vertical ladder that has no fall protection. This also qualifies for a confined space entry designation.

There is standby generator on site.

CMOM Issues – An alarm dialer should be considered for this pump station to provide operator notification of mechanical or electrical problems. Future flows should be determined for assurance that the pumps have adequate capacity.

Identified Improvement Needs – This pump station should be included in a program of pump station upgrades. Consideration should be given to renovating the existing drywell into a wetwell for submersible pumps. The upgrade should include a valve vault with a control enclosure mounted over the valves. Consideration should be given to directing flow from the pump station to a sewer tributary to the Ohio PS to reduce the amount of flow the Vine Street PS must handle.

4.3.7 Howard PS

General – The Howard PS is located in the northeastern portion of the City about ½ block west of the intersection of N. Kentucky and North Dakota Road. It is accessible from N. Kentucky Street along an access drive. The pump station is a wet-well mounted, vacuum primed package pump station. Pumps and motors, electrical and control panels, and valves are protected by a fiberglass enclosure that can be lifted off for access to the equipment. Level control is provided by float switches. Access to the 4-foot diameter precast concrete wetwell is through a hatch which is part of the base plate and outside of the station enclosure. The pump station was originally installed in 1972 and was replaced in 2008.

2007 Flood – The pump station was totally replaced in the summer of 2008 because of unreliable operation resulting from damage during the 2007 flood event.

Pumps and Piping – The two pumps are driven by 3 horsepower motors and the pumping rate from each pump is reported to be 150 gpm. Station firm capacity is 150 gpm. The pumps and motors, discharge check valves, and discharge plug valves are located under the fiberglass cover.

Suction pipes extend to near the wetwell bottom. There are no suction shutoff valves in this station configuration. The 4" force main extends approximately 2500 feet east and south where it discharges to a manhole on a sewer tributary to the Ohio PS.

Existing Conditions – The pump station was completely replaced in 2008 and therefore is in very good condition. The precast concrete wetwell shows some signs of corrosion; however, not to the extent that action is needed at this time. There are no reported operational or safety concerns.

Electrical service is 120/240 three-phase from overhead power. There is no standby generator on site.

CMOM Issues –The capacity is reported to be sufficient for current flows.

Identified Improvement Needs –The corroding cast iron manhole steps should be removed from the wetwell and the holes in the wall patched with non-shrink grout. This will reduce the potential that someone would try to use the deteriorated steps to access the wetwell.

4.3.8 Bassett PS

General – This pump station serves the industrial area at the south end of the City, on the north side of Portland Street, between S. Washington Street and Wheeler Avenue. The pump station was originally installed in 1974 and replaced in kind in 2010. It is a wet-well mounted, vacuum primed package pump station. Controls and valves are protected by a fiberglass enclosure that can be lifted off for access to the equipment. Access to the 6-foot diameter precast concrete wetwell is through a hatch which is part of the base plate, but outside of the station enclosure.

2007 Flood – This station is reported to not have been damaged by the 2007 flood.

Pumps and Piping – The two pumps each have 5 horsepower motors, discharge check valves, and three-way discharge plug valve located under the fiberglass cover. Suction pipes extend to near the wetwell bottom. There are no suction shutoff valves in this station configuration. The 6" force main extends approximately 1900 feet north to a manhole at W. Acer Street and South Street. The receiving sewer is tributary to the Main Plant PS.

Existing Conditions – The pump station is in very good condition because it was totally replaced in 2010. The precast concrete wetwell shows some signs of corrosion; however, not to the extent that action is needed at this time.

Electrical service is 120/240 three-phase extended underground from the overhead power. There is no standby generator on site.

CMOM Issues – The capacity is considered adequate for current tributary flows.

Identified Improvement Needs – There are no necessary improvements that have been identified at this time. The wetwell condition should be monitored so the interior can be given a protective coating if additional corrosion begins to occur.

4.3.9 Park East PS

General – This pump station is also new following the 2007 flood. It is located on the north side of Park Avenue, the entrance road to Riverside Park. The pump station serves a portion of the Riverside Park area. It is a wet-well mounted, vacuum primed package pump station. The structure on which the pump station is mounted was previously a drywell/wetwell configuration. The drywell is no longer used and the pump station is mounted above the wetwell. The date of original construction is not known. Controls and valves are protected by a fiberglass enclosure that can be lifted off for access to the equipment. Access to the concrete wetwell is through a hatch which is part of the base plate, but outside of the station enclosure. Pump control is accomplished by a bubbler system.

2007 Flood – As mentioned above, the pump station was totally replaced after the 2007 flood due to damage from water over the station.

Pumps and Piping – Each of the two pumps are driven by 2 horsepower motors. As with several other similar pump station configurations, the discharge check valves, and three-way discharge plug valve are located under the fiberglass cover. Suction pipes extend to near the wetwell bottom. There are no suction shutoff valves in this station configuration. The 4" force main extends approximately 350 feet east to a manhole tributary to the Main Plant PS.

Existing Conditions – All but the structure of the pump station was completely replaced following the 2007 flood and therefore is in very good condition. The precast concrete wetwell shows some signs of corrosion; however, not to the extent that action is needed at this time.

Electrical service is 120/240 three-phase extended underground from the overhead power. There is no standby generator on site.

CMOM Issues – The capacity of this pump station is considered adequate by City staff for the flow that it receives. The pump station remains susceptible to flooding, although the City is considering improvements to the dikes surrounding Riverside Park to protect the whole area from flooding. If these improvements are not undertaken, the wetwell should be considered for raising to an elevation above the anticipated flood elevation.

Identified Improvement Needs – There are no improvements that have been identified at this time.

4.3.10 Park West PS

General – This pump station is also located in Riverside Park, between the two main recreational buildings. The pumping equipment configuration is the wet-well mounted, vacuum primed package pump station style that was totally replaced in 2010. The pumping rate for each pump is 100 gpm. Float switches are used for level control. The wetwell is a rectangular structure and the date of original construction is not known.

2007 Flood – The pump station controls were partially replaced after the 2007 flood due to damage from water over the station; however it remained unreliable and was therefore replaced in 2010.

Pumps and Piping – The two pumps and 2 horsepower motors, electrical and control panels are located under the fiberglass cover. Check valves and plug valves are located below the base plate of the pumping equipment in the wetwell. Suction pipes extend to near the wetwell bottom. There are no suction shutoff valves in this station configuration. The 4" force main extends approximately 200 feet north to a manhole tributary to the Park East PS.

Existing Conditions – The pump station electrical, mechanical, and support components are all new. Staff reports that the capacity is adequate for the flow received.

Electrical service is 120/240 three-phase extended underground from the overhead power on the light pole next to the pump station. There is no standby generator on site.

CMOM Issues – The capacity of this pump station is considered adequate by City staff for the flow that it receives. The pump station remains susceptible to flooding, although the City is considering improvements to the dikes surrounding Riverside Park to protect the whole area from flooding.

Identified Improvement Needs – There are no improvements needed at this time.

4.3.11 Marshmallow PS

General – The pump station is a wet-well mounted, vacuum primed package pump station, similar to several others in the City. Pumps and motors, electrical and control panels, and valves are protected by a fiberglass enclosure that can be lifted off for access to the equipment. Level control is provided by float switches. Access to the 4-foot diameter precast concrete wetwell is through a hatch in the base plate outside the station enclosure. The pump station was installed in 1978. Access to the pump station site is from Marshmallow Lane (1300 Street) between Kansas

Avenue and W. Miller Lane. Service is provided to a portion of an industrial park with only a small amount of flow being contributed at this time.

2007 Flood – This station was not impacted by the 2007 flood.

Pumps and Piping – The two pumps are each rated for 200 gpm and have 2 horsepower motors. The discharge check and shutoff valves are located under the baseplate of the pump station and therefore are in a corrosive environment. City staff reports that the pump station is significantly under-loaded. The 6" force main extends east from the pump station approximately 1400 feet and discharges to a manhole tributary to the West Int PS.

Existing Conditions – The overall condition of the pump station is considered to be acceptable and City staff consider it to be reliable. Corrosion of the discharge piping and valves in the wetwell will make any repairs to those items problematic, with total replacement of all valves and piping likely when a valve needs replacement. The concrete of the wetwell appears to be in reasonable condition. There are no reported operational or safety issues associated with this pump station. There is no standby generator on site.

CMOM Issues – Provisions for connection of a portable generator to be used in the event of a loss of primary power is the only consideration needed at this time.

Identified Improvement Needs – There are no improvements identified at this time.

4.3.12 Water Plant PS

General – This pump station is located on the site of the Water Treatment Plant and receives the domestic waste from the plant. The Water Plant is located on the north side of US Highway 54, just west of the bridge at the Neosho River west of Iola. The pump station was constructed with the water treatment plant in 2005. There are two submersible pumps with a below-ground valve vault. Electrical and controls are mounted to a stainless steel frame. Level control is provided by a pressure transducer and float switches are included for backup.

2007 Flood – The water treatment plant site was partially covered with water during the 2007 flood event; however, the wastewater pump station was not impacted.

Pumps and Piping – Each submersible pump is driven by a 5 horsepower motor and the pumps are each rated for 100 gpm. The 4" check valves and 4" gate valves are located in the valve vault adjacent to the wetwell. The 4" force main extends approximately 2500 feet in an easterly direction, discharging to a manhole tributary to the West Interceptor Pump Station.

Existing Conditions – The station is considered to be in good condition. Limit switches on the check valves are not functioning and City staff feel there is no need to restore that function. Power to the pump station is 480 volt, three phase, extended from the Water Treatment Plant main power. The City power plant is located adjacent to the Water Treatment Plant. Consequently, reliability of power to the pump station is considered great.

CMOM Issues – There are no issues related to flooding, secondary power, or station reliability for this pump station.

Identified Improvement Needs – There are no improvements identified at this time.

4.3.13 Cedarbrook 1

General – The pump station is located in the northern part of Iola in the Cedarbrook Subdivision. It is accessible along McGuire Drive from Cottonwood Street in a new subdivision. The pump station is just west of the intersection of McGuire Drive and Chambers Drive. This station was installed in 2009 and level control is by float switches. A post-mounted control and electrical panel is located adjacent to the 6' diameter wetwell.

Pumps and Piping – The wetwell contains two 3.0 horsepower motor driven pumps, each rated for 175 gpm at 24' TDH. Discharge piping from each pump is 4" DIP extending through the valve vault, which contains the 4" swing check and plug valves. A 4" Class 200 PVC force main extends 477' southeast to the discharge manhole north of Miller Road which is part of the sewer system tributary to the West Interceptor Pump Station.

Existing Condition – Because the station is less than 2 years old, it is considered to be in very good condition. Power service is 230 volt, 3 phase. There is no standby generator on site.

CMOM Issues – There are no current issues regarding threat by flooding, reliability, or capacity. The control panel is equipped with an alarm light and horn.

Identified Improvement Needs – There are no improvement needs identified at this time.

4.3.14 Cedarbrook 2

This pump station is to be constructed in 2011 and will also be located in the Cedarbrook Subdivision. It will be near the intersection of McGuire Drive and Archer Drive and accessible from Cottonwood Street along either McGuire Drive or Archer Drive. The station configuration will the same as Cedarbrook 1 with 2.5 horsepower pumps rated at 100 gpm at 16' TDH. The 302' 4" Class 200 PVC force main will discharge to a manhole tributary to the Cedarbrook 1 Pump Station.

4.4 CMOM Issues

Adequate capacity and reliability are the two major issues with pump stations. The goal is to pump all flows that come to the pump station at all times. The assessment of the pump stations serving the City of Iola has identified improvements that are needed to meet these two issues and also the issue of safety. The assessment and the identification of improvements that provide for adequate capacity and for improved reliability are efforts that would be required by a CMOM program.

4.5 Recommended Improvements

Table 4-2 provides a summary of the specific improvements for each pump station in priority order. The benefits and purpose(s) of the improvements are also listed in the table. A budget-level probable project cost is also shown. The detailed estimates for each pump station are included in Appendix D.

Consideration should also be given to the following;

1. System wide telemetry and reporting capability via radio telemetry, dialers, and/or internet status reporting.

2. Connections at each pump station site to allow a portable generator connection.

TABLE 4-2 WASTEWATER PUMP STATION RECOMMENDED IMPROVEMENTS
City of Iola, Kansas
Wastewater Collection System Review and Assessment

Pump Station Name	Recommended Improvements	Benefit/Purpose	Probable Project Cost
Vine Street	1. Televise service area tributary to PS 2. New 1200' of 10" force main 3. Rehabilitate the wetwell 4. Replace with new pump station with submersible pumps and valve vault	1. Identify sources of inflow 2. Eliminate discharge to overloaded sewer 3. Extend useful life of the structure 4. Reduce safety concerns and improve reliability	$ 446,000
Main Plant Auxiliary	1. Remove the station from service and install larger pumps in the Main Plant Pump Station	1. Eliminates unreliable station with personnel safety concerns	$ 288,000
Kentucky	1. Convert the drywell to a wetwell 2. Install valve vault and control building	1. Corrects electrical code violation 2. Improves staff safety, decreases maintenance requirements	$ 136,000
West Interceptor	1. Install wetwell trough 2. Install flow meter	1. Reduces air binding of center pump 2. Monitor service area growth	$ 40,000
Ohio Station	1. Install temporary flow meter to determine existing peak flow rate to the pump station 2. Construct a new pump station and abandon the existing structures	1. Allows proper sizing for current and future needs 2. Replace deteriorating pump station with no longer available repair parts	$ 297,000
Main Plant	See "Main Plant Auxiliary", above.	N/A	
Park West	Nothing at this time	N/A	
Howard	Nothing at this time	N/A	
Bassett	Nothing at this time	N/A	
Park East	nothing at this time	N/A	
Marshmallow	nothing at this time	N/A	
Water Plant	nothing at this time	N/A	
Cedarbrook 1	nothing at this time	N/A	
Cedarbrook 2	nothing at this time	N/A	
		Total Probable Project Cost:	**$ 1,207,000**

SECTION 5
Gravity Sanitary Sewers

5.1 General

The collection system represents a significant infrastructure investment, with most of the value in the miles of gravity sewers which are below ground and out of sight. Periodic maintenance is necessary to maintain flows and to assess condition of the sewers. Without periodic maintenance, chronic problems can include backups of sewage into buildings, overflows of wastewater to the ground surface and into drainage ways, and collapse of streets and alleys.

There is an estimated 60 plus miles of gravity sewers serving the City of Iola, with pipe sizes ranging from 8" to 30" in diameter. The greatest length of any one size of pipe is for 8" diameter. The majority of sewers of Iola were installed prior to the 1950's and are exclusively vitrified clay tile pipe (VCP). More recently installed sewers are made of polyvinyl chloride (PVC) pipe.

5.2 Inspection of Sewers

Approximately 35% of the total length of gravity sewers were inspected by closed-circuit televising during the summer of 2010 and early 2011. All pipe 10" and greater in diameter was televised with a total length of 52,000 feet. Additionally, 58,000 feet of 8" diameter sewers was inspected. Pipe conditions and defects were noted during the inspection and a video record and tabulation of defects was provided by the televising contractor. These assessments of the condition of each segment of sewer between manholes were rated and the sewers ranked by severity of the defects, taking into account both types and numbers of defects. Defects can include cracks, intruding tree roots, missing pipe, offset joints, improperly made service taps, and a multitude of other physical conditions that will result in eventual failure of the pipe and/or provide an entrance for extraneous flow.

Figure 5-1 shows the location of sewers that were televised. The sewers selected for rehabilitation are shown in red and those televised but not recommended at this time for rehabilitation are shown in green.

5.3 Sewer Rehabilitation

The written record and select photos of the sewer televising provided by the televising contractor are contained in three separate notebooks. The televising was recorded onto DVDs, copies of which are contained in the notebooks with the hardcopy documentations. The sewers initially determined from this evaluation that need to be rehabilitated are listed in Tables 5-1a Sewer

Rehabilitation. Additional sewers determined to need rehabilitation due to the additional inspections completed in the Vine Street Pump Station area are shown in Table 5-1b. In some instances, the pipe was deteriorated to a condition that prevented the camera from passing through the sewer. Figure 5-2 Point Repairs and Tables 5-2a and 5-2b Sanitary Sewer Point Repairs list and show the locations where sewers will need to be excavated and repaired before the pipe between manholes can be rehabilitated. Table 5-2b indicates the point repairs necessary in the Vine Street Pump Station area.

The method for rehabilitation in nearly all cases will be to line the sewers with a cured-in-place pipe which uses the existing pipe as a form. The method involves insertion of a resin impregnated fabric tube that is expanded by and cured with either hot water or steam. The insertion takes place at a manhole. The higher temperature of the hot water or steam activates the chemical reaction in the resin to form a rigid pipe. This method restores the structural integrity of the sewer, seals locations where extraneous flow and tree roots can enter, and provides a smoother surface than the original VCP pipe to better convey wastewater. Service connections to residences and businesses can be restored from inside the pipe using a closed-circuit camera and remotely operated tools.

The total probable cost for sewer rehabilitation listed in Table 5-1a and Table 5-1b are $1,306,602 and $687,878, respectively and the probable cost for point repairs listed in Table 5-2a and Table 5-2b are $8,050 and $135,100, respectively.

5.4 CMOM Issues

This aspect of the project resulted in the closed-circuit televised inspection of approximately 25% of the total length of sanitary sewers within the City of Iola. The selection of sewers for televising was based on input from the collection system maintenance crew's experience and opinions of which are likely to be the most deteriorated sewers within the system. The evaluation of the televising record was used to develop a prioritized listing of sanitary sewers for rehabilitation. The cumulative estimated costs have been compared to the program funding discussed in Section 1 to define which sewer segments can be rehabilitated in the near future and which will need to be scheduled over time and paid for through the operating budget of the utility. This systematic approach to identify, prioritize, and schedule sewer system rehabilitation is consistent with proposed regulations and consequently expected to be applicable to any future federal or state regulations that would be promulgated.

5.5 Recommended Improvements

Tables 5-1a and 5-1b provide the listing of sanitary sewer rehabilitation that is recommended for inclusion in the Program Funding discussed in paragraph 1.4 of Section 1. A single sewer

TABLE 5-1a SEWER REHABILITATION
City of Iola, Kansas
Wastewater Collection System Review and Assessment

From MH	To MH	Size	Street	Length	Unit Cost	Constr-uction Cost	Project Costs	Cumulative Costs
525	524	8″	N 1ST ST	424	$45	$19,080	$2,862	$21,942
530	529	8″	E LINCOLN	293	$45	$13,185	$1,978	$37,105
535	536	8″	E MONROE ST	510	$45	$22,950	$3,443	$63,497
517	516	8″	E CARPENTER	470	$45	$21,150	$3,173	$87,820
397	25	8″	DOUGLAS ST	414	$45	$18,630	$2,795	$109,244
546	545	8″	E DOUGLAS	424	$45	$19,080	$2,862	$131,186
546	547	8″	E DOUGLAS	421	$45	$18,945	$2,842	$152,973
531	532	8″	E LINCOLN	410	$45	$18,450	$2,768	$174,191
398	397	8″	W LINCOLN ST	385	$45	$17,325	$2,599	$194,114
409	408	8″	E CARPENTER	517	$45	$23,265	$3,490	$220,869
430	429	8″	E BUCHANAN	389	$45	$17,505	$2,626	$241,000
539	540	8″	E LINCOLN	306	$45	$13,770	$2,066	$256,835
401	402	8″	HENRY	344	$45	$15,480	$2,322	$274,637
447	448	8″	MONROE ST	399	$45	$17,955	$2,693	$295,286
541	540	8″	E CARPENTER	308	$45	$13,860	$2,079	$311,225
544	545	8″	E BRECKENRIDGE	368	$45	$16,560	$2,484	$330,269
483	481	8″	MUSTANG CT	204	$45	$9,180	$1,377	$340,826
421	420	8″	E BUCHANAN	336	$45	$15,120	$2,268	$358,214
412	411	8″	W BUCHANAN	302	$45	$13,590	$2,039	$373,842
424	425	8″	MONROE ST	302	$45	$13,590	$2,039	$389,471
528	529	8″	E CARPENTER	303	$45	$13,635	$2,045	$405,151
403	402	8″	E BENHAM	300	$45	$13,500	$2,025	$420,676
31	471	8″	DOUGLAS ST	381	$45	$17,145	$2,572	$440,393

Table 5-1a (cont.)

From MH	To MH	Size	Street	Length	Unit Cost	Constr-uction Cost	Project Costs	Cumulative Costs
30	448	8″	BENTON ST	354	$45	$15,930	$2,390	$458,712
22	392	8″	W MONROE ST	184	$45	$8,280	$1,242	$468,234
58	55	8″	E ROCK	399	$45	$17,955	$2,693	$488,882
411	410	8″	W BUCHANAN	308	$45	$13,860	$2,079	$504,821
540	529	8″	BRECKENRIDGE	327	$45	$14,715	$2,207	$521,744
117	115	10″	E MONROE	462	$54	$24,948	$3,742	$550,434
565	566	8″	N 3RD ST	303	$45	$13,635	$2,045	$566,114
446	447	8″	MONROE ST	284	$45	$12,780	$1,917	$580,811
418	417	8″	E BRECKENRIDGE	375	$45	$16,875	$2,531	$600,217
519	518	8″	N OAK	351	$45	$15,795	$2,369	$618,381
519	516	8″	BUCKEYE ST	325	$45	$14,625	$2,194	$635,200
548	547	8″	E MONROE ST	247	$45	$11,115	$1,667	$647,982
396	25	8″	MONROE ST	345	$45	$15,525	$2,329	$665,836
537	538	8″	E DOUGLAS	338	$45	$15,210	$2,282	$683,328
525	526	8″	N 1ST ST	162	$45	$7,290	$1,094	$691,711
534	533	8″	E MONROE ST	216	$45	$9,720	$1,458	$702,889
525	522	8″	1st STREET	329	$45	$14,805	$2,221	$719,915
400	399	8″	BRECKENRIDGE	244	$45	$10,980	$1,647	$732,542
537	536	8″	E DOUGLAS	419	$45	$18,855	$2,828	$754,225
399	398	8″	BRECKENRIDGE	322	$45	$14,490	$2,174	$770,889
543	544	8″	E CARPENTER	290	$45	$13,050	$1,958	$785,896
520	519	8″	N OAK	144	$45	$6,480	$972	$793,348
527	526	8″	N 1ST ST	146	$45	$6,570	$986	$800,904
522	521	8″	N OAK	146	$45	$6,570	$986	$808,459

Table 5-1a (cont.)

From MH	To MH	Size	Street	Length	Unit Cost	Constr-uction Cost	Project Costs	Cumulative Costs
529	527	8″	BRECKENRIDGE	160	$45	$7,200	$1,080	$816,739
541	542	8″	E CARPENTER	64	$45	$2,880	$432	$820,051
521	520	8″	N OAK	51	$45	$2,295	$344	$822,690
409	410	8″	E CARPENTER	45	$45	$2,025	$304	$825,019
401	400	8″	H ALLEY	14	$45	$630	$95	$825,744
522	523	8″	ELM ST	418	$45	$18,810	$2,822	$847,375
419	420	8″	E CARPENTER	323	$45	$14,535	$2,180	$864,090
419	418	8″	E CARPENTER	225	$45	$10,125	$1,519	$875,734
515	514	8″	COLBOURN ST	121	$45	$5,445	$817	$881,996
516	515	8″	COLBOURN ST	162	$45	$7,290	$1,094	$890,379
514	471	8″	LINCOLN ST	148	$45	$6,660	$999	$898,038
52	51	12″	E ERWIN ST	336	$60	$20,160	$3,024	$921,222
29	28	12″	E DOUGLAS ST	339	$60	$20,340	$3,051	$944,613
30	29	12″	E DOUGLAS ST	340	$60	$20,400	$3,060	$968,073
85	84	12″	S WALNUT ST	340	$60	$20,400	$3,060	$991,533
28	27	12″	W DOUGLAS ST	420	$60	$25,200	$3,780	$1,020,513
21	20	16″	W MONROE	349	$80	$27,920	$4,188	$1,052,621
22	23	16″	W MONROE	351	$80	$28,080	$4,212	$1,084,913
20	19	16″	W MONROE	174	$80	$13,920	$2,088	$1,100,921
6	5	21″	N ST AT E	449	$106	$47,594	$7,139	$1,155,655
9	8	18″	N ST AT E	431	$92	$39,652	$5,948	$1,201,254
8	7	18″	N ST AT E	282	$92	$25,944	$3,892	$1,231,090
395	396A	8″	W MONROE ST	30	$45	$1,350	$203	$1,232,642
396A	396	8″	W MONROE ST	280	$45	$12,600	$1,890	$1,247,132

Table 5-1a (cont.)

From MH	To MH	Size	Street	Length	Unit Cost	Constr-uction Cost	Project Costs	Cumulative Costs
14	13	16″	N ST AT E	82	$80	$6,560	$984	$1,254,676
56	55	12″	E IRWIN	24	$60	$1,440	$216	$1,256,332
449	30	8″	DOUGLAS ST	232	$45	$10,440	$1,566	$1,268,338
31	30	10″	E DOUGLAS ST	337	$54	$18,198	$2,730	$1,289,266
473	472	8″	BRECKENRIDGE	335	$45	$15,075	$2,261	$1,306,602

Total Length: 22,392

TABLE 5-1b SEWER REHABILITATION
City of Iola, Kansas
Wastewater Collection System Review and Assessment

From MH	To MH	Size	Street	Length	Unit Cost	Constr-uction Cost	Project Costs	Cumulative Costs
358	359	8″	BROADWAY ALLEY	516	$45	$23,220	$3,483	$26,703
355	354	8″	EAST ST ALLEY	376	$45	$16,920	$2,538	$46,161
326A	329	8″	BROADWAY ALLEY	450	$45	$20,250	$3,038	$69,449
329	330	8″	NEOSHO ALLEY	473	$45	$21,285	$3,193	$93,926
306	307	8″	MADISON ALLEY	400	$45	$18,000	$2,700	$114,626
292	291	8″	BROADWAY ALLEY	195	$45	$8,775	$1,316	$124,718
290	289	8″	BROADWAY ALLEY	190	$45	$8,550	$1,283	$134,550
352	571	8″	E NEOSHO ST	301	$45	$13,545	$2,032	$150,127
360	351	8″	E SPRUCE ST	318	$45	$14,310	$2,147	$166,583
330	317	10″	E SPRUCE ST	364	$54	$19,656	$2,948	$189,188
561	559	6″	E JACKSON	269	$45	$12,105	$1,816	$203,108
65	287	8″	E VINE ST	216	$45	$9,720	$1,458	$214,286
599	LH	8″	E SPRUCE ST	356	$45	$16,020	$2,403	$232,709
73	300	8″	E VINE ST	297	$45	$13,365	$2,005	$248,079
444	443	8″	N COLBORN ST	405	$45	$18,225	$2,734	$269,038
708	709	8″	W BUCHANAN ST	354	$45	$15,930	$2,390	$287,357
724	723	8″	EDWARDS ST	313	$45	$14,085	$2,113	$303,555
731	730	8″	E JIM ST	393	$45	$17,685	$2,653	$323,893
575	574	8″	E MEADOWBROOK ST	153	$45	$6,885	$1,033	$331,811

Table 5-1b (cont.)

From MH	To MH	Size	Street	Length	Unit Cost	Constr-uction Cost	Project Costs	Cumulative Costs
296	290	8″	OAK ST	428	$45	$19,260	$2,889	$353,960
289	288	8″	E NEOSHO ST	384	$45	$17,280	$2,592	$373,832
336	330	10″	E SPRUCE ST	298	$54	$16,092	$2,414	$392,337
317	310	10″	E SPRUCE ST	183	$54	$9,882	$1,482	$403,702
309	310	10″	N 1ST ST	170	$54	$9,180	$1,377	$414,259
311	75	12″	N 1ST ST	190	$60	$11,400	$1,710	$427,369
346	347	8″	MADISON ALLEY	469	$45	$21,105	$3,166	$451,640
335	336	8″	VINE ST ALLEY	460	$45	$20,700	$3,105	$475,445
304	303	8″	MADISON ALLEY	293	$45	$13,185	$1,978	$490,607
294	295	8″	E BROADWAY ST	160	$45	$7,200	$1,080	$498,887
576	575	8″	E MEADOWBROOK ST	249	$45	$11,205	$1,681	$511,773
577	575	8″	E MEADOWBROOK ST	400	$45	$18,000	$2,700	$532,473
359	360	8″	E NEOSHO ST	484	$45	$21,780	$3,267	$557,520
354	353	8″	MADISON ALLEY	400	$45	$18,000	$2,700	$578,220
343	344	8″	MADISON ALLEY	238	$45	$10,710	$1,607	$590,537
345	346	8″	MADISON ALLEY	446	$45	$20,070	$3,011	$613,617
315	316	8″	VINE ST ALLEY	394	$45	$17,730	$2,660	$634,007
318	317	8″	E BROADWAY ST	469	$45	$21,105	$3,166	$658,277
303	302	8″	MADISON ST ALLEY	354	$45	$15,930	$2,390	$676,597
561	563	6″	E JACKSON ST	95	$45	$4,275	$641	$681,513
294	95	8″	E BROADWAY ST	123	$45	$5,535	$830	$687,878

Total Length: 13,026

TABLE 5-2a SANITARY SEWER POINT REPAIRS
City of Iola, Kansas
Wastewater Collection System Review and Assessment

Down stream MH #	Up stream MH #	Problem Description	Approximate Depth to Flowline	Surface Type	Probable Point Repair Cost	Repair Completed By City Staff	Contract Point Repair Cost
476	475	Corroded iron pipe - replace	5 feet	Mixed	$28,000	x	
420	419	Intruding Tap	5 feet	Gravel Alley	$3,000		$3,000
523	522	Intruding Tap	8 feet	Gravel Alley	$3,500	x	
526	525	Intruding Tap	10 feet	Gravel Alley	$4,000	x	
538	537	Root Ball, Pipe Broken	6 feet	Gravel Alley	$3,000	x	
547	548	Collapsed Pipe	6 feet	Gravel Alley	$3,000	x	
518	519	Collapsed Pipe	7 feet	Gravel Alley	$3,000	x	
392	22	Collapsed Pipe (2 Locations)	11 feet	Gravel Alley	$7,000	x	
448	30	Collapsed Pipe	11 feet	Gravel Alley	$4,000	x	
471	31	Broken Pipe with Void	7 feet	Gravel Alley	$3,000	x	
402	401	Intruding Tap	10 feet	Gravel Alley	$4,000		$4,000
545	546	Collapsed Pipe (3 Locations)	6 feet	Gravel Alley	$8,000	x	
536	535	Collapsed Pipe	8 feet	Gravel Alley	$3,500	x	
530	529	Collapsed Pipe	6 feet	Gravel Alley	$3,000	x	
524	525	Collapsed Pipe	12 feet	Gravel Alley	$5,000	x	
					Total Probable Point Repair Cost:		**$7,000**
					Construction Contingency:		**$1,050**
					Total Point Repair Project Budget:		**$8,050**

TABLE 5-2b SANITARY SEWER POINT REPAIRS
City of Iola, Kansas
Wastewater Collection System Review and Assessment

Down stream MH #	Up stream MH #	Problem Description	Approximate Depth to Flowline	Surface Type	Probable Point Repair Cost	Repair Completed By City Staff	Contract Point Repair Cost
362	363	Collapsed Pipe	4 feet	Gravel Alley	$3,000	x	
359	361	Collapsed Pipe	4 feet	Street	$4,000		$4,000
345	344	Collapsed Pipe (3 Locations)	9 feet	Street	$14,000		$14,000
349	350	Collapsed Pipe	8 feet	Gravel Alley	$3,500		$3,500
348	349	Bad Service Tap	12 feet	Gravel Alley	$5,000		$5,000
347	348	Collapsed Pipe	16 feet	Street	$7,000	x	
339	340	Collapsed Pipe (2 Locations)	10 feet	Gravel Alley	$7,000	x	
336	337	Collapsed Pipe	12 feet	Street	$6,000	x	
323	325	Collapsed Pipe (2 Locations)	10 feet	Street	$10,000	x	
327	328	Collapsed Pipe	5 feet	Street	$4,000		$4,000
318	319	Collapsed Pipe (2 Locations)	6 feet	Street	$7,000		$7,000
301	302	Collapsed Pipe	9 feet	Street	$5,000	x	
299	301	Collapsed Pipe	9 feet	Street	$5,000	x	
309	308	Collapsed Pipe	11 feet	Street	$5,000	x	
292	293	Bad Service Tap (2 Locations), Collapsed Pipe	8 feet	Street	$12,000		$12,000
64	286	Collapsed Pipe	7 feet	Gravel Alley	$3,000	x	
561	562	Bad Service Tap, Collapsed Pipe	4 feet	Street	$7,000	x	
573	574	Collapsed Pipe	6 feet	Street	$4,000		$4,000
338	339	Bad Service Tap (3 Locations)	10 feet	Street	$14,000		$14,000
337	338	Bad Service Tap	9 feet	Street	$5,000		$5,000
306	305	Bad Service Tap (2 Locations)	7 feet	Gravel Alley	$6,000		$6,000
298	288	Bad Service Tap (2 Locations)	11 feet	Street	$10,000	x	
288	289	Bad Service Tap	7 feet	Street	$4,000	x	
348	351	Bad Service Tap	15 feet	Street	$7,000	x	
360	359	Intruding Tap	8 feet	Street	$4,500		$4,500

Table 5-2b (cont.)

Down stream MH #	Up stream MH #	Problem Description	Approximate Depth to Flowline	Surface Type	Probable Point Repair Cost	Repair Completed By City Staff	Contract Point Repair Cost
353	354	Collapsed Pipe	6 feet	Street	$4,000	x	
344	343	Collapsed Pipe	8 feet	Gravel Alley	$3,500		$3,500
346	345	Collapsed Pipe	9 feet	Street	$5,000		$5,000
316	315	Bad Service Tap (2 Locations)	8 feet	Gravel Alley	$8,000		$8,000
317	318	Bad Service Tap (3 Locations)	10 feet	Street	$14,000	x	
302	303	Bad Service Tap (2 Locations)	9 feet	Gravel Alley	$8,000	x	
561	563	Collapsed Pipe	6 feet	Street	$4,000	x	
345	353	Collapsed Pipe (3 Locations)	8 feet	Street	$13,000		$13,000
335	334	Collapsed Pipe	12 feet	Gravel Alley	$5,000		$5,000
308	307	Bad Service Tap (2 Locations), Collapsed Pipe	10 feet	Street	$14,000	x	
95	294	Collapsed Pipe	18 feet	Patio	$8,000	x	
					Total Probable Point Repair Cost:		**$117,500**
					Construction Contingency:		**$17,600**
					Total Point Repair Project Budget:		**$135,100**

rehabilitation bid package should be developed and cost proposals received from qualified sewer rehabilitation contractors. With the EPA grant funding in place, this work should proceed immediately following finalization and acceptance of this report by the City of Iola.

Future sanitary sewer collection system evaluation tasks to be undertaken are to televise additional City sewers. The remaining sanitary sewers should be scheduled for inspection over the next 10 year time period. Additionally, once the first major sanitary sewer rehabilitation project has been completed, system-wide flow and rainfall monitoring should be undertaken to quantify the amount of extraneous flow remaining and to identify and prioritize the portions of the City that will be televised in the future. The results of a system-wide flow and rainfall monitoring effort may result in the need to consider private source inflow and infiltration removal as the next most cost-effective approach to further reduction of sanitary sewer overflows. Continuous rehabilitation of the collection system can be expected as more recently installed sewers begin to deteriorate with age and use.

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SECTION 6
Sanitary Sewer Manholes

6.1 General

Manholes is the wastewater collection system provide access to the sewers for inspection, for maintenance, and for emergency cleaning if a backup occurs due to an obstruction. Good access to manholes must be available and the structure of the manhole must be maintained. Manholes can be a source of inflow and infiltration, thus contributing to surcharging of sewers and possible backups into buildings and overflows to surface waters. Stormwater can gain entrance through the ring and cover, either due to perforations in the cover or due to broken seals between the ring and the manhole. Cracks in manhole walls and poor seals at locations were pipes penetrate the manholes also contribute to unwanted water in the wastewater collection system. Detailed inspection of the manholes helps to identify these defects for correction.

6.2 Manhole Inspections

The City of Iola staff undertook an extensive inspection of approximately 570 manholes of the collection system in the spring and summer of 2010. The inspections were from the ground surface and did not include entry into the manholes. The detailed inspection observed the structural condition and the potential for each manhole to contribute to inflow and infiltration. There may be as many as 250 more manholes that are yet to be inspected. For those that were inspected, the inspection team also determined the position of each manhole by global positioning system (GPS) equipment.

6.3 Manhole Rehabilitation

The findings of the inspection effort were tabulated, rated, and prioritized. Figure 6-1 Manhole Rehabilitation shows the location of the 92 manholes being recommended for rehabilitation in red. All other manholes are shown in green. A listing of the manholes that should be rehabilitated is given in Table 6-1 Manhole Rehabilitation Table.

The table lists manholes by the number assigned during the 2010 comprehensive inspection by City personnel. If a problem was described on the inspection form, it is repeated in the table. Recommended rehabilitation at a manhole is based on problem description and on the condition data entered on the form. Basic information for the surface conditions and depth of manhole are listed and this data, along with the recommended rehabilitation was used in estimating the probable cost. For multiple manholes found to be severely enough deteriorated that the integrity of the structure was threatened, rehabilitation was undertaken to restore the

structure's integrity. Those manholes that still require rehabilitation have a cost listed in the last column. The remaining probable cost for rehabilitation of the 70 identified manholes is $94,350.

The general nature of the work needed at each manhole is given in the table. That work ranges from replacement of the ring and cover to total rehabilitation. Total rehabilitation includes ring and cover replacement, structural repair, and lining of manholes to restore the structure and to prevent further deterioration from corrosive conditions.

Many manholes in Iola constructed prior to the more recent use of pre-cast concrete structures were hand assembled with bricks. The top portion of the structure, referred to as the chimney, was restricted to a shaft with a diameter of just over 24 inches. Observation from the surface of the condition of the sewer connections, inverts and benches, and walls in the lower part of deep manholes may have been restricted. When manholes are entered to accomplish rehabilitation, additional, unseen deteriorated conditions may need to be remedied at that time. Contract documents for manhole rehabilitation should provide for the means which allows for the appropriate and complete rehabilitation at the time the manholes are being entered for rehabilitation.

6.4 CMOM Issues

This aspect of the project resulted in the visual inspection of approximately 75% of the total number of known sanitary sewer manholes and cleanouts within the City of Iola. The selection of manholes for rehabilitation was based on a rating system with those manholes identified as most deteriorated to have the greatest priority for rehabilitation. The estimated probable cost to rehabilitate each identified manhole is cumulated to define those that can be included in the current program budget as discussed in Section 1. During the performance of the manhole inspections, the location of each structure was determined by GPS equipment for development of an inventory of the sewer system infrastructure. As with the sanitary sewer rehabilitation efforts of Section 5, this systematic approach to identify, prioritize, locate, and schedule manhole rehabilitation is consistent with proposed regulations and consequently expected to be applicable to any future federal or state regulations that would be promulgated.

6.5 Recommended Improvements

Tables 6-1 Manhole Rehabilitation Table provides the listing of sanitary sewer manholes (in priority order) recommended for rehabilitation as part of the current sewer system rehabilitation program. A single manhole rehabilitation bid package should be developed and cost proposal received from qualified sewer rehabilitation contractors. Funding for this work will come from a combination of utility funds and a low interest load through the KDHE, as discussed in Section 1.

TABLE 6-1 MANHOLE REHABILITATION TABLE							
City of Iola, Kansas							
Wastewater Collection System Review and Assessment							
MH #	Problem Description from Inspection Form	Recommended Rehabilitation	Ground Surface Type	Manhole Depth (ft)	Probable Rehabilitation Cost	Full/Partial Rehabilitation Already Completed	Manhole Rehabilitation Cost Remaining
32	East Side. Manhole deteriorated due to H2S	Replace F&C, Line MH	Field	8	$2,300	X	--
36	Wet-Moist, Corroded, deteriorated	Replace F&C, Line MH	Lawn	6	$1,900	X	--
37	Corroded and Deteriorated due to H2S	Replace F&C, Line MH	Lawn	6	$1,900	X	--
39	Manhole completely deteriorated apparently due to H2S	Replace F&C, Line MH	Lawn	7	$2,100	X	--
40	Manhole completely deteriorated apparently due to H2S	Replace F&C, Line MH	Lawn	5	$1,600	X	--
41	Manhole deteriorated due to H2S	Replace F&C, Line MH	Field	7	$2,100	X	--
42	The outlet pipe is leaking at the top. Manhole completely deteriorated due to H2S.	Raise & Replace F&C, Line MH	Street	9	$3,100	X	--
44	Manhole deteriorated due to H2S. Cover and lid corroded due to H2S.	Raise and Replace F&C, Line MH	Yes	11	$3,500	X	--
46	Entire manhole deteriorated due to H2S	Raise & Replace F&C, Line MH	Street	9	$3,100	X	--
47	Manhole deteriorated	Replace F&C	Alley, Driveway	12	$800	X	--
48	Both pipe seals have a "moderate/stream" on the leak. Entire MH deteriorated due to H2S.	Raise & Replace F&C, Line MH	Street	8	$2,900	X	--
71	Manhole deteriorated to H2S.	Raise & Replace F&C, Line MH	Lawn	13	$3,700	X	$2,950
83	Wet and Moist. West outlet cracked. Ring is loose	Clean & Line, seal cover, remove steps	Alley	10	$2,800		$2,800
115	Wet/Moist drip stains. Complete deterioration on wall. Light to moderate stream. Slight corrosion on lid.	Clean, Repair & Line, Replace F&C	Street	14	$4,500	X	$3,700

TABLE 6-1 (CONT)

MH #	Problem Description from Inspection Form	Recommended Rehabilitation	Ground Surface Type	Manhole Depth (ft)	Probable Rehabilitation Cost	Full/Partial Rehabilitation Already Completed	Manhole Rehabilitation Cost Remaining
146	Deterioration bottom of manhole. Lid is cracked. Above west pipe is a 16" pipe from west or concrete walls.	Replace F&C, Line MH	Alley	14	$3,700	X	--
147	Small cone. Manhole Deterioration. Pipe seal looks deteriorated.	Line MH	Alley	6	$1,400	X	--
148	Small cracks. Manhole needs to be raised.	Raise and Replace F&C, Line MH		6	$2,400	X	--
149	Wall shelf and pipe seal all have cracks. Pieces Missing. Major cracks and deterioration. Deteriorated due to H2S.	Replace F&C, Line MH	Street	5	$1,900	X	--
150	Wall has minor cracks. Bottom of manhole is deteriorated. Steps are Unsafe. North of Circle Drive to the west on sidewalk. KY Apartments	Replace F&C, Line MH	Curb, Lawn	5	$1,900	X	--
151	Manhole deteriorated due to H2S.	Replace F&C, Line MH		7	$2,400	X	--
152	Manhole Deteriorated due to H2S. Steps are gone - Deteriorated. West pipe seal leaking	Replace F&C, Line MH	Lawn	12	$3,200	X	--
153	Manhole is deteriorated due to H2S	Replace F&C, Line MH	Street	13	$3,700	X	--
154	Manhole deteriorated due to H2S	Raise & Replace F&C, Line MH	Street	5	$1,900	X	--
287		Repair bench, Line MH, Replace F&C	Lawn	4	$1,900		$1,900
377		Replace F&C, Line MH	Lawn	7	$2,100	X	--
382	No channel, standing water, damp/moist brick walls.	Replace F&C, Restore Bench, Line MH	Street	7	$2,900	X	--
383	Roots growing through brick	Raise & Replace F&C, Clean MH, Line MH	Lawn	5	$1,900	X	--
393	Cracked where cone meets wall. Roots growing in manhole	Replace F&C, Clean & Line MH	Alley	13	$3,400	X	$2,900
405		Line MH	Driveway	11	$3,300	X	$2,500
453	Leaking between bricks	Rebuild Invert, Line MH	Sidewalk	10	$1,300	X	--
1	Line plugged to east, leaking around concrete plug.	Replace F&C, Regrout Plug	Gravel	15	$1,000	X	$500

TABLE 6-1 (CONT)

MH #	Problem Description from Inspection Form	Recommended Rehabilitation	Ground Surface Type	Manhole Depth (ft)	Probable Rehabilitation Cost	Full/Partial Rehabilitation Already Completed	Manhole Rehabilitation Cost Remaining
3		Replace F&C, Line MH	Ditch	11	$3,000	X	$2,500
6	Past Leakage but OK now.	Remove Steps, Line Brick MH	Highway	12	$2,700		$2,700
24	Ring is cracked and missing pieces. Inlet and outlet pipes are metal and/or plastic.	Replace F&C, Line MH	Ditch	8	$2,300	X	$1,800
27	Looks like a crack. Minor deterioration on west side, minor leak. Perforated cover.	Replace F&C, Line MH	Creek, ditch	10	$3,300	X	$2,800
29	Strong seal. Pieces broken and missing.	Replace F&C, Line MH	Street, by rail	9	$2,800	X	$2,000
77	Channel could be tile.	Replace F&C, Remove Steps	Lawn		$1,000	X	$500
81	Ring is good, lid has slight corrosion. Light drip stains. Tile	Replace F&C, Line MH		9	$2,800	X	$2,000
116	Moderate/stream leak. Wet/Moist. Bottom of hole has deterioration. Unsafe steps. Leak on north and south side of wall	Replace F&C, Line MH	Street, Ditch	17	$4,600	X	$3,800
118	Small cracks in channel. Pieces Missing.	Line MH?	Street	13	$3,700	X	$2,900
122	Ring is off set. Pieces missing on pipe and channel. Deteriorated	Reset Barrel, Raise MH 3"		6	$1,600	X	$550
123	West pipe outlet is shut off. Manhole appears to be out of service. "Dry". Could consider raising to higher ground.	Replace F&C	Field	7	$500	X	--
124	Pipe seal pieces missing. Pieces missing - Corroded.	Replace F&C, Line MH	Field	7	$2,100	X	$1,600
160	Ring is cracked. Cover is good. Moderate stream West side leaking. Crack in wall. A few pieces missing at top by ring	Replace F&C, Line MH	Ditch	11	$3,000	X	$2,500
190	Leaking between blocks at bottom. No pipe seal leaking.	Made of Blocks	Lawn	13	$2,900		$2,900
191	Blocks cracked, roots growing in	Blocks cracked, roots growing in	Lawn	14	$3,200		$3,200

TABLE 6-1 (CONT)

MH #	Problem Description from Inspection Form	Recommended Rehabilitation	Ground Surface Type	Manhole Depth (ft)	Probable Rehabilitation Cost	Full/Partial Rehabilitation Already Completed	Manhole Rehabilitation Cost Remaining
193	Cracks in blocks. East pipe seal leaking	Line MH	Parking Lot	13	$2,900		$2,900
226	Flaking at top of chimney	Replace F&C		11	$800	X	--
227	Shelf has deterioration west side	Replace F&C, Line MH, Replace Bench	Alley	9	$3,000	X	$2,500
229	Adjustment 3" down from lid. Moist at bottom.	Replace F&C	Alley	6	$500	X	--
234	Wall, shelf, channel has deterioration. Cover is corroded.	Replace F&C, Clean & Line MH	Alley	7	$2,100	X	$1,600
235	Top of manhole has corroded.	Replace F&C	Alley	7	$500	X	--
236	Pieces missing on top wall and cone. Top ring corroded.	Replace F&C, Patch Chimney	Lawn	8	$1,000	X	$500
243	Top of manhole pieces missing.	Replace F&C	Alley	9	$500	X	--
244		Replace F&C, Patch Chimney	Alley	10	$1,000	X	$500
246	Cracks top of manhole.	Replace F&C, Patch Chimney	Alley	6	$1,000	X	$500
247	Debris in channel. Top of manhole cracked.	Replace F&C, Patch Chimney	Alley	8	$1,000	X	$500
272	Top of manhole has pieces missing.	Replace F&C, Patch Chimney	Alley	9	$1,000	X	$500
298		Replace F&C, Patch Chimney	Street	7	$1,300	X	$500
327	Pipe seal slightly corroded. Ring and cover deteriorated.	Replace F&C, Line MH	Driveway	4	$1,700	X	$900
330	Pieces missing	Replace F&C, Line MH	Street	11	$3,300	X	$2,500
336	North pipe is above. South pipe seal deteriorated.	Plug holes in Cover, Repair Bench, Line MH	Street	13	$4,200	X	$3,400
341	Has adjustment ring	Replace F&C, Repair Chimney	Alley	7	$1,000	X	$500
360	Deterioration in the channel and pipe seal	Replace F&C, Repair Chimney	Street	10	$1,300	X	$500
361	Pipe going west has pieces missing	Replace F&C, rebuild channel	Street	4	$1,300	X	$500
364	Deterioration shelf & channel & pipe. Pipe has pieces missing	Replace F&C, rebuild channel	Street	3	$1,300	X	$500
388	Deteriorated shelf and channel.	Line MH	Street	15	$3,400	X	--
389	Major cracks and gaps in concrete and walls.	Replace F&C, Line MH	Street	14	$4,000	X	--
390	Major cracks/gaps in shelf and channel.	Replace F&C, Line MH	Street	12	$3,500	X	--

TABLE 6-1 (CONT)

MH #	Problem Description from Inspection Form	Recommended Rehabilitation	Ground Surface Type	Manhole Depth (ft)	Probable Rehabilitation Cost	Full/Partial Rehabilitation Already Completed	Manhole Rehabilitation Cost Remaining
398	Offset 3" bricks and strong seal missing	Replace F&C, Repair Chimney	Street	6	$1,300	X	$500
403	Leaking where wall meets cone. Leaking every where	Replace F&C, Rebuild Invert, Line MH	Alley	8	$2,800	X	--
447		Replace F&C, Line MH		9	$2,800	X	$2,000
448		Replace F&C, Line MH	Alley	13	$3,400	X	--
463	Shelf and channel has deterioration	Replace F&C, Line MH	Alley	9	$2,500	X	--
469		Replace F&C, Rebuild Channel, Line MH	Street/ Alley	8	$3,100	X	--
471		Rebuild Channel & Bench, Line MH	Street	6	$1,900		$1,900
473		Replace F&C, Line MH		6	$2,200	X	$1,400
474		Replace F&C, Line MH		5	$1,900	X	$1,100
475		Replace F&C, Line MH	Street	5	$1,900	X	$1,100
477	8" pipe goes back to the north.	Replace cleanout F&C	Lawn		$500	X	--
478		Rebuild bench	Lawn	4	$500		$500
484		Line MH	Lawn	5	$1,100	X	--
485		Line MH	Lawn	5	$1,100	X	--
487		Raise & Replace F&C with extension	Lawn	3	$1,300	X	$550
491	Chimney has cracks.	Replace F&C, Repair Chimney	Driveway	6	$1,300	X	$500
519		Replace F&C, Rebuild Bench, Line MH	Alley	13	$3,900	X	$3,400

TABLE 6-1 (CONT)

MH #	Problem Description from Inspection Form	Recommended Rehabilitation	Ground Surface Type	Manhole Depth (ft)	Probable Rehabilitation Cost	Full/Partial Rehabilitation Already Completed	Manhole Rehabilitation Cost Remaining
522		Replace F&C, Rebuild Bench, Line MH	Alley	13	$3,900	X	$3,400
526		Replace F&C, Rebuild Bench, Line MH	Street	7	$2,900	X	$2,100
527		Replace F&C, Rebuild Bench, Line MH	Street	6	$2,700	X	$1,900
529		Rebuild Bench, Line MH	Street	6	$1,900		$1,900
543		Replace F&C, Rebuild channel & Bench		9	$1,300	X	$500
547		Replace F&C, Patch Chimney	Alley	8	$1,000	X	$500
551		Replace F&C, Rebuild Channel & Bench	Street	9	$1,300	X	$500
553		Replace F&C, Rebuild Channel & Bench	Street	9	$1,300	X	$500
554		Replace F&C, Rebuild Channel & Bench, Line MH	Alley	8	$2,800	X	$2,300
16	Channel and shelf not visible. Perforated cover.	Replace F&C	Street	17	$800	X	--
17	East side has pipe with flow. Depth to pipe estimated at 9.5'. Strong seal. Channel not visible and pipe seal. No steps. Perforated cover.	Replace F&C	Street	15	$800	X	--
18	Channel not visible. Cover is corroded and cracked.	Replace F&C	Street	11	$800	X	--
19	Ring is corroded.	Replace F&C	Street	11	$800	X	--
22	Channel - pipe section not visible	Replace F&C	Street		$800	X	--
72	Wet and moist. Slight deterioration. There is a valve in the bottom.	Replace F&C	Driveway	10	$800	X	--
82	Wet and moist. Drip stains. Outlet cracked. North outlet. Additional above east inlet extra inlet pipe. West pipe seal has crack. Manhole in bad shape.	Replace F&C	Lawn	11	$500	X	--
		Total Probable Manhole Rehabilitation Costs:			$215,600		$94,350

The remaining 250 or so manholes should be scheduled for inspection over the next two years to complete the inventory of structures and to identify additional manholes that should be rehabilitated. Funding for manhole rehabilitation was included in the rate evaluation completed in 2006.

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SECTION 7
Conclusions and Recommendations

7.1 Master Plan Goals

This project reviewed and assessed the existing collection system and provides a Master Plan for collection system rehabilitation based on the following goals:

a. Identify specific sewers, manholes and pump stations for rehabilitation/replacement in a priority order.
b. Provide cost estimates for the recommended collection system work.
c. Provide the City with a better opportunity to address normal operations on a more cost effective basis.
d. Position the City of Iola to comply with anticipated federal regulations referred to as CMOM (Capacity, Management, Operations, and Maintenance)

7.2 Conclusions

The following findings from the study were influential in the development of improvement recommendations.

a. Portions of the wastewater collection system become overloaded during significant rainfall events that may occur several times per year.
b. Much of the sanitary sewer infrastructure has deteriorated over time and rehabilitation is necessary and appropriate.
c. Of the thirteen pump stations that are currently part of the sanitary sewer collection system, five were found to be in need of rehabilitation or replacement due to inadequate capacity, safety concerns, and/or unavailable repair parts due to age.
d. Sufficient information is not presently available to recommend the best improvements needed at the Vine Street Pump Station. Required pumping capacity must be more accurately defined.
e. Closed-circuit television inspection of approximately 35% of the total length of sanitary sewers, in the system, confirmed that repair and rehabilitation are needed to reduce the amount of extraneous flow entering the sewers during rainfall events and to address deteriorated piping that can eventually result in collapse and pavement failures.
f. A major portion of the sewer rehabilitation can be accomplished by "No-Dig" methods that do not require excavation to restore the full function of the pipe. At several locations; however, the pipe has deteriorated to an extent that will require excavation to replace the pipe before the remainder of the sewer segment between manholes can be rehabilitated by no-dig methods. The City has already

completed several of these point repairs as the defects were revealed during the television inspection effort. The City staff is very familiar and aware of the issues with the collection system. This assessment has allowed them to prioritize their needs.

g. Over two thirds of the manholes and cleanouts of the sanitary sewer collection system were inspected by City staff. Of the 570 inspected, 92 manholes were found to require rehabilitation. Several manholes were in a serious enough condition that the City had those rehabilitated immediately.

h. CMOM requirements have not been formalized by federal (EPA) rulemaking process at this time. There is no indication of when federal regulations addressing sanitary sewer overflows (SSOs), the subject of the proposed CMOM requirements, will become effective. The activities completed for this study and implementation of the recommendations should allow the City to readily fulfill the majority of requirements expected when CMOM regulations are eventually put into effect.

i. Growth within the community is projected to be approximately 5% during the next 20 years. Three pump stations located in the northern part of the City will primarily be impacted by this growth and so should be monitored closely to ensure adequate capacity during development.

j. The existing Sewer Use Ordinance contains language that should allow the City of Iola to investigate sources of private inflow and infiltration at such time it might be deemed appropriate. This should be reviewed by the City attorney.

7.3 Recommendations

Sections 4, 5 and 6 of this report provide details of the total recommended rehabilitation efforts for pump stations, sewers, and manholes. There are four pump stations identified for upgrade and one pump station recommended for removal from service, with the function of that pump station transferred to another existing station. The total probable construction cost for pump station upgrades and related work is $999,000. Sewer rehabilitation and point repairs have an estimated probable construction cost of $2,159,000. Manhole rehabilitation recommendations total $94,350, and an approximate value of $121,250 has already been completed by the City, an additional $167,350 of point repairs has been accomplished by City crews.

In summary, the recommendations are to complete:

- All recommendations of Table 4-2 Wastewater Pump Station Recommended Improvements for the Main Plant Auxiliary, Kentucky, West Interceptor, and Ohio Pump Stations.
- Point repairs shown in Figure 5-2 Point Repairs and listed in Tables 5-2a and 5-2b Point Repairs, to be completed in advance of the sewer rehabilitation.

- A project to rehabilitate the sewers shown in Figure 5-1 Sewer Rehabilitation and listed in Tables 5-1a and 5-1b Sewer Rehabilitation.
- Manhole Rehabilitation listed in Table 6-1 Manhole Rehabilitation Table.

7.4 Implementation Plan

An implementation plan that priorities needs must be closely coordinated with the funding resources available. For rehabilitation of the sanitary sewer collection system, the City has been proactive in gathering resources, including; (1) passage of a sewer rate adjustment in 2006 in part to fund collection system rehabilitation needs, (2) securing two grants from the Environmental Protection Agency for a total of $768,000, and (3) confirming loan funding availability from the Kansas Department of Health and Environment.

The initial estimate for a project budget for collection system rehabilitation was based on these three funding sources. It was developed prior to the extensive collection system inspection and condition survey documented by this report. The initial budget provided for an estimated program cost of $3,045,000, as indicated in Appendix B.

Table 7-1a Summary of Total Program Costs provides a comparison of the initial program budget and the identified rehabilitation and improvement costs resulting from the inspections and assessments. There is some shifting of values between the major categories, but the overall cost for identified work is very close to the original program budget without the Vine Street Pump Station area. All work identified through the initial program budget for immediate work can be funded. With the additional area around the Vine Street Pump Station included the proposed costs are approximately $968,300 greater than the original program budget. Table 7-1b includes the same items discussed above; however it does not include the televising work that has already been accomplished.

Table's 7-1a and b were prepared using generalized percentages for engineering costs. Table 7-1c indicates an adjusted budget format at a much greater detail which attempts to reflect the following:

1. Rehabilitation of the sanitary sewer pipelines will be completed by a specialty contractor and methods with limited engineering design input required.
2. With large scale CIPP projects, the preparation of the construction documents and the selection of a contractor is a critical need to ensure consistency of the work and the long term quality desired.
3. The City of Iola has very capable staff with the abilities to complete most point and manhole repairs.

4. Budget or construction dollars for point repairs and manhole repair should be included in the overall budget to ensure City forces have ample funding to allow completion of the work as they can schedule it.
5. The pump stations require a wide ranging set of solutions to rehabilitate each individual location to meet its specific needs, which can increase overall costs.
6. During the design of the pump station rehabilitation projects, issues and unknown factors (mechanical, process, electrical, and control) will generally tend to complicate final solutions.
7. The need for onsite resident observation will be reduced due to the large portion of the project consisting of CIPP activities assuming the contract documents are configured properly to require specific levels and types of in pipe inspection.
8. The pump station rehabilitation projects will be both individual and specific to a given location which will necessitate a higher level of construction services.
9. Site rehabilitation and force main reconfiguration may require both temporary and permanent easements.
10. During the planning stage, allowances for additional TV inspection, geo technical borings (pump stations), and construction testing costs must be considered to ensure a fully capable budget.
11. The City of Iola has explored funding options and has a potential array of funding sources that will require administrative activities to meet funding requirements.

The City should initiate engineering services to begin design of pump station improvements, sewer and manhole rehabilitation. A preliminary schedule for implementation is indicated by Table 7-2 Implementation Schedule.

7.5 CMOM Issues

A major goal of this study was to ensure that any proposed improvements would be applicable to future, probable CMOM regulations regarding sanitary sewer system overflows and backups. A proposed regulatory program labeled CMOM was used as a guide to determine what positions the City of Iola to meet the potential regulations. The efforts of this study that are expected to apply include the following:

- Determination of pump station conditions, pumping capacity, and reliability.
- Systematic approach to identify, prioritize, and schedule sewer system rehabilitation.
- Systematic approach to identify, prioritize, and schedule manhole rehabilitation.
- Development of a sewer system inventory on the GIS database.

Table 7-1a Summary of Total Program Costs
Iola Collection System Assessment
PEC Proj. No. 08A54-003-3704

Collection System Rehabilitation Program Items	Pre-System Inspection		Post-System Inspection (Without Vine St. Area)			Post-System Inspection (All Areas)		
	Item Cost	Subtotal	Item Cost	Construction Contingency	Subtotal	Item Cost	Construction Contingency	Subtotal
Televising		**$254,117**			**$241,000**			**$241,000**
Sewer Rehabilitation								
Point Repairs			$8,050			$143,150		
Sewer Lining			$1,136,176			$1,734,331		
SUBTOTAL SEWER REHABILIATION		**$1,604,925**		$172,334	**$1,317,000**		$281,622	**$2,159,000**
Pump Station Improvements		**$686,000**	$868,696	$130,304	**$999,000**	$868,696	$130,304	**$999,000**
ManholeRehab		**$120,000**	$82,043	$12,307	**$94,350**	$82,043	$12,307	**$94,350**
Engineering								
Televising	$13,125		$5,000			$5,000		
Sewer Rehabilitation	$240,739		$197,550			$323,850		
Pump Station Improvements	$102,900		$149,850			$149,850		
Manhole Top End Rehab	$18,000		$14,153			$14,153		
Grant and Loan Coordination	$6,000		$6,000			$6,000		
SUBTOTAL ENGINEERING		**$380,764**			**$372,553**			**$498,853**
TOTAL PROGRAM COST		**$3,045,806**			**$3,023,903**			**$3,992,203**
EPA GRANT		**$762,000**			**$768,000**			**$768,000**
Utility Costs for 45% Match of EPA Grant		**$623,455**			**$628,364**			**$628,364**
Utility Costs beyond matching funds		**$1,660,351**			**$1,627,539**			**$2,595,839**
Total Utility Funding		**$2,283,806**			**$2,255,903**			**$3,224,203**
Annual Financing Costs for Potential KDHE Loan Ammendment (2.51% for 17 years)		**$166,690**			**$164,650**			**$235,330**

Table 7-1b Summary of Total Program Costs
Iola Collection System Assessment
PEC Proj. No. 08A54-003-3704

Collection System Rehabilitation Program Items	Pre-System Inspection		Post-System Inspection (Without Vine St. Area)			Post-System Inspection (All Areas)		
	Item Cost	Subtotal	Item Cost	Construction Contingency	Subtotal	Item Cost	Construction Contingency	Subtotal
Sewer Rehabilitation								
Point Repairs			$8,050			$143,150		
Sewer Lining			$1,136,176			$1,734,331		
SUBTOTAL SEWER REHABILIATION		**$1,604,925**		$172,334	**$1,317,000**		$281,622	**$2,159,000**
Pump Station Improvements		**$686,000**	$868,696	$130,304	**$999,000**	$868,696	$130,304	**$999,000**
ManholeRehab		**$120,000**	$82,043	$12,307	**$94,350**	$82,043	$12,307	**$94,350**
Engineering								
Sewer Rehabilitation	$240,739		$197,550			$323,850		
Pump Station Improvements	$102,900		$149,850			$149,850		
Manhole Top End Rehab	$18,000		$14,153			$14,153		
Grant and Loan Coordination	$6,000		$6,000			$6,000		
SUBTOTAL ENGINEERING		**$367,639**			**$367,553**			**$493,853**
TOTAL PROGRAM COST		**$2,778,564**			**$2,777,903**			**$3,746,203**
EPA GRANT		**$762,000**			**$768,000**			**$768,000**
Utility Costs for 45% Match of EPA Grant		**$623,455**			**$628,364**			**$628,364**
Utility Costs beyond matching funds		**$1,393,109**			**$1,381,539**			**$2,349,839**
Total Utility Funding		**$2,016,564**			**$2,009,903**			**$2,978,203**
Annual Financing Costs for Potential KDHE Loan Ammendment (2.51% for 17 years)		**$147,180**			**$146,700**			**$217,370**

Table 7-1c Summary of Adjusted Program Costs
PROPOSED PROJECT BUDGET
PEC Proj. No. 08A54-003-3704

Collection System Rehabilitation Program Items	Responsibility	Post-System Inspection (All Areas)		
		Construction Cost	Contingency 15%	
SEWER REHABILITATION (Currently Identified)				
Point Repairs Remaining	City Field staff	$143,150	$21,473	**$164,623**
Sewer Lining	Contractor	$1,734,331	$260,150	**$1,994,481**
Manhole Rehabilitation	City Field staff	$82,043	$12,306	**$94,349**
PUMP STATION IMPROVEMENTS	Contractor	$868,696	$130,304	**$999,000**
CONTINGENCY AND ADDITIONAL WORK RESERVE**	City Staff or Contractor			**$55,000**
SUBTOTAL SYSTEM REHABILIATION CONSTRUCTION & CONTINGENCY COSTS				**$3,307,453**
OTHER PROJECT COSTS				
Design and construction Documents Development	Engineer			**$198,400**
Construction Services	Engineer			**$100,724**
Resident Observation Allowance (As Required))	Engineer			**$15,000**
Full Time Resident Observation (Est)	City Field staff			**$38,000**
Loan and EPA Grant Coordination	Engineer			**$12,000**
CDBG Grant Coordination	City Staff			**$12,000**
Easement Development (As Required)	Engineer			**$9,600**
Geology Allowance (As Required)	Geo Tech			**$7,500**
Construction Testing	Contractor			**$10,000**
Additional TV Inspection Allowance (As Required)	Contractor			**$18,000**
Easement Costs Allowance (As Required)	City Staff			**$10,000**
Misc. city Admin & Legal Costs (As Required)	City Staff			**$7,500**

TOTAL PROGRAM COST	**$3,746,177**
EPA GRANT	**$768,000**
Utility Costs for 45% Match of EPA Grant	**$628,364**
Utility Costs beyond matching funds	**$2,349,813**
Total Utility Funding	**$2,978,177**
Annual Financing Costs for KDHE Loan Ammendment (2.51%, 17 years)	**$217,370**

** CONTINGENCY FOR UNKNOWN DESIGN FACTORS AND/OR COSTS

Table 7-2 Recommended Implementation Plan
Iola Collection System Assessment
PEC Proj. No.08A54-003-3704

Activity	Completion Date *
Initiate design services for the recommended pump station, sewer, and manhole rehabilitation	August 2011
Prepare Contract Documents for manhole rehabilitation	September 2011
Prepare Contract Documents for sewer rehabilitation	September 2011
Prepare Contract Documents for pump station improvements	January 2012
Complete manhole rehabilitation projects	March 2012
Complete sewer rehabilitation projects	April 2012
Complete pump station rehabilitation	August 2012

* Target Dates Dependent on City, KDHE, EPA requirements and adminstration.

Future efforts for additional assessment of the collection system that would likely be required from a regulatory program include:

- Development of response procedures to sanitary sewer overflow (SSO) events.
- Development of a maintenance management system for the pump stations, sewers and manholes.
- Collection system flow and rainfall measurements for assessing need for additional collection system rehabilitation to reduce SSO events.
- Continued accumulation of data for the collection system inventory.
- Investigation of private sector sources of extraneous flows, including downspouts, sump pumps and foundation drains connected to the sanitary sewers

7.6 Future Sanitary Sewer System Activities

The Wastewater User Charge Assessment report of September 2006 (the Assessment) outlined both a capital outlay program and a continuing maintenance program for the collection system. The major portion of the capital outlay program of the Assessment will be implemented by the recommended rehabilitation and improvements outlined in this Design Memorandum. The work will represent several years' of effort of the capital outlay program. Table 2-4 Collection System Annual Capital Outlay is reprinted in this report as Figure 7-1.

The capital outlay program of the Assessment provided for rehabilitation and replacement of sanitary sewers, manholes, and wastewater pump stations. It also included funds for truck and trailer-mounted maintenance equipment and for a maintenance crew vehicle. The level of funding proposed for collection system annual capital outlay was to provide for annual rehabilitation/replacement of between 1% and 2% of the total length of sewers, for annual pump station rehabilitation/replacement, and for purchase of the collection system maintenance equipment. The capital outlay program is shown in the Assessment as starting in the year 2007 at an initial value of $200,000 and increasing by 3% per year to account for inflation.

The rehabilitation and improvements recommended in this Design Memorandum represent multiple years of that proposed work. Funds identified for collection system rehabilitation and improvements are appropriately applied to the work recommended in this Design Memorandum.

Figure 7-1
(reprint of Table 2-4 from the 2006 "City of Iola, Wastewater User Charge Assessment"

Table 2-4
Collection System Annual Capital Outlay
Iola Wastewater System

	Column A	Column B	Column C	Column D	Column E
Year	Pipe & MH Rehab/ Replace[b]	Mobile Equipment[a]	Pump Station Rehab/ Replace[c]	Sum[d]	Selected Annual Capital Outlay Value[e]
2007	$227,578	$5,000	$0	$232,578	**$200,000**
2008	$182,905	$5,000	$16,000	$203,905	**$204,000**
2009	$188,393	$5,000	$80,000	$273,393	**$208,000**
2010	$194,044	$10,000	$0	$204,044	**$212,000**
2011	$199,866	$6,000	$30,000	$235,866	**$216,000**
2012	$264,872	$6,000	$0	$270,872	**$221,000**
2013	$272,818	$6,000	$0	$278,818	**$225,000**
2014	$281,003	$6,000	$12,000	$299,003	**$230,000**
2015	$289,433	$13,000	$0	$302,433	**$234,000**
2016	$298,116	$7,000	$68,000	$373,116	**$239,000**
2017	$326,679	$7,000	$0	$333,679	**$244,000**
2018	$336,480	$7,000	$120,000	$463,480	**$249,000**
2019	$346,574	$7,000	$0	$353,574	**$254,000**
2020	$356,971	$15,000	$76,000	$447,971	**$259,000**
2021	$367,680	$8,000	$0	$375,680	**$264,000**
2022	$378,711	$8,000	$15,000	$401,711	**$269,000**
2023	$390,072	$8,000	$16,000	$414,072	**$275,000**
2024	$401,774	$8,000	$24,000	$433,774	**$280,000**
2025	$413,827	$17,000	$16,000	$446,827	**$286,000**
2026	$426,242	$9,000	$20,000	$455,242	**$291,000**
TOTAL				**$6,800,039**	**$4,860,000**

Footnotes:

(a) Estimate for truck-mount and trailer-mounted maintenance equipment and for vehicle costs, spread over the 20-year period.

(b) Provides for pipe rehabilitation and/or replacement of about 2,900 ft/yr in the 1st 5 years, 5,500 ft/yr in the next 5 year period, and 4,700 ft/yr for the next 10 years. Value in 2007 includes $50,000 for manhole rehabilitation downstream of Russell Stover. Pipe footage is from priority ranking of deteriorating sewers as determined by City staff. Evaluation table for sewers is included in Appendix C.

(c) Values shown are based on priority ranking and current condition assessment by City staff. Evaluation table for pump stations is shown in Appendix D.

(d) The value in this column is the sum of the values from the previous three columns for equipment, pipe and MHs, and pump stations.

(e) The selected annual capital outlay values assume $200,000 in 2007 to meet the identified immediate needs within the period from 2007 through 2011. A 3% inflation factor was applied to the years beyond 2007. This level of funding is intended to provide for annual rehabilitation/replacement of between 1% and 2% of the total length of sewers, pump station rehabilitation/replacement, and purchase of major maintenance equipment. Values shown are rounded to the nearest $1,000.

It must be stressed that the acquisition of equipment for the collection system maintenance still needs to take place.

Table 7-3 Updated Collection System Annual Capital Outlay provides a revised capital outlay schedule for the next 20 years. The schedule accounts for the pipe and manhole rehabilitation and replacement and for the pump station improvements recommended in this Design Memorandum. Column A assumes a 100-year life for sewers and manholes. Column B provides an estimated 10-year life for mobile equipment, and Column C assumes pump station will need to be totally replaced on a 50-year basis. Column D is the sum of the estimated capital costs for sewers, manholes, pump stations and collection system maintenance equipment. Column E is suggested level of funding for a capital reserve fund which allow dollars budgeted in the Assessment (Figure 7-1, Column E) to be available for loan payments for that portion of the recommended collection system rehabilitation of this Design Memorandum that will be funded through the low-interest revolving loan administered by the Kansas Department of Health & Environment.

A maintenance management program for the wastewater utility was also outlined in the Assessment. The level of funding proposed for the annual operating budget provided for three full-time positions and related expenses for a crew with the primary responsibility of conducting preventive maintenance of sewers, manholes, pump stations, and the lagoon system and for administration of maintenance and repair conducted by private contractors. The recommendations of this Design Memorandum do not impact the recommended maintenance management needs of the collection system and the City of Iola should continue to move towards formation of a fully-equipped crew for wastewater maintenance and management.

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Table 7-3
Updated Collection System Annual Capital Outlay
Iola Wastewater System

	Column A	Column B	Column C	Column D	Column E
Year	Pipe & MH Rehab/ Replace[a]	Mobile Equipment[b]	Pump Station Rehab/ Replace[c]	Sum[d]	Selected Annual Capital Outlay Value[e]
2012	$133,000	$6,000	$80,000	$219,000	**$100,000**
2013	$136,990	$6,000	$80,000	$222,990	**$103,000**
2014	$141,100	$6,000	$80,000	$227,100	**$106,000**
2015	$145,333	$13,000	$80,000	$238,333	**$109,000**
2016	$149,693	$7,000	$80,000	$236,693	**$113,000**
2017	$154,183	$7,000	$80,000	$241,183	**$116,000**
2018	$158,809	$7,000	$80,000	$245,809	**$119,000**
2019	$163,573	$7,000	$80,000	$250,573	**$123,000**
2020	$168,480	$15,000	$80,000	$263,480	**$127,000**
2021	$173,535	$8,000	$80,000	$261,535	**$130,000**
2022	$178,741	$8,000	$80,000	$266,741	**$134,000**
2023	$184,103	$8,000	$80,000	$272,103	**$138,000**
2024	$189,626	$8,000	$80,000	$277,626	**$143,000**
2025	$195,315	$17,000	$80,000	$292,315	**$147,000**
2026	$201,174	$9,000	$80,000	$290,174	**$151,000**
2027	$207,210	$9,000	$80,000	$296,210	**$156,000**
2028	$213,426	$9,000	$80,000	$302,426	**$160,000**
2029	$219,829	$9,000	$80,000	$308,829	**$165,000**
2030	$226,424	$18,000	$80,000	$324,424	**$170,000**
2031	$233,216	$10,000	$80,000	$323,216	**$175,000**
TOTAL				**$5,360,760**	**$2,685,000**

Footnotes:

(a) Provides for pipe rehabilitation and/or replacement of approximately 1% of the total collection system per year with an average annual inflation rate of 3%. This represents an estimated 100-year effective life for sewer pipe and manholes.

(b) Estimate for truck-mounted and trailer-mounted maintenance equipment and for vehicle costs, spread over the 20-year period.

(c) At a total replacement cost estimated to be about $4,000,000 for the existing pump stations and an assumption of a 50-year effective life, a replacement fund of the amount shown should accumulate funds that can be used to replace pump stations periodically. The costs for maintenance and repair of pump station remains in the operating budget.

(d) The value in this column is the sum of the values from the previous three columns for equipment, pipe and MHs, and pump stations.

(e) The selected annual capital outlay values assume $100,000 in 2012 and a 3% inflation factor was applied to the years beyond 2012.

APPENDIX A

COLLECTION SYSTEM MAP

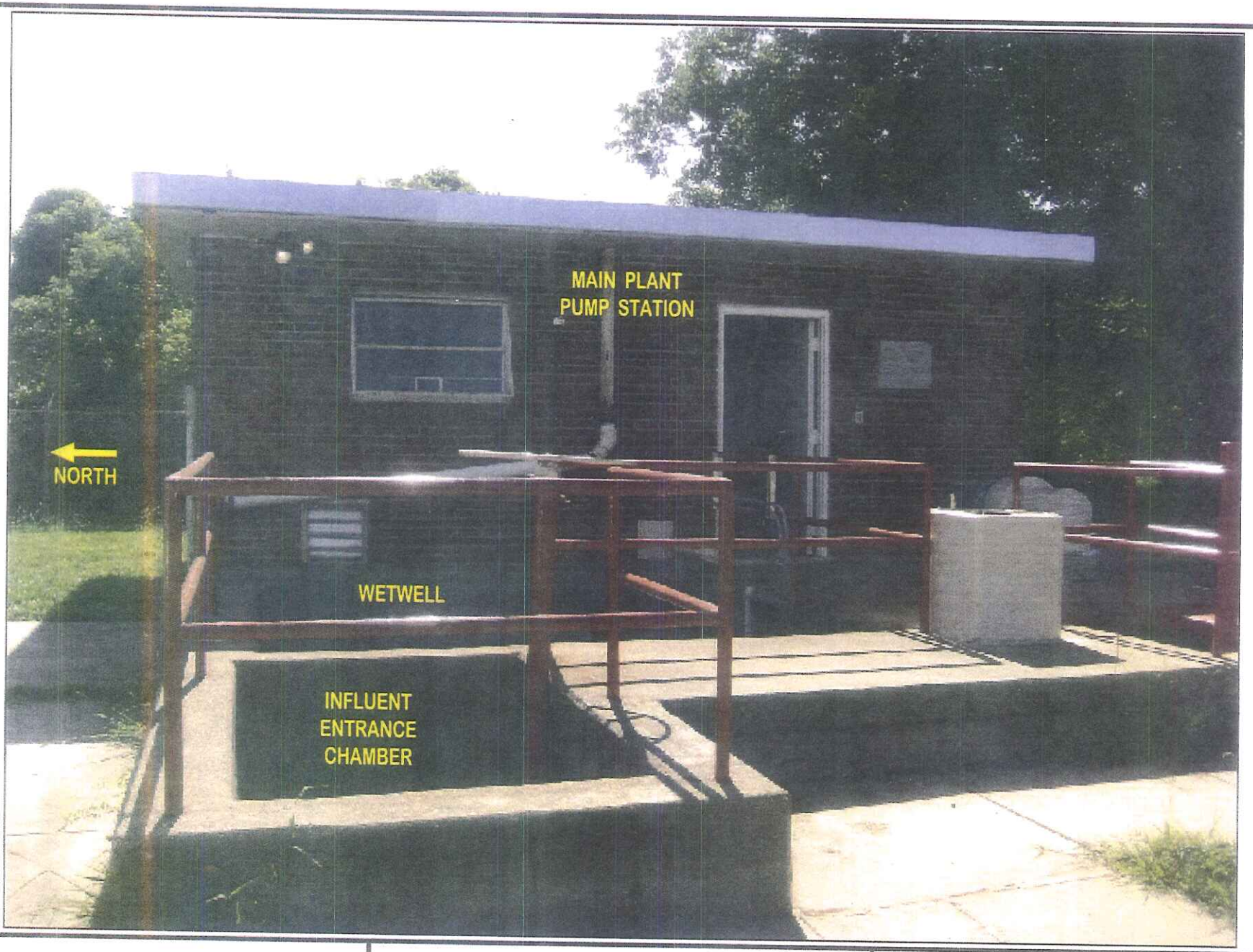
APPENDIX B

SUMMARY OF PROBABLE PROJECT COSTS
PRE-SYSTEM INSPECTION WORK

APPENDIX C

PUMP STATION PHOTOGRAPHS

Photo 1	Main Plant Pump Station
Photo 2	Main Plant and Auxiliary Pump Station
Photo 3	Ohio Pump Station
Photo 4	West Interceptor Pump Station
Photo 5	Vine Street Pump Station
Photo 6	Kentucky Pump Station
Photo 7	Bassett Pump Station
Photo 8	Howard Pump Station
Photo 9	Park East Pump Station
Photo 10	Park West Pump Station
Photo 11	Marshmallow Pump Station
Photo 12	Water Plant Pump Station



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785-233-8300 • FAX 785-233-8855

PHOTO 1
MAIN PLANT PUMP STATION
COLLECTION SYSTEM ASSESSMENT

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PHOTO 2
MAIN PLANT AND AUXILIARY PUMP STATION
COLLECTION SYSTEM ASSESSMENT

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PHOTO 3
OHIO PUMP STATION
COLLECTION SYSTEM ASSESSMENT

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PHOTO 4
WEST INTERCEPTOR PUMP STATION
COLLECTION SYSTEM ASSESSMENT

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PHOTO 5
VINE STREET PUMP STATION
COLLECTION SYSTEM ASSESSMENT

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PHOTO 6
KENTUCKY PUMP STATION
COLLECTION SYSTEM ASSESSMENT

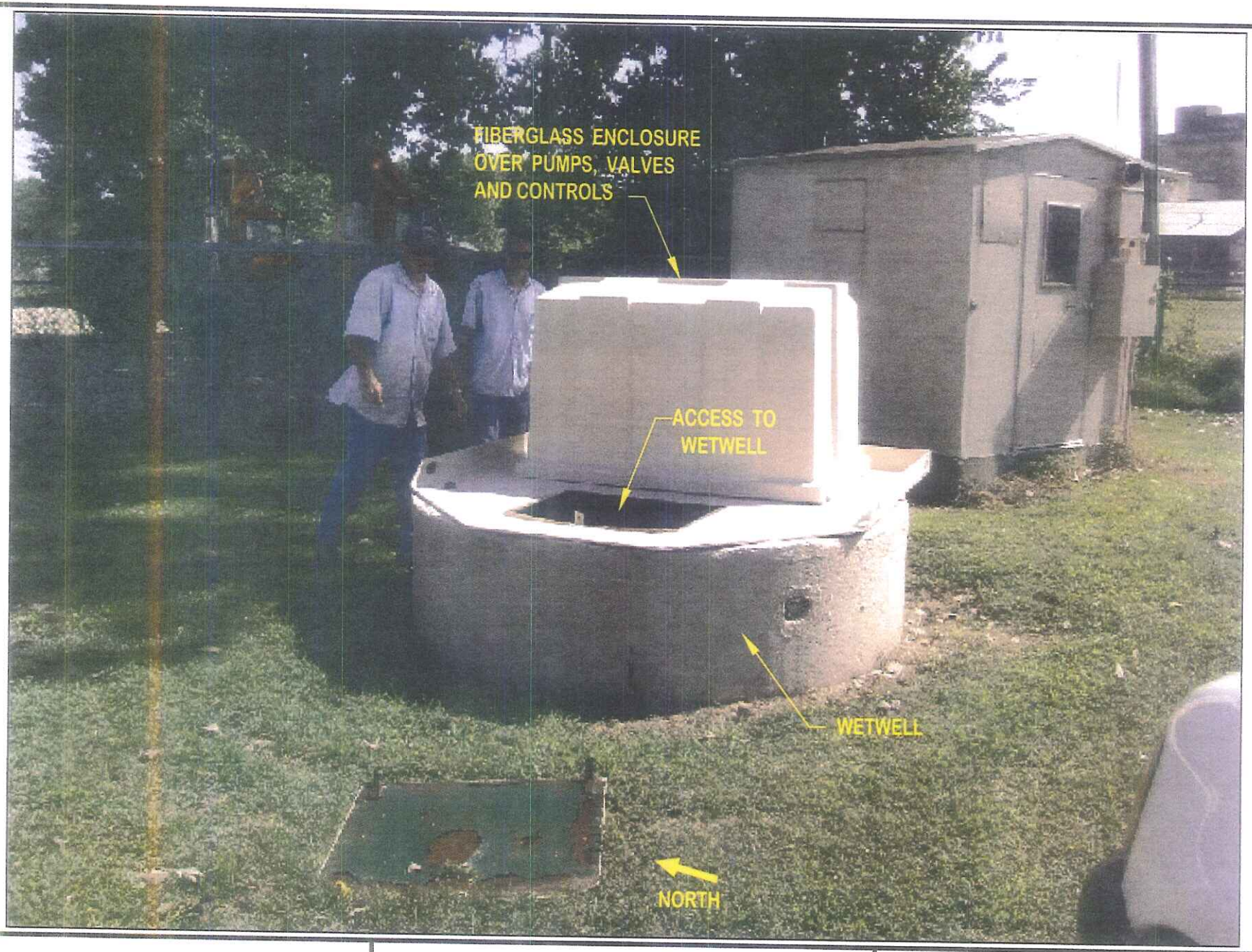

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PHOTO 7
BASSETT PUMP STATION
COLLECTION SYSTEM ASSESSMENT

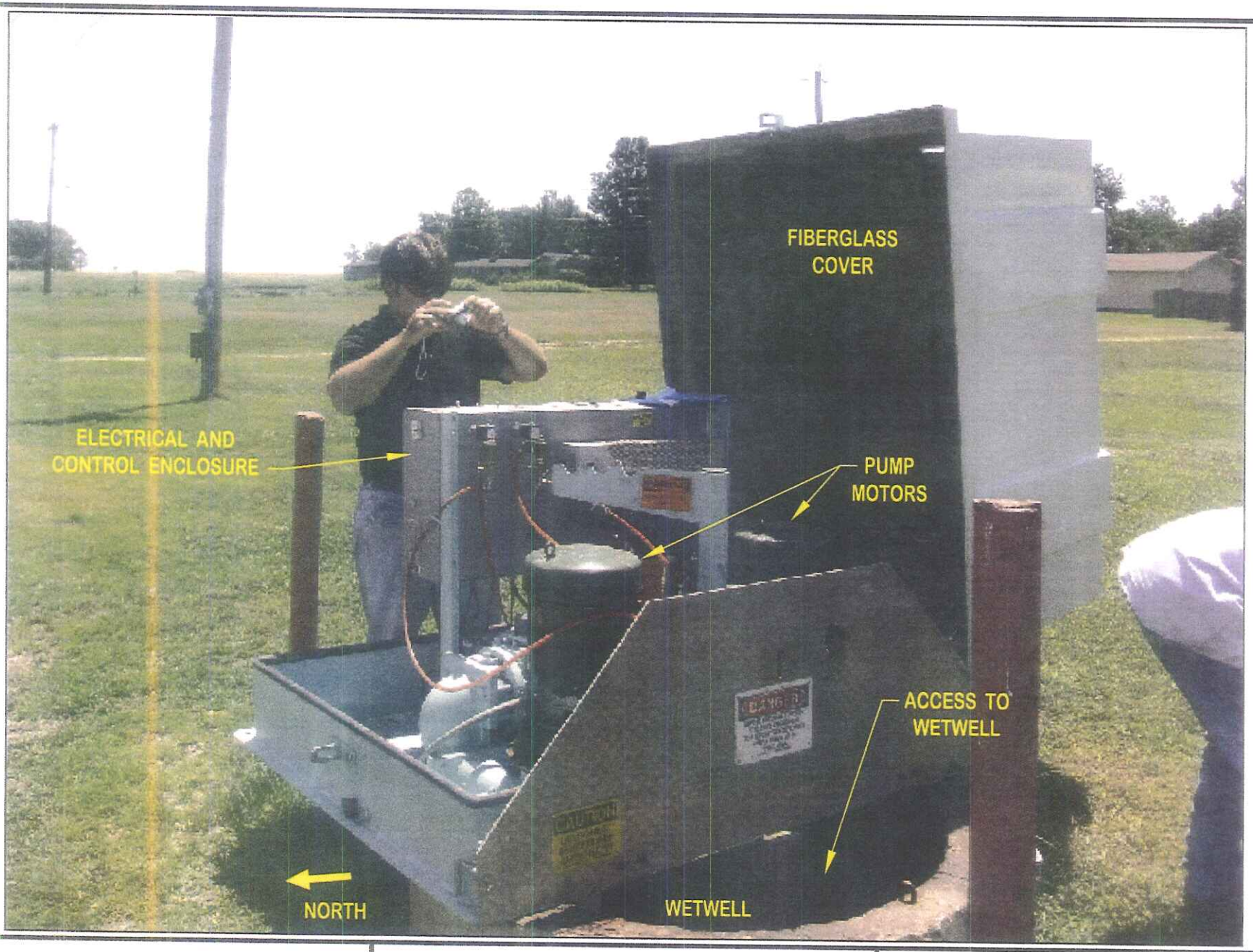

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PHOTO 8
HOWARD PUMP STATION
COLLECTION SYSTEM ASSESSMENT

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PHOTO 9
PARK EAST PUMP STATION
COLLECTION SYSTEM ASSESSMENT

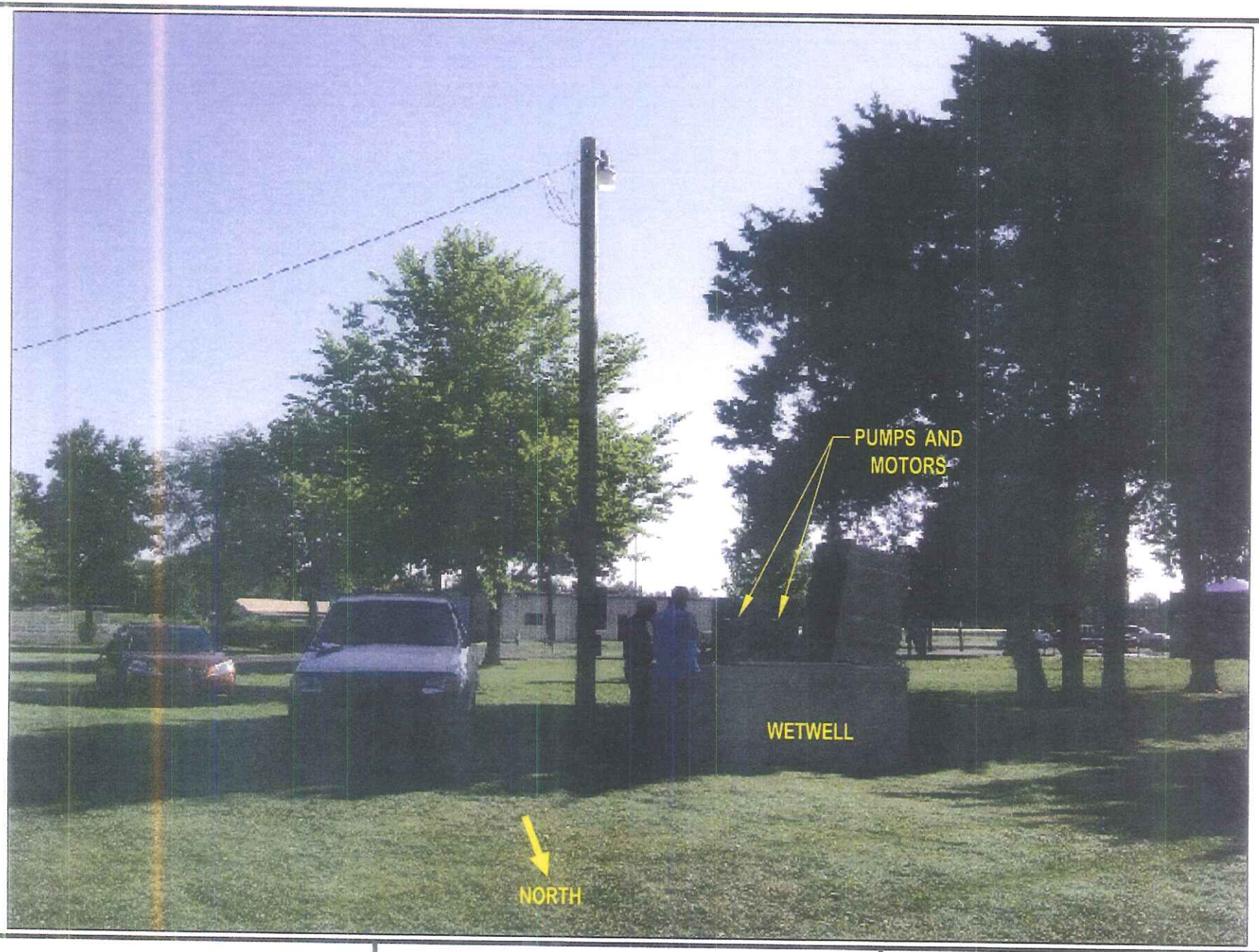

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PHOTO 10
PARK WEST PUMP STATION
COLLECTION SYSTEM ASSESSMENT

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PHOTO 11
MARSHMALLOW PUMP STATION
COLLECTION SYSTEM ASSESSMENT

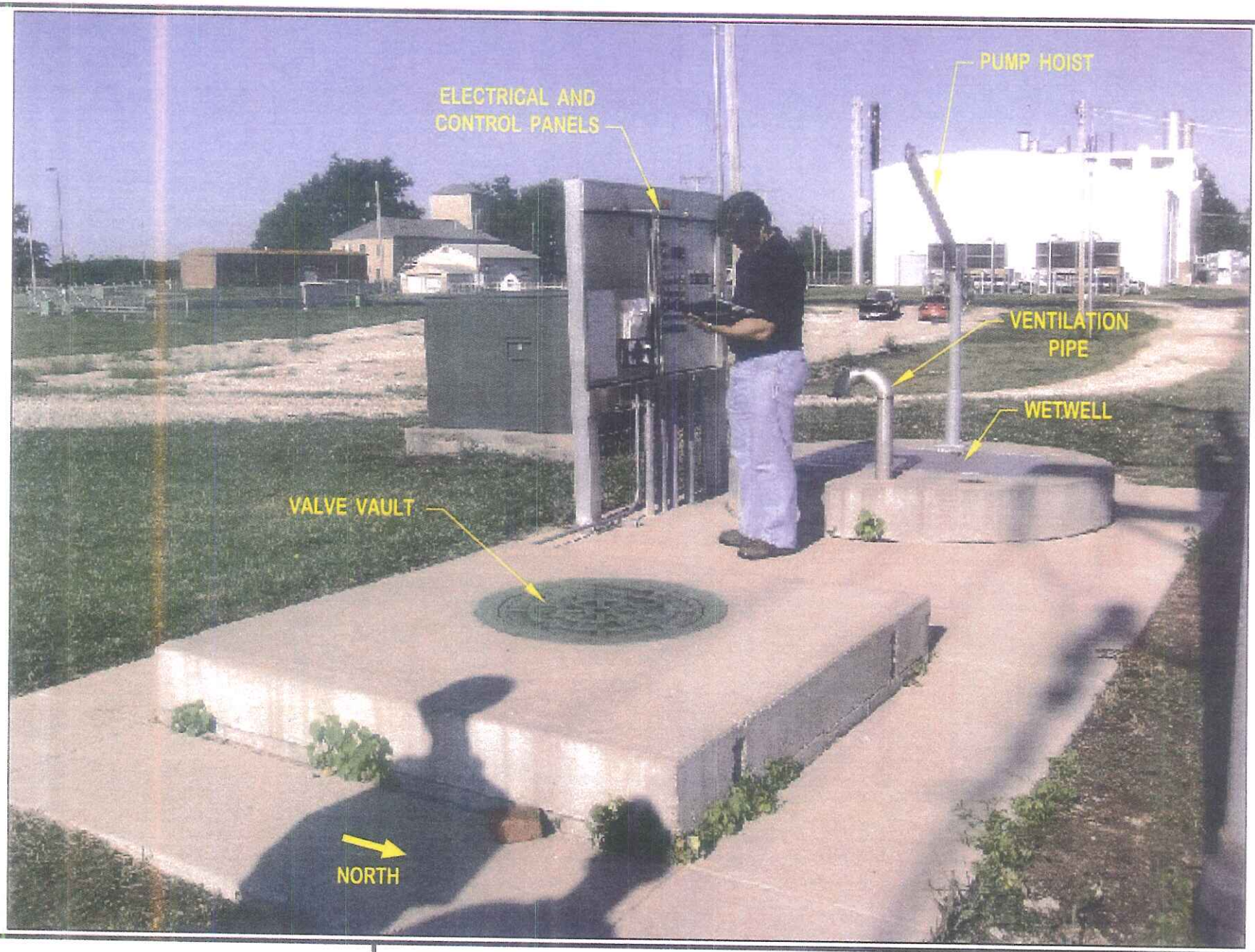

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PHOTO 12
WATER PLANT PUMP STATION
COLLECTION SYSTEM ASSESSMENT

APPENDIX D

Main Plant Pumping Assessment Letter Report

505

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

January 11, 2011

Mrs. Judy Brigham, Administrator
City of Iola
P. O. Box 308
Iola, Kansas 66749

RE: Main Plant Pumping Assessment
City of Iola Wastewater Collection System
PEC Project No. 08A54-004-3704

Dear Judy:

This letter report presents the assessment of alternatives for the existing Main Plant Auxiliary Pump Station (Auxiliary PS) for conveying peak wet weather flows from the Main Plant Pump Station (Main Plant PS) site to the Wastewater Lagoon System. These assessment services have been provided by Professional Engineering Consultants, P.A. (PEC) as additional services as defined in Amendment No. 1, authorized in July of 2010.

Background

The structure for the Main Plant PS was constructed in the early 1960's as part of a project that included construction of the three cells of the Wastewater Lagoon System. At that time, the 14" diameter force main was extended from the Main Plant PS to a distribution box at the Lagoon System.

Wastewater system improvements that were completed in 1977 added the Auxiliary PS, the 24" diameter force main, and the Parshall Flume Structure to measure influent flow to the Lagoon System. The Auxiliary PS was installed to operate only when flows to the Main Plant PS exceeded the capacity of those pumps. The Auxiliary PS takes suction from the wetwell of the Main Plant PS. Not long after the Auxiliary PS was completed, the West Interceptor Pump Station (West Int PS) and its companion 14" force main were completed. The West Int PS force main connects to the 24" force main from the Auxiliary PS near that pump station.

Photo 1 – Main Plant and Auxiliary Pump Station and Photo 2 – Main Plant Pump Station show ground-level views of both stations and provides a clear indication of their close proximity. The Main Plant PS is constructed of reinforced concrete with all but the brick building on the upper level being below ground. All of the Auxiliary PS is below ground except for the 3-foot diameter entrance tube that extends about 3 feet above the ground.

Figure 1 – Schematic of Pump Stations and Force Mains shows the interconnection of the force mains from the Main Plant PS, Auxiliary PS, and West Int PS. All three pump stations discharge to the Lagoon System through a shared 24" force main. Under normal operations and during dry weather conditions, the Main Plant PS and the West Int PS operate with only one pump at each station in service. During major rainfall events, the West Int PS requires two pumps to operating (firm capacity of 2,700 gpm), the Auxiliary PS is put into operation with one pump operating at 4,600 gpm, and the Main Plant PS is turned off. At these peak flow times, a total flow of 7,300 gpm (sum of the reported firm capacity of the Auxiliary and West Int PSs) can be conveyed through the force main system.

Figure 2 – Existing Main Plant Pumping Layout shows the general configuration in plan view of the Main Plant PS and Auxiliary PS. Wastewater flows by gravity from the east in the 30" diameter influent interceptor sewer to Manhole 1 and then south into the wetwell of the Main Plant PS. Under dry weather conditions and during moderate rainfall, up to two of the pumps in the Main Plant PS operate. The existing pumps are currently sized for pumping 1500 gpm from the two outer pumps and 2000 gpm from the pump in the center position. The firm capacity of the pump station is 2,200 gpm. During heavy rainfall events, when the pumps in the Main Plant PS are unable to keep up with the incoming flow, the Auxiliary PS, with a firm capacity of 4,600 gpm, has been placed into operation manually. The Main Plant PS is turned off by staff during this time. The Main Plant PS discharges to a 14" force main and the Auxiliary PS discharges to a 24" force main.

In response to a compliance schedule from the Kansas Department of Health & Environment, the City began a project in 2005 to upgrade the existing lagoon system to improve the quality of the water being discharged from the lagoons. When design of the lagoon improvements was fully underway, the City identified the need to replace the existing pumps in the Main Plant Pump Station due to age and maintenance costs. At the time that decision was made, there were no major problems identified for the Auxiliary PS.

In July of 2007, just a month after the construction contract was awarded for the lagoon improvements, a major flood event in the region resulted in the Auxiliary PS being filled with flood water. Controls, motors, and all other electrical gear were damaged as a result of being fully under water. Approximately 2 years later, the station was flooded again as a result of a broken water line inside the enclosure. The continued vulnerability to significant damage due to flooding, the costs for the resulting repairs, the safety concerns of the entry/exit methods and of the small spaces in the below-ground steel chamber, and other maintenance and operating issues have resulted in a desire on the part of the City to consider alternatives to this key facility.

The goal of this assessment is to consider alternatives to the Auxiliary PS that:

1. Improve personnel safety conditions by reducing or eliminating the need to enter and perform maintenance in the below-ground chamber.
2. Reduce the potential for damage from flooding and the associated repair costs.
3. Maintain a firm pumping capacity of 4,600 gpm to match the existing capacity.

4. Minimize construction costs for improvements and future costs for operation, maintenance, and repair.

Force Main Isolation Valves

In the process of assessing possible modifications to the Main Plant and/or Auxiliary PSs, it became obvious that if there is any failure of any one of the three force mains, all three pump stations must be removed from service to allow a major repair. There are no valves in the force mains that would allow a maintenance crew to isolate a portion of a force main in a manner similar to what is done with water main repair. The recommendations at the end of this letter include installation of valves for the purpose of isolating portions of force mains so that at least some wastewater pumping can be accomplished during a force main repair. Suggested locations for isolation valves are shown in Figure 1 for the existing configuration. Locations for isolation valves are also indicated for each alternative, as appropriate, on the figure representing an alternative.

Design Criteria

To provide a level of redundancy considered standard for municipal wastewater pump stations, the pump station must be capable of pumping the design rate of flow when the pump with the greatest capacity is not operating. In defining the "size" of pump stations, the pumping rate with the largest pump not operating is called the "firm pumping capacity". For the existing Auxiliary PS with identical pumps, the firm pumping capacity is the capacity of a single pump or 4,600 gpm. An evaluation of the peak wastewater flows to the Main Plan PS wetwell was not within the scope of this assessment. The Auxiliary PS has historically been capable of conveying all flows, so use of the 4,600 gpm as the firm capacity for evaluating alternatives is appropriate.

In conducting this assessment, it has been assumed that all existing pump stations are operating near their design conditions and that all force mains have minimal build-up of materials in the pipe interior and so that no restrictions exist in the force mains, other than those indicated on construction plans.

Alternatives

Three alternatives have been configured to meet the goals listed above. All three alternatives involve new pumps, new starters and controls, and utilization of the existing structures, piping and valves to the greatest extent possible for each option. Completing any of the three alternatives will likely require that the force mains be shutdown and emptied sufficiently to accomplish the work. Therefore, some pumping and/or trucking of wastewater to the lagoons by a contractor should be anticipated to facilitate construction.

Alternative 1 – Auxiliary PS Pump Change-Out and Relocate Controls

For this alternative, the below-ground chamber remains in service and the two existing dry pit pumps are replaced with dry-pit submersible pumps, each with a capacity of 4,600 gpm. This style of pump was installed in the Main Plant PS with the recent wastewater system improvements. Each motor would be a nominally rated at 70 horsepower. Alternative 1 is represented in Figure 3 – Alternative 1 – Pump Change Out and Control Relocation. The pumps proposed for this alternative can operate submerged and require considerably less maintenance than the current style of pump and motor. With Alternative 1, lighting and a sump pump that can be submerged will be installed in the chamber, but all other ancillary equipment will be located above ground and above the 2007 maximum flood elevation. The relocated equipment includes the motor starters, controls, and ventilation.

The manufacturer of the existing pumps (Smith & Loveless) does not offer dry-pit submersible pumps, so pumps of another manufacturer that will have dimensions and configurations different than the existing pumps must be retrofitted into the existing space. The certainty of significant modifications to the steel piping in the very confined space of the below-ground chamber to accommodate new pumps means the work of this alternative will have to be accomplished by a specialty contractor. Some of the electrical work within the existing Main Plan PS Building could potentially be accomplished by City staff.

This alternative partially meets the first three goals of this evaluation; however, it does not eliminate the below-ground chamber. It only reduces the number of times the chamber would need to be accessed because the critical electrical components will be located above ground.

Alternative 2 – Main Plant PS Pump Change-Out

Under this alternative, the three dry-pit submersible pumps in the existing Main Plant PS are to be replaced with pumps of greater capacity. Figure 4 – Alternative 2 - Main Plant Pump Station Pump Change Out shows the changes associated with this alternative. The need for the below-ground chamber would be eliminated. Because of the large difference in pumping capacity needs during dry weather (1500 gpm or less) and for wet weather (4600 gpm), the speed of each pump should be controlled by a variable frequency drive (VFD) to minimize the number of pump starts per hour and to better match the rate of flow entering the wetwell under both wet and dry weather conditions. New controls will operate pumps based on the level in the wetwell so that as the level begins to rise, the speed of the operating pump is increased. If the wetwell level continues to increase and a single pump operating at full speed is unable to keep up with the rate of wastewater entering the wetwell, the controls will start a second pump and vary the speed of both pumps up to full speed and a maximum combined pumping rate of 4600 gpm.

The three new pumps will be sized to deliver 2300 gpm per pump when two pumps are operating simultaneously. Each pump will be rated to convey 2,700 gpm when operating alone at full speed. The availability of pumps that meet the design conditions and that can be installed

without piping modifications has been confirmed with the manufacturer of the existing pumps. Each new pump would be driven by a 47 hp motor (nominal). The VFDs will be located in the upper level of the Main Plant PS. The existing 14" force main will need to be connected to the existing 24" force main at the pump station site to minimize the discharge pressure and therefore to minimize installed motor horsepower requirements.

Two variations to this alternative were considered, but not further developed due to the motor horsepower that would be required. One variation provided that the 14" force main would not be connected to the 24" force at the pump station site. An initial evaluation of the hydraulic conditions showed that to convey 4600 gpm with two pumps through only the 14" force main, each pump would need to be driven by a 200 hp motor. The second variation considered replacing only two of the existing pumps with pumps that could individually pump 4600 gpm. The interconnection between the 14" force main and 24" force main at the pump station site would be accomplished as part of this variation to Alternative 2. If one of the larger pumps were out of service, the firm pumping capacity could be provided by the other. Again, the motor horsepower was high, estimated at 170 hp and the hydraulic conditions in the suction side of the pump (very high suction velocity) could contribute to premature pump failure due to cavitation.

As shown in Figure 1 – Schematic of Pump Stations and Force Mains, there are no existing isolation valves on any of the force mains; consequently, making the connection between the 14" and 24" force mains shown in Figure 4 will require that all three pump stations be out of operation and the force mains sufficiently drained to accomplish the connection. A general contractor experienced in large diameter pressure piping in a buried situation should be utilized to complete this work. Replacement of the pumps and installation of the VFDs and controls can be considered as work City staff could undertake. The potential is addressed further under the paragraphs below titled: **Estimated Costs**.

This alternative meets the first three goals, also. This alternative totally eliminates the below-ground chamber and the associated safety risks. The elimination of two pumps out of the current total of five pumps contributes to a potential reduction in future maintenance and repair costs, which addresses the fourth goal. There will be some salvage value to the City for equipment removed from the Auxiliary PS.

Alternative 3 – Submersible Pumps In the Existing Wetwell

This alternative is represented in Figure 5 – Alternative 3 – Submersible Pumps in the Wetwell. Two submersible pumps, each capable of delivering 4600 gpm would be installed in the existing wetwell. The pumps would be installed at the south end of the wetwell to avoid construction over the below-ground chamber (to be abandoned) and over the existing 30" gravity sewer and the 14" force main. Discharge piping from each pump would be extended out to a below-ground valve vault. The check valves and shut off valves from the Auxiliary PS chamber would be re-installed in the vault, assuming they are in good, workable condition. To prevent possible damage from water freezing in the pumps and piping exposed in the open-top wetwell, air

release/vacuum relief valves will be installed on the pump discharge piping ahead of each check valve in the valve vault. The valve vault should be located offset from the pump discharges to allow access by a truck-mounted hoist for removal and installation of the proposed pumps. The piping would be extended to connect with the existing 24" force main. Starters and controls for the pumps would be installed in the existing Main Plant PS Building, potentially in the location of the existing (and seldom used) restroom. The below-ground chamber for the Auxiliary PS would be abandoned in place.

The nature of the major portion of this work is considered heavy construction and therefore lends itself to all work being completed by a general contractor experienced in wastewater pump station construction and modifications.

This alternative meets the first three goals listed above. Re-use of the valves from the Auxiliary PS partially meets the fourth goal.

Estimated Costs

An estimate of the probable design, construction, and construction services costs for each alternative was made. A salvage value for functioning equipment removed from service has not been used to reduce the overall probable project costs because the salvage values can not be readily determined.

A detailed, estimated cost for each Alternative has been provided in the tables in the attachments to this letter report. A summary of the costs for the three Alternatives is shown below:

	Alternative 1 – Auxiliary PS Pump Change-Out and Relocate Controls	**Alternative 2 – Main Plant PS Pump Change-Out, New Controls, and Force Main Connection**	**Alternative 3 – Submersible Pumps In the Existing Wetwell, New Controls, and a New Valve Vault**
Probable Construction Cost	$194,000	$230,000	$301,000
Design & Construction Services	$48,000	$58,000	$75,000
Probable Total Project Cost	**$242,000**	**$288,000**	**$376,000**

The above costs listed for Probable Construction Cost include a 15% contingency for unknown costs that may become apparent during construction. The estimate for Design and Construction Services is based solely on a percentage of the probable construction cost because the scope of engineering that may be required is not well enough defined at this time. Consequently, a value

of 25% was used and this percentage represents the approximate value for a typical design/bid/build project. For any work completed by City staff, the associated labor, contractor costs, and engineering costs should be less.

Non-Monetary Comparison

In addition to the probable costs associated with each alternative, there are non-monetary aspects that may favor one alternative over the others. A listing of the aspects considered positive and negative for each alternative are given below:

Alternative 1 – Auxiliary PS Pump Change-Out and Relocated Controls

Positive Aspects:
+ Electrical controls can be mounted above the 2007 flood elevation
+ Pumps designed for flooded conditions can be used
+ Reasons for personnel to enter the chamber are reduced
+ Ventilation, lighting and sump pump can be made flood resistant

Negative Aspects:
– Entry into the below-ground chamber is still necessary
– The below-ground chamber is steel and will need continued maintenance
– Access for pump maintenance remains very restricted
– A total of five pumps must be kept in service
– Most of the improvement work should be accomplished by a specialty contractor
– Installation of submersible dry-pit pumps may require significant piping changes in a confined space.

Alternative 2 – Main Plant PS Pump Change-Out, New Controls, and Force Main Connection

Positive Aspects:
+ Electrical controls can be mounted above the 2007 flood elevation
+ Pumps designed for flooded conditions can be used
+ Pumps will be readily accessible in the drywell
+ The confined, below-ground steel chamber is eliminated with this alternative
+ Only 3 pumps will require operation and maintenance
+ A major portion of the work is suitable for completion by City staff
+ VFDs allow pumping at a rate close to the actual influent flow rate

Negative Aspects:
– VFDs for motor control present additional maintenance requirements
– The connection of the 14" force main to the 24" force main at the pump station site is necessary to minimize the pump motor horsepower required

Alternative 3 – Submersible Pumps In the Existing Wetwell, New Controls, and a New Valve Vault

Positive Aspects:

+ Electrical controls can be mounted above the 2007 flood elevation
+ Proposed pumps are designed for flooded conditions
+ The confined, below-ground steel chamber is eliminated with this alternative
+ The existing check valves and two of the shut off valves from the Auxiliary PS can be reused

Negative Aspects:

– A below-ground valve vault is required
– Five pumps must be kept in service
– Construction requires a general contractor
– The pumps must be removed from the wetwell for periodic inspection

Conclusions

Alternative 1 has the lowest probable project cost of $242,000; however, it is based on leaving the below-ground chamber in service and therefore does not fully meet the first and second goals listed on page 3 of this report. The positive aspects are less, and the negative aspects are greater than those for Alternative 2.

Alternative 2 has a probable project cost $46,000 greater than Alternative 1. The non-monetary considerations favor Alternative 2.

Portions of Alternative 2 can be completed by City forces if deemed appropriate by the City. Of the total probable project cost of $230,000, approximately $50,000 is attributable to labor and contractor costs for work related to pumps and controls.

Work completed by City forces would avoid some of these contractor costs, and potentially some of the design and construction services costs that would be associated with preparation of bid documents and with construction-phase services.

If the City desires and is in the position to use staff, Alternative 2 can also be completed over a period of time. Specifically, the new VFD motor starters and new controls can be almost completely installed before any electrical connections need to be made. Additionally, the pumps can be changed out one by one without taking the pump station out of service and without piping modifications. The only caution would be to not have the pump change-out work underway during seasons when heavy storms are possible.

Alternative 3 has the highest probable project cost of $376,000. The new valve vault and the additional 24" force main contribute greatly to the higher cost. The non-monetary aspects of this alternative provide no overwhelming reason to consider Alternative 3 over either of the other two alternatives.

Recommendations

Although somewhat higher in cost over Alternative 1, we believe Alternative 2 will provide the preferred configuration and will best meet the project goals. We would recommend that the City implement Alternate 2 in the best interests of long term safety, operations, and maintenance impacts. It is also suggested that the City consider installation of isolation valves on the force mains, as shown for the recommended alternative.

Please contact me with any questions or comments you may have regarding this letter report. We can prepare an amendment to our contract for services for your consideration following the City's decision on how it will proceed.

Sincerely,
Professional Engineering Consultants, P.A.

Steven D. Sandberg, P.E.

SDS/pkr

cc: Mitch Phillips, Supt., w/attachments
Corey Schinstock, Assistant City Admin., w/attachments

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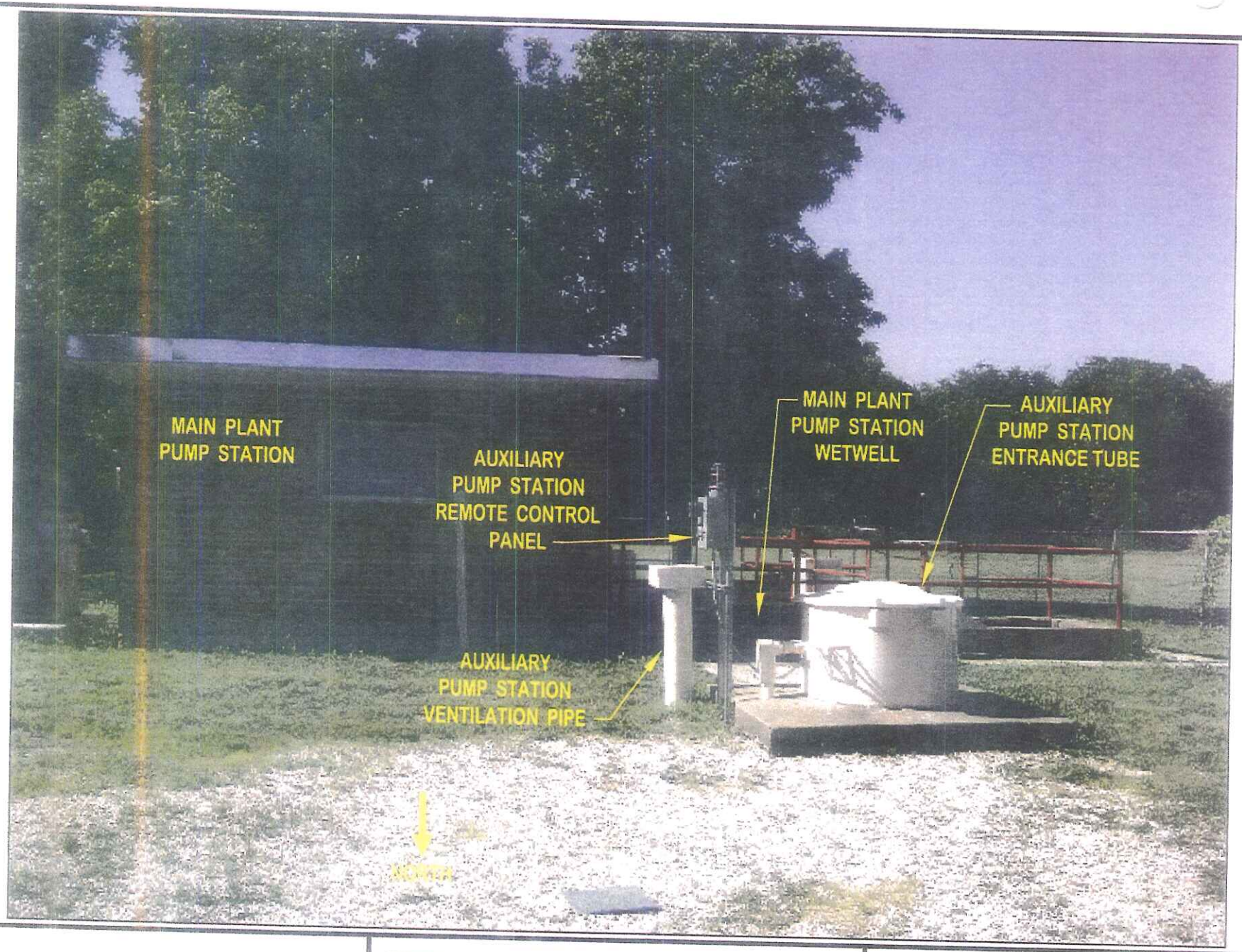

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PHOTO 1
MAIN PLANT AND AUXILIARY PUMP STATION
MAIN PLANT PUMPING ASSESSMENT

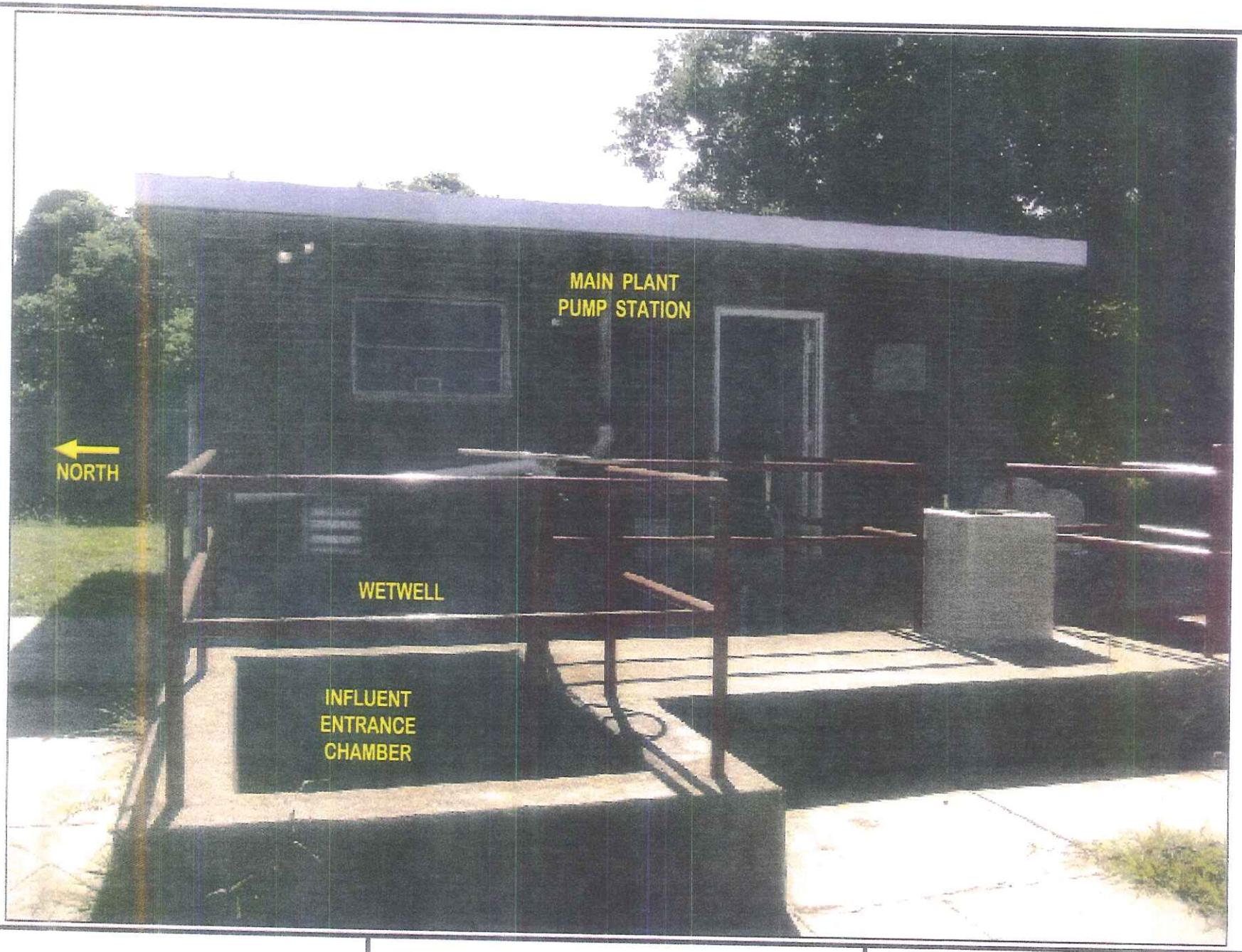

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PHOTO 2
MAIN PLANT PUMP STATION
MAIN PLANT PUMPING ASSESSMENT

Table 1 - Alternative 1

Iola Main Plant Pumping Assessment
PEC Proj No 08A54-004-3704

Alternative 1 - Pump Change Out and Control Relocation

Preliminary Probable Project Cost Estimate

By: SDS
Date: 2/28/2011

Pumps and Associated Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
2 EA	Remove existing pumps	$2,000.00	1.00	1.20	$4,800
2 EA	Purchase dry-pit submersible pump, 70 hp	$28,000.00	1.00	1.20	$67,200
2 EA	Install dry-pit submersible pump	$10,000.00	1.00	1.20	$24,000
1 LS	Motor starters and controls in Main Plant PS Building	$34,300.00	1.00	1.20	$41,160
1 LS	Sump pump	$1,000.00	1.20	1.20	$1,440
1 LS	Ventilation system	$1,000.00	1.20	1.20	$1,440
1 LS	Lighting	$1,000.00	1.20	1.20	$1,440
1 LS	Steel chamber repair	$4,000.00	1.00	1.20	$4,800
1 LS	Allowances for Retrofit Restrictions	$10,000.00	1.00	1.00	$10,000
SUB TOTAL					$156,300

General and Site Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	Plug 24" FM during pump installation	$5,000.00	1.00	1.20	$6,000
1 LS	Stormwater Pollution Control (Erosion Control)	$500.00	1.00	1.20	$600
1 LS	Mobilization	$2,000.00	1.00	1.20	$2,400
1 LS	Site Preparation	$1,000.00	1.00	1.20	$1,200
1 LS	Site Cleanup, Seeding, Etc.	$500.00	1.00	1.20	$600
0 LS	Traffic Control	$1,000.00	1.00	1.20	$0
1 LS	Demobilization	$1,000.00	1.00	1.20	$1,200
SUB TOTAL					$12,000

Probable Construction Cost	$168,300
Construction Contingency @ 15%	$25,200
Project Costs for Design, Construction Services, etc. @ 25%	$48,400
Probable Total Project Costs →	$241,900

Table 2 - Alternative 2

Iola Main Plant Pumping Assessment
PEC Proj No 08A54-004-3704

Alternative 2 - Main Plant Pump Station Change Out
Preliminary Probable Project Cost Estimate
By: SDS
Date: 2/28/2011

Pumps and Associated Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
3 EA	Remove existing pumps	$500.00	1.00	1.20	$1,800
3 EA	Purchase dry-pit submersible pumps, 50 hp	$25,500.00	1.00	1.20	$91,800
3 EA	Install dry-pit submersible pumps	$1,000.00	1.00	1.20	$3,600
1 LS	VFD motor starters and controls	$48,800.00	1.00	1.20	$58,560
SUB TOTAL					$155,800

General and Site Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	Force main interconnection	$30,000.00	1.00	1.20	$36,000
1 LS	Stormwater Pollution Control (Erosion Control)	$500.00	1.00	1.20	$600
1 LS	Abandon Auxiliary PS	$2,000.00	1.00	1.20	$2,400
1 LS	Mobilization	$2,000.00	1.00	1.20	$2,400
1 LS	Site Preparation	$1,000.00	1.00	1.20	$1,200
1 LS	Site Cleanup, Seeding, Etc.	$500.00	1.00	1.20	$600
0 LS	Traffic Control	$1,000.00	1.00	1.20	$0
1 LS	Demobilization	$1,000.00	1.00	1.20	$1,200
SUB TOTAL					$44,400

Probable Construction Cost	$200,200
Construction Contingency @ 15%	$30,000
Project Costs for Design, Construction Services, etc. @ 25%	$57,600
Probable Total Project Costs →	$287,800

Table 3 - Alternative 3

Iola Main Plant Pumping Assessment
PEC Proj No 08A54-004-3704

Alternative 3 - Submersible Pumps in the Existing Wetwell

Preliminary Probable Project Cost Estimate

By: SDS

Date: 2/28/2011

Pumps and Associated Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
2 EA	Submersible pumps, 70 hp	$28,000.00	1.00	1.20	$67,200
2 EA	Install submersible pumps	$5,000.00	1.00	1.20	$12,000
1 LS	Pump discharge piping	$10,000.00	1.20	1.20	$14,400
1 LS	Motor starters and controls in Main Plant PS Building	$41,300.00	1.00	1.20	$49,560
SUB TOTAL					$143,200

Valve Vault

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	Valve vault	$20,000.00	1.20	1.20	$28,800
1 LS	Install check and gate valves from Auxiliary PS	$4,000.00	1.00	1.20	$4,800
1 LS	Piping	$15,000.00	1.20	1.20	$21,600
2 EA	Air release valves	$1,000.00	1.20	1.20	$2,880
SUB TOTAL					$58,100

General and Site Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
70 LF	24" force main	$250.00	1.00	1.20	$21,000
3 EA	24" 90 deg bends	$6,000.00	1.00	1.20	$21,600
1 LS	Connect to existing 24" FM	$5,000.00	1.00	1.20	$6,000
1 LS	Stormwater Pollution Control (Erosion Control)	$1,000.00	1.00	1.20	$1,200
1 LS	Abandon Auxiliary PS	$2,000.00	1.00	1.20	$2,400
1 LS	Mobilization	$3,000.00	1.00	1.20	$3,600
1 LS	Site Preparation	$1,000.00	1.00	1.20	$1,200
1 LS	Site Cleanup, Seeding, Etc.	$1,000.00	1.00	1.20	$1,200
0 LS	Traffic Control	$1,000.00	1.00	1.20	$0
1 LS	Demobilization	$2,000.00	1.00	1.20	$2,400
SUB TOTAL					$60,600

Probable Construction Cost	$261,900
Construction Contingency @ 15%	$39,300
Project Costs for Design, Construction Services, etc. @ 25%	$75,300
Probable Total Project Costs →	$376,500

APPENDIX E

Pump Station Cost Estimates

1. Vine Street Pump Station
2. Main Plant Auxiliary Pump Station (See Appendix D)
3. Kentucky Pump Station
4. West Interceptor Pump Station
5. Ohio Pump Station

Vine Street Pump Station

Wastewater Collection System Review and Assessment
PEC Proj No 08A54-004-3704

Probable Project Cost Estimate
By: SDS
Date: 2/28/2011

Pumps and Associated Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	New 15 hp pump station and valve vault	$200,000.00	1.00	1.00	$200,000
1 LS	Demolis and remove existing pump station from service	$10,000.00	1.00	1.00	$10,000
SUB TOTAL					**$210,000**

Force Main

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1200 LF	10" Force Main	$65.00	1.00	1.20	$93,600
1 LS	Stormwater Pollution Control (Erosion Control)	$500.00	1.00	1.20	$600
1 LS	Mobilization	$2,000.00	1.00	1.20	$2,400
2 EA	Connect to Existing	$500.00	1.00	1.20	$1,200
1 LS	Site Cleanup, Seeding, Etc.	$1,000.00	1.00	1.20	$1,200
0 LS	Traffic Control	$500.00	1.00	1.20	$0
1 LS	Demobilization	$1,000.00	1.00	1.20	$1,200
SUB TOTAL					**$100,200**

Subtotal of Construction	**$310,200**
Construction Contingency @ 15%	**$46,500**
Probable Construction Cost	**$357,000**
Project Costs for Design, Construction Services, etc. @ 25%	**$89,200**
Probable Total Project Costs →	**$446,000**

Kentucky Pump Station

Wastewater Collection System Review and Assessment
PEC Proj No 08A54-004-3704

Probable Project Cost Estimate
By: SDS
Date: 2/28/2011

Pumps and Associated Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	Remove existing pumps	$1,000.00	1.00	1.20	$1,200
2 EA	Purchase new pumps, 10 hp	$15,000.00	1.00	1.20	$36,000
1 LS	Install pumps and piping	$25,000.00	1.00	1.20	$30,000
1 LS	Install valve vault and control building	$25,000.00	1.00	1.20	$30,000
1 LS	Demolition	$3,000.00	1.00	1.20	$3,600
SUB TOTAL					$100,800

General and Site Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	Mobilization	$1,000.00	1.00	1.20	$1,200
1 LS	Site Preparation	$200.00	1.00	1.20	$240
1 LS	Site Cleanup, Seeding, Etc.	$200.00	1.00	1.20	$240
1 LS	Traffic Control	$0.00	1.00	1.20	$0
1 LS	Demobilization	$500.00	1.00	1.20	$600
0 LS			1.00	1.20	$0
1 LS			1.00	1.20	$0
SUB TOTAL					$2,300

Subtotal of Construction	$103,100
Construction Contingency @ 15%	$15,500
Probable Construction Cost	$119,000
Project Costs for Design, Construction Services, etc. @ 15%	$17,800
Probable Total Project Costs →	$136,000

West Interceptor Pump Station

Wastewater Collection System Review and Assessment
PEC Proj No 08A54-004-3704

Probable Project Cost Estimate
By: SDS
Date: 2/28/2011

Pumps and Associated Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	Install flow meter	$5,000.00	1.50	1.20	$9,000

SUB TOTAL $9,000

General and Site Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	Wetwell Trough	$12,000.00	1.40	1.20	$20,160
1 LS	Stormwater Pollution Control (Erosion Control)	$0.00	1.00	1.20	$0
1 LS	Mobilization	$500.00	1.00	1.20	$600
1 LS	Site Preparation	$0.00	1.00	1.20	$0
1 LS	Site Cleanup, Seeding, Etc.	$0.00	1.00	1.20	$0
0 LS	Traffic Control	$0.00	1.00	1.20	$0
1 LS	Demobilization	$500.00	1.00	1.20	$600

SUB TOTAL $21,400

Subtotal of Construction	$30,400
Construction Contingency @ 15%	$4,600
Probable Construction Cost	$35,000
Project Costs for Design, Construction Services, etc. @ 15%	$5,300
Probable Total Project Costs →	$40,000

Ohio Pump Station

Wastewater Collection System Review and Assessment
PEC Proj No 08A54-004-3704

Probable Project Cost Estimate
By: SDS
Date: 2/28/2011

Pumps and Associated Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	New 15 hp pump station and valve vault	$200,000.00	1.00	1.00	$200,000
1 LS	Demolis and remove existing pump station from service	$20,000.00	1.00	1.00	$20,000
SUB TOTAL					$220,000

General and Site Work

QUANTITY	DESCRIPTION	UNIT PRICE	INSTALL COSTS	CONTRACTOR COSTS	TOTAL
1 LS	Stormwater Pollution Control (Erosion Control)	$500.00	1.00	1.20	$600
1 LS	Mobilization	$1,000.00	1.00	1.20	$1,200
1 LS	Site Preparation	$1,000.00	1.00	1.20	$1,200
1 LS	Site Cleanup, Seeding, Etc.	$500.00	1.00	1.20	$600
0 LS	Traffic Control	$0.00	1.00	1.20	$0
1 LS	Demobilization	$500.00	1.00	1.20	$600
SUB TOTAL					$4,200

Subtotal of Construction	$224,200
Construction Contingency @ 15%	$33,600
Probable Construction Cost	$258,000
Project Costs for Design, Construction Services, etc. @ 15%	$38,700
Probable Total Project Costs →	$297,000

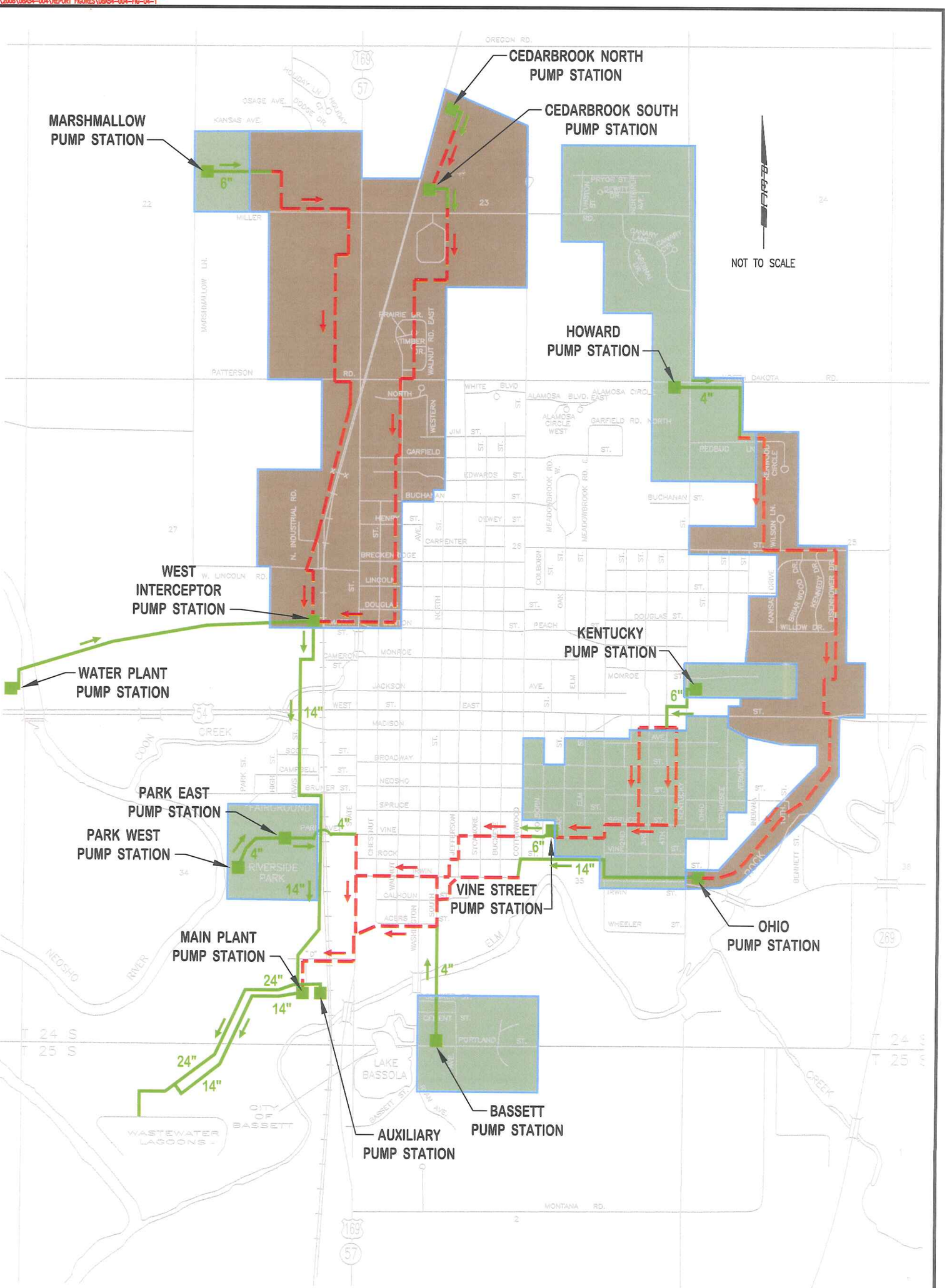

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FIGURE 4-1
PUMP STATIONS, FORCE MAINS, CONNECTING SEWERS, AND SERVICE AREAS

TABLE 4-1 WASTEWATER PUMP STATION INVENTORY
City of Iola, Kansas
Wastewater Collection System Review and Assessment

Pump Station Name	Pump Station Style	Estimated Peak Influent Rate (gpm) *	Firm Pumping Capacity (gpm)	Level Control Devise	No. of Pumps	Pump Motor HP	Pump Size (in.)	Force Main (diameter/length, material)	Electrical Service (voltage/ phases)	Date of Original Constr-uction	Damaged by 2007 Flood	Pump Manufacturer	Upgrade Date	General Condition of Station
Main Plant	cast-in-place concrete structure with open-top wetwell and controls in above-ground building	<4,600	2,200	pressure transducer	3	20/30/20	8"/8"/8"	14"/1645'/DIP	240/3	1962	Yes	ABS	2008	Reprogram alarm dialer. Pumps, valves, electrical service and controls replaced in 2008. No major work anticipated in the next 10 years.
Main Plant Auxiliary	below-ground steel chamber w/ pumps & control, takes suction from wetwell of Main Plant PS	<4,600	4,600	air bubbler	2	60/60	12"/12"	24"/2,200'/DIP	240/3	1978	Yes	Smith+Loveless	n.a.	Flooded out in 2009 from water leak. Under assessment for replacement to reduce damage potential and to address safety concerns
West Interceptor	cast-in-place concrete structure with open-top wetwell and controls in below-ground drywell	<2,250	2,250	air bubbler	3	30/30/30	6"/6"/6"	14"/6,500'/DIP	240/3	1978	No	Gorman/Rupp	2010	Influent sewers cause air binding of pumps. Pressure gauges on the pump discharge are not working.
Ohio Station	below-ground steel chamber houses pumps and control, cast-in-place rectangular wetwell	<2,250	2,250	air bubbler	3	20/40/20	6"/8"/6"	14"/3,700'/DIP	480/3	1975	No	Smith+Loveless	1986	Pump station is oversized for current influent rate
Vine Street	below-ground steel chamber houses pumps and control, precast wetwell	unknown	400	float switches	2	5/5 7.5/7.5 (2-speed)	4"/4"	6"/20'/CIP	240/3	1962	No	Smith+Loveless	1997	Unable to keep up with wet weather flows at low speed (880 rpm) and causes damage to the receiving manhole at high speed (1175 rpm)
Kentucky	cast-in-place concrete structure with wetwell and drywell access openings in control building	unknown	unknown	air bubbler	2	5/5	4"/4"	8"/1,025'/CIP	240/3	unknown	No	Smith+Loveless	1970	Current configuration is in violation of electrical codes. Corrosion in wetwell. Access to 20' deep drywell won't meet safety code for ladder access.
Howard	vacuum primed, wetwell mounted, fiberglass enclosure over valves and control panel	< 150	150	float switches	2	3/3	4"/4"	4"/2,500'/DIP	240/3	1972	Yes	Smith+Loveless	2007	Station was replaced after 2007 flood. The elevation of the station was not raised at that time.
Bassett	vacuum primed, wetwell mounted, fiberglass enclosure over valves and control panel	< 380	380	float switches	2	5/5	4"/4"	6"/1,900"/DIP	240/3	1974	No	Smith+Loveless	2009	Pump station was totally replaced in the summer of 2009. No major work anticipated in the next 10 years.
Park East	vacuum primed, wetwell mounted, fiberglass enclosure over valves and control panel	< 100	100	float switches	2	2/2	4"/4"	4"/351'/?	240/3	n.a.	Yes	Smith+Loveless	2007	New in 2007. No major work anticipated in the next 10 years
Park West	vacuum primed, wetwell mounted, fiberglass enclosure over valves and control panel	< 50	100	float switches	2	2/2	4"/4"	4"/351'/?	240/3	n.a.	Yes	Smith+Loveless	2010	Totally replace with a new pump station in 2010
Marshmallow	vacuum primed, wetwell mounted, fiberglass enclosure over valves and control panel	< 200	200	float switches	2	2/2	4"/4"	6"/1,400"/PVC	240/3	1978	No	Smith+Loveless	n.a.	Pump station has little influent flow, it is in fair condition, and is considered reliable.
Water Plant	submersible pumps, separate valve vault, exposed control panel	< 100	100	pressure transducer	2	5/5	4"/4"	4"/2,500/PVC	480/3	2005	No	Flygt	n.a.	Condition is good, no major work anticipated in the next 10 years
Cedarbrook South	submersible pumps, separate valve vault, exposed control panel	< 175	175	float switches	2	3/3	3"/3"	4"/470'/PVC	240/3	2009	No	ABS	n.a.	New in 2009. No major work anticipated in the next 10 years
Cedarbrook North	submersible pumps, separate valve vault, exposed control panel	< 100	100	float switches	2	2/2	3"/3"	4"/280'/PVC	240/3	2011	No	ABS	n.a.	New in 2011. Had not been constructed by publication date of this Design Memorandum.

* Values estimated from operator reports of any pump station backups during major rain events.

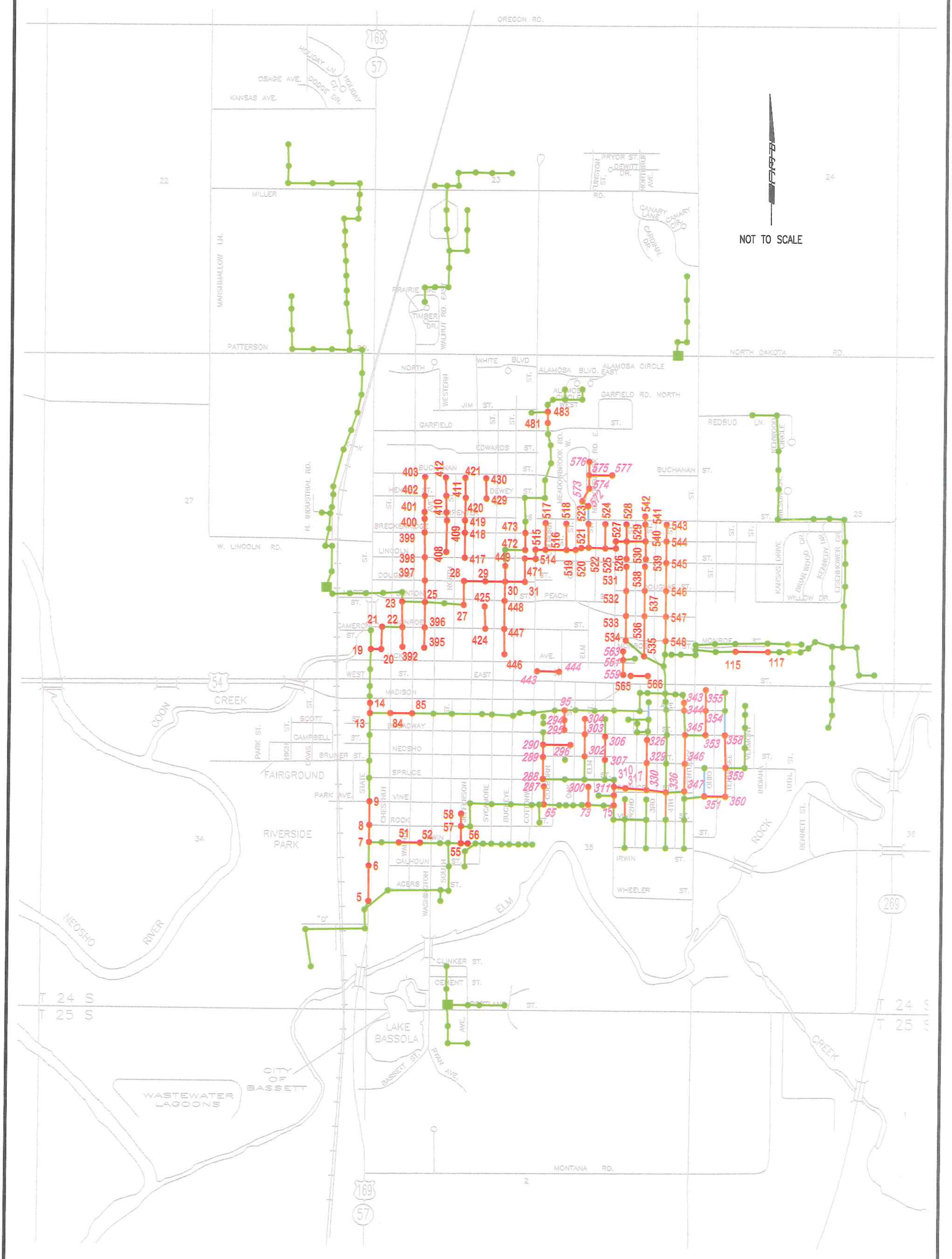

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FIGURE 5-1
SEWER REHABILITATION

REPLACE CORRODED IRON PIPE MH 475 TO MH 476 280 L.F.

ONE POINT REPAIR MH 519 TO MH 518

TWO POINT REPAIR MH 572 TO MH 523

ONE POINT REPAIR MH 574 TO MH 573

ONE POINT REPAIR MH 522 TO MH 523

ONE POINT REPAIR MH 419 TO MH 420

ONE POINT REPAIR MH 525 TO MH 524

ONE POINT REPAIR MH 529 TO MH 530

ONE POINT REPAIR MH 401 TO MH 402

ONE POINT REPAIR MH 537 TO MH 538

ONE POINT REPAIR MH 31 TO MH 471

ONE POINT REPAIR MH 525 TO MH 526

THREE POINT REPAIRS MH 546 TO MH 545

ONE POINT REPAIR MH 535 TO MH 536

ONE POINT REPAIR MH 30 TO MH 448

ONE POINT REPAIR MH 561 TO MH 563

ONE POINT REPAIR MH 548 TO MH 547

TWO POINT REPAIRS MH 561 TO MH 562

ONE POINT REPAIR MH 343 TO MH 344

TWO POINT REPAIRS MH 22 TO MH 392

THREE POINT REPAIRS MH 345 TO MH 344

TWO POINT REPAIRS MH 339 TO MH 340

THREE POINT REPAIRS MH 339 TO MH 338

ONE POINT REPAIR MH 95 TO MH 294

ONE POINT REPAIR MH 354 TO MH 353

THREE POINT REPAIRS MH 323 TO MH 322

THREE POINT REPAIRS MH 292 TO MH 293

THREE POINT REPAIRS MH 345 TO MH 353

TWO POINT REPAIRS MH 323 TO MH 325

THREE POINT REPAIRS MH 358 TO MH 357

TWO POINT REPAIRS MH 306 TO MH 305

ONE POINT REPAIR MH 362 TO MH 363

TWO POINT REPAIRS MH 302 TO MH 303

ONE POINT REPAIR MH 327 TO MH 328

ONE POINT REPAIR MH 359 TO MH 361

ONE POINT REPAIR MH 288 TO MH 289

ONE POINT REPAIR MH 308 TO MH 309

ONE POINT REPAIR MH 338 TO MH 337

TWO POINT REPAIRS MH 318 TO MH 319

TWO POINT REPAIRS MH 351 TO MH 352

TWO POINT REPAIRS MH 288 TO MH 298

THREE POINT REPAIRS MH 317 TO MH 318

ONE POINT REPAIR MH 337 TO MH 336

ONE POINT REPAIR MH 348 TO MH 351

ONE POINT REPAIR MH 299 TO MH 301

TWO POINT REPAIRS MH 316 TO MH 315

ONE POINT REPAIR MH 348 TO MH 347

ONE POINT REPAIR MH 286 TO MH 64

ONE POINT REPAIR MH 349 TO MH 348

TWO POINT REPAIRS MH 335 TO MH 334

ONE POINT REPAIR MH 301 TO MH 302

THREE POINT REPAIRS MH 307 TO MH 308

ONE POINT REPAIR MH 350 TO MH 349

● APPROXIMATE REPAIR LOCATION

○ REPAIR ALREADY COMPLETED BY CITY FORCES

NOTES IN ITALIC WERE TELEVISED AS PART OF THE PHASE 2 VINE ST. PUMP STATION WORK.

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FIGURE 5-2
POINT REPAIRS

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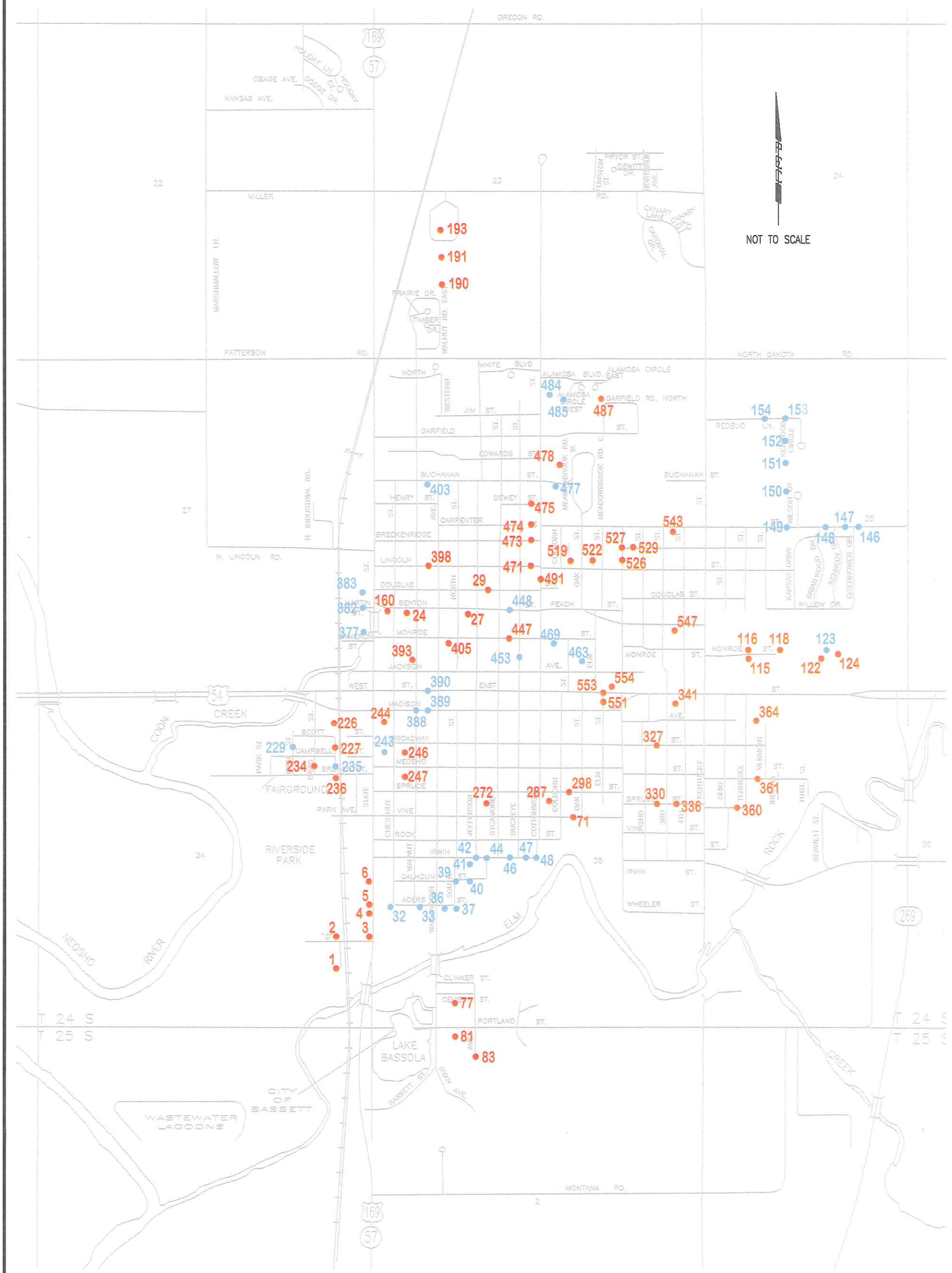

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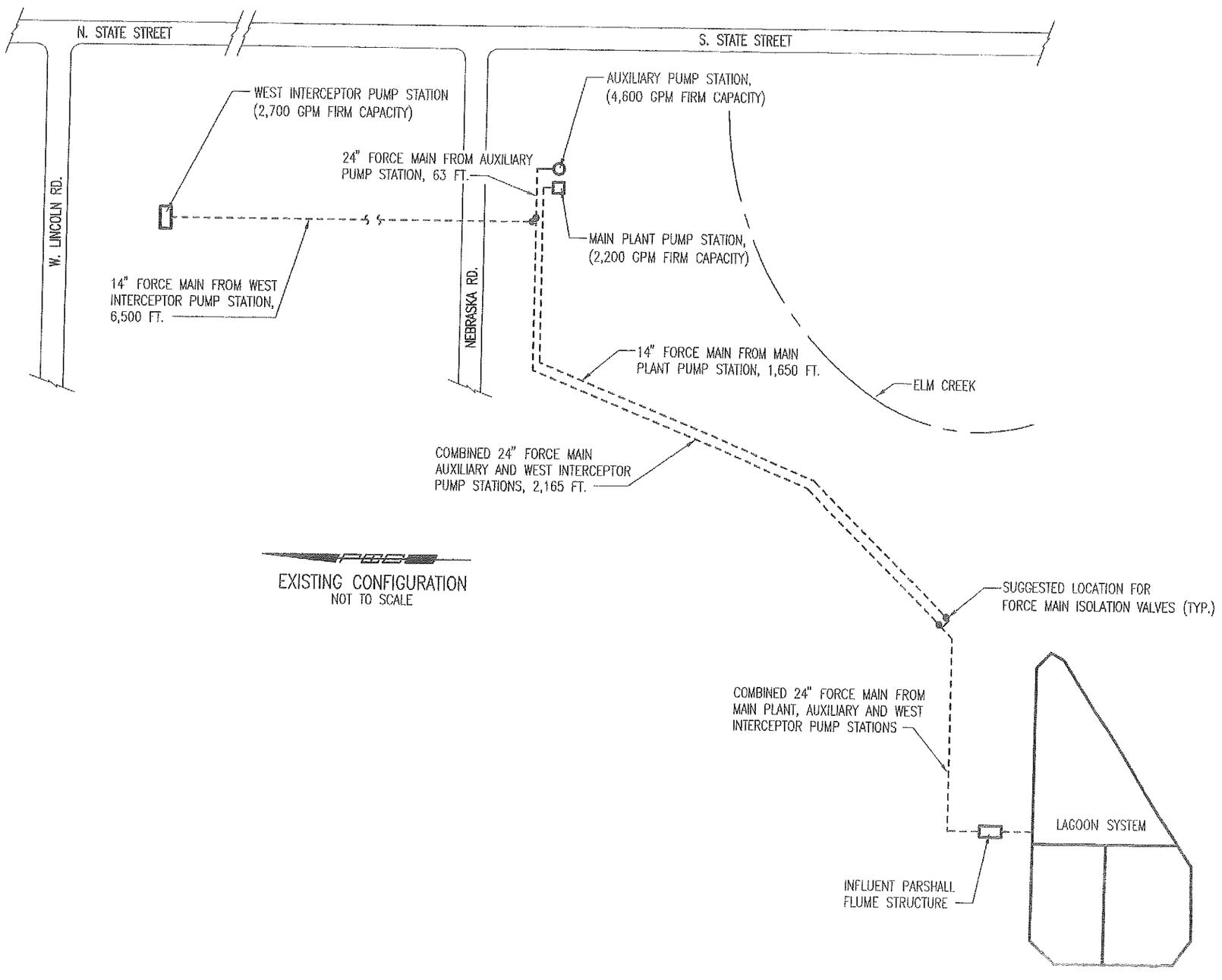
FIGURE 6-1

MANHOLE REHABILITATION

Iola Collection System Assessment
Summary of Probable Project Costs - Pre System Inspection Work

List of All Priority Needs		Full Program		Minimum - All of Priority 1, provide only grant match		Intermediate - Priority 1 plus Priority 2 Sewers		Large - All of Priority 1 and Priority 2 Projects		Future Program - meet Priority 3 and greater	
		Item Cost	Subtotal	Item Cost	Subtotal	Item Cost	Subtotal	Item Cost	Subtotal	Item Cost	Subtotal
Televising - Contract Costs											
User Charge Assessment (Updated Costs)	Priority 1A Televising	$41,617		$41,617		$41,617		$41,617		$0	
	Priority 1B Televising	$125,000		$125,000		$125,000		$125,000		$0	
	Priority 2 Televising	$87,500		$0		$87,500		$87,500		$0	
	Priority 3 Televising	$87,500		$0		$0		$0		$87,500	
	Priority 4 Televising	$87,500		$0		$0		$0		$87,500	
	SUBTOTAL TELEVISING COSTS		$429,117		$166,617 *		$254,117		$254,117		$175,000
Sewer Rehabilitation - Contract Costs											
User Charge Assessment (Update Costs)	Priority 1 Sewer Rehabilitation	$823,825		$823,825		$823,825		$823,825		$0	
	Priority 2 Sewer Rehabilitation	$781,100		$0		$781,100		$781,100		$0	
	Priority 3 Sewer Rehabilitation	$1,388,910		$0		$0		$0		$1,388,910	
	SUBTOTAL SEWER REHABILITATION		$2,993,835		$823,825 *		$1,604,925		$1,604,925		$1,388,910
Manhole Top End Rehab - Contract Costs											
Current Collection System Assessment	Priority 1 (150 manholes)	$75,000		$75,000		$75,000		$75,000		$0	
	Priority 1 GPS Unit	$20,000		$20,000		$20,000		$20,000		$0	
	Priority 2 (50 manholes)	$25,000		$0		$25,000		$25,000		$0	
	Priority 3 (50 manholes)	$25,000		$0		$0		$0		$25,000	
	SUBTOTAL MH TOP END REHAB		$145,000		$95,000 *		$120,000		$120,000		$25,000
Pump Station Improvements - Contract Costs											
Current Collection System Assessment	Priority 1 - Vine Street Pump Station	$129,000		$129,000		$129,000		$129,000		$0	
	Priority 1 - Ohio Pump Station	$114,000		$114,000		$114,000		$114,000		$0	
	Priority 1 - West Interceptor Pump Statio	$85,000		$85,000		$85,000		$85,000		$0	
	Priority 2 - Kentucky Pump Station	$338,000		$0		$0		$338,000		$0	
	Priority 2 - Alarm Dialers	$20,000		$0		$0		$20,000		$0	
	SUBTOTAL PS IMPROVEMENTS		$686,000		$328,000 *		$328,000		$686,000		$0
Engineering - Estimated at 15% of Contract Cost											
Current Collection System Assessment	Televising	$39,375		$0		$13,125		$13,125		$26,250	
	Priority 1 Sewer Rehabilitation	$123,574		$123,574		$123,574		$123,574		$0	
	Priority 2 Sewer Rehabilitation	$117,165		$0		$117,165		$117,165		$0	
	Priority 3 Sewer Rehabilitation	$208,337		$0		$0		$0		$208,337	
	Manhole Top End Rehab	$21,750		$14,250		$18,000		$18,000		$3,750	
	Pump Station Improvements	$102,900		$49,200		$49,200		$102,900		$0	
	Grant and Loan Coordination	$16,000		$11,000		$6,000		$6,000		$0	
	SUBTOTAL ENGINEERING		$629,100		$198,024 *		$327,064		$380,764		$238,337
PROGRAM COST			$4,883,053		$1,611,466		$2,634,106		$3,045,806		$1,827,247
EPA Grants (require 45% match required)			$762,000		$762,000		$762,000		$762,000		
Utility Costs for 45% Match of EPA Grant			$623,455		$623,455		$623,455		$623,455		$623,455
Utility Costs Beyond Matching Funds			$3,497,598		$226,011		$1,248,651		$1,660,351		$1,203,792
Total Utility Funding			$4,121,053		$849,466		$1,872,106		$2,283,806		$1,827,247
Annual Financing Costs for Potential KDHE Loan Amendment (2.51% for 17 years)			$300,786		$62,000		$136,641		$166,690		$133,366

* Values shown in gray boxes are subject to EPA grant procurement and contract conditions.



EXISTING CONFIGURATION
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No.	Revision	By	Date

FIGURE 1
SCHEMATIC OF PUMP STATIONS
AND FORCE MAINS
MAIN PLANT PUMPING ASSESSMENT

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Designed by	SDS	Job No.	08A54-004-3704
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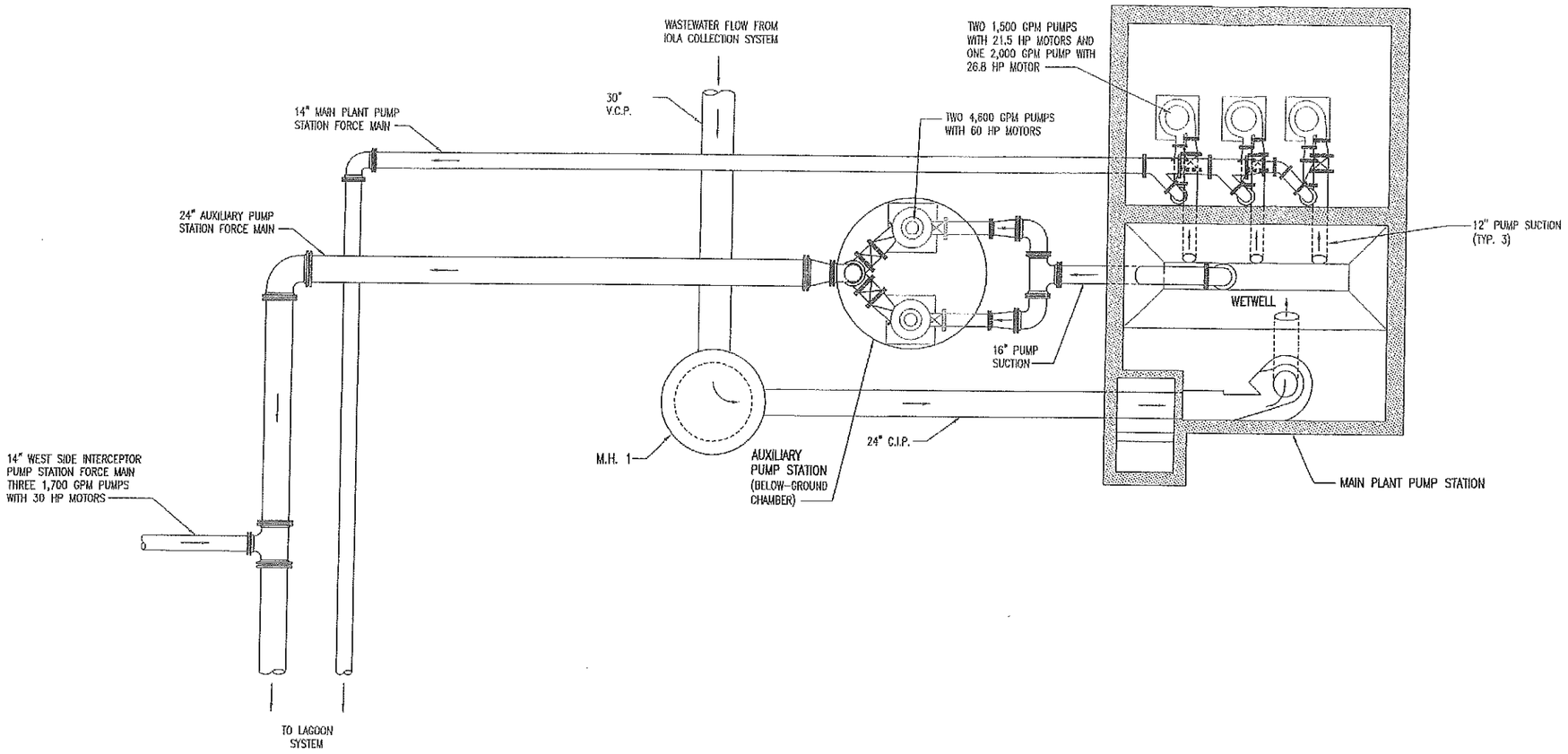

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F:\IOLA\08A54-004\REPORT FIGURES\08A54-004-FIG-02

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FIGURE 2
EXISTING MAIN PLANT PUMPING LAYOUT
MAIN PLANT PUMPING ASSESSMENT

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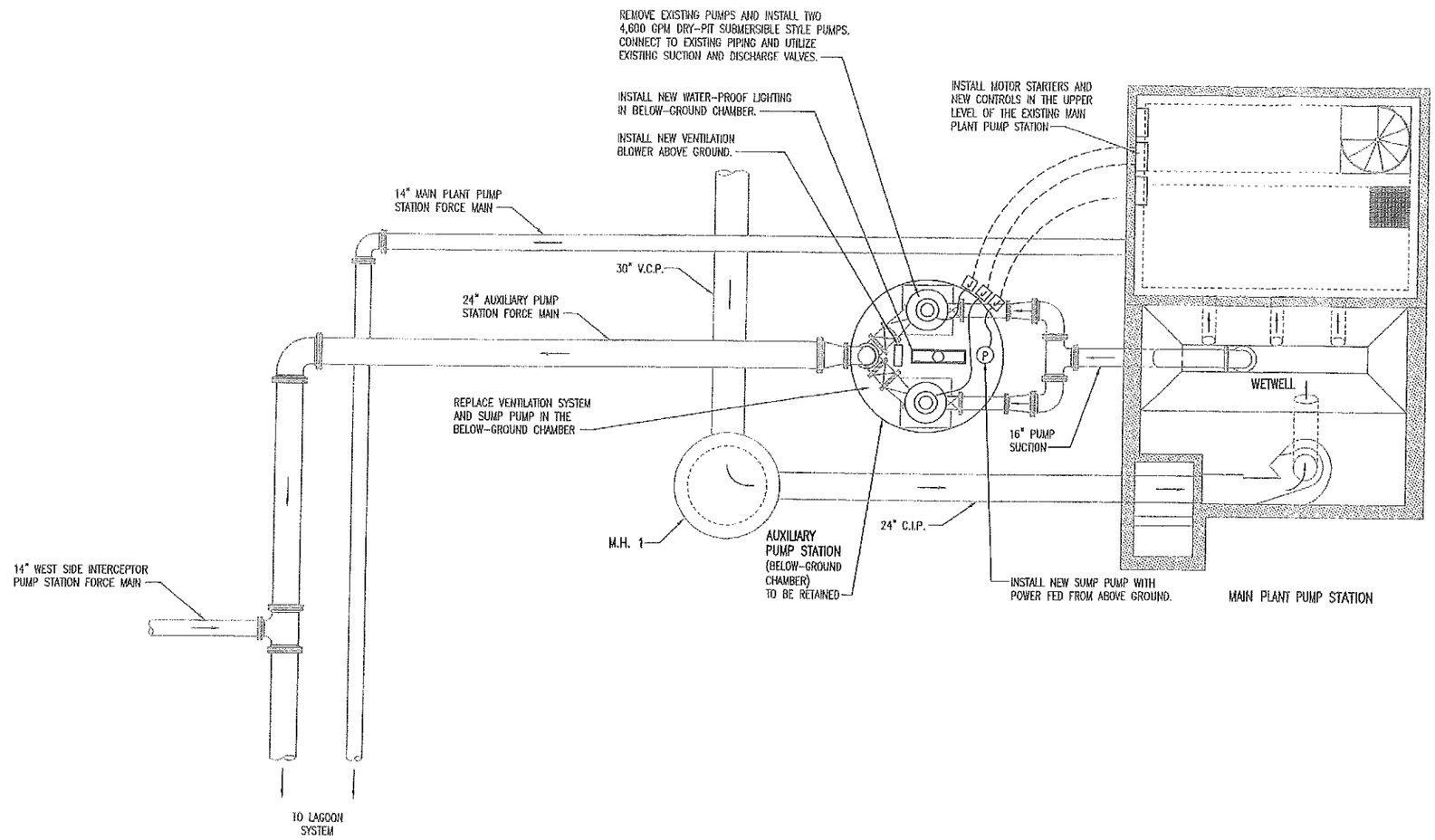

SEE FIGURE 1 FOR THE RECOMMENDED LOCATIONS OF FORCE MAIN ISOLATION VALVES APPROPRIATE FOR ALTERNATIVE 1.

No	Revision	By	Date

FIGURE 3
ALTERNATIVE 1 – PUMP CHANGE OUT AND CONTROL RELOCATION
MAIN PLANT PUMPING ASSESSMENT

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FIG.

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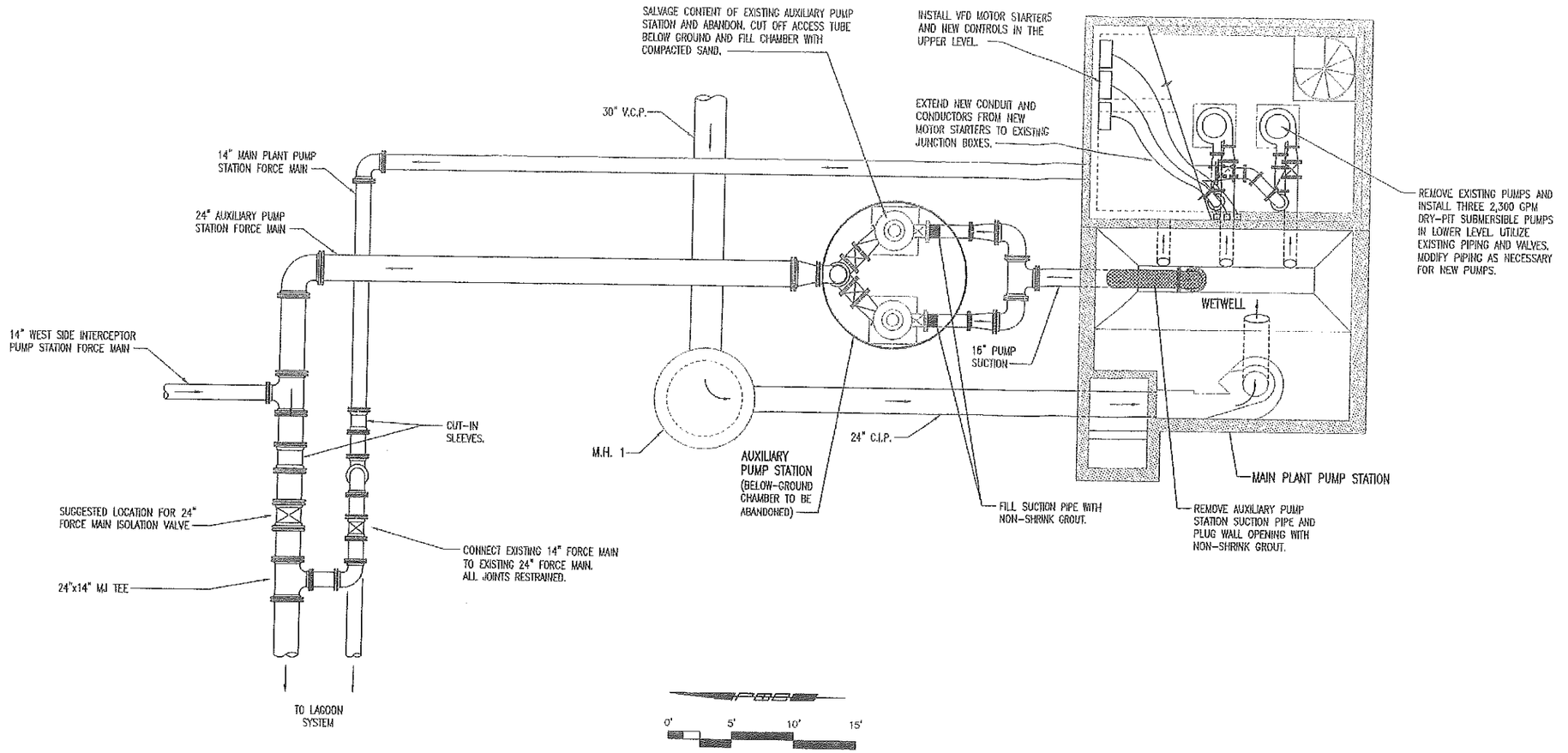
F:\2008\08A54-004\REPORT FIGURES\08A54-004-FIG-03



ALTERNATIVE 2 – FORCE MAIN MODIFICATIONS
NOT TO SCALE

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FIGURE 4
ALTERNATIVE 2 – MAIN PLANT
PUMP STATION PUMP CHANGE OUT

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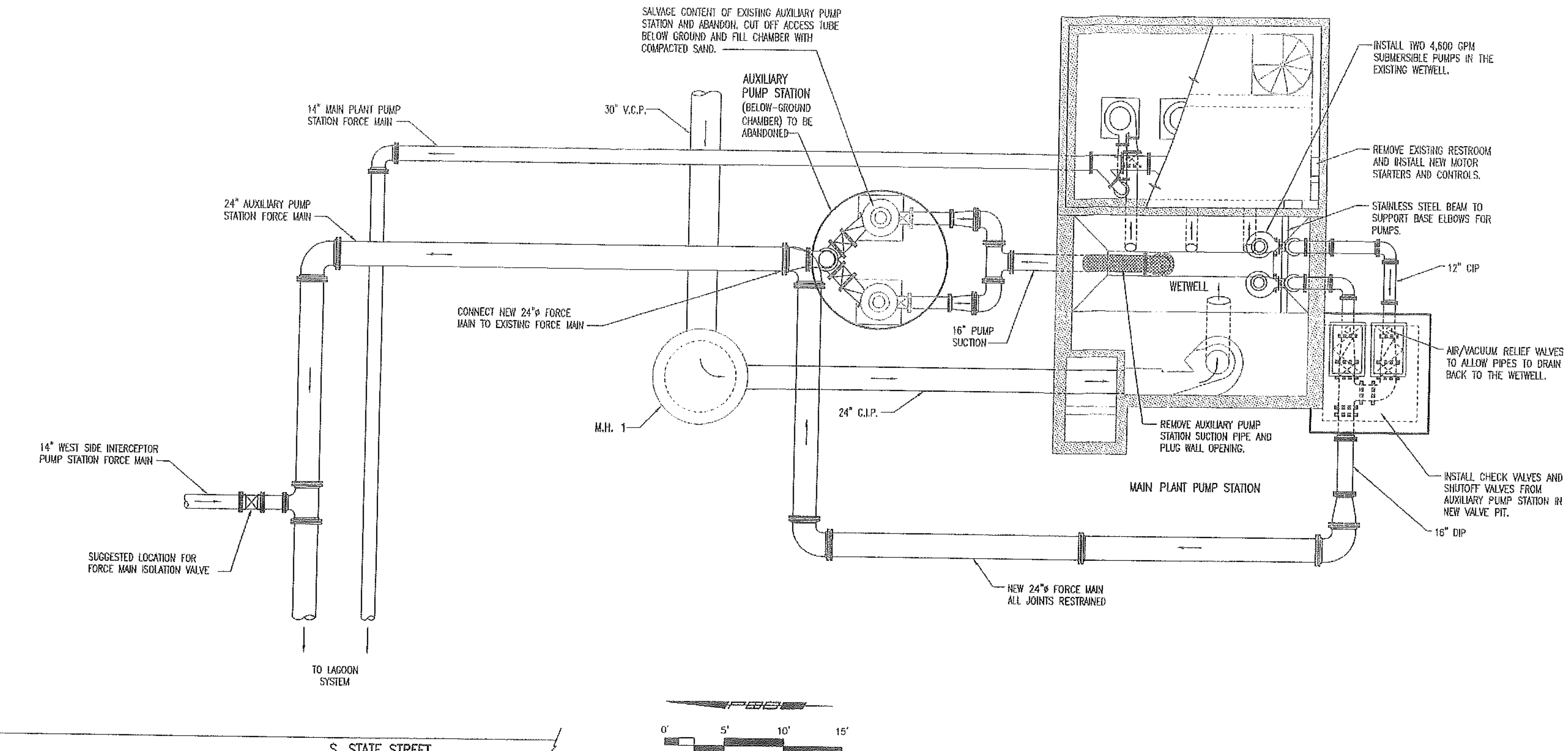

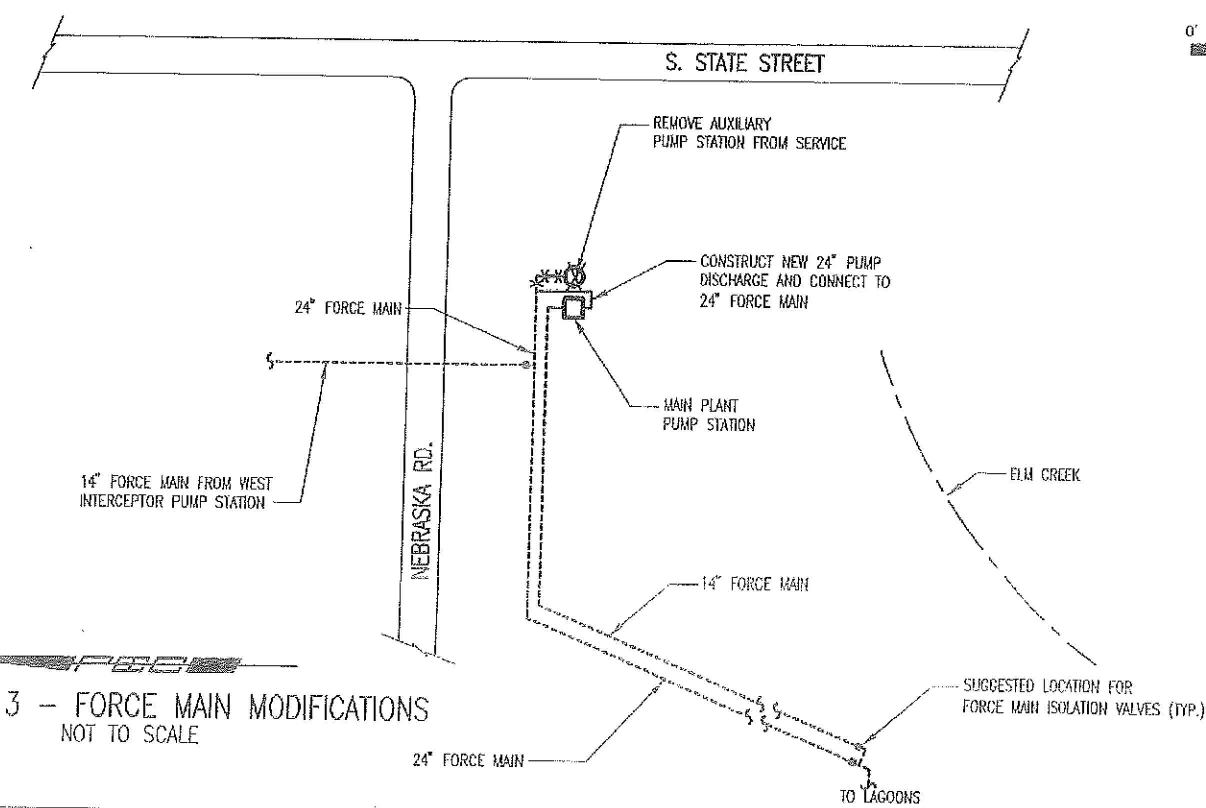

ALTERNATIVE 3 – FORCE MAIN MODIFICATIONS
NOT TO SCALE

No.	Revision	By	Date

FIGURE 5
ALTERNATIVE 3 – SUBMERSIBLE PUMPS IN THE WETWELL
MAIN PLANT PUMPING ASSESSMENT

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