9.3 Site Lighting Master Plan

Site Lighting Master Plan

State of Washington

Pierce College

Fort Steilacoom and Puyallup Campuses

Lakewood and Puyallup, Washington

FINAL REPORT

HARGIS

JUNE 24, 2016

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1. EXECUTIVE SUMMARY

1.1 INTRODUCTION

Hargis Engineers, Inc. (Hargis) was contracted to evaluate the complete existing campus site lighting at the Pierce College Fort Steilacoom and Puyallup campuses, and to develop design criteria for future landscaping and site lighting improvements.

It was conveyed that areas of both campuses may not have existing adequate site lighting, and that there have not been any standards for design of site lighting to date. Within the scope of this study and report, we reviewed the existing conditions and defined criteria and layout for future improvements to site lighting to meet those design criteria. The goals of the study are to provide uniform and consistent lighting across both campuses, with security, energy efficiency, dark sky/light pollution, and maintenance being key considerations in development of design criteria and standards.

1.2 REFERENCES

The following are referenced in design criteria and product literature associated with the findings of this study and report:

1. Illuminating Engineering Society, RP-20: Lighting for Parking Facilities
2. Illuminating Engineering Society, RP-33: Lighting for Exterior Environments
3. AGI – Lighting Modeling Software – AGI32 Lighting Software version 2.36

1.3 OBJECTIVES

Within the scope of this report, the following are our objectives:

1. Existing Conditions: Review and document existing site lighting conditions at both campuses
2. Design Criteria: Develop criteria for site parking, site pedestrian circulation, and building entry zones.
3. Master Plan for Future Improvements: Develop a specific plan, considering existing infrastructure, to meet design criteria established in report

2. EXISTING CONDITIONS ASSESSMENT

2.1 INTRODUCTION AND OVERVIEW

The existing conditions assessment and review were conducted during the evening hours on four evenings over the course of January and February of 2016. The goals of the site assessment and survey were to document all existing site lighting fixtures and associated photometric performance on both campuses, both building-mounted and mounted independently to structures on the site. Limited documentation for existing site lighting was available for both campuses, observations regarding existing lighting fixtures were

based on visual observation only – additional information would require detailed electrical survey and access to each fixture to assess condition and lamp source type/wattage.

2.2 METHODOLOGY AND INSTRUMENTATION USED

To observe existing illuminance levels, a Minolta T-1 illuminance meter was utilized. In reviewing existing site conditions, areas with similar photometric performance were grouped by zone. A general understanding of the average illuminance was developed by a rolling average of the illuminance levels throughout areas of each zone of the site, discrete measurements on specific intervals were not provided based on the extents of area included in the study. Minimum and maximum levels were observed in each area and documented by zone. Where areas of each zone contained non-operable fixtures, these areas were generally excluded from the analysis to provide a baseline equivalent to when all fixtures within the zone are operational.

2.3 GENERAL OBSERVATIONS

On both campuses, a variety of design approaches and existing illuminance levels were observed. Both campuses include a combination of fluorescent, metal halide, high pressure sodium, and LED sources. Illumination levels vary significantly across the campuses. At both campuses, it was observed there are a number of fixtures in need of repair or maintenance, with some functioning at less than optimal levels based on damage to fixture or failing lamps, and others completely non-operational based on factors beyond the scope of this study. Many of the pedestrian circulation areas are illuminated from lighted bollards. No motion or occupancy based controls were observed on either campus. In general, most building entry areas included adequate lighting relative to proposed design criteria and do not require significant improvement to meet design criteria, though replacement with fixtures consistent with master planning design criteria may be considered for energy efficiency and maintenance benefits.

2.3.1 FORT STEILACOOM CAMPUS

The primary pedestrian circulation courtyard area is northeast of the Cascade Building, between the Olympic, Sunrise, Rainier and Cascade buildings. This area is predominantly lighted by bollard-scale fixtures, and while it provides a level of pathway illumination, does not meet IES design criteria for pedestrian circulation areas. The parking areas west and south of the Cascade Building have been retrofit with LED-type parking fixtures, and those areas appear to generally be well illuminated. The parking areas of the north of campus primarily include canopy-style fixtures mounted vertically on poles, and are a negative source of light trespass. The parking areas to the east of the Cascade Building are significantly below illuminance design criteria, and the service drive which runs through the Cascade Building is also significantly under illuminated for the type of use and potential security issues within this area. The main entry drive off Farwest Drive Southwest, and the areas west of

the Olympic Building (between main entry drive and building) were also not illuminated to design criteria. The pedestrian areas adjacent to the Health Education Center and Cascade Building have newer pedestrian scale lighting that may have an aesthetic significance, similar fixtures were utilized at both buildings which appear to be of different specific vintages.

2.3.2 PUYALLUP CAMPUS

The primary pedestrian circulation areas on campus include the courtyard area between the Gaspard Administration Building, College Center, and Brouillet Library Buildings, at these areas, there is a mix of building, planter-mounted, pole, and bollard mounted lighting of varying lamp sources and illuminance levels. At the pedestrian walkway areas north of the Brouillet Library and east/north of the Arts and Allied Health Building, these areas primarily include pole-mounted lighting with metal halide lamping, and generally appear to be well illuminated in comparison to other similar areas of campus. The parking areas on the east side of the campus include mounded landscape features high pressure sodium pole-mounted fixtures and inadequate illumination throughout most of these areas, influenced also by fixture spacing and wattage/type. The west parking areas are lit by metal halide pole-mounted fixtures, and was particularly subject to multiple lamps being out, assumed that maintenance is needed to restore operation. Drive areas on the perimeter of campus generally include high pressure sodium pole-mounted fixtures, with illumination below design criteria.

3. SITE LIGHTING MASTER PLAN

3.1 INTRODUCTION AND OVERVIEW

At all pedestrian circulation and parking areas throughout both campuses, the primary goal of the master plan is to identify a design approach to modify the existing site lighting systems to meet the selected design criteria. Consideration was given to the existing infrastructure in place, including electrical rough-in (conduit and wiring to location of fixture), and existing poles and site lighting bases to help identify an approach that would be the most cost-effective way to promote the goals of the master planning study.

3.2 METHODOLOGY

To maximize effectiveness and cost, existing poles were considered for re-use in master plan layouts, especially at parking areas, where existing poles are of sufficient height to promote effective area lighting. Within pedestrian areas, pole-mounted fixtures were utilized at a mounting height of 15’ above grade. Within parking areas, where new pole-mounted fixture were required, the mounting height was selected to match existing adjacent fixtures in same area. Fixture-mounted occupancy controls at pole-mounted fixtures could be utilized to reduce light levels to 50% (or as desired by college) during

periods when the area is unoccupied, while still providing a level of lighting to facilitate campus security operations.

For purposes of site modeling in the AGI lighting calculation platform, the following fixtures were utilized, which meet the design criteria established by the study:

1. Pole Mounted Parking Areas: Philips Gardco Ecoform, 15,000 Lumens
2. Pedestrian Circulation Areas, Pole Mounted: Philips Gardco Slenderform, 5,500 or 10,000 Lumens
3. Pedestrian Circulation Areas, Bollard Mounted: Philips Gardco School Bollard
4. Surface Mounted Canopy: Philips Gardco G3 Series, 12,000 Lumens

To simplify the modeling process, the site was modeled as flat. Project-specific enhancements to site lighting should consider changes in elevation and provide additional modeling and adjust placement of fixtures as appropriate.

3.3 DESIGN CRITERIA – LIGHTING LEVELS AND UNIFORMITY, LIGHT TRESPASS

The proposed lighting design criteria for the master plan is based on the Illumination Engineering Society (IES), Recommended Practice (RP) publications for parking and exterior lighting, and are influenced by the level of activity, type of area, and surface being illuminated. All fixtures included in analysis are based on meeting IES "full cutoff" requirements, which requires that no light is transmitted above the height of the fixture to the environment above (and limits pollution to adjacent areas).

Proposed Lighting Design Criteria*			
Area	Minimum Horizontal Illumination (Lux)**	Uniformity Ratio (Avg: Min)	Reference
Parking Lot - Asphalt***	5	4:1	IES RP-20, Table 2
Parking Lot - Concrete***	10	4:1	IES RP-20, Table 2
Building Entries - Primary	20	2:1	IES RP-33, Table 2
Building Entries - Other	10	2:1	IES RP-33, Table 2
Pedestrian Plaza/Walkway	15-30****	4:1	IEP RP-33, Table 1

* Considering site as type LZ2, default zone for light commmercial business districts
** 10.8 Lux = 1 Footcandle, Observer Age 25-65, assume light loss factor of 0.7
*** Includes associated drive aisles
****Represents target (average) illumination level, Category G-I Activity Level

3.4 DESIGN CRITERIA – LIGHTING FIXTURES AND ASSOCIATED CONTROLS

It is not the intent or goal of this study to create a specific product to be utilized in design of site lighting systems at the campuses, but rather, define a specific set of criteria which can then be applied to multiple fixture types and manufacturers, to allow flexibility for

selection and integration with design goals in specific areas of the campus. The determining criteria and impact to fixture selection criteria is noted below:

First Cost: Overall sum of construction cost associated with the described option, including contractor's material and labor costs, overhead, profit and contingency

Visual/Aesthetics: The look and appearance of the light fixtures in relationship to the existing campus

Security: Due to the nature of this facility and the increased nighttime activity it is important that the lighting systems maintain a high degree of visibility. This criterion evaluates the option compared to IES standards for illuminance levels. Pole-mounted fixtures provide an enhanced level of visibility in comparison to bollard or ground-mounted lighting, based on the transmission of light more uniformly across the vertical component of the lighting subject.

Maintenance & Operations: Energy savings and activities required to maintain the lighting system. These activities would include lamp replacement, component replacement and servicing in the event of a unit failure.

Uniformity: Evaluates the option based on the uniformity of the light and a person's ability to perceive the appearance of higher light levels.

Efficacy and Energy Efficiency: Evaluates the efficiency of the fixture and light source to efficiently convert electrical energy into light, measured by lumens per watt. Fixture mounted controls with the potential to reduce usage during unoccupied hours.

Light Pollution/Dark Sky: Evaluates the ability of a fixture to effectively communicate the light to the desired area, while minimizing the impact on the surrounding environment.

3.4.1 BASIS OF STUDY

For the purposes of photometric modeling, a sample set of light fixtures were included, to help quantify the potential improvements to the existing site lighting to bring into conformance with master planning design criteria. Those fixtures, as noted in the drawings associated with this report, are intended to be representative of potential types used, but are not intended to be used as a sole-source fixture for a campus standard. The intent is to include a flexible set of design criteria to allow for competitive bidding/quoting for future site lighting improvement projects.

3.4.2 POLE MOUNTED

Pole heights in parking areas to be 25-40' depending on existing and adjacent pole heights. Pole heights in pedestrian areas to be 10-15'. All lamp sources shall be LED, at neutral white color temperature (4500K nominal). Efficacy of all pole mounted fixtures to meet minimum 100 lumens/watt. Distribution type shall be selected based on maximizing layout towards design criteria. Fixture or pole-mounted occupancy sensors utilized to reduce light to 50% during unoccupied periods. Fixture to meet IES full cutoff criteria, and be mounted with illuminated face of fixture

parallel to grade below (oriented downwards). Fixtures to include minimum 5 year warranty for all LED array and driver components.

3.4.3 BUILDING MOUNTED

Fixtures utilized for building mounted lighting shall be selected to primarily provide lighting at building entries and at areas of the perimeter as needed to enhance site lighting levels. All lamp sources shall be LED, at neutral white color temperature (4500K nominal). Efficacy of all building mounted fixtures to meet minimum 70 lumens/watt. Fixture to meet IES full cutoff criteria, and be mounted with illuminated face of fixture parallel to grade below (oriented downwards). Fixtures to include minimum 5 year warranty for all LED array and driver components.

3.4.4 BOLLARD OR GROUND MOUNTED

Bollard mounted fixtures may be utilized to enhance the desired aesthetic within a specific area of campus, subject to review and approval of college. All lamp sources shall be LED, at neutral white color temperature (4500K nominal). Efficacy of all building mounted fixtures to meet minimum 70 lumens/watt. Design considerations shall include light trespass, as this type of fixture is less likely to be available as meeting the IES cutoff criteria. Façade lighting at buildings is discouraged, and subject to approval of the college on a project-specific basis. Fixtures to include minimum 5 year warranty for all LED array and driver components.

3.5 DESIGN CONCEPT FOR INCORPORATING BOLLARD OR OTHER SMALLER-SCALE PEDESTRIAN LIGHITNG CONCEPTS

Subject to review and approval by the college, there may be areas on campus where bollard lighting and pedestrian-scale lighting concepts may be appropriate for the desired aesthetic within an area of campus. Where these design concepts are utilized, the design criteria for lighting levels and uniformity should be maintained the extent possible and practical. It is recommended that the use of pedestrian-scale pole lighting be included within the overall scheme to help maintain the desired uniformity.

1. APPENDICES/DRAWING ATTACHMENTS

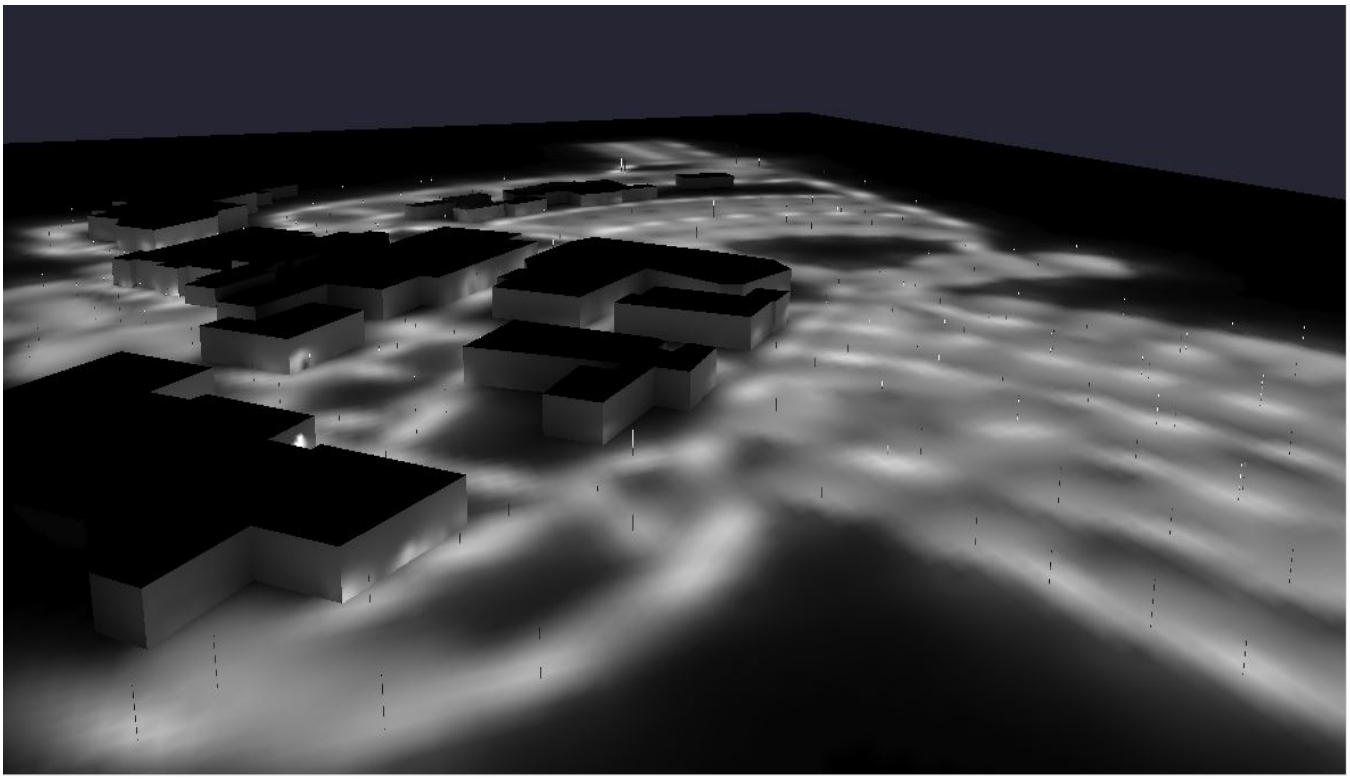
APPENDIX 1: Fort Steilacoom, Visual Renderings of Photometric Modeling

APPENDIX 2: Fort Steilacoom, Visual Renderings of Photometric Modeling

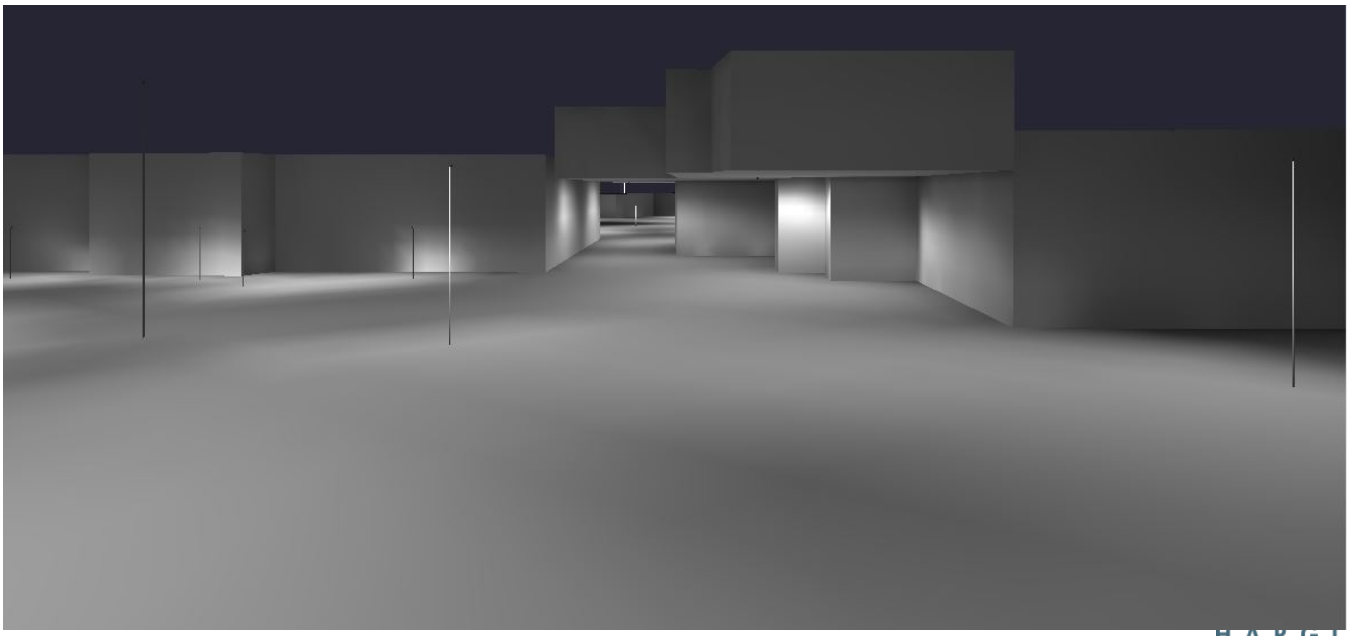
APPENDIX 3: Master Planning Drawings, Fort Steilacoom and Puyallup Campuses

APPENDIX 4: Conceptual Plans and Renderings for Bollard or Small-Scale Pedestrian Lighting

APPENDIX 1 – FORT STEILACOOM RENDERINGS



View from north of Rainier Building looking south



View from east of Cascade Building, looking west towards service drive (thru building)

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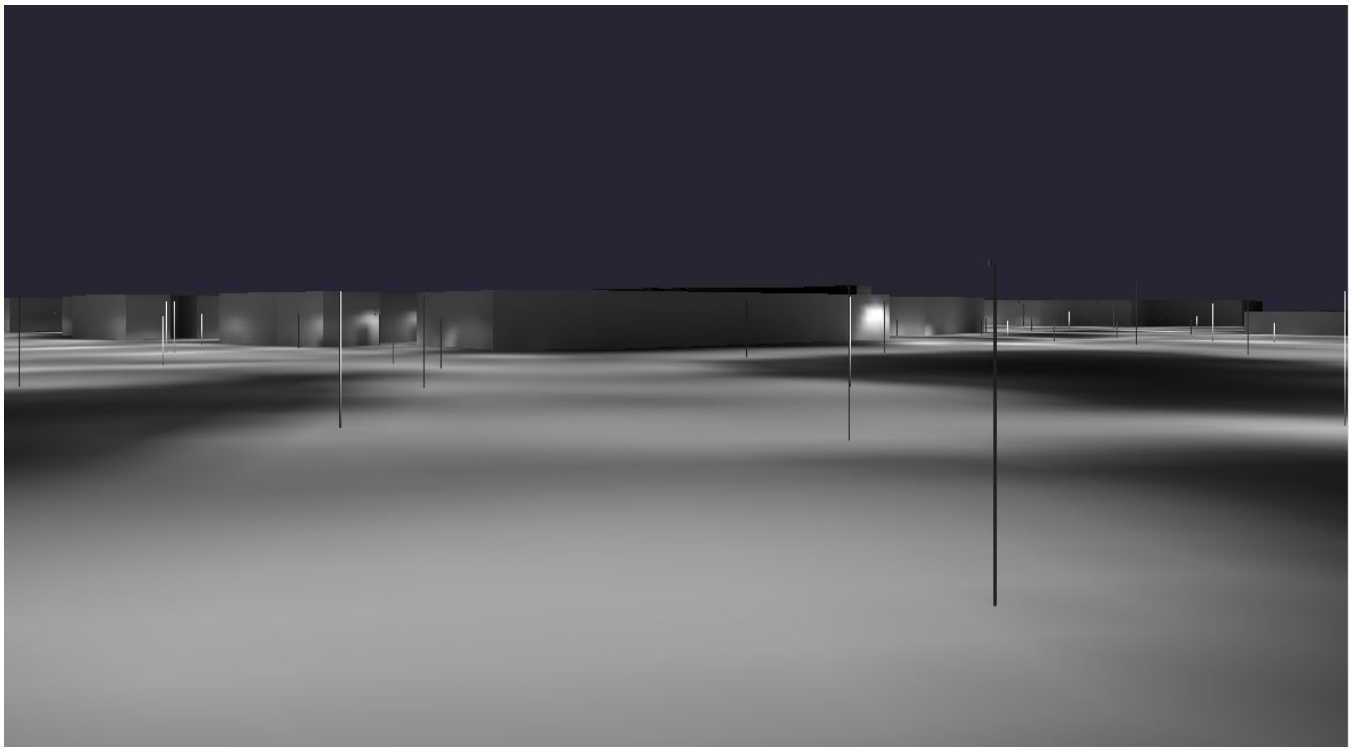
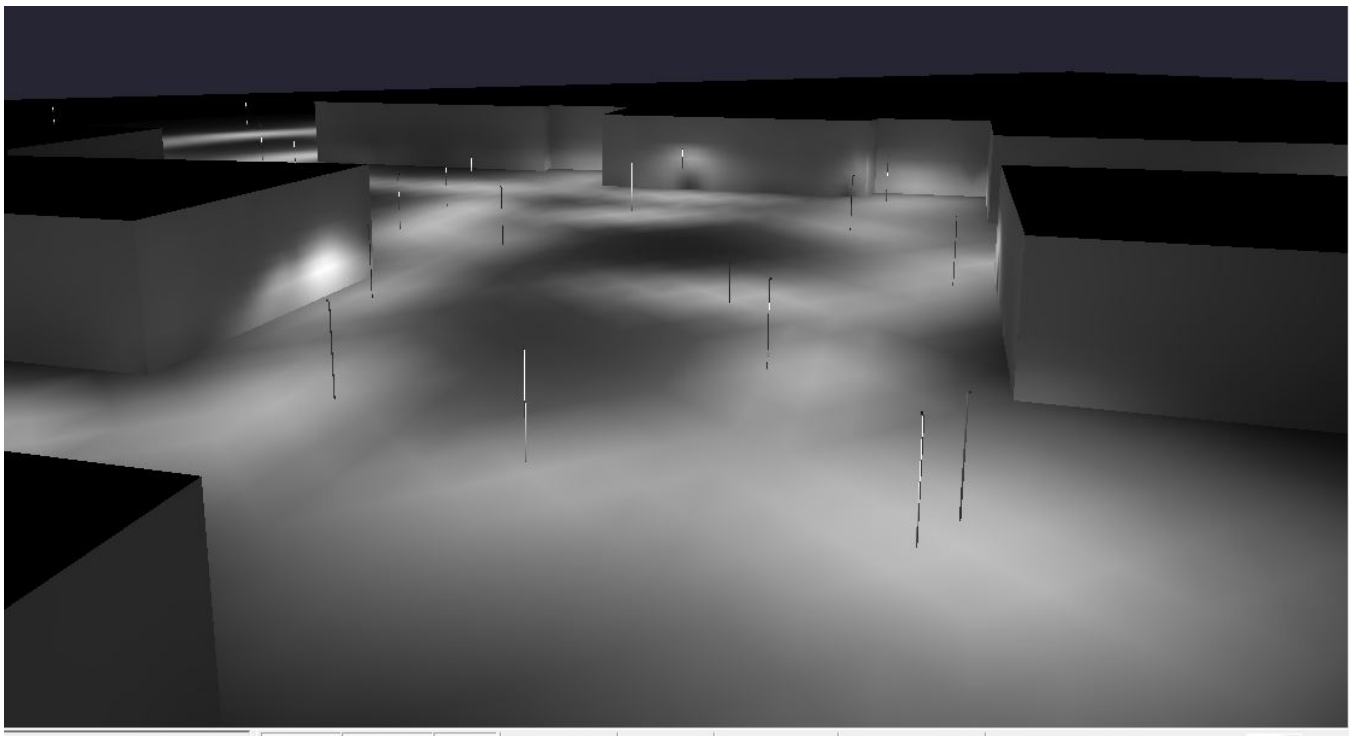
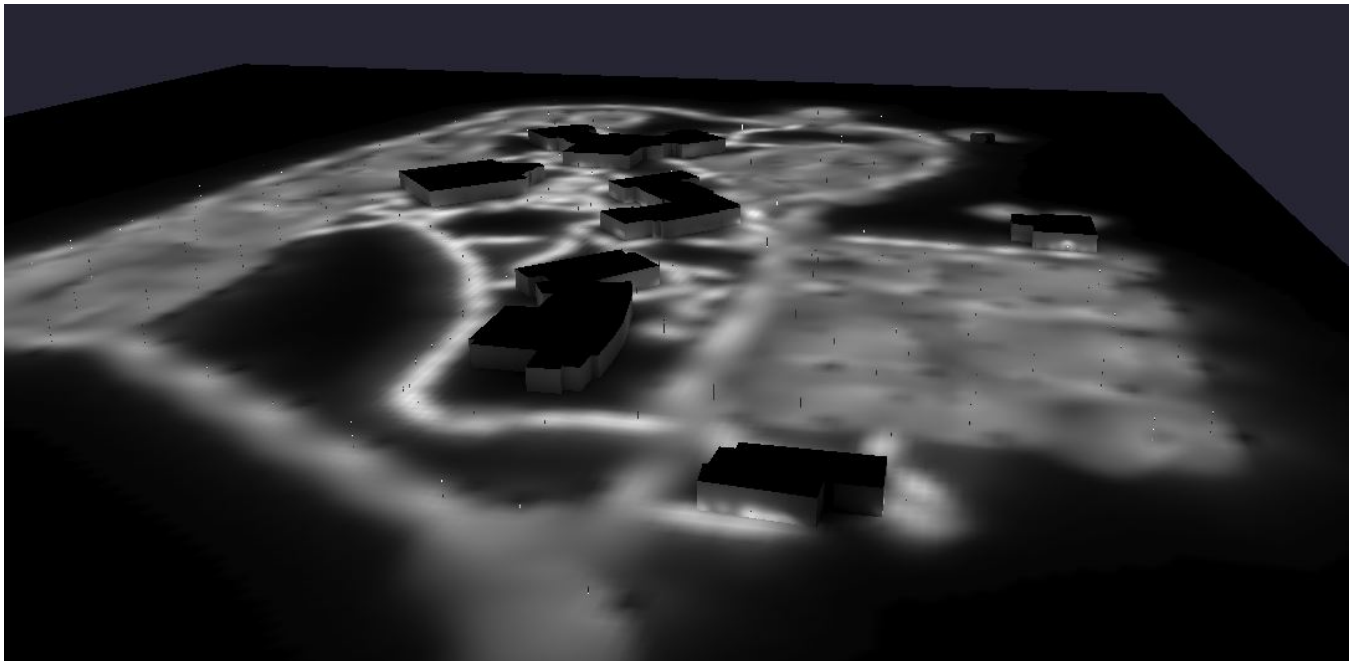


View looking east on main entry drive towards Olympic building

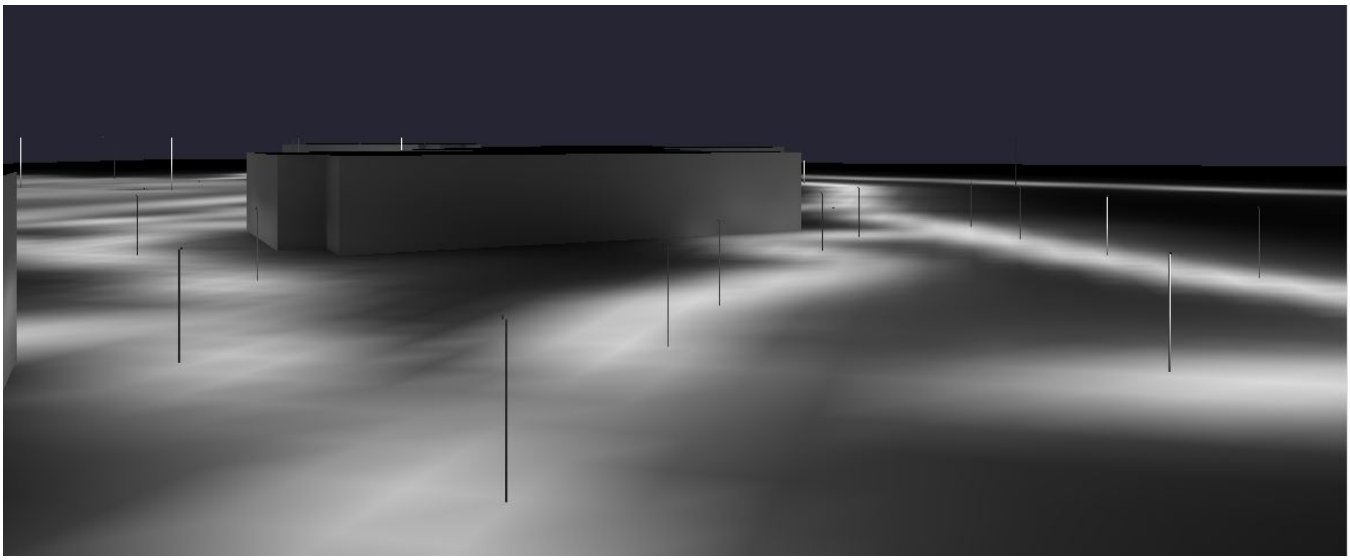


View looking east across pedestrian plaza between Cascade, Rainier, Olympic, Sunrise buildings

APPENDIX 2 – PUYALLUP RENDERINGS



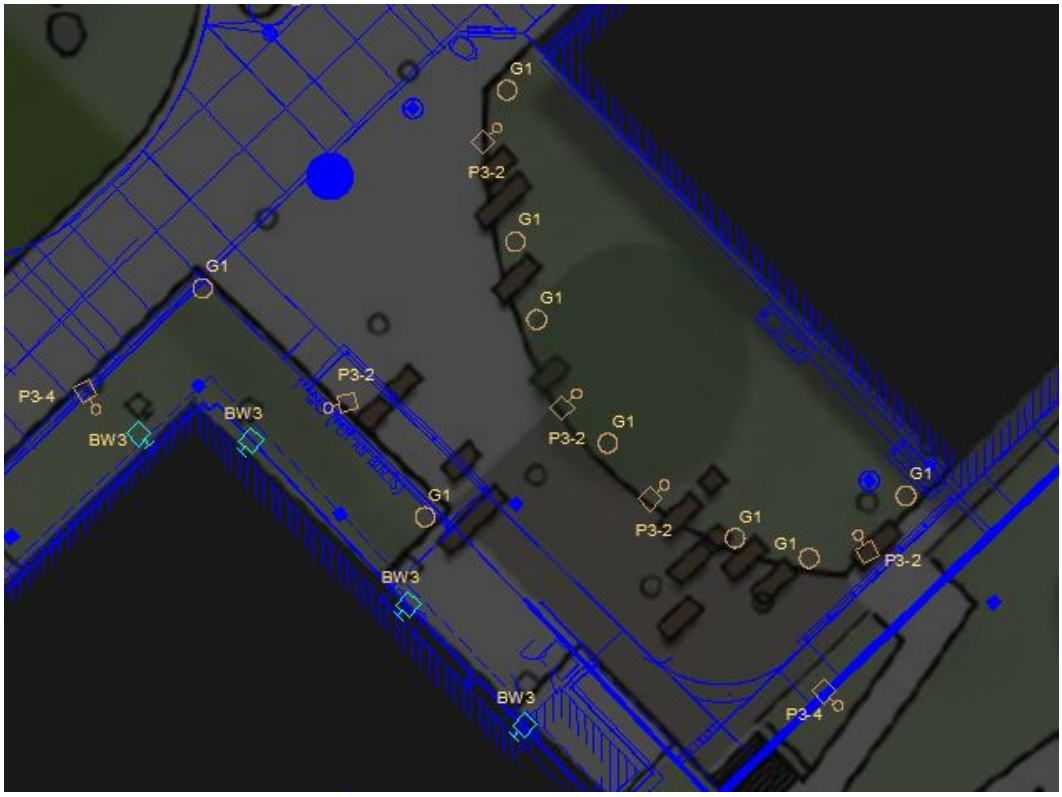
View from north end of campus looking south

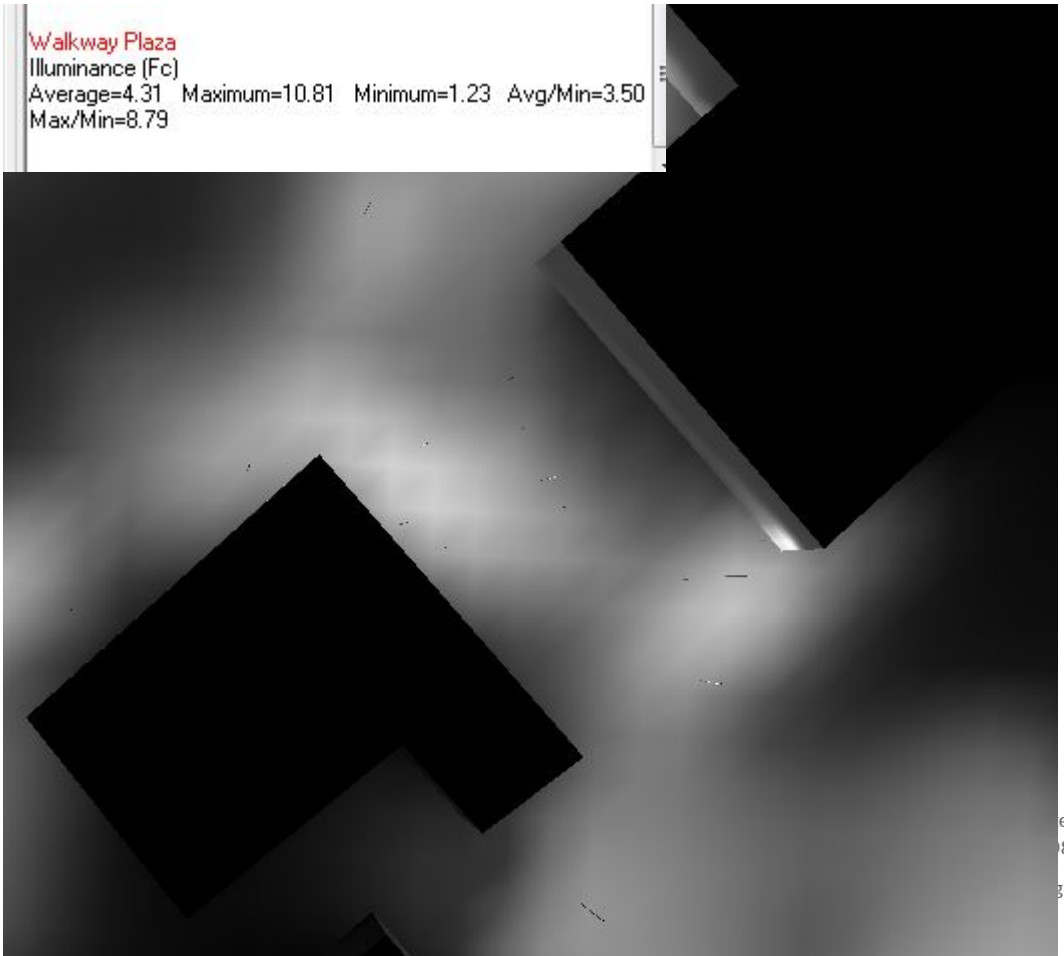


View from east of College Center building, looking north towards Arts and Allied Health building

APPENDIX 3 – SEE DRAWINGS

APPENDIX 4 – CONCEPTUAL PLANS AND RENDERINGS FOR BOLLARD OR SMALL-SCALE PEDESTRIAN LIGHTING





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