VERDAD RESOURCES
HARAMBE 2920 PAD PROJECT

LIGHT MITIGATION PLAN

SECTION 32, TOWNSHIP 2 NORTH, RANGE 64 WEST, 6TH P.M.
WELD COUNTY, COLORADO

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I. INTRODUCTION

This light mitigation plan is being prepared for the Verdad Resources Harambe 2920 Pad project. The project consists of the development of infrastructure to support the drilling and production of 8 oil and gas wells located in Weld County.

The purpose of this report is to demonstrate compliance with the various State and Local lighting regulations. This report will predict the light impacts that will occur during the different development phases (Pre-Production and Production) of the project and detail the various lighting mitigation standards and practices that will be used to limit light pollution and conform to the required lighting regulations. The intent of the project's lighting plan is to provide a safely lit workplace environment that protects the surrounding public and wildlife environment.

II. GENERAL LOCATION AND DESCRIPTION

A. LOCATION AND EXISTING CONDITIONS

The Harambe 2920 Pad is located on a 322-acre parcel of land owned by Newman LLC in the S1/2 N1/2 of Section 32, Township 2 North, Range 64 West, 6th P.M. The site is located approximately 2 miles south and 0.4 miles west of the intersection between the County Road 16 and County Road 53. The parcel is zoned agricultural-A1 , and the existing land-use is dry farm agricultural.

B. PROPOSED DEVELOPMENT

The proposed development will augment and expand the existing Verdad Resources Harambe 2920 Pad. The total combined proposed working pad surface (WPS) will be 6.37-acres (277,525 SF). The Pre-Production Phase will be the initial phase of the project beginning with the pad construction and will remain until all the wells have been drilled and hydraulically stimulated. The Production Phase will be the project's final phase and will include drill-out, flowback, and production activities. Due to the continuous nature of oil and gas operations, many of the pre-production activities mentioned above must be performed during night-time hours.

C. PROPOSED LIGHTING

Proposed lighting to facilitate low-light working conditions will be exterior flood and spot type lighting. For all work operations, the proposed lighting will be temporary and be provided by portable light towers and lights permanently affixed to equipment (e.g., the drilling rig). The development of the project will require most of the work operations to be performed continuously (7-days a week & 24-hour a day). Proposed lighting will change for each work operation of each phase of the project. The light fixture schedules for the proposed lighting are included below in each work operation section.

Lighting Best Management Practices (see Section V, below) will be used to minimize light pollution during all work operations of the proposed project. All lighting shall conform to Federal, State, and Industry recognized standards for both on-site workplace safety and off-site public and wildlife protection (OSHA, FAA, COGCC, IESNA, and ANSI). Care will be taken to keep lighting levels at the specified levels on the lighting plans while providing safe, well-lit working areas. Care will also be taken to prevent unintended light from leaving the site and becoming a hazard or nuisance to the public or surrounding wildlife habitat.

III. PRE-PRODUCTION PHASE FACILITY LIGHTING PLAN

The Pre-Production Phase will consist of the following work operations: Pad Construction Operations, Drilling Operations, and Hydraulic Stimulation Operations. The state and local governing lighting regulations for this section will be the COGCC's Rule 424, specifically 424.a.(2).A., which also includes Rule 424.c.. Lighting photometric plans for all operations of the Pre-Production Phase should address adequate lighting to ensure on- and off-site safety during work operations while assessing the lighting impacts to the health, safety, and welfare of persons occupying building units within 2,000-feet, motorists on roads within 2,000-feet, and wildlife in high priority habitats within 2,000-feet. All Lighting BMPs for this phase of the project shall conform to the Lighting Photometric Plan, Lighting Standards and Best Management Practices (BMPs) section of this project.

A. PAD CONSTRUCTION OPERATIONS

Pad Construction Operations typically consist of structure demolition, equipment haul-off, and grading of the well pad to facilitate the development of the new wells. Pad Construction Operations also includes placing necessary utilities to support the wells. It is anticipated that work for this operation will only occur during daylight hours, which is adequate for safely completing Pad Construction Operations. No lighting, permanent or temporary, is planned for Pad Construction Operations.

B. DRILLING OPERATIONS

Drilling Operations consist of bringing a drill rig onto the site and drilling the proposed wells. This work operation will take place continuously (7-days a week & 24-hour a day). Current development plans include utilizing a single drilling rig development scenario during Drilling Operations. Lighting will be temporary and be provided by portable light towers and lights permanently affixed to the drilling rig. A Drilling Operations Photometric Plan and a Drilling Rig Photometric Plan are attached as Appendix A. All proposed lighting for safely completing the Drilling Operations is listed below:

Table 1 – Drilling Operations Lighting Fixture Schedule.

Light Type	Number of Units	Approximate Height, FT (above GE)	Wattage per Unit	Lumens per Unit	Total Lumens
RAB Lighting Model FXLED 300SF Light Tower	2	25	120	135,513	271,026
RAB Lighting Model FXLED 300SF Wall Mount	12	25	120	135,513	1,626,156
Hilight V5+S Light Tower	2	23	120	154,000	308,000
				Total Lumens	**2,205,182**

**Plus, additional lighting permanently affixed to the drill rig.*

All lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report, fixture specification sheet and BUG calculation are included in Appendix E. If deemed necessary, additional light units may be utilized to address safety concerns. Contact a lighting engineer to verify that any additional lighting units and lighting BMPs will remain within the required lighting standards stated in this report.

C. HYDRAULIC STIMULATION OPERATIONS

Hydraulic Stimulation Operations consist of hydraulically fracturing (frac) the proposed wells. This work operation will take place continuously (7-days a week & 24-hour a day). Current development plans include utilizing a single frac crew development scenario during Hydraulic Stimulation Operations. Lighting will be temporary and

be provided by portable light towers. A Hydraulic Stimulation Operations Lighting Plan is attached as Appendix B. All proposed lighting for safely completing the Hydraulic Stimulation Operations is listed below:

Table 2 – Hydraulic Stimulation Operations Lighting Fixture Schedule.

Light Type	Number of Units	Approximate Height, FT (above GE)	Wattage per Unit	Lumens per Unit	Total Lumens
RAB Lighting Model FXLED 300SF Light Tower	7	25	120	135,513	948,591
RAB Lighting Model FXLED 300SF Wall Mount	12	25	120	135,513	1,626,156
Hilight V5+S Light Tower	3	23	120	154,000	462,000
				Total Lumens	**3,036,747**

All lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report, fixture specification sheet and BUG calculation are included in Appendix E. If deemed necessary, additional light units may be utilized to address safety concerns. Contact a lighting engineer to verify that any additional lighting units and lighting BMPs will remain within the required lighting standards stated in this report.

D. Regulations for Lighting Impacts to Health, Safety, and Welfare

All lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report. As shown on the Drilling Operations Photometric Plan, Drilling Rig Photometric Plan, and Hydraulic Stimulation Operations Lighting Plan (Appendix A and Appendix B), lighting levels will be contained within the 100-foot offset of the WPS boundary during all work operations of Pre-Production Phase. As noted, lighting impacts for this phase of the project will be governed by Rule 424 of the COGCC. The following discusses the impacts to the public and surrounding habitat as defined Rule 424.c.(3).:

1. Persons Occupying Building Units within 2,000-feet of the Oil and Gas Facility:
    a. There is one Residential Building Units within 2,000-feet of the Oil and gas Facility. It is approximately 1,769 feet to the north of the WPS. No impacts are anticipated to the Residential Building Units due to the implemented lighting BMPs and no direct light reaching the Residential Building Units.
2. Motorists on Roads within 2,000-feet of the Oil and Gas Facility:
    a. The end of County Road 16 is approximately 1,649 feet to the north of the WPS. No impacts are anticipated to motorists on the road due to the implemented lighting BMPs and no direct light reaching the road.
3. Wildlife occupying any High Priority Habitat within 2,000-feet of the Oil and Gas Facility:
    a. An Aquatic Sportfish Waters boundary is approximately 161 feet to the south of the WPS. An CPW State Wildlife Area boundary is approximately 580 feet to the south of the WPS. No impacts are anticipated to this High Priority Habitat due to the implemented lighting BMPs and no direct light reaching the High Priority Habitat.

IV. PRODUCTION PHASE FACILITY LIGHTING PLAN

The Production Phase will be the final phase of the project. The Production Phase will consist of the following work operations: Drill-Out and Flowback Operations and Productions Operations. The state and local governing lighting regulations for this section will be the COGCC's Rule 424, specifically 424.a.(2).B., which also includes

Rule 424.d.&e.. Lighting photometric plans for all operations of the Production Phase should address adequate lighting to ensure on- and off-site safety during work operations while assessing the lighting impacts to the health, safety, and welfare of persons occupying building units within 2,000-feet, motorists on roads within 2,000-feet, and wildlife in high priority habitats within 2,000-feet. Additionally, lighting photometric plans for all operations of the Production Phase are required to conform to a zoning/land-use maximum permissible light level defined in Rule 424.d.. The permissible light level is an overall average of the site's light intensity and is calculated by the total lumens divided by the total WPS. The site is within an agricultural zoning/land-use, with a maximum permissible light level of 2.5 lumens per square foot (LM/SF). All Lighting BMPs for this phase of the project shall conform to the Lighting Photometric Plan, Lighting Standards and Best Management Practices (BMPs) section of this project.

A. Drill-Out and Flowback Operations

Drill-Out and Flowback Operations consist of recovering fluids following Hydraulic Stimulation Operations. Flowback Operations also consist of equipment and material mobilization from the site. The mobilization activities may continue approximately 120 days following the drill-out work. These work operations will take place continuously and simultaneously (7-days a week & 24-hour a day). Lighting will be temporary and be provided by portable light towers. The Drill-Out Operations Photometric Plan is attached as Appendix C. All proposed lighting for safely completing Drill-Out Operations is listed below:

Table 3 – Drill-Out Operations Lighting Fixture Schedule.

Light Type	Number of Units	Approximate Height, FT (above GE)	Wattage per Unit	Lumens per Unit	Total Lumens
RAB Lighting Model FXLED 300SF Light Tower	2	25	120	135,513	271,026
RAB Lighting Model FXLED 300SF Wall Mount	12	25	120	135,513	1,626,156
				Total Lumens	**1,897,182**

All lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report, fixture specification sheet and BUG calculation are included in Appendix E. If deemed necessary, additional light units may be utilized to address safety concerns. Contact a lighting engineer to verify that any additional lighting units and lighting BMPs will remain within the required lighting standards stated in this report.

It is expected that the temporary lighting utilized during Drill-Out Operations will exceed the maximum permissible light level of 2.5 lumens per square foot (LM/SF) of the total WPS. Due to Lighting BMPs, no light will leave the site. The following is the calculated light levels for the Drill-Out Operations:

Table 4 – Calculated Drill-Out Operations Permissible Light Levels.

Description	Total Lumens	WPS (SF)	Maximum Permissible Light LM/SF	Calculated Permissible Light LM/SF
Drill-Out Temporary Lighting	1,897,182	277,525	2.5	6.8
			TOTAL LIGHT LEVEL	**6.8**

The Drill-Out Operations Photometric Plan in Appendix C shows the calculated light distribution at the site during Drill-Out Operations. With this configuration, this work operation exceeds the recommended regulatory

limits. Due to the wall panels, light will be contained within the WPS. No direct light is anticipated to leave the 100-foot offset of the WPS.

The Flowback Operations Photometric Plan is attached as Appendix D. All proposed lighting for safely completing Flowback Operations is listed below:

Table 5 – Flowback Operations Lighting Fixture Schedule.

Light Type	Number of Units	Approximate Height, FT (above GE)	Wattage per Unit	Lumens per Unit	Total Lumens
RAB Lighting Model FXLED 300SF Light Tower	2	25	120	135,513	271,026
RAB Lighting Model FXLED 300SF Wall Mount	12	25	120	135,513	1,626,156
				Total Lumens	**1,897,182**

All lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report, fixture specification sheet and BUG calculation are included in Appendix E. If deemed necessary, additional light units may be utilized to address safety concerns. Contact a lighting engineer to verify that any additional lighting units and lighting BMPs will remain within the required lighting standards stated in this report.

It is expected that the temporary lighting utilized during Flowback Operations will exceed the maximum permissible light level of 2.5 lumens per square foot (LM/SF) of the total WPS. Due to Lighting BMPs, no light will leave the site. The following is the calculated light levels for the Flowback Operations:

Table 6 – Calculated Flowback Operations Permissible Light Levels.

Description	Total Lumens	WPS (SF)	Maximum Permissible Light LM/SF	Calculated Permissible Light LM/SF
Flowback Temporary Lighting	1,897,182	277,525	2.5	6.8
			TOTAL LIGHT LEVEL	**6.8**

The Flowback Operations Photometric Plan in Appendix D shows the calculated light distribution at the site during Flowback Operations. With this configuration, this work operation exceeds the recommended regulatory limits. Due to the wall panels, light will be contained within the WPS. No direct light is anticipated to leave the 100-foot offset of the WPS.

B. Production Operations

Production operations consist of the daily gathering of the resources from the wells and maintenance of the permanent production equipment. Typically, productions operations will only occur during daylight hours. No lighting, permanent or temporary is anticipated on the site during production operations.

C. Regulations for Lighting Impacts to Health, Safety, and Welfare

All lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report. As shown on the Drill-Out Operation Photometric Plan, Flowback Operations Photometric Plan, and Production Operation Plan (Appendix C, Appendix, D, and Appendix E), lighting levels will be contained within the 100-foot offset of the WPS boundary during all work operations of the Production Phase. As noted, lighting impacts for this phase of the project will be governed by Rule 424 of the

COGCC. The impacts to the public and surrounding habitat as defined Rule 424.d.(3).:

1. Persons Occupying Building Units within 2,000-feet of the Oil and Gas Facility:
    a. There is one Residential Building Units within 2,000-feet of the Oil and gas Facility. It is approximately 1,769 feet to the north of the WPS. No impacts are anticipated to the Residential Building Units due to the implemented lighting BMPs and no direct light reaching the Residential Building Units.
2. Motorists on Roads within 2,000-feet of the Oil and Gas Facility:
    a. The end of County Road 16 is approximately 1,649 feet to the north of the WPS. No impacts are anticipated to motorists on the road due to the implemented lighting BMPs and no direct light reaching the road.
3. Wildlife occupying any High Priority Habitat within 2,000-feet of the Oil and Gas Facility:
    a. An Aquatic Sportfish Waters boundary is approximately 161 feet to the south of the WPS. An CPW State Wildlife Area boundary is approximately 580 feet to the south of the WPS. No impacts are anticipated to this High Priority Habitat due to the implemented lighting BMPs and no direct light reaching the High Priority Habitat.

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V. LIGHTING STANDARDS AND BEST MANAGEMENT PRACTICES (BMPs) – RULE 424.b.

The following lighting BMPs will be used to minimize and control light pollution:

- Most work operations will take place 7-days a week & 24-hour a day. Care will be taken to keep lighting levels at the specified levels on the lighting plans while providing safe, well-lit working areas during night-time and other low-light conditions. Care will also be taken to prevent unintended light from leaving the site and becoming a hazard or nuisance to the public or surrounding wildlife habitat.
- During the Pad Construction Operations, no night-time work is anticipated. Daylight work will be performed during this work operation.
- No permanent lighting is proposed for this project. All lighting shall conform to Federal, State, and Industry recognized standards for both on-site workplace safety and off-site public protection (OSHA, FAA, COGCC, IESNA, and ANSI). No direct light, except those governed by FAA standards, shall shine beyond the boundaries of the WPS, especially onto public roads, adjacent properties, and/or high priority habitats. All lighting shall conform with all COGCC, county, municipal, and any applicable governing body's standards.
- Temporary lighting will be 3-head and 4-head LED flood lights on mobile 25-foot telescoping towers (BUG Rating is B3-U3-G5). All lighting will be capable of adjustment and will be directed inward and between 45-65° downward towards working areas on the WPS. No light should shine above the horizontal plane passing through the center point of the light source. Lights will be shielded with a photometric diffusion fabric or membrane tint to prevent direct or reflected direct light from leaving the site.
- Wall Panels (e.g., visual/sound walls) will be placed along the edges of the WPS and will be removed following Flowback Operations.
- For workplace safety, no direct or reflected direct light shall shine towards the entrance of the WPS.
- Watch for and remove glare and reflection points during all work operations of the project from temporary or permanent structures, temporary lighting, vehicles, construction equipment, and clothing/PPE.
- Any lighting damaged and/or improperly directed or angled will be promptly fixed and/or corrected to conform to the lighting plan.
- Equipment shall be operated and/or orientated and/or shielded in such a manner that lights permanently affixed to equipment do not shine above the horizontal plane passing through the center point of the light source or shine beyond the boundary of the WPS.
- For all work operations, once temporary lighting is in place, a lighting self-audit of the site will be performed to ensure that no unintended light will leave the site and become a hazard or a nuisance.
- For any change to the lighting during any work operations, a lighting self-audit of the site will be performed to ensure that no unintended light will leave the site and become a hazard or a nuisance.
- For non-working or shut-down days where no personnel are on-site or in working areas, non-essential temporary lighting will be turned off. If no personnel are on-site and essential temporary lighting is needed, the essential temporary lighting will be inspected every 24 hours.
- All redundant, unused, or not-needed lights will be turned off.
- Any additional light units used to address workplace safety concerns that are not shown on the lighting photometric plans will be verified by a lighting engineer to ensure that the modified lighting will remain within the required lighting standards stated in this report.
- Where safely applicable, the following are suggestions to aid in controlling and minimizing the site's lighting levels:
    - Using automation, timers, or motion sensors
    - Using or changing fixtures to full cut-off lighting fixtures to shield and direct light
    - Using or changing to lighting colors that reduce light intensity
    - Using or changing low-glare or no-glare lighting
    - Adjusting or adding additional light shields such as photometric diffusion fabric or tinted membranes
    - Adjusting or adding additional temporary wall panels (e.g., visual/sound walls)

VI. PRE-PRODUCTION PHASE FACILITY LIGHTING – 424.c.

Pre-Production Phase facility lighting will be temporary exterior lighting. To ensure the safety of all persons on- and off-site and to wildlife and their habitats, all lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report.

The requirements of this section have already been incorporated in this report in Section III, above. Please refer to that section for the governing rules concerning safety and lighting impacts for this phase of the project.

VII. PRODUCTION PHASE FACILITY LIGHTING WHEN PERSONNEL ARE ON-SITE AND NOT ON-SITE – 424.d.& e.

To ensure the safety of all persons on- and off-site and to wildlife and their habitats, all lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report which discusses BMPs when personnel are both on-site and off-site.

For all work operations proposed lighting will be temporary and be provided by portable light towers and lights permanently affixed to construction and maintenance equipment. All temporary lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report.

The requirements of this section have already been incorporated in this report in Section IV and Section V, above. Please refer to those sections for the governing rules concerning lighting BMPs, safety, and lighting impacts for this phase of the project.

VIII. CUMULATIVE IMPACTS – 424.f.

No cumulate impacts according to COGCC's Rule 424.f. are anticipated due to the implemented lighting BMPs and no direct light reaching a building unit within 1-mile. The lighting plan for this project was developed so that the cumulative impact of the proposed lighting will conform to the required 4 lux at any residential building unit or high occupancy building unit within 1-mile of the site, measured at 5.5 feet above grade in a direct line of sight to the brightest light fixture on-site (Rule 424). For further reference, additional lighting levels at various points of interest around and from the WPS have been provided for each work operation below. Proposed lighting for this project will be contained within the 100-foot offset of the WPS boundary.

Light intensity calculations shown on the lighting plans are in foot-candles, which is defined as one lumen per square foot (LM/SF). Light intensity levels vary across the site and are dependent on the height, location, and brightness of the light source. Light intensity levels are affected by the relative position and reflectability of objects and/or surfaces on the site. Foot-candles can be converted to lux (LM/SM) by using the following conversion: 1 Fc = 10.8 lux.

A. Pad Construction Operations

No lighting, permanent or temporary, is planned for Pad Construction Operations, so there will be no light intensity calculations.

B. Drilling Operations

Based upon the light intensity calculations shown on the Drilling Operations Photometric Plan in Appendix A, the maximum foot-candle (Fc) observed within the WPS during Drilling Operations will be located directly beneath the temporary wall mounted light on the middle-south side of the wall panel, calculated as 49.7 Fc. The maximum foot-candle at the entrance of the WPS is calculated at 1.1 Fc. The maximum foot-candle at the edge of the WPS is calculated as 0.0 Fc. Due to the wall panels, the maximum foot-candle at the 100-foot offset of the WPS boundary will be 0.0 Fc. The maximum foot-candle at public roads within 1-mile of the WPS boundary will be 0.0 Fc. The maximum foot-candle at building units within 1-mile of the WPS boundary will be 0.0 Fc. The following is a summary of the calculated and required light intensity levels:

Table 7 – Drilling Operations Calculated Maximum Light Intensity at Points of Interest.

Point of Interest	Foot-Candle	Lux	Required
Within the WPS	49.7	536.8	N/A
At the Entrance of the WPS	1.1	11.9	N/A
At the Edge of the WPS	0.0	0.0	N/A
100-foot offset of the WPS boundary	0.0	0.0	N/A
Public Roads within 1-Mile of the WPS	0.0	0.0	N/A
Building Units within 1-Mile of the WPS	N/A	N/A	4 Lux

C. Hydraulic Stimulation Operations

Based upon the light intensity calculations shown on the Hydraulic Stimulation Operations Photometric Plan in Appendix B, the maximum foot-candle (Fc) observed within the WPS during Hydraulic Stimulation Operations will be located directly beneath the temporary portable light tower on the west side of the proposed row of wells, calculated as 55.0 Fc. The maximum foot-candle at the entrance of the WPS is calculated at 1.1 Fc. Due to the wall panels,the maximum foot-candle at the edge of the WPS is calculated at 0.0 Fc. The maximum foot-candle at the 100-foot offset of the WPS boundary will be 0.0 Fc. The maximum foot-candle at public roads within 1-mile of the WPS boundary will be 0.0 Fc. The maximum foot-candle at building units within 1-mile of the WPS boundary will be 0.0 Fc. The following is a summary of the calculated and required light intensity levels:

Table 8 – Hydraulic Stimulation Operations Calculated Maximum Light Intensity at Points of Interest.

Point of Interest	Foot-Candle	Lux	Required
Within the WPS	55.0	594	N/A
At the Entrance of the WPS	1.1	11.9	N/A
At the Edge of the WPS	0.0	0.0	N/A
100-foot offset of the WPS boundary	0.0	0.0	N/A
Public Roads within 1-Mile of the WPS	0.0	0.0	N/A
Building Units within 1-Mile of the WPS	N/A	N/A	4 Lux

D. Drill-Out Operations

Based upon the light intensity calculations shown on the Drill-out Operations Photometric Plan in Appendix C, the maximum foot-candle (Fc) observed within the WPS during drill-out operations will be located directly

beneath the temporary wall mounted light on the middle-south side of the WPS, calculated as 49.0 Fc. The maximum foot-candle at the entrance of the WPS is calculated at 1.1 Fc. Due to the wall panels, the maximum foot-candle at the edge of the WPS is calculated as 0.0 Fc. The maximum foot-candle at the 100-foot offset of the WPS boundary will be 0.0 Fc. The maximum foot-candle at public roads within 1-mile of the WPS boundary will be 0.0 Fc. The maximum foot-candle at building units within 1-mile of the WPS boundary will be 0.0 Fc. The following is a summary of the calculated and required light intensity levels:

Table 9 – Drill-Out Operations Calculated Maximum Light Intensity at Points of Interest.

Point of Interest	Foot-Candle	Lux	Required
Within the WPS	49.0	529.2	N/A
At the Entrance of the WPS	1.1	11.9	N/A
At the Edge of the WPS	0.0	0.0	N/A
100-foot offset of the WPS boundary	0.0	0.0	N/A
Public Roads within 1-Mile of the WPS	0.0	0.0	N/A
Building Units within 1-Mile of the WPS	N/A	N/A	4 Lux

E. Flowback Operations

Based upon the light intensity calculations shown on the Flowback Operations Photometric Plan in Appendix D, the maximum foot-candle (Fc) observed within the WPS during flowback operations will be located directly beneath the temporary wall mounted light on the middle-south side of the WPS, calculated as 49.0 Fc. The maximum foot-candle at the entrance of the WPS is calculated at 1.1 Fc. Due to the wall panels, the maximum foot-candle at the edge of the WPS is calculated as 0.0 Fc. The maximum foot-candle at the 100-foot offset of the WPS boundary will be 0.0 Fc. The maximum foot-candle at public roads within 1-mile of the WPS boundary will be 0.0 Fc. The maximum foot-candle at building units within 1-mile of the WPS boundary will be 0.0 Fc. The following is a summary of the calculated and required light intensity levels:

Table 10 – Flowback Operations Calculated Maximum Light Intensity at Points of Interest.

Point of Interest	Foot-Candle	Lux	Required
Within the WPS	49.0	529.2	N/A
At the Entrance of the WPS	1.1	11.9	N/A
At the Edge of the WPS	0.0	0.0	N/A
100-foot offset of the WPS boundary	0.0	0.0	N/A
Public Roads within 1-Mile of the WPS	0.0	0.0	N/A
Building Units within 1-Mile of the WPS	N/A	N/A	4 Lux

F. Production Operations

No lighting, permanent or temporary is anticipated on the site during production operations.

IX. CONCLUSION

This report was prepared in compliance with State and Local lighting regulations, specifically COGCC's Rule 424. The proposed lighting configurations, as shown on the Lighting Photometric Plans for the Harambe 2920 Pad project, conforms with the State and Local lighting regulations requirements. To ensure the safety of all persons on- and off-site and to wildlife and their habitats, all lighting shall conform to the Lighting Photometric Plans and the Lighting Standards and Best Management Practices (BMPs) section of this report.

X. APPENDIX

APPENDIX A – DRILLING OPERATIONS LIGHTING PLAN

CERTIFICATE

THIS ALSO CERTIFIES THAT I HAVE RELATIVE EXPERIENCE IN LIGHT MITIGATION TECHNIQUES AND DESIGN.

COLORADO LICENSED
PAUL A. HAWKS
42408
05-06-22
PROFESSIONAL ENGINEER

1" = 100'

NOTES:

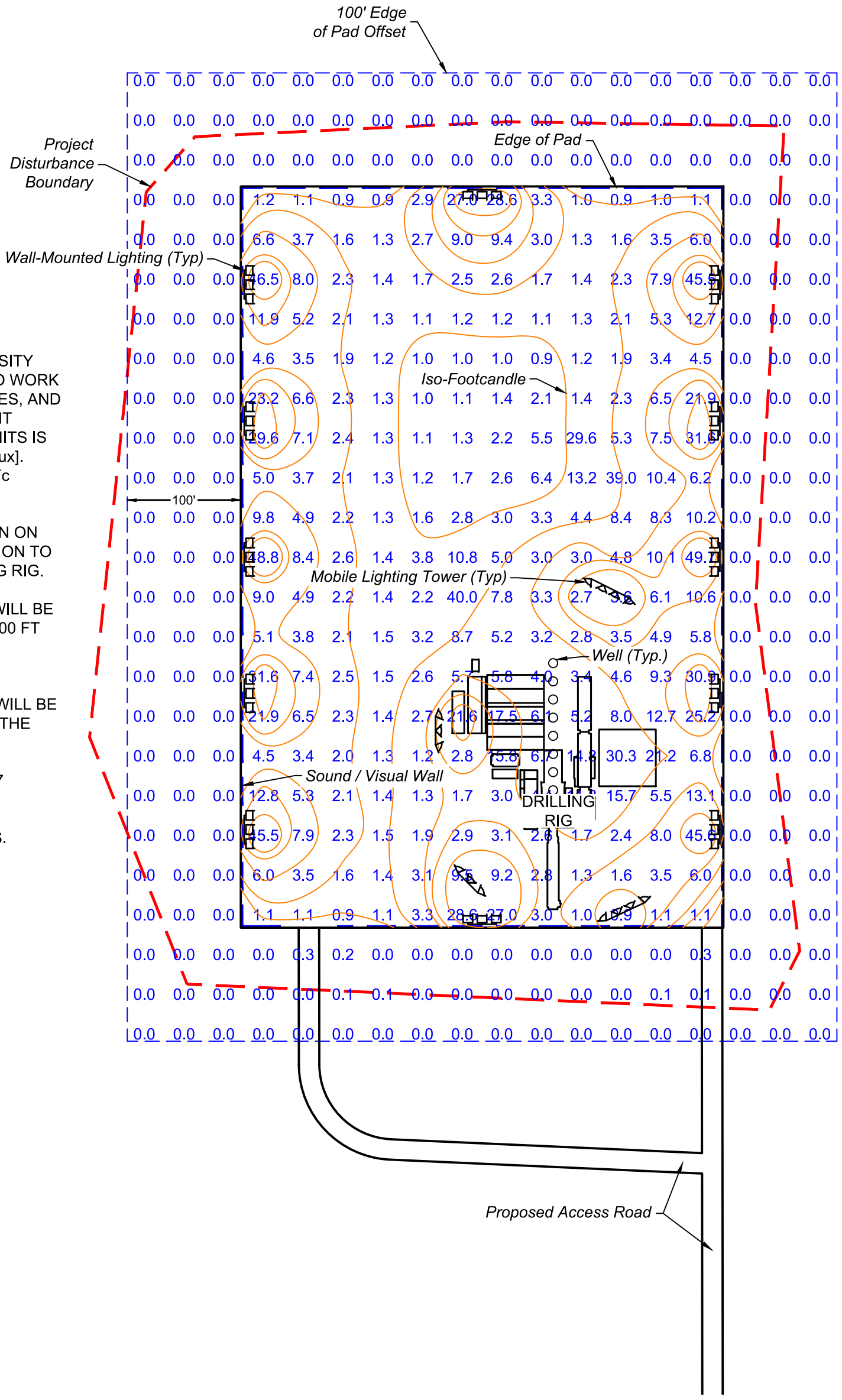
1. MEASURED LIGHT INTENSITY LEVEL WITH RESPECT TO WORK AREAS, OUTDOOR SPACES, AND UNATTENDED EQUIPMENT AREAS. ILLUMINANCE UNITS IS GIVEN IN Fc [1 fc = 10.8 Lux].
   MAXIMUM = 49.7 Fc
   MINIMUM = 0.0 Fc

2. LIGHTING LEVELS SHOWN ON THIS PLAN ARE IN ADDITION TO LEVELS ON THE DRILLING RIG. DIRECT LIGHTING FROM DRILLING OPERATIONS WILL BE CONFINED WITHIN THE 100 FT EDGE OF PAD OFF-SET BOUNDARY.

3. DRILLING RIG LIGHTING WILL BE PRESENT ONLY DURING THE DRILLING PHASE.

4. TOTAL PAD AREA = ± 6.37 ACRES, 277,525 Sq. Ft.

5. 2,205,182 TOTAL LUMENS. 7.946 LUMENS/SQ. FT.



1 DRILLING PAD SITE LIGHTING PHOTOMETRIC PLAN

SCALE: 1" = 100'

LIGHTING FIXTURE SCHEDULE

SYMBOL	LIGHT UNIT DESCRIPTION	BUG RATING	MOUNTING INFO	VOLTS	LAMP QUANTITY	LUMENS / LAMP	UNITS QUANTITY	LUMENS / UNIT	TOTAL LUMENS
	RAB LIGHTING MODEL FXLED 300SF	B3-U3-G5	25' TOWER	120	3	45,171	2	135,513	271,026
	RAB LIGHTING MODEL FXLED 300SF	B3-U3-G5	25' WALL	120	3	45,171	12	135,513	1,626,156
	HILIGHT V5+S	B3-U3-G5	23' TOWER	120	4	38,500	2	154,000	308,000

UINTAH ENGINEERING & LAND SURVEYING

UELS, LLC
Corporate Office * 85 South 200 East
Vernal, UT 84078 * (435) 789-1017

VERDAD RESOURCES LLC

HARAMBE 2920 PAD
S 1/2 N 1/2, SECTION 32, T2N, R64W, 6th P.M.
WELD COUNTY, COLORADO

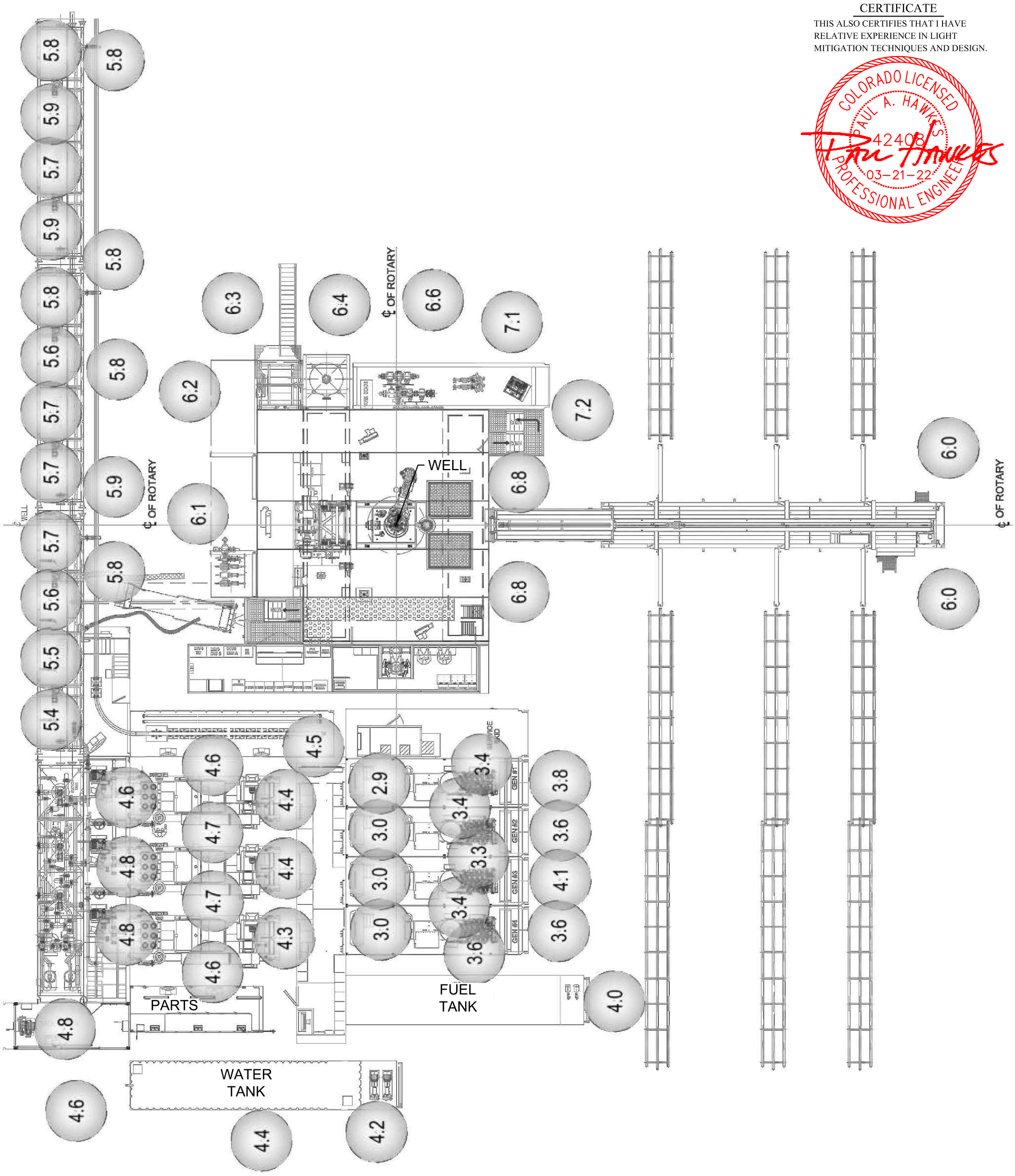
SCALE: AS NOTED	DRAWN BY: C.C.	DATE DRAWN: 03-08-22
UELS FILE NO.: V - 1 8 5	REVISED: 05-06-22 C.C.	

DRILLING OPERATIONS PHOTOMETRIC PLAN

CERTIFICATE

THIS ALSO CERTIFIES THAT I HAVE RELATIVE EXPERIENCE IN LIGHT MITIGATION TECHNIQUES AND DESIGN.

COLORADO LICENSED
PAUL A. HAWKS
42408
03-21-22
PROFESSIONAL ENGINEER



2 DRILLING RIG SITE LIGHTING PHOTOMETRIC PLAN

SCALE: NO SCALE

UINTAH ENGINEERING & LAND SURVEYING

UELS, LLC
Corporate Office * 85 South 200 East
Vernal, UT 84078 * (435) 789-1017

VERDAD RESOURCES LLC

HARAMBE 2920 PAD
S 1/2 N 1/2, SECTION 32, T2N, R64W, 6th P.M.
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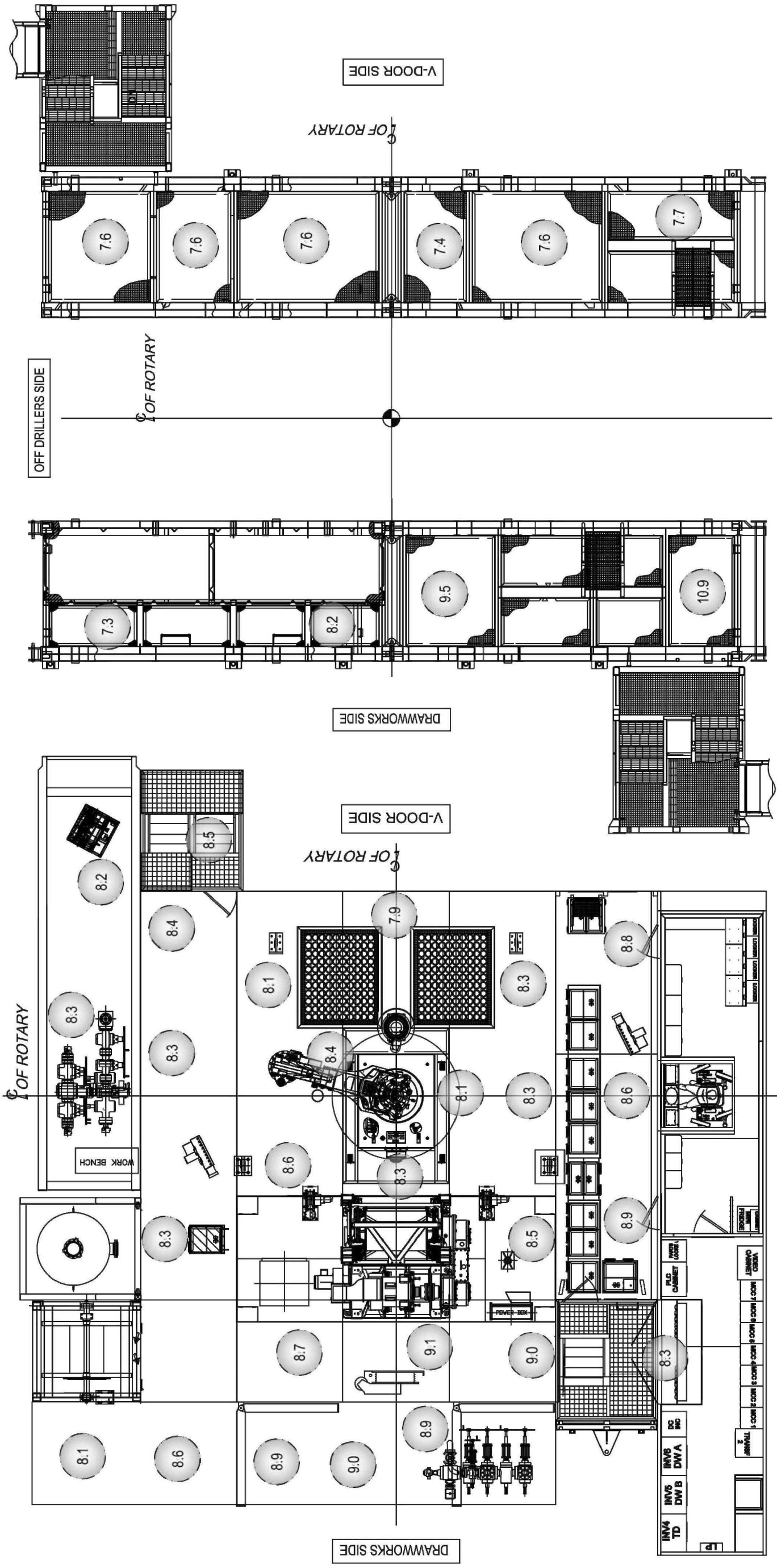

PLAN VIEW @ MIDDLE SUBSTRUCTURE BOX

PLAN VIEW @ DRILLFLOOR

DRILLING RIG LIGHTING PHOTOMETRIC PLAN

3 SCALE: NO SCALE

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DRILLING OPERATIONS RIG PHOTOMETRIC PLAN

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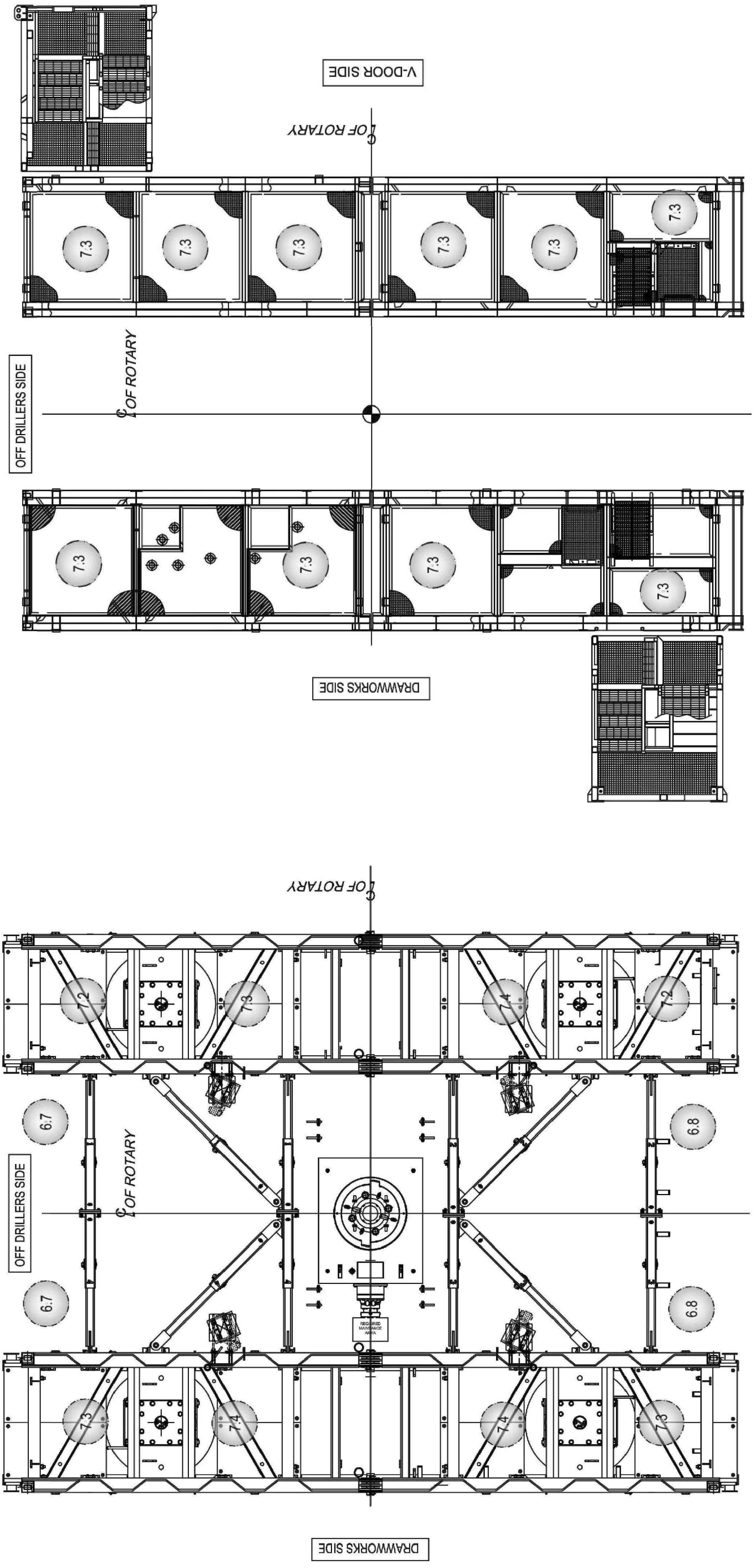

PLAN VIEW @ TOP
SUBSTRUCTURE BOX

PLAN VIEW @ BOTTOM
SUBSTRUCTURE BOX

4 DRILLING RIG LIGHTING PHOTOMETRIC PLAN

SCALE: NO SCALE

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VERDAD RESOURCES LLC

HARAMBE 2920 PAD
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WELD COUNTY, COLORADO

SCALE: AS NOTED	DRAWN BY: C.C.	DATE DRAWN: 03-08-22
UELS FILE NO.: V - 1 8 5	REVISED: 03-21-22 C.C.	

DRILLING OPERATIONS RIG PHOTOMETRIC PLAN

APPENDIX B – HYDRAULIC STIMULATION OPERATIONS LIGHTING PLAN

CERTIFICATE

THIS ALSO CERTIFIES THAT I HAVE RELATIVE EXPERIENCE IN LIGHT MITIGATION TECHNIQUES AND DESIGN.

COLORADO LICENSED
PAUL A. HAWKS
42408
PROFESSIONAL ENGINEER
05-06-22

1" = 100'

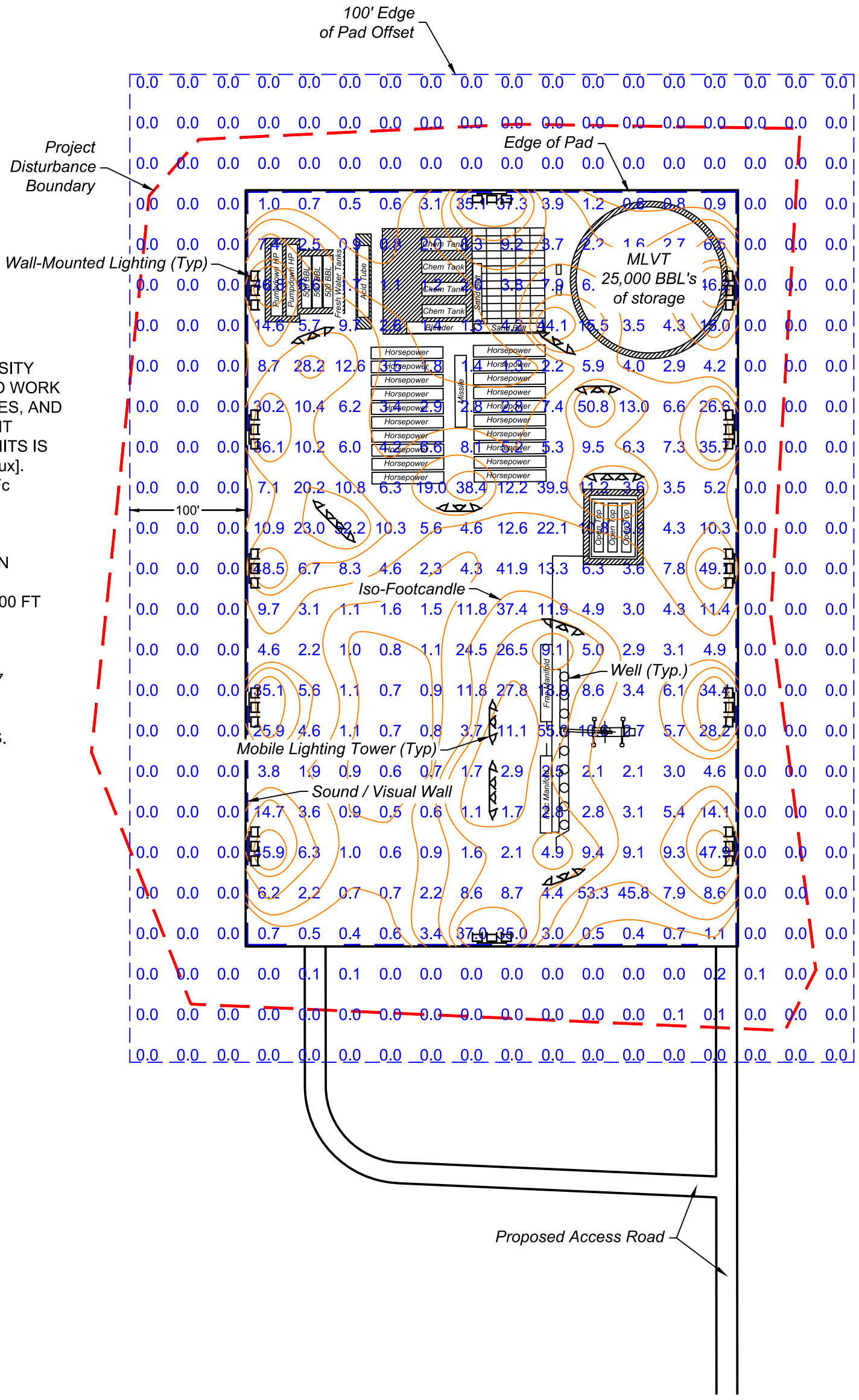
NOTES:

1. MEASURED LIGHT INTENSITY LEVEL WITH RESPECT TO WORK AREAS, OUTDOOR SPACES, AND UNATTENDED EQUIPMENT AREAS. ILLUMINANCE UNITS IS GIVEN IN Fc [1 fc = 10.8 Lux].
   MAXIMUM = 55.0 Fc
   MINIMUM = 0.0 Fc

2. DIRECT LIGHTING FROM HYDRAULIC STIMULATION OPERATIONS WILL BE CONFINED WITHIN THE 100 FT EDGE OF PAD OFF-SET BOUNDARY.

3. TOTAL PAD AREA = ± 6.37 ACRES, 277,525 Sq. Ft.

4. 3,036,747 TOTAL LUMENS.
   10.942 LUMENS/SQ. FT.



1 HYDRAULIC STIMULATION PAD SITE LIGHTING PHOTOMETRIC PLAN

SCALE: 1" = 100'

LIGHTING FIXTURE SCHEDULE

SYMBOL	LIGHT UNIT DESCRIPTION	BUG RATING	MOUNTING INFO	VOLTS	LAMP QUANTITY	LUMENS / LAMP	UNITS QUANTITY	LUMENS / UNIT	TOTAL LUMENS
	RAB LIGHTING MODEL FXLED 300SF	B3-U3-G5	25' TOWER	120	3	45,171	7	135,513	948,591
	RAB LIGHTING MODEL FXLED 300SF	B3-U3-G5	25' WALL	120	3	45,171	12	135,513	1,626,156
	HILIGHT V5+S	B3-U3-G5	23' TOWER	120	4	38,500	3	154,000	462,000

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HARAMBE 2920 PAD
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WELD COUNTY, COLORADO

SCALE: AS NOTED	DRAWN BY: C.C.	DATE DRAWN: 03-08-22
UELS FILE NO.: V - 1 8 5	REVISED: 05-06-22 C.C.	

HYDRAULIC STIMULATION OPERATIONS PHOTOMETRIC PLAN

APPENDIX C – DRILL-OUT OPERATIONS PHOTOMETRIC PLAN

CERTIFICATE

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COLORADO LICENSED
PAUL A. HAWKS
42408
05-06-22
PROFESSIONAL ENGINEER

1" = 100'

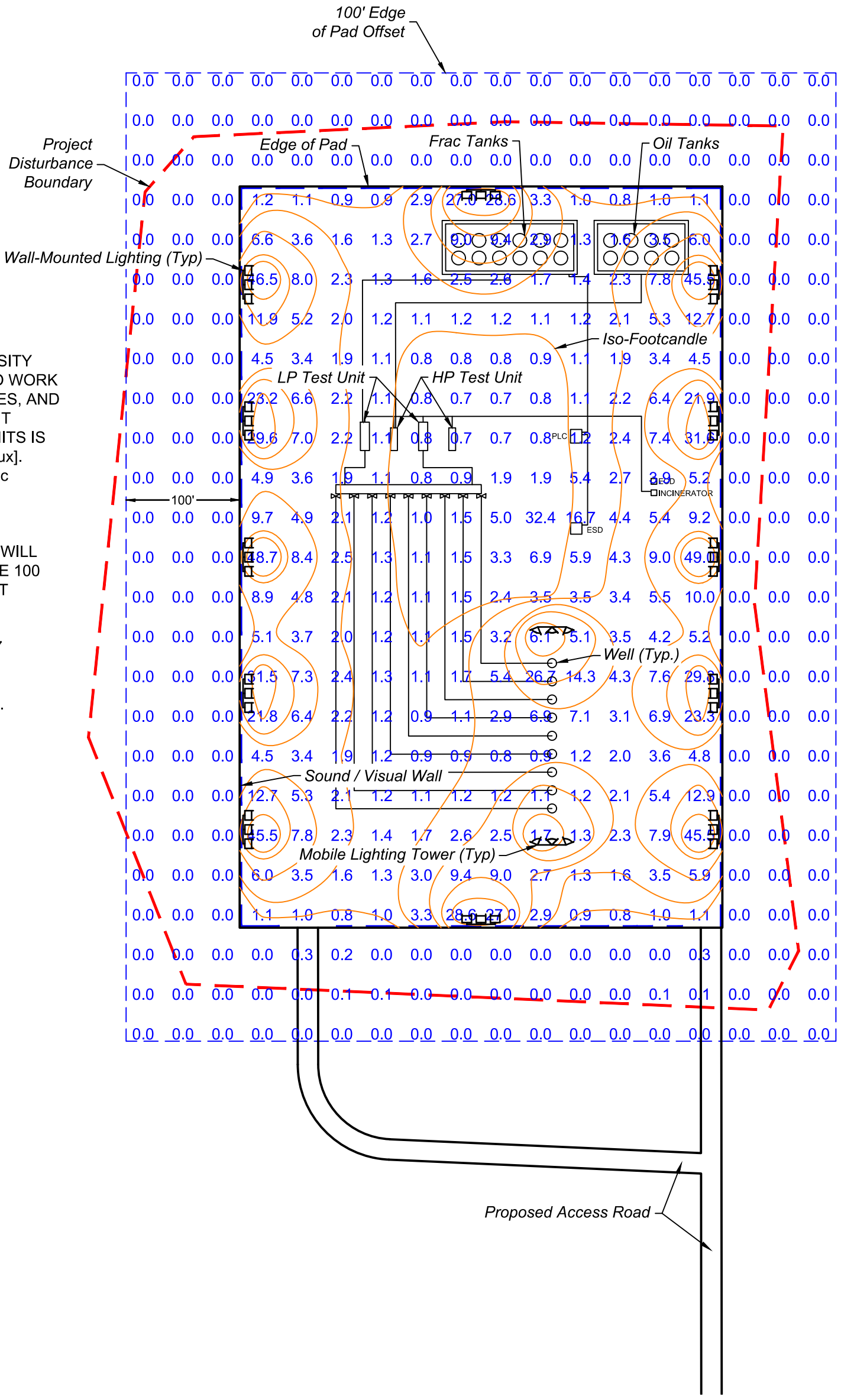
NOTES:

1. MEASURED LIGHT INTENSITY LEVEL WITH RESPECT TO WORK AREAS, OUTDOOR SPACES, AND UNATTENDED EQUIPMENT AREAS. ILLUMINANCE UNITS IS GIVEN IN Fc [1 fc = 10.8 Lux].
   MAXIMUM = 49.0 Fc
   MINIMUM = 0.0 Fc

2. DIRECT LIGHTING FROM DRILL-OUT OPERATIONS WILL BE CONFINED WITHIN THE 100 FT EDGE OF PAD OFF-SET BOUNDARY.

3. TOTAL PAD AREA = ± 6.37 ACRES, 277,525 Sq. Ft.

4. 1,897,182 TOTAL LUMENS.
   6.836 LUMENS/SQ. FT.



1 DRILL-OUT OPERATIONS SITE LIGHTING PHOTOMETRIC PLAN

SCALE: 1" = 100'

LIGHTING FIXTURE SCHEDULE

SYMBOL	LIGHT UNIT DESCRIPTION	BUG RATING	MOUNTING INFO	VOLTS	LAMP QUANTITY	LUMENS / LAMP	UNITS QUANTITY	LUMENS / UNIT	TOTAL LUMENS
	RAB LIGHTING MODEL FXLED 300SF	B3-U3-G5	25' TOWER	120	3	45,171	2	135,513	271,026
	RAB LIGHTING MODEL FXLED 300SF	B3-U3-G5	25' WALL	120	3	45,171	12	135,513	1,626,156

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DRILL-OUT OPERATIONS PHOTOMETRIC PLAN

APPENDIX D – FLOWBACK OPERATIONS PHOTOMETRIC PLAN

CERTIFICATE

THIS ALSO CERTIFIES THAT I HAVE RELATIVE EXPERIENCE IN LIGHT MITIGATION TECHNIQUES AND DESIGN.

COLORADO LICENSED
PAUL A. HAWKS
42408
05-06-22
PROFESSIONAL ENGINEER

1" = 100'

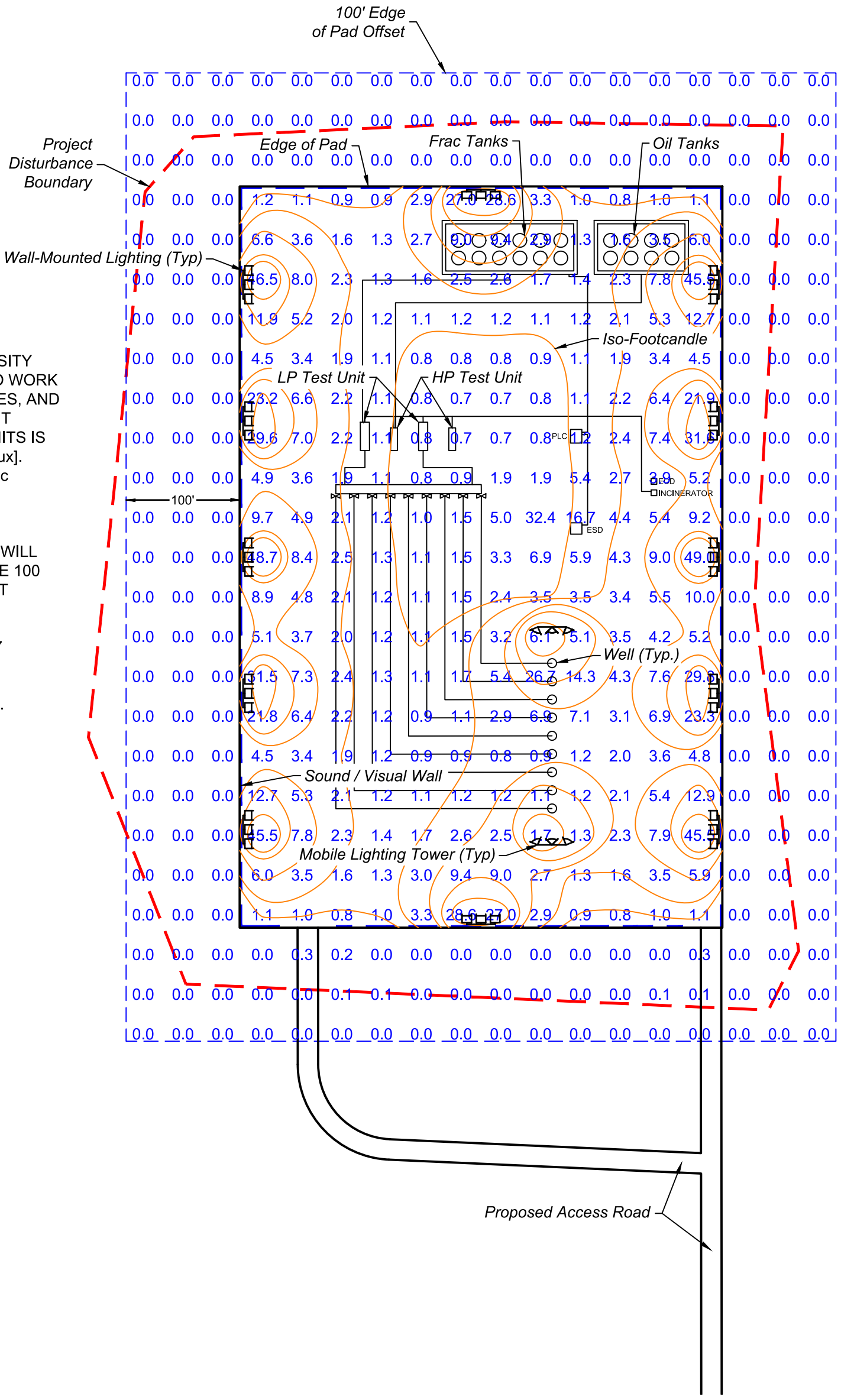
NOTES:

1. MEASURED LIGHT INTENSITY LEVEL WITH RESPECT TO WORK AREAS, OUTDOOR SPACES, AND UNATTENDED EQUIPMENT AREAS. ILLUMINANCE UNITS IS GIVEN IN Fc [1 fc = 10.8 Lux].
   MAXIMUM = 49.0 Fc
   MINIMUM = 0.0 Fc

2. DIRECT LIGHTING FROM DRILL-OUT OPERATIONS WILL BE CONFINED WITHIN THE 100 FT EDGE OF PAD OFF-SET BOUNDARY.

3. TOTAL PAD AREA = ± 6.37 ACRES, 277,525 Sq. Ft.

4. 1,897,182 TOTAL LUMENS.
   6.836 LUMENS/SQ. FT.



1 FLOWBACK PAD SITE LIGHTING PHOTOMETRIC PLAN
SCALE: 1" = 100'

LIGHTING FIXTURE SCHEDULE

SYMBOL	LIGHT UNIT DESCRIPTION	BUG RATING	MOUNTING INFO	VOLTS	LAMP QUANTITY	LUMENS / LAMP	UNITS QUANTITY	LUMENS / UNIT	TOTAL LUMENS
	RAB LIGHTING MODEL FXLED 300SF	B3-U3-G5	25' TOWER	120	3	45,171	2	135,513	271,026
	RAB LIGHTING MODEL FXLED 300SF	B3-U3-G5	25' WALL	120	3	45,171	12	135,513	1,626,156

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UELS FILE NO.: V - 1 8 5	REVISED: 05-06-22 C.C.	

FLOWBACK OPERATIONS PHOTOMETRIC PLAN

APPENDIX E – LIGHT FIXTURE SPECIFICATION SHEET

FXLED300SF

Ultra high output, high efficiency LED floodlight with NEMA Types: 7H x 6V, 6H x 4V, 4H x 6V, 5H x 5V and 3H x 3V. patent-pending "Air-Flow" technology ensures long LED and driver lifespan. Use for general and security lighting for large areas, building façades, signs and landscapes.

Color: Bronze

Weight: 66.1 lbs

Project:	**Type:**
Prepared By:	**Date:**

Driver Info

Type	Constant Current
120V	2.65A
208V	1.59A
240V	1.38A
277V	1.17A
Input Watts	325.9W

LED Info

Watts	300W
Color Temp	5000K (Cool)
Color Accuracy	72 CRI
L70 Lifespan	100,000 Hours
Lumens	45,171
Efficacy	138.6 lm/W

Technical Specifications

Compliance

UL Listed:

Suitable for wet locations. Suitable for ground mounting.

IESNA LM-79 & LM-80 Testing:

RAB LED luminaires and LED components have been tested by an independent laboratory in accordance with IESNA LM-79 and LM-80.

Optical

NEMA Type:

NEMA Beam Spread of 7H x 6V

Performance

Lifespan:

100,000-Hour LED lifespan based on IES LM-80 results and TM-21 calculations

Construction

IP Rating:

Ingress Protection rating of IP66 for dust and water

Maximum Ambient Temperature:

Suitable for use in up to 40°C (104°F)

Effective Projected Area:

EPA = 4

Cold Weather Starting:

Minimum starting temperature is -40°C (-40°F)

Thermal Management:

Superior thermal management with external "Air-Flow" fins

Lens:

Tempered glass lens

Housing:

Die-cast aluminum housing and door frame

Mounting:

Heavy-duty slipfitter for 2 3/8"OD pipe

Reflector:

Specular and semi-specular vacuum-metalized polycarbonate

Gaskets:

High-temperature silicone gaskets

Technical Specifications (continued)

Construction

Finish:

Formulated for high durability and long-lasting color

Green Technology:

Mercury and UV free. RoHS-compliant components.

Tilt Increment:

Rotates in 6 degree increments

LED Characteristics

LEDs:

Multip-chip, high-output, long-life LEDs

Color Consistency:

7-step MacAdam Ellipse binning to achieve consistent fixture-to-fixture color

Color Stability:

LED color temperature is warrantied to shift no more than 200K in color temperature over a 5-year period

Color Uniformity:

RAB's range of Correlated Color Temperature follows the guidelines of the American National Standard for Specifications for the Chromaticity of Solid State Lighting (SSL) Products, ANSI C78.377-2017.

Electrical

Drivers:

Constant Current, 1050mA, 50/60 Hz, 120-277V, 4 kV surge protection, 120V: 2.65A, 208V: 1.59A, 240V: 1.38A, 277V: 1.17A, THD <20%, Power Factor: 99%

THD:

9.26% at 120V, 12.56% at 277V

Power Factor:

99.3% at 120V, 96.6% at 277V

Note:

All values are typical (tolerance +/- 10%)

Other

Equivalency:

Equivalent to 1000W Metal Halide

Warranty:

RAB warrants that our LED products will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the end user, including coverage of light output, color stability, driver performance and fixture finish. RAB's warranty is subject to all terms and conditions found at rablighting.com/warranty.

Buy American Act Compliance:

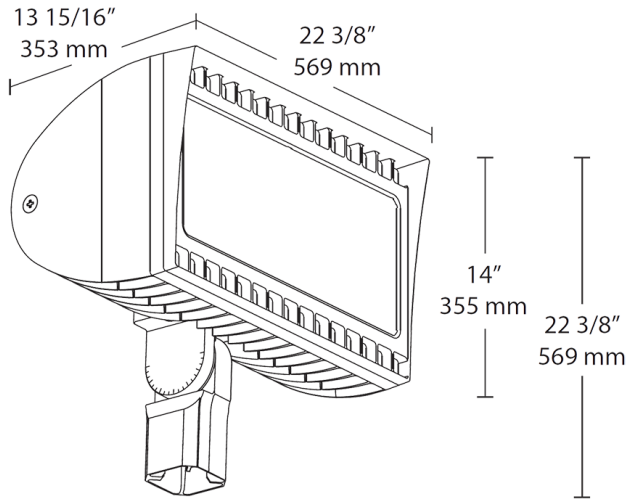
RAB values USA manufacturing! Upon request, RAB may be able to manufacture this product to be compliant with the Buy American Act (BAA). Please contact customer service to request a quote for the product to be made BAA compliant.

Listings

DLC Listed:

This product is listed by Design Lights Consortium (DLC) as an ultra-efficient premium product that qualifies for the highest tier of rebates from DLC Member Utilities. DLC Product Code: PF5PMFXJ

Dimensions



Features

- 300W replaces 1000 MH floodlights
- 100,000-hour LED lifespan
- 5-Year, No-Compromise Warranty

Ordering Matrix

Family	Wattage	Mounting	Color Temp	NEMA Type	Finish	Driver Options	Options	Other Options
FXLED	300	SF						
	200 = 200W **300 =** 300W	**SF =** Slipfitter **T =** Trunnion	**Blank =** 5000K (Cool) **N =** 4000K (Neutral) **Y =** 3000K (Warm)	**Blank =** 7H x 6V **B64 =** 6H x 4V **B55 =** 5H x 5V **B33 =** 3H x 3V **B46 =** 4H x 6V	**Blank =** Bronze **W =** White	**Blank =** 120-277V **/480 =** 480V **/BL =** Bi-Level (Slipfitters only) [1] **/D10 =** 0-10V Dimming	**Blank =** No option **/PCS =** 120V Swivel **/PCS2 =** 277V Swivel **/PCT =** 120-277V Twistlock **/PCT4 =** 480V Twistlock **/PCS4 =** 480V Swivel **/LC =** Lightcloud® Controller	**USA =** BAA Compliant **Blank =** Standard

[1] Slipfitter models only

IES ROAD REPORT
PHOTOMETRIC FILENAME : RABFXLED300SF_30D.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST] DLF20180512001-1a
[TESTLAB] Deliver Co. Ltd.
[MANUFAC] RAB LIGHTING INC. RC LIGHTING
[ISSUEDATE] 05/12/18
[_CONVERT] Luminaire test position and photometric web converted from original test data

CHARACTERISTICS

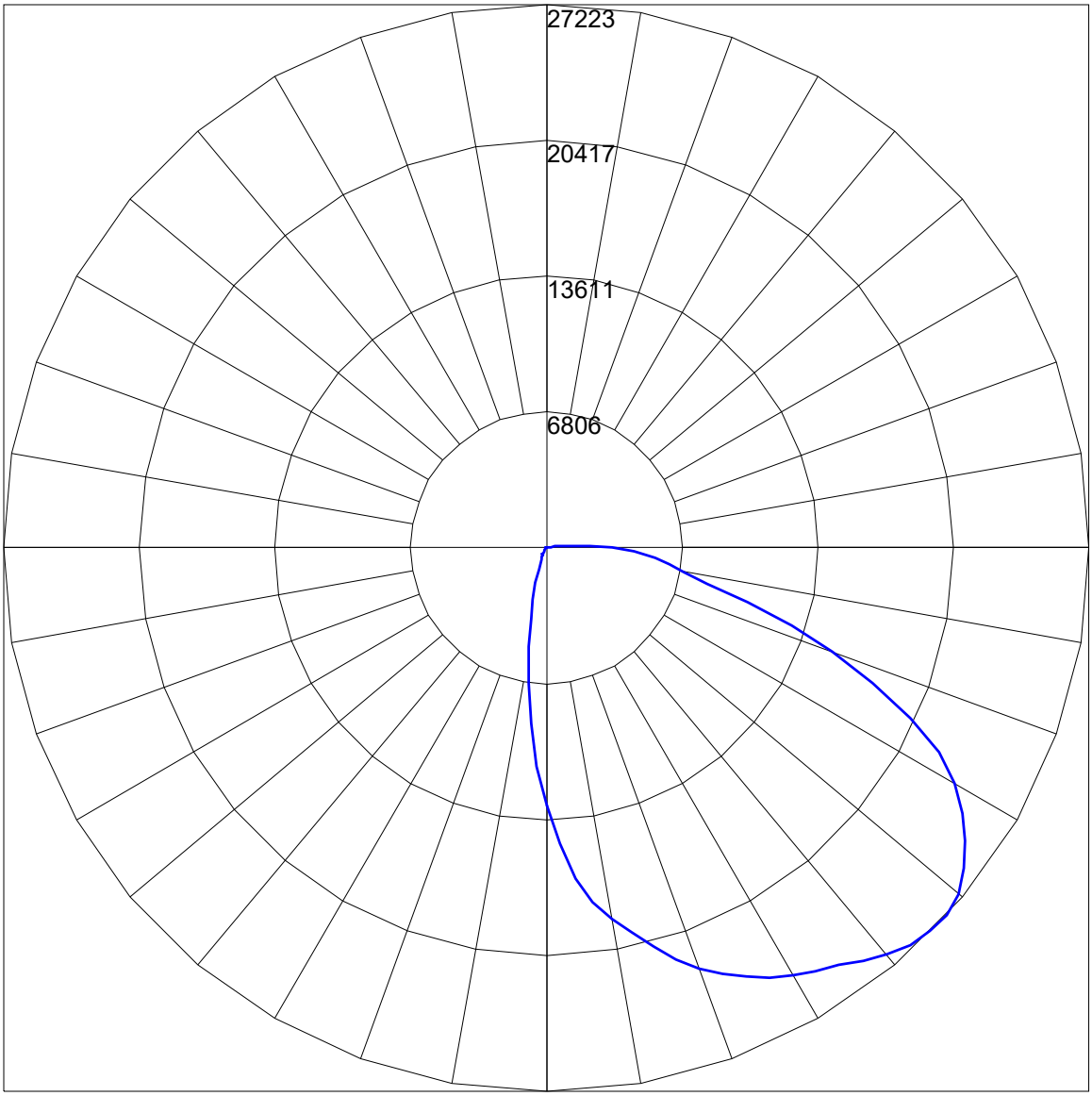
IES Classification	Type IV
Longitudinal Classification	Very Short
Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Luminaire Lumens	45134
Downward Total Efficiency	N.A. (absolute)
Total Luminaire Efficiency	N.A. (absolute)
Luminaire Efficacy Rating (LER)	138
Total Luminaire Watts	325.921
Ballast Factor	1.00
Upward Waste Light Ratio	0.01
Maximum Candela	27222.949
Maximum Candela Angle	360H 47.5V
Maximum Candela (<90 Degrees Vertical)	27222.949
Maximum Candela Angle (<90 Degrees Vertical)	360H 47.5V
Maximum Candela At 90 Degrees Vertical	3383.779 (7.5% Luminaire Lumens)
Maximum Candela from 80 to <90 Degrees Vertical	7519.438 (16.7% Luminaire Lumens)
Cutoff Classification (deprecated)	N.A. (absolute)

LUMINAIRE CLASSIFICATION SYSTEM (LCS)

	Lumens	% Lamp	% Luminaire
FL - Front-Low (0-30)	7859.9	N.A.	17.4
FM - Front-Medium (30-60)	21395.0	N.A.	47.4
FH - Front-High (60-80)	10409.2	N.A.	23.1
FVH - Front-Very High (80-90)	1598.0	N.A.	3.5
BL - Back-Low (0-30)	2114.1	N.A.	4.7
BM - Back-Medium (30-60)	1264.3	N.A.	2.8
BH - Back-High (60-80)	112.0	N.A.	0.2
BVH - Back-Very High (80-90)	3.2	N.A.	0.0
UL - Uplight-Low (90-100)	305.4	N.A.	0.7
UH - Uplight-High (100-180)	72.5	N.A.	0.2
Total	45133.6	N.A.	100.0
BUG Rating	B3-U3-G5		

IES ROAD REPORT
PHOTOMETRIC FILENAME : RABFXLED300SF_30D.IES

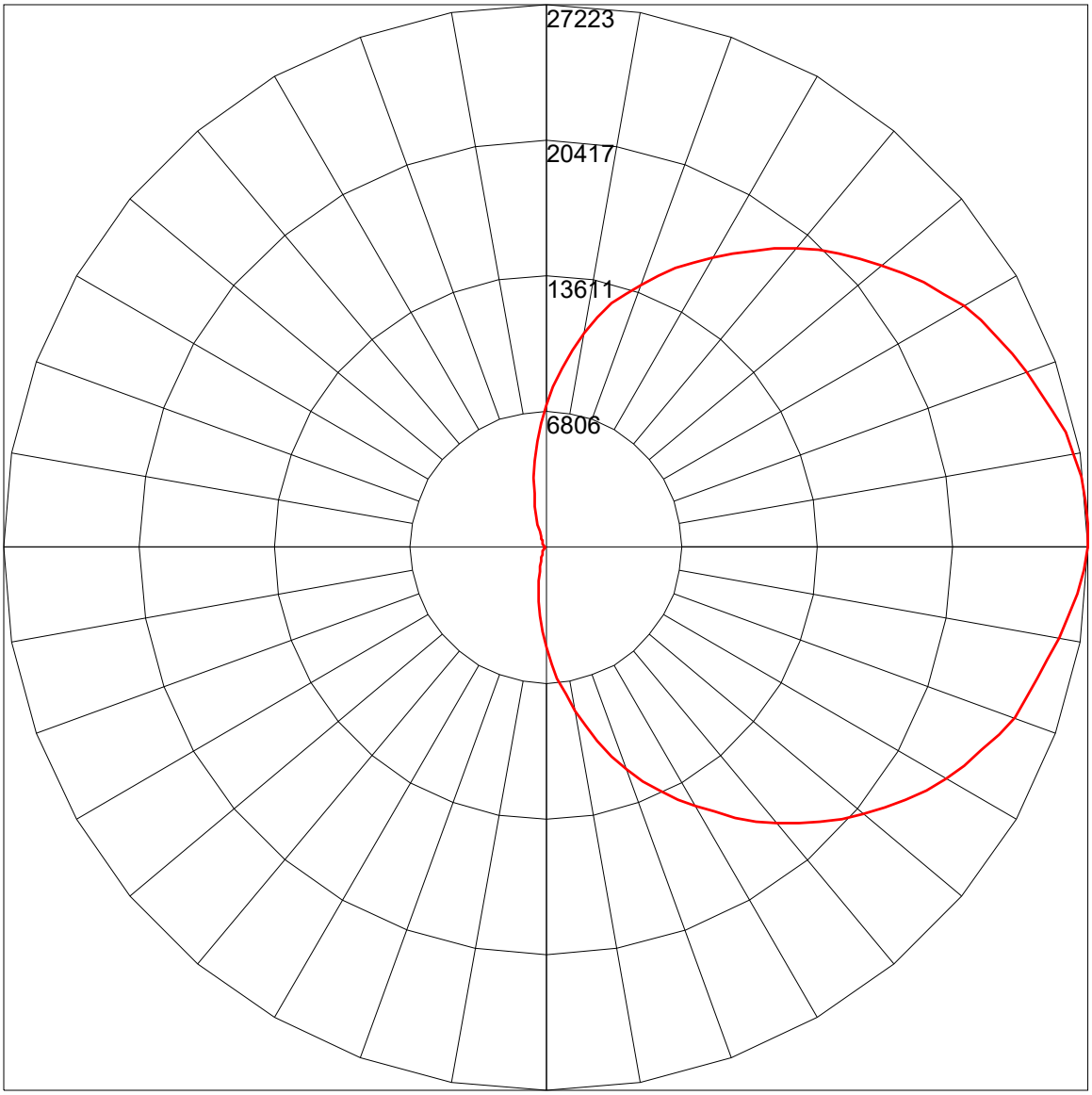
POLAR GRAPH



Maximum Candela = 27222.949 Located At Horizontal Angle = 360, Vertical Angle = 47.5
Vertical Plane Through Horizontal Angles (360 - 180) (Through Max. Cd.)

IES ROAD REPORT
PHOTOMETRIC FILENAME : RABFXLED300SF_30D.IES

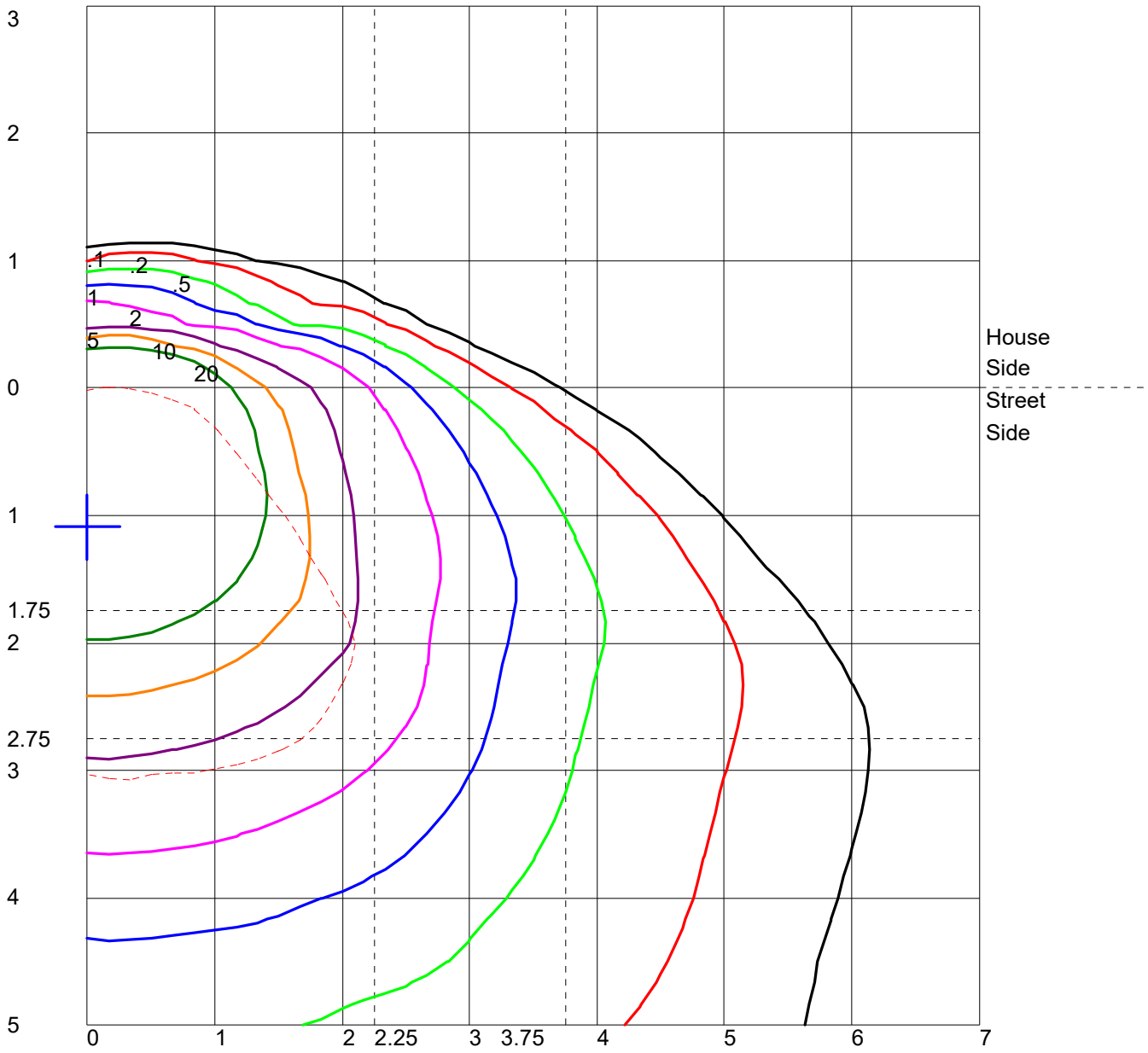
POLAR GRAPH



Maximum Candela = 27222.949 Located At Horizontal Angle = 360, Vertical Angle = 47.5
Horizontal Cone Through Vertical Angle (47.5) (Through Max. Cd.)

IES ROAD REPORT
PHOTOMETRIC FILENAME : RABFXLED300SF_30D.IES

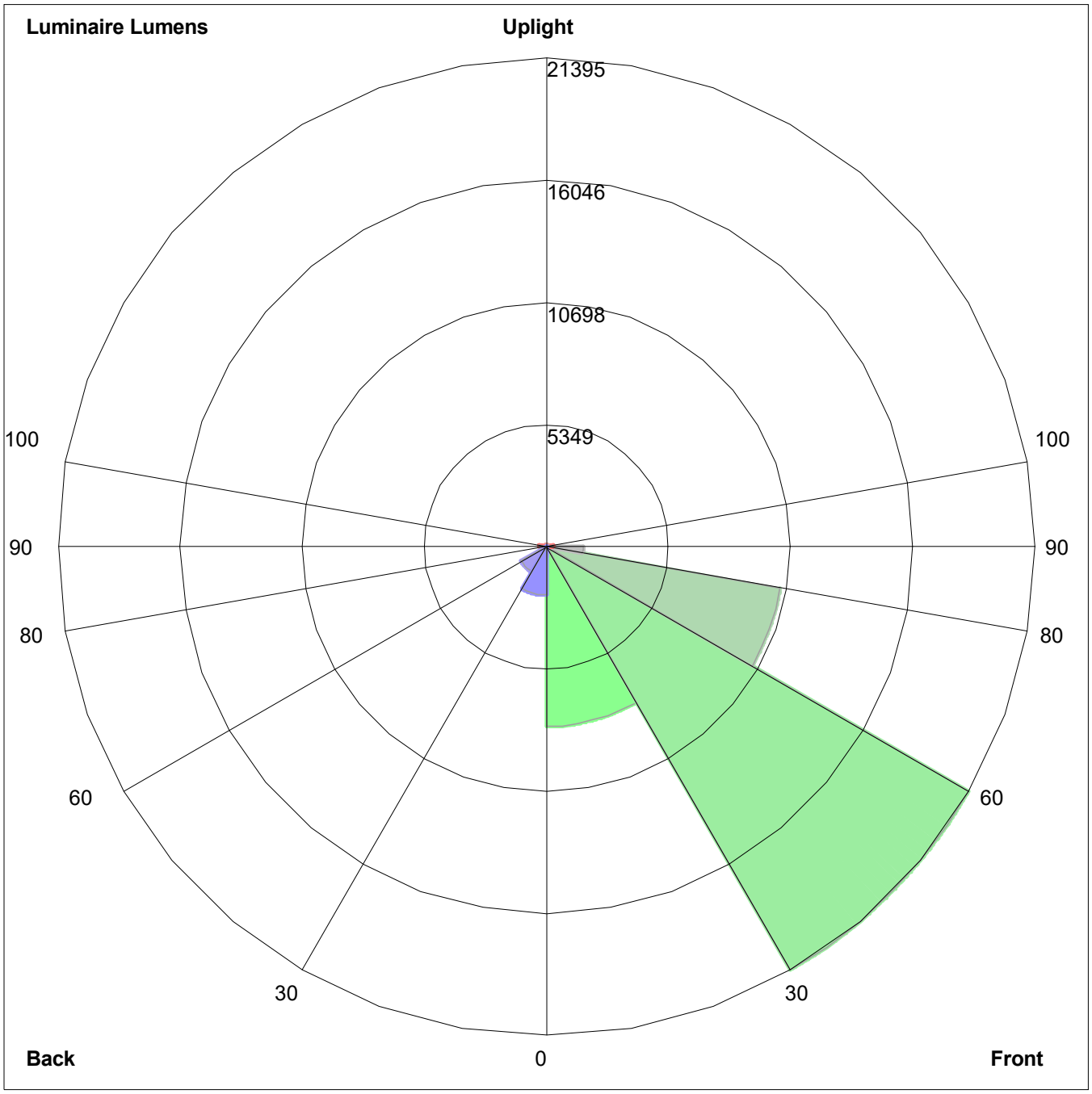
ISOFOOTCANDLE LINES OF HORIZONTAL ILLUMINANCE



Distance In Units Of Mounting Height
Values Based On 10 Foot Mounting Height
1/2 Maximum Candela Trace Shown As Dashed Curve
(+) = Maximum Candela Point

IES ROAD REPORT
PHOTOMETRIC FILENAME : RABFXLED300SF_30D.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=7859.9, Medium= 21395.0, High=10409.2, Very High= 1598.0
Back: Low=2114.1, Medium=1264.3, High=112.0, Very High=3.2
Uplight: Low=305.4, High=72.5

BUG Rating : B3-U3-G5

HiLight V4 S

HiLight V5+ S

The HiLight V4 S and V5+ S light towers are perfect for multiple applications. For the ultimate in fuel economy and reliability, the LED HiLight V5+ is our premium offering. Its LED lighting technology provides a wide range of benefits and represents outstanding lifetime value for our customers. The second model, the HiLight V4 is the leading solution within the 4000W metal halide light tower segment. Both models offer assured robustness and extended safety features

LED
4 x 350 W

LIGHT COVERAGE
43,055 ft²
AVG. 20LUXES

LIFE SPAN
6,000 Hrs
METAL HALIDE

0.56 g/h

Manual vertical mast

HardHat® technology

Spillage free frame

LIGHT COVERAGE
53,819 ft²
AVG. 20LUXES

LIFE SPAN
50,000 Hrs
LED

0.185 g/h

		BATTERY		DIESEL			ELECTRIC		
									
		HiLight Z3+	HiLight B5+	HiLight V5+ S	Hilight V4 S	HiLight V4W	HiLight E3+	HiLight P2+	HiLight V2+ | V3+
Light coverage ft2		32,292 (average 10 luxes)	53,819 (average 20 luxes)	53,819 (average 20 luxes)	43,055 (average 20 luxes)	43,055 (average 20 luxes)	32,292 (average 10 luxes)	21,527 (average 10 luxes)	21,527 (average 10 luxes)
Lamps		LED	LED	LED	Metal halide	Metal halide	LED	LED	LED
Mast		Vertical Hydraulic	Vertical Hydraulic	Vertical manual	Vertical manual	Vertical manual	Vertical manual	Vertical manual	Vertical manual
Features		Battery Powered Noise & CO2 free	Compact box	HardHat® canopy	HardHat® canopy	HardHat® canopy	Electric	Electric	Electric
Performance data									
Rated frequency	Hz	60	60	60	60	60	60	60	60
Rated voltage	VAC	120	120	120	120	120-240	120	120	120
Rated power (PRP)	kW	-	2.7	2.7	6.8	8	-	-	-
Operating temperature (min/max)	°F (°C)	-4/ 122 (-20/ 50)	-4/ 104 (-20/ 40)	-13 / 122 (-25 / 50)	-13 / 122 (-25 / 50)	-13 / 122 (-25 / 50)	-	-	-
Sound power level (LwA)	dB(A)	-	82	86	94	89	-	-	-
Sound pressure level (LpA) at 7m	dB(A)	-	55	63	73	64	-	-	-
Engine									
Model		-	Kubota Z481	Kubota Z482	Kubota Z482	Kubta D1105	-	-	-
Speed	rpm	-	1800	1800	3600	1800	-	-	-
Rated net output (PRP)	kW	-	3	3	8.1	10	-	-	-
Coolant		-	Water	Water	Water	Water	-	-	-
Number of cylinders		-	1	2	2	3	-	-	-
Alternator									
Model		-	Meccalte LT3/74	Meccalte LT3/75	Sincro EK 2 MCT	DP06/AG164	-	-	-
Rated output	kVA	-	3.5	4.5	7.5	8	-	-	-
Insulation / Enclosure protection	class / IP	-	H / 20	H / 21	H / 23	H / 23	-	-	-
Fuel consumption									
Fuel tank capacity	gallon (l)	-	34.3 (230)	28 (105)	28 (105)	42 (160)	-	-	-
Autonomy	h	18-32	220	150	50	90	-	-	-
Power output									
Auxiliary Power	W	-	1,200	1,200	2,400	7,200	-	-	-
Outlets		-	120 VAC, 10A, GFCI Duplex (NEMA 5-20R)	120 VAC, 10A, GFCI Duplex (NEMA 5-20R)	120 VAC, 20A, GFCI Duplex (NEMA 5-20R)	121 VAC, 20A, GFCI Duplex (NEMA 5-20R) 240VAC, 30A, TL (NEMA L5-30R)	-	-	-
Lights									
Floodlights		LED	LED	LED	Metal halide	Metal halide	LED	LED	LED
Wattage	W	4x 160	4 x 350	4 x 350	4 x 1,000	4 x 1,000	4 x 160	320	320 | 4 x 120
Luminous Flux	Lumen	4 x 16,000	4 x 38,500	4 x 38,500	4 x 110,000	4 x 110,000	4 x 16,000	28,000	28,000 | 4 x 12,000
Mast									
Type		Hydraulic, vertical, 5 section	Hydraulic, vertical, 5 section	Manual vertical, 5 section	Manual vertical, 5 section	Manual vertical, 5 section	Manual	Manual	Manual
Rotation	degrees	340	340	360	360	360	0	0	0
Maximum height	ft (m)	26 (7.9)	26 (7.9)	25 (7.5)	25 (7.5)	25 (7.5)	23 (7)	11 (3.4)	17 (5)
Maximum speed wind	mph (kph)	50 (80)	50 (80)	51 (80)	51 (80)	59 (95)	52 (80)	32(50)	32 (50)
Enclosure and trailer									
Type		Box type Forklift pockets	Box type Forklift pockets	DOT US Compliant Unibody trailer with 4 point leveling system	DOT US Compliant Unibody trailer with 4 point leveling system	DOT US Compliant Unibody trailer with 4 point leveling system	-	-	Trailer with Bumpers in PE
Base Frame		-	Spillage free frame	Spillage free frame	Spillage free frame	Spillage free frame	-	-	-
Enclosure		Galvanneal Steel Canopy & Powder coating painting	Galvanneal Steel Canopy & Powder coating painting	Gull-wing Hard Hat Doors	Gull-wing Hard Hat Doors	Gull-wing Hard Hat Doors	Hard Hat Canopy	-	-
Dimensions and weigth									
Dimensions in transport Up-right Towbar (L x W x H)	in (m)	-	-	77 x 48 x 102 (1.95 x 1.22 x 2.59)	77 x 48 x 102 (1.95 x 1.22 x 2.59)	74 x 53 x 98 (1.88 x 1.34 x 2.49)	-	-	-
Dimensions in transport - Towed (L x W x H)	in (m)	46 x 46 x 97 (1.16x 1.16x 2.46)	46 x 46 x 97 (1.16x 1.16x 2.46)	110 x 48 x 102 (2.79 x 1.22 x 2.59)	110 x 48 x 102 (2.79 x 1.22 x 2.59)	110 x 53 x 98 (2.79 x 1.34 x 2.49)	48 x 32 x 84 (1.2 x 0.8 x 2.14)	19.7 x 19.7 x 87 (0.5 x 0.5 x 2.2)	45 x 335 x 79 (1.1 x 0.85 x 2)
Weight	lb (kg)	2160(980)	2160(980)	1,768 (802)	1,970 (894)	2,041 (926)	608 (276)	99 (45)	243 (110)

IES ROAD REPORT
PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED_30D.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST]
[TESTLAB]
[TESTDATE]
[ISSUEDATE]
[OTHER]
[MANUFAC]
[LUMCAT] fl-350-85x135
[LUMINAIRE] fl-350-85x135
[LAMPCAT] LED
[LAMP] LED
[_CONVERT] Luminaire test position and photometric web converted from original test data

CHARACTERISTICS

IES Classification	Type IV
Longitudinal Classification	Medium
Lumens Per Lamp	37338 (1 lamp)
Total Lamp Lumens	37338
Luminaire Lumens	37345
Downward Total Efficiency	99 %
Total Luminaire Efficiency	100 %
Luminaire Efficacy Rating (LER)	97
Total Luminaire Watts	386
Ballast Factor	1.00
Upward Waste Light Ratio	0.01
Maximum Candela	26112.25
Maximum Candela Angle	67.5H 70V
Maximum Candela (<90 Degrees Vertical)	26112.25
Maximum Candela Angle (<90 Degrees Vertical)	67.5H 70V
Maximum Candela At 90 Degrees Vertical	1300.775 (3.5% Lamp Lumens)
Maximum Candela from 80 to <90 Degrees Vertical	12466.58 (33.4% Lamp Lumens)
Cutoff Classification (deprecated)	Non-Cutoff

IES ROAD REPORT
PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED_30D.IES

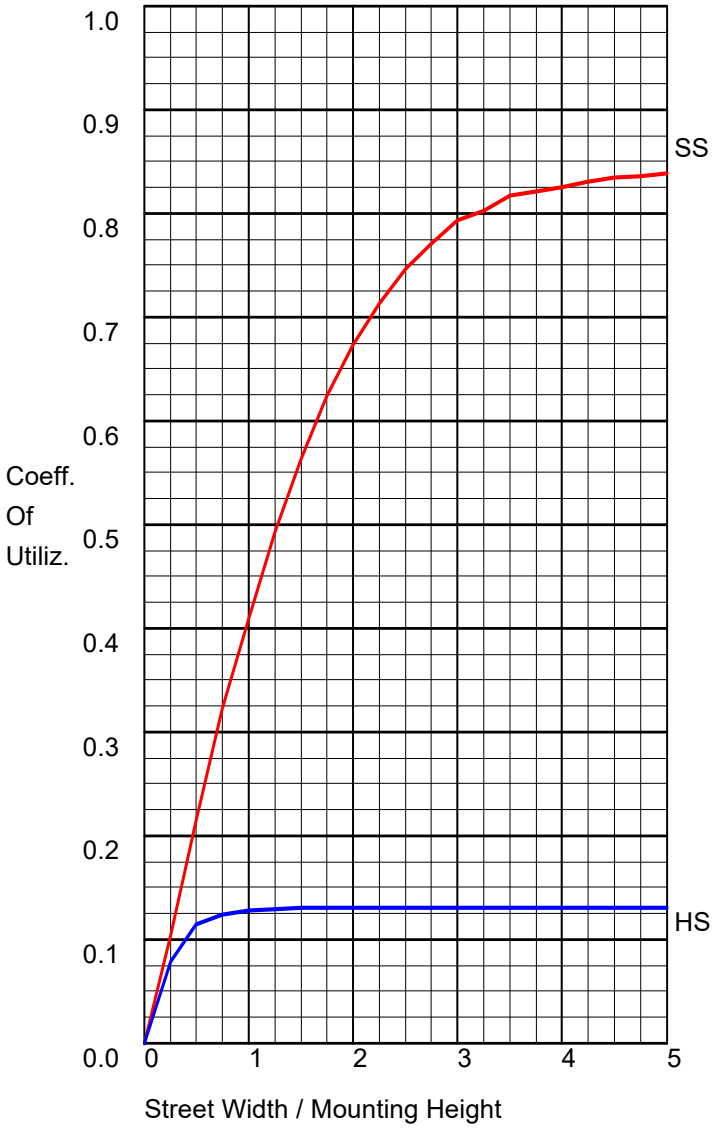
LUMINAIRE CLASSIFICATION SYSTEM (LCS)

	Lumens	% Lamp	% Luminaire
FL - Front-Low (0-30)	2894.2	7.8	7.8
FM - Front-Medium (30-60)	13146.5	35.2	35.2
FH - Front-High (60-80)	15017.0	40.2	40.2
FVH - Front-Very High (80-90)	866.9	2.3	2.3
BL - Back-Low (0-30)	1604.2	4.3	4.3
BM - Back-Medium (30-60)	2657.2	7.1	7.1
BH - Back-High (60-80)	606.9	1.6	1.6
BVH - Back-Very High (80-90)	18.3	0.0	0.0
UL - Uplight-Low (90-100)	353.2	0.9	0.9
UH - Uplight-High (100-180)	180.1	0.5	0.5
Total	37344.5	99.9	100.0
BUG Rating	B3-U3-G5		

Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED_30D.IES

COEFFICIENTS OF UTILIZATION

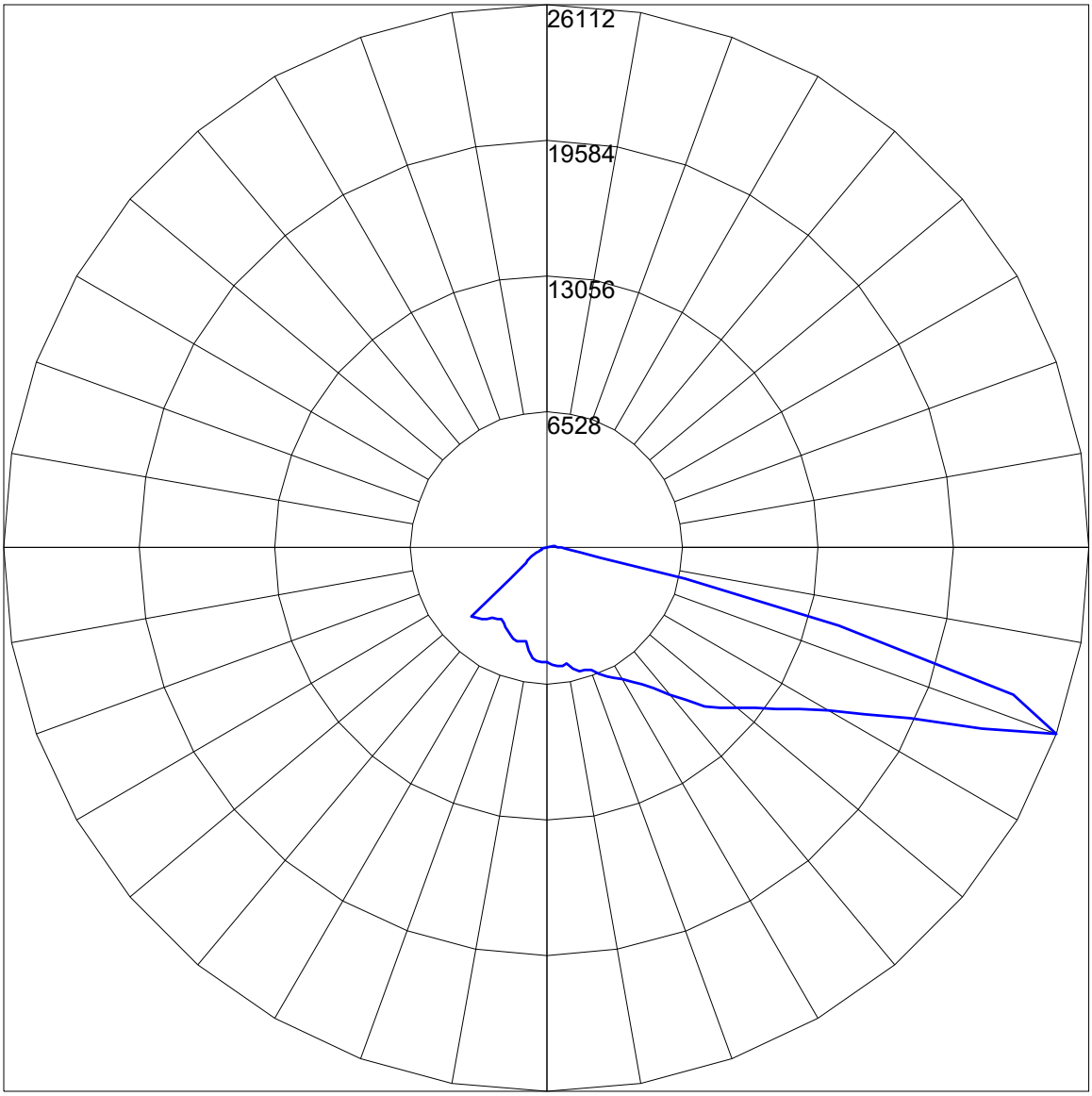


FLUX DISTRIBUTION

	Lumens	Percent Of Lamp
Downward Street Side	31924.7	85.5
Downward House Side	4886.6	13.1
Downward Total	36811.3	98.6
Upward Street Side	533.0	1.4
Upward House Side	0.3	0.0
Upward Total	533.3	1.4
Total Flux	37344.6	100.0

IES ROAD REPORT
PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED_30D.IES

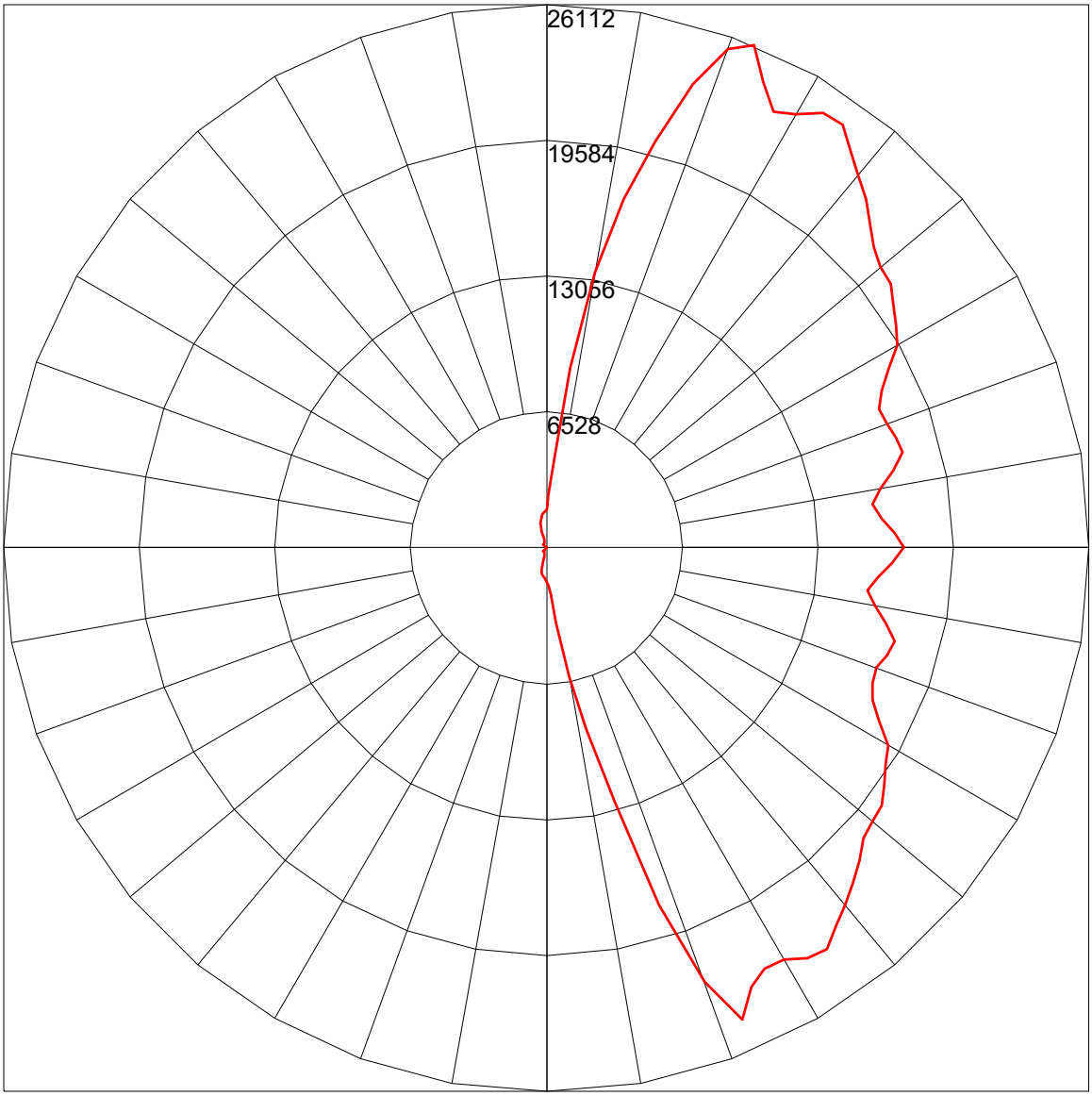
POLAR GRAPH



Maximum Candela = 26112.25 Located At Horizontal Angle = 67.5, Vertical Angle = 70
Vertical Plane Through Horizontal Angles (67.5 - 247.5) (Through Max. Cd.)

IES ROAD REPORT
PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED_30D.IES

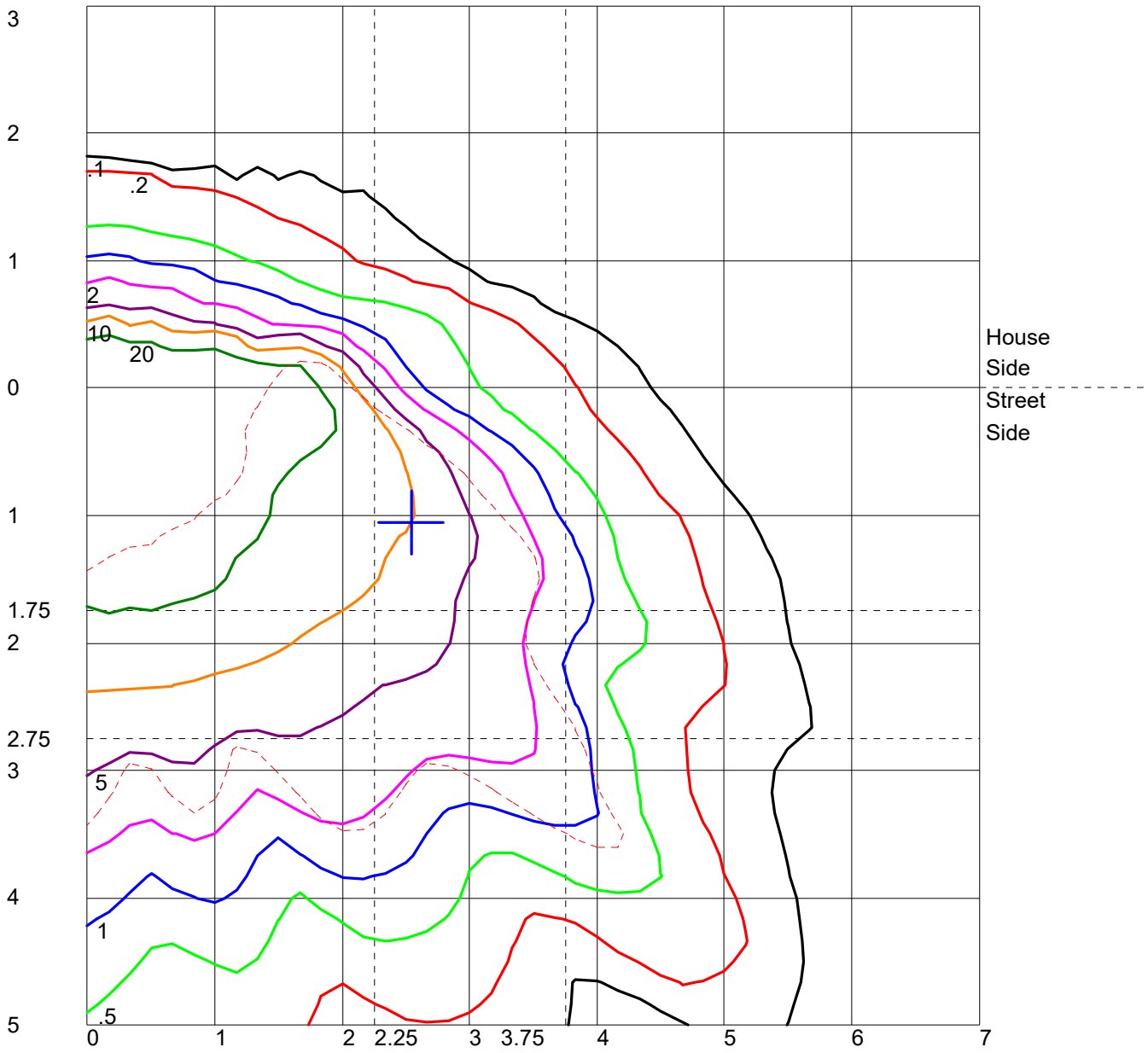
POLAR GRAPH



Maximum Candela = 26112.25 Located At Horizontal Angle = 67.5, Vertical Angle = 70
Horizontal Cone Through Vertical Angle (70) (Through Max. Cd.)

IES ROAD REPORT
PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED_30D.IES

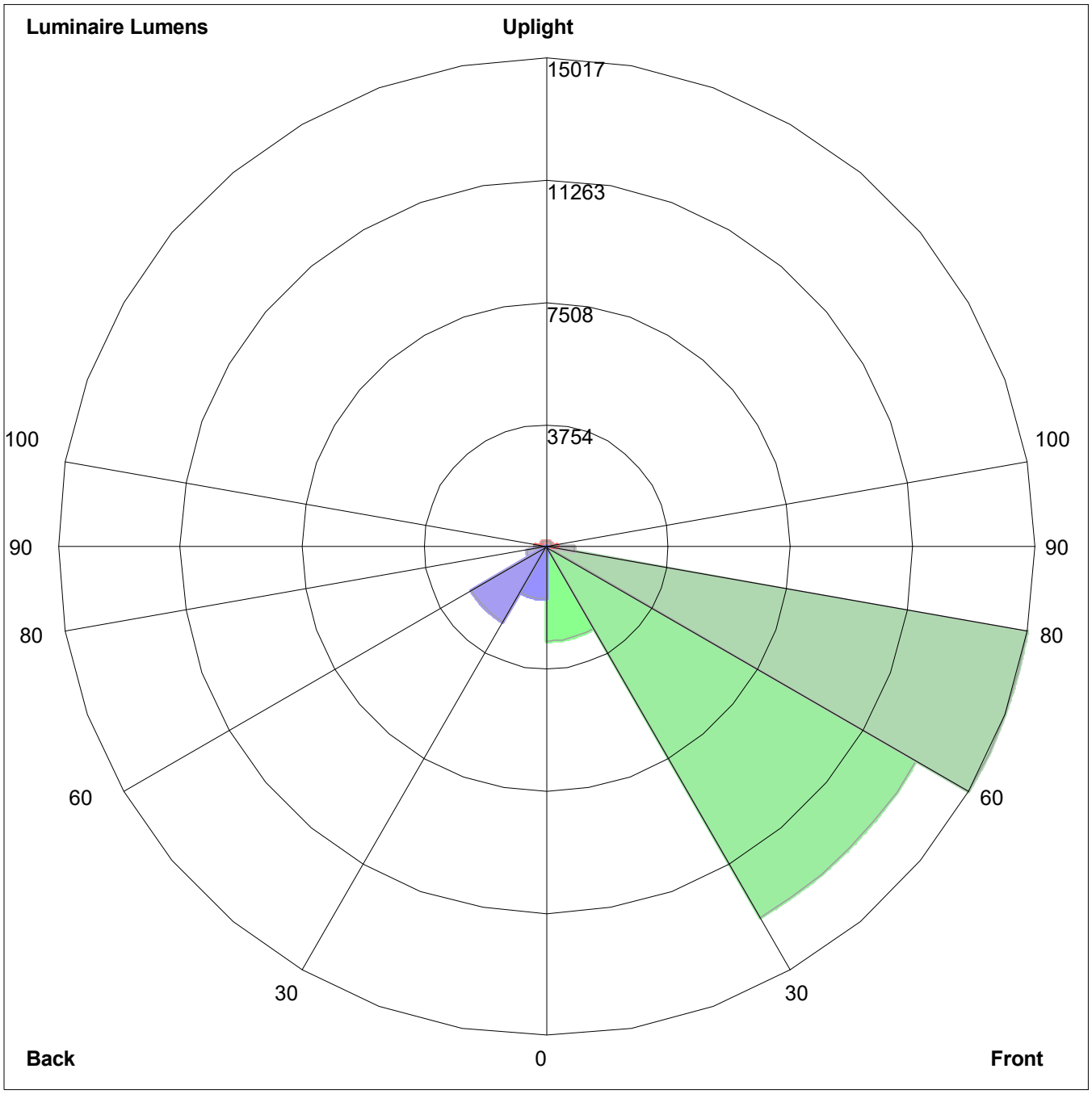
ISOFOOTCANDLE LINES OF HORIZONTAL ILLUMINANCE



Distance In Units Of Mounting Height
Values Based On 10 Foot Mounting Height
1/2 Maximum Candela Trace Shown As Dashed Curve
(+) = Maximum Candela Point

IES ROAD REPORT
PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED_30D.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=2894.2, Medium=13146.5, High= 15017.0, Very High=866.9
Back: Low=1604.2, Medium=2657.2, High=606.9, Very High=18.3
Uplight: Low=353.2, High=180.1

BUG Rating : B3-U3-G5