

# Energy Model Report

Arlington County Regulation 4.1 Site Plan Conditions

Riverhouse North – Parcel 1 & 2

*Arlington, VA*

**ArCo 4.1 SPC Report v1.2**

*October 3<sup>rd</sup>, 2022*



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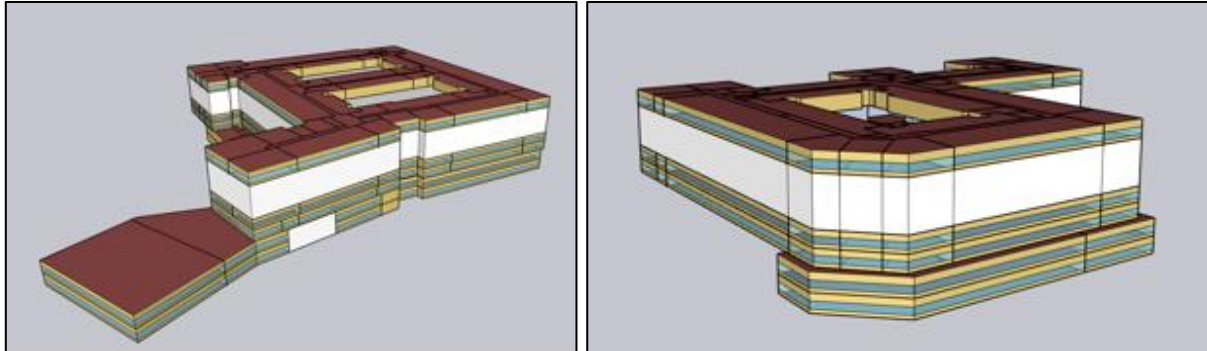
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## Purpose

Sustainable Building Partners, LLC (SBP) has developed a whole building energy simulation using Energy Plus v9.6 via the Open Studio v1.3 interface for the proposed Riverhouse North (Parcel 1 & 2) multifamily building in Arlington, VA. SBP utilizes the model as a design tool for the purpose of enhancing the energy performance of the facility and to increase LEED Energy & Atmosphere Credit 2 points. SBP's modeling methodology is consistent with LEED and ASHRAE 90.1-2010 Appendix G modeling protocol and best practices.



**Figure 1: Energy Model Rendering of Riverhouse North Parcels**

### **Arlington Regulation 4.1 Site Plan Conditions**

This energy analysis is submitted in support of Condition 18A of the Arlington Regulation 4.1 [Site Plan Conditions](#). The analysis uses LEED v4 for the primary benchmarking with an ASHRAE 90.1-2010 Appendix G baseline condition.

### **Performance Disclaimer**

This analysis is based on an early Schematic Design thus all results and benchmarking should be viewed as relative order-of-magnitude (RoM). This report works to establish high-level performance targets and general design standards but does not guarantee future performance.



## Preliminary Energy Estimates

This section of the report summarizes the results and benchmarking of the preliminary whole building hourly energy simulations. Table 1 provides the results of the hourly energy simulations.

### Summary of Performance & Primary Design Alternates

A summary of the preliminary energy performance benchmarking has been provided in Table 1.

**Table 1: Annual Energy Consumption & Performance Benchmarking**

| Description <sup>(3)</sup> | Total Energy Cost (\$/sqft) | Energy Cost Savings <sup>(1)</sup> | Site EUI (kBtu/sf) | Source EUI (kBtu/sf) | GHG <sup>(2)</sup> (Tons CO2e) | Energy Star Score |
|----------------------------|-----------------------------|------------------------------------|--------------------|----------------------|--------------------------------|-------------------|
| Parcel 1 (50% SD)          | \$1.20 – \$1.40             | 20 - 25%                           | 45 - 50            | 100 - 105            | 1,900+                         | ≥75               |
| Parcel 2 (50% SD)          | \$1.10 – \$1.30             | 20 - 25%                           | 45 - 50            | 100 - 105            | 1,300+                         | ≥75               |

(1) ASHRAE 90.1-2010 (LEED) Baseline design  
 (2) Estimated based on Year 1 (current) electric grid profile (EGRID projections). Future obligations will likely be reduced as the grid generation profile shifts towards low-carbon renewable energy sources.



## Design Considerations

The following subsections summarize the primary limiting factors and other unique conditions associated with this design.

### Preliminary Design

Throughout the early-design process, the project team has worked to optimize the building design through the quantitative and qualitative evaluation of various Energy Efficiency Opportunities (EEOs). Many of the discussed EEOs will be incorporated later in the design process (e.g. lighting), or are still being actively evaluated at this stage. All measures are evaluated based on energy savings, first cost, maintenance considerations, operational considerations, and infrastructure limitations.

### Primary Features Impacting Energy Performance

Please see the [BOD](#) section for full design details. This section provides a summary of the specific items driving overall energy performance.

#### Split-System Heat Pumps

- 14 SEER / 8.2 HSPF (Code Minimum)
- Equipped with ECMs

#### DOAS

- Air-cooled DX
- Gas-fired furnace
- Hot-gas reheat

#### Garage Lighting Power Reductions

- Estimated  $\geq 50\%$  reduction in designed lighting power (anticipated)

#### EnergyStar Appliances

- Fridge, dishwasher, clothes washer

#### Low Flow Plumbing Fixtures

- 1.75 GPM Showers, 1.5 GPM Faucets

#### Gas-Fired Condensing Water heaters (assumed)

- 95% E<sub>t</sub>
- See below



## Domestic Hot Water

Current BOD: Gas-fired condensing water heaters (central)

Design Alternates:

- In-unit electric-resistance storage (market standard)
- Heat pumps (in-unit or clustered)
- Heat pumps (central)

**Table 2: DHW Performance Comparison (annualized, per avg. unit)**

| DHW System                      | Annual Energy Per Unit (avg) | Annual Cost Per Unit (avg) | Source Energy Per Unit (kBtu/yr) | GHG Per Unit (lbs CO <sub>2</sub> e/yr) <sup>(1)</sup> |
|---------------------------------|------------------------------|----------------------------|----------------------------------|--|
| <b>In-Unit Electric Storage</b> | 2,015 kWh/yr                 | \$240                      | 21,400                           | 1,300  |
| <b>Gas-fired Condensing</b>     | 95 thm/yr                    | \$95                       | 10,100                           | 1,100  |
| <b>Heat Pump</b>                | 705 kWh/yr                   | \$85                       | 7,500                            | 440  |

(1) Estimated based on Year 1 (current) EGRID projections

### Challenges/Limiting Factors

- In-unit Electric: Highest operating energy, cost, short- and mid-term emissions
- In-unit or clustered HPWHs: Challenging space and venting requirements
- Central HPWHs (ganged plant): Scalability, plant size
- Central HPWHs (commercial): Cost, low-temperature operation, limited number of manufacturers
- Gas-Fired: Highest first cost, counter to long-term electrification initiatives

## Dedicated Outside Air System (DOAS)

Current BOD: Air-cooled DX with gas-fired furnace

Design Alternates:

- Air-source heat pump with gas-fired auxiliary
- Air-source heat pump with electric-resistance auxiliary
- Air-cooled DX with electric resistance heating

**Table 3: DOAS Performance Comparison (Annualized, per 1k CFM)**

| DOAS Configuration                       | Energy Cost Per 1k CFM | Source Energy Per 1k CFM (mmBtu/yr) | GHG Emissions (tons CO <sub>2</sub> e/yr) <sup>(1)</sup> |
|--|------------------------|-------------------------------------|--|
| <b>Gas-Fired Furnace</b>                 | \$2,400                | 240                                 | 11   |
| <b>Heat Pump with Gas Auxiliary</b>      | \$2,400                | 219                                 | 7  |
| <b>Heat Pump with Electric Auxiliary</b> | \$2,800                | 250                                 | 8  |
| <b>Electric-Resistance</b>               | \$7,000                | 639                                 | 19   |

(1) Estimated based on Year 1 (current) EGRID projections

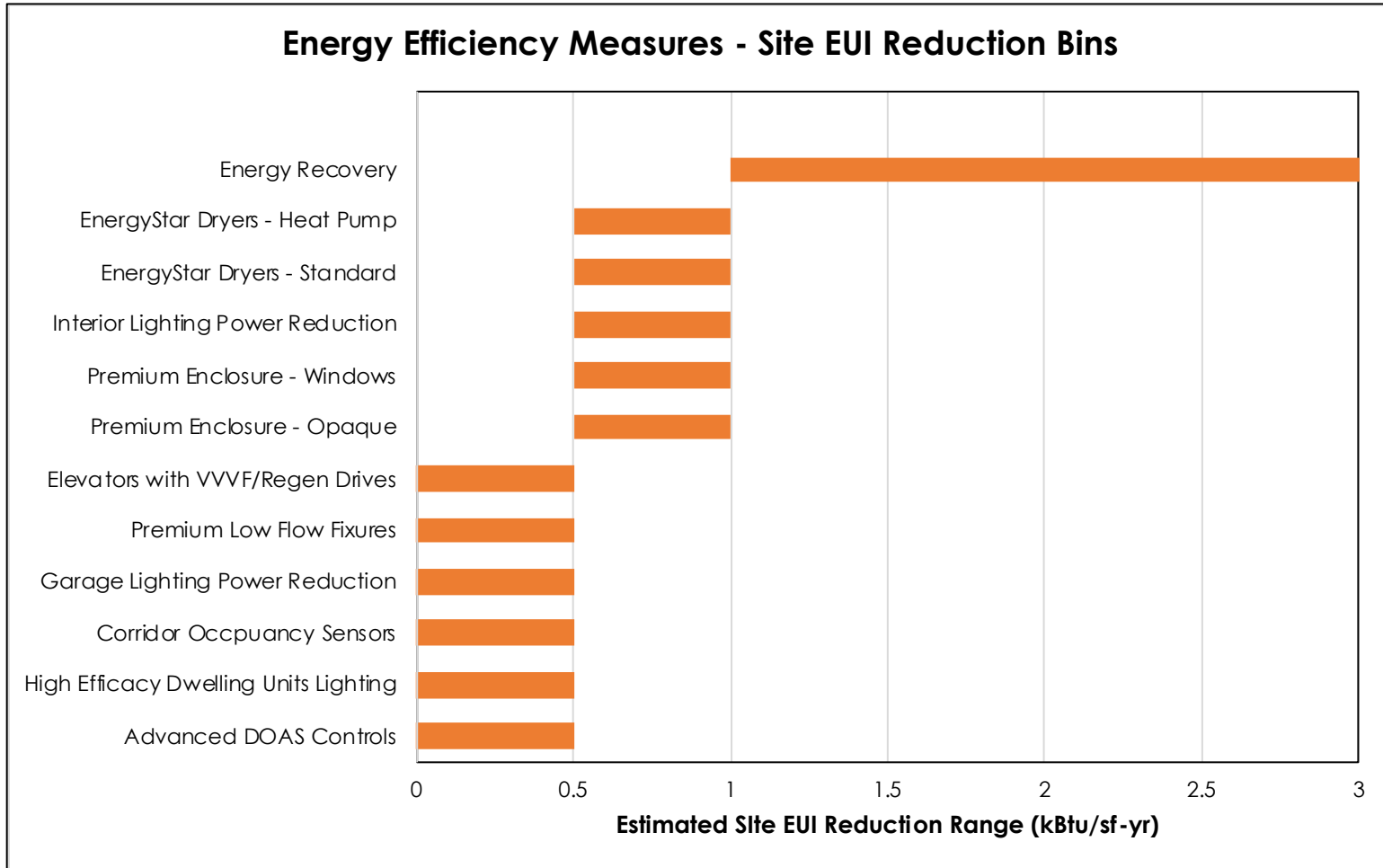
### Challenges/Limiting Factors

- Gas-fired Furnace: Counter to long-term electrification initiatives
- Heat Pumps: Size limitations (≤70-tons), auxiliary systems at low ambient temps
- Electric-Resistance: Highest operating energy, cost, and short- and mid-term emissions



## Energy Efficiency Opportunities

The following is a list of specific load reduction and energy savings strategies that could increase the overall energy performance of the building. **At this phase of design, measures should be evaluated for RoM only.**



**Figure 2: Estimated EEO Energy Reductions**



### Measure Narrative Descriptions

The subsequent tables provide general descriptions of the measures list in Figure 2 above.

**Table 4: Energy Efficiency Opportunity (EEO) Summary**

| EEO | Measure                              | Category            | Base Design                            | Measure Description                                       | Included in Tier 2 |
|-----|--------------------------------------|---------------------|--|---|--------------------|
| 1   | Premium Enclosure - Opaque           | Building Enclosure  | See <a href="#">enclosure</a> section. | Roof: R-40+<br>No signif. points of wall thermal bridging | NO                 |
| 2   | Premium Enclosure - Windows          |                     |  | U-0.35 / 0.25 SHGC  | YES                |
| 3   | Interior Lighting Reduction          | Lighting            | 0.60 W/sf (common & BOH areas)         | 0.48 W/sf   | YES                |
| 4   | High Efficacy Dwelling Unit Lighting |                     | 40 - 50 lumens/Watt                    | ≥60-70 lumens/Watt  | NO                 |
| 5   | Garage Lighting Reduction            |                     | 0.12 W/sf                              | 0.08 W/sf   | YES                |
| 6   | Corridor Occupancy Controls          |                     | 24/7 operation                         | Bi-level lighting controls (50% when unocc.)              | YES                |
| 7   | EnergyStar Dryers                    | Process & Equipment | Standard Electric                      | Moisture Sensing OR Ventless Condensing HP                | NO (base design)   |
| 8   | Elevators – VVVF & Regen. Drives     |                     | Standard traction                      | VVVF controls + regenerative drives                       | YES                |
| 9   | Premium Low Flow Fixtures            | Plumbing            | Shower – 1.75 GPM<br>Faucets: 1.50 GPM | Showers – 1.5 GPM<br>Lav. Faucets: 0.5 GPM                | YES                |
| 10  | Discharge Air Temp. Reset Controls   | HVAC                | Fixed DAT: 70°F                        | Reset based on OAT<br>60°F DAT @ ≥76°F                    | NO                 |
| 11  | Ventilation Energy Recovery          |                     | No Energy Recovery                     | Enthalpy wheel pretreats all incoming outdoor air         | YES                |





## Preliminary Basis of Design

Many assumptions and placeholders have been used in this analysis given the early nature of the design. The intent of this type of analysis is relative order of magnitude (RoM), so small adjustments to design inputs or schedules likely won't change overall findings and takeaways from the analysis. SBP asks that the subsequent section be reviewed for general accuracy.

### General Design & Operational Parameters

**Table 5: General Project Parameters**

|                        |   |
|------------------------|---|
| Project Types          | Mixed-Use: Multifamily & Retail   |
| Modeling Software      | EnergyPlus V9.6 / OpenStudio V1.3.0   |
| Project Location       | Arlington, VA   |
| Climate Zone/Weather   | 4A / TMY3 – Washington, DC  |
| Design Day Conditions  | Cooling – 92°F / 77°F, Heating – 15°F   |
| Design Temperatures    | 75°F – Cooling / 70°F Heating   |
| Quantity of Floors     | Parcel 1: 8 Floors<br>Parcel 2: 8 Floors  |
| Building Area (GSF)    | Parcel 1: ~586,000 GSF<br>Parcel 2: 350,000 GSF   |
| Dwelling Units         | Parcel 1: 550 Units<br>Parcel 2: 401 Units  |
| Electric Utility Rates | EIA, 2021 VA avg – Residential: \$0.1214/kWh<br>EIA, 2021 VA avg – Commercial: \$0.0782/kWh |
| Gas Utility Rates      | EIA, 2020 VA avg – Commercial: \$0.78/therm   |

### Exterior Opaque Constructions

All assemblies have been developed in accordance with the SD design package, ASHRAE RP-1365, 2017 DC Energy Code, and ASHRAE 90.1 Appendix A.

**Table 6: Opaque Envelope Performance Summary**

| Assembly Name  | Assembly Type | Description                                | Proposed Performance | Points of Thermal Bridging               |
|--|---------------|--|----------------------|--|
| Wood Stud Wall   | Ext. Wall     | Wood Stud<br>R-20 Batt                     | U-0.054              | --                                       |
| Metal Stud Wall<br>(nominal condition)                       | Ext. Wall     | Metal Stud<br>1.5" C.I + R-13 Batt         | U-0.072              | Metal studs, SS brick ties               |
| Metal Panel Wall at<br>Floor Edge<br>(predominant condition) | Ext. Wall     | Metal Stud<br>1.5" C.I + R-13 Batt         | U-0.134              | Metal studs, SS brick ties, shelf angles |
| Base Roof  | Roof          | R-38 Batt between<br>wood joists           | 0.034                | --                                       |
| Floor over garage  | Floor         | Est. R-12.6 insulation<br>below conc. slab | 0.071                | --                                       |

See [Enclosure Calculation](#) section for full layer-by-layer sections.



## Window Assemblies

All performance has been estimated based performance specifications provided by the design team.

### Basis of Design - Glazing:

1" IGU, Double-pane, low-E, air-filled

### Basis of Design – Framing:

Residential: Non-metal

Lobby/Retail: Thermally-broken aluminum

**Table 7: Window Assembly Performance (frame + glass)**

| Window System | U-value | SHGC |
|---------------|---------|------|
| Residential   | 0.35    | 0.40 |
| Lobby/Retail  | 0.42    | 0.40 |

## Lighting Systems

The lighting design was not available for this analysis and has been approximated based on a standard market design

**Table 8: Lighting Summary**

| Use Type                               | Lighting Power (W/sf) | Occupancy / Daylighting Controls | Design Target LPD (W/sf) <u>EEOs</u> |
|--|-----------------------|----------------------------------|--------------------------------------|
| Multifamily (common & BOH)             | 0.60                  | As required by 2015 VECC         | 0.48                                 |
| Parking Garage                         | 0.12                  | OS / Bi-Level                    | 0.08                                 |
| Dwelling Units (not regulated by 90.1) | 40-50 lm/W            | N/A                              | ~60-70 lm/W                          |



## Equipment & Appliances

**Table 9: Process & Equipment Summary**

| Component                       | Description   |
|---------------------------------|---|
| <b>Dwelling Unit Appliances</b> | <ul style="list-style-type: none"> <li>• Fridge: EnergyStar (required by SPCs)</li> <li>• Dishwasher: EnergyStar (required by SPCs)</li> <li>• Clothes Washer: EnergyStar (required by SPCs)</li> <li>• Dryer: Electric, EnergyStar</li> <li>• Range: Electric, standard</li> </ul> |
| <b>Misc. Plug Loads</b>         | Modeled in accordance with LEED Multifamily Midrise Guidelines  |
| <b>Elevators</b>                | MRL<br>Gearless Traction  |
| <b>Garage Ventilation</b>       | <ul style="list-style-type: none"> <li>• 0.75 CFM/sf</li> <li>• DCV (CO/NOx controls) + VFDs</li> </ul>   |

## Domestic Hot Water System

The DHW system was described in the system narrative as follows.

**Table 10: DHW Summary**

| Component                | Description                                |
|--------------------------|--|
| <b>Water Heater Type</b> | Gas-fired condensing storage water heaters |
| <b>Configuration</b>     | Central plant                              |
| <b>Storage Capacity</b>  | 200-gallons (per heater)                   |
| <b>Efficiency</b>        | ~95% E <sub>t</sub>                        |

## Base Building HVAC Narrative

**Table 11: HVAC Basis of Design**

| Design Component          | Description   |
|---------------------------|---|
| <b>Primary System</b>     | <u>Split System Heat Pumps</u> <ul style="list-style-type: none"> <li>• 14 SEER / 8.2 HSPF</li> <li>• Equipped with ECMs</li> </ul>   |
| <b>Ventilation System</b> | <u>100% Dedicated Outside Air Unit</u> <ul style="list-style-type: none"> <li>• Air-Cooled DX</li> <li>• Gas-fired Furnace</li> <li>• Hot gas reheat</li> <li>• Fixed discharge air temperature (70°F)</li> </ul> |
| <b>Ventilation Rates</b>  | <ul style="list-style-type: none"> <li>• Dwelling Units – ASHRAE 62.2</li> <li>• Common – ASHRAE 62.1</li> <li>• Corridors – 0.20 CFM/sf</li> </ul>   |



## Appendix – Opaque Assembly Calculations

Modeled assemblies have been developed consistent with Appendix A of ASHRAE 90.1-2010.

| <b>Wood Stud Wall (Parallel Path)</b> |               |                                   |
|---------------------------------------|---------------|-----------------------------------|
| <b>Path 1</b>                         | <b>Path 2</b> | <b>Layer</b>                      |
| 0.17                                  | 0.17          | Exterior Air Film                 |
| 0.00                                  | 0.00          | Façade (outside thermal boundary) |
| 0.56                                  | 0.56          | 5/8" Gypsum Board                 |
| 20.00                                 | 0.00          | R-20 Batt Insulation              |
| 0.00                                  | 6.88          | 4x6" Wood Studs                   |
| 0.56                                  | 0.56          | 5/8" Gypsum Board                 |
| 0.68                                  | 0.68          | Interior Air Film                 |
| <b>21.97</b>                          | <b>8.85</b>   | <b>Total Assembly R-value</b>     |
| <b>75%</b>                            | <b>25%</b>    | <b>Path Area %</b>                |
| <b>0.054</b>                          |               | <b>Total Assembly U-value</b>     |

| <b>Metal-Stud Wall</b> |  |
|------------------------|--|
| <b>R-value</b>         | <b>Layer</b>   |
| 0.17                   | Exterior Air Film  |
| 0.00                   | Façade (outside thermal boundary)                                    |
| 5.85                   | 1.5" Continuous Insulation (R-7.5 nom) (derated for cladding system) |
| 0.56                   | 5/8" Gypsum Board  |
| 6.00                   | 3.5" Batt Insulation (R-13 nom) between metal studs at 16" O.C.      |
| 0.56                   | 5/8" Gypsum Board  |
| 0.68                   | Interior Air Film  |
| <b>13.82</b>           | <b>Total Assembly R-value</b>  |
| <b>0.072</b>           | <b>Total Assembly U-value</b>  |



| Typical Roof |             |  |
|--------------|-------------|--|
| Path 1       | Path 2      | Layer                                    |
| 0.17         | 0.17        | Exterior Air Film                        |
| 0.00         | 0.00        | Roof Membrane (outside thermal boundary) |
| 0.56         | 0.56        | 5/8" Gypsum Board                        |
| 38.00        | 0.00        | R-38 Batt Insulation                     |
| 0.00         | 6.88        | Wood Joists                              |
| 0.56         | 0.56        | 5/8" Gypsum Board                        |
| 0.61         | 0.61        | Interior Air Film                        |
| <b>39.9</b>  | <b>8.78</b> | <b>Total Assembly R-value</b>            |
| <b>90%</b>   | <b>10%</b>  | <b>Path Area %</b>                       |
| <b>0.034</b> |             | <b>Total Assembly U-value</b>            |

| Floor Over Garage |                               |
|-------------------|-------------------------------|
| R-value           | Layer                         |
| 0.17              | Exterior Air Film             |
| 12.60             | 3" rigid insulation           |
| 0.38              | 6" concrete slab              |
| 0.92              | Interior Air Film             |
| <b>14.07</b>      | <b>Total Assembly R-value</b> |
| <b>0.071</b>      | <b>Total Assembly U-value</b> |



## Appendix - Simulation Output Files (Parcel 1)

The following screen captures are selected simulation output files for the Design Energy Cost (DEC) or Proposed case as well as those from the Performance Rating Method (PRM) or Baseline case.

### Proposed Model Output Reports

|  | Electricity Energy Use [kWh] | Electricity Demand [W] | Natural Gas Energy Use [therm] | Natural Gas Demand [Btu/h] |
|--|------------------------------|------------------------|--------------------------------|----------------------------|
| Heating -- General                     | 175437.34                    | 258420.10              | 67758.91                       | 3451517.46                 |
| Cooling -- General                     | 642643.22                    | 475882.66              | 0.00                           | 0.00                       |
| Interior Lighting -- General           | 555999.93                    | 82427.21               | 0.00                           | 0.00                       |
| Interior Lighting -- Residential       | 303478.59                    | 77104.32               | 0.00                           | 0.00                       |
| Exterior Lighting -- Elevators         | 75049.05                     | 27233.60               | 0.00                           | 0.00                       |
| Exterior Lighting -- Exterior Lighting | 21780.02                     | 5000.00                | 0.00                           | 0.00                       |
| Exterior Lighting -- Garage Fans       | 163356.61                    | 18648.00               | 0.00                           | 0.00                       |
| Exterior Lighting -- Garage Lighting   | 217808.81                    | 24864.00               | 0.00                           | 0.00                       |
| Interior Equipment -- General          | 168931.59                    | 40192.01               | 0.00                           | 0.00                       |
| Interior Equipment -- Residential      | 1222404.83                   | 288711.35              | 0.00                           | 0.00                       |
| Fans -- General                        | 389955.28                    | 45774.27               | 0.00                           | 0.00                       |
| Pumps -- General                       | 2126.90                      | 242.80                 | 0.00                           | 0.00                       |
| Water Systems -- DHW                   | 0.00                         | 0.00                   | 50527.64                       | 947329.10                  |

**ASHRAE Baseline Building Output Reports****EAp2-4/5. Performance Rating Method Compliance**

|  | Electricity Energy Use [kWh] | Electricity Demand [W] | Natural Gas Energy Use [therm] | Natural Gas Demand [Btu/h] |
|--|------------------------------|------------------------|--------------------------------|----------------------------|
| Heating -- General                     | 0.00                         | 0.00                   | 81299.37                       | 5089751.92                 |
| Cooling -- General                     | 855471.02                    | 561817.09              | 0.00                           | 0.00                       |
| Interior Lighting -- General           | 555999.93                    | 82427.21               | 0.00                           | 0.00                       |
| Interior Lighting -- Residential       | 303478.59                    | 77104.32               | 0.00                           | 0.00                       |
| Exterior Lighting -- Elevators         | 75049.05                     | 27233.60               | 0.00                           | 0.00                       |
| Exterior Lighting -- Exterior Lighting | 21780.02                     | 5000.00                | 0.00                           | 0.00                       |
| Exterior Lighting -- Garage Fans       | 265454.49                    | 30303.00               | 0.00                           | 0.00                       |
| Exterior Lighting -- Garage Lighting   | 453768.36                    | 51800.00               | 0.00                           | 0.00                       |
| Interior Equipment -- General          | 168931.59                    | 40192.01               | 0.00                           | 0.00                       |
| Interior Equipment -- Residential      | 1297340.34                   | 306409.85              | 0.00                           | 0.00                       |
| Fans -- General                        | 872581.51                    | 102461.17              | 0.00                           | 0.00                       |
| Pumps -- General                       | 37594.20                     | 6029.39                | 0.00                           | 0.00                       |
| Water Systems -- DHW                   | 0.00                         | 0.00                   | 72199.15                       | 1124953.30                 |



## Appendix - Simulation Output Files (Parcel 2)

The following screen captures are selected simulation output files for the Design Energy Cost (DEC) or Proposed case as well as those from the Performance Rating Method (PRM) or Baseline case.

### Proposed Model Output Reports

|  | Electricity Energy Use [kWh] | Electricity Demand [W] | Natural Gas Energy Use [therm] | Natural Gas Demand [Btu/h] |
|--|------------------------------|------------------------|--------------------------------|----------------------------|
| Heating -- General                     | 132595.77                    | 192098.51              | 42265.43                       | 2196637.18                 |
| Cooling -- General                     | 404419.27                    | 315625.87              | 0.00                           | 0.00                       |
| Interior Lighting -- General           | 358918.29                    | 51016.48               | 0.00                           | 0.00                       |
| Interior Lighting -- Residential       | 224894.46                    | 57138.58               | 0.00                           | 0.00                       |
| Exterior Lighting -- Elevators         | 75049.05                     | 27233.60               | 0.00                           | 0.00                       |
| Exterior Lighting -- Exterior Lighting | 21780.02                     | 5000.00                | 0.00                           | 0.00                       |
| Exterior Lighting -- Garage Fans       | 118776.94                    | 13559.00               | 0.00                           | 0.00                       |
| Exterior Lighting -- Garage Lighting   | 158372.17                    | 18079.00               | 0.00                           | 0.00                       |
| Interior Equipment -- General          | 88154.23                     | 19425.22               | 0.00                           | 0.00                       |
| Interior Equipment -- Residential      | 920779.56                    | 217472.56              | 0.00                           | 0.00                       |
| Fans -- General                        | 211675.18                    | 25205.42               | 0.00                           | 0.00                       |
| Pumps -- General                       | 1403.66                      | 160.23                 | 0.00                           | 0.00                       |
| Water Systems -- DHW                   | 0.00                         | 0.00                   | 33866.22                       | 695063.97                  |





## ASHRAE Baseline Building Output Reports

|  | Electricity Energy Use [kWh] | Electricity Demand [W] | Natural Gas Energy Use [therm] | Natural Gas Demand [Btu/h] |
|--|------------------------------|------------------------|--------------------------------|----------------------------|
| Heating -- General                     | 0.00                         | 0.00                   | 54965.21                       | 3710556.19                 |
| Cooling -- General                     | 593796.20                    | 420251.87              | 0.00                           | 0.00                       |
| Interior Lighting -- General           | 358918.29                    | 51016.48               | 0.00                           | 0.00                       |
| Interior Lighting -- Residential       | 224894.46                    | 57138.58               | 0.00                           | 0.00                       |
| Exterior Lighting -- Elevators         | 75049.05                     | 27233.60               | 0.00                           | 0.00                       |
| Exterior Lighting -- Exterior Lighting | 21780.02                     | 5000.00                | 0.00                           | 0.00                       |
| Exterior Lighting -- Garage Fans       | 193017.99                    | 22034.00               | 0.00                           | 0.00                       |
| Exterior Lighting -- Garage Lighting   | 329945.66                    | 37665.00               | 0.00                           | 0.00                       |
| Interior Equipment -- General          | 88154.23                     | 19425.22               | 0.00                           | 0.00                       |
| Interior Equipment -- Residential      | 977881.45                    | 230959.06              | 0.00                           | 0.00                       |
| Fans -- General                        | 580868.51                    | 67549.32               | 0.00                           | 0.00                       |
| Pumps -- General                       | 29476.50                     | 4860.67                | 0.00                           | 0.00                       |
| Water Systems -- DHW                   | 0.00                         | 0.00                   | 50059.79                       | 947329.10                  |



## Acronym Legend

|                   |                                      |
|-------------------|--------------------------------------|
| AHU               | Air-Handling Unit                    |
| CHW               | Chilled Water                        |
| CI or C.I.        | Continuous Insulation                |
| CO <sub>2</sub> e | Carbon Dioxide Equivalent            |
| COP               | Coefficient of Performance           |
| CRI               | Color Rendering Index                |
| CS                | Core & Shell                         |
| CW                | Condenser Water                      |
| DAT               | Discharge Air Temperature            |
| DCV               | Demand Controlled Ventilation        |
| DEC               | Design Energy Cost                   |
| DHW               | Domestic Hot Water                   |
| DX                | Direct Expansion                     |
| EA                | Energy & Atmosphere                  |
| ECM               | Electronically Commutated Motor      |
| EEO               | Energy Efficiency Opportunity        |
| EER               | Energy Efficiency Ratio              |
| EF                | Energy Factor                        |
| E <sub>t</sub>    | Thermal Efficiency                   |
| EUI               | Energy Use Index (kBtu/sf)           |
| FCU               | Fan Coil Unit                        |
| FP                | Fan-Powered                          |
| GHG               | Greenhouse Gas                       |
| GPM               | Gallons per Minute                   |
| HP                | Heat Pump OR Horsepower              |
| HSPF              | Heating Seasonal Performance Factor  |
| HW                | Hot Water                            |
| IGU               | Insulated Glass Unit                 |
| LPD               | Lighting Power Density               |
| NC                | New Construction                     |
| OC or O.C.        | On center                            |
| PRM               | Performance Rating Method            |
| REC               | Renewable Energy Credit              |
| RTU               | Rooftop Unit                         |
| SAT               | Supply Air Temperature               |
| SC                | Shading Coefficient                  |
| SEER              | Seasonal Energy Efficiency Ratio     |
| SHGC              | Solar Heat Gain Coefficient          |
| SS                | Stainless Steel                      |
| SSHP              | Split System Heat Pump               |
| VAV               | Variable Air Volume                  |
| VFD               | Variable Frequency Drive             |
| VRF               | Variable Refrigerant Flow            |
| VRV               | Variable Refrigerant Volume          |
| VSD               | Variable Speed Drive                 |
| VT                | Visible Transmittance                |
| VVVF              | Variable Voltage, Variable Frequency |
| WSHP              | Water Source Heat Pump               |
| W/sf              | Watts per Square Foot                |



# LEED v4 for BD+C New Construction

Riverhouse North Building 1 & 2

October 10, 2022



| 1 0 0 Integrative Process |   |   | Possible Points: 1             |
|---------------------------|---|---|--------------------------------|
| Y                         | ? | N |                                |
| 1                         |   |   | Credit 1 Integrative Process 1 |

| 11 4 1 Location and Transportation |   |    | Possible Points: 16   |
|------------------------------------|---|----|---|
| Y                                  | ? | N  |   |
| 1                                  |   | 16 | Credit 1 LEED for Neighborhood Development <b>PATH 1</b> 16 |
|                                    |   |    | Credit 2 Sensitive Land Protection <b>PATH 2</b> 1          |
|                                    | 2 |    | Credit 3 High Priority Site 2                               |
| 5                                  |   |    | Credit 4 Surrounding Density & Diverse Uses 5               |
| 4                                  |   | 1  | Credit 5 Access to Quality Transit (v4.1) 5                 |
|                                    | 1 |    | Credit 6 Bicycle Facilities (v4.1) 1                        |
| 1                                  |   |    | Credit 7 Reduced Parking Footprint (v4.1) 1                 |
|                                    | 1 |    | Credit 8 Electric Vehicles (v4.1) 1                         |

| 5 1 4 Sustainable Sites |   |   | Possible Points: 10  |
|-------------------------|---|---|--|
| Y                       | ? | N |  |
| Y                       |   |   | Prereq 1 Construction Activity Pollution Prevention Required |
| 1                       |   |   | Credit 1 Site Assessment 1                                   |
|                         | 1 | 1 | Credit 2 Site Development - Protect or Restore Habitat 2     |
| 1                       |   |   | Credit 3 Open Space 1  |
|                         |   | 3 | Credit 4 Rainwater Management 3                              |
| 2                       |   |   | Credit 5 Heat Island Reduction 2                             |
| 1                       |   |   | Credit 6 Light Pollution Reduction 1                         |

| 5 2 4 Water Efficiency |   |   | Possible Points: 11                             |
|------------------------|---|---|---|
| Y                      | ? | N |   |
| Y                      |   |   | Prereq 1 Outdoor Water Use Reduction Required   |
| Y                      |   |   | Prereq 2 Indoor Water Use Reduction Required    |
| Y                      |   |   | Prereq 3 Building-Level Water Metering Required |
| 1                      | 1 |   | Credit 1 Outdoor Water Use Reduction 2          |
| 3                      | 1 | 2 | Credit 2 Indoor Water Use Reduction 6           |
|                        |   | 2 | Credit 3 Cooling Tower Water Use (v4.1) 2       |
| 1                      |   |   | Credit 4 Water Metering 1                       |

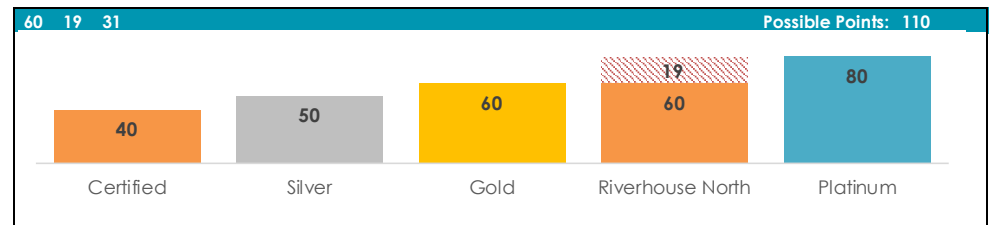
| 12 10 11 Energy and Atmosphere |   |   | Possible Points: 33  |
|--------------------------------|---|---|--|
| Y                              | ? | N |  |
| Y                              |   |   | Prereq 1 Fundamental Commissioning and Verification Required |
| Y                              |   |   | Prereq 2 Minimum Energy Performance Required                 |
| Y                              |   |   | Prereq 3 Building-Level Energy Metering Required             |
| Y                              |   |   | Prereq 4 Fundamental Refrigerant Management Required         |
| 3                              | 2 | 1 | Credit 1 Enhanced Commissioning 6                            |
| 8                              | 2 | 8 | Credit 2 Optimize Energy Performance 18                      |
| 1                              |   |   | Credit 3 Advanced Energy Metering 1                          |
|                                |   | 2 | Credit 4 Demand Response (v4.1) 2                            |
|                                | 5 |   | Credit 5 Renewable Energy (v4.1) 5                           |
|                                | 1 |   | Credit 6 Enhanced Refrigerant Management 1                   |

| 9 1 3 Materials and Resources |   |   | Possible Points: 13  |
|-------------------------------|---|---|--|
| Y                             | ? | N |  |
| Y                             |   |   | Prereq 1 Storage and Collection of Recyclables Required                  |
| Y                             |   |   | Prereq 2 Construction and Demolition Waste Management Planning Required  |
| 3                             |   | 2 | Credit 1 Building Life-Cycle Impact Reduction 5                          |
| 2                             |   |   | Credit 2 Product Disclosure & Optimization - EPDs 2                      |
| 1                             |   | 1 | Credit 3 Product Disclosure & Optimization - Sourcing of Raw Materials 2 |
| 2                             |   |   | Credit 4 Product Disclosure & Optimization - Material Ingredients 2      |
| 1                             | 1 |   | Credit 5 Construction and Demolition Waste Management 2                  |

| 8 1 7 Indoor Environmental Quality |   |   | Possible Points: 16  |
|------------------------------------|---|---|--|
| Y                                  | ? | N |  |
| Y                                  |   |   | Prereq 1 Minimum Indoor Air Quality Performance Required     |
| Y                                  |   |   | Prereq 2 Environmental Tobacco Smoke Control (v4.1) Required |
| 2                                  |   |   | Credit 1 Enhanced Indoor Air Quality Strategies 2            |
| 3                                  |   |   | Credit 2 Low-Emitting Materials (v4.1) 3                     |
| 1                                  |   |   | Credit 3 Construction Indoor Air Quality Management Plan 1   |
|                                    |   | 2 | Credit 4 Indoor Air Quality Assessment 2                     |
| 1                                  |   |   | Credit 5 Thermal Comfort 1                                   |
| 1                                  |   | 1 | Credit 6 Interior Lighting 2                                 |
|                                    |   | 3 | Credit 7 Daylight 3  |
|                                    | 1 |   | Credit 8 Quality Views 1                                     |
|                                    |   | 1 | Credit 9 Acoustic Performance 1                              |

| 6 0 0 Innovation |   |   | Possible Points: 6  |
|------------------|---|---|---|
| Y                | ? | N |   |
| 1                |   |   | Credit 1.1 Innovation Credit: Low-Mercury Lamps 1                                 |
| 1                |   |   | Credit 1.2 Pilot Credit: Integrative Analysis of Building Materials 1             |
| 1                |   |   | Credit 1.3 Innovation: O+M Starter Kit 1  |
| 1                |   |   | Credit 1.4 Pilot Credit: Assess and Plan for Resiliency 1                         |
| 1                |   |   | Credit 1.5 Exemplary Performance: Low-Emitting Materials (90%+ in 3 categories) 1 |
| 1                |   |   | Credit 2 LEED Accredited Professional 1   |

| 3 0 1 Regional Priority Credits |   |   | Possible Points: 4  |
|---------------------------------|---|---|---|
| Y                               | ? | N |   |
| 1                               |   |   | Credit 1 Regional Priority: Access to Quality Transit (thrsh: 4 pts) 1              |
| 1                               |   |   | Credit 2 Regional Priority: Green Vehicles 1  |
|                                 |   | 1 | Credit 3 Regional Priority: Rainwater Mgmt (thrsh: 3 pts) 1                         |
| 1                               |   |   | Credit 4 Regional Priority: Reduced Parking Footprint, Opt Energy (thrsh: 10 pts) 1 |





**LEED v4 for BD+C New Construction**

RiverHouse North (Building 1 & 2)

October 10, 2022

4.1 Submission



Scorecard

| Credit                             |                                      | Requirement & Comments  | Yes | Maybe | Action   |
|------------------------------------|--------------------------------------|---|-----|-------|--|
| <b>General</b>                     |                                      |   |     |       |  |
| <b>General</b>                     | LEED Certification                   | Project is required to achieve LEED Gold as part of the Sector Plan requirements.   |     |       | No action required.  |
| <b>Permitting</b>                  | Arlington County Sustainability      | The applicant recognizes the LEED Conditions Packet requirements at specific permitting milestones. Those requirements will be provided during the permitting process. The applicant will follow the conditions written in the Board Report and the guidelines here: <a href="https://environment.arlingtonva.us/energy/green-building/leed-permit-submission/">https://environment.arlingtonva.us/energy/green-building/leed-permit-submission/</a>  |     |       | No action required.  |
| <b>Integrative Process</b>         |                                      |   |     |       |  |
| <b>Credit 1</b>                    | Integrative Process                  | <p><u>Required:</u> Identify opportunities for synergies across disciplines and building systems, through an analysis of energy and water-related systems and a LEED charette. At concept design or before completion of SD:</p> <ul style="list-style-type: none"> <li>- Perform simple box energy model</li> <li>- Perform simple water budget analysis</li> <li>- Complete the BOD and OPR (commissioning requirements)</li> </ul> <p><u>Activity:</u> SBP has completed v1 of the Energy Model to help inform design decisions. SBP has started discussing potable water reduction strategies and will be completing a water budget analysis.</p>   | 1   |       | On track. Will complete water budget analysis before end of SD.          |
| <b>Location and Transportation</b> |                                      |   |     |       |  |
| <b>Credit 2</b>                    | Sensitive Land Protection            | <p><u>Required Option 1:</u> Locate the development footprint on land that has been previously developed.</p> <p><u>Observed:</u> Previously developed</p>  | 1   |       | No action required.  |
| <b>Credit 3</b>                    | High Priority Site                   | <u>Required Option 3:</u> (2 pts) Brownfield Redevelopment  |     | 2     | Provide Phase I or Phase II ESA Report to determine feasibility.         |
| <b>Credit 4</b>                    | Surrounding Density and Diverse Uses | <p><u>Required Option 3:</u> (1-5 pts) Walkable Location</p> <p><u>Observed:</u> WalkScore 79 for 3 pts</p>   | 5   |       | No action required.  |
| <b>Credit 5</b>                    | Access to Quality Transit            | <p><u>Required Path 1:</u> Locate the project within 1/2-mile of metro or 1/4-mile of bus lines. Demonstrate the number of weekday/weekend trips as follows:</p> <p>Option 1: (1 pt) 72/30<br/>           Option 2: (2 pts) 100/70<br/>           Option 3: (3 pts) 144/108<br/>           Option 4: (4 pts) 250/160<br/>           Option 5: (5 pts) 360/216</p> <p><u>Observed:</u> ~180 rides/day</p>  | 4   |       | No action required.  |
| <b>Credit 6 ★</b>                  | Bicycle Facilities                   | <p><u>Required:</u> Implement all of the following:</p> <ol style="list-style-type: none"> <li>1. Location must support a bicycle network.</li> <li>2. Short term bike storage must be within 200 feet of a functional entrance and long term storage must be within 300 feet of a functional entrance.</li> <li>3. For non-residential portions, provide bike spaces for:               <ul style="list-style-type: none"> <li>- 5% of occupants (but no less than 4) AND</li> <li>- 2.5% of peak visitors (but no less than 4)</li> </ul> </li> <li>4. For residential units, provide bikes spaces for:               <ul style="list-style-type: none"> <li>- 1 per 3 dwelling units OR 15% of residents (higher #) AND</li> <li>- 2.5% of peak visitors (but no less than 4)</li> </ul> </li> <li>5. For non-residential portions, provide 1 shower for the first 100 occupants and 1 shower for each 150 occupants thereafter</li> </ol> |     | 1     | Explore feasibility. Will only track as part of an above-Gold Scorecard. |
| <b>Credit 7</b>                    | Reduced Parking Footprint            | <p><u>Required Option 2:</u> Reduce Parking</p> <p>Number of spots does not exceed the minimum local code requirements for parking capacity and parking is reduced by 30% per ITE Handbook.</p>   | 1   |       | On track. Will determine based on final parking count.                   |



**LEED v4 for BD+C New Construction**

RiverHouse North (Building 1 & 2)

October 10, 2022

4.1 Submission



Scorecard

| Credit                   |  | Requirement & Comments  | Yes | Maybe | Action   |
|--------------------------|--|---|-----|-------|--|
| <b>Credit 8</b>          | Electric Vehicles<br><i>v4.1 credit substitution</i> | <u>Required:</u><br>Provide electric charging spaces for 5% of parking capacity OR provide electric vehicle ready spaces for 10% of parking capacity.   |     | 1     | Will explore feasibility.  |
| <b>Sustainable Sites</b> |  |   |     |       |  |
| <b>Prereq 1</b>          | Construction Activity Pollution Prevention           | <u>Required:</u> Erosion and Sediment Control Plan must conform to 2012 EPA Construction General Permit (CGP) or more stringent local regulations.  | Y   |       | Include compliant erosion and sediment control measures in the drawings.   |
| <b>Credit 1</b>          | Site Assessment                                      | <u>Required:</u> Provide documentation explaining if/how the following site features influences the project design:<br>- Topography<br>- Hydrology<br>- Climate<br>- Vegetation<br>- Soils<br>- Human Use<br>- Human Health Effects   | 1   |       | SBP to complete site assessment credit documentation.  |
| <b>Credit 2</b>          | Site Development - Protect or Restore Habitat        | <u>Required Option 2</u> (1 pt): Preserve and protect 40% of the greenfield area on the site (if area exists). Donate \$0.40 per sf (total site area) to approved conservation organizations (i.e NFWF)   |     | 1     | No action required at this time. Will action if needed to maintain Gold.   |
| <b>Credit 3</b>          | Open Space   | <u>Required:</u> Provide outdoor space $\geq$ 30% of the total site. 25% of the outdoor space must be vegetated or have overhead vegetated canopy. Turf does not count towards vegetation. Outdoor space must be physically accessible.<br><u>Activity:</u> Courtyards represent ~ 30% of total LPB area. Targeting credit using courtyards and any other amenity space at grade level. | 1   |       | On track. Program courtyards such that 25% is vegetated. SBP will refine take-offs and provide feedback at next milestone.                         |
| <b>Credit 5</b>          | Heat Island Reduction                                | <u>Required:</u> Option 1 (2 pts) - Nonroof and roof. Nonroof (/0.5) + Roof (/0.75) + Vegetated Roof (/0.75) > Total Site Paving Area + Roof<br><u>Activity:</u> High roof will be white TPO (or similar). Will target light covered pavers in courtyard area.  | 1   |       | Explore feasibility. Will explore paver palette to determine if enough light colored pavers can be selected for Courtyard areas to meet threshold. |
| <b>Credit 5</b>          | Heat Island Reduction                                | <u>Required:</u> Option 2 (1 pt) - 75% of parking is undercover<br><u>Observed:</u> All parking is undercover.  | 1   |       | No action required.  |
| <b>Credit 6</b>          | Light Pollution Reduction                            | <u>Option 1:</u> Backlight uplight glare (BUG) method. Can be included in luminaire cut sheets.<br>- Uplight = U3<br>- Trespass = backlight & glare requirements base on mounting height and distance to lighting boundary.   | 1   |       | 1. Select fixtures with BUG ratings that meet B3-U3-G1.<br>2. Place amenity light fixtures on time clock control.                                  |
| <b>Water Efficiency</b>  |  |   |     |       |  |
| <b>Prereq 1</b>          | Outdoor Water Use Reduction                          | <u>Required Prereq:</u> Reduce irrigation by 30% (prereq)   | Y   |       | On track. Will limit irrigation as much as possible. Design for drip, moisture sensors, controllers where irrigation is needed.                    |
| <b>Credit 1</b>          | Outdoor Water Use Reduction                          | <u>Required Option 2:</u> 50% Reduction (1 pt), 100% Reduction (2 pts)<br>Strategies include drought tolerant plantings, drip irrigation, moisture control sensors, or cisterns.<br><u>Activity:</u> Plan to limit irrigation as much as possible. Courtyards may need drip.  | 1   | 1     |  |



**LEED v4 for BD+C New Construction**

RiverHouse North (Building 1 & 2)

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4.1 Submission



Scorecard

| Credit                       |  | Requirement & Comments   | Yes | Maybe | Action  |
|------------------------------|--|--|-----|-------|---|
| <b>Prereq 2</b>              | Indoor Water Use Reduction                 | <p><u>Required</u> (Prerequisite):</p> <ol style="list-style-type: none"> <li>Reduce indoor water use by 20%</li> <li>All qualifying plumbing fixtures must be labeled EPA WaterSense</li> <li>ENERGY STAR residential clothes washer and dishwasher.</li> <li>Process Water:               <ol style="list-style-type: none"> <li>No once through cooling for heat rejecting equipment</li> <li>Cooling tower and evaporative condensers must have:                   <ul style="list-style-type: none"> <li>- makeup water meters</li> <li>- conductivity controllers</li> <li>- efficient drift eliminators</li> </ul> </li> </ol> </li> </ol> <p><u>Activity</u>: Project will specify low flow fixtures and ENERGY STAR appliances.</p> | Y   |       | <p>On track. Will select fixtures that meet 1.28 gpf WC, 0.125 gpf Urinal, 1.0 gpm Lav, 1.5 gpm KS, and 1.75 gpm Shower to target 35% water use reduction.</p> <p>Will select all ENERGY STAR appliances.</p> |
| <b>Credit 2</b>              | Indoor Water Use Reduction                 | <p><u>Required</u>: Reduce demonstrate a water use reduction from UPC/IPC baseline and EPAAct 1992 standards.</p> <p>25% (1 pt), 30% (2 pts) <b>35% (3 pts)</b>, 40% (4 pts), 45% (5 pts), 50% (6 pts)</p>   | 3   | 2     |   |
| <b>Prereq 3</b>              | Building-Level Water Metering              | <p><u>Required</u>: Design to include whole building water meter and provide meter data to USGBC for 5 years.</p>  | Y   |       | <p>No action required.</p> <p>On track. Will include a whole building water meter.</p>  |
| <b>Credit 4</b>              | Water Metering                             | <p><u>Required</u>: Install permanent water submeters for two or more of the following: Irrigation, indoor plumbing fixtures, domestic hot water, boiler (min 100,000 gal/yr), or reclaimed water.</p> <p><u>Activity</u>: Discussed submetering units, irrigation, and domestic hot water.</p>  | 1   |       | <p>On track. Will show submetering for units, irrigation, and domestic hot water.</p>   |
| <b>Energy and Atmosphere</b> |  |  |     |       |   |
| <b>Prereq 1</b>              | Fundamental Commissioning and Verification | <p><u>Required</u>: Contract Commissioning Agent to commission energy systems in the building.</p> <p>Note that Fundamental Commissioning now requires a contract at beginning of DD, includes a review of the mid-construction documents, and includes review of the building envelope.</p>   | Y   |       | <p>No action required at this time. Will hire CxA by DD.</p>  |
| <b>Credit 1</b>              | Enhanced Commissioning                     | <p><u>Option 1</u>: Enhanced systems commissioning (3-4 pts)</p> <ul style="list-style-type: none"> <li>- Path 1: (3 pts) Enhanced Commissioning (similar to v2009)</li> <li>- Path 2: (4 pts) Enhanced Monitoring-based commissioning</li> </ul> <p>Achieve Path 1 AND include procedures and measurement points in the commissioning plan.</p>   | 3   |       |   |
| <b>Credit 1</b>              | Enhanced Commissioning                     | <p><u>Option 2</u>: Envelope commissioning (2 pts).</p> <p>Requirements include, but are not limited to:</p> <ul style="list-style-type: none"> <li>- Hire BECx before Permit Submission - Credentials must be approved by AHJ</li> <li>- Complete drawing reviews</li> <li>- Submit BECx Plan to AHJ prior to envelope installation</li> <li>- Submit BECx Report to AHJ prior to final inspection]</li> </ul>  |     | 2     |   |
| <b>Prereq 2 / Credit 2</b>   | Minimum / Optimize Energy Performance      | <p><u>Option 1</u>: Whole-building energy simulation</p> <p>Meet mandatory provisions and demonstrate 12% energy improvement beyond ASHRAE 90.1-2010. (5% required for Prerequisite)</p> <p>6%-1pt, 8%-2pts, 10%-3pts, 12%-4pts, 14%-5pts, 16%-6pts, 18%-7pts, 20%-8pts, 22%-9pts, 24%-10pts, 26%-11pts, 29%-12pts, 32%-13pts, 35%-14pts, 38%-15pts, 42%-16pts, 46%-17pts, 50%-18pts</p> <p><u>Activity</u>: First energy model iteration completed to inform design decisions.</p>  | 8   | 2     | <p>On track. Will consider EEOs for increased performance. Reference energy model report.</p>   |
| <b>Prereq 3</b>              | Building-Level Energy Metering             | <p><u>Required</u>: Install building energy meters to encompass all energy used by the building and provide meter data to the USGBC for 5 years.</p>   | Y   |       | <p>No action required at this time.</p> <p>On track. Will include a whole building energy metering point to collect whole building energy use data.</p>   |



**LEED v4 for BD+C New Construction**

RiverHouse North (Building 1 & 2)

October 10, 2022

4.1 Submission



Scorecard

| Credit                         |   | Requirement & Comments   | Yes      | Maybe    | Action  |
|--------------------------------|---|--|----------|----------|---|
| <b>Prereq 4</b>                | Fundamental Refrigerant Management                      | <u>Required</u> ; Do not use CFC based refrigerants  | <b>Y</b> |          | On track. Will note refrigerants within mechanical schedule.  |
| <b>Credit 3</b>                | Advanced Energy Metering                                | <u>Required</u> ; In addition to the whole building energy meters, install submeters to monitor all energy end uses that represent 10% or more of the total annual consumption of the building.<br><br>Meters must use BAS or other network, must store data for minimum of 36 months, data must be remotely accessible, must record consumption and demand, must report hourly, daily, monthly and annual.<br><br>Activity: VECC 2018 positions project well.   | <b>1</b> |          | On track. Will use energy model to determine the applicable end uses that represent 10% or more of annual consumption and must be metered.  |
| <b>Credit 6</b>                | Enhanced Refrigerant Management                         | <u>Required Option 2</u> ; Calculation of refrigerant impact. Comply with weighted average calculation:<br><br>$\frac{\sum (LCGWP + LCODP \times 10^3) \times Q_{unit}}{Q_{total}} \leq 100$   |          | <b>1</b> | Explore feasibility. Determine if selected systems will comply.   |
| <b>Credit 7</b>                | Renewable Energy<br>v4.1 credit substitution            | <u>Required</u> ; Purchase RECs for the threshold of annual building energy use for a period of 10 years.<br>1pt - 10%, 2 pts - 20%, 3 pts - 30%, 4 pts - 40%, 5 pts - 50%   |          | <b>5</b> | Will explore at end of construction.  |
| <b>Materials and Resources</b> |   |  |          |          |   |
| <b>Prereq 1</b>                | Storage/Collection of Recyclables                       | <u>Required</u> ; Provide an easily-accessible, dedicated area for the collection and storage of paper, cardboard, glass, plastics, and metals.<br>Additionally, provide collection areas for 2 of the following: batteries, mercury lamps, and/or electronic waste  | <b>Y</b> |          | On track. Will provide recycling chutes and space for storing recyclables and batteries/electronic waste.   |
| <b>Prereq 2</b>                | Construction and Demolition Waste Management Planning   | <u>Required</u> ; Develop and implement a Construction Waste Management plan that identifies 5 main materials targeted for recycling during construction.  | <b>Y</b> |          | On track. Will include requirements in specifications for GC to follow.   |
| <b>Credit 1</b>                | Building Life-Cycle Impact Reduction                    | <u>Required Option 4</u> ; Whole Building LCA (3-4 pts)<br>v4.1 Path 3 (3 pts): Conduct an LCA that demonstrates a 10% reduction in 3 of 6 impact categories, one of which must be Global Warming Potential (GWP).<br><br>v4.1 Path 4 (4 pts): Incorporate building reuse for the proposed design. Conduct an LCA that demonstrate a 20% reduction in GWP and a 10% reduction in two additional impact categories.<br><br>Paths 3/4: No impact category may increase more than 5% compared to the baseline building. | <b>3</b> |          | Will conduct LCA Kick-off after 4.1 submission filing. Kick-off will include owner, architect, and structural engineer. Will itemize early decisions that have reduced material quantity from baseline conditions and will brainstorm ways to further reduce material impact based on material choices. |
| <b>Credit 2</b>                | Building Product Disclose and Optimization (BPDO): EPDs | <u>Required Option 1</u> : Use 20 different permanently installed products, sourced from at least 5 different manufacturers, with EPDs.<br>- Critically reviewed LCA - 0.25 products<br>- Industry-Wide EPD - 0.5 products<br>- Product-Specific Type III EPD - 1 product  | <b>1</b> |          | On track. Will include requirements in specifications for GC to follow.   |
| <b>Credit 2</b>                | Building Product Disclose and Optimization (BPDO): EPDs | <u>Required Option 2</u> : Use products that comply with criteria for 50% by cost of the total value of permanently installed products, or at least 10 products.<br>- Reduced impacts below industry average in 3 categories<br>- Products also locally sourced (w/i 100 miles) - double their contribution up to 200% cost or 2 products  | <b>1</b> |          | On track. Will include requirements in specifications for GC to follow.   |



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RiverHouse North (Building 1 & 2)

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4.1 Submission



Scorecard

| Credit                              |  | Requirement & Comments  | Yes | Maybe | Action  |
|-------------------------------------|--|---|-----|-------|---|
| <b>Credit 3</b>                     | Building Product Disclose and Optimization (BPDO): Sourcing of Raw Materials | <u>Required Option 1:</u> Raw Material Source and Extraction Reporting (1 pt)<br>Use at least 20 products from 5 manufacturers with raw material extraction reports.<br>- Self-Declared Reports - 0.5 products<br>- 3rd Party Corporate Sustainability Report (CSR) - 1 product   | 1   |       | On track. Will include requirements in specifications for GC to follow.                                   |
| <b>Credit 4</b>                     | Building Product Disclose and Optimization (BPDO): Material Ingredients      | <u>Option 1 Material Ingredient Reporting</u> (1 pt) - Use at least 20 products, from 5 different manufacturers, with one of the following certifications indicating that their material ingredients have been reported and their environmental and health impacts are minimal.<br>- Health Product Declaration<br>- Cradle to Cradle (v2 Basic / v3 Bronze or higher)<br>- Cradle to Cradle Material Health Certificate (Bronze or higher)<br>- Declare<br>- UL Product Lens Certification<br>- ANSI/BIFMA e3 Furniture Sustainability Standard (3 points or higher)   | 1   |       | On track. Will include requirements in specifications for GC to follow.                                   |
| <b>Credit 4</b>                     | Building Product Disclose and Optimization (BPDO): Material Ingredients      | <u>Option 2 Material Ingredient Optimization</u> (1 pt) - Use products that comply with criteria for 25% by cost of the total value of permanently installed products.<br>- GreenScreen v1.2 Benchmark<br>- GreenScreen List Translator - 100% cost<br>- GreenScreen Assessment - 150% cost<br>- Cradle to Cradle Certified<br>- Cradle to Cradle v2 Gold - 100% cost<br>- Cradle to Cradle v2 Platinum - 150% cost<br>- Cradle to Cradle v3 Silver - 100% cost<br>- Cradle to Cradle v3 Gold/Platinum - 150% cost<br>- REACH Authorization, Restriction, and Candidate List<br>- Product does not contain any listed ingredients - 100% cost<br>Products also locally sourced (w/i 100 miles) - double their contribution up to 200% cost or 2 products  | 1   |       | On track. Will include requirements in specifications for GC to follow.                                   |
| <b>Credit 5</b>                     | Construction and Demolition Waste Management                                 | <u>Option 1 Diversion</u><br>Path 1: Divert 50% and 3 Material Streams (1 pt)<br>Path 2: Divert 75% and 4 Material Streams (2 pts)  | 1   | 1     | On track. Will include requirements in specifications for GC to follow.                                   |
| <b>Indoor Environmental Quality</b> |  |   |     |       |   |
| <b>Prereq 1</b>                     | Minimum Indoor Air Quality Performance                                       | <u>Required for Mechanically-Ventilated Buildings:</u><br>1. Meet the minimum requirements of ASHRAE 62.1-2010 and demonstrate with room-by-room calculations in USGBC Calculator ( <a href="https://www.usgbc.org/resources/minimum-indoor-air-quality-performance-calculator">https://www.usgbc.org/resources/minimum-indoor-air-quality-performance-calculator</a> ).<br>2. Provide airflow monitoring with alarm capabilities (when/if OA varies by 15% or more) on VAV OA equipment. Constant volume: balance outdoor airflow as defined in 62.1-2010. Install a current transducer on the supply fan, an airflow switch, or similar monitoring device.<br>3. Install CO sensors in any closed combustion or power vented equipment (if applicable)<br><br><u>Activity:</u> Confirmed DOAS provided. | Y   |       | On track. DOAS equipment provided to deliver OA to units and common areas.                                |
| <b>Prereq 1</b>                     | Minimum Indoor Air Quality Performance - Residential ONLY                    | <u>Required for all Dwelling Units:</u><br>1. Meet the requirements of LEED v4.1 Multifamily EQ Prerequisite Minimum indoor air quality performance, EQ Prerequisite Combustion venting and EQ Prerequisite Radon-resistant construction.<br><br><u>Observed:</u> Arlington County in Radon Zone 2 - exempt from radon requirements + units located over exhausted garage.  | Y   |       | On track. Ensure any indoor fireplaces are direct vent with closed combustion.                            |
| <b>Prereq 2</b>                     | Environmental Tobacco Smoke (ETS) Control                                    | <u>Required:</u> Prohibit smoking in the building and within 25 feet of entries, outdoor air intakes and operable windows. Provide a robust no smoking policy highlighting communication and enforcement of no smoking policy.  | Y   |       | On track. Will add signage.<br><br>On track. Building is non-smoking and lease language will be provided. |





**LEED v4 for BD+C New Construction**

RiverHouse North (Building 1 & 2)

October 10, 2022

4.1 Submission



Scorecard

| Credit   |  | Requirement & Comments  | Yes | Maybe | Action  |
|----------|--|---|-----|-------|---|
| Credit 1 | Enhanced Indoor Air Quality Strategies             | <p><u>Required Option 1</u>; Enhanced IAQ Strategy (1 pt) - For mechanically ventilated implement <u>all</u> of the following.</p> <p>a) Entryway Systems - 10ft in direction of travel<br/>           b) Interior Cross contamination prevention - Exhaust hazardous gas areas<br/>           c) Filtration - MERV 13 filtration on all OA</p>   | 1   |       | <p><u>Option 1 on track</u>;</p> <p>1. Will show 10' long walk-off mats inside all building entrances (not required at egress-only doors).<br/>           2. Will ensure housekeeping rooms, laundry rooms, and any rooms with chemicals have <u>deck-to-deck partitions, hard lid ceiling, and/or self closing doors.</u></p> <p><u>Option 1 on track</u>;</p> <p>1. Will ensure housekeeping rooms, laundry rooms, and any rooms with chemicals are directly exhausted to the outdoors.<br/>           2. Will specify MERV 13 filters in mechanical schedule</p> |
| Credit 1 | Enhanced Indoor Air Quality Strategies             | <p><u>Required Option 2</u>; Additional enhanced IAQ strategies(1pt)- Select one of the following:</p> <p>a) Exterior contaminant prevention - model contamination dispersion<br/>           b) Increased ventilation - 30% over ASHRAE<br/> <b>c) Carbon dioxide monitoring - in all densely occupied spaces (25 people per 1,000 square feet or 1 person per 40 square feet)</b><br/>           d) Additional source control - for spaces where air contaminants are likely (besides CO2) evaluate potential sources of contaminants and alarm if unsafe conditions occur.</p>  | 1   |       | On track. Will show CO2 sensors in the following spaces (any space with the occupancy ratio of 25 people per 1,000 sf):   |
| Credit 2 | Low-Emitting Materials<br>v4.1 credit substitution | <p><u>Required</u>; Perform Product Category Calculations for VOCs and Emissions limits for up to 5 of the following categories (2 categories-1 pt, 3 categories-2 pts, 4 categories-3 pts, 5 categories-3pts+EP):</p> <p>- Interior paints and coatings<br/>           - Flooring<br/>           - Insulation<br/>           - Composite Wood (ULEF)<br/>           - Ceilings<br/>           - Wall Panels<br/>           - Interior adhesives and sealants<br/>           - Furniture</p>  | 3   |       | On track. Will include requirements in specifications for GC to follow.   |
| Credit 3 | Construction Indoor Air Quality Management Plan    | <p><u>Required</u>;</p> <p>1. Develop and Implement IAQ Management Plan during construction that meets updated SMACNA requirements.<br/>           2. Prohibit smoking inside the building and within 25 feet of entrances during construction.</p>   | 1   |       | On track. Will include requirements in specifications for GC to follow.   |
| Credit 5 | Thermal Comfort                                    | <p><u>Required</u>;</p> <p>1. Demonstrate system meets ASHRAE 55-2010 for each space type<br/>           2. Provide thermal comfort controls for at least 50% of individual occupant spaces. Provide group thermal comfort controls for all shared multioccupant spaces.</p> <p><u>Activity</u>; Discussed equipment requirements to support thermostats in 50% of single-occupant spaces and 100% of multi-occupant spaces.</p>  | 1   |       | On track. Will design equipment to meet thermal comfort requirements.   |
| Credit 6 | Interior Lighting                                  | <p><u>Required Option 1</u>; Lighting Control (1pt)<br/>           Provide individual controls at 3 levels (on, off, midlevel) for 90% of individual spaces. Multioccupant spaces must have 3 levels or multizones, presentation lighting controlled separately, switches must be in same location as luminaires.</p> <p><u>Activity</u>; Discussed lighting control equipments, specifically in the units, to achieve credit.</p>  | 1   |       | On track. Will provide the appropriate level of lighting controls in applicable spaces.   |
| Credit 8 | Quality Views                                      | <p><u>Required</u>; Demonstrate 75% of regularly occupied floor area has at least two of the following:</p> <ul style="list-style-type: none"> <li>- Multiple lines of sight to vision glazing at least 90 degrees</li> <li>- Views that include at least 2 of the following: (1) flora, fauna, sky (2) movement, (3) objects at least 25 feet from glazing</li> <li>- Unobstructed views located within the distance of 3x head height of vision glazing</li> <li>- Views with a view factor of 3 or greater.</li> </ul> <p><u>Observed</u>; Some conceptual unit layouts may need further evaluation, specifically those with inboard bedroom with no windows or transom windows.</p> |     | 1     | Explore feasibility. Some unit layout with bedrooms without windows or only transom windows may swing the credit out of compliance depending on total quantity of such conditions.  |



**LEED v4 for BD+C New Construction**

RiverHouse North (Building 1 & 2)

October 10, 2022

4.1 Submission



Scorecard

| Credit                   |   | Requirement & Comments   | Yes | Maybe | Action   |
|--------------------------|---|--|-----|-------|--|
| <b>Innovation</b>        |   |  |     |       |  |
| <b>Credit 1.1</b>        | Innovation Credit: Low-Mercury Lamps  | <p><u>Requirements:</u></p> <ul style="list-style-type: none"> <li>- For all mercury-containing lamps purchased for the building, the lamps must have an average of 70 picograms of mercury per lumen-hour or less</li> <li>- Lamps containing no mercury may be counted only if their energy efficiency at least equals that of their mercury-containing counterparts</li> </ul> <p><i>Note:</i> This credit can be achieved by using majority (~90%+) LED bulbs.</p> | 1   |       | Plan for integral LED lighting in units.   |
| <b>Credit 1.2</b>        | Pilot Credit: Integrative Analysis of Building Materials                                      | <p><u>Requirements:</u></p> <ul style="list-style-type: none"> <li>- Use at least 3 different permanently installed products that have a documented LCA (life-cycle assessment) with a qualitative analysis of the potential health, safety, and environmental impacts.</li> </ul>   | 1   |       | Will complete at end of project.   |
| <b>Credit 1.3</b>        | Innovation: O+M Starter Kit   | <p><u>Requirements:</u> To achieve 1 pt, implement 2 of the following policies. To achieve 2 pts, implement 4 policies.<br/>(SBP can help to develop policy templates)</p> <ul style="list-style-type: none"> <li>- Site Management Policy</li> <li>- Ongoing Purchasing and Waste Policy</li> <li>- Facility Maintenance and Renovations Policy</li> <li>- Green Cleaning Policy</li> <li>- Integrated Pest Management</li> </ul>                                     | 1   |       | Select 2 policies to implement.  |
| <b>Credit 1.4</b>        | Pilot Credit: Assess and Plan for Resiliency  | <p><u>Requirements:</u></p> <ul style="list-style-type: none"> <li>- Must complete Hazard Assessment</li> <li>- Must complete a Climate Related Risk Management Plan or Emergency Preparedness Plan</li> </ul>   | 1   |       | Will complete Hazard Assessment and Climate Related Risk Management Plan for project before end of DD. |
| <b>Credit 1.5</b>        | Exemplary Performance: Low-Emitting Materials (90%+ in 3 categories) or Heat Island Reduction | <p>Low-emitting - 90%+ in 3 categories<br/>OR<br/>Heat Island - achieve both options</p>   | 1   |       | On track. Will include requirements in specifications for GC to follow.                                |
| <b>Credit 2</b>          | LEED Accredited Professional  | 1 LEED AP  | 1   |       | Compliant.   |
| <b>Regional Priority</b> |   |  |     |       |  |
| <b>Credit 1</b>          | Regional Priority   | Regional Priority: Access to Quality Transit (thshr: 4 pts)  | 1   |       | On track.  |
| <b>Credit 2</b>          | Regional Priority   | Regional Priority: Green Vehicles  | 1   |       | On track.  |
| <b>Credit 3</b>          | Regional Priority   | Regional Priority: Rainwater Mgmt (thshr: 3 pts)   |     | 1     | Not anticipated.   |
| <b>Credit 4</b>          | Regional Priority   | Regional Priority: Reduced Parking Footprint, Opt Energy (thshr: 10 pts)   | 1   |       | On track.  |