LED Conversion Plan & Lighting Cabinet Relocation

March 12, 2015

Street Light LED Conversion Plan

Prepared by, Kevin Risch
Clark Dietz, Inc.

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Wisconsin.

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Date: March 12, 2015 Reg. No. E-36446

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Contents

1- Objective

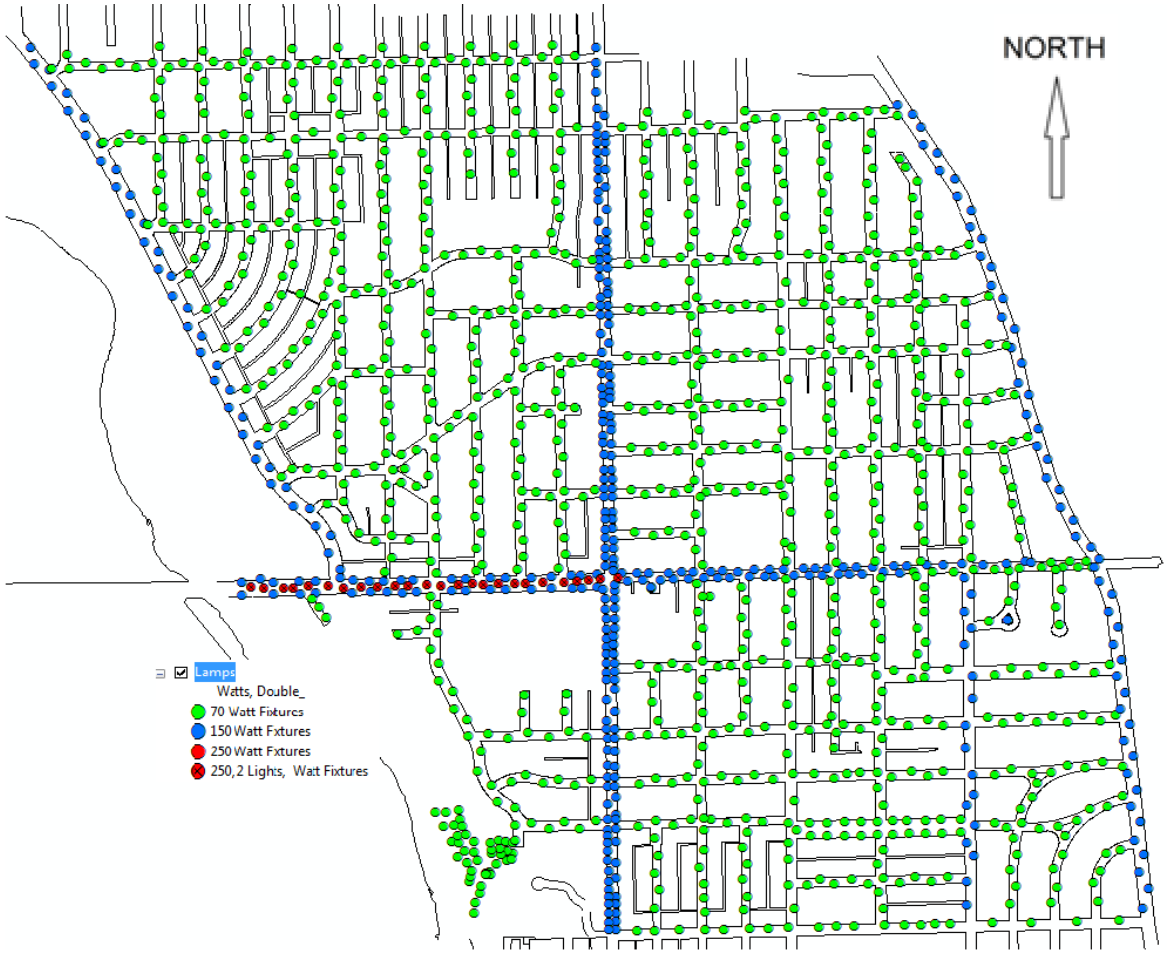
The overall objective of this study will be to:

- Provide an inventory of existing street lights together with wattages within the Village.
- Provide an LED lighting conversion strategy using estimated annual investments
- Provide a cost estimate for replacement and energy and expected maintenance cost savings
- Design documents for the relocation of the existing lighting cabinet behind the residence at 3949 Summit Avenue and relocate the cabinet to Lake Drive, including a plan and specifications with material breakdown.

2- Inventory

2.1 – Existing Fixture Inventory

The Village has a total of 1,416 high pressure sodium light fixtures. These fixtures are mostly comprised of 70 Watt (1,015 each) within the residential neighborhoods and parks. The remaining fixtures consist of 150 Watt (351 each) and 250 Watt (50 each) which is located on both arterial and collector roads.



EXISTING LIGHTING

2.2 – Existing Lighting Circuits Inventory

All of the light circuits throughout the village either fall on 240 volt lines or 480 volt lines at the varying wattages delineated in the above map. The 240 volt circuits are located along E. Capitol Drive from the east limits to the west limits of the Village, and along N. Oakland Avenue from the south limits to the

north limits of the village. These wattages are either 250 watt or 150 watt fixtures. The 480 volt lines are everywhere else within the Village and are comprised of either 150 watt or 70 watt fixtures.

2.3 – Existing Lighting Circuits Testing Requirement

We recommends that any future outdoor lighting circuits (which are under consideration for upgrade to LED lighting) have their circuit voltages tested, documented, and evaluated for any values that are found to be over any of the voltage value standards of 480 Volts, 240 Volts, 208 Volts, or 120 Volts (depending on what system supplies a particular circuit). Any anomalies should be mitigated before proceeding on any future LED outdoor lighting replacement projects (based on what was discovered in a previous report for the Village Hall parking lot). This is especially important to the Village since we were informed that much of the existing Village outdoor lighting circuits use this older 480 Volt (hot to neutral) system rather than the more common 240 (hot to hot) system widely used today.

3- LED Lighting Conversion Strategy

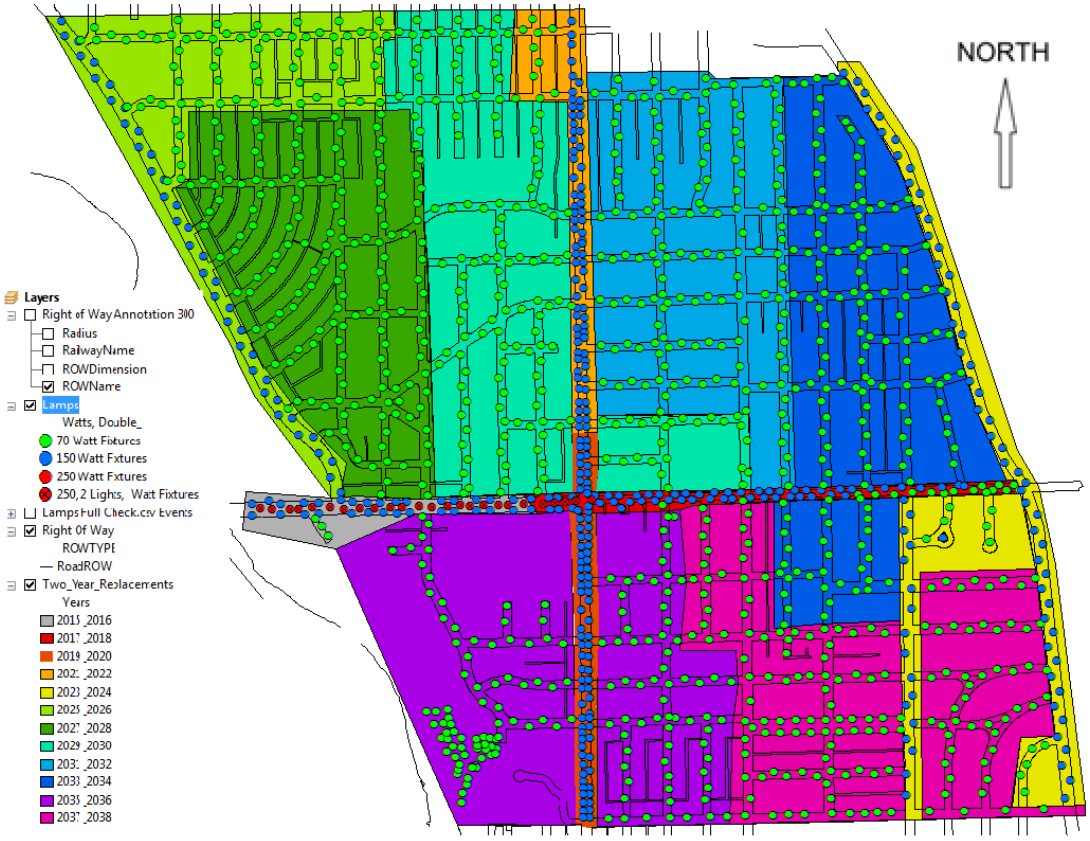
3.1 – Conversion Strategy

This proposed lighting fixture replacement was developed assuming that the Village will reserve approximately $75,000 annually and that there will be a replacement contract awarded every other year. This would allow each contract to utilize funds over two years or $150,000. (Note: the fixture selection is based on matching the existing fixture style. Therefore, it is not intended to replace any light poles or bases).

3.2 – Conversion Areas

Using the total budget over the two year period, areas were identified to replace as many fixtures as possible using the $150,000. This strategy will replace all the fixtures throughout the Village by the year 2038, by replacing fixtures every other year at $75,000 per year.

3.3– LED Replacement Sequence



4- Cost Estimate and Annual Savings

4.1– Proposed Fixture Costs

The cost component is based on a fixture head that has been designed as an LED unit and not a retrofit fixture together with an installation cost per each fixture. Each fixture that was selected was determined based on the existing voltage as well as the current fixture wattage. Based on the inventory there are 5 different fixture classifications that all of the lights fall into. These include:

- 1) 70 Watt, 480 Volts, Traditionaire (Cooper)
- 2) 70 Watt, 240 Volts, Traditionaire (Cooper)
- 3) 150 Watt, 240 Volts, Libertyville (Sternberg)
- 4) 150 Watt, 480 Volts, Libertyville (Sternberg)
- 5) 250 Watt, 240 Volts, Libertyville (Sternberg)

The replacement fixtures that closely matched these fixtures were the same manufacturer's, but manufactured using LED components (See Exhibit 1).These fixtures include:

- 1) 51 Watt, 480 Volts, Traditionaire (Cooper) - $800
- 2) 51 Watt, 240 Volts, Traditionaire (Cooper) - $750
- 3) 112 Watt, 240 Volts, Libertyville (Sternberg) - $1,725
- 4) 112 Watt, 480 Volts, Libertyville (Sternberg) - $1,725
- 5) 185 Watt, 240 Volts, Libertyville (Sternberg) - $1,975

The total cost estimate to replace all 1,416 fixtures within the Village of Shorewood is estimated at $1,798,275 and the timeline for the LED reach 70% lumen depreciation estimated to 16 years (70,000 hours). At 16 years the fixture has only reached 70 percent of the lumens it had when it was first installed. This means the fixture can remain in place until the levels are no longer acceptable.

			Annual Savings	
# Lamps	Years	Cost with Installation	Energy	Maintenance
74	2015 & 2016	$149,525.00	$3,327.00	$2,970.00
77	2017 & 2018	$148,225.00	$2,772.00	$4,235.00
86	2019 & 2020	$150,650.00	$2,934.00	$4,455.00
83	2021 & 2022	$149,600.00	$2,779.00	$4,565.00
83	2023 & 2024	$149,450.00	$2,779.00	$4,565.00
111	2025 & 2026	$148,925.00	$2,666.00	$6,105.00
150	2027 & 2028	$149,950.00	$2,550.00	$8,250.00
149	2029 & 2030	$149,000.00	$2,533.00	$8,195.00
147	2031 & 2032	$147,000.00	$2,499.00	$8,085.00
148	2033 & 2034	$147,950.00	$2,516.00	$8,140.00
150	2035 & 2036	$150,000.00	$2,550.00	$8,250.00
158	2037 & 2038	$158,000.00	$2,686.00	$8,690.00
1416		$1,798,275.00	$32,591.00	$76,505.00

4.2– Annual Savings with LED Fixtures

The installation of LED technology introduces an annual cost savings due to both the energy as well as reduced maintenance costs. As can be seen in the above table, there is a savings due to the reduction of energy usage. However, the savings from maintenance is approximately 2.5 times larger than energy savings due to longer life expectancy of the LED fixture compared to a HPS fixture. Using the estimated annual savings the payback period would be approximately 16.5 years assuming the complete build out.

5- Relocation of Lighting Cabinet 3549 Summit Ave

ITEM SPECIFIC REQUIREMENTS AND SPECIAL PROVISIONS

5.1 ITEM 643.0100 TRAFFIC CONTROL

The Contractor shall be responsible for all roadway markings and signage per the Manual on Uniform Traffic Control Devices to ensure proper traffic flow. Traffic control shall be paid under the unit bid item 643.0100 Traffic Control.

The Contractor shall maintain all traffic control devices in their proper location and in a working condition. Upon notification by the Engineer or his representative during working hours, the Contractor shall, within one (1) hour of notification, relocate, repair, replace or removed any unsatisfactory device. If the Contractor does not rectify the situation within one (1) hour, the Engineer may have City forces to correct the problem and charge the Contractor for their services. All streets segments in this project shall be open to local traffic throughout the duration of the project.

5.2 ITEM 652.0225 CONDUIT RIGID NONMETALLIC SCHEDULE 40 2-INCH

This work shall consist of installing a 2"Schedule 40 PVC conduit in an open trench in parkway as shown on the plans or in those areas designated by the Engineer for tree protection.

Prior to the start of trenching for pipe placement operations, the Contractor shall properly locate and identify all existing utilities in proximity to the pipeline alignment so as not to delay work and avoid conflict or disruption of utility services. The Contractor shall confirm the alignment of all critical utilities, using vacuum excavation or other suitable excavation methods, for further detailed confirmations as necessary.

The contractor shall submit to the Engineer specifications on material to be used. The material shall include the pipe, fittings, drilling mud, drilling additives and any other item, which is to be an installed component of the project or used during construction.

This item will be measured in linear feet, installed and accepted. Payment shall be in full compensation for all labor, tools, equipment, material and incidentals necessary to complete this item of work.

5.3 ITEM 653.0135 PULL BOXES STEEL 24X36-INCH

This work shall be in accordance with WisDOT's Standard Specifications Section 653 – Pull Boxes and Junction Boxes, along with S.D.D. 9B-4-9 as shown on the plans.

This shall be as specified in WisDOT's Standard Specifications Section 653 – Pull Boxes and Junction Boxes.

5.4 ITEM 654.0224 CONCRETE CONTROL CABINET BASE TYPE L24

This work shall be in accordance with WisDOT's Standard Specifications Section 654 – CONCRETE CONTROL CABINET BASE TYPE L24, along with S.D.D. 9C-14-2 as shown on the plans.

5.5 ITEM 655.0630 ELECTRICAL WIRING LIGHTING 4AWG

This work shall be in accordance with WisDOT's Standard Specification Section 655 – Electrical Wiring and the lighting plan.

A 24 inch length of wire shall be left in each handhole for termination. An extra loop (approximately five (5) feet) of all wires entering a pull box shall be provided.

Conductors shall be installed in the PVC raceway in continuous lengths without splices from terminal to terminal (pole to pole). Splicing will be permitted only at light pole bases of the poles. No underground splicing allowed.

Electric wire lighting will be measured in feet for each conductor complete in place and accepted.

Electric wire lighting measured will be paid for at the contract unit price per foot for AWG #4 which price shall be payment in full for furnishing and installing electrical wire; for making all connections, wire nuts, fuses, fuseholder, splices, tape, insulating varnish or sealant, testing circuits, and for all labor, tools, equipment and incidentals necessary to complete the work.

5.6 ITEM 656.0200 ELECTRICAL SERVICE METER BREAKER PEDESTAL

This work shall be in accordance with WisDOT's Standard Specifications Section 654 – ELECTRICAL SERVICE METER BREAKER PEDESTAL, along with S.D.D. 9D-1-5 as shown on the plans.

5.7 ITEM 659.2224 LIGHTING CONTROL CABINETS 240/480 24-INCH

This work shall be in accordance with WisDOT's Standard Specifications Section 654 – LIGHTING CONTROL CABINETS 240/480 24-INCH, along with S.D.D. 9D-4-1 as shown on the plans.

5.8 ITEM 671.0212 CONDUIT HDPE DIRECTIONAL BORE 1-DUCT 2-INCH

This work shall be completed in accordance WisDOT's Standard Specification Section 671.

Prior to the start of drilling, reaming and pipe placement operations, the Contractor shall properly locate and identify all existing utilities in proximity to the pipeline alignment so as not to delay work and avoid conflict or disruption of utility services. The Contractor shall confirm the alignment of all critical utilities, using vacuum excavation or other suitable excavation methods, for further detailed confirmations as necessary.

The bore path shall be designed by the drilling contractor to ensure that pipe joints do not deflect more that 50% of manufacturer's recommended maximum deflection.

The contractor shall submit to the Engineer specifications on material to be used. The material shall include the pipe, fittings, drilling mud, drilling additives and any other item, which is to be an installed component of the project or used during construction.

This item will be measured in linear feet, installed and accepted. Payment shall be in full compensation for all labor, tools, equipment, material and incidentals necessary to complete this item of work.

5.9 ITEM SPV.0105.01 REMOVING EXISTING LIGHTING CABINET

This work shall consist of the removal of the existing lighting cabinet located at 3549 Summit Avenue. The contractor shall coordinate all work with the Village of Shorewood, Dave Best at 414-788-7555 as well as with the electric utility company for the removal of the existing electrical connection.

The contractor will not be allowed to disconnect this service until all other infrastructure is in place together with the new lighting controller cabinet. Once the new cabinet is in place, contractor shall coordinate with the Village of Shorewood prior to removing service at the existing location.

This item of work will be measured as a single unit of work, completed in place and accepted.

The removal of the existing Lighting Cabinet as measured will be paid for at the contract lump sum price which shall be payment in full for disconnection of electrical service with coordination and utility company fees, for hauling and removal offsite, for removal of all conduit above ground and one foot below ground and for all labor, tools, equipment and incidentals necessary to complete the work.

5.10 ITEM SPV.0105.02 WE ENERGIES 480 VOLT SERVICE

This work shall consist of applying for new service on behalf of the Village at the new location of the Lighting Control Cabinet. The contractor shall coordinate all work with the Village of Shorewood, Dave Best at 414-788-7555 as well as with the electric utility company for the new electrical connection. Contractor shall be responsible for installing the concrete base and meter pedestal prior to new service being installed.

Once the new cabinet is in place, contractor shall coordinate with the Village of Shorewood prior to removing service at the existing location and connection of the circuits at the new location.

This item of work will be measured as a single unit of work, completed in place and accepted.

The installation of New WE Energies Service as measured will be paid for at the contract lump sum price which shall be payment in full for installation of electrical service with coordination and utility company fees, and for all labor, tools, equipment and incidentals necessary to complete the work.

5.11 ITEM SPV.0105.03 RESTORATION (PROJECT LIMITS)

The Contractor shall repair disturbed lawn areas adjacent to construction by placing and compacting a minimum of 4 inches of pulverized topsoil and then seed area disturbed within construction limits. The Contractor shall backfill all lawn areas within five (5) working days of disturbance.

Seeding shall conform to Section 630, State of Wisconsin Department of Transportation Standard Specifications for Highway and Structure Construction, current edition. Seed shall be seed mixture No. 40. The sowing rate shall be two pounds per 1000 square feet of area.

Construction limits shall be considered areas within 18 inches of any new construction and any area disturbed by the contractor's operations. The level of the site restoration shall meet the level of the surrounding area being neither above nor below it.

The contractor shall be responsible for fertilizer, seed, water, and protection for a period of fourteen (14) days from the installation of the topsoil, seed, and fertilizer. At the end of fourteen (14) days, any bare areas shall be replanted and re-inspected after an additional fourteen (14) days.

Topsoil shall be placed to a minimum depth of 4 inches and shall not be placed over any foreign debris or material. All disturbed areas needing more than 4 inches of topsoil shall be placed in lifts and thoroughly compacted so that there are no excessive settlement areas after contract is completed. The finished topsoil elevation shall be at or slightly above the top of curb or sidewalk elevation after thorough compaction.

This item of work will be measured as a single unit of work, completed in place and accepted.

The Restoration as measured will be paid for at the contract lump sum price which shall be payment in full for pulverized topsoil, for all seed mixture No. 40, for all fertilizer, for hauling and placing of the material and for all labor, tools, equipment and incidentals necessary to complete the work.

5.12 ITEM SPV.0105.04 LIGHTING CONNECTIONS

This work shall consist of furnishing all material and work to connect the new lighting circuits to the existing fixtures. The Contractor will perform splice connections of the electrical wire as to connect all new wiring to the existing fixtures to the circuit as shown per plan. The contractor shall include all connections in this work area. It is anticipated that there will be 3 connections to the existing poles and 1 connection to new lighting control cabinet.

3M Scotchcast kits to be used as approved by Engineer.

This work should only be attempted when the new lighting can be made operational and this connection work can be completed in one day without affecting the existing light circuit.

Lighting connection will be measured as a single unit of work, complete in place and accepted.

Lighting connection as measured will be paid for as contract lump sum, which shall be payment in full for connecting and splicing the circuits to existing, digging, splice kits and for all labor, tools, equipment and incidentals necessary to complete the work

EXHIBIT 1

LED LIGHT FIXTURES
& COST QUOTES