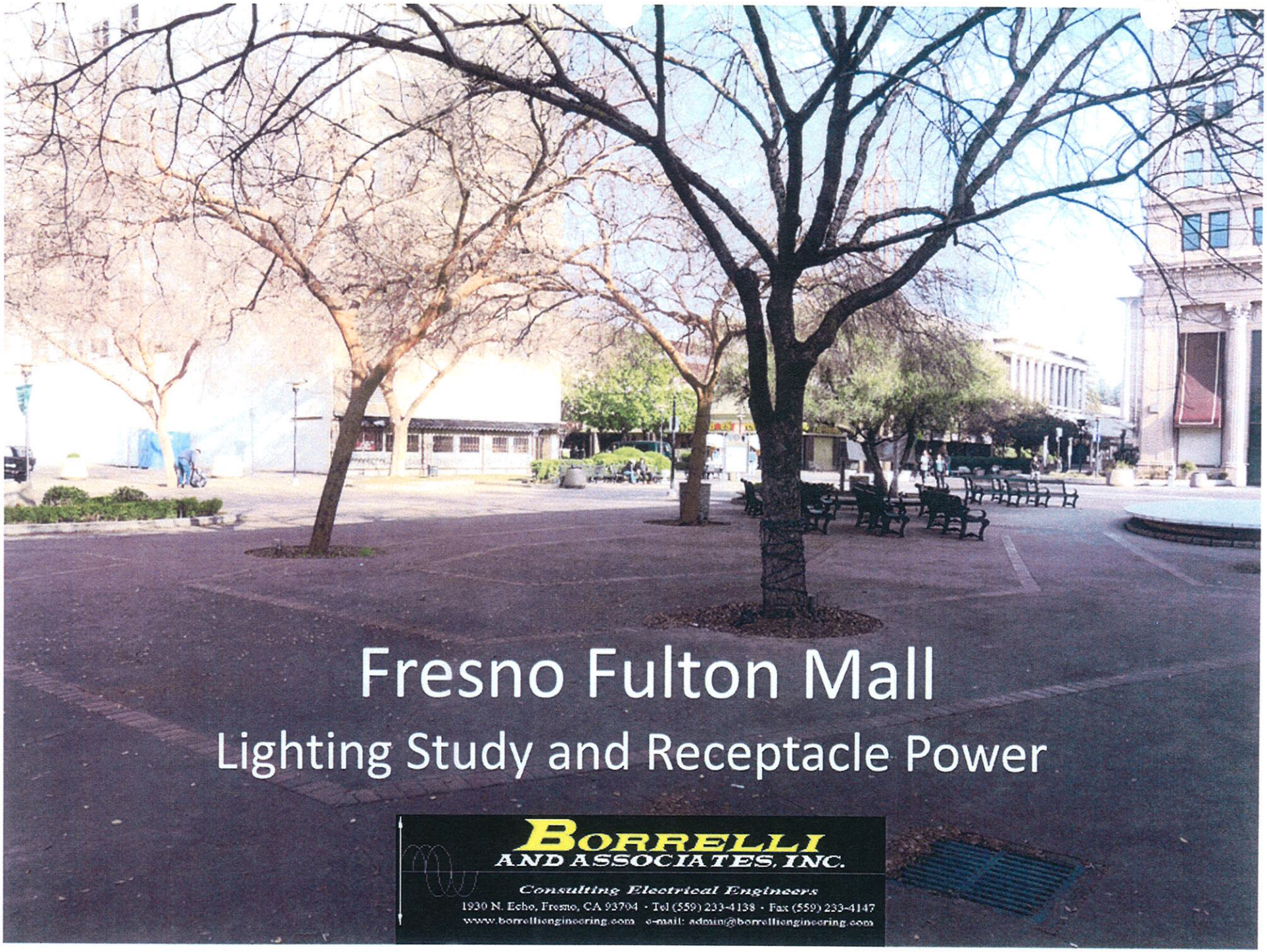

Fresno Fulton Mall

Lighting Study and Receptacle Power

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Lighting Study for

Fulton Mall

Fresno, CA

BAI#10150

Prepared For the City Of Fresno Facilities and Major Projects Division

2101 "G" Street, Building A

Fresno, CA 93706

February 11, 2011

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Date: February 11, 2011

To: Mr. Mark Johnson
City Of Fresno, General Services Department, Facilities and Major Project Division
2101 "G" Street, Building A
Fresno, CA 93706

From: John Borrelli, PE
Borrelli and Associates, Inc.
1930 N. Echo Avenue
Fresno, CA 93704

Subject: Fulton Mall Lighting Study

Dear Mr. Johnson:

Borrelli and Associates is pleased to submit our Lighting Investigation Report for the Fulton Mall. The enclosed report delineates findings and recommendations to bring the lighting into compliance with standards.

We are honored to have been part of this investigation and hope to assist you in the future should the need arise. If you have any questions or concerns, please don't hesitate to contact me at (559) 233-4138.
Sincerely,

John Borrelli, PE
Professional Engineering License E16390
Borrelli and Associates, Inc.

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Introduction

From January 10, 2011 to February 17, 2011 Borrelli and Associates, Inc. conducted a review of the plans for construction of the Fulton Mall, as well as inspections of the existing electrical systems within the Mall. The purpose was to identify deficiencies and determine solutions to increase the light output. This report lists those and provides recommendations to solve the potential problems.

Codes and Standards

The California State Building Standards Commission lists the following codes as part of the current Title 24, California Code of Regulations.

1. Part 1 - California Building Standards Administrative Code
2. Part 2 - California Building Code (CBC)
3. Part 3 - California Electrical Code (CEC)
4. Part 6 - California Energy Code (CNC)
5. Part 8 - California Historical Building Code (CHBC)
6. Part 9 - California Fire Code (CFC)
7. Part 10 - California Existing Building Code (CEBC)
8. Part 11 - California Green Building Standards Code (CGBSC)
9. Part 12 - California Reference Standards Code

In addition to Title 24, the following standards are also applicable.

1. Illuminating Engineering Society of North America's (IESNA) Lighting Handbook
2. National Fire Protection Association 101 – Life Safety Code

Existing Conditions

Currently there are 152 light fixtures at Fulton Mall. These fixtures are 175W metal halide. There are two, similar looking, fixture types installed on the mall. One fixture style discontinued style from an out of business manufacturer. The other is a Cooper Lighting #230P27H07 (208V, single phase as verified with city crews on January 27, 2011) fixture. Currently the latter is being used as a replacement fixture for the outdated older style lamps.

Of the 152 fixtures, 41 of them are not currently working. From reviewing the existing plan circuitry 12 of the fixtures appear to be not working due to the ballast, lamp, or internal wiring. This would need to be confirmed. The remaining 29 fixtures may not be working due to the previous reasons or due to a break in the underground circuits. There are 16 locations where breaks in the underground circuits have mostly likely occurred.

The power available for vendors for festivals between Fresno Street and Tulare Street consists of 15 power pedestals (referred to as "Festoon Cubicles" in the original plans). These have six 15A/1P circuit breakers feeding twelve 20A, 120V receptacles. The pedestal itself is fed by a 30A, 208V, 3 phase circuit. The distribution of the pedestals is 3 along Fulton between Fresno and Mariposa, 3 along Fulton between Mariposa and Tulare, 4 along Mariposa between Van Ness and Fulton, and 5 along Mariposa between Fulton and Broadway. Voltmeter tests were done on the receptacles. For the most part they are functional except within the Mariposa Mall Area. The pedestals that do not function are the original pedestals installed per the Victor Gruen original mall plans dated 1964. There are existing receptacles installed within the tree planter areas within the Mariposa mall and Free speech area that are functional. Those

receptacles appear to have been installed after the original mall 1964 construction since they do not appear on the original 1964 Victor Gruen plans. Refer to plan sheet E2.12 contained within the plans accompanying this report for locations of those existing receptacles.

Plans and Specifications were created to repair at a bare minimum the existing non-functional lights and receptacles within the mall. Refer to the following Table 1 for an electrical construction cost estimate for this option. Cost indicated within the table represents work within the construction plans.

Option 1 – Repair of Existing Non-Functional Lighting and Repair of Existing Non Functional Receptacles

Table 1: Estimate for work shown on plans				
Item	Cost/Qty	Quantity		Cost
Ballasts	$320.00	41	Each	$13,120.00
Lamps	$45.00	41	Each	$1,845.00
120V GFI Receptacles	$63.50	90	Each	$5,715.00
Saw cut and remove concrete	$13.95	942.32	Sq. Yards	$13,145.36
Hand Trench	$102.00	942.32	Cu. Yards	$96,116.59
Backfill	$56.85	927.47	Cu. Yards	$52,726.45
Patch Concrete	$122.55	927.47	Sq. Yards	$113,660.97
Repair damaged pipes				$0.00
1 Inch PVC Conduit	$7.00	6612.70	Feet	$46,288.92
N36 Pull boxes	$1,400.00	25	Each	$35,000.00
Lighting conductors	$8.49	2628.72	Feet	$22,327.69
Receptacle conductors	$8.49	4236.35	Feet	$35,982.51
Total				$435,928.47

Note: Assumption all 41 fixtures do not function do to damaged circuits.

Lighting within the Mall

Within the following options we explored different lighting rehabilitation scenarios and included an electrical construction cost for each of the different scenarios.

Option 2 - New Pole Mounted Lights at Every Third Fixture Location

This option involves removing all of the existing pole mounted light fixtures and replacing them with approximately 2/3 less fixtures (i.e. every third fixture). The new fixtures will have higher wattage lamps and improved optics. Due to the height limitation (thirteen to fourteen feet), this option will provide high lighting levels at the poles but the light levels will quickly drop off as you walk away from each pole. This leads to a lesser quality of lighting coverage. Refer to the following Table 2 for an electrical construction cost estimate for this option.

Table 2: Estimate to replace approximately 1/3 of all lights			
Description	Cost Per	Qty.	Cost
Remove existing fixtures	$65.00	151	$9,815.00
Fixtures and poles	$2,500.00	52	$130,000.00
Base	$90.25	52	$4,693.00
Total			$144,508.00

Option 3 - New Pole Mounted Lights At All Locations Utilizing the Existing Poles

This option will replace all of the existing pole mounted light fixtures with new fixture heads while using the same poles. The new fixtures will have the same wattage lamps. However, these will have significantly better optics. They will direct more light down, where it is need. While this design is not perfect, it will be significantly better than the current lighting or replacing only 1/3 of the fixtures. Refer to the following Table 3 for an electrical construction cost estimate for this option.

Table 3: Estimate to replace all lights only			
Description	Cost Per	Qty.	Cost
Remove existing fixtures	$65.00	151	$9,815.00
Fixtures and poles	$2,500.00	151	$377,500.00
Total			$387,315.00

Option 4 - Retain Existing Fixtures and Repair As Needed

Because approximately 76.82% of the existing fixtures are currently working, this option would replace any burnt out lamps and ballasts and reconnect to the existing circuits. Refer to the following Table 4 for an electrical construction cost estimate for this option.

Table 4: Estimate to replace defective parts			
Description	Cost Per	Qty.	Cost
Ballasts	$320.00	40	$12,800.00
Lamps	$45.00	40	$1,800.00
Total			$14,600.00

Note: The estimate above assumes a live circuit feeds is available at the fixture atop the pole

Option 5 - Installing Building Mounted Lights

W e reviewed the possibility of installing wall mounted fixtures on the buildings adjacent to the pole mounted fixtures that are not working and connecting to the building owners' panels. Most of the business managers were opposed to this idea and indicated a permission request needed to be obtain from the business owner. Refer to Appendix B for all the properties surveyed. The city attorney's office should also be consulted with to see the possible legal ramifications of this option. Also, some of the fixtures not working are adjacent to parking lots. Refer to the following Table 5 for an electrical construction cost estimate for this option.

Table 5: Estimate to install wall mounted lights			
Description	Cost Per	Qty.	Cost
Fixtures	$750.00	80	$60,000.00
Connecting fixtures	$1,000.00	80	$80,000.00
Total			$140,000.00

Note: Assumes circuit capacity at owner's panel and owner permission given.

The following options will explore the possibility of installing new underground lighting circuits within the mall and back feeding the lighting at the current existing locations

Option 6 - Reusing Existing Conduits for New Underground Circuits

Reusing the existing conduits involves pulling out the existing conductors, pulling a mandrel through, and pulling in new conductors. If possible, this is the best option. However, due to the size of the conduits and the age of both the conduits and conductors, this will not be practicable for many conduit runs. Refer to the following Table 6 for an electrical construction cost estimate for this option.

Table 6: Estimate to replace all conductors within Existing Conduit			
Description	Cost per	Qty	Cost
Remove existing wires	$19.23	8628.64	$165,928.77
Conductors	$6.49	5631.92	$36,572.28
Total			$202,501.05

Note: Assumes reuse of the existing conduit will work.

There are several methods for running new conduits and conductors to each light pole along the mall using directional boring techniques. This will require two bores down Fulton (one from Tuolumne to Tulare and one from Inyo to Tulare), and one each down Kern, Mariposa, and Merced. The following options will explore those options as well as boring methods.

Option 7 – Installing New Conduit and Circuits Using Direction boring at 3-Foot Depths

This option is to horizontal directional drill down the middle of Fulton, Kern, Mariposa, and Merced malls at three feet below grade. At this depth, the drill should miss most conduits and pipes. However, there will probably be some utilities at this depth so further investigative work would need to be done to locate these utilities. This will mean holes will have to be dug to repair any conduits or pipes that are damaged. Also, electricity and some water lines will have to be shut off during the drilling. The branches from the main conduits (in the drilled bores) to the fixtures will be hand trenched. Refer to the following Table 7 for an electrical construction cost estimate for this option.

Table 7: Estimate for Horizontal Directional Drillings at 3 feet below grade			
Description	Cost Per	Qty	Cost
HDD Mobilization	$1,550.00	1	$1,550.00
HDD Set-up	$780.00	5	$3,900.00
HDD in clay or soft sandstone	$9.00	4234.55	$38,110.96
Repair damaged pipes	$45.00	423.00	$19,035.00
Saw Cut	$4.10	3233.61	$13,257.82
Patch Concrete	$2.27	3233.61	$7,338.51
Hand Trench	$102.00	718.58	$73,295.27
Backfill	$56.85	718.58	$40,851.33
2 Inch PVC Conduit	$10.85	7468.17	$81,029.60
N16 Pull boxes	$1,100.00	68	$74,800.00
N36 Pull boxes	$1,400.00	38	$53,200.00
Conductors	$6.49	8588.391	$55,770.87
Total			$462,139.37

Option 8 – Installing New Conduit and Circuits Using Direction boring at 10-Foot Depths with Bore Angle into Each Pullbox

The next option for horizontal directional drilling is to drill at 10-feet below grade and *angle* into each pull box. This will require approximately 100 separate drillings. However, the chances of drilling into an existing conduit or pipe are reduced. Refer to the following Table 8 for an electrical construction cost estimate for this option.

Table 8: Estimate for Horizontal Directional Drillings at 10 feet below grade with bore angle			
Description	Cost Per	Qty	Cost
HDD Mobilization	$1,550.00	1	$1,550.00
HDD Set-up	$780.00	5	$3,900.00
HDD in clay or soft sandstone	$9.00	4269.55	$38,425.96
Repair damaged pipes	$45.00	85.00	$3,825.00
Saw Cut	$4.10	3233.61	$13,257.82
Patch Concrete	$2.27	3233.61	$7,338.51
Hand Trench	$102.00	718.58	$73,295.27
Backfill	$56.85	718.58	$40,851.33
2 Inch PVC Conduit	$10.85	7503.17	$81,409.35
4' Diameter * 11' Deep CIP Manholes	$2,646.00	106	$280,476.00
Conductors	$6.49	8628.64	$56,032.24
Total			$600,361.49

Option 9 – Installing New Conduit and Circuits Using Direction boring at 10-Foot Depths with no bore angle

This option for horizontal directional boring is drilling at 10 feet below grade and keeping the drillings at this depth. It is unlikely there are any utilities at this depth; therefore the probability of hitting any conduits or pipes is significantly reduced. This option requires replacing the pull boxes with manholes. Refer to the following Table 9 for an electrical construction cost estimate for this option.

Table 9: Estimate for HDD between each Pull box at 10 feet below grade

Description	Cost Per	Qty.	Cost
HDD Mobilization	$1,550.00	1	$1,550.00
HDD Set-up	$780.00	100	$78,000.00
HDD in clay or soft sandstone	$9.00	4469.55	$40,225.96
Repair damaged pipes	$45.00	85.00	$3,825.00
Saw Cut	$4.10	3233.61	$13,257.82
Patch Concrete	$2.27	3233.61	$7,338.51
Hand Trench	$102.00	718.58	$73,295.27
Backfill	$56.85	718.58	$40,851.33
2 Inch PVC Conduit	$10.85	7703.17	$83,579.35
N16 Pull boxes	$1,100.00	68	$74,800.00
N36 Pull boxes	$1,400.00	38	$53,200.00
Conductors	$6.49	8858.64	$57,525.80
Total			$527,449.05

Option 10 – Installing New Conduit and Circuits Utilizing Trenching and Concrete Saw cutting

The final option is similar to the first horizontal directional drilling. However, instead of drilling, the concrete will be saw cut and a trench will be dug by hand. This will be very labor intensive but, if done correctly, will virtually eliminate the possibility of damaging any existing conduits or pipes. Refer to the following Table 10 for an electrical construction cost estimate for this option.

Table 10: Estimate to hand trench only (recommended)

Description	Cost Per	Qty.	Cost
Saw Cut	$4.10	6883.53	$28,222.49
Patch Concrete	$2.27	6883.53	$15,621.80
Hand Trench	$102.00	718.58	$73,295.27
Backfill	$56.85	718.58	$40,851.33
Repair damaged pipes	$45.00	30.00	$1,350.00
2 Inch PVC Conduit	$10.85	6883.53	$74,686.35
N16 Pull boxes	$1,100.00	68	$74,800.00
N36 Pull boxes	$1,400.00	38	$53,200.00
Conductors	$6.49	7916.06	$51,404.95
Total			$413,432.19

Another part of this study was to explore the possibilities of adding receptacles within the mall. The following sections will look at that option.

Receptacles

The existing power pedestals are sparsely spaced. A festival with many vendors along the mall will require running extension cords from the pedestals to the vendors. This presents a tripping hazard and may cause the vendor to be disconnected from power.

In addition if each receptacle is used, they can only provide an average of 3A at 120V per receptacle. If a festival with many vendors is held, this will probably not be sufficient, especially if there are food vendors requiring refrigeration or electric heating. Also, some of the equipment may require 208V.

Installing a new power pedestal with a 120V receptacle and a 208V receptacle near each light pole between Fresno Street and Tulare Street will solve these problems. These receptacles will have stainless still lockable cover plates. All vendors can be located near a pedestal. This will eliminate the need to run extension cords across the walkway. The 120V and 208V receptacles will accommodate most of the power requirements of any vendor. This will require one of the conduit install options listed at the bottom of Table 11. Refer to the following Table 11 for an electrical construction cost estimate for this option.

Table 11: Estimate to install new Receptacles				
Description	Cost Per	Qty.	Cost	Total Cost Receptacle Install at different depths
Pedestal	$930.00	47	$43,710.00	
120V Receptacles w/lockable covers	$163.50	47	$7684.50	
208V Receptacles	$175.50	47	$8248.50	
20A/1P Circuit Breakers	$76.00	9	$684.00	
30A/2P Circuit Breakers	$286.00	9	$2,574.00	
Sub-Total			$62,901.00	
HDD at 3 feet below grade			$207,547.46	$270,448.46
HDD at 10 feet below grade with pull boxes			$253,621.50	$125,802.00
HDD at 10 feet below grade with manholes			$229,317.35	$292,218.35
Hand trenching			$191,311.73	$254,212.73

Recommendations and Conclusions

Since replacing all of the conduits and conductors will be expensive, at a minimum we recommend replacing the conduits and conductors determined to be causing problems and replacing the pull box covers with steel covers with hold-down bolts so they can be secured. Because the area between Fresno Street and Tulare Street will require trenching for new receptacle conduits, this area should also have new lighting conduits installed.

If the City intends to hold festivals on the Fulton Mall the existing receptacles may not be sufficient. Therefore, we recommend installing the new receptacles and associated devices in the Receptacles section per the attached plans and specs. Hand trenching is the preferred method so adjacent decorative concrete work will have minimum damage. The estimate for the preferred option is shown in Table 1.

Appendix A: Property Survey

On January 25, 2011 a survey was conducted to determine the general receptiveness of the property owners toward the option to install building mounted lights. Below are the results of this survey.

Address	Result
1302 N. Fulton Mall	Not allowed to view panels
1252 N. Fulton Mall	Not allowed to view panels
1244 N. Fulton Mall	Vacant
1228-1240 N. Fulton Mall	Not allowed to view panels
1150 N. Fulton Mall	Vacant
1130 N. Fulton Mall	Not allowed to view panels
1118 N. Fulton Mall	Not allowed to view panels
1108 N. Fulton Mall	Not allowed to view panels
1060 N. Fulton Mall	Not allowed to view panels
1044 N. Fulton Mall	Closed
1036 N. Fulton Mall	Closed
1024 N. Fulton Mall	Not allowed to view panels
1022 N. Fulton Mall	Vacant
1014 N. Fulton Mall	Not allowed to view panels
2014 Tulare Street	Not allowed to view panels
926 N. Fulton Mall	Not allowed to view panels
902 N. Fulton Mall	Closed
829 N. Fulton Mall	Not allowed to view panels
835 N. Fulton Mall	Vacant
845 N. Fulton Mall	Not allowed to view panels
887 N. Fulton Mall	Vacant
909 N. Fulton Mall	Not allowed to view panels
913 N. Fulton Mall	Not allowed to view panels
917 N. Fulton Mall	Not allowed to view panels
927 N. Fulton Mall	Not allowed to view panels
931 N. Fulton Mall	Not allowed to view panels
933 N. Fulton Mall	Closed
959 N. Fulton Mall	Vacant
1015 N. Fulton Mall	Vacant
1017 N. Fulton Mall	Not allowed to view panels
1025 N. Fulton Mall	Three 20A/1P, 120V circuit breakers available
1029 N. Fulton Mall	Not allowed to view panels
1031 N. Fulton Mall	Not allowed to view panels
1039 N. Fulton Mall	Not allowed to view panels
1045 N. Fulton Mall	Not allowed to view panels
1111 N. Fulton Mall	Closed
1135 N. Fulton Mall	Not allowed to view panels
1137 N. Fulton Mall	Not allowed to view panels
1141 N. Fulton Mall	Vacant
1155 N. Fulton Mall	Vacant
1243 N. Fulton Mall	Vacant
1331 N. Fulton Mall	Not allowed to view panels