VILLAGE OF SUGAR GROVE
BOARD REPORT

TO: VILLAGE PRESIDENT & BOARD OF TRUSTEES

FROM: WALTER MAGDZIARZ, COMMUNITY DEVELOPMENT DIRECTOR

SUBJECT: DISCUSSION: ZONING ORDINANCE AMENDMENT, DATA CENTER DISTRICT

AGENDA: JANUARY 18, 2022 VILLAGE BOARD MEETING

DATE: JANUARY 14, 2022

ISSUE

Shall the Village Board discuss a Zoning Ordinance amendment establishing a zoning district exclusively for data centers.

DISCUSSION

One of the outcomes of the Village's unsuccessful bid for the Facebook data center campus was the realization that by-right uses are critically important to corporate location decisions.

Shortly thereafter, it was decided that establishing a data center zoning district would expedite the decision-making process for the next data center proposal. Village staff drafted regulations for a data center district in which data centers are the only permitted use. Data centers would be permitted in industrial zoning districts, as well, but the exclusive zoning district for data centers is anticipated to provide a higher level of certainty for the public than an industrial district which permits a host of uses which may not be desirable in proximity to a residential district.

Since the data center district was presented to the Planning Commission for a recommendation, Village staff continued its research about data centers, their needs and impacts. During this interim, communities across the country have begun to push back against data centers because of real or perceived community impacts, including noise, water consumption, prison-like appearance of many of these facilities, and in some locales the unrealized tax benefit that was expected.

The impact getting the most attention is the voracious water usage of these facilities, particularly the hyperscale facilities. The Village is sensitive to the water consumption aspect as the Village does not have a limitless supply of freshwater. Water supply is one issue. Wastewater disposal is another.

The data center industry is accelerating efforts to reduce water usage as it moves towards achieving sustainability goals and standards. While the industry will likely achieve some of its sustainability goals, the reality is it will continue to consume water in its cooling operations which are essential to the operation of a data center.

One possible solution is to make data centers a Special Use if their water consumption exceeds a certain volume or quantity. Village staff has no recommendation, at this time, as to what that threshold is, and making data centers a Special Use defeats the purpose of establishing a by-right data center district.

Additionally, any possible on-site electric sub-station should be a threshold for the Special Use Permit requirement as these facilities can be unsightly. At this time, Village staff has no recommendation as to what the threshold for these facilities should be.

The data center primer that Village staff prepared for the Planning Commission identifies noise created by the electrical equipment, cooling and power generators associated with data centers as a possible nuisance. There is mounting evidence that data centers are not the benign neighbors as presented. While the proposed regulations have distance requirements to mitigate the noise impacts, there are many variables involved with the production of noise and the level of impact on neighboring property.

The primer also documents the appearance of these facilities, which is generally, not of quality materials and design. The buildings are typically big box industrial buildings surrounded by security fences with electric substations on-site or nearby.

ATTACHMENTS

- Data center, primer
- Data center, photo album

COSTS

There is no cost to discuss the matter.

RECOMMENDATION

Village staff is of the opinion that the community has the infrastructure to support future data center proposals. The Village Board should provide input and direction to Village staff concerning the proposed zoning amendment.

SUGAR GROVE
INCORPORATED 1957

COMMUNITY DEVELOPMENT

M E M O R A N D U M

TO: Planning Commission

FROM: Walter Magdziarz, Community Development Director
Danielle Marion, Planning & Zoning Administrator

BACKGROUND & HISTORY

In 2019 the Village participated in a state-wide site selection competition for a large data center known then as Project Apogee. The Village made the cut and entered into detailed negotiations with the unnamed company. In the end, Project Apogee—became known as Project Ventus, and was recently revealed to be Facebook—decided to locate their investment in DeKalb.

The selection and negotiation process was revealing for the Village. During this process we learned several things. First, Sugar Grove has all of the attributes a data center needs: massive fiber optic capacity and redundancy, power (electric), and water. Second, data centers place little to zero demand on public services and in return generate massive amounts of property tax revenue for taxing districts. Lastly, with no assurances the data center use was an acceptable, permitted use in the community the Village will continue to be an also-ran in future selection competitions.

Which brings us to the purpose of the proposed zoning amendment: to establish data centers as a by-right, permitted use in the Village.

What is a data center? Simply, it is a building housing immense amount of data servers, electrical conduit and cooling equipment. The first generation of data centers occupied space in office buildings. The second generation of data centers found entire office buildings being converted to data center functions with necessary cooling and generator capacity being added onto the buildings or in repurposed parking lots. Today, with the demand for data by cell phones, GPS, and internet of things (IoT) digital needs have outstripped the capacity that can be provided in re-used office buildings. The current iteration of data centers are large footprint buildings (i.e., warehouse or logistics building), often multi-level, with electrical substations on-site or nearby, and vast amounts of surface area on the ground or roof covered by cooling equipment.

Data centers are immense capital investments for the data center company and the utilities serving the data center. It is common for hyperscale (cloud) data centers to require an investment of $800 million or more (excluding land costs) by the data company. The capital investment in the facility translates to large property tax revenue for taxing districts. However, data centers produce a relatively low number of permanent jobs. Many of the permanent jobs are high paying but on a per square foot basis the number of jobs is extremely small when compared to other uses.

Data centers are high-security facilities. Depending on the data center company, the security at the facility varies but restricted access to the building and to the property itself is the norm. Security fences, controlled access gates, closed-circuit and infrared cameras are the norm at many data center facilities. Windowless facilities are typical. Electrical and cooling equipment is often required for a fully functioning data center and contribute to the power plant appearance of many data centers.

Typical data center security features (clockwise from upper left) vehicle security gate, closed-circuit/infrared cameras, security fence.

What began in a closet or one or more rooms in an office, has morphed into larger and larger buildings and multi-building campuses around the globe. The largest single-building data center in the US is Lakeside Technology Center located at 350 E. Cermak Road in Chicago. This facility, the former R.R. Donnelly Yellow Pages publishing factory, has 1.1 million square feet of floor area spread over 8 floors. This will pale in comparison to the 7 million square foot facility under construction in Reno, Nevada (The Citadel Campus operated by Stack Infrastructure) and a nearby 7.2 million square foot facility in the planning stages.

350 E. Cermak Road, Chicago

A Data Center Primer

What defines a modern data center?
Modern data centers are very different than they were just a short time ago. Infrastructure has shifted from traditional on-premises physical servers to virtualized infrastructure that supports applications and workloads across pools of physical infrastructure and into a multi-cloud environment.

In this era, the modern data center is wherever its data and applications are. It stretches across multiple public and private clouds to the edge of the network via mobile devices and embedded computing. In this constantly shifting environment, the data center must reflect the intentions of users and applications.

Why are data centers important to business?
In the world of enterprise IT, data centers are designed to support business applications and activities that include:

- Email and file sharing
- Productivity applications
- Customer relationship management (CRM) and enterprise resource planning (ERP)
- Big data, artificial intelligence, and machine learning
- Communications and collaboration services

What are the core components of a data center?
Data center design includes routers, switches, firewalls, storage systems, servers, and application delivery controllers. Because these components store and manage business-critical data and applications, data center security is critical in data center design. Together, they provide:

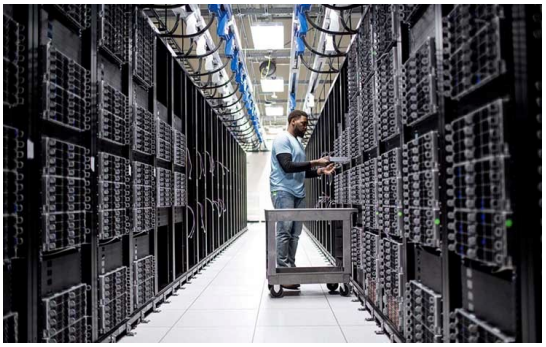
- **Network infrastructure.** This connects servers (physical and virtualized), data center services, storage, and external connectivity to end-user locations.
- **Storage infrastructure.** Data is the fuel of the modern data center. Storage systems are used to hold this valuable commodity.
- **Computing resources.** Applications are the engines of a data center. These servers provide the processing, memory, local storage, and network connectivity that drive applications.

How do data centers operate?
Data center services are typically deployed to protect the performance and integrity of the core data center components.

- **Network security appliances.** These include firewall and intrusion protection to safeguard the data center.
    - **Application delivery assurance.** To maintain application performance, these mechanisms provide application resiliency and availability via automatic failover and load balancing.

What is in a data center facility?

The main component is rows of servers. But all these servers require significant infra-structure to support the center's hardware and software. These include power subsystems, uninterruptible power supplies (UPS), ventilation, cooling systems, fire suppression, backup generators, and connections to external networks.




The innards of a data center: servers, electrical conduit, cooling systems, and power generation.

What are the standards for data center infrastructure?

The most widely adopted standard for data center design and data center infrastructure is ANSI/TIA-942. It includes standards for ANSI/TIA-942-ready certification, which ensures compliance with one of four categories of data center tiers rated for levels of redundancy and fault tolerance.

Tier 1: Basic site infrastructure. A Tier 1 data center offers limited protection against physical events. It has single-capacity components and a single, non-redundant distribution path.

Tier 2: Redundant-capacity component site infrastructure. This data center offers improved protection against physical events. It has redundant-capacity components and a single, non-redundant distribution path.

Tier 3: Concurrently maintainable site infrastructure. This data center protects against virtually all physical events, providing redundant- capacity components and multiple independent distribution paths. Each component can be removed or replaced without disrupting services to end users.

Tier 4: Fault-tolerant site infrastructure. This data center provides the highest levels of fault tolerance and redundancy. Redundant-capacity components and multiple independent distribution paths enable concurrent maintainability and one fault anywhere in the installation without causing downtime.

Types of data centers

Not all data centers are alike. Many types of data centers and service models are available. Their classification depends on whether they are owned by one or many organizations, how they fit (if

they fit) into the topology of other data centers, what technologies they use for computing and storage, and even their energy efficiency. There are four main types of data centers:

Enterprise data centers. These are built, owned, and operated by companies and are optimized for their end users. Most often they are housed on the corporate campus. An example is the Allstate data center in Rochelle, IL.

Managed services data centers. These data centers are managed by a third party (or a managed services provider) on behalf of a company. The company leases the equipment and infrastructure instead of buying it.

Colocation data centers. In colocation ("colo") data centers, a company rents space within a data center owned by others and located off company premises. The colocation data center hosts the infrastructure--building, cooling, bandwidth, security, etc. while the company provides and manages the components, including servers, storage, and firewalls.

Cloud data centers. In this off-premises form of data center, data and applications are hosted by one of the cloud services providers such as Amazon Web Services (AWS), Google, Facebook, Oracle, Alphabet, Microsoft (Azure), Tencent or IBM Cloud.

(Source: Cisco)

DISCUSSION

While Sugar Grove has the attributes to support data center development, it does not have a monopoly. Just in the Chicagoland area there are clusters of data centers in the Loop, 350 E. Cermak, O'Hare area (Elk Grove Village, Franklin Park, Des Plaines, Itasca, Wood Dale), and the I-88 corridor (Oak Brook, Lombard and Aurora). A new cluster is developing in northeast Indiana. The most active and largest data center markets in the US are Ashburn, VA, Silicon Valley, Dallas and Phoenix.

Data centers locate where massive fiber capacity (and redundancy) and power is present and water is plentiful. Fiber optic capacity (and its location) is a closely guarded secret among data service providers but we know that there is a massive transcontinental fiber optic system that runs from 350 E Cermak, generally along 22nd Street and I-88 to I-80 in the Quad Cities and to points west. We also have knowledge of a massive fiber presence in the IL 47 corridor and Randall/Orchard Road in Kane County. Population is not a primary determinant for data center location decisions.

There is no shortage of power in northern Illinois but the proximity to major transmission lines is key given the power consumption of these facilities. Sugar Grove has two parallel 134kV transmission lines traversing the planning area north of Wabaunsee Community College campus. Com Ed has plans to construct a massive electric sub-station north of I-88 on Healy Road in the future as demand increases.

Secondarily, Nicor has a large transmission line traversing the Village's planning area which can be used to fuel electric generation for back-up purposes.

Given the utility requirements for a state of the art data center, the likely location in Sugar Grove for such facilities will be to the north along the high voltage electric transmission lines corridor and the massive fiber optics along I-88.

Is data center development just the latest development fad? Hardly. Data centers are the utility system for the internet. Without them, the internet cannot function at the levels we've become accustom to. Data centers are a relatively recent phenomena fueled by the growth in the use of the internet for everything from mobile phones (social media) to autonomous vehicles and e-commerce to the internet of things (IoT). That's in addition to the mundane data functions of banks, insurance companies, health care companies, education, and the government. One internet company, Oracle, reports it needs to open a new data center region every 23 days to keep up with demand. Facebook is currently in the throes of building ten one million square foot campuses in 2020 alone. Co-location companies are also rapidly expanding capacity.

The worldwide infrastructure as a service (IaaS) market grew 37.3% in 2019 to total $44.5 billion, according to research released today by Gartner. Amazon continues to lead the IaaS market in 2019, followed by Microsoft, Alibaba, Google and Tencent.

"Cloud underpins the push to digital business, which remains at the top of CIOs' agendas," said Sid Nag, research vice president at Gartner. "It enables technologies such as the edge, AI, machine learning and 5G, among others. At the end of the day, each of these technologies require a scalable, elastic and high-capacity infrastructure platform like public cloud IaaS, which is why the market witnessed strong growth."

(Data Center Frontier, August 10, 2020)

What's a typical data center facility? Typical is a relative term. Today, typical is large footprint, high rack density facilities with back-up power capabilities and on-site cooling. Due to their need for high security, many data center facilities take on the appearance of a jail or prison with the high perimeter walls and security fences on most properties. Data centers can be standalone buildings or multiple buildings on a "campus."

Ubiquitous building typology: Data center or logistics building?

Examples of multi-level data centers

11 level data center, Google, Singapore

2-level data floor, Cyxtera, Elk Grove Village, IL

6 story data center, Coresite, Ashburn, VA

3-level data floor, Equinix, Ashburn, VA

Despite their low impact on taxing district services, data centers can have negative influences. Data centers do not employ many people and, thus, generate little traffic. These facilities take on the appearance of a power station or a jail or prison with the windowless walls, exterior cooling towers and generators, and extreme security fencing. The equipment needed to cool the facility and to generate power produce noise. These facilities operate 24/7.

Facebook data center campus, The Dalles, OR

Facebook data center campus, Pryor, OK

On-site electric substation, Facebook data center campus, Altoona, IA

Water storage and cooling equipment, Digital Realty, Elk Grove Village, IL

Microsoft data center campus, Quincy, WA *(top)*, Compass data center campus, Goodyear, AZ *(right)*, Facebook data center campus, Altoona, IA *(bottom)*

The attached data center photo album captures the wide variety of physical attributes, features and scale of a data center and the similarities regardless of size. Most of these examples are retrofits of office and industrial buildings and their parking lots. The Raging Wire (Itasca), Facebook (Altoona, IA) and CyrusOne (Aurora) data centers are the only examples of new construction specific to a data center user.

THE LARGEST DATA CENTERS IN THE US

Facebook campuses, each campus 1.1 M sqft in 3-5 buildings

Prineville, OR	New Albany, OH	Clarksville, TN
Forest City, NC	Pryor, OK	Midlothian, TX
Altoona, IA	Fort Worth, TX	The Dalles, OR
DeKalb, IL	Gallatin, TN	Social Circle, GA

Bumblehive (NSA), 1.1 M sqft, 4 buildings
Bluffdale, UT

Lakeside Technology Center (Digital Realty), 1.1 M sqft
Chicago, IL

Digital Realty Ashburn Campus (Digital Realty), 1.5 M sqft, 7 buildings, 2 more under construction
Ashburn, VA

Ashburn Corporate Center (DuPont Fabros), 1.6 M sqft, 6 buildings
Ashburn, VA

Dallas Infomart (Equinix), 1.6 M sqft, 3 buildings, expansion planned
Dallas, TX

Supernap Digital Exchange Campus (Switch), 2.4 M sqft, 9 buildings
Las Vegas, NV

(source: Data Center Knowledge)

Data Centers

This photo album is intended only for information purposes to provide images of existing data centers in the region and is not an endorsement of any data center provider or construction style. The images are intended to provide a record of the wide range of types of facilities, the features, appearance, and construction style of data centers and what the Village of Sugar Grove is likely to expect if it welcomes this use to the community. These examples are primarily suburban retrofit projects. Only three examples are new construction.

Since many data centers desire anonymity, the names attributed to each location are based on best available sources and may not accurately represent the ownership of the facilities or the data center companies occupying the facilities.

CyrusOne

- Aurora


2005
CytusOne

Byte Grid (Lincoln Rackhouse)

- Aurora

Cyxtera

- Elk Grove Village

Digital Realty

- Elk Grove Village

Digital Realty & Server Central

- Elk Grove Village

Equinix

- Elk Grove Village


DO NOT
ENTER


DO NOT
ENTER


2001

Unnamed data center

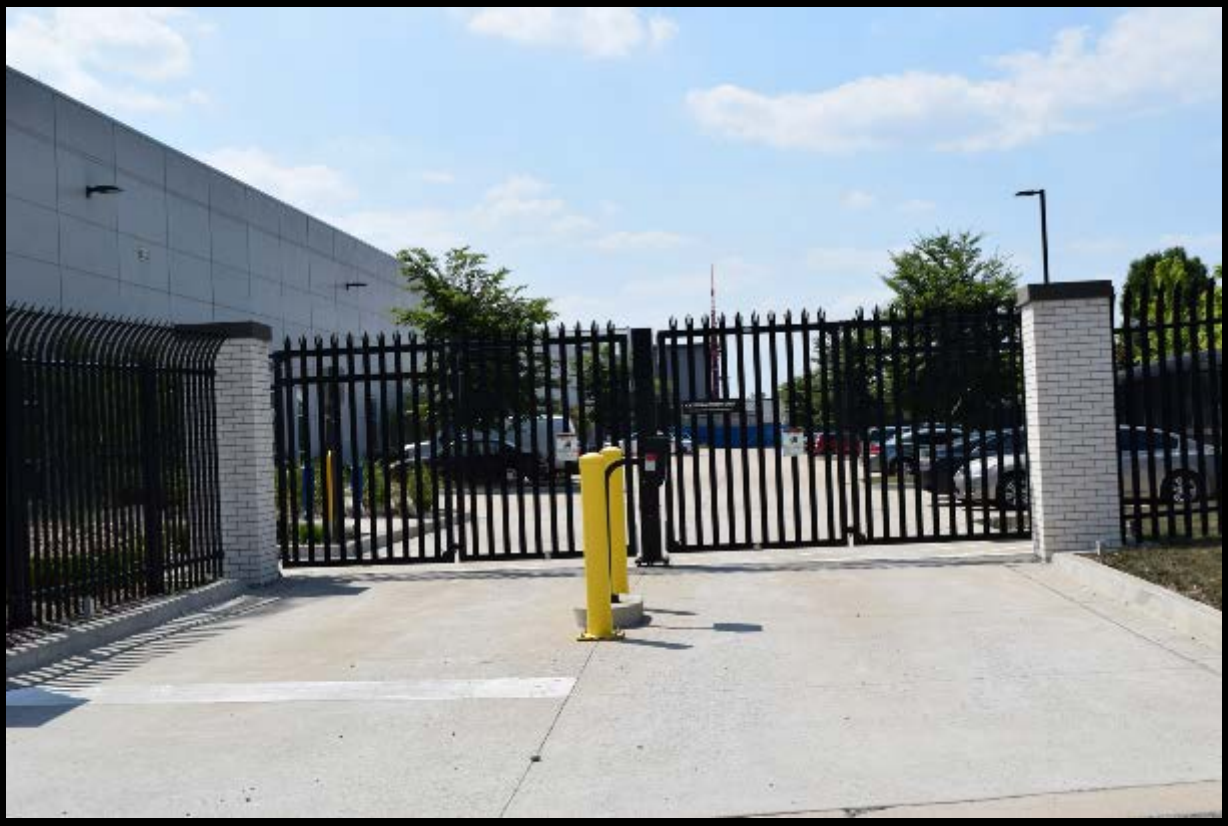
- Elk Grove Village

Stream Data Centers

- Elk Grove Village

Stack Infrastructure

- Elk Grove Village



T5

- Elk Grove Village


200
T5
22MW DATA CENTE
T5DataCenters.com/Chicago

Raging Wire

- Itasca

CyrusOne

- Lombard

360 Technology Center Solutions

- Lombard

NYI & ON Communications

- Oak Brook

Evoque Data Centers

- Oak Brook

Cyxtera

- Oak Brook


STOP

New Continuum

- West Chicago

Equinix

- Westmont

Element Critical

- Wood Dale (2 locations)

Facebook

- Altoona, IA


200