Response to:

Independent Assessment of Indianapolis Power & Light's Downtown Underground Network

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Introduction

Indianapolis Power & Light Company (IPL) has drafted the following information in response to the recommendations of the "Independent Assessment of Indianapolis Power & Light's Downtown Underground Network" by O'Neill Management Consulting dated December 13, 2011, or "O'Neill Report". The recommendation section has been included for reference in Appendix E of this submission. We appreciate the independent assessment of O'Neill Management Consulting which has provided us additional information to use as we continually strive to improve our business practices.

Our mitigation measures exemplify these four key points:

- **Our downtown network is safe and reliable.** We remain committed to implement actions to minimize the risk and impact of potential future events.

- **We are committed to safety and continuous improvement.** At IPL, Safety is our first value, but it goes hand in hand with our value to Strive for Excellence. We are committed to safety, both for the public and our employees, and continuously improving. We have taken a number of actions to make improvements to our downtown network throughout 2011, prior to, during the audit period, and following the report publication.

- **We have significantly enhanced our working relationship with Citizens Thermal.** We have reviewed the external factors that can impact our underground system including steam facilities. We have developed concrete plans to improve operational communications and field actions described further in this report.

- **We fully cooperated with O'Neill in their investigation.** We are committed to implementing the recommendations in the O'Neill Report over the next 24 months to continue to provide safe reliable service.

A description of IPL's action plan for each of the ten report recommendations follows, supplemented by the Implementation Schedule which comprises Appendix A. IPL will provide status updates to the Commission during scheduled meetings at the request of the Commission and in annual "IPL Update to the O'Neill Recommendations" filings to the Commission by January 31, 2013 and 2014.

Tier I Recommendations

The first five recommendations were identified as "highest emphasis" or Tier I in the O'Neill report. IPL action items and milestones are listed for each recommendation. Appendix A includes a comprehensive implementation schedule as well.

Consultant Recommendation:

1. Immediately identify and address, presumably through coordination with Citizens Thermal, all manholes that have been too hot to safely enter and inspect. After mitigating the heat, inspect the holes, including measuring the current in all secondary leading from each such manhole. Where necessary, replace cable that has been significantly damaged by the heat.

   IPL Response

   Staff from IPL and Citizens Thermal met with O'Neill Management Consulting to review Recommendation 1 from the O'Neill Report. The purpose of the meeting was to discuss the report findings and what actions the two companies should take to address the recommendation.

   Prior to the meeting on January 4, 2012, IPL and Citizens Thermal have worked closely together. Between the two companies we are responsible for the majority of underground facilities located within the downtown Indianapolis area. Because of this fact, it is important for the two companies to work together and to cooperate with each other and with the other utilities that share the right-of-way. Described below are key steps that IPL and Citizens Thermal have taken or have been accomplished prior to the meeting on January 4th.

   - *Engineering and Operations leadership from IPL and Citizens Energy Group met on December 8, 2011, to discuss the coordination of communication between the two companies. A number of issues were discussed and it was agreed that periodic meetings of this group would be beneficial to share lessons learned and develop joint plans for operational, risk assessment and data sharing practices in the future. The next meeting of this group is scheduled for February 8, 2012.*

   - *Citizens Thermal has provided IPL with steam data and GIS data that shows the location of Citizens' manholes and steam lines. IPL has taken this data and incorporated it into a map that shows the location of IPL's manholes and vaults. The GIS staffs of both companies continue to work together to refine the map products. A sample of the new maps that have been created are attached as Appendix B.*

- *Citizens Thermal annually performs an infra-red survey of their steam system looking for temperature anomalies. Typically this survey is conducted in February each year. Citizens has agreed to share the results of the 2012 survey with IPL. Additionally, Citizens will provide IPL with survey data results since 2001 during the week of January 9th. IPL will use this information to help determine areas where significant cable damage from heat has occurred. A representative sample of cables from these areas will be obtained for laboratory analysis and evaluation.*

a) Immediately identify and address all manholes that have been too hot to safely enter and inspect.

- IPL Actions to Date

  From IPL's prior manhole inspection data, the Company identified twenty-one (21) manholes that needed to be re-inspected. Those inspections took place the week of November 28, 2011. Six (6) manholes were found to still be too hot to enter. Citizens Thermal mitigated the heat issues and IPL has entered and inspected all of those manholes, and no found no damage.

- IPL Commitments

  Citizens Thermal has committed to provide IPL with the prior 10 years of their infra-red survey results. IPL will take that data and merge it with IPL's failure data to identify additional manholes that should be evaluated for potential cable damage from prior steam leaks. The evaluation will include taking current reading on secondary cables looking for current imbalance or current fluctuations which could be an indication of the cable insulation breaking down. The evaluation will also include collecting additional cable samples, if warranted, to be sent out for laboratory analysis and evaluation. Based on the findings of both of these evaluation methods the cables will be replaced where warranted.

- Deliverables

  IPL has completed this portion of the recommendation and will report the results of the further analysis in meetings at the request of the Commission.

b) After mitigating the heat, perform inspection.

- IPL Actions to Date

  The manholes deemed too hot to enter have all been inspected and no damage was observed. Cable samples have been taken and sent for laboratory analysis. Preliminary results are expected by mid-April 2012.

- IPL Commitments

  IPL and Citizens Thermal have committed to notifying each other immediately when a steam leak or high heat condition is found. A notification process has been put in place so that the appropriate people at each company receives the information. Telephone calls with follow-up emails will be used. IPL has established a special joint email address to be used for these notifications. This will allow Citizens to use a single email address to notify multiple people at IPL to receive the information.

  IPL will inspect manholes and vaults in a timely manner that have been exposed to high heat from steam leaks upon notification by Citizens Thermal that the situation has been mitigated.

  IPL will commit to notifying Citizens Thermal if a hot manhole or vault is discovered during routine work activities or during scheduled inspections in a timely manner.

- Deliverables

  Starting in January 2012, Citizens Thermal will begin providing IPL with a monthly report of steam anomalies that they are aware of. The report will include new anomalies, active anomalies, and the status of prior reported anomalies. This will provide for better tracking between the two companies on the status and locations of issues.

c) Where necessary, replace cable that has been significantly damaged by the heat

- IPL Actions to Date

  IPL has sent cable samples for laboratory analysis to determine if it has been significantly damaged by heat.

- IPL Commitments

  IPL is committed to replacing cables that laboratory analysis indicates the cable insulation is significantly damaged by heat.

Going forward IPL plans to utilize laboratory analysis for evaluating selected cables exposed to high levels of heat from steam leaks to determine if the cable insulation has been significantly damaged as part of IPL's asset management strategy.

- Deliverables

IPL will replace any cables that have been identified by laboratory analysis as having sustained significant cable insulation damage from exposure to high levels of heat within approximately 60 days of receiving laboratory results.

It is IPL's understanding that Citizens Energy will commit to the following for commitments for Recommendation 1:

a) Provide historic infra-red survey results with IPL by January 13, 2012, and was delivered on January 13th .
b) Utilize the joint email address to notify IPL of steam anomalies and mitigation status.
c) Provide a monthly report of steam anomalies and mitigation measures by the 5th business day of the following month beginning in January 2012. (The first report is due February 7th.)
d) *Respond to IPL notifications of hot manholes or vaults in a timely manner.*
e) Meet periodically with IPL operations and engineering staff to share lessons learned and develop joint plans for operational, risk assessment and data sharing practices. (The next meeting is scheduled for February 8th.)

Consultant Recommendation:

2. Improve the program of inspection and repair of manholes and vaults, re-focusing the work force on finding not just conditions indicative of imminent failure but also those that might cause excessive stress or might lead to a failure under some not unlikely circumstances. Furthermore, do the repairs indicated by such an enhanced program of inspection.

IPL Response

a) Improve the program of inspection and repair of manholes and vaults

- IPL Actions to Date

IPL has developed an enhanced inspection form that will be used for the 2012 manholes inspections. On January 7th, IPL conducted initial training for the new form. It was used to complete an off-cycle manhole inspections by January 19th prior to the 2012 Super Bowl. IPL will improve the forms as needed based on results and feedback. A sample of the new inspection form is attached as Appendix C. New tablet computers have been purchased and will be programed and ready for a field trial by the end of January 2012.

- IPL Commitments

IPL is creating a detailed inspection procedure document with pictures of examples of acceptable and unacceptable conditions. We will develop logic into the inspection process to implement business rules in the field. We will conduct additional training by February 15, 2012, for the tablet computers to be used in the field beginning March 1, 2012. The inspection program will be reviewed annually.

IPL will complete quality inspection audits to determine the effectiveness of the new procedures throughout 2012 and 2013. IPL will use a third party auditor to field check samples of inspection reports for accuracy and consistency. The inspection program, inspector training, and report criteria will be an iterative process and will be improved based on audit results. IPL will also prioritize future inspections based on specific equipment and conditions reported.

IPL will strive for continuous improvement of the inspection process. Experience from internal construction audits and quality improvement efforts will be applied to the inspection program.. We will apply similar efforts to the engineering design and construction activities. for the downtown network in 2012.

- Deliverables

  The new handheld tablet computers will be used by crews performing inspections starting in March 2012. IPL will report the status of this endeavor in meetings at the request of the Commission and annual update reports.

b) Do the repairs indicated by such an enhanced program of inspection.

- IPL Actions to Date

  IPL has remediated four (4) issues identified between January 7 and January 19th in the off-cycle manhole inspection.

- IPL Commitments

  IPL is committed to fixing issues identified in the inspections that need attention. The prioritizing of the repair work will be condition based. Inspection results and work completed will be tracked in an Asset Management database and in IPL's Work Management system.

- Deliverables

  Beginning in March 2012 , a service level indicator will be maintained and tracked by the Asset Management group to track the status of repairs on the Downtown Network from the inspections.

Consultant Recommendation:

3. Begin a program of retrofitting termination chambers with elbow fittings, and specifying such equipment for new or replacement network transformers. Also, protect the tops of network transformers with deflector shields, and specify corrosion-resistant tops for new transformers.

IPL Response

a) Begin a program of retrofitting termination chambers with elbow fittings, and specifying such equipment for new or replacement network transformers.

- IPL Actions to Date

IPL staff discussed the recommendation to change the termination chamber on network transformers to an elbow type termination with the O'Neill staff. IPL plans to utilize a 600 Amp bolted elbow connector.

- IPL Commitments

IPL will adjust its standard transformer specification to include this requirement to eliminate the termination chamber by the end of the 1st quarter of 2012. A 600 amp bolted elbow connector will be used with 4/0 copper conductor for each transformer. IPL will initiate a request for quotes (RFQs) to retrofit stock units in the 3rd quarter of 2012 and have them available to start being used beginning in the 4th quarter of 2012 for transformer replacements after that time. IPL will evaluate the replacement units and determine the effectiveness of the modified units during 2013.

- Deliverables

IPL will report the status of the specification changes, purchases and installations beginning in its 2013 annual update report.

b) Protect the tops of network transformers with deflector shields, and specify corrosion-resistant tops for new transformers.

- IPL Actions to Date

To date IPL has installed sixty-six (66) deflector shields as network transformers have been replaced. IPL believes they are a cost effective solution to protecting the transformer tops from corrosion. The parties discussed using deflector shields over changing the material specification for the tops of the transformers to stainless steel since the shields protect the

transformers from debris, which is believed to be a cause of potential corrosion. O'Neill noted IPL's effective construction practices that minimize corrosion including placing rails under the transformer to avoid moisture on the floor of the vault, placement in the center of vaults to avoid scraping the bottom or sides of the units, and current practice of repainting and replacing units with evidence of rust.

- IPL Commitments

  IPL will formally document the use of deflector shields in its vault construction standards by the end of the 1st quarter of 2012. IPL will identify locations from the approximate 140 remaining vaults with harsh environments, that is, those exposed to road salt, excessive debris, or other factors, as part of its asset management strategy to select and install additional shields by the 4th quarter of 2012, and evaluate the shield effectiveness by the 4th quarter of 2013.

- Deliverables

  IPL will report the status of the specification changes and installations in meetings at the request of the Commission and annual reports.

Consultant Recommendation:

4. Begin a program of replacement of certain failure-prone network protectors, such as those with an aluminum bus, and also those that show evidence of water ingress despite being designed to be submersible. In some cases, a simple repair may suffice to remediate the latter condition. Continue to replace network transformers and network protectors found to be in such poor condition that failure is likely.

IPL Response

a) Network Protectors with Aluminum bus

- IPL Actions to Date

IPL has worked with Charlie Fijnvandraat, of O'Neill Management Consulting to identify the potential locations on the IPL system of network protectors with aluminum bus work. We have provided the manufacturers with our network protector serial numbers to help determine which protectors may have been manufactured with aluminum bus work. To date, twenty-nine (29) protectors have been identified as needing to be checked to see if they have aluminum bus work Templates have already been fabricated to be used to measure the thickness of the bus.

- IPL Commitments

IPL is committed to identifying which network protectors in its system have aluminum bus work. While IPL has not had any issues with network protectors with aluminum bus, the industry as a whole has and has moved to remove these protectors from service. Because of this industry experience, IPL will implement a program to either replace or monitor these protectors.

- Deliverables

  - *By the end of the 1st quarter 2012, IPL will work with the manufacturers to identify the year of manufacture where needed for as many of the remaining network protectors as possible. .*

  - *By the end of the 1st quarter 2012, IPL will sample 33% of the protectors manufactured within the range of years in question that may have aluminum bus.*

b) Action for those that show evidence of water ingress

- IPL Actions to Date

  IPL crews note external evidence of water ingress during regular inspection processes and remediates equipment based on conditional assessments.

  IPL currently crews open and vent all network protectors due to historic issues with toluene gas in certain Westinghouse units. IPL has discussed the concern raised in the O'Neill Report that this practice may be contributing to some of the moisture issues with network protectors with field crews to develop a strategy to modify operating procedures. This strategy includes testing for toluene gas in vaults. In addition, IPL has developed a strategy to identify units with potential water ingress as described below.

- IPL Commitments

  i) IPL will begin inspecting and pressure testing network protectors that are identified as having aluminum bus work to determine evidence of water ingress in the 1st quarter of 2012. Units will be scheduled for replacement as warranted.

  ii) IPL plans to revise its field procedure to require crews to pressurize network protectors after they have been opened. This change will help to assure that the network protector has been properly sealed and will prevent the ingress of water.

  iii) IPL will retest the network protectors with the toluene gas issue and confirm that toluene gas is no longer present by the end of the 3rd quarter of 2012. Once this is confirmed the practice of venting a network protector before manually operating will be revoked. This should help reduce damage to the door gaskets on the network protectors and allow them to seal properly.

  iv) Those protectors found to be in good condition with no signs of rust or moisture ingress into the protector and can hold pressure, will be noted for future inspection tracking but not replaced..

  v) For those protectors found to be in good condition but cannot hold pressure, crews will complete maintenance tasks such as replacing door gaskets to successfully seal the unit. If the protector will not seal and hold pressure it will be scheduled for replacement.

vi) Those protectors showing signs of rust on the case or evidence of moisture ingress will be scheduled for replacement based upon a conditional assessment.

- Deliverables

  IPL will provide updates to the Commission in meetings at the request of the Commission and annual update reports.

c) Continued replacement network transformers and network protectors

- IPL Actions to Date

  Over the years, IPL has averaged six to eight network transformer condition-based replacements each year.

- IPL Commitments

  IPL is committed to replacing equipment that is deteriorated or warrants replacement because of its condition or other factors as part of our asset management strategy.

- Deliverables

  IPL will report actual equipment replacement volumes in 2013 and 2014 annual update reports.

Consultant Recommendation:

5. Improve the process of asset management by dedicating additional resources to development of equipment databases and processes that facilitate effective failure analysis and resource planning for condition-based equipment maintenance and replacement that goes beyond imminent failure.

IPL Response

a) Improve the process of asset management by dedicating additional resources to asset management

- IPL Actions to Date

IPL has been utilizing the resources of an outside contractor to help supplement the staffing of the Asset Management group. The contractor has helped to setup a number of tracking reports and has been helping to write a number of asset management procedure documents.

- IPL Commitments

IPL recognizes the need to dedicate additional full time resources to the asset management process. IPL management has approved the addition of an engineer to the Asset Management group and has posted that opening. Once interviews are completed, an offer will be extended to fill the position in a timely manner. IPL will also continue to utilize the assistance of the outside contractor. IPL is committed to assigning the staffing necessary to the asset management process to achieve the desired goals.

Staffing and technology alone will not make IPL's asset management process successful. This will be a longer term effort to implement the processes and procedures and the culture change needed for an effective asset management process. This will be an iterative process to develop, implement, and adjust a number of processes and procedures. This will be accomplished by having O'Neill Management Consulting involved in the process to review and comment on IPL's progress.

- Deliverables

  - *IPL will provide a status report on the staffing in meetings at the request of the Commission and in the annual reports for 2012 and 2013.*

- *IPL will provide a status report on the progress being made to implement the asset management process in meetings at the request of the Commission and in the annual reports for 2012 and 2013.*

b) Effective failure analysis process

- IPL Actions to Date

  IPL developed a new Failure Analysis form that was implemented in August of 2011. For all network failures since that date, the form has been used to record information concerning the failure. A Microsoft Access (MS) Failure Analysis database was created to store this data and the events since August have been recorded in the database.

  IPL has also implemented a formal asset performance management software system (Ivara) to help improve the asset management process. This software facilitates tracking conditions and indicators to formalize and prioritize decision making along with being a data repository of key asset information.

- IPL Commitments

  IPL will populate the MS Access Failure Analysis database through this Failure Analysis form with all available information for failures that occurred in 2011 by the end of the 1st quarter 2012 to be used for data analysis purposes.

  IPL will continue to leverage the Ivara enterprise asset management software. This includes storing inspection data, building algorithms to formalize the decision making, and feeding prioritized work to our work management system.

- Deliverables

  IPL will report any future downtown network events by email in the same way it reports major storms to the Commission. In addition, IPL will revise documentation for the formal root cause failure analysis by the 2nd quarter of 2012.

c) Resource planning for condition-based equipment maintenance and replacement that goes beyond imminent failure.

- IPL Actions to Date

  IPL will be expanding its staff to include additional resources to help with the development and improvement of asset management databases and processes. Internal and external personnel, including an engaged consultant with over 36 years of related electric utility experience in the asset management and reliability field, are committed to completing the recommendations described in this response document.

  IPL assesses the condition of equipment including transformers, network protectors, termination chambers, primary cable, secondary cable, manhole structures, and vaults enclosures based on physical attributes and environmental factors. Abnormal conditions are identified during regular inspections and repaired on the basis of priority. Over two-hundred fifty (250) unique equipment repairs were remediated in 2011. Five network transformers and three network protectors were proactively replaced in 2011.

- IPL Commitments

  IPL is in the process of reviewing and revising its practices to include the findings. We will continue to enhance inspection processes to more effectively determine plans for condition based facility renewal plans. The probability of possible future event occurrence and impacts on public safety will be further enhanced in a matrix as one input along with other recommendations in the O'Neill report such as changes in material specifications to revise strategies for each asset.

  IPL will complete this process and address the status in meetings at the request of the Commission. IPL will continue to review resource requirements and if necessary assign or acquire additional resources.

- Deliverables

  IPL will complete this condition-based equipment maintenance and replacement analysis by the 3rd quarter of 2012 and address the status in meetings at the request of the Commission.

Tier II Recommendations:

The next set of recommendations were list as Tier II in the O'Neill report. These recommendations were described as the next level to be addressed after the Tier I recommendations. The Tier II recommendations will in some cases take a longer time to implement and complete.

Consultant Recommendation:

6. Evaluate technology for electronic capture of field inspection findings through the use of handheld devices, such as tablets, smart phones, or other means. Integrate this with recommendations 1), 2), and 5) above.

   IPL Response

   a) Evaluate technology for electronic capture of field inspection findings through the use of handheld devices, such as tablets, smart phones, or other means.

      - IPL Actions to Date

        IPL purchased tablet computers for initial testing and evaluation. Those devices were delivered the week of January 6, 2012. They will be programed and ready for initial field trials by the end of January 2012.

      - IPL Commitments

        IPL is committed to the use of tablet computers to capture and process inspection results. This will improve the inspection results by incorporating the business rules into the inspection process. The end goal is to have the business rules built into the inspection process. IPL will initially use the Ivara Asset Management software currently being implemented to accomplish this goal. IPL will continue to evaluate the effectiveness of the Ivara software to meet the commitment of having the business rules built into the inspection process and the tablet device. IPL will be prepared to use another solution for the tablet devices should it be determined the Ivara software is not providing the intended results.

      - Deliverables

        By the end of the 1st quarter 2012, IPL will utilize tablet computers for inspections. By the end of the 3rd quarter 2012 evaluate the effectiveness of the Ivara software for enforcing the business rules on the tablets for the inspections.

b) Integrate this with recommendations 1), 2), and 5) above

- IPL Actions to Date

  IPL has acquired tablet computers to capture data electronically in the field using the enhanced inspection form and procedures described in #1.

- IPL Commitments

  - *IPL will evaluate options to make the Citizens facility information available on the tablets through a map viewer following the GIS database project completion in Q4 2012. (See recommendation #1)*

  - *IPL is committed to using a tablet device to capture enhanced inspection data. The training guides with picture examples will be loaded on the computers for easy access in the field. The use of these devices allow the business rules to be built into the inspection process which will help improve the inspection results.*

    IPL is committed to initiate processes and procedures to electronically transfer data from the enhanced inspection forms (as described in recommendation #2) directly into its Asset Management System to evaluate results more effectively, systematically and holistically (See recommendation #5). IPL will review and improve the processes based on internal reviews, changes in technology, and other information.

- Deliverables

  - *By the end of the 1st quarter of 2012, IPL will have tablet computers programmed and ready for initial field trials.*

  - *By the end of the 1st quarter of 2012, IPL will have the processes and procedures in place to transfer data from the tablet device directly into the Asset Management System.*

  - *IPL will review the inspection results, audit findings and inspection processes annually to identify areas of improvement.*

  - *IPL will report the status of these efforts in meetings at the request of the Commission and annual update reports in 2013 and 2014.*

Consultant Recommendation:

7. Re-examine the SCADA project, re-focusing on the data that such equipment will capture, and managing the stages of implementation so as to get benefits from even partial implementation as the project progresses.

IPL Response

- IPL Actions to Date

IPL's SCADA plans for the Central Business District include incorporating eleven (11) gateway vaults to bring back information from each network protector connected to a transformer on the system. A gateway vault includes information from up to thirty (30) transformers. To date, five (5) gateway vaults are connected in the SCADA system and sending data to the system operators multiple times per hour. The operators are monitoring the system which helped to identify one transformer issue in July prior to an equipment outage.

Each network protector sends status information as well as voltage, current and calculated loading. A listing of the data points comprises Appendix D. Given the incremental nature of the roll-out, IPL is in the process of developing business practices through discussions with operations staff to optimize the system. This task was established as part of the overall DOE Smart Energy Project which is on schedule and within budget.

While the use of fiber optic cables enables a large data bandwidth there are other constraints of the remote terminal units (RTUs) that act as data collectors and the database itself. IPL actively manages the addition of data points to optimize the system's effectiveness.

IPL anticipates the SCADA project as part of its incremental plans to use communication enabled or "smart" devices to enhance operations. The infrastructure being installed is scalable for future phases of the project. The current budget and DOE grant opportunity is limited in scope and duration, so IPL will focus on finishing the project as planned by April 2013 before considering expansions.

IPL considered the O'Neill discussion about specific issues on page 70 of the report. We are learning through experience with each gateway vault connection how to complete communications testing more efficiently. As O'Neill mentioned on page 69, underground networks present communications challenges which are being overcome. We are improving our understanding of the data being received and plan to create real-time reports in the near future. We are open to adding counters for network

protector operations or related reports when we better understand the data and collect a significant amount of history (12 to 24 months) to determine alarm points. We look forward to learning more about the system and specific devices as we progress in the project which is scheduled to be complete in Q2 2013.

- IPL Commitments

  By March 30, 2012 of IPL will update the deployment plan for the Network SCADA project to cover the plan and schedule for bringing the remaining vaults on line and the data that will be brought back from each vault. This may include additional data points that are available but not currently being brought back to the Morris Street Operations Center.

  By the end of the 2nd quarter 2012 IPL will complete the identification of system users, the business benefits, and business rules and practices. In the 2nd quarter of 2012 training for the first phase of the deployment is on-going and will continue and will include sample vault data screenshots. Following final deployment, additional training and final business practices will be published in the 3rd quarter of 2013.

- Deliverables

  Complete the update of the Network SCADA Deployment plan for the remaining vaults by March 30, 2012.

  IPL will provide status updates in meetings at the request of the Commission and annual update reports.

Consultant Recommendation:

8. Continue to deploy small-scale technological advances such as thermal imaging, fault direction indicators, and lift/locking manhole covers in selected locations.

IPL Response

a) Thermal imaging

- IPL Actions to Date

IPL had previously acquired two thermal imaging cameras for evaluation for their use in manholes and vault. That evaluation proved to be successful and warranted the purchase of additional cameras. IPL now has six of the smaller format thermal imaging cameras for use in manholes and vaults.

- IPL Commitments

IPL is committed to the use of thermal imaging to find potential problems prior to potential equipment failures. The manhole and vault inspections will include an assessment with a thermal imaging camera.

- Deliverables

All manhole and vault inspections in 2012 will include an assessment with a thermal imaging camera.

b) Fault direction indicators

- IPL Actions to Date

As part of the DOE Smart Energy project IPL plan to install fault indicators on each of the forty-four (44) network primary circuits. The fault indicators will help reduce the amount of time required to locate cable faults. The fault indicators will have the ability to be interrogated from street level eliminating the need to open the manhole to check the fault indicator.

- IPL Commitments

IPL is committed to install two fault direction indicators at the first branch connection point on each of the 44 network primary circuits.

- Deliverables

  - *By the end of 2nd quarter of 2012, IPL will order the fault direction indicators.*

  - *By December 31, 2012, IPL will install two fault direction indicators on each of 44 network primary circuits for a total of 88 indicators.*

c) Swiveloc lift/locking manhole covers in selected locations

- IPL Actions to Date

  IPL purchased 156 of the Swiveloc manhole covers. To date, 150 Swiveloc manhole covers have been installed in select locations. They were installed on manholes that will be within the security perimeter for Lucas Oil stadium and other downtown areas identified to have high concentrations of pedestrian traffic.

- IPL Commitments

  IPL believes that the Swiveloc manhole cover provides an additional degree of security from unauthorized access to the manhole and provides improved public safety should an over-pressurization event should occur by keeping the manhole cover captured. The plan is to monitor the Swiveloc covers that have been installed to see if there are any access issues or problems with unlocking the covers after a year in service and exposure to the elements. IPL will contact other utilities in cold weather cities to obtain their experience with the Swiveloc cover. IPL will re-evaluate the Swiveloc covers by the 4th quarter of 2013 or sooner depending on IPL's field experience and the experience of others to determine if further deployment is warranted.

- Deliverables

  IPL will prepare a report on the effectiveness of the Swiveloc cover, any operational issues or concerns, and recommendations on further use of the covers for inclusion in the 2014 update report.

Consultant Recommendation:

9. Continue to develop automated mapping/GIS data and applications for the downtown underground network, and develop models of secondary loads flows in the networks.

   IPL Response

   a) Continue to develop automated mapping/GIS data and applications for the downtown underground network

      - IPL Actions to Date

        IPL has engaged consulting assistance to populate its Geographic Information System (GIS) mapping system with central business district (CBD) facility data in the 4th quarter of 2011. The base map data layers are expected to be complete later this month. Citizens Thermal has provided facility information to IPL which will be incorporated into our GIS system with technical assistance from O'Neill Management Consulting.

      - IPL Commitments

        IPL will complete the GIS data population including duct runs, conductor types and footages and connectivity in August and verify information in the field as needed.

      - Deliverables

        IPL will provide status updates in meetings at the request of the Commission and annual reports.

   b) Develop models of secondary loads flows in the networks.

      - IPL Actions to Date

        Parallel efforts are underway to build the primary network and five secondary downtown networks in a modeling software system known as CYME from the core IPL facility data.

      - IPL Commitments

        IPL will complete the base model in the 2nd quarter of 2012 and complete analyses of the five (5) networks by the 4th quarter of 2012. This analysis

will include load flow studies, available fault current, and contingency analysis.

O'Neill Management Consulting suggested IPL reach out to Entergy who is using this software in New Orleans for a similar application and has provided contact information for Entergy's Subject Matter Expert. IPL will follow-up with Entergy to share lessons learned.

- Deliverables

  IPL will provide status updates in meetings at the request of the Commission and annual update reports.

Consultant Recommendation:

10. Re-evaluate Dissolved Gas Analysis on network transformers, and explore the possibilities for fire retardant dielectric in vaults.

IPL Response

a) Re-evaluate Dissolved Gas Analysis on network transformers

- IPL Actions to Date

IPL discussed its philosophy to establish a baseline for all 315 network transformers through Dissolved Gas Analysis (DGA) through the 4th quarter of 2013.

- IPL Commitments

IPL will incorporate results in its asset management database and establish the appropriate re-test cycle based on the DGA baseline results and equipment condition. In addition, if transformer failures occur, DGA testing will be completed when possible for baseline data comparison.

- Deliverables

IPL will provide status updates in meetings at the request of the Commission and annual reports.

b) Explore the possibilities for fire retardant dielectric in vaults

- IPL Actions to Date

IPL has completed some preliminary research on the use of the fire retardant dielectric fluid in equipment and placed an initial order for the (Cooper FR3) dielectric fluid.

- IPL Commitments
IPL will retro-fill the termination chambers initially in the transformer shop to solidify procedures, train staff and complete this task in the field for termination chambers based upon prioritized locations by the 4th quarter of 2013.This is a complimentary measure to the long term solution to eliminate the use of the termination chambers through 600 amp bolted connectors as new transformers are purchased (Recommendation 3A above).

- Deliverables

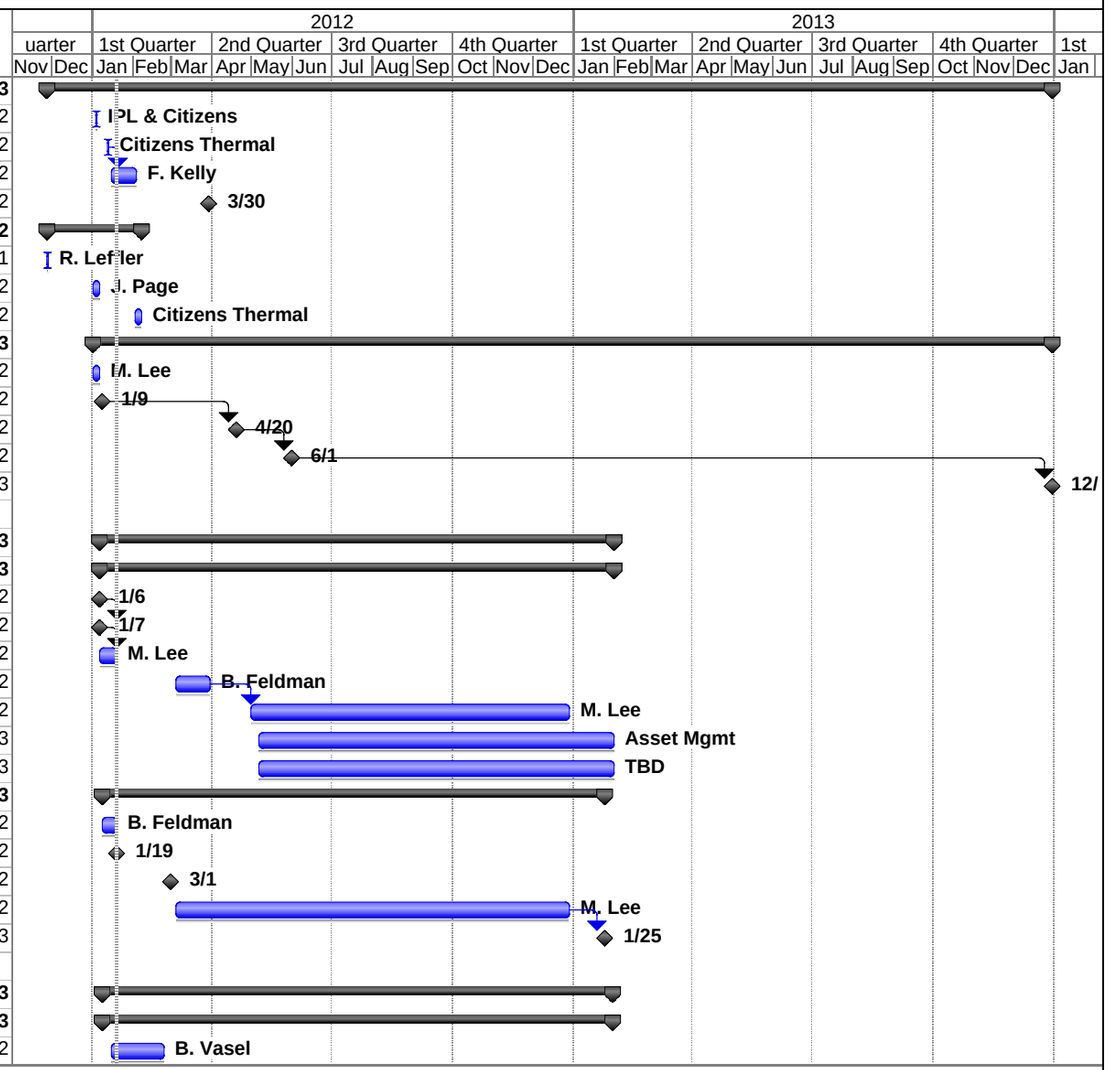
  IPL will provide status updates in meetings at the request of the Commission and annual update reports.

Summary

IPL is committed to completing the actions described herein in a timely and efficient manner. We also commit to providing a summary of accomplishments, significant findings and lessons learned for each of the ten recommendations in annually filed reports by January 31 in 2013 and 2014. In addition, IPL would be pleased to meet with the Commission staff upon request to discuss progress.

IMPLEMENTATION SCHEDULE OF NETWORK AUDIT RECOMENDATIONS

ID	Task Name	Duration	Start	Finish
1	**Rec. 1 - Coordination w/Citizens Thermal**	**547 days?**	**Mon 11/28/11**	**Tue 12/31/13**
2	Meeting Between IPL & Citizens	1 day?	Wed 1/4/12	Wed 1/4/12
3	Citizens Provide Thermal Survey Data	1 day	Fri 1/13/12	Fri 1/13/12
4	Create New GIS Map	15 days	Mon 1/16/12	Fri 2/3/12
5	Citizen to Provide 2012 Survey Data	0 days	Fri 3/30/12	Fri 3/30/12
6	**1A & B-Identify Hot Manholes**	**53 days?**	**Mon 11/28/11**	**Tue 2/7/12**
7	Identify Hot Manholes	1 day?	Mon 11/28/11	Mon 11/28/11
8	Inspect Hot Manholes After CTE Repairs	5 days?	Mon 1/2/12	Fri 1/6/12
9	Monthly Citizens Report	3 days	Fri 2/3/12	Tue 2/7/12
10	**1C - Laboratory Analysis**	**522 days?**	**Mon 1/2/12**	**Tue 12/31/13**
11	Collect Samples	5 days?	Mon 1/2/12	Fri 1/6/12
12	Send Samples to lab	0 days	Mon 1/9/12	Mon 1/9/12
13	Receive Lab Results	0 days	Fri 4/20/12	Fri 4/20/12
14	Determine Criteria for Replacing Cables	0 days	Fri 6/1/12	Fri 6/1/12
15	Replace cables as warranted	0 days	Tue 12/31/13	Tue 12/31/13
16				
17	**Rec. 2 - Enhanced Inspections**	**280 days?**	**Fri 1/6/12**	**Thu 1/31/13**
18	**2A - Improved Inspection Process**	**280 days?**	**Fri 1/6/12**	**Thu 1/31/13**
19	New Inspection Form	0 days	Fri 1/6/12	Fri 1/6/12
20	Train Field Crews on New Form	0 days	Sat 1/7/12	Sat 1/7/12
21	Begin Inspections w/New Form	10 days?	Sat 1/7/12	Thu 1/19/12
22	Tablet Computers forField Trial	20 days?	Mon 3/5/12	Fri 3/30/12
23	2012 Inspection under New Process	174 days?	Tue 5/1/12	Fri 12/28/12
24	IPL Quality Inspection Audits	194 days?	Mon 5/7/12	Thu 1/31/13
25	Third Party Quality Inspection Audits	194 days?	Mon 5/7/12	Thu 1/31/13
26	**2B - Repairs Identified from Inspections**	**274 days?**	**Mon 1/9/12**	**Fri 1/25/13**
27	Schedule Repairs - Off Cycle January Inspection	9 days	Mon 1/9/12	Thu 1/19/12
28	Complete Repairs - Off Cycle January Inspection	0 days	Thu 1/19/12	Thu 1/19/12
29	Implement Service Level Indicators	0 days	Thu 3/1/12	Thu 3/1/12
30	Schedule Repairs - 2012 Inspection Program	215 days?	Mon 3/5/12	Fri 12/28/12
31	Complete Repairs - 2012 Inspection Program	0 days	Fri 1/25/13	Fri 1/25/13
32				
33	**Rec. 3 - Material Standards**	**278 days?**	**Mon 1/9/12**	**Thu 1/31/13**
34	**3A - Termination Chamber Change to Elbows**	**278 days?**	**Mon 1/9/12**	**Thu 1/31/13**
35	Revise Network Transformer Specification	30 days?	Mon 1/16/12	Fri 2/24/12

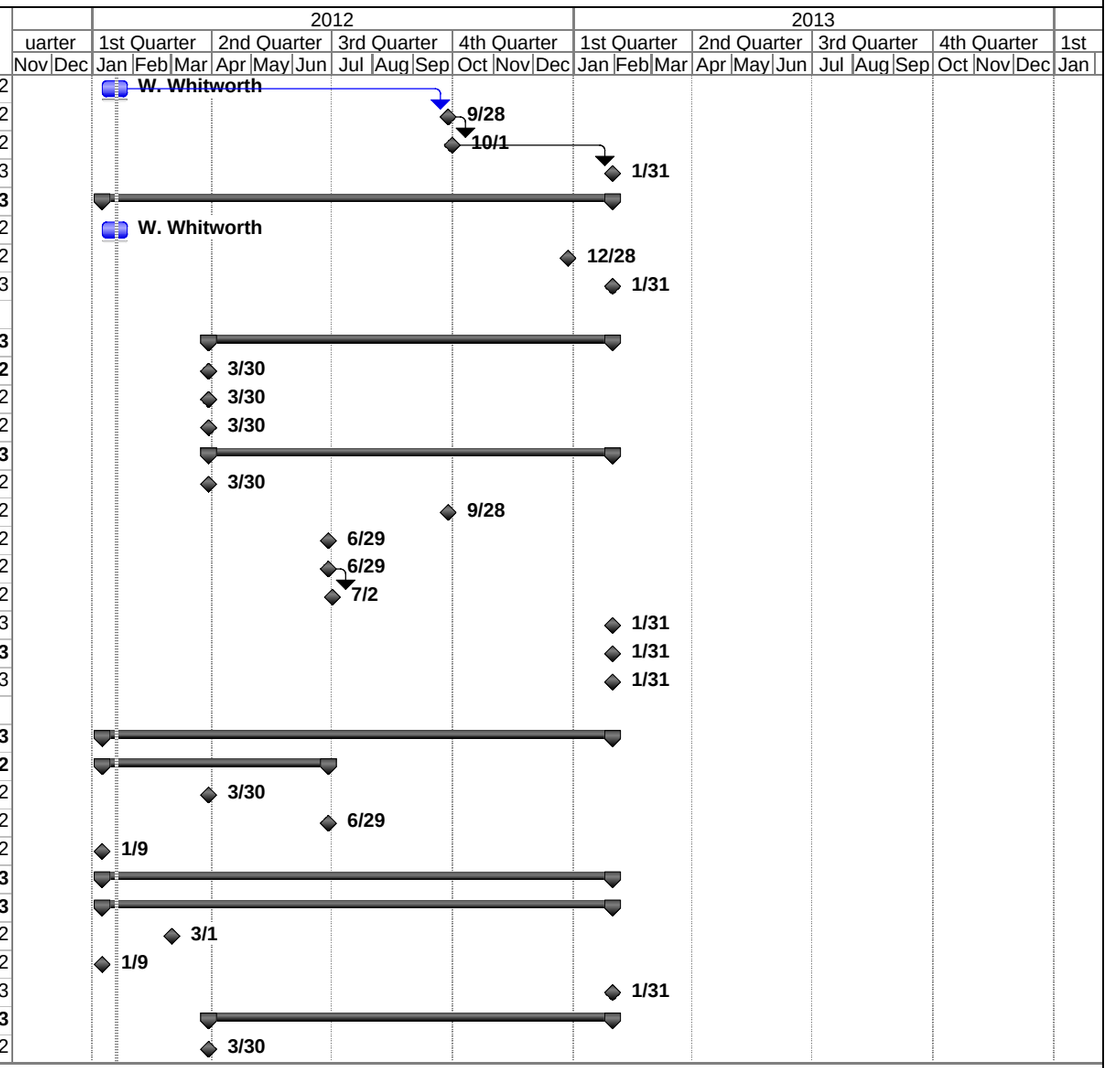


Project: Action Plan Schedule
Date: Thu 1/19/12

Task — Milestone — External Tasks
Split — Summary — External Milestone
Progress — Project Summary — Deadline

IMPLEMENTATION SCHEDULE OF NETWORK AUDIT RECOMENDATIONS

ID	Task Name	Duration	Start	Finish
36	Revised Construction Standards Drawings	15 days?	Mon 1/9/12	Fri 1/27/12
37	Modify existing stock units	0 days	Fri 9/28/12	Fri 9/28/12
38	Modified units available for installation	0 days	Mon 10/1/12	Mon 10/1/12
39	Report on Installation of Modified Units	0 days	Thu 1/31/13	Thu 1/31/13
40	**3B - Install Deflector Shield**	**278 days?**	**Mon 1/9/12**	**Thu 1/31/13**
41	Revised Construction Standards	15 days?	Mon 1/9/12	Fri 1/27/12
42	Install Additional Locations for Installation	0 days	Fri 12/28/12	Fri 12/28/12
43	Report on Installation of Progress	0 days	Thu 1/31/13	Thu 1/31/13
44				
45	**Rec. 4 - Network Protectors & Transformers**	**219 days**	**Fri 3/30/12**	**Thu 1/31/13**
46	**4A - Protectors with Aluminum Bus**	**0 days**	**Fri 3/30/12**	**Fri 3/30/12**
47	Finalize Potential Locations of Protectors with AL Bus	0 days	Fri 3/30/12	Fri 3/30/12
48	Sample 33% of Possible Units with AL Bus	0 days	Fri 3/30/12	Fri 3/30/12
49	**4B - Protectors with Water Ingress**	**219 days**	**Fri 3/30/12**	**Thu 1/31/13**
50	Begin Inspecting & Pressure Test Protectors with AL Bus	0 days	Fri 3/30/12	Fri 3/30/12
51	Complete Toluene Gas Testing of Network Protectors	0 days	Fri 9/28/12	Fri 9/28/12
52	Develop Repair Plan from Inspection Results	0 days	Fri 6/29/12	Fri 6/29/12
53	Revised Protector Venting Practice	0 days	Fri 6/29/12	Fri 6/29/12
54	Begin Repair/Replace Protectors based on New Criteria	0 days	Mon 7/2/12	Mon 7/2/12
55	Report on Progress	0 days	Thu 1/31/13	Thu 1/31/13
56	**4C - Transformer & Protector Replacements**	**0 days**	**Thu 1/31/13**	**Thu 1/31/13**
57	Continue Current Practice & Report Progress	0 days	Thu 1/31/13	Thu 1/31/13
58				
59	**Rec. 5 - Asset Management Procedures**	**278 days**	**Mon 1/9/12**	**Thu 1/31/13**
60	**5A - Failure Analysis Process**	**124 days**	**Mon 1/9/12**	**Fri 6/29/12**
61	Load Jan.-July 2011 Data into DB	0 days	Fri 3/30/12	Fri 3/30/12
62	Update RCA Procedures	0 days	Fri 6/29/12	Fri 6/29/12
63	Notify IURC of Reportable Events	0 days	Mon 1/9/12	Mon 1/9/12
64	**5B - Resource Planning for Maint. & Equip.. Replacement**	**278 days**	**Mon 1/9/12**	**Thu 1/31/13**
65	**5A - Asset Management Staffing**	**278 days**	**Mon 1/9/12**	**Thu 1/31/13**
66	Hire New Asset Mgmt Engineer (In Progress)	0 days	Thu 3/1/12	Thu 3/1/12
67	Continue use of Consultant	0 days	Mon 1/9/12	Mon 1/9/12
68	Report Progress	0 days	Thu 1/31/13	Thu 1/31/13
69	**5B - Fault Analysis Process**	**219 days**	**Fri 3/30/12**	**Thu 1/31/13**
70	Add JAN-AUG 2011 Data to the Database	0 days	Fri 3/30/12	Fri 3/30/12



Project: Action Plan Schedule
Date: Thu 1/19/12

Task — Milestone — External Tasks
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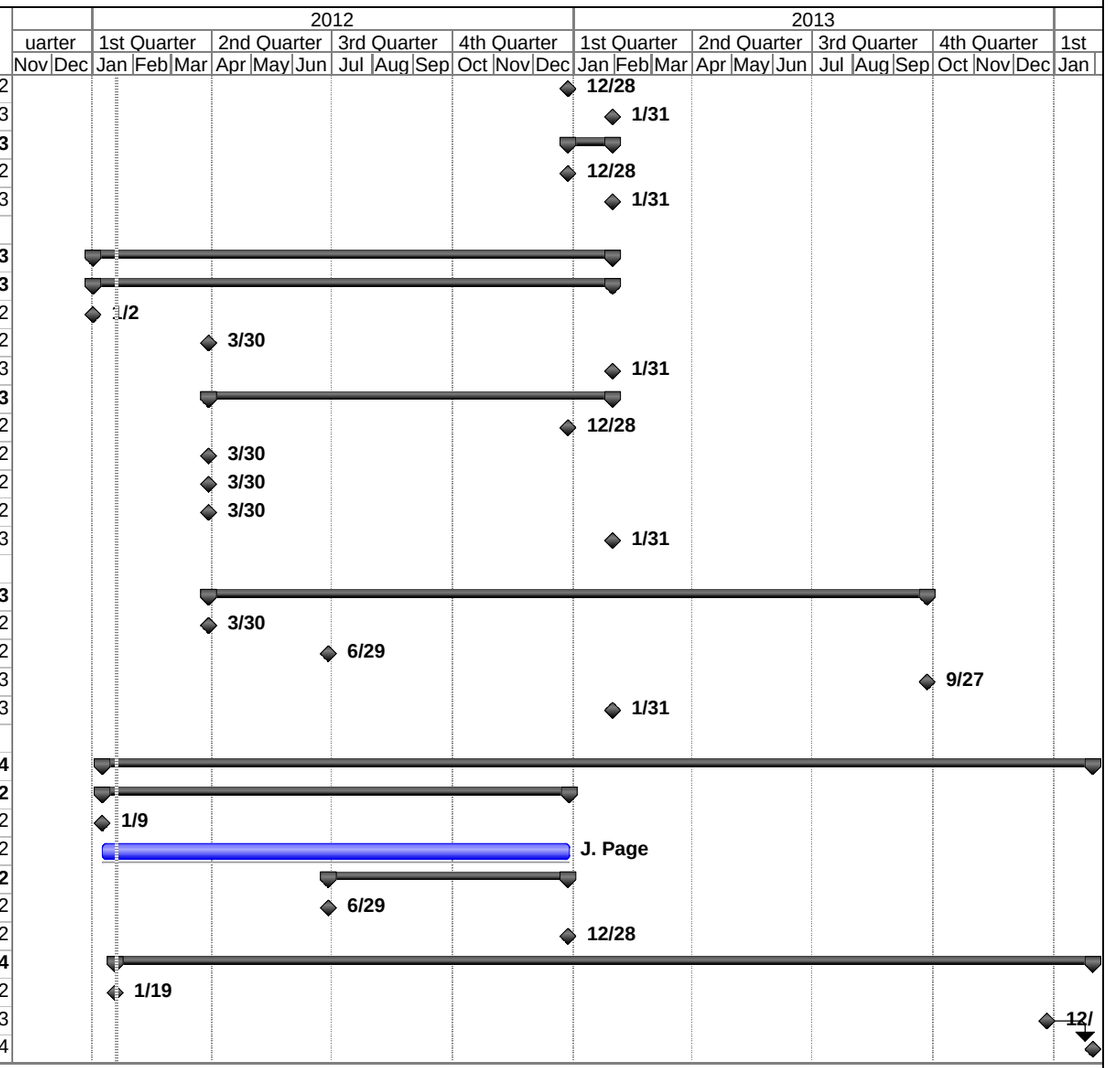
IMPLEMENTATION SCHEDULE OF NETWORK AUDIT RECOMENDATIONS

ID	Task Name	Duration	Start	Finish
71	Integrate with Ivara Asset Mgmt System	0 days	Fri 12/28/12	Fri 12/28/12
72	Report Progress	0 days	Thu 1/31/13	Thu 1/31/13
73	**5C -Condition Based Equipment Replacement Process**	**24 days**	**Fri 12/28/12**	**Thu 1/31/13**
74	Complete Development of Criteria and Process	0 days	Fri 12/28/12	Fri 12/28/12
75	Report Progress	0 days	Thu 1/31/13	Thu 1/31/13
76				
77	**Rec. 6 - Technology Improvements**	**284 days**	**Mon 1/2/12**	**Thu 1/31/13**
78	**6A - Tablet Computers**	**284 days**	**Mon 1/2/12**	**Thu 1/31/13**
79	Purchase Devices	0 days	Mon 1/2/12	Mon 1/2/12
80	Program Device & Begin Field Trials	0 days	Fri 3/30/12	Fri 3/30/12
81	Report on Progress	0 days	Thu 1/31/13	Thu 1/31/13
82	**6B - Integrate Tablet Computers with Rec. 1, 2, and 5**	**219 days**	**Fri 3/30/12**	**Thu 1/31/13**
83	Make GIS data available on Tablet	0 days	Fri 12/28/12	Fri 12/28/12
84	Rec. 1 Integration Plan	0 days	Fri 3/30/12	Fri 3/30/12
85	Rec. 2 Integration Plan	0 days	Fri 3/30/12	Fri 3/30/12
86	Rec. 5 Integration Plan	0 days	Fri 3/30/12	Fri 3/30/12
87	Report on Progress	0 days	Thu 1/31/13	Thu 1/31/13
88				
89	**Rec. 7 - SCADA Project**	**390 days**	**Fri 3/30/12**	**Fri 9/27/13**
90	Complete Update of Deployment Plan	0 days	Fri 3/30/12	Fri 3/30/12
91	Complete Identification of Users	0 days	Fri 6/29/12	Fri 6/29/12
92	Complete User Training & Final Business Practices	0 days	Fri 9/27/13	Fri 9/27/13
93	Report on Progress	0 days	Thu 1/31/13	Thu 1/31/13
94				
95	**Rec. 8 - Small scale Technology**	**539 days?**	**Mon 1/9/12**	**Fri 1/31/14**
96	**8A - Thermal Imaging**	**255 days?**	**Mon 1/9/12**	**Fri 12/28/12**
97	Acquire Additional Cameras	0 days	Mon 1/9/12	Mon 1/9/12
98	Use for with 2012 Inspections	255 days?	Mon 1/9/12	Fri 12/28/12
99	**8B - Fault Direction Indicators**	**130 days**	**Fri 6/29/12**	**Fri 12/28/12**
100	Issue Purchase Order	0 days	Fri 6/29/12	Fri 6/29/12
101	Install Indicators	0 days	Fri 12/28/12	Fri 12/28/12
102	**8C - Swiveloc Manhole Covers**	**531 days**	**Thu 1/19/12**	**Fri 1/31/14**
103	Complete Initial Installations	0 days	Thu 1/19/12	Thu 1/19/12
104	Complete Evaluation of Effectiveness	0 days	Fri 12/27/13	Fri 12/27/13
105	Issue Recommendation for Additional Covers	0 days	Fri 1/31/14	Fri 1/31/14

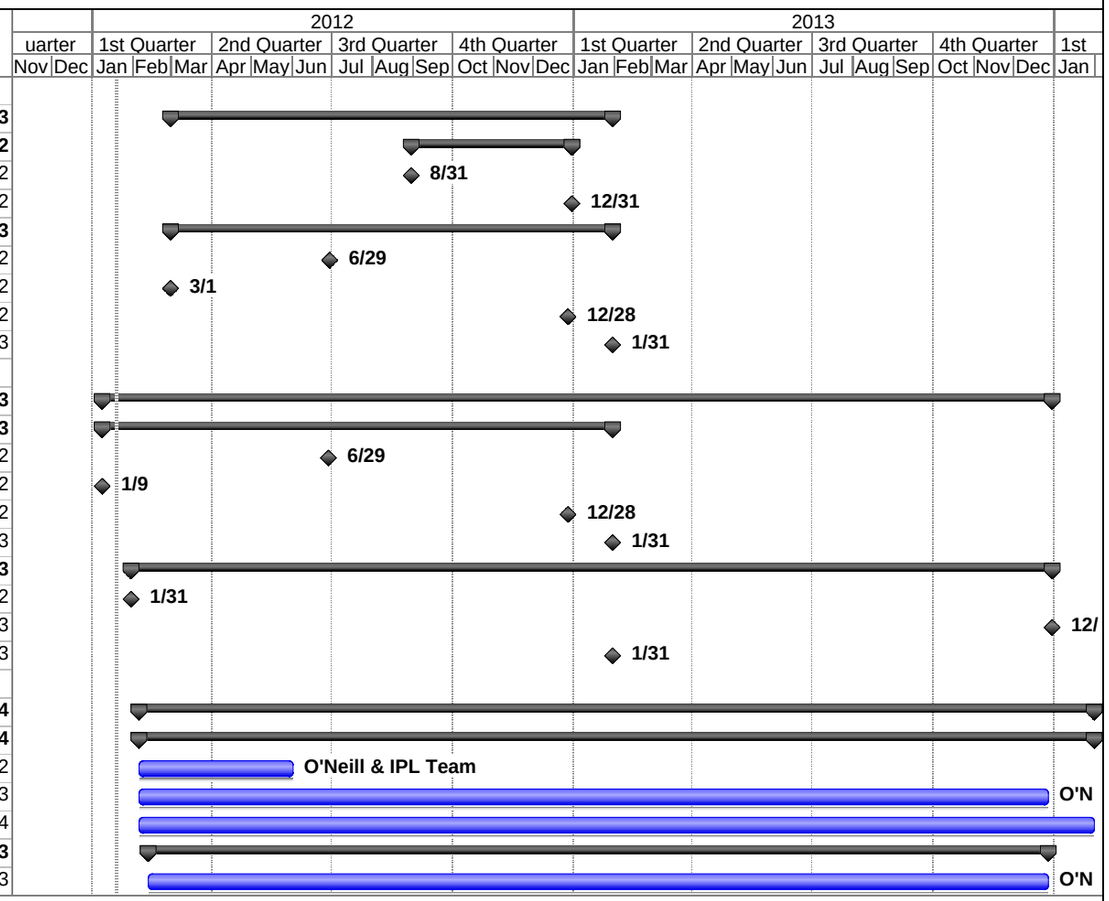


Project: Action Plan Schedule
Date: Thu 1/19/12

Task — Milestone — External Tasks
Split — Summary — External Milestone
Progress — Project Summary — Deadline

IMPLEMENTATION SCHEDULE OF NETWORK AUDIT RECOMENDATIONS

ID	Task Name	Duration	Start	Finish
106				
107	**Rec. 9 - GIS Mapping & Network Modeling**	**240 days**	**Thu 3/1/12**	**Thu 1/31/13**
108	**9A - Develop Mapping Products**	**86 days**	**Fri 8/31/12**	**Mon 12/31/12**
109	GIS Secondary Network Model	0 days	Fri 8/31/12	Fri 8/31/12
110	Verify Data	0 days	Mon 12/31/12	Mon 12/31/12
111	**9B - Develop CYME Models**	**240 days**	**Thu 3/1/12**	**Thu 1/31/13**
112	Complete Creation of Network Models	0 days	Fri 6/29/12	Fri 6/29/12
113	Contact Other CYME Users	0 days	Thu 3/1/12	Thu 3/1/12
114	Complete Analysis of the Secondary Network with CYME	0 days	Fri 12/28/12	Fri 12/28/12
115	Report on Progress	0 days	Thu 1/31/13	Thu 1/31/13
116				
117	**Rec. 10 - DGA & Flame Retardant Fluid**	**516 days**	**Mon 1/9/12**	**Tue 12/31/13**
118	**10A - Re-Evaluate DGA Testing**	**278 days**	**Mon 1/9/12**	**Thu 1/31/13**
119	Incorporate into Asset Mgmt Process	0 days	Fri 6/29/12	Fri 6/29/12
120	Begin DGA Testing of Network Transformers	0 days	Mon 1/9/12	Mon 1/9/12
121	Modify Re-Test Cycle based on Test Results	0 days	Fri 12/28/12	Fri 12/28/12
122	Report on Progress	0 days	Thu 1/31/13	Thu 1/31/13
123	**10B - Fire Retardant Fluids**	**500 days**	**Tue 1/31/12**	**Tue 12/31/13**
124	Purchase FR3 Fluid	0 days	Tue 1/31/12	Tue 1/31/12
125	Complete Retro-Fill of Termination Chambers with FR3	0 days	Tue 12/31/13	Tue 12/31/13
126	Report on Progress	0 days	Thu 1/31/13	Thu 1/31/13
127				
128	**O'Neill Management Consulting Oversight**	**520 days?**	**Mon 2/6/12**	**Fri 1/31/14**
129	**Progress Meetings**	**520 days?**	**Mon 2/6/12**	**Fri 1/31/14**
130	Weekly Conference Calls	85 days?	Mon 2/6/12	Fri 6/1/12
131	Monthly Review of Progress	495 days?	Mon 2/6/12	Fri 12/27/13
132	Annual Review of Progress	520 days?	Mon 2/6/12	Fri 1/31/14
133	**Technical Discussions**	**490 days?**	**Mon 2/13/12**	**Fri 12/27/13**
134	Schedule as Needed	490 days?	Mon 2/13/12	Fri 12/27/13



Project: Action Plan Schedule
Date: Thu 1/19/12

Task | Milestone | External Tasks
Split | Summary | External Milestone
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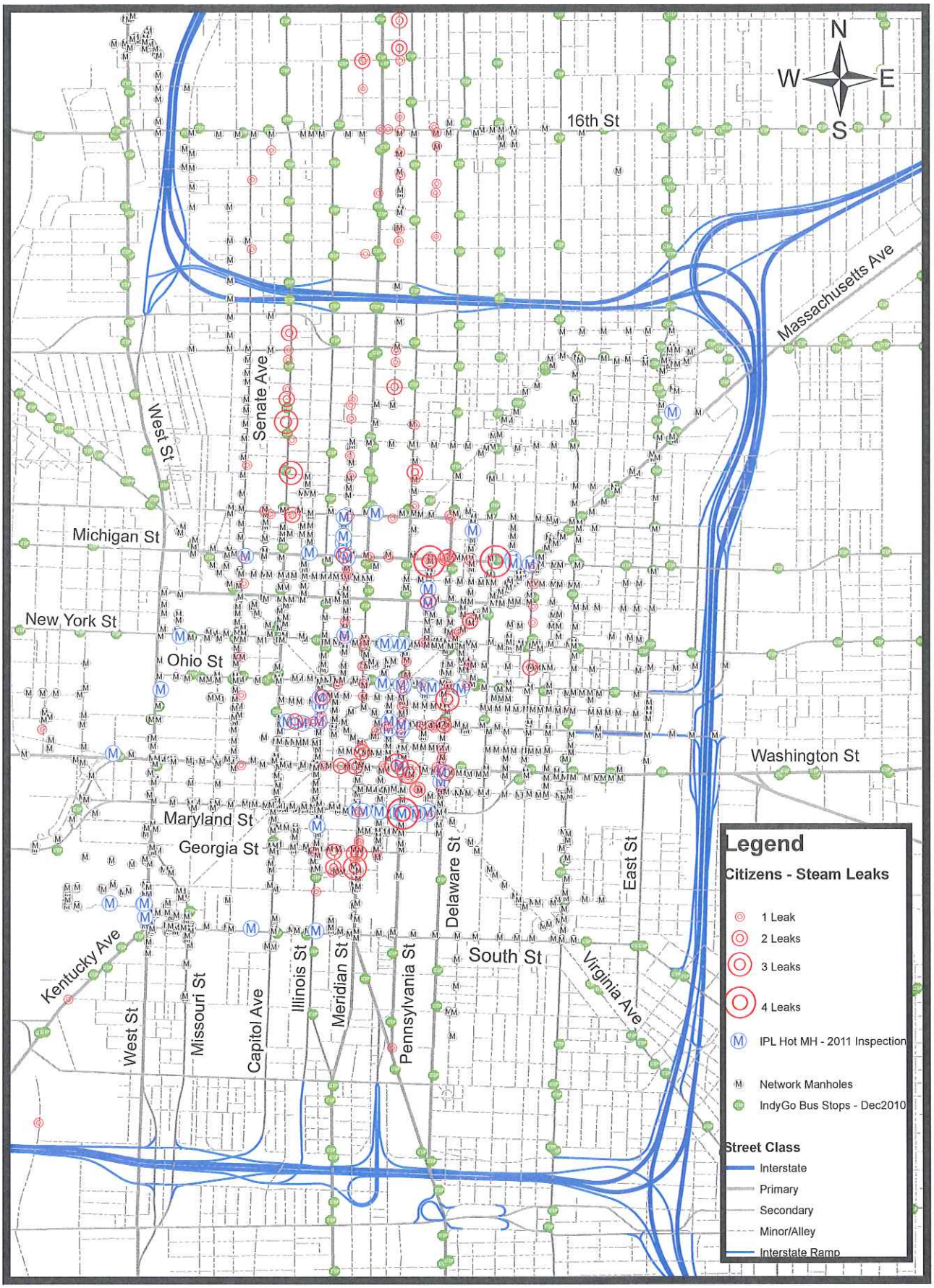
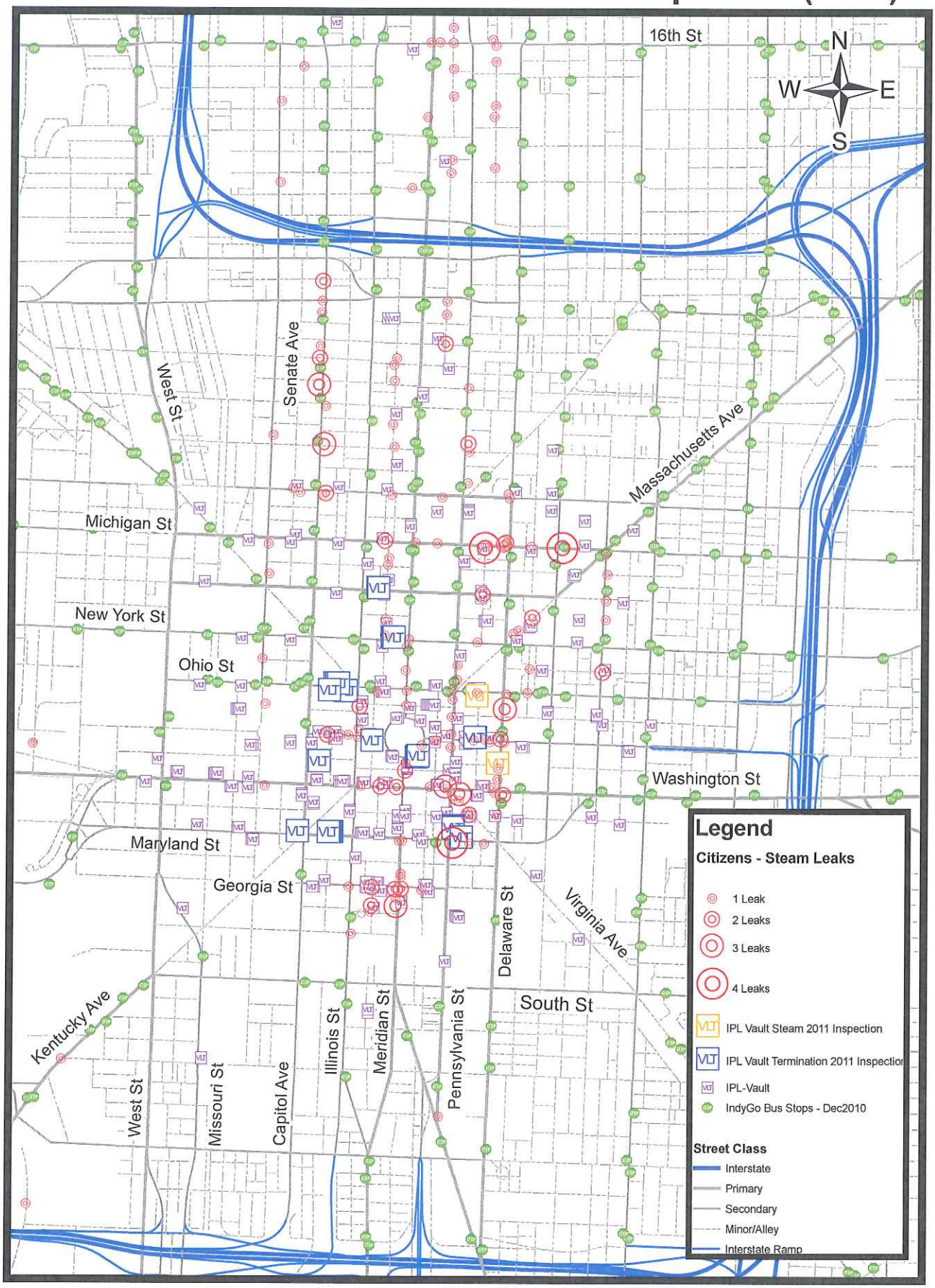
Appendix B

Citizens Steam Leaks with IPL Hot Manholes (2011)



Citizens Steam Leaks with IPL Vault Inspection (2011)



MAP SECTION [redacted]

MANHOLE # [redacted]

ROUTE - Manhole Inspection - Submechanic, 3 Year, No Specific Requirement

Employee: [redacted]

Status: Unprocessed

Power Delivery

Asset	Indicator	Reading	Collected On	Comments
	MH - Check Asbestos	☐ No ☐ Yes ☐ Unsure		
	MH - Check Ground or Neutral Cables	☐ Normal - No problems found ☐ Bonding needs attention ☐ Primary neutral needs attention ☐ Secondary neutral needs attention		
	MH - Check Infrared Inspection Results	☐ Normal - No problems found ☐ Minor hot spot (10 - 30 F rise) ☐ Hot spot - 1 month follow up (30 - 100 F rise) ☐ Severe hot spot correct ASAP (>100 F rise)		
	MH - Check Manhole - Cable Racks	☐ Normal Condition ☐ Rack needs porcelain ☐ Significant rust ☐ Needs new racks or extensions ☐ Missing ☐ Off the wall		
	MH - Check Manhole - Cable Support	☐ Normal - Adequate ☐ Inadequate		

ROUTE - Manhole Inspection - Submechanic, 3 Year, No Specific Requirement

Employee:
Status: Unprocessed

Power Delivery

Asset	Indicator	Reading	Collected On	Comments
	MH - Check Manhole - Cover	☐ Normal - Solid		
		☐ Vented		
		☐ Swiveloc		
		☐ Wrong manhole label		
		☐ Swiveloc plug damage		
		☐ Swiveloc sudden pressure event indicator		
		☐ Square Cover		
	MH - Check Manhole - Debris	☐ Normal condition		
		☐ Some minor debris		
		☐ Significant debris		
		☐ Bracing and lumber in hole		
		☐ Mud 6 inches or more		
	MH - Check Manhole - Duct Mouth	☐ Normal -Beveled edge/duct shoes		
		☐ Some rough edges containing cables		
		☐ Very rough edges containing cables		
	MH - Check Manhole - Flooding	☐ Normal condition - dry		
		☐ A few inches of water		
		☐ Approximately one foot of water		
		☐ Approximately two feet of water		
		☐ Greater than three feet of water		
		☐ Sewage in manhole		

ROUTE - Manhole Inspection - Submechanic, 3 Year, No Specific Requirement

Employee:
Status: Unprocessed

Power Delivery

Asset	Indicator	Reading	Collected On	Comments
	MH - Check Manhole - Other	☐ Normal		
		☐ Street lighting only		
		☐ Needs restriction to enter		
		☐ Car parked on		
		☐ Other		
		☐ Asphalt covered		
		☐ Cannot locate		
	MH - Check Manhole - Ring	☐ Normal		
		☐ Broken		
	MH - Check Manhole - Steam	☐ Normal - No steam issues		
		☐ Steam in manhole		
		☐ Steam in manhole - to hot to enter		
	MH - Check Manhole - Structure	☐ Normal condition		
		☐ Abandoned and empty		
		☐ Roof deterioration		
		☐ Wall deterioration		
	MH - Check Primary Cable	☐ Normal		
		☐ Not applicable		
		☐ Damaged or leaking oil		

ROUTE - Manhole Inspection - Submechanic, 3 Year, No Specific Requirement

Employee:
Status: Unprocessed

Power Delivery

Asset	Indicator	Reading	Collected On	Comments
	MH - Check Primary Cable - Fireproofing	☐ Normal - Present		
		☐ Not Applicable		
		☐ Missing		
		☐ Melted or damaged		
	MH - Check Primary Cable - ID Tags	☐ Normal - Present		
		☐ Not Applicable		
		☐ Missing or unable to read		
	MH - Check Primary Cable - Splice Cases	☐ Normal - No leaking		
		☐ Not Applicable		
		☐ Damaged or oil seeping		
	MH - Check Secondary Cable	☐ Normal		
		☐ Not Applicable		
		☐ Bare conductor		
		☐ Damaged or leaking oil		
	MH - Check Secondary Cable - Idle	☐ Normal		
		☐ Idle cable not labeled retired in place		
		☐ Idle cable not capped and sealed		
	MH - Check Secondary Current	☐ Normal		
		☐ Zero amps on a conductor		
		☐ Greater than 200 amps on a conductor		
		☐ Fluctuating secondary current		

ROUTE - Manhole Inspection - Submechanic, 3 Year, No Specific Requirement

Employee:
Status: Unprocessed

Power Delivery

Asset	Indicator	Reading	Collected On	Comments
	MH - Check Secondary Splices	☐ Normal - No Leaking		
		☐ Not Applicable		
		☐ Damaged or oil seeping		
		☐ Pin hole		
	MH - Check Service Cable - Duct Seal	☐ Normal - Present		
		☐ Not Applicable		
		☐ Missing		
	MH - Check Service Cable - Limiters	☐ Normal - Limiters present on all service cables		
		☐ Limiters missing on some service cables		

Appendix D: Current Data Points

Network SCADA Data					
Status Points	RTUNO	PNTNO	SUBNAM	PNTNAM	
	34	1	GVAULT05	611-330W.MD DEVICE STATUS	
	34	2	GVAULT05	611-330W.MD RELAY ALARM	
	34	3	GVAULT05	611-330W.MD NWP RELAY BREAKER	
	34	4	GVAULT05	611-330W.MD BREAKER FAILURE	
	34	5	GVAULT05	611-330W.MD BREAKER PUMPING	
	34	6	GVAULT05	611-330W.MD PUMP PROTECTION ENABLE	
	34	7	GVAULT05	611-330W.MD RESET PUMP	
	34	8	GVAULT05	611-330W.MD PRIMARY SWITCH	
Analog Points	RTUNO	PNTNO	SUBNAM	PNTNAM	
	34	1	GVAULT05	611-330W.MD IA	
	34	2	GVAULT05	611-330W.MD IB	
	34	3	GVAULT05	611-330W.MD IC	
	34	4	GVAULT05	611-330W.MD VNA	
	34	5	GVAULT05	611-330W.MD VNB	
	34	6	GVAULT05	611-330W.MD VNC	
	34	7	GVAULT05	611-330W.MD VTA	
	34	8	GVAULT05	611-330W.MD VTB	
	34	9	GVAULT05	611-330W.MD VTC	
	34	10	GVAULT05	611-330W.MD KW	
	34	11	GVAULT05	611-330W.MD KVAR	
	34	12	GVAULT05	611-330W.MD RELAY TEMP	
	34	13	GVAULT05	611-330W.MD KVA	

Section 9: Conclusions and Recommendations

9.1 Conclusions

In this section we summarize our key findings and conclusions, taken from the previous sections of the report (and as further summarized in the Executive Summary).

- System Design – The underground network system in Indianapolis is well designed, with features typical of other downtown network systems throughout the United States. There is no need to change the fundamental design of the system in terms of the number and type of feeders, the configuration of feeders and transformers, the size and type of equipment (with the exception of some details of specification on which we elaborate below). The capacity is adequate and the redundancy is good. One could say that the overlap of the steam system is a design problem, but we believe that is better handled as part of the condition.

- System Condition – The condition of the system is not as good as the design. This is true for three main reasons: environment, maintenance, and the vintage/type of certain specific types of equipment, i.e.,

    - The environment, while benign in terms of being drier than most cities, is harsh in places because of the extensive (second largest in the US) steam system which causes some manholes to be too hot to enter and some ducts to be so hot the cable may be over its rating.

    - The maintenance of the system needs to be improved by a program of re-training and re-focusing the dedicated work force to observe and record conditions that could lead to failures, and to do the necessary repairs.

    - The age of the system is not significantly different than many other comparable cities, but there are some pieces of equipment that have a design that many other utilities have moved away from, for example, the termination chambers of the network transformers, and the aluminum bus in some network protectors, and some aspects that may allow water ingress.

- Asset Management – IPL is in the earlier stages of the application of asset management and needs to improve in order to reach the level that many other utilities have achieved and to which most aspire. While IPL has done some prioritization and resource planning, it lacks the databases and tools to plan in a modern way the maintenance and replacement of its facilities. It needs a better process for failure analysis.

- Technology – IPL has begun to apply technology to its downtown underground system. It is not uncommon to find in other utilities as well that many technological

advances, including automated mapping, geographic information systems, and outage management systems are implemented in the overhead system and residential underground but not in the downtown underground network. The SCADA project needs to be re-examined and possibly re-directed for best value and impact. The other technological steps IPL is taking appear warranted and likely to be effective and appropriate if deployed in the right way.

9.2 Recommendations

Flowing from the findings and conclusions are the following recommendations, detailed earlier in the report.

The first five listed immediately below carry our highest emphasis:

1) Immediately identify and address, presumably through coordination with Citizens Thermal, all manholes that have been too hot to safely enter and inspect. After mitigating the heat, inspect the holes, including measuring the current in all secondary leading from each such manhole. Where necessary, replace cable that has been significantly damaged by the heat.

2) Improve the program of inspection and repair of manholes and vaults, re-focusing the work force on finding not just conditions indicative of imminent failure but also those that might cause excessive stress or might lead to a failure under some not unlikely circumstances. Furthermore, do the repairs indicated by such an enhanced program of inspection.

3) Begin a program of retrofitting termination chambers with elbow fittings, and specifying such equipment for new or replacement network transformers. Also, protect the tops of network transformers with deflector shields, and specify corrosion-resistant tops for new transformers.

4) Begin a program of replacement of certain failure-prone network protectors, such as those with an aluminum bus, and also those that show evidence of water ingress despite being designed to be submersible. In some cases, a simple repair may suffice to remediate the latter condition. Continue to replace network transformers and network protectors found to be in such poor condition that failure is likely.

5) Improve the process of asset management by dedicating additional resources to development of equipment databases and processes that facilitate effective failure analysis and resource planning for condition-based equipment maintenance and replacement that goes beyond imminent failure.

The next five recommendations represent a second tier, or next level:

6) Evaluate technology for electronic capture of field inspection findings through the use of handheld devices, such as tablets, smart phones, or other means. Integrate this with recommendations 1), 2), and 5) above.

7) Re-examine the SCADA project, re-focusing on the data that such equipment will capture, and managing the stages of implementation so as to get benefits from even partial implementation as the project progresses.

8) Continue to deploy small-scale technological advances such as thermal imaging, fault direction indicators, and lift/locking manhole covers in selected locations.

9) Continue to develop automated mapping/GIS data and applications for the downtown underground network, and develop models of secondary loads flows in the networks.

10) Re-evaluate Dissolved Gas Analysis on network transformers, and explore the possibilities for fire retardant dielectric in vaults.

9.3 Obtaining commitment for implementation

Once this report has been made public, the IURC will want to engage IPL in a process of commitment to implementation of those findings that are found to be valid and compelling. This may involve some iterative communications about what is meant, how certain objectives might best be achieved, and so forth. Typically, after a report of this type, regulators and utilities agree on a quantified list of commitments and a schedule of status reporting on the progress of the commitments. No doubt such a process will take place in this instance as well, which will allow the recommendations made in this report to improve the performance of the Indianapolis downtown underground system.

Addendum – January 16, 2012 Fault at Center Substation

On Monday, January 16, 2012 at approximately 11AM, an incident took place at IPL's Center substation, located at 343 Wisconsin Street, that led to a fire in the station. This substation does not serve any customers on the IPL secondary network in downtown Indianapolis which was the target of the audit mandated by the IURC.

Nevertheless, given the public concern raised by this issue, IPL plans to engage the same auditor to review, inspect and comment on IPL's failure analysis and recommendations regarding this January 16, 2012 incident.