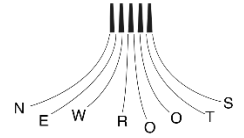


## VT's Washington-Alexandria Architecture Center

DIVISION: MULTIFAMILY | 02.21.2023

TEAM: WAAC

### PLANT: Potomac Living at New Town



#### Project Summary

Potomac Living at New Town (PLANT) is a multifamily development located to the north of Old Town, Alexandria. The eastern portion of Alexandria that borders the Potomac River is in desperate need of additional housing. PLANT's primary concern is to address that need by providing both market rate and affordable units. It will be an extension of the existing Old Town street grid, and is highly connected to the DC metropolitan area by public transit.

#### Design Strategy

The PLANT site's design strategy prioritizes community-scale green energy production and environmentally conscious living by the river, embraces daylighting, and utilizes passive and active mechanical system cooperation within a carbon negative cross-laminated timber structure.

**ARCHITECTURE:** Our site is located at the northern end of historic Alexandria, along the Potomac River where a decommissioned coal plant currently stands. We are reimagining the site to be a vibrant, self-sufficient community which provides new clean power for the site and surrounding area. Our mixed-use proposal includes 200,000 sf of multi-family residential living in addition to about 20,000 sf of commercial functions. The mass timber form speaks to the historic townhomes of Alexandria and preserves the human scale of the massing through its stepped and terraced form. Our proposal emphasizes a sense of community through a co-living design, featuring slightly smaller units with spacious community amenities.



Figure 1. Neighborhood Master Plan

#### Project Data

- **Location:** Alexandria, VA, USA
- **Climate Zone:** 4 (DOE)
- **Lot Size:** 1.08 acres
- **Building Size:** 222,000 GSF, 12 stories
- **Occupancy:** 193 UNITS (393 bedrooms)
- **Construction Cost:** \$300/ft<sup>2</sup>


#### Technical Specifications

- R-Values**
- Wall: 48
  - Floor: 43
  - Roof: 78
  - Windows: U=0.21
- HVAC**
- DOAS HVAC, GEOTHERMAL, VRFs
- On-Site Energy Production**
- 2505 MWh/year

#### Partners

##### Industry Partners

Kathryn Prigmore, Architect  
 Stephen Koenig, Architect, Planning Commission  
 Adam O'Neill, Civil Engineering Consultant  
 OVIAR Global Resilience Systems



**ENGINEERING:** The engineering aspects of this project center around the replacement of the site's decommissioned coal power plant with a reusable energy generation station. The proposal reuses the plant's smokestacks as solar updraft towers and adds a solar panel farm to act as the updraft system's greenhouses. The photovoltaic system will function as microgrid supporting our proposed housing development and the others being developed by the city. In addition to power production, the power plant site will house hydrothermal carbonization for waste management, batteries for energy storage, and cisterns for rainwater treatment and catchment.

**MARKET ANALYSIS:** The design will reflect the unique residential market of one of the most largely affluent areas of the country. To help the city achieve its goal of having healthy, mixed-income communities, PLANT will include a range of rental prices for units. It is projected that Alexandria will need approximately 14,000 new rental units, and that the average rental cost will be \$1,657.

**DURABILITY AND RESILIENCE:** As previously mentioned, the PLANT site is directly along the Potomac River. The project itself is not in immediate danger from floods or sea level rise because of a dramatic grade change along the riverbank, but flood resilience plans have been put in place. Creating a micro-grid from our solar farm, updraft towers, and other power sources allows us to power our energy-efficient sites without disruption from the wider grid in the case of a blackout.

**EMBODIED ENVIRONMENTAL IMPACT:** Throughout the lifetime of the project, the construction process will be analyzed to minimize waste by selecting a mass timber and low carbon concrete structural system and prioritizing sustainability without sacrificing high performance. This will be accomplished with the use of locally sourced new materials as well as existing site materials where reuse is possible. These practices will minimize both embodied and operational carbon, meeting the targeted EUI.

**INTEGRATED PERFORMANCE:** To improve the efficiency of the passive systems within the multi-family buildings, the power plant will handle much of the building's mechanical and waste services. The community's waste management system will produce hydrochar that can be sent away to be made into graphite for lithium batteries. The restoration of the coastal wetland allows the filtration of water and runoff.

**OCCUPANT EXPERIENCE:** This project follows the WELL standards by emphasizing mindfulness programming, promoting physical activity, and implementing restorative spaces. The incorporation of natural daylight and other elements will be used to decrease threats of depression and anxiety, increase focus, and support recovery from illness. Occupant health will be prioritized by monitoring indoor air quality, installing natural or displacement ventilation systems, and filtering the air to decrease the likelihood of respiratory illness and support cognitive health.

**COMFORT AND ENVIRONMENTAL QUALITY:** Dedicated outdoor air systems (DOAS), variable refrigerant flows (VRFs), and district cooling systems will be used alongside a geothermal system for heating, ventilation, and air conditioning to control building environment and comfort.

**ENERGY PERFORMANCE:** The renewable energy power plant (built around the existing smokestacks from the decommissioned coal plant) will produce 2.1 GWh per year on average and the solar updraft towers produce 438,000 KWH per year. Which will be more than what PLANT and the other 4 developments will need. The baseline EUI for this project is 58, but our EUI is 18.96. The Passive House multifamily EUI standard is 30. Some of the power produced will be stored on site for resilience purposes..