Street Light System Master Plan

Prepared For

City of Hawaiian Gardens

This Street Light System Master Plan has been prepared by or under the direction of the following Registered Civil Engineer:

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TABLE OF CONTENTS

FIGURES,TABLES AND MAPS

APPENDICIES

EXECUTIVE SUMMARY

The following report documents the activities, findings, and recommendations for a master plan of street lighting developed for the City of Hawaiian Gardens.

Norris-Repke Engineers and Land Surveyors were contracted by the City to prepare the master plan in March of 2006.

The project began with information gathering and field reviews including meetings with representatives of the Southern California Edison Company to obtain facilities lists and location maps of the existing streetlights within the City. Meetings and discussions were also held with various city staff members to gather information about the City's lighting standards, recent projects, City Land Use and Zoning, and payments for energy and maintenance of the existing streetlights within the City.

The information gathered was then transferred to 3-200 scale City Street Maps. Map 1 shows the pole location, pole number, pole type, luminaire wattage, luminaire type, and an account or circuit number used by Edison for billings to the City. Map 2 overlays the City's Zoning classifications for comparing the existing lighting to the land use. Map 3 shows both the existing street light locations and the proposed infill lighting proposed by Norris-Repke to bring the lighting levels up to the IES standard. Map 4 details the proposed phasing schedule for the street light master plan

Separate from Norris-Repke, the firm of Applied Geodetics was contracted by the City to locate each streetlight by a Global Positioning (GPS) Survey. Norris-Repke acknowledges Applied Geodetics' gracious sharing of the GPS surveys that have allowed an accurate location plotting of each of the existing streetlights throughout the City. This assisted immensely in the lighting level or photometric evaluation part of the project.

The illumination standards used for the lighting level or photometric evaluations are taken from the Illuminating Engineering Society (IES) of North America Guidelines as set forth in the ANSI/IESNA RP-8-00 publication entitled "American National Standard Practice for Roadway Lighting" copy write 1999.

The lighting inventory indicates a total of 541 existing streetlights within the City. The majority of these lights are owned, operated and maintained by the Southern California Edison Company. The lighting fixture types are predominately 'High Pressure Sodium Luminaires' Model M250R2 or M400 with wattages varying from 70 to 400 watts. Lighting throughout the residential areas of the City utilize 100 watt lamps and are mounted on wood poles with irregular pole spacing and a variety of steel mast arm lengths. By count there are 380 wood poles. Power is provided to the wood pole mounted lights by a system of overhead wires or conductors running from pole to pole. Newer style concrete poles with

underground wiring have also been installed along Pioneer Blvd., Carson St., and along the southern portion of Norwalk Blvd. Portions of 226th, 212th, 211th, and Bloomfield Avenue have also been upgraded with concrete poles and underground wiring. These by count total 77 concrete poles. The survey also located 15 steel poles at intersections we believe to be owned and maintained by the City as part of the City's traffic signal hardware.

The annual energy and maintenance costs billed to the City by the Edison Company for the 2005/2006 fiscal year are estimated at or about $48,000.00.

From the nighttime surveys conducted by Norris Repke, streetlight outages are estimated between 10% and 20%. Luminaire repairs or light bulb replacements by Edison are performed on a spot basis after an annual or semi-annual surveillance, or sooner upon receiving an outage report from citizens, or city staff. This can lead to some lights being out for several months and possibly up to a year if the outages go un-reported. Patrolling Sheriffs are also good at reporting outages, but that task is secondary to their law enforcement responsibility to the City. A regular monthly or quarterly patrol by a city staff member to log and report the outages to Edison is recommended. The City pays Edison monthly on an un-metered rate schedule with the City paying the same if the lights are burning or not.

Nearly every street in the City has some level of street lighting. The spacing between the existing lights varies along each street with gaps or dark spots being found along nearly all of the streets within the City. This appears to be the primary deficiency factor resulting in poor lighting uniformity throughout the City. From the inventory information assembled by Norris Repke and the GPS location survey performed by Applied Geodetics a detailed lighting level evaluation has been performed for each street estimating luminance, illuminance, veiling luminance ratio, visibility level (STV), and luminance vs. spacing for lighting uniformity. For each street three to four evaluations were run using the Aladdin Roadway Lighting Design program. The first run performed shows the optimum spacing of lights to meet the IES Standard. The next two evaluations detail the existing lighting levels typical for the existing maximum and minimum light spacing found within the street block. A final evaluation or run of the program shows the lighting levels provided by the recommended infill lighting.

Four City Maps have been prepared for the report. Reduced scale maps are included within the report and 200 scale copies are found at the end of the report.

Lastly, budget estimates for the installation of infill streetlight construction was prepared with a budget projection for the additional energy costs for such lighting. The costs to replace the old wooden pole lighting system with new concrete poles and underground wiring have also been estimated.

Research detailing a variety of ornamental pole types and decorative luminaires has been assembled and submitted separately for consideration along the major boulevards of the City. These could also be used for residential lighting should the decision be made to replace the wooden poles and overhead wiring throughout the City with new poles and underground wiring. The costs for ornamental lighting has not been estimated as there or many different poles or light standards to select from. A 10 to 20 percent increase would cover most of the selections if standard poles and an ornamental mast arm and luminaire are used. For ornate or custom cast light poles a 25% to 50% cost increase would be incurred. A final pricing estimate should be performed following the selection of any ornamental poles and luminaires to be installed.

It is our express desire to thank the City's Staff and the Sheriff Deputies who discussed the lighting effectiveness for the City, the representatives of the Southern California Edison Company, Applied Geodetics, and Pacific Lighting Sales who have graciously assisted with the project.

INTRODUCTION

The City of Hawaiian Gardens retained Norris Repke Engineers and Land Surveyors to provide professional engineering and computer services to develop a Street Light System Master Plan (SLSMP). The SLSMP provides the City with:

- A complete set of street light inventory maps.
- A Master Plan that utilizes modern technology and the highest engineering principles in providing roadway lighting.
- A Master Plan that provides the City Engineer and other public officials responsible for design, construction and operation of street lighting systems with practical information for evaluating, proposing, achieving and maintaining good nighttime visibility on the City's streets and sidewalks.
- Budget information to prepare a Capital Improvement Program for completing the infill of missing streetlights throughout the City and replacing the older unattractive wooden light poles and overhead wiring with concrete or decorative metal poles and underground wiring.

The purpose of roadway lighting is to produce quick, accurate, and comfortable visibility at night. These qualities of visibility will safeguard, facilitate and encourage vehicular and pedestrian traffic. The driver must be able to see distinctly and locate with certainty all significant details in or adjacent to the edges of the roadway. The pedestrian must also be able to see distinctly the edges of walkways, vehicles, and obstacles. It is very important to make the streets and highways as useful as possible during the hours of darkness as they are during daytime. Thus the proper use of roadway lighting as an operative tool provides economic and social benefits to the public that include:

a) Reduction in nighttime accidents.

b) Prevention of crime and aid to police protection.

c) Facilitation of traffic flow.

d) Promotion of business and industry during nighttime hours.

e) Inspiration for community spirit and growth.

The overall objective in preparing the master plan was to recommend lighting levels and provide recommendations to economically achieve these benefits. In summary, the SLSMP provides the following elements:

- An inventory of the existing street light system and an analysis of the adequacy lighting levels.
- An evaluation of the quantity and quality of lighting for each street classification.
- Recommended levels of illumination for residential, commercial and industrial areas.
- Development of recommendations and cost estimates to bring all existing street lighting to established national lighting standards.
- Development of a cost estimate to upgrade street lighting, where required.

STREET LIGHTING DESIGN STANDARDS

The initial step in the development of the SLSMP is to identify the various types of streets in the City. The City's General Plan currently classifies City streets in - three (3) categories based on street purpose, usage and width (see Figure 1).

Figure 1: Street Classifications

General Plan Street Classification	Re-Classification to match IES grouping
Primary (100 Feet R/W)	Arterial
Commuter (60 Feet R/W)	Collector
All other streets	Local

Arterials are defined as streets that serve the through movement of traffic and provide connection to higher classifications of roadway (i.e., freeways and expressways). Collectors are defined as those roadways that collect traffic from local streets and may have a limited amount of direct access to adjacent land uses. Local streets have direct access to adjacent land uses and accommodate lower volumes of traffic.

The street classifications were then compared to the abutting land use. The land use areas are classified as commercial, intermediate and residential. The criteria for area classification were established to define the amounts of pedestrian and vehicular movement during the night when the need for illumination is most critical. Certain land uses, such as office and industrial parks, may fit into any of the above-mentioned three area classifications. The classification selected should be consistent with the expected night pedestrian activity. The following is a brief discussion of each area classification.

Commercial: A business area of a municipality where ordinarily there are pedestrians during night hours. This definition applies to densely developed business areas outside, as well as within the central part of a municipality. These areas contain land uses that attract a relatively heavy volume of nighttime vehicular and/or pedestrian traffic on a frequent basis.

Intermediate: Those areas of a municipality often characterized by moderate to heavy nighttime pedestrian activity. Such areas include libraries community recreation centers, large apartment buildings, industrial buildings or neighborhood retail stores.

Residential: A residential development, or a mixture of residential and small commercial establishments, characterized by moderate pedestrian

traffic at night. This definition includes areas with single-family homes, town houses and/or small apartment buildings.

Typical area types adjacent to arterial and collectors within the City of Hawaiian Gardens range from residential and commercial to industrial and institutional. All local streets fall under the residential category.
Most lighted roadways have adjacent walkways and specific or separate lighting systems are seldom provided for such areas except in some commercial and industrial areas, with minimal illumination being provided. Such incidental lighting may not always produce the proper quality or quantity of light for comfort and safety of pedestrians. In most cases spillover light from the roadway luminaires is relied upon to provide walkway illumination.

Proper illumination should be provided on pedestrian walkways for the guidance, safety, and comfort of the users of such facilities. Pedestrians are concerned with the recognition of individuals on the walkway and they must be able to detect small obstacles in their pathway including bumps and depressions or changes in elevation such as stairways or ramps. Vertical illuminance criteria are important in the detection of figures by silhouette. These criteria will also help with the detection of peripheral movement of figures.
The next step is to establish appropriate lighting design standards for those street classifications and adjacent walkways. The Illuminating Engineering Society (IES) of North America provides recommendations for lighting levels for the three categories of streets, within both the roadway and walkway; these recommendations are shown in Tables 1 and 2:

Table 1: Roadway Illumination Guidelines

Classification		I.E.S. Lighting Standard	
Street	Area	Average Illuminance (Footcandles)	Illuminance Uniformity
Major	Commercial	1.20	3.0 to 1
	Intermediate	0.90	3.0 to 1
	Residential	0.60	3.5 to 1
Collector	Commercial	0.80	3.0 to 1
	Intermediate	0.60	3.5 to 1
	Residential	0.40	4.0 to 1
Local	Commercial	0.60	6.0 to 1
	Intermediate	0.50	6.0 to 1
	Residential	0.30	6.0 to 1
Parking Lot	Open Space	0.5 - 2.0	4:1

Notes: 1. Source: Illumination Engineering Society of North America, "Lighting Handbook", 8th Edition, 1993.
2. Footcandle is the amount of direct light thrown by one candle on a one square foot surface, every part of which is one foot away from the candle.
3. Illuminance uniformity ratio is the average illuminance of the roadway design area between two adjacent luminance divided by the lowest value at any point in the area.

Table 2: Walkway Illumination Guidelines

Walkway Class	Average Conditions		Special Conditions[1]	
	Avg. Illuminance Horizontal Levels[2] (Footcandles)	Illuminance Uniformity Horizontal Avg. to Min. (Footcandles)	Min. Illuminance Avg. Vertical Levels[3] (Footcandles)	Illuminance Uniformity Avg. to Min. Ratio
Sidewalk along streets by area classification				
Commercial	0.1	4 to 1	2.0	5 to 1
Intermediate	0.5	4 to 1	1.0	5 to 1
Residential	0.2	10 to 1	0.5	5 to 1
Park Walkways	0.5	10 to 1	0.5	5 to 1
Pedestrian Tunnels	2.0	4 to 1	5.5	5 to 1
Pedestrian Overpasses	0.2	10 to 1	0.5	5 to 1
Pedestrian Stairways	0.5	10 to 1	1.0	5 to 1

Notes: 1. Special conditions where additional lighting is needed.
2. Values measured or calculated at ground level.
3. Values measured or calculated (5 feet)) above pavement, in both directions, parallel to the direction of travel on the walkway.

Field Inspection of Lighting Levels

Norris Repke conducted nighttime field inspections at several locations in the city between March 2006 and November 2006. The inspections were conducted to evaluate the existing lighting levels at sample locations for each street type (arterial, collector and local). The results indicate that only a few of the City's streets fully meet or exceed the minimum IES standards.

Recommended Lighting Design Standards

The design of a roadway lighting system involves consideration of visibility, aesthetics, safety, environmental conditions, appropriate material and equipment, and economics. These criteria were considered in recommending lighting standards for the City.

Various agencies in Los Angeles and Orange Counties were also contacted to obtain their current lighting standards and practices. Through this study it was found that most neighboring municipalities use the current IES standards, or an earlier version thereof.

Norris-Repke proposes that the City of Hawaiian Garden adopt the current IES Standards for use by the City for all classifications of land use and roadway/walkway. The Master Plan of street lighting prepared for the City

utilizes these standards as the measuring benchmark for evaluation of the existing street lighting found throughout the City and also the development of new lighting schemes for infill or replacement lighting.

The recommended standards are designed to provide a balance between safety and operating costs. As described earlier, the lighting level standards change according to land use and roadway/walkway classifications. Where pedestrian and vehicular activity is expected to be greater, higher levels of lighting are required. By adhering to these standards accident and crime potential are reduced and safety is increased.

All new and infill street lighting installations will utilize underground wiring to supply power to the fixture and shall be designed and constructed in accordance with applicable sections of the "Standard Specifications for Public Works Construction," (Green Book), current edition, published by Building News, Inc., as modified by the City of Hawaiian Gardens.

Streetlight Cutoff Classifications

The Illuminating Engineering Society of North America (IES) has developed cutoff classifications for the lighting industry, which are intended to reduce the negative impacts of lighting. There are four levels of cutoff classifications: Full Cutoff, Cutoff, Semi-Cutoff and Non-Cutoff. Full Cutoff light fixtures offer the most light distribution control and provide significant mitigation to light pollution; however, there are benefits and limitations to each light cutoff classification.

For lighting within street categories listed below the following cutoff classifications are recommended:

Residential – Cutoff: A luminaire light distribution where the candela per 1000 lamp lumens does not numerically exceed 25 (2.5 percent) at or above an angle 90° above nadir, and 100 (10 percent) at or above a vertical angle 80° nadir. This applies to all vertical angles around the luminaire.

Intermediate – Semi-Cutoff: A luminaire light distribution where the candela per 1000 lamp lumens does not numerically exceed 50 (5 percent) at or above an angle 90° above nadir, and 200 (20 percent) at or above a vertical angle 80° nadir. This applies to all vertical angles around the luminaire.

Commercial – Non-Cutoff: A luminaire light distribution where there is no candela limitation in the zone above maximum candela.

Street Trees and Lighting Compatibility

Both trees and roadway lighting are indispensable municipal assets. However, street lighting and trees located within or near the public rights-of-way must be

installed and maintained to ensure compatibility. Locating streetlights such that the current and future tree canopy does not significantly conflict with the desired lighting dispersion precludes the need for pruning. Conversely, selecting new trees that will fit the available roadway space, with minimum conflict to utilities, will reduce the need for tree pruning.

In the event that pruning is required trees will be trimmed on an as needed basis to ensure that the canopy of the tree does not obstruct light dispersion to any intended target. The party responsible for such maintenance shall be that which has ownership of the tree; the City of Hawaiian Gardens shall maintain trees within the public right-of-way and trees located on private property shall be the responsibility of the private property owner.

INVENTORY AND MAPPING

To compile an inventory of the street lighting throughout the City of Hawaiian Gardens Norris-Repke staff first met with officials of the Southern California Edison (SCE) Company, to obtain their street lighting plats. The information obtained was transferred to a 200 Scale map of the City. Concurrently, the City separately engaged the firm of Applied Geodetics to do a Global Positioning (GPS) Survey of the streetlights within the City. Finally, Norris-Repke integrated the information it received from Applied Geodetics with the SCE data to produce a coordinate based survey location of each streetlight within the City. That information is described in the following exhibits:

Map 1 - depicts the location of each existing street light with its pole type, luminaire type and wattage, and the account or circuit number used by Edison to bill the City.

Map 2 - depicts the existing street light inventory with an overlay of the City's Zoning shown.

Map 3 - shows the existing and proposed infill lighting to bring the existing street lighting up to IES standards.

Table 3 - provides a spreadsheet listing that describes an inventory of existing streetlights and proposed master plan installations.

Table 3

City of Hawaiian Gardens

Inventory of Existing Street Lights and Proposed Master Plan Installations

Street / Type	Reach		Existing Lighting			Spacing +/-		Proposed New Lighting			Spacing +/-		Proposed Phasing
Land Use	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Schedule by Year
Carson St./ Arterial													
A-C4	Pioneer	Juan	Centerline	10 / C	2-200	100	150						
A-C4	Intersection of Violeta		Centerline	1 / S	5-150	N/A							
A-C4	Intersection of Juan		Centerline	1 / S	6-150	N/A							
A-C4	Juan	Norwalk	Centerline	6 / C	2-200	125	125						
			South	2 / C	1-200	675	675						
A-C4	400' from Juan		Centerline	1 / S	5-200	N/A							
A-C4	Norwalk	Claretta	Centerline	9 / C	2-200	100	125						
A-C4	Intersection of Norwalk		Centerline	1 / S	4-400	N/A							
A-C4	Intersection of Belshire		Centerline	1 / S	4-250	N/A							
A-C4	Claretta	Bloomfield	Centerline	7 / C	2-200	100	200						
A-C4	Intersection of Claretta		Centerline	1 / S	3-310	N/A							
A-C4	200' from Claretta		Centerline	1 / S	3-310, 1-200, 1-150	N/A							
A-C4	975' from Claretta		Centerline	1 / S	5-200	N/A							
A-C4	Intersection of Bloomfield		Centerline	1 / S	1-400, 1-250, 2Unknown	N/A							
Norwalk Blvd./ Arterial													
A-C4	South of 226th	226th	West	1 / W	1-200	200	200						
				1 / W	1-100	200	200						
A-C4	226th	Civic Center	Centerline	13 / C	2-200	125	175						
A-C4	Intersection of 223rd		Centerline	1 / S	4-250	N/A							
A-C4	Intersection of 221st			1 / S	3-150, 3-200	N/A							
A-C4	Intersection of Civic Center			1 / S	5-250								
A-C4	Civic Center	Carson	Centerline	4 / C	2-200	125	125						
A-C4	Carson	Tilbury	**No Lighting**					East	1 / C	1-200	125' North of Carson		Year 1
A-C4	Tilbury	215th	West	2 / W	1-200	350	350	East	3 / C	1-200	100'	250'	Year 1
				1 / W	1-100	Norwalk/215th							
				1 / W	1-70	100' North of 216th St.							
A-C4	215th	214th	West	1 / W	1-200	100' North of 215th St.		East	2 / C	1-200	150'		Year 1
A-C4	Intersection of 214th		Centerline	1 / S	2-200	N/A							
A-R4/C4	214th	Centralia	West	7 / W	1-200	150	200	East	3 / C	1-200	175'		Year 1
			East	1 / S	1-250	650' N/of 214th							
				2 / C	1-200	250	250						
A-C4	Intersection of Centralia		4 Corners	4 / S	1-250	N/A							
Centralia St./ Arterial													
A-R3/M1/C4	West of Seine Av	Norwalk	South	8 / W	1-200	125	250	South	5 / C	1-200	230'	350'	Year 1

Table 3

City of Hawaiian Gardens

Inventory of Existing Street Lights and Proposed Master Plan Installations

Street / Type	Reach		Existing Lighting			Spacing +/-		Proposed New Lighting			Spacing +/-		Proposed Phasing
Land Use	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Schedule by Year
Civic Center/ Arterial													
A-R4	Pioneer	Norwalk	South	10 / W	1-250	250	500						
				1 / W	1-200	400' East of Norwalk							
221st Street / Collector/Arterial													
C-R2	Norwalk	Claretta	South	7 / W	1-100	130	175	North	2 / C	1-100	250'		Year 1
C-R2	200' East of Norwalk		North	1 / C	1-100	N/A							
C-C4	Claretta	Wardham	South	5 / W	1-100	200'	200	North	1 / C	1-100	East corner of Verne Av.		Year 1
								South	2 / C	1-100			Year 5
Pioneer / Arterial													
C-R2/C4	South of 223rd	Carson	West	15 / C	1-150	100'	300'						
			East	15 / C	1-150	100'	200'						
A-C4	Carson	216th	**No Lighting**					East	3 / C	1-200	75'	100'	Year 1
A-C4	216th	215th	East	3 / C	1-200	115'							
A-C4	N/E Corner of 215th/Pioneer			1 / S	1-400								
Bloomfield / Arterial													
A-C4/R4	Carson	N/City Limit	West	3 / C	1-200	100'	150'	West	1 / C	1-200	West Corner		Year 1
			East	3 / C	1-200	150'							
A-R2/MHP	Woodson	E/City Limit	West	3 / C	1-150	300'	500'						
215th St. / Local													
L-C4/Hospital	Pioneer	Elaine	South	8 / C	1-200	175'	200'						
221st / Local													
L-R2	Pioneer	Seine	North	5 / W	1-100	250'	300'	North	2 / C	1-100	100'		Year 3
								South	5 / C	1-100	200'	250'	Year 3
L-R2/School	Seine	Elaine	North	2 / W	1-100	250'	300'	South	3 / C	1-100	200'	250'	Year 1
L-R2	Elaine	Juan	North	2 / W	1-100	250'	300'	South	1 / C	1-100	100'	250'	Year 3
								North	1 / C	1-100	100'	250'	Year 3
L-R2	Joliet	Norwalk	North	4 / W	1-100	250'	300'	North	2 / C	1-100	100'	250'	Year 4
223rd St. / Local													
L-R2/C4	Pioneer	Norwalk	South	20 / W	1-100	100'	200'						
L-R2	Devlin	Funston	South	1 / C	1-100	N/A							
L-C4/R2	Norwalk	Belshire	South	3 / W	1-100	150"	250'	North	1 / C	1-100	175'	250'	Year 4
								South	1 / C	1-100	175'	250'	Year 4
L-R2	Belshire	Wardham	South	5 / W	1-100	150"	250'	North	6 / C	1-100	175'	250'	Year 5

Table 3

City of Hawaiian Gardens

Inventory of Existing Street Lights and Proposed Master Plan Installations

Street / Type	Reach		Existing Lighting			Spacing +/-		Proposed New Lighting			Spacing +/-		Proposed Phasing
Land Use	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Schedule by Year
222nd St. / Local													
L-C4/R2	Norwalk	Belshire	North	3 / W	1-100	175'	225'	North	2 / C	1-100	200'	250'	Year 4
L-R2	Belshire	Wardham	South	7 / W	1-100	150'	350'	North	7 / C	1-100	200'	250'	Year 5
								South	2 / C	1-100	150'		Year 5
211th St. / Local													
L-C4/R1	Norwalk	Claretta	South	10 / C	1-100	125'	150'						
212th St. / Local													
L-R1	Norwalk	Claretta	North	5 / C	1-100	250'	300'						
L-R1			South	5 / C	1-100	250'	300'						
L-C4	100' East of Norwalk		South	1 / W	1-100	N/A							
213th St. / Local													
L-C4/R1/Church	Norwalk	Claretta	South	6 / W	1-100	175'	250'	North	5 / C	1-100	125'	300'	Year 2
									1 / C	1-100	150'	250'	Year1
214th St. / Local													
L-R4	Elaine	Norwalk	South	5 / W	1-100	150'	250'	North	7 / C	1-100	150'	250'	Year 2
L-R3	Norwalk	Claretta	North	7 / W	1-100	100'	300'	North	2 / C	1-100	275'		Year 2
Schultze dr. / Local													
L-R3	214th	North end	West	1 / C	1-100	75' North of 214th							
215th St. / Local													
L-R3	Horst	Norwalk	South	2 / W	1-70	200'		South	1 / C	1-100	200' East of Horst		Year 1
L-R3/C4	450' East of Horst		South	1 / W	1-100	N/A							
			South	2 / W	1-100	100'							
L-C4/R2	Norwalk	Belshire	North	2 / W	1-100	250'		South	2 / C	1-100	200'		Year 2
L-R2	Belshire	Ely Av	North	2 / W	1-100	150'							
216th St. / Local													
L-R2/C4	Horst	Norwalk	North	2 / W	1-100	250'		North	1 / C	1-100	300' West of Norwalk		Year 1
	Norwalk	Belshire	North	2 / W	1-100	200'		North	2 / C	1-100	200'		Year 2
			South	2 / W	1-100	100'							
Tilbury St. / Local													
L-C4/R2	Horst	Norwalk	South	3 / C	1-100	200'	225'		2 / C	1-100	400'		Year 1
L-C4	200' West of Norwalk		North	1 / W	1-200	N/A		North					
L-C4/R2	Norwalk	Belshire	South	2 / W	1-100	150'		South	2 / C	1-100	250'		Year 2

Table 3

City of Hawaiian Gardens

Inventory of Existing Street Lights and Proposed Master Plan Installations

Street / Type	Reach		Existing Lighting			Spacing +/-		Proposed New Lighting			Spacing +/-		Proposed Phasing
Land Use	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Schedule by Year
L-C4			North	3 / W	1-100	250'	300'						
224th St. / Local													
L-R2/C4	Norwalk	Belshire	South	2 / W	1-100	500'		South	1 / C	1-100	275' East of Norwalk		Year 4
			South	2 / W	1-70	250'							
L-R2	Belshire	Claretta	Staggered	3 / W	1-100	150'	250'	Staggered	2 / C	1-100	400'		Year 5
L-R2	Claretta	Wardham	South	3 / W	1-100	200'		Staggered	4 / C	1-100	100'	200'	Year 5
Brittain St. / Local													
L-R2/C4	Norwalk	Wardham	South	10 / W	1-100	150'	250'	North	4 / C	1-100	225'	300'	Year 5
226th St. / Local													
L-R2	Arline	Devlin	North	5 / C	1-100	175'	250'						
			South	4 / C	1-100	200'	300'						
L-R2/R4	Devlin	Norwalk	South	7 / C	1-100	150'	300'						
L-R2/C4	Juan	Ibex	North	3 / W	1-100	250'							
L-R2/School	Cortner	Wardham	South	6 / W	1-100	100'	175'	North	4 / C	1-100	175'	200'	Year 1
L-School	Cor. Of Cortner/226th		South	1 / S	1-100	N/A							
L-R2/C4	Norwalk	Cortner	North	1 / W	1-70	125' East of Norwalk		North	4 / C	1-100	125'	250'	Year 1
Wardham ave. / Local													
L-R2/PARK	Britian	221st	East	2 / C	2-200	175'							
			West	2 / W	1-100	800'		West	2 / C		200'	600'	Year 5
				1 / W	1-200	400' South of 221st							
	226th	Brittian						West	1 / C	1-100			Year 1
Arline Ave. / Local													
L-R2	226th	223rd	East	2 / W	1-100	200'		East	1 / C	1-100	100' South of 223rd		Year 3
L-R2	223rd	221st	West	2 / W	1-100	200'		East	3 / C	1-100	200'	250'	Year 3
L-R2	221st	Carson	East	5 / W	1-100	200'	250'	Staggered	7 / C	1-100	100'	225'	Year 3
								West	1 / C	1-100			Year 1
Clarkdale Ave./Local													
L-R2	South End	223rd	East	3 / W	1-100	100'	200'	East	1 / C	1-100	175' from 226th		Year 3
L-R2	223rd	221st	East	2 / W	1-100	200'		West	3 / C	1-100	200'	225'	Year 3
								East	1 / C	1-100	corner of 223rd		Year 3
L-R2	221st	Civic Center	West	4 / W	1-100	150'	200'	East	3 / C	1-100	150'	200'	Year 2
L-R2	Civic Center	Carson	East	2 / W	1-100	100'		West	3 / C	1-100	180'	200'	
								West	1 / C	1-100			Year 1

Table 3

City of Hawaiian Gardens

Inventory of Existing Street Lights and Proposed Master Plan Installations

Street / Type	Reach		Existing Lighting			Spacing +/-		Proposed New Lighting			Spacing +/-		Proposed Phasing
Land Use	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Schedule by Year
Violeta Ave. / Local													
L-R2	226th	223rd	East	3 / W	1-100	175'	275'	East	3 / C	1-100	100'	200'	Year 3
L-R2	223rd	221st	East	2 / W	1-100	250'		West	3 / C	1-100	250'		Year 3
L-R2	221st	Civic Center	East	3 / W	1-100	150'	250'	Staggered	4 / C	1-100	100'	200'	Year 2
L-R2	Civic Center	Carson	East	3 / W	1-100	200'		West	3 / C	1-100	200'		Year 2
Seine Ave. / Local													
L-R2	226th	223rd	West	1 / W	1-100	125' from 226th							
			East	3 / W	1-100	100'	175'	East	3 / C	1-100	150'	275'	Year 3
L-R2	223rd	221st	East	2 / W	1-100	200'		West	3 / C	1-100	200'	250'	Year 3
L-R2	221st	Civic Center	East	3 / W	1-100	200'		West	3 / C	1-100	200'		Year 2
L-R2	Civic Center	Carson	East	2 / W	1-100	250'		West	2 / C	1-100	200'	400'	Year 2
								East	1 / C	1-100			Year 1
Devlin Ave. / Local													
L-R2	226th	223rd	East	4 / W	1-100	200'		West	4 / C	1-100	150'	175'	Year 3
L-R2	221st	Civic Center	East	5 / W	1-100	125'	150'						
L-R2	Civic Center	Carson	East	3 / W	1-100	200'	175'	West	3 / C	1-100	175'	200'	Year 2
								West	1 / C	1-100			Year 1
Funston Ave. / Local													
L-R2	226th	223rd	East	4 / W	1-100	150'	225'	West	4 / C	1-100	150'	200'	Year 3
Elaine Ave. / Local													
L-R2	226th	223rd	East	4 / W	1-100	150'	200'	West	4 / C	1-100	175'	200'	Year 3
L-R2	223rd	221st	West	2 / W	1-100	175'		East	3 / C	1-100	100'	200'	Year 3
								West	2 / C	1-100			Year 1
L-R2	221st	Civic Center	East	3 / W	1-100	150'	250'	East	2 / C	1-100	400	400	Year 3
L-R2	Civic Center	Carson	East	2 / W	1-100	200'		West	3 / C	1-100	200'		Year 2
								East	1 / C	1-100			Year 1
L-School/R3	215th	North End	Staggered	7/W	1-100/1-150	100'	250'	West	1 / C	1-100			Year 2
Juan Ave. / Local													
L-R2	226th	223rd	East	4 / W	1-100	150'	250'	East	1 / C	1-100	150' South of 223rd		Year 3
L-R2	223rd	221st	East	2 / W	1-100	250'		West	3 / C	1-100	200'	250'	Year 3
L-R2	221st	Civic Center	West	4 / W	1-100	150'	225'	East	2 / C	1-100	200'		Year 3
L-R2	Civic Center	Carson	Staggered	3 / W	1-100	150'	250'	East	2 / C	1-100	200'		Year 2
L-C4/R1/R3	Carson	214th	West	6 / W	1-100	125'	250'	East	5 / C	1-100	175'	250'	Year 2
L-M1	214th	Centralia	West	4/W	1-100	150'	200'	West	2 / C	1-100	200'		Year 5

Table 3

City of Hawaiian Gardens

Inventory of Existing Street Lights and Proposed Master Plan Installations

Street / Type	Reach		Existing Lighting			Spacing +/-		Proposed New Lighting			Spacing +/-		Proposed Phasing
Land Use	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Schedule by Year
Joliet Ave. / Local													
L-R2	226th	223rd	West	4 / W	1-100	150'	250'	East	2 / C	1-100	225'		Year 4
L-R2	223rd	221st	West	2 / W	1-100	175'		Staggered	5 / C	1-100	100'	200'	Year 4
L-R2	221st	Civic Center	West	3 / W	1-100	150	425'	West	2 / C	1-100	225'		Year 4
Horst Ave. / Local													
L-R2	226th	223rd	West	4 / W	1-100	150'	200'	East	4 / C	1-100	175'	200'	Year 4
L-R2	223rd	221st	West	2 / W	1-100	200'		Staggered	5 / C	1-100	100'	200'	Year 4
L-R2	221st	Civic Center	East	4 / W	1-100	150	200'	West	3 / C	1-100	150'	175'	Year 4
L-R1/R2/R3	Tilbury	214th	West	4 / W	1-100	150	200'	East	5 / C	1-100	125'	250'	Year 1
			East	1 / C	1-100	East corner of Horst							
Ibex Ave. / Local													
L-R2	226th	223rd	West	4 / W	1-100	150'	200'	East	4 / C	1-100	150'	200'	Year 4
L-R2	223rd	221st	West	2 / W	1-100	200'		Staggered	4 / C	1-100	100'	200'	Year 4
L-R2	221st	Civic Center	East	4 / W	1-100	150'	200'	West	4 / C	1-100	175'		Year 4
Farlow St. / Local													
L-R1	Claretta	East End	South	2 / W	1-100	200'							
Belshire St. / Local													
L-R2	226th	221st	East	4 / W	1-100	250'	500'						
			West	1 / W	1-100	80' South of 224th							
L-R2/R4/C4	221st	Carson	East	5 / W	1-100	125'	350'	East	5 / C	1-100	150'	500'	Year 1
				1 / C	1-200	400' North of 221st							
L-R1/R2/C4	Carson	214th	West	6 / W	1-100	100'	450'	East	3 / C	1-100	100'	200'	Year 1
								East	2 / C	1-100	100'	200'	Year 2
Claretta Ave. / Local													
L-R2	226th	224th	East	2 / W	1-100	250'		East	1 / C	1-100	200'		Year 1
								East	1 / C	1-100	200'		Year 5
L-R2	224th	221st	West	3 / W	1-100	250'		East	3 / C	1-100	250'		Year 5
L-R2/R4	221st	North End	West	3 / W	1-100	100'							
				2 / W	1-70	100'							
				1 / C	1-200	160' from end		West	1 / C	1-100	200' from end		Year 1
			East	2 / W	1-100	250'							
				1 / W	1-200	End of street							
L-C4/R4	Carson	Tilburry	East	1 / W	1-100	150' North of Carson							
			West	1 / C	1-150	Northwest corner of Carson			1 / C	1-100			Year 1

Table 3

City of Hawaiian Gardens

Inventory of Existing Street Lights and Proposed Master Plan Installations

Street / Type	Reach		Existing Lighting			Spacing +/-		Proposed New Lighting			Spacing +/-		Proposed Phasing
Land Use	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Side of St.	No./ Pole Type	Wattage	From	To	Schedule by Year
L-R1/R3	City Limit	212th						West	4 / C	1-100	150'	350'	Year 2
L-R1/R3	212th	211th	East	1 / C	1-100	100' South of 211th							
Verne Ave. / Local													
L-R3/C4	221st	Carson	East	2 / W	1-100	550'		East	4 / C	1-100	200'	500'	Year 1
			West	3 / W	1-100	450'	525'	West	2 / C	1-100	500'		Year 1
Hawaiian Ave. / Local													
L-R3/C4	221st	Carson	East	7 / W	1-100	100'	225						
				1 / W	1-200	50' South of Carson							
				1 / W	1-70	350' North of 221th							
Canada dr. / Local													
L-R3	Hawaiian ave	East end	South	1 / C	1-100	100' East of Hawaiian							
Alley / Local (Between Carson St. And Civic Center dr.)													
L-R2/C4	Arline	East of Juan	North	4 / W	1-100	150'	200'						
			South	1 / W	1-100	corner of Seine ave.							
			North	3 / W	1-70	250'							
Alley / Local (Between Norwalk ave. and Horst ave.)													
L-R2/R3/C4	Tilbury	214th	West	6 / W	1-70	100'	200'						
Alley / Local (Between 214th st. and 215th st.)													
L-R3	Horst	Norwalk	South	2 / W	1-70	200'							
Alley / Local (Between 215th st. and 216th st.)													
L-R2/R3	Horst	Norwalk	South	1 / W	1-100	75' East of Horst		South	1 / C	1-100	100'		Year 1
				1 / W	1-70	300' East of Horst							
Alley / Local (Between 216th st. and Tilbury)													
L-R2	Horst	Norwalk	South	1 / W	1-100	150' East of Horst		South	1 / C	1-100	100'		Year 1
				1 / W	1-70	350' East of Horst							
Alley / Local (Between Norwalk ave. and Belshire ave.)													
L-R2/C4	215th	Tilbury	East	3 / W	1-70	100'	300'						
Alley / Local (Between Tilbury st. and Carson st.)													
L-C4	Belshire	West end	North	2 / W	1-70	100'							
			TOTAL	541					262				

LIGHTING DEFICIENCIES

In discussion with representatives from the Southern California Edison Company, General Electric Luminaires and Lamp products were identified as the most commonly used street light fixtures throughout the Southern California Area; an inventory detailing the make of each light fixture does not exist. However, we believe that the General Electric Luminaire Model M250R2, with and without cutoff shielding, to be the most commonly found fixture within the City. The variance in the actual luminaire photo metrics appears to be of minor significance, with the wattage, pole height, and pole spacing having the greatest effect on the deficiency evaluation provided in the report. If and when final designs are prepared for infill or replacement lighting it is recommended that the designer confirm the make, model, and lamp wattage of the luminaire to be provided

Using the Edison inventory plat maps depicting the location for each streetlight within the City, Norris Repke made a street-by-street evaluation of the existing lighting, and compared that information to the IES Standards for streets and roadways. These evaluations are contained in Appendix Volumes 1 thru 3. The streets are listed alphabetically or by increasing street number and are indexed to assist the user.

For each block there are three to four iterations of the photometric evaluation. The first iteration is labeled as Optimum, which represents the maximum spacing for the type of pole and luminaire used to meet the IES Standard. For a local street with two 18 foot half street widths, a standard pole height of 25 feet and a mast arm length of 6 feet, the optimum spacing will generally run 126 feet for a right side installation, 106 feet spacing for a left side installation, and 192 feet for a staggered installation.

The Aladdin program requires this optimum evaluation to be run first to show the IES illumination and lumination values provided by the optimum layout. The next one or two iterations detail the existing pole spacing and show the photometric values resulting from that spacing. Where multiple spacing distances occur the minimum and maximum spacing found within each block has been run. The last evaluation shows the photometric values of the street lighting with the proposed infill lighting.

There are multiple ways to provide infill lighting. Where only a few lights are missing along one side of a street individual lights are recommended to fill in the gaps. Where the existing spacing exceeds 150 feet and is fairly uniform, a second row of lights on the opposite side of the street has been recommended, with a light placement location in between that of the existing lighting, resulting in a staggered configuration.

A spreadsheet summary listing the deficiencies found and the proposed infill streetlights recommended is included in Table 4. Map No. 3 describes the proposed infill locations throughout the City. By count an estimated 244 light locations along residential streets and 18 locations along the arterial or collector streets require infill streetlights.

MAINTENANCE PROGRAM

Edison being the owner of the majority of the streetlight system throughout the City, it is Edison that provides maintenance as part of the unit cost of providing each streetlight to the City. The more streetlights the City requests Edison to provide the City determines the final cost to the City.

At signalized intersections where the City owns streetlights or safety lights, the lights are maintained by the City or by a maintenance contractor, with the energy consumption costs being metered.

The disadvantage to Edison owning and maintaining the streetlight system arises from the limited regularity in which Edison surveys the City to check for burnouts. This is generally done once or twice a year with a drive through maintenance survey. They do however respond promptly to a citizen or City staff report of a burnout; but it primarily relies upon others to submit complaints between its annual or semi annual maintenance survey. In this situation an un-metered light is being paid for even though it may be burned out.

It is common for City's to do a monthly or quarterly drive through with a City Maintenance worker to check for burned out streetlights. This comes with a City born labor cost. It is also common for the Police or Sheriff Officer's to keep and turn in a log sheet of burned out lights they encounter during their night time patrols. This is secondary to their policing responsibilities and they are not specifically looking for burned outs lighting. Edison will generally respond within a day or two of a reported burnout.

In the nighttime surveys performed by Norris-Repke an estimated 10 to 20 percent of the streetlights throughout the City were observed non-functioning. In all respects this rate is very high and should merit a specific survey to look for and report outages throughout the City to reduce the immediate outage situation.

FINANCIAL ANALYSIS

Street Light Project Prioritization and Development of 5-Year Program:

Street light system improvement projects were identified and prioritized and annual project phasing was determined for a five-year system-wide improvement program according to the following methodology:

- Proposed future street light locations were classified as to proximate land use and adjacent roadway classification. These attributes were used to gauge the benefit of any particular streetlight installation. Greater benefit was attributed to light locations where significant vehicle or pedestrian/vehicle activity would be expected during the hours of darkness. Thus, commercial areas and other busy public locations were given preference over less intensive activity areas, such as residential neighborhoods. By this same logic, lights serving arterials were favored over lights serving collectors, and lights serving collectors were favored over lights serving local roadways.

Table 4
Street Light System Improvement
5-Year Program Project Phasing and Capital Cost Forecast

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Capitol Costs (2006 Constant $)	$81,000 (18 20HP) $204,714 (51 10HP)	$260,910 (65 10HP)	$212,742 (53 10HP)	$160,560 (40 10HP)	$140,490 (35 10HP)	$81,000 (18 20HP) $204,714 (244 10HP)
Contingencies[2]	$42,858	$39,137	$31,912	24,084	$21,074	$159,065
Design, Administration, and Construction Management[3]	$45,715	$41,746	$34,039	$25,690	$22,479	$169,669
Total Costs (2006 Constant $)	$374,287	$341,793	$278,693	$210,334	$184,043	$1,389,150
Budgeted Costs with Inflation[4]	$374,287	$358,883	$292,628	$220,851	$193,246	$1,439,895

Notes: 1. Refer to Table 3 and Map 4 for project details and locations.
2. Contingencies represent 15% of unadjusted capitol costs.
3. Represents 16% of projects capitol costs.
4. Annual inflation rate is assumed to be 5% per year.

The financial details of the proposed 5-year streetlight improvement program are provided in Table 4. The proposed streetlight system improvements by project and program year are detailed in Table 3 and Map 4.

Once funding becomes available and design of the streetlight improvement program is authorized, construction would need to be coordinated with other street projects in accordance with the City's master plan of improvements

The City will also incur additional energy and maintenance expense to be paid directly to the Edison Company. The City currently is paying approximately $8,053 a month for streetlight energy costs. The additional 242 100 watt lights and the 18 200 watt lights at the current rates of $8.16 & $8.70 per light per month will add $2,132 per month in energy and maintenance costs if the current LS-1 rate schedule is continued by the city. This amounts to $25,584 annually, approximately a 26% increase to the existing $96,645 annual expenditure.

Should the City consider replacing the existing wooden poles with new concrete poles and under-grounding the wiring the cost to replace the existing 380 poles are estimated at:

380 x $4014=	$1,525,320
Adding 15% for removal and disposal of old poles	$228,798
Adding 16% for design, administration, and construction management	$244,051
Adding 15% for contingency	$228,798
Total	$2,226,967

The total cost for infill light construction and wood pole replacement are estimated at:

Grand Total	$3,666,862

The replacement of the existing wood poles would not increase the monthly energy and maintenance costs. Those costs would remain the same as long as the number of poles and luminaire wattage remained the same. Edison rates do however change periodically as Edison receives approval from the Public Utilities Commission for a rate adjustment. The construction estimates should also be adjusted annually for inflation starting 6 months from this publication.

Recognizing that a streets pavement must be cut to install underground wiring the combining or scheduling of the streetlight improvements to coincide with street resurfacing projects would help defray both construction administration costs for both projects.

Two lower costs alternatives should also be considered as options for increasing the level of lighting throughout the City. First, the placement of additional wood poles along such streets as Arline, Clarkdale, Violeta, Seine, Devlin, Funston, Elaine, Juan, Joliet, Horst and Ibex could be accomplished with much of the wiring costs being reduced and a pole mast arm and luminaire costs of about $700 per pole. Should the City at some time in the future decide to replace the wood poles with newer concrete or steel poles and underground the wiring the extra costs of both the removal and the installation would be added to long-term program expenditures.

The last alternative involves the replacement of the existing lamps or light bulbs with higher wattage lamps. This option could be as simple as changing the lamp within the existing luminaire, but frequently will need fuse and ballast replacement, if not a full luminaire replacement. This option would be at a significantly lower cost than constructing a new streetlight and could be considered along streets such as 226th Street from Cortner to Wardham, 213th Street from Norwalk to Claretta, 214th from Horst to Norwalk and Juan Avenue from Carson to 214th. Sections of other streets where the light spacing is regular or can be made regular with spot infill lighting could also be considered for lamp replacement. It should be noted that where the light spacing is irregular, trying to increase the lighting levels with a higher wattage lamp will affect the lighting uniformity ratio and any lamp wattage replacement should be engineered before implementation.

CONCLUSION AND RECOMMENDATIONS

Previous efforts by the City to provide street lighting throughout the City are considered good and significant with every street having some level of street lighting. The existing lights have also been upgraded to high pressure sodium vapor for energy conservation. The major streets of the City including Carson Boulevard, Pioneer Boulevard south of Carson and Norwalk Boulevard south of Carson have recently been upgraded and adequately meet the current IES Lighting Standards. We understand that an upgrade in lighting for portions of Norwalk Boulevard north of Carson is in the planning stage. The residential streets of 211th and 212th between Norwalk and Claretta, Civic Center Drive, 223rd and 226th street from Pioneer to Norwalk also show upgraded lighting improvements to full or near full compliance with the IES Lighting Standards. The remainder of the City is considered to have a fair level of lighting, but random and irregular light spacing allows dark spots to exist along most if not all of the unmentioned streets.

By count the City has 541 existing streetlights. Our recommendation is to add an additional 262 lights to fill in and improve the existing lighting throughout the City to the full IES Standard. This would represent approximately a 48% increase in the number of lights, which in turn increases energy and maintenance costs to be paid to the Edison Company. This is significant, but a plan to install infill lighting is recommended as soon a funding can be provided. The costs for new concrete poles and underground wiring for such infill lighting is estimated to be approximately $1,400,000.

Approximately 380 lights mounted on wood poles with overhead wiring exist throughout the City. The luminaries have been modernized but the wooden poles and overhead wiring are considered by some to be a visual blight. The ultimate replacement of these poles with newer concrete or steel poles and the placement of the wiring with underground wiring as part of a long term or multiyear program are recommended. The costs for such improvements are estimated to be approximately $2,200,000. This estimate can be affected by inflation and material fluctuations and should be adjusted each year in a multi-year improvement program.

The combined capital costs for both infill and replacement lighting are estimated to be in the range of $3,600,000. Should decorative or ornamental poles be considered, this amount would be increased to reflect the actual costs for the poles, mast arms and luminaires selected.

The City does have a Lighting and Landscape District in placethat appears to generate approximately $80,000 for energy and capital expenditures a year, with about $48,000 of this going for energy costs. At $32,000 a year it would take over 120 years to complete all improvements. The District however could be reevaluated and new assessments proposed to generate the additional funding

needed for multiyear capital program. The costs for legal fees, debt funding, and assessment engineering would need to be added if a public bond is considered. This is subject to Proposition 218 and may take a City vote to approve. The disposition of the community towards such expenditure should be polled to see if there is support for a bond initiative.

Street lighting is eligible for gas tax funding. Using gas tax funds for street lighting should be carefully considered as it would take away the use of funds for street pavements, sidewalks, and or street drainage projects that may already have been considered, or are needed by the City.

A grant application for the next Metropolitan Transportation Authority Call for Projects should be considered as a potential source for grant funding. This Master Plan report we believe is suitable as a support document for such a grant application.

The most viable funding methods would appear to be in the adjustment of the Lighting and Landscape District revenues with a new bond initiative and submittal of an application for the next MTA Call for Projects.