



GADWALL PAD LIGHTING PLAN

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Article I. Introduction

Facility Information

This document provides site-specific information for the Gadwall Pad within the Gadwall OGD. The information in this document relates specifically to the time during the construction, drilling, completion, and production of the eight (8) proposed horizontal wells on this location.

The proposed location is rangeland approximately 2,700 feet east of Weld County Road 97, south of Highway 14. The Pad will be in the NWNE Section 30, Township 8 North, Range 60 West, zoned Agricultural within the Ag-Rural Planning Area of Weld County. A WOGLA application for the Gadwall Pad was approved as WOGLA18-0087 on September 5, 2018. A 1041 WOGLA Minor Amendment extending the term of WOGLA18-0087 was approved by Weld County OGED on May 7, 2021.

The proposed Working Pad Surface will be 15.9 acres, reduced to 7.5 after interim reclamation. The Pad is on Parcel 054130100003 owned by Deborah J. Holub and William F. Stepanek. The location is currently used for grazing.

The proposed production facility equipment for the Gadwall Pad will be located within the Working Pad Surface adjacent to the wells and will consist of 5 oil tanks, 5 water tanks, 8 separators, 2 vapor recovery towers (VRT), 1 vapor recovery unit (VRU), 2 electric compressors, 2 Enclosed Combustion Devices (ECD), 1 meter skid, 1 LACT Unit, 3 Pigging Stations, 1 gas lift, 1 drain vault, 1 scrubber, 1 Instrument Air skid, 3 KO drums, 1 temporary product cooler skid, 1 temporary MLVT, and proposed electrical and/or solar equipment.

Phase	Duration (days)	Estimated Start Date
Pad Construction	20	1 st Quarter (March) 2022
Facility Construction	60	2 nd Quarter (April) 2022
Drilling	52	2 nd Quarter (June) 2022
Completion	56	4 th Quarter (October) 2022
Flowback	30	4 th Quarter (November) 2022
Production	9125 (25 Years)	4 th Quarter (December) 2022
Interim Reclamation	20	2 nd Quarter (June) 2023

Article II. Plan Narrative

Jurisdictional Agency

The Relevant Local Government has lighting plan requirements under applicable Weld County code.

The Land Use designation of the proposed Location is agricultural within the Ag-Rural Planning Area, which is lighting Zone LZ-1 Per Weld County Code, which allows up to 12.0 lumens per SF of hardscape during construction and up to 1.25 lumens per SF of hardscape during production per Sec. 21-5-405.

The standards within COGCC Rule 424 are equivalently protective; Operator will follow the more restrictive standard or Operator is requesting a higher maximum permissible light level than would otherwise be allowed by Rule 424.d.(2), as the local government agrees to the higher maximum permissible light level and the requested level is protective of public safety, public welfare, and wildlife.

COGCC Maximum Permissible Light Levels:

LAND USE	Lumens per square foot of Working Pad Surface
Residential /Rural/State Parks/State Wildlife Areas/High Priority Habitat/Wilderness Areas/National Park/National Monument	1.25
Commercial/Agricultural	2.5
Light Industrial	5.0
Industrial	7.5

Article III. Mitigation Measures and Best Management Practices

- Operator will direct site lighting downward and inward, such that no light shines above a horizontal plane passing through the center point light source.
- Operator will use appropriate technology within fixtures that obscures, blocks, or diffuses the light to reduce light intensity outside the boundaries of the Oil and Gas Facility.
- Operator will minimize lighting when not needed using timers or motion sensors; to minimize light pollution and obtrusive lighting.
- Operator will use full cut-off lighting; to minimize light pollution and obtrusive lighting.
- Operator will use lighting colors that reduce light intensity to minimize light pollution and obtrusive lighting.
- Operator will use low-glare or no-glare lighting to minimize light pollution and obtrusive lighting.
- All production lighting specified has a 3000k Color Temperature which is considered “warm lighting” to minimize impacts to wildlife.
- When operator has active operations involving personnel ongoing at an oil and gas location, Operator will provide sufficient on-site pre-production lighting to ensure the safety of all persons on or near the site.
- Prior to the Commencement of Production Operations, Operator will take all necessary and reasonable precautions to ensure that lighting from Oil and Gas Facilities does not unnecessarily impact the health, safety, and welfare of persons occupying the 0 Building Units (0 HOBUs) within 5,280 feet within 2,000 feet of the Oil and Gas Facility.
 - Per the provided lighting plans, the closest residential building unit will experience a calculated lighting impact of less than 0.1 Lux, well below the 4 Lux maximum of Rule 424.f.
- Prior to the Commencement of Production Operations, Operators will take all necessary and reasonable precautions to ensure that lighting from Oil and Gas Facilities does not unnecessarily impact the health, safety, and welfare of Motorists on Highway 14 within 2,000 feet of the Oil and Gas Facility.
 - Per the lighting calculations provided in the lighting plans, lighting from pre-production activities including drilling and completion operations is not anticipated to leave location. In both phases the proposed lighting is at 0.5 foot-candles well within the limits of the pad. During production the proposed lighting is within 0.1 foot-candles well within the limits of the pad.
- Prior to the Commencement of Production Operations, Operators will take all necessary and reasonable precautions to ensure that lighting from Oil and Gas Facilities does not unnecessarily impact the health, safety, and welfare of Wildlife occupying any High Priority Habitat within 2,000 feet of the Oil and Gas Facility. There are approximately 110 acres of Pronghorn Winter Habitat within 2,000 of the Working Pad Surface. The CPW was consulted and had no concerns or requests for mitigation.
 - As demonstrated within the lighting plans, the proposed pre-production lighting is 0.5 foot-candles inside the limits of the pad and 0.1 foot-candles during production. This location will be fenced in both

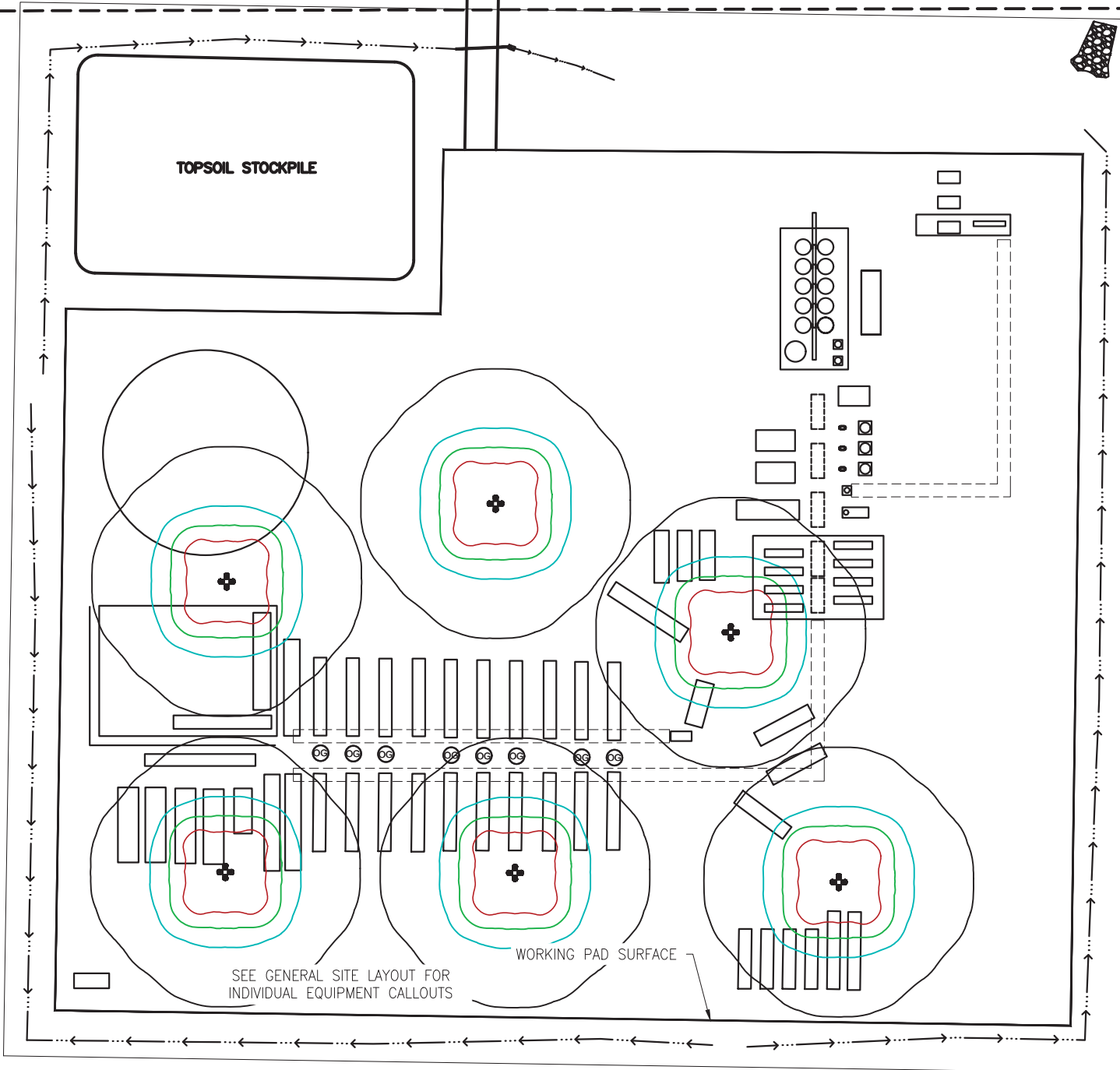
the pre-production and production phases and therefore wildlife will not be in the vicinity of the proposed lighting.

- All permanent production facility lighting is controlled by a switch. It is Mallard's Standard Operating Proceed (SOP) for permanent production facility lighting to be turned off when not needed. If personnel are working on location and require lighting for safe operations, the lighting will be turned on.

Article IV. **Exhibits/References/Appendices**

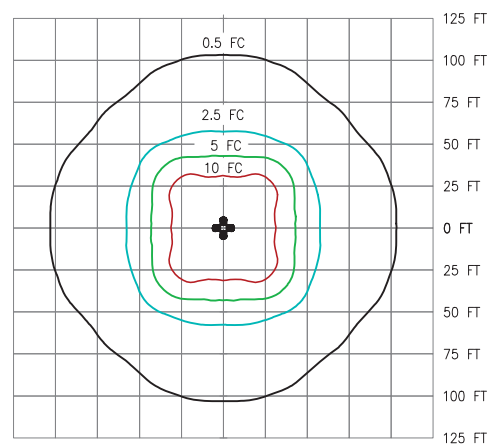
Signed Stamped Lighting Layouts

Lighting Spec Sheets



LIGHTING FIXTURE SCHEDULE				
TYPE	DESCRIPTION	LUMENS PER FIXTURE	FIXTURE COUNT PER TRAILER	TRAILER SUBTOTAL
1	GENERAC MLT6SMD5 320W LED FIXTURES (4 LIGHTS MOUNTED PER TRAILER)	47,000	4	188,000

SITE TOTALS	
PROPOSED NUMBER OF TRAILERS	6
TOTAL LUMENS	1,128,000 LUMENS
SITE SQUARE FOOTAGE	692,604 SQ. FT
LUMENS/SQ. FT	1.63 LUMENS/SQ. FT
WELD COUNTY PRE-PRODUCTION LIMITS	12 LUMENS/SQ. FT
MAXIMUM NUMBER OF TRAILERS TO MAINTAIN WELD COUNTY LIMITS	44






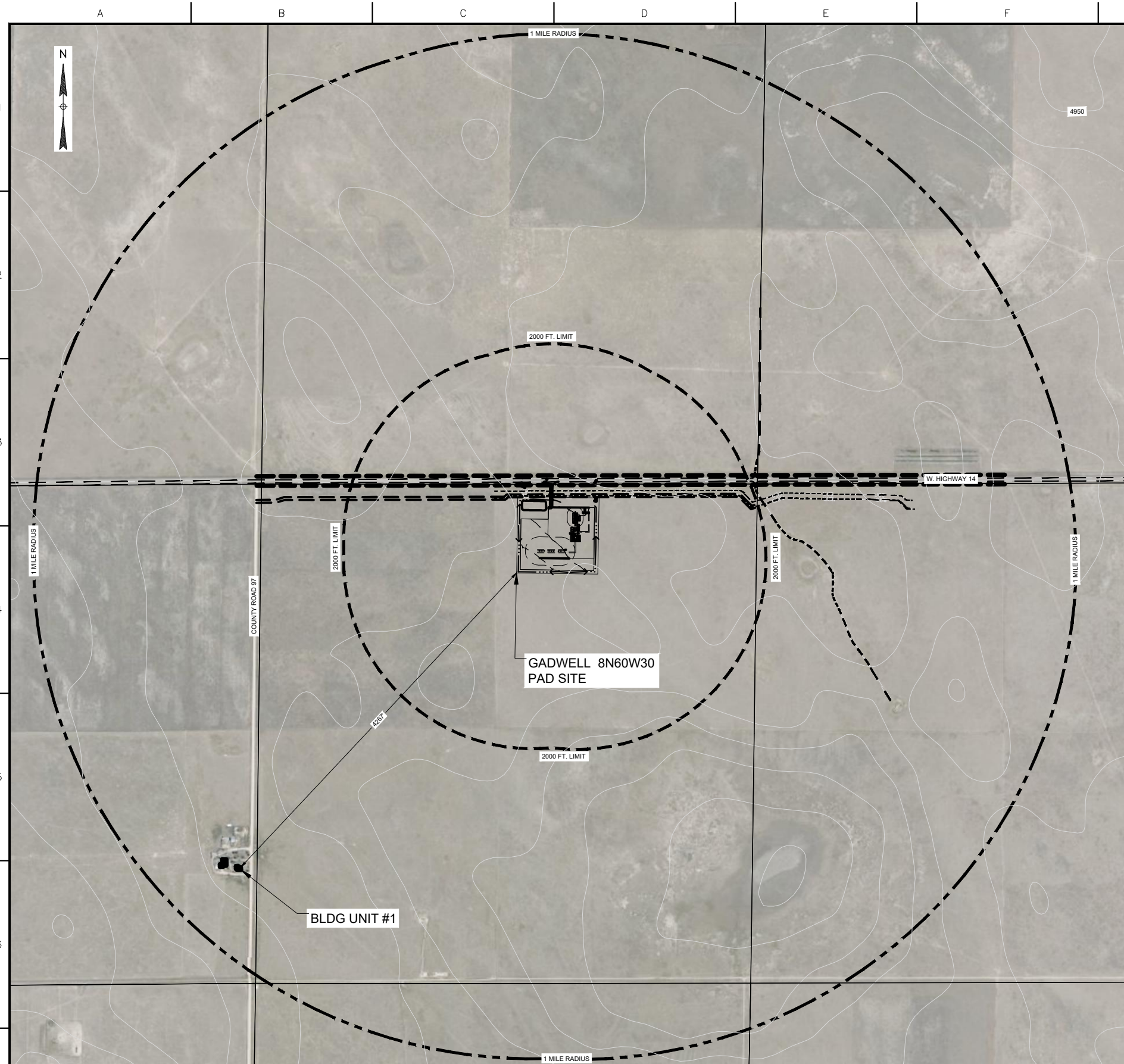
FOR PERMIT ONLY

NOTES:

- A. THIS DRAWING IS BASED ON TEMPLATE LIGHTING TRAILER THAT SHALL BE PLACED BY FRAC CONTRACTOR DURING PRE-PRODUCTION FRACING PERIOD. FINAL PLACEMENT SHALL BE BY CONTRACTOR AND SHALL AVOID PLACING TRAILERS WITHIN 100' OF SITE BOUNDARY.
- B. ALL LIGHT FIXTURES AND INSTALLATION MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST ISSUE OF LOCAL AND NATIONAL ELECTRICAL CODES, ELECTRICAL SPECIFICATIONS AND DRAWINGS.
- C. ALL LIGHT FIXTURES AND THE INSTALLATION OF THESE LIGHT FIXTURES SHALL COMPLY WITH COGCC SECTION 424 AND DARK SKY COMPLIANT REQUIREMENTS.

REFERENCE DRAWINGS		REVISIONS					
		△					
		△					
		△					
		△					
		△					
		△	ISSUED FOR PERMIT	08/03/21	RJM	JVT	RJM TWV
		△	ISSUED FOR REVIEW	07/28/21	RJM	JVT	RJM TWV
DWG NO.	TITLE	REV	DESCRIPTION	DATE	BY	CHK	ENG APR

			
MALLARD EXPLORATION GADWELL FACILITY FRAC PRE-PRODUCTION LIGHTING LAYOUT			
SCALE:	(FORMATTED 22X34) AS NOTED	DRAWING NO. 21080-01-73002	



CALCULATED LIGHTING IMPACT RESULTS				
BUILDING UNIT NO.	PRE-PRODUCTION DRILLING	PRE-PRODUCTION COMPLETIONS	PRODUCTION	REGULATORY LIMIT
1	<0.1 LUX	<0.1 LUX	<0.1 LUX	4 LUX

ILLUMINATION AT 1-MILE	<0.1 LUX
LUMINATION MAXIMUM PER COGCC RULE 424.F	4 LUX



FOR PERMIT ONLY

NOTES:

A. THIS DRAWING IS BASED ON PRELIMINARY LIGHTING LAYOUTS FOR PRODUCTION AND PRE-PRODUCTION SCENARIOS AS DETAILED ON DRAWINGS -73001 THROUGH 73003. THIS DRAWING MEANT TO SHOW POTENTIAL INTERACTIONS WITH ADJACENT STRUCTURES, WHICH ARE MINIMIZED THROUGH USE OF ENGINEERED LIGHTING DESIGN.

B. ALL LIGHT FIXTURES AND INSTALLATION MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST ISSUE OF LOCAL AND NATIONAL ELECTRICAL CODES, ELECTRICAL SPECIFICATIONS AND DRAWINGS.

C. ALL LIGHT FIXTURES AND THE INSTALLATION OF THESE LIGHT FIXTURES SHALL COMPLY WITH COGCC SECTION 424 AND DARK SKY COMPLIANT REQUIREMENTS.

	REFERENCE DRAWINGS
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REVISIONS

[illegible]**HALKER**
CONSULTING

MALLARD EXPLORATION
GADWALL PAD FACILITY
COGCC LIGHTING PERMIT
LIGHTING LAYOUT

SCALE: (FORMATTED 22X34)
NONE

DRAWING NO.
21080-01-73004



PROJECT: _____
 CATALOG #: _____
 FIXTURE TYPE: _____
 NOTES: _____

FDC Flood Light Contractor



Images are shown for illustration purpose only.

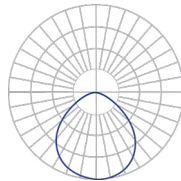
The **Flood Light Contractor Series** luminaire is a high performance lighting solution that comes in Small, Medium, Large, X-Large, and Huge. This versatile fixture has a slim rugged aluminum housing, watertight compartment for driver, and efficient heat sink. A variety of mounting options are available including Knuckle, Trunnion, Slipfitter, and Yoke. This FDC series is an excellent price-competitive solution without compromising quality that is ideal for signage, roadways, security, and general lighting applications.

APPLICATIONS

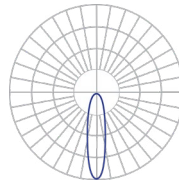
Landscape lighting, signage, internal roadways, parking lots, and general area lighting

REPLACEMENT

Up to 1000W Metal Halide



Wide Flood Distribution



Narrow Flood Distribution



PERFORMANCE INFORMATION

SERIES NUMBER	WATT	LUMENS	CCT
FDCS 20 G1 5K	15W	2,000	5000K
FDCS 35 G1 5K	27W	3,600	5000K
FDCM 60 G1 5K	45W	5,650	5000K
FDCM 80 G1 5K	60W	7,450	5000K
FDCL 93 G1 5K	70W	8,900	5000K
FDCL 130 G1 5K	100W	13,300	5000K
FDCX 180 G1 5K	135W	18,000	5000K
FDCX 180 NFL G1 5K	135W	18,000	5000K
FDCX 260 G1 5K	200W	26,200	5000K
FDCX 260 NFL G1 5K	200W	26,500	5000K
FDCH 350 G1 5K*	250W	34,500	5000K
FDCH 350 NFL G1 5K*	250W	34,500	5000K
FDCH 480 G1 5K	350W	50,000	5000K
FDCH 480 NFL G1 5K	350W	49,500	5000K

*DLC Pending

ORDERING GUIDE

EXAMPLE: FDCS 35 WFL G1 5K

Luminaire Type	Size	Lumen Output	Light Distribution	Generation	Voltage	CCT	Finish	Dimming	Mount	Options
FDC Flood Light Contractor	S= Small	20 2,000 Lumens 35 3,600 Lumens	BLANK= Wide Flood 7Hx6V	G1	BLANK= 120-277V	4K 4000K 5K 5000K	BLANK= Dark Bronze B= Black** W= White**	BLANK= Non-dimming D= Dimming	BLANK= Knuckle Mount T= Trunnion Mount	BLANK= No Option P= Button Photocell
	M= Medium	60 5,650 Lumens 80 7,450 Lumens			BLANK= 120-277V HVU= 347-480V					
	L= Large	90 8,900 Lumens 130 13,300 Lumens								
	X= X-Large	180 18,000 Lumens 260 26,200 Lumens	BLANK= Wide Flood 7Hx6V NFL= Narrow Flood 4Hx4V		T= Trunnion Mount S= Slipfitter Mount					
	H= Huge	350 34,500 Lumens 490 49,500 Lumens			Y= Yoke Mount					

**For a custom color, please call to place your order

Due to continuous product improvements, specification and/or equipment updates may change without notice.

SPECIFICATIONS

HOUSING

One-piece die-cast aluminum housing with heat sink for effective conductive and convective cooling. The vented housing isolates the LED module from the driver. The LED driver is directly assembled on the casting for a low operative temperature and a long life span. The doorframe is sealed with an extruded silicone gasket to prevent moisture from accumulating.

AMBIENT TEMPERATURE

Suitable for use in -40°C to +45°C (-40°F to 113°F).

MOUNTING

Knuckle Mount

½ NPS adjustable knuckle mount in aluminum.

Trunnion Mount

Adjustable trunnion mount in aluminum for direct surface mounting with bolt to lock in the aiming angle.

Slipfitter Mount

Adjustable slipfitter mount in aluminum that fits 2-3/8" O.D. tenon. Includes set screws for securing luminaire to tenon and aiming angle markings with bolt to lock in the aiming angle.

Yoke Mount

Adjustable Yoke Mount with bolt to lock aiming angle, painted for corrosion. Direct mounting to surface.

EFFICACY

Up to 138 lumens per watt (see individual wattage data).

CCT AND CRI

4000K and 5000K CCT available; 70 CRI

OPTICS

Superior lighting uniformity for vertical and horizontal NEMA 7HX6V and 4HX4V flood distribution while reducing back light from poles.

ELECTRICAL

High efficiency current driver above 90%.
50/60Hz operation with standard 120-277 input.
Standard PC UNV B3-Button Photocell.

FDCS & FDCM is non-dimmable.

FDCL, FDCX & FDCH with 0-10V dimming option.

FINISH

Dark Bronze coat finish with superior resistance to corrosion and weather. Custom colors available.

WARRANTY

5-year limited warranty. Comprehensive warranty terms can be located on www.slgus.com.

CERTIFICATIONS

UL listed for wet locations. Design Lights Consortium® (DLC) Premium qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.slgus.com/DLC to confirm which versions are qualified.

MOUNTING



1/2" NPS Knuckle Mount
Small and Medium size only



Trunnion Mount
Small and Medium size only



Trunnion Mount
Large and X-Large size only



Slipfitter Mount
Large and X-Large size only



Yoke Mount
Huge size only

OPTIONS

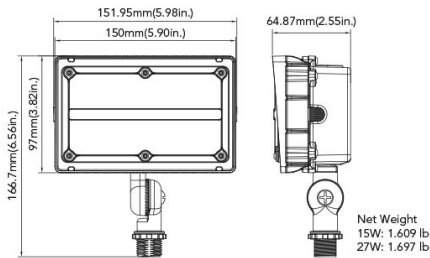


PC UNV B3

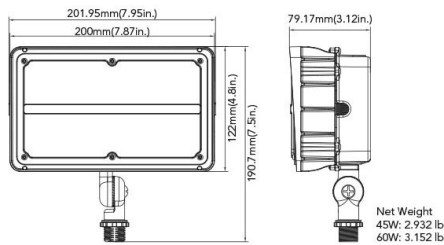
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DIMENSIONS

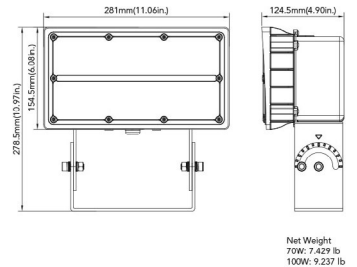
SMALL
15W & 27W
Knuckle Mount



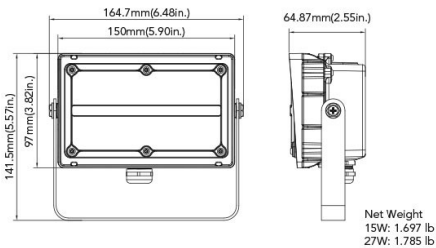
MEDIUM
45W & 60W
Knuckle Mount



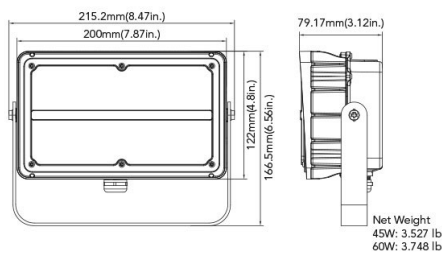
LARGE
70W, 90W, 100W
Trunnion Mount



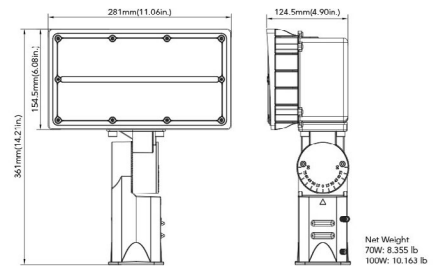
SMALL
15W & 27W
Trunnion Mount



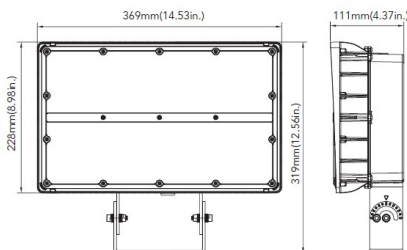
MEDIUM
45W & 60W
Trunnion Mount



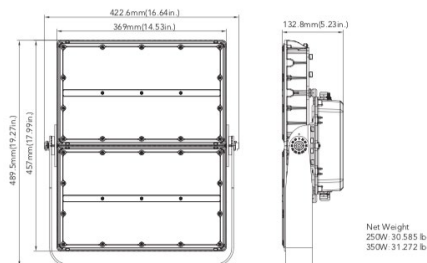
LARGE
70W, 90W, 100W
Slipfitter Mount



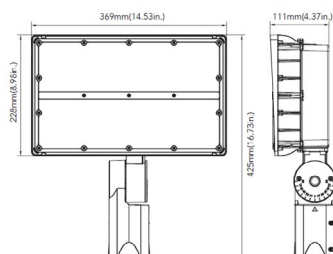
X-LARGE
135W & 200W
Trunnion Mount



HUGE
250W & 350W
Yoke Mount

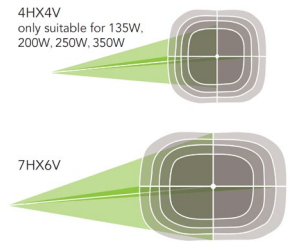
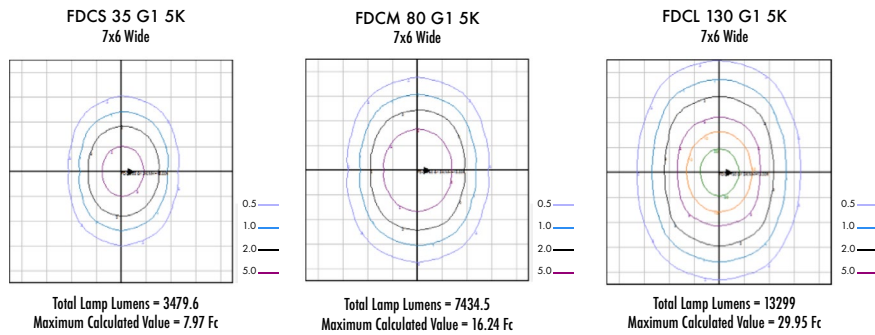


X-LARGE
135W & 200W
Slipfitter Mount



Due to continuous product improvements, specification and/or equipment updates may change without notice.

PHOTOMETRIC



Horizontal Footcandles
Arrangement: Single
Light Loss Factor = 1.00
Scale: 1 in = 7.5 ft
Mounting Height = 15.00 ft

PERFORMANCE DATA

4K & 5K						
Distance Type	Wattage	Voltage	Lumen Output	Efficacy (LPW)	CRI Min	Replacement
7HX6V	15W	120-277V	2,000 Lm	133	70	70W MH
7HX6V	27W	120-277V	3,600 Lm	133	70	100W MH
7HX6V	45W	120-277V	5,650 Lm	126	70	150W MH
7HX6V	60W	120-277V	7,450 Lm	124	70	175W MH
7HX6V	60W	347-480V	7,600 Lm	127	70	175W MH
7HX6V	70W	120-277V	8,900 Lm	127	70	250W MH
7HX6V	70W	347-480V	9,300 Lm	133	70	250W MH
7HX6V	90W	347-480V	12,400 Lm	138	70	400W MH
7HX6V	100W	120-277V	13,300 Lm	133	70	400W MH
7HX6V	135W	120-277V	18,000 Lm	132	70	400W MH
7HX6V	135W	347-480V	18,000 Lm	132	70	400W MH
4HX4V	135W	120-277V	18,000 Lm	132	70	400W MH
4HX4V	135W	347-480V	18,000 Lm	132	70	400W MH
7HX6V	200W	120-277V	26,000 Lm	130	70	400W MH
7HX6V	200W	347-480V	26,000 Lm	130	70	400W MH
4HX4V	200W	120-277V	26,000 Lm	130	70	400W MH
4HX4V	200W	347-480V	26,000 Lm	130	70	400W MH
7HX6V	250W	120-277V	34,500 Lm	138	70	750W MH
7HX6V	250W	347-480V	34,500 Lm	138	70	750W MH
4HX4V	250W	120-277V	34,500 Lm	138	70	750W MH
4HX4V	250W	347-480V	34,500 Lm	138	70	750W MH
7HX6V	350W	120-277V	50,000 Lm	137	70	1000W MH
7HX6V	350W	347-480V	50,000 Lm	137	70	1000W MH
4HX4V	350W	120-277V	49,500 Lm	137	70	1000W MH
4HX4V	350W	347-480V	49,500 Lm	137	70	1000W MH

Due to continuous product improvements, specification and/or equipment updates may change without notice.

ELECTRICAL LOAD

	Current (A)					
Wattage	120V	208V	240V	277V	347V	480V
15W	0.13	0.07	0.06	0.05	0.04	0.03
27W	0.23	0.13	0.11	0.10	0.08	0.06
45W	0.38	0.22	0.19	0.16	0.13	0.09
60W	0.50	0.29	0.25	0.22	0.17	0.13
70W	0.58	0.34	0.29	0.25	0.20	0.15
90W	0.75	0.43	0.38	0.32	0.26	0.19
100W	0.83	0.48	0.42	0.36	0.29	0.21
135W	1.13	0.65	0.56	0.49	0.39	0.28
200W	1.67	0.96	0.83	0.72	0.58	0.42
250W	2.08	1.20	1.04	0.90	0.72	0.52
350W	2.92	1.68	1.46	1.26	1.01	0.73

Lumen Ambient Temperature (LAT) Multipliers

Ambient		Lumen Multiplier
0°C	32°F	1.04
5°C	41°F	1.04
10°C	50°F	1.03
15°C	59°F	1.02
20°C	68°F	1.01
25°C	77°F	1.00
30°C	86°F	0.99
35°C	95°F	0.98
40°C	104°F	0.97

Projected LED Lumen Maintenance

Operating Hours	0	25,000	50,000	100,000
Lumen Maintenance	1	0.97	0.97	0.96

Due to continuous product improvements, specification and/or equipment updates may change without notice.