

*Planning for Data Centers*

**What are data centers?**

Data centers are physical facilities that organizations use to store their computing machines and related hardware. This includes IT systems infrastructure like servers, data storage drives, and network equipment<sup>1</sup>. Data centers have accompanying accessory uses such as utilities, external mechanical equipment, water towers, and security facilities that may be located on the same site.

Data centers form the backbone of the digital world. They support typical everyday tasks such as internet usage, shopping, gaming, and streaming services. Businesses need data centers for complex processes such as cloud computing, cybersecurity, ecommerce, communications, data processing, and artificial intelligence driven uses.

There are several types of data centers that provide different services for customers<sup>2</sup>. Aside from building and lot size, the data center types are essentially the same from the land use perspective as internal equipment, ownership, and operations are outside of typical zoning regulation. However, understanding the types of data centers provides context when a development proposal arises in a community.

- **Enterprise data centers** are owned and operated by individual businesses and used to solely support that company’s data and information technology needs.
- **Managed data centers** are third party service facilities that manage another company’s computer hardware, data, and infrastructure.
- **Colocation data centers** enable businesses to rent space for their servers and other computing hardware. Aside from providing physical space, these facilities also offer a range of services including maintenance, backup power systems, and multiple network connections.
- **Cloud data centers** are third party owned facilities where hardware is run and managed by the cloud company. Customers can run websites and applications using the servers hosted in the facility.



Denver Federal Data Center, Lakewood, CO. Source: [www.hga.com](http://www.hga.com)



Equinix NY4 Data Center, Secaucus, NJ. Source: [www.datacenters.com](http://www.datacenters.com)



Data center server racks. Source: [www.lifewire.com](http://www.lifewire.com)

<sup>1</sup> Amazon Web Services definition of a data center. <https://aws.amazon.com/what-is/data-center/>

<sup>2</sup> [5 Different Types Of Data Center \[With Examples\] - RankRed;](#)

- **Edge data centers** are smaller facilities located close to the populations they serve to increase data processing speed and decrease data transmission delays. They deliver cloud computing resources and cached content to end users and typically connect to a larger central data center or multiple data centers
- **Hyperscale data centers** are massive facilities that house critical computing and network infrastructure that provides scalability and high-speed processing for large volumes of data. Consuming several hundred acres of land and including several million square feet of building space, these facilities allow big companies like Amazon, Google, and Microsoft to deliver key services to customers worldwide.

Other data centers may be an accessory use to commercial or industrial land uses. **Microdata centers** are smaller version of edge data centers that may include a single room to handle the computing needs in a specific location. **Modular data centers** are mobile pre-engineered and prefabricated buildings, complete with power and cooling infrastructure, and used to house computer servers and network equipment. Modular data centers reduce the time and cost associated with deploying a new data center.

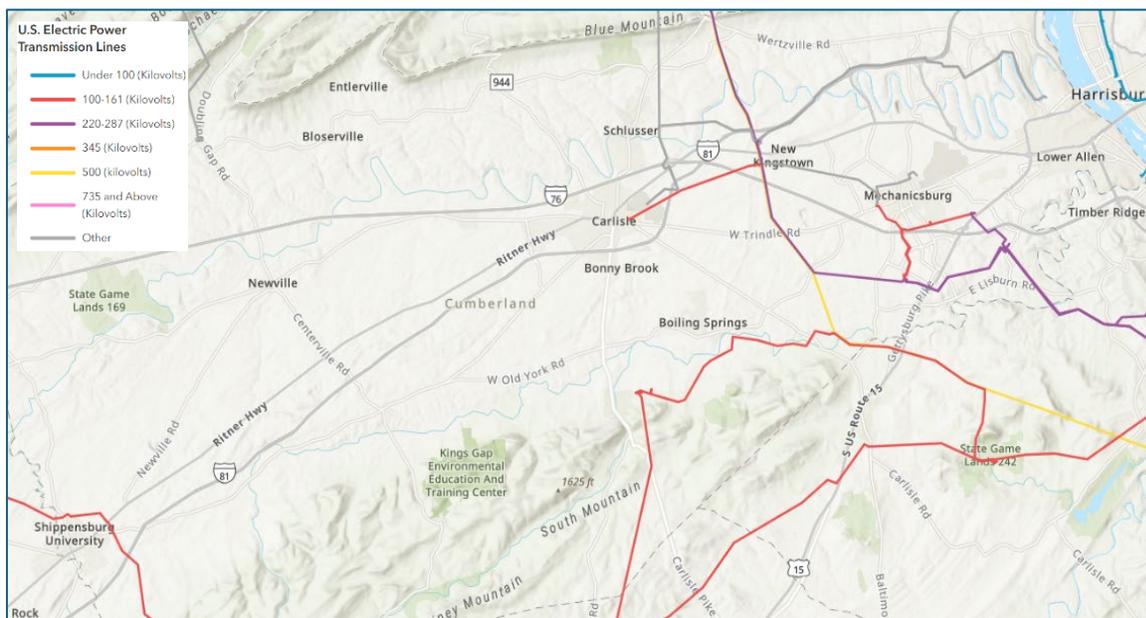


Modular data center. Source: Microsoft.

### Why Are Data Centers Locating in Cumberland County?

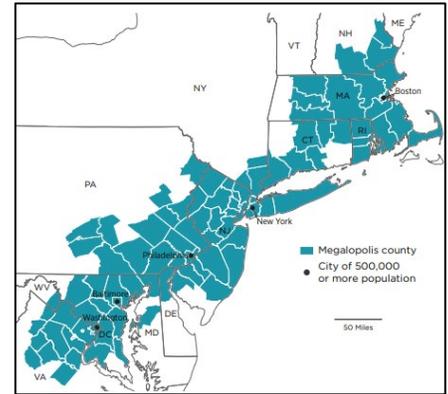
Data centers have critical locational requirements, all of which can be found in Cumberland County:

- **Energy** – Data centers require large amounts of energy to power and cool equipment. The amount of power can range from small-scale data centers needing 1-5 megawatts of power to hyperscale data centers often exceeding 100mw and in some cases up to 1 gigawatt. Cumberland County is home to electric transmission lines from 100 to over 500 kilovolts that can support data center developments. Locations immediately adjoining or near such energy infrastructure are the priority locations for data center development, especially those larger types. Future enhancements to the electrical grid in the county may create additional locations suitable for data center development.



Electric power transmission lines in Cumberland County. Source: ESRI

- **Proximity to customers** – Data centers are typically located near customers to reduce improve data processing and transmission speeds. Cumberland County is in the middle of the of Bos Wash megalopolis, the northeastern United States corridor stretching from Boston to Washington, D.C. With 5 cities of over 500,000 population and growing, the BosWash megalopolis will continue to drive data center demand that could be accommodated in the county.
- **Safe location** –Data centers require a safe environment free from natural or manmade disasters that could threaten operations and service delivery. Cumberland County is recognized by the Federal Emergency Management Agency (FEMA) as having relatively low risk to natural and manmade hazards<sup>3</sup>. The county’s moderate climate, low susceptibility to major storms, and low crime make it an attractive location for data centers.
- **Water resources** – Data centers consume large amounts of water to cool equipment and maintain proper humidity in buildings. Water consumption varies based upon the facility size, surrounding environment, and type of cooling system. Seasonally, data centers use more water in summer when temperatures are higher and cooling needs increase. Water consumption can vary from about 20,000 gallons per day for smaller data centers to over 500,000 gallons per day for a hyperscale center<sup>4</sup>. Cumberland County’s abundant surface and groundwater resources can supply the water needed for all data center types.



Bos Wash Megalopolis.  
Source: US Census Bureau



Google data center cooling system.  
Source: Google

## Community Impacts

Like any new land use, communities must evaluate the positive and negative impacts of data centers, making sure the use complements and does not conflict with the community in which they are located.

Benefits of Data Centers	Challenges of Data Centers
<ul style="list-style-type: none"> <li>• Substantial property tax revenue</li> <li>• Little to no traffic generation</li> <li>• High-salary jobs created</li> <li>• No impact to school district</li> <li>• Provides critical infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Water Consumption</li> <li>• Power needs</li> <li>• May produce noise</li> <li>• Limited job creation per square foot of building space</li> </ul>

<sup>3</sup> [Map | National Risk Index](#)

<sup>4</sup> [Data Center Water Usage: A Comprehensive Guide - Dgtl Infra](#)

## Zoning Considerations

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Data centers, while a new use that may not be provided for in many municipal ordinances, look and function like other commercial or light industrial uses already present in the community. Municipalities should evaluate data centers in comparison to other similar uses and develop new zoning regulations, as appropriate, that address the unique characteristics of data centers. In many cases, municipalities may choose to regulate data centers using existing zoning standards that apply to similar industrial or commercial uses. In doing so, the municipality regulates land uses equitably and decreases the complexity of the zoning ordinance by creating new regulations that may not be necessary.

The following zoning considerations have been developed through interviews with developers and research on data center ordinances from other jurisdictions. The considerations are broken into different topical areas, include a brief description, and then include suggested regulations. Municipalities are encouraged to review this information in the local context, determining the types of regulation that are consistent with local policy.

### **Data Center-Zoning Definition**

From a regulatory standpoint, municipalities need not define every data center type (see page 1) as a separate use. Rather, municipalities can identify data centers as a specific use that can be considered a principle or accessory use. Modular and micro data centers may be an accessory use to an existing commercial or light industrial use. The other types of data centers are typically principle uses but may have other accessory uses found on the same or an adjacent lot (see below). Data centers often include other supporting infrastructure that should be considered and regulated as an accessory use.

**Data Center:** *A use involving a building/premise in which most of the use is occupied by computers and/or telecommunications and related equipment, including supporting equipment, where information is processed, transferred and/or stored<sup>5</sup>*

**Data Center Accessory Use:** *Utilities, utility lines, electrical substations, pump stations, water towers, mechanical equipment and environmental controls (air conditioning or cooling towers, fire suppression, etc.), redundant/backup power supplies, redundant data communications connections, and high security when located on the same tract or assemblage of adjacent parcels developed as a unified development for a Data Center.<sup>6</sup>*

### **Appropriate Zoning Districts**

Energy and water infrastructure are primary site requirements for data centers. When determining which zoning districts to allow a data centers, municipalities should investigate where this infrastructure is located and permit data centers in those areas. Given the specific site requirements of data centers, municipalities may consider a fixed or floating data center overlay zone. Such a zone could be centered on those locations where appropriate water, energy, and fiber optic infrastructure, thereby relieving the municipality of providing data centers in a broader area where infrastructure may not exist or other land use compatibility issues may be present.

The way data centers are permitted, by right, conditional use, or special exception can assist in implementing municipal land use policies. Municipalities wanting to encourage data center development could permit the use by right which streamlines the approval process while not requiring additional review processes. Municipalities desiring for a more detailed review of projects, especially in areas with sensitive environmental features or land use compatibility issues, should permit data centers by special exception or conditional use. As noted above, municipalities should regulate data centers using existing regulations for industrial and commercial uses that would also be applicable to data centers.

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<sup>5</sup> Prince William County Virginia Zoning Ordinance Chapter 32, article I, part 100. Definition of a “Data Center”

<sup>6</sup> Limerick Township Zoning Ordinance Chapter 184, article II, section 184-10. Definition of “Data Center Accessory Use)

Zoning District <sup>7</sup>	Use Permitted	Considerations
Industrial, light industrial, manufacturing, etc.	By right	Water Capacity Energy availability Land availability Proximity to residential districts and uses Environmental impacts Technology hub Natural and created hazards
Commercial	By right	
Business or technology	By right	
Mixed use	By conditional use or special exception	
Agricultural	By conditional use or special exception	
Data center or technology overlay district – in proximity to high voltage transmission lines of 115kv or more	By right <or> By conditional use or special exception	

### ***Bulk and Area Requirements<sup>8</sup>***

**Minimum lot size.** 3 acres or existing minimum lot size for commercial or industrial uses.

**Maximum impervious coverage.** 60%-80% depending on project type, lot size, and location. Consider using existing standards for industrial or commercial uses.

**Height.** 80’ and the height of the building may be increased to 100 feet provided that an additional setback of one foot is provided for every foot of building height over 80 feet. The building height requirement shall include roof mounted equipment such as cooling and ventilation systems, HVAC units or cooling towers<sup>9</sup>.

**Setbacks.** Use existing commercial and industrial zoning districts setbacks. Consider increased setbacks when taller structures adjoin residential uses<sup>10</sup>.

### ***Building Facades***

Data centers may include multiple, large industrial buildings with long, tall walls. The facades of those buildings can be attractively designed to improve compatibility with surrounding properties and overall visual appeal in the community. Municipalities should determine if facades for other uses are regulated and if so, consider applying those existing standards to data centers to encourage consistency. New, data center specific façade regulation should be reasonable and appropriate, ensuring that data centers are not subject to stringent regulation that other similar uses are not required to follow.

<sup>7</sup> The municipality should tailor the zoning districts to match the districts on the zoning map.

<sup>8</sup> The municipality may refer to existing zoning district regulations, or incorporate separate requirements as noted herein.

<sup>9</sup> Multistory data centers are becoming more common. Allowing increased height makes for efficient land use and centralizes the use in appropriate areas.

<sup>10</sup> Data centers have limited amounts of truck traffic and heavy vehicles. Extensive loading and heavy vehicle setbacks should be avoided.

**Principal building facades**<sup>11</sup>. Any side of a building that faces a road or a zoning district that permits a residential use must incorporate at least two of the following design elements every 150 horizontal feet. If more than two sides of a building meet the façade requirements, the facades shall be consistent in terms of design and materials.

- Change in building height
- Building step-backs or recesses
- Fenestration (i.e. arrangement, design, and installation of windows and other openings in a building)
- Change in building material, pattern, texture or color
- Use of accent materials

### **Land Use Compatibility**

Data centers include large expansive buildings but lack high volumes of traffic, noise, and lighting that may conflict with residential uses. Data centers look and function like office/research parks and light industrial complexes. With practical land use compatibility standards, data centers can be located near residential zones and uses with minimal conflicts.

**Buffering.** A buffer yard of 100 feet is required between the data center and any district that permits residential uses or planned residential properties. No buildings or parking lots shall be constructed in the buffer.

Heightened buffering standards may require the buffer yard to include plantings and/or an earthen berm with a minimum height of six feet and a slope not greater than 2:1. The type of data center and level of regulation of similar uses should guide municipalities in determining the need for heightened regulation.

**Screening**<sup>12</sup>. Screening must be provided between accessory buildings including mechanical equipment and substations, and adjacent roads and properties. Screening can be accomplished by principal buildings, existing vegetation that will remain on the property, a proposed vegetative screen, or a visually solid fence, screen wall, panel, parapet wall or other visually solid screen as approved by the municipality.

**Landscaping**<sup>13</sup>. Plants should be provided in the required buffer area, as screening, at the main entrance of the building, in parking lots, or along the façade of the proposed data center.

Municipalities should reference existing landscaping standards where appropriate. Heightened standards may require a certain number of trees per square foot of building space. Given the large size of some projects, such standards may be impractical.

**Fencing.** Fencing may be considered for security purposes but is not needed for land use compatibility if appropriate screening, buffering, and landscaping are also required. Chain-link, slatted insert, and barbed wire or other visually intrusive fence, as determined by the zoning officer, may be discouraged along public streets or when adjacent to residential uses.



*Google data center cooling system.  
Source: Ruppert Landscape*

<sup>11</sup> Prince William County Virginia Zoning Ordinance. Chapter 32, article V, part 509.4.A.

<sup>12</sup> Prince William County Virginia Zoning Ordinance. Chapter 32, article V, part 509.4.B.

<sup>13</sup> The municipality should review the existing ordinance. Are tree plantings already required? CCPD recommends removing duplications.

**Noise**<sup>14</sup>. The applicant should provide a noise study indicating sound generated by a data center will not exceed the following as measured at the property line. This requirement does not apply during a time of power outage.

- 67 decibels from 7:00am to 8:00pm Monday-Friday
- 57 decibels from 8:00pm to 7:00am Monday-Friday
- 57 decibels on Saturdays and Sundays

**Lighting.** Existing lighting requirements shall apply.

### ***Infrastructure***

Electric and water infrastructure are the two primary characteristics unique to data centers that should receive focused municipal review. The municipality's review coupled with outside agencies and infrastructure provider oversight should ensure that data center benefits are enjoyed without compromising the community's health, safety, and welfare.

**Water**<sup>15</sup>. The applicant shall submit an analysis of raw water needs (groundwater or surface water) from either private or public sources, indicating quantity of water required. If the source is from a municipal system, the applicant shall submit documentation that the public authority will supply the water needed.

If the data center is to rely upon nonpublic sources of water, a water feasibility study will be provided. The purpose of the study will be to determine if there is an adequate supply of water for the proposed data center and to estimate the impact of the data center on existing wells in the vicinity. No data center shall be approved without sufficient water and/or for a use that poses adverse impact on existing wells in the vicinity. A water feasibility study shall include the following minimum information:

- Calculations of the projected water needs
- A geologic map of the area with a radius of at least one mile from the site
- The location of all existing and proposed wells within 1,000 feet of the site, with a notation of the capacity of all high-yield wells
- The location of all existing on-lot sewage disposal systems within 1,000 feet of the site
- The location of all streams within 1,000 feet of the site and all known point sources of pollution
- Based on the geologic formation(s) underlying the site, the long-term safe yield shall be determined
- A determination of the effects of the proposed water supply system on the quantity and quality of water in nearby wells, streams, and the groundwater table
- A statement of the qualifications and the signature(s) of the person(s) preparing the study

The applicant shall provide proof of review and approval from the Susquehanna River Basin Commission (SRBC) for projects that have:

- Water withdrawals of 100,000 gallons per day (gpd) or more over a 30-day average from any source or combination of sources within the Susquehanna River Basin.
- Any consumptive water use of 20,000 gpd or more over a 30-day average from any water source

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<sup>14</sup> Limerick Township Pennsylvania Zoning Ordinance. Chapter 184, article X, section 83.B

<sup>15</sup> Dickinson Township, Cumberland County Zoning Ordinance section 205-112.P and Q