The Osborn

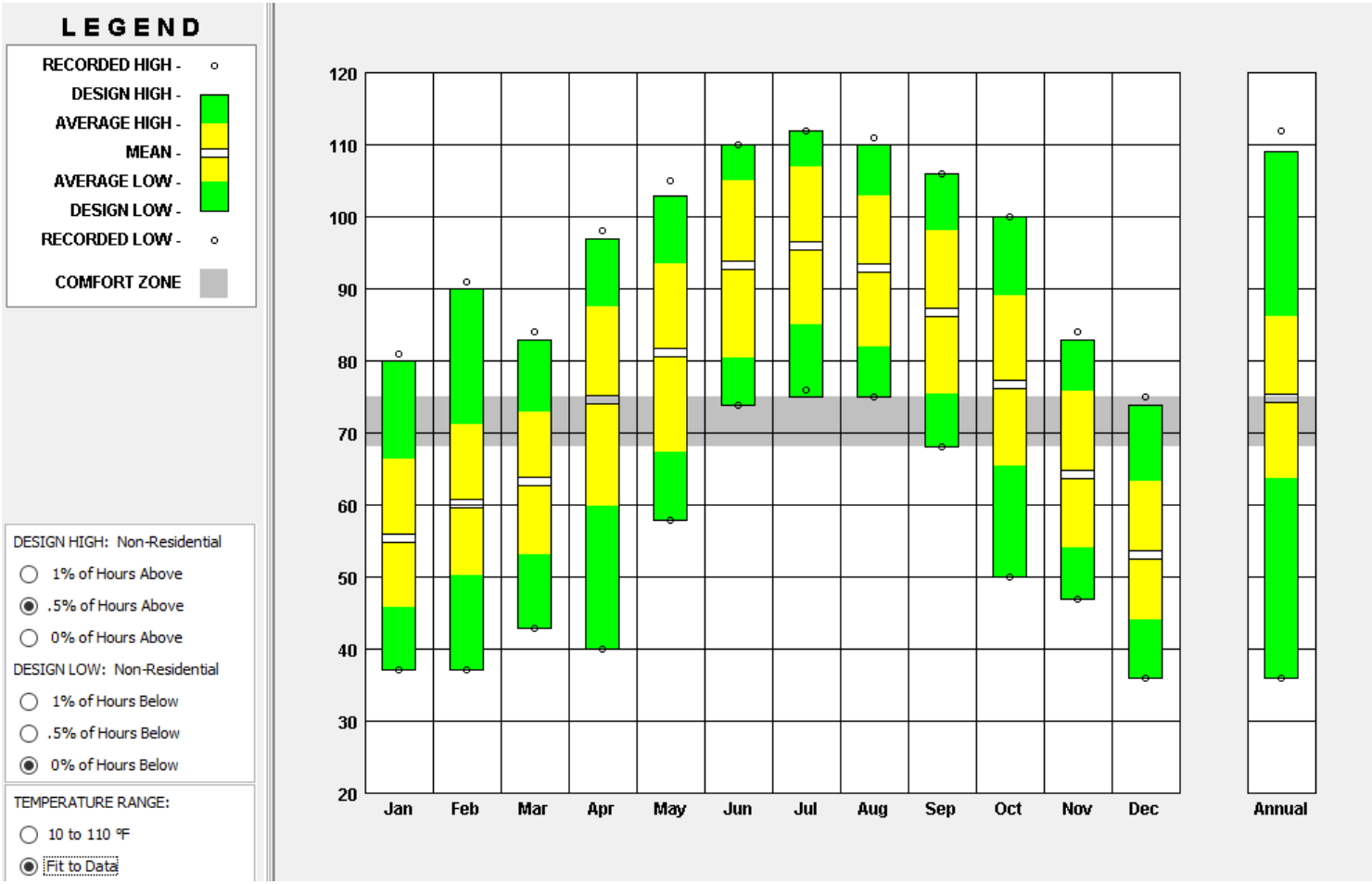
Preliminary Energy Model Analysis

Presented by

Quest energy group

May 2023

Weather



- Average annual temperature in Scottsdale, Arizona = 75 °F
- Cooling Design dry-bulb/ MCWB: 115 F
- Heating Design dry-bulb: 34 F

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BUILDING COMPONENT		STANDARD REFERENCE DESIGN- LEED ASH 2010 Apx G		STANDARD REFERENCE DESIGN- IECC 2021 (ASH 2019 Ch-11)		PROPOSED DESIGN	
Roof		Type: R-Value U-factor:	Insulation above deck R20 CI 0.048	Type: R-Value U-factor:	Insulation above deck R25 CI 0.039	Type: R-Value U-factor:	Insulation above deck R30 CI 0.032
Walls	Above Grade Residential	Type: R-Value U-factor:	Steel-framed R13 + R7.5ci 0.064	Type: R-Value U-factor:	Steel-framed R13 + R7.5ci 0.064	Type: R-Value U-factor:	Steel-framed R19 + R7.5ci 0.060
	Above Grade Non Residential	Type: R-Value U-factor:	Steel-framed R13 0.124	Type: R-Value U-factor:	Steel-framed R13 + R3.8ci 0.084	Type: R-Value U-factor:	Steel-framed R19 + R7.5ci 0.060
Floors	Floors Non Residential	Type: R-Value U-factor:	Steel Joist R19 0.052	Type: R-Value U-factor:	Mass Floor R8.3 CI 0.087	Type: R-Value U-factor:	Mass Floor NA 0.322
	Floors Residential	Type: R-Value U-factor:	Steel Joist R19 0.052	Type: R-Value U-factor:	Mass Floor R6.3 CI 0.107	Type: R-Value U-factor:	Mass Floor NA 0.322
	Exposed Floors	Type: R-Value U-factor:	Steel Joist R19 0.052	Type: R-Value U-factor:	Mass Floor R8.3 CI 0.087	Type: R-Value U-factor:	Mass Floor NA 0.322
Glazing		Area:	Per Drawings	Area:	Per Drawings	Area:	Per Drawings
		Frames:	Included Below	Frames:	Included Below	Frames:	Modeled Seperatley
		U-factor: Operable SHGC:	0.75 0.25	U-factor: Operable SHGC:	0.60 0.23	U-factor: Operable SHGC:	0.25 (COG) 0.23 & 0.30
		U-factor: Fixed SHGC:	0.70 0.25	U-factor: Fixed SHGC:	0.45 0.25	U-factor: Fixed SHGC:	0.25 (COG) 0.23 & 0.30
		External shading	None	External shading	None	External shading	Per Drawings

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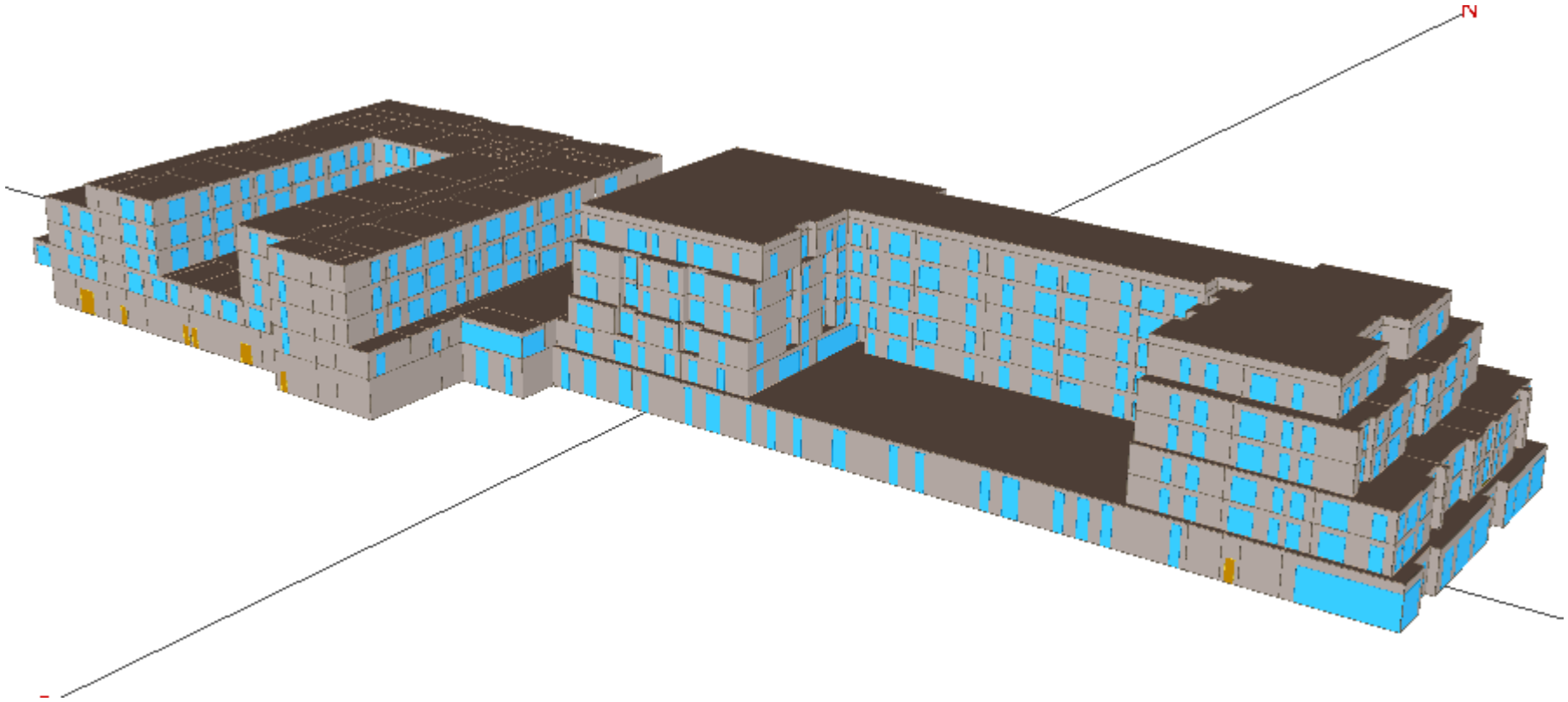

eQUEST– 3D model

Lighting

Interior Lighting						
BUILDING COMPONENT	STANDARD REFERENCE DESIGN- LEED ASH 2010 Apx G		STANDARD REFERENCE DESIGN- ASH 2019		PROPOSED DESIGN	
	Method	Building Area Method (W/sf)	Method	Building Area Method (W/sf)	Method	As-Designed (W/sf)
Lighting Interior	Parking Garage	0.25 W/sf	Parking Garage	0.18 W/sf	Parking Garage	0.08 W/sf
	Retail	1.40 W/sf	Retail	0.84 W/sf	Retail	neutral to base
	Dinning	0.99 W/sf	Dinning	0.80 W/sf	Dinning	neutral to base
	Multifamily	0.60 W/sf	Multifamily	0.45 W/sf	Multifamily	neutral to base
	Corridors	0.60 W/s	Corridors	0.45 W/s Bi-level Lighting	Corridors	0.35 W/s Bi-level Lighting
	Units	0.91 W/sf	Units	0.45 W/sf	Units	0.45 W/sf

HVAC

Mechanical

BUILDING COMPONENT	STANDARD REFERENCE DESIGN- LEED ASH 2010 Apx G		STANDARD REFERENCE DESIGN- ASH 2019		PROPOSED DESIGN	
Mech ventilation	Outside Air	Same As Proposed	Outside Air	Same As Proposed	Outside Air	As Designed
Fuel Type	Fuel type:	Electric	Fuel type:	Electric	Fuel type:	Electric
Common Area Heating /Cooling	Equipment type:	System 4 Pkg rooftop Heat Pump	Equipment type:	System 9 Pkg rooftop Heat Pump	Equipment type:	Standard Split system
	Heating Efficiency:	7.7 HSPF	Heating Efficiency:	8.2 HSPF	Heating Efficiency:	8.2 HSPF
	Cooling Efficiency:	13 SEER	Cooling Efficiency:	14 SEER	Cooling Efficiency:	15.7 SEER
	Economizer:	Required. Hight Limit Shutoff 75F	Economizer:	Per Section C403.5.2	Economizer:	As Designed
Residential Heating/ Cooling	Equipment type:	System 2 Pkg Terminal Heat Pump	Equipment type:	System 8 Pkg Terminal Heat Pump	Equipment type:	Standard Split system
	Heating Eff:	3.7-(0.052 × Cap/1000)=2.92 COP	Heating Eff:	3.7-(0.052 × Cap/1000)=2.92 COP	Heating Eff:	8.2 HSPF
	Cooling Eff:	14.0-(0.300 × Cap/1000)=9.5 EER	Cooling Eff:	14.0-(0.300 × Cap/1000)=9.5 EER	Cooling Efficiency:	15.7 SEER
	Fan Power:	Per code. We can take credit	Fan Power:	As Designed	Fan Power:	As Designed
Capacity	Sized proportionally to the capacities in the proposed design based on sizing runs, and shall be established such that no smaller number of unmet heating load hours and no larger heating capacity safety factors are provided than in the proposed design.		Sized proportionally to the capacities in the proposed design based on sizing runs, and shall be established such that no smaller number of unmet heating load hours and no larger heating capacity safety factors are provided than in the proposed design.		As Proposed	

DHW

DHW						
BUILDING COMPONENT	**STANDARD REFERENCE DESIGN- LEED ASH 2010 Apx G**		**STANDARD REFERENCE DESIGN- ASH 2019**		**PROPOSED DESIGN**	
Service water heating	Fuel type:	**Gas**	Fuel type:	**Gas**	Fuel type:	**Gas**
	Efficiency:	**80%**	Efficiency:	**80%**	Efficiency:	**90%**
	Showers	**2.5 GPM**	Showers	**2.5 GPM**	Showers	**2 GPM**
	Lavatories	**2.2 GPM**	Lavatories	**2.2 GPM**	Lavatories	**1.5 GPM**

Utility Rates

Utility rates used for this analysis are based on state averages from the Energy Information Administration (EIA)

EIA Commercial Electrical rate: $0.094/kWh
EIA Gas rate: $0.871/ Therms

Results- ASH 2019- Ch-11

#	Run	Electric	Gas	Electric	Gas	Total Cost		Cost Savings
								IECC 2021-ASH 2019
		(kWh)	(Therm)	($)	($)	($)	($/ft²)	%
0	IECC 2021-ASH 2019 Baseline	3,723,457	17,970	$ 409,580	$ 15,652	$ 425,232	$ 1.30	
E-1	0+R-19+E7.5ci Walls	3,720,321	17,970	$ 409,235	$ 15,652	$ 424,887	$ 1.30	0.1%
E-2	E-1+R30ci Roof	3,710,141	17,970	$ 408,116	$ 15,652	$ 423,768	$ 1.30	0.3%
E-3	E-2+Concrete Floors	3,765,163	17,970	$ 414,168	$ 15,652	$ 429,820	$ 1.31	-1.1%
E-4	E-3+Shades	3,753,057	17,970	$ 412,836	$ 15,652	$ 428,488	$ 1.31	-0.8%
E-5	E-4+Design Glass1 U-0.25 SHGC 0.30	3,798,894	17,970	$ 417,878	$ 15,652	$ 433,530	$ 1.33	-2.0%
E-6	E-3+Design Glass 2 U-0.25, SHGC0.23	3,738,375	17,970	$ 411,221	$ 15,652	$ 426,873	$ 1.31	-0.4%
L-1	E-6+LED Interior Lighting	3,710,560	17,970	$ 408,162	$ 15,652	$ 423,814	$ 1.30	0.3%
L-2	L-1+LED Parking garage	3,586,167	17,970	$ 394,478	$ 15,652	$ 410,130	$ 1.25	3.6%
M	L-2+Mechanical Efficiency	3,531,877	17,970	$ 388,506	$ 15,652	$ 404,158	$ 1.24	5.0%
P-1	M+90% HW Heaters	3,531,877	15,973	$ 388,506	$ 13,913	$ 402,419	$ 1.23	5.4%

Results- ASH 2010- LEED:

#	Run	Electric	Gas	Electric	Gas	Total Cost		Cost Savings ASH 2010	LEED Points
		(kWh)	(Therm)	($)	($)	($)	($/ft²)	%	
B-3	ASH 2010 Baseline	4,747,267	17,970	$ 522,199	$ 15,652	$ 537,851	$ 1.65		0
E-1	0+R-19+E7.5ci Walls	4,683,046	17,970	$ 515,135	$ 15,652	$ 530,787	$ 1.62	1.3%	0
E-2	E-1+R30ci Roof	4,657,501	17,970	$ 512,325	$ 15,652	$ 527,977	$ 1.62	1.8%	0
E-3	E-2+Concrete Floors	4,680,279	17,970	$ 514,831	$ 15,652	$ 530,483	$ 1.62	1.4%	0
E-4	E-3+Shades	4,680,279	17,970	$ 514,831	$ 15,652	$ 530,483	$ 1.62	1.4%	0
E-5	E-4+Design Glass1 U-0.25 SHGC 0.30	4,700,200	17,970	$ 517,022	$ 15,652	$ 532,674	$ 1.63	1.0%	0
E-6	E-3+Design Glass 2 U0.25, SHGC0.23	4,625,983	17,970	$ 508,858	$ 15,652	$ 524,510	$ 1.60	2.5%	0
L-1	E-6+Corridor 0.35 LPD	4,490,958	17,970	$ 494,005	$ 15,652	$ 509,657	$ 1.56	5.2%	0
L-2	L-1+LED Parking garage	4,279,730	17,970	$ 470,770	$ 15,652	$ 486,422	$ 1.49	9.6%	2
L-3	L-2+Reduced Unit Lighting	4,125,720	17,970	$ 453,829	$ 15,652	$ 469,481	$ 1.44	12.7%	4
M	L-3 +Mechanical Efficiency	3,629,474	17,970	$ 399,242	$ 15,652	$ 414,894	$ 1.27	22.9%	9
P-1	M+90% HW Heaters	3,629,474	15,973	$ 399,242	$ 13,913	$ 413,155	$ 1.26	23.2%	9
P-2	P-1+2 GPM Shower 1.5 Lav	3,629,474	12,374	$ 399,242	$ 10,778	$ 410,020	$ 1.25	23.8%	9

Next Steps

- Finalize design and complete code compliance documentation
- Pool Loads
- Kitchen loads
- MAU