CONCEPT FEASIBILITY STUDY | U.S. FRAMEWORK

UNDERGROUND DATA CENTERS

A community-integrated campus with a public landscape above

Feasibility • Power-plant options • Permitting • Concept designs • Investment gates

Prepared November 8, 2026

Concept-level U.S. assessment; no specific parcel or jurisdiction selected.

BOTTOM LINE

Underground data centers are technically feasible at selected sites—especially proven mine/cavern reuse—but are not yet evidenced as generally cheaper, quieter, faster, or easier to permit. The strongest proposition is a well-engineered, grid-connected or hybrid facility that makes a measurable public-space commitment while screening out unsuitable geology, water, power, life-safety, and community conditions.

This prospectus is a decision framework, not a site-specific engineering design, legal opinion, environmental assessment, construction estimate, or investment recommendation. All regulatory requirements and code editions must be verified with the agencies having jurisdiction for the selected site.

Executive decision brief

The concept can work, but the value proposition should be framed as “industrial infrastructure that returns the surface to community use,” not “underground means no impacts.” A data center still needs dependable electricity, heat rejection, fiber, cooling, emergency access, fire protection, equipment delivery, and a route for construction spoil. The surface park is credible only after those functions, access easements, structural loads, ventilation, drainage, security, and long-term maintenance are designed together.

Decision question	Current answer	What would change the answer
Is an underground data center technically possible?	Yes, at particular mine/cavern and engineered below-grade sites. U.S. operator-reported precedents include limestone-mine facilities. [S01–S04]	Site-specific geotechnical, hydrogeological, structural, life-safety, logistics and operations validation.
Is it generally cheaper or faster than a conventional build?	Not demonstrated by available public evidence. No matched audited $/MW or schedule comparison was found.	Contractor-priced, scope-matched alternatives for a named parcel, including water, excavation, fire/life safety and power.
Can a facility have its own plant?	Potentially. A dedicated gas-fired or fuel-cell plant, microgrid and storage can be engineered; full islanding is a major utility, fuel, emissions and reliability undertaking. [S16, S25–S29]	Firm fuel and air approvals, black-start/islanding studies, redundant capacity, operating economics and community acceptance.
Can a public park sit above it?	Potentially, with structural and operational limits. A low-load trail/pollinator landscape is the easiest starting point; sports/event uses require stronger proof. [S33–S36]	Certified load zones, waterproofing/drainage, service access, park operator, funding and recorded easements.
What should be done next?	Select a region and candidate sites; start utility and geotechnical screening in parallel; hold joint planning/fire/utility pre-application meetings.	Advance only candidates that pass the hard gates in Section 12.

What the concept is—and is not

- Is: a below-grade mission-critical data facility paired with an accessible public realm above, a controlled heavy-equipment portal, and a design that makes noise, water, air, energy, traffic, safety, and public benefits measurable.
- May be: a converted mine, engineered cavern, cut-and-cover/basement campus, or hybrid with some technical plant at grade. These are different project types and must be costed separately.
- Is not: an assumed zero-noise, zero-emissions, zero-water, zero-visual-impact, fully energy-independent, or automatically cheaper development. Cooling equipment, plant stacks, truck access, construction, power infrastructure and water management remain material.

Recommended development posture

Advance to a site-screening and pre-feasibility phase—not construction underwriting. Keep three alternatives open: (A) conventional above-grade data center with community buffering; (B) adaptive reuse of a verified existing mine/cavern; and (C) new underground excavation. For power, use utility-backed supply as the base case and analyze an islandable microgrid / onsite prime-power plant as an explicit alternative. Do not represent full self-sufficiency as the default.

1. Project basis and planning assumptions

The study uses a notional 20 MW critical IT-load campus only to show how decisions and sensitivities should be framed. It is not a selected design, lease commitment, grid-service request, plant rating, or cost estimate. “20 MW” must be kept distinct from total facility demand and from a market report’s facility-capacity denominator.

Planning item	Concept assumption / diligence rule
Capacity basis	20 MW critical IT load for scenario math. Confirm whether eventual business case means IT load, utility service, or total facility capacity.
Facility power	Facility demand = IT load × PUE; add design margin, auxiliaries and resilience criteria as applicable. An N+1 plant needs installed capacity above coincident load.
Build approach	Compare conventional greenfield, verified mine/cavern reuse and new excavation on identical capacity, redundancy, cooling, security and schedule scope.
Siting	No state, county, municipality, utility, aquifer, rock type, or parcel provided. Regulatory notes therefore describe U.S. screening—not approvals.
Public realm	Illustrative options only. Park uses are contingent on structure, waterproofing, easements, access, safety, code, security and funded maintenance.
Economics	No IRR/NPV or project budget is supportable yet. Use public benchmarks only as context; obtain utility, contractor, insurer, tenant and financing inputs.
Power plant	Assess utility-only, grid-plus-onsite, and islanded cases. “Self-contained” must define fuel, firm capacity, black start, autonomy, redundant capacity, emissions and operating mode.

2. Feasibility verdict and principal value proposition

Conditional feasibility

Research found U.S. operating precedents at Iron Mountain’s former limestone mine in Pennsylvania and Bluebird’s limestone-mine facility in Missouri. These establish that a particular underground facility can be built and operated; operator descriptions are not independent performance audits and cannot prove general savings or transferability. The geology, mine geometry, cooling, flooding, access, and grid context of each parcel are decisive. [S01–S04]

Potential community value

- Return a large portion of the parcel to open space, trails, gardens, play or civic uses—if the cap, easements, service routes and park operations support it.
- Reduce visible building mass and screen service areas; potentially use brownfield or existing-mine land where reuse is safe and legally supportable.
- Make mitigation verifiable: public baseline and follow-up noise monitoring, construction haul-route plans, defined generator-test windows, drainage performance, complaint response and annual benefit reporting.
- Create a site plan that shows where the community may go and where equipment, emergency response, air intakes/exhausts and security boundaries require clearances.

Limits and counterweights

Excavation or mine conversion may add ground-support, seepage control, dewatering, drainage, ventilation, vertical transport, fire/smoke-control, waterproofing and rescue costs. Underground systems may complicate network/fiber routing, equipment replacement, emergency access, and expansion. Heat is not eliminated by burial; it must be rejected to air, water, ground, or a useful heat customer. [S03–S12]

3. Concept architecture and site planning

Core site components

Component	Design intent / evidence needed
Underground data halls	Define excavation/reuse extent, depth, occupancy, floor slabs/load path, rack density, future equipment loads, security and expansion limits. Verify rock, support, seismic response, water, radon and legacy conditions.
Equipment portal	A dedicated, controlled truck entrance sized from actual delivery envelopes and turning templates. Include a weather-protected receiving dock, staging, hoist/lift path, fire separation, security, road queue management and equipment-removal path.
Power and cooling plant	Coordinate utility substation, UPS/BESS, generators/turbines/fuel cells, cooling and heat rejection. Keep exhaust, intakes, emergency access and acoustic envelopes clear of park users and neighboring homes.
Park cap / public realm	Divide surface into certified load zones. Coordinate waterproofing, drainage, soil depth, roots, irrigation, inspection hatches, utilities, public paths, access control and closure procedures.
Community edge	Use buffers, berms/planting where compatible, façade/portal screening, safe truck approach, pedestrian/bicycle connections and published construction hours. Do not screen vents or emergency paths.
Utilities and resiliency	Separate or diversify power and fiber routes where feasible; define water, sewer, stormwater, fuel, fire flow, drainage and communication systems, including failure modes and repair access.

Portal and equipment-logistics principles

- Size the route around the largest expected rack, switchgear, transformer, chiller or modular equipment—not a generic delivery truck. Verify road/bridge loads, vertical clearances, turning radii, ramp grade, hoist capacity, loading-dock geometry and replacement/removal route.
- Separate construction traffic and spoil haulage from park access; maintain safe pedestrian/bicycle routes and emergency response. Stage trucks on-site rather than in residential streets. A 53-foot tractor-trailer is a documented precedent at Iron Mountain WPA-1, not a universal minimum or design solution. [S01]
- If blasting is proposed, assess vibration, hours, notice, monitoring, explosives licensing and local/state requirements. If not, compare other excavation methods and their schedule, spoil, groundwater and neighborhood impacts.

4. Engineering feasibility: subsurface, structure, safety

Ground, water and existing-mine risk

Require staged investigations by qualified geotechnical and hydrogeological professionals. For a new cavern, the excavation geometry, rock-mass strength, discontinuities, groundwater and construction sequence

determine support and stability. For reuse, add records, as-built surveys, rock/lining condition, water inflow history, contamination, subsidence and legacy mine access. Maps are screening tools, not acceptance criteria. [S03–S04, S10–S12]

- Map seasonal groundwater and aquifer connections; measure inflow and pressure; assess uplift, seepage, karst/voids, abandoned workings, settlement, sinkholes and neighboring wells.
- Model surface flooding, pluvial drainage, storm surge where relevant, portal/shaft entry, climate extremes, groundwater rise and loss of pumping/power. “Below grade” is not flood protection by itself.
- Design redundant drainage, leak detection, isolation, waterproofing, emergency power and maintainable pumps. Identify lawful destinations for construction dewatering, cooling blowdown and treated wastewater before excavating.
- Screen brownfields with All Appropriate Inquiries/Phase I and likely Phase II sampling, vapor intrusion and remediation; a Phase I does not establish that subsurface materials are clean. [S15]

Structure and equipment loads

Design to actual rack, power, cooling, raised-floor, battery, lifting, maintenance-vehicle, soil, snow, crowd, wind and seismic loads—plus future equipment changes. Surface use is not an aesthetic overlay: saturated planting media and concentrated play/event loads can control the cap design. Published example rack loads are not substitutes for vendor loads and the engineer of record. [S05, S33]

Fire, life safety and operational access

Deep occupied levels can trigger special underground-building provisions. As an example only, 2021 IBC Section 405 addresses occupied floors more than 30 feet below exit discharge and includes construction, sprinklers, smoke control, egress and standby/emergency power requirements; locally adopted edition and amendments control. Establish early with the building official/fire marshal the occupancy classification, exit discharge, number and separation of exits, smoke control, suppression/detection, fire-service access, refuge/evacuation, emergency power and battery fire strategy. [S05–S06]

- Develop a fire/smoke strategy for IT halls, UPS batteries, fuel systems and plant spaces; coordinate detection, compartmentation, suppression, drainage and smoke migration.
- Demonstrate independent, maintainable evacuation and emergency-responder access during flooding, loss of power, smoke, equipment failure and construction. A mine’s existing shaft is not automatically an acceptable exit.
- Construction in tunnels/shafts/chambers may fall under OSHA underground-construction rules; a facility being underground does not alone make it a “mine” under MSHA. Resolve the actual activity and jurisdiction. [S30]

5. Power strategy, including self-contained plants

KEY DISTINCTION

A dedicated onsite plant can make a campus more independent of grid interruptions, but “own plant” does not automatically mean energy independence. Firm fuel, plant redundancy, auxiliary power, permits, grid synchronization/islanding, black start, dispatch rights, emissions and maintenance must all be solved. A microgrid can be grid-connected and islandable; it is not necessarily self-sufficient.

Power configurations to compare

Configuration	What it provides	Main trade-offs / feasibility	Concept view
1. Utility + UPS + emergency	Lowest complexity of the onsite	Still exposed to utility capacity and	Baseline reference.

generation	options; grid provides normal energy, UPS bridges transient outage, engines cover emergency outages.	upgrades; emergency generators have limited operating purpose and air/noise rules. Not a self-contained prime-power plant.	
2. Utility + islandable microgrid + BESS + prime-power plant	Can serve as normal supply and island during outages; dispatchable generation supports continuous operations. BESS handles transfer/ride-through, peak support and black-start functions if designed for it.	Requires utility/interconnection agreements, controls/protection, firm fuel and full emissions permitting. More resilient but more capital, operating and community footprint. Strongest "community-responsible self-supply" case to test.	
3. Fully islanded plant (no utility dependence)	Dedicated generation and fuel systems meet all normal facility energy and reserve requirements.	Highest burden: redundant firm capacity, fuel supply/storage, maintenance, start/black-start, reserve margin, cooling parasitics, emissions, water, spares and operators. A single-fuel or single-plant failure can threaten the entire campus. Only pursue for a strategic need with strong economics.	
4. Renewable-plus-storage microgrid	Onsite PV and/or contracted renewables with BESS and dispatchable firming; reduces some grid purchases and can improve emissions profile.	PV is intermittent and limited by surface area; storage duration and recharge need analysis. At data-center scale it is usually a complement unless paired with adequate firm generation or grid supply.	
5. Future nuclear SMR/microreactor	Potential firm, low-carbon generation if technology, license, site and commercial arrangements align.	Long-lead, licensing, security, fuel, waste, emergency planning, cost and deployment uncertainties. Do not make it the base schedule/cost case absent an approved vendor/site/permit path. DOE discusses benefits and challenges; no generic project readiness is implied. [S27]	

Onsite generation technologies

Technology	Strengths for a data center	Key diligence and constraints
Natural-gas reciprocating engines	Modular blocks, dispatchable power, familiar service ecosystem; can be configured for prime power or standby depending on design and permits.	Firm gas capacity/pressure, pipeline and backup fuel strategy; NOx/CO/CO2, engine count and stack design; emissions and noise permits; maintenance and outage planning. Emergency-only operating limits cannot be repurposed as unrestricted prime-power authority. [S16–S17, S29]
Gas turbines / combined heat and power	Large blocks, potential for continuous duty; CHP can improve useful energy value when a real heat customer exists.	Air permit, emissions, fuel pipeline capacity, turbine lead time, heat rejection, water and acoustic/stack placement. CHP is attractive only with a dependable thermal offtaker and temperature match; otherwise it may add complexity. [S16, S28–S29]
Stationary fuel cells	Potential high-efficiency continuous generation; modular deployment. Fuel cells using natural gas still have upstream fuel emissions and are not automatically zero-carbon.	Fuel-cell type, fuel quality/processing, fuel supply, vendor availability, stack replacement, maintenance and permitting. Verify delivered cost and duty-cycle guarantees; DOE outlines fuel-cell fundamentals. [S26, S28]
Solar PV + battery energy storage	Adds renewable energy, can shave peaks/bridge transitions and support selected resilience/flexibility functions.	Surface area, intermittency, storage duration, fire code, battery siting and replacement. A park roof is not a large power field and should not be assumed to supply a 20 MW IT campus alone.
Battery / thermal storage	Fast response and short-duration ride-through; can reduce transient and peak demands or	Storage is not a primary energy source; duration, recharge, temperature, degradation,

	shift some cooling load.	fire protection and controls matter. Model critical versus deferrable loads.
Hydrogen / other low-carbon fuels	Could reduce direct carbon at point of use with a suitable technology and verified low-carbon fuel supply.	Fuel availability, lifecycle carbon, storage, transport, conversion efficiency, safety, price and code path remain project-specific; do not assume commercial supply at the site.

Recommended power architecture for study

Carry a utility-backed islandable microgrid as the lead concept: firm grid service where available; diverse feeders only where genuine source/path diversity is demonstrated; UPS for no-break ride-through; a sized battery system for transition, black start and selected flexibility; and a modular, dispatchable onsite plant sized to a defined service target. Evaluate gas engines/turbines or fuel cells against verified fuel, emissions, tariff and resilience cases. Solar/renewables are supplemental. Keep fully islanded supply and nuclear as explicit alternatives, not assumed base cases. DOE describes microgrids as systems that can operate connected to or islanded from the grid; FERC's 2026 work highlights changing large-load rules for co-location and behind-the-meter generation. [S18, S25, S28]

Plant sizing: 20 MW IT illustration

Assumed PUE	Illustrative coincident facility demand	Annual energy at 100% of 20 MW IT load continuously
1.20	24 MW	210,240 MWh/year
1.30	26 MW	227,760 MWh/year
1.40	28 MW	245,280 MWh/year

These are arithmetic scenarios (20 MW IT × PUE × 8,760 hours), not a design forecast. They assume the full 20 MW IT load operates continuously; actual load factor, seasonal cooling, PUE measurement boundary and future compute density will change energy. Installed plant nameplate must exceed the required net service load when accounting for auxiliaries, ambient derating, maintenance and the chosen N+1/2N criterion. A single 24–28 MW nameplate plant would not provide N+1 resilience at those loads.

Power-plant regulatory and community screen

- Obtain an air-agency pre-application determination for each technology, full source aggregation, engine/turbine specifications, potential-to-emit, attainment status, NSR/PSD/Title V screening, applicable NSPS/NESHAP, test hours, emergency and non-emergency dispatch, and enforceable operating limits. State/local agencies issue most data-center air permits. [S16–S17]
- Secure fuel capacity and resilience: pipeline pressure/firm transportation, gas curtailment terms, alternative fuel if any, storage volumes, fire separation and delivery route. A gas plant's fuel line may have separate utility, road, pipeline and land-use approvals; interstate pipeline facilities can involve FERC. [S29]
- Evaluate stack height/dispersion, generator and cooling noise, low-frequency sound, vibration, lighting, truck deliveries and testing at homes, schools and park edges. Set auditable limits and post-construction verification; local noise standards govern. [S32, S35]
- Do not design the main combustion plant underneath public park space merely to hide it. Below-grade plant rooms create additional combustion-air, exhaust-stack, heat, fire, fuel, responder-access and maintenance problems. Compare a screened/bermed service area or remote campus plant; preserve the park's quiet zones and clean-air intakes.
- A behind-the-meter plant may still face utility tariff, interconnection, reliability and cost-allocation obligations. Verify current state commission, utility and RTO/ISO rules for the chosen configuration. [S18–S19]

6. Cooling, water and heat rejection

Underground location does not remove the IT heat load. Compare direct-to-chip/liquid or air-side cooling with dry, evaporative and hybrid rejection under local climate and water constraints. Dry coolers can reduce onsite evaporative water use but may increase energy or equipment footprint; cooling towers can improve heat rejection but consume water and discharge blowdown. Closed internal loops are not “zero water” if an external tower evaporates water. [S07–S09]

Question	Required evidence
Water supply	Written utility confirmation for annual/peak demand, quality, pressure/fire flow, drought restrictions, expansion schedule, rates and service commitments; assess reclaimed water and state water rights if self-supply is proposed.
Cooling performance	Annual/peak energy, PUE and WUE under local dry-/wet-bulb weather and intended rack density; redundant heat rejection and fault cases.
Discharge	Cooling blowdown chemistry, treatment, volume, sewer acceptance/pretreatment or NPDES route; construction dewatering and long-term seepage destination.
Water ingress	Seasonal groundwater, perched water, aquifer connection, hydrostatic pressure, karst/voids, flood path, uplift, sump failure and loss-of-power case.
Heat use	Identify an actual year-round nearby thermal customer and temperature match before crediting recovered heat; otherwise design the real heat rejection system.

7. Community program and concept renderings

Four generated concept renderings explore surface uses above a hypothetical underground facility. They are illustrative design concepts—not surveyed plans, code-compliant designs, construction documents, or depictions of a selected property. The portal and plant locations are conceptual. Final park access and programming must follow structural, maintenance, security, ventilation, fire-access and community review.

Option A — neighborhood park and walking loop

Best first-phase public-realm candidate where the cap is designed for pedestrian and small gathering loads: accessible loop, seating, shade, native planting, pollinator meadow and a discreet service edge. Keep truck access on a separate perimeter approach; place deeper-rooted trees only in engineered soil zones.



Concept rendering A. Neighborhood-scale park and walking loop above a hypothetical underground data center; service portal is separated from primary public circulation.

Option B — sports and recreation

Potentially valuable but structurally demanding. Multi-use court, fitness area and open lawn require dynamic/crowd loads, anchorage, impact surfacing, lighting, noise review, emergency lanes and event-size limits. Use only within certified load zones and after community-led programming.



Concept rendering B. Active recreation option; high-dynamic-load uses are conditional on engineered capacity and safe separation from service operations.

Option C — woodland trails and ecological landscape

A quieter landscape option with loop trails, native meadow and tree clusters in designated soil-volume “islands.” Avoid assuming continuous deep soil over the entire cap. Specify root barriers, drainage, irrigation, replacement access and habitat-maintenance responsibility.



Concept rendering C. Woodland/trail option; tree placement, soil volumes and infiltration must be designed with the roof structure and drainage system.

Option D — civic plaza and community garden

A flexible neighborhood interface with plaza seating, raised planters, small community events and possible interpretive signage. Raised planters add saturated load and require approved water, drainage and stewardship. Event structures, vehicles and crowd concentrations are prohibited from unverified zones.



Concept rendering D. Civic-plaza option with community gathering space; event loads, planters, service easements and long-term stewardship require approval.

Common park design rules

- Map cap load limits, drainage, waterproofing, vents, hatches, utility corridors, emergency routes, plant intake/exhaust, service access and security first; then overlay park programming.
- Use a certified “surface use plan” with permitted load zones, prohibited vehicle zones, event limits, closure protocols, maintenance responsibility and public-access hours. Record easements and maintainable access rights.
- Do not assume standard park soil depths or large trees are feasible; calculate saturated soil, snow, crowds, play, maintenance equipment and tree overturning loads. Coordinate root depth, planter systems, soil replacement and waterproofing. [S33]
- Set plant and hardscape choices with residents. Consider accessible paths, shade, seating, restrooms only if utilities and maintenance support them, pollinator habitat, play/fitness if structurally feasible, and locally desired amenities.
- Put public value in enforceable agreements: park capital funding, maintenance/endowment, public hours, maintenance response, monitoring, noise and lighting standards, truck routes, local workforce commitments and annual public reporting.

8. U.S. regulatory, zoning and approval map

IMPORTANT

There is no single federal “underground data-center permit.” Zoning, building, fire, park access, noise and roads are strongly jurisdiction-specific. Federal permits may be triggered by waters/wetlands, discharges, air emissions, federal funding/land/rights-of-way or other agency actions. This is an early-screening checklist, not legal advice.

Workstream / trigger	Likely approval or review	First action
Zoning / land use	Permitted/conditional use, rezoning, variance, site plan, subdivision, development agreement; park/open-space dedication and easements.	Joint pre-application with planning, parks, building, fire, public works and road authority. Include plant, portal, vents, stacks, loading hours and public access.
Building / fire / accessibility	Locally adopted building, fire, mechanical, electrical, energy, accessibility and life-safety codes; underground occupancy and smoke control.	Ask officials for adopted editions, underground thresholds, egress, fire-service access, smoke control, suppression, emergency power and battery strategy.
Construction safety / excavation	OSHA/state-plan requirements for excavation, tunnels, shafts, underground construction and blasting; ATF/state/local explosive approvals if blasting.	Submit geotechnical baseline, excavation sequence, ventilation/rescue, spoil, settlement/vibration monitoring and emergency plan. Resolve OSHA/MSHA boundary for mine conversion.
Stormwater / dewatering	NPDES construction permit, NOI/SWPPP, erosion controls; dewatering discharge and industrial wastewater/pretreatment. Federal one-acre threshold is a screen; state programs may differ.	Map common-plan disturbance and every outfall; ask state NPDES authority; sample water and identify lawful discharge route before excavation. Check permit in force when applying. [S13]
Wetlands / surface waters	CWA Section 404 if dredge/fill is discharged to jurisdictional waters; state/Tribal wetland rules may be broader.	Wetland/stream delineation and Corps jurisdictional determination before fixing portal, utilities, park grading, staging and outfalls. [S14]
Groundwater / injection	State groundwater/well rights; EPA/state Underground Injection Control if design constitutes subsurface injection; NPDES if qualifying discharge reaches surface water.	Prepare water balance and hydrogeologic memo; define dewatering, heat rejection, discharge/injection and neighbor-well impacts.
Federal review nexus	NEPA, ESA Section 7, NHPA Section 106 can arise with federal action/funding/authorization; ESA take risk may exist independently.	Identify federal land, loan, permit, easement or right-of-way; consult lead agency, USFWS/NMFS, SHPO/THPO/Tribes as applicable.
Air quality / onsite plant	State/local air permit; applicable NSPS/NESHAP; potential NSR/PSD and Title V based on source, PTE, location and operating	Submit complete plant and backup-engine inventory and modeled emissions before equipment procurement. Emergency-engine

	profile.	rules do not grant general prime-power operation. [S16–S17]
Noise / public process	State/local noise ordinance, permit conditions, generator testing, construction-hours and public-hearing rules.	Baseline and modeled day/night + low-frequency sound; publish test hours, post-build monitoring, complaint response and corrective action.
Hazardous materials / fire	EPCRA/Tier II; SPCC if thresholds/pathway apply; fuel tanks, refrigerants, lithium batteries, hazardous waste and fire-code thresholds.	Inventory fuel/oil/chemicals/refrigerants/batteries; assess SPCC, Tier II, waste, refrigerant leakage, fire access and responder plan. [S40]
Traffic / roads / utilities	Driveway/encroachment, road opening, oversize/overweight, haul-route, utility ROW and interconnection permits; ownership matters.	Truck swept-path, pavement/bridge, queue, safety and road-condition studies; obtain written utility service/interconnection path.

Regulatory details to treat as live diligence

- EPA's 2022 Construction General Permit is reported to expire February 16, 2027, with a proposed 2027 permit pending in the researched source. Confirm the actual permit and administering authority when filing; state-authorized programs can differ. [S13]
- Clean Air Act rules differ by generator type, size, fuel, construction date, source status, location and emergency/non-emergency operation. Screen the full fleet and proposed dispatch; most air permits are state/local. [S16–S17]
- The WOTUS litigation map and implementation can change; parcel-specific Corps determinations and current state/Tribal rules matter. Section 404 applies only when the relevant discharge and jurisdictional criteria are met. [S14]
- NEPA is not a general private-project approval. Determine whether there is a federal action; then identify required agency review and consultations. [S45, S43, S44]
- Noise is predominantly state/local. Examples from one county are not national standards. Evaluate homes and park users, nighttime conditions, low-frequency tones and generator testing. [S32, S35]

9. Market and illustrative economics

Market signal: real demand, not guaranteed absorption

CBRE reported 10,903 MW of supply in North American primary data-center markets in H1 2026, 1.4% vacancy, 7,481 MW under construction and 80.4% of under-construction capacity preleased. LBNL's 2026 update estimates 649 TWh U.S. data-center electricity use in 2030 in its reference case, with a wide 521–843 TWh uncertainty range. These signal sector demand and power pressure; neither proves tenants will pay a premium for an underground building. [S20, S23]

Cost and commercial framing

Cushman & Wakefield's 2026 U.S. guide reports a $17.6 million/MW average conventional greenfield development cost; JLL reports global shell-and-core benchmarks of $10.7 million/MW in 2025 and $11.3 million/MW in 2026, while separating tenant technology fit-out. Definitions, geography and inclusions differ, and neither estimates an underground project. A simple 20 × $17.6 million scaling equals $352 million only if the MW basis and scope truly align; treat it as arithmetic context, not a budget. [S45, S43, S44]

Public evidence reviewed did not yield an audited, scope-matched $/MW premium/discount, project schedule or whole-facility energy saving for an underground build. CBRE's published rents are asking rates and smaller block prices should not be extrapolated to a 20 MW lease. State incentives vary and must be verified for the exact parcel/entity. [S23–S24]

Illustrative cost model structure

Cost / value line	Underground-specific questions to price
Land / site	Land, title, easements, brownfield liabilities, mine rights, park dedication and access.
Civil / structure	Cavern purchase/conversion or excavation; rock support; waterproofing; portals; shaft/ramps; spoil; settlement monitoring; drainage/dewatering.
MEP / resilience	Power plant and interconnection, utility upgrade, UPS/BESS, cooling/heat rejection, ventilation, fire/life safety, fiber, security, controls and redundancy.
Environment / approvals	Phase I/II, remediation, water permits, air permits, public process, construction mitigation, insurance and schedule contingency.
Operations	Electricity and demand charges, fuel and transport, water/sewer, staffing, maintenance, plant overhaul, pumps, cooling, property taxes and park maintenance.
Revenue / financing	Tenant rent and power pass-through, lease term/ramp, prelease, tenant credit, incentives, debt/equity terms, replacement capex and exit value.

Investment decision rule

Underwrite only after matched estimates for conventional greenfield, mine reuse and new excavation; written utility/fuel/water commitments; credible 20 MW tenant/lease evidence; site-specific permit path; quantified park obligations; and cost/schedule contingency. Do not state IRR, NPV, payback, or “savings” until these inputs exist.

10. Risk register

Risk	Rating	Why it matters	Mitigation / owner gate
Ground instability, voids, karst or mine liabilities	High	Can stop excavation, compromise structure or cause settlement.	Staged borings, mapping, geophysics, mine records, geotechnical baseline; gate 2.
Groundwater/flood ingress and loss of pumping	High	Can threaten power/IT and affect aquifers or neighboring properties.	Hydrogeology, flood/portal analysis, redundant drainage/power, permitted water destination; gate 2.
No firm power or delayed upgrades	High	Can strand the site or delay revenue years beyond shell delivery.	Utility/RTO studies, written milestones, tariff/cost allocation and bridge-power permit path; gate 3.
Onsite generation fails permits or fuel supply	High	A plant may be unavailable or legally limited during grid constraints.	Air pre-application, firm fuel study, PTE model, noise study, controls and operating agreements; gate 3/4.
Life-safety / smoke-control / egress infeasible	High	Deep occupancy can require costly specialized design; failure is a no-go.	Early AHJ determination, fire engineering, multiple exits, emergency response and mock logistics; gate 4.
Underground cost premium erodes returns	High	No public matched cost basis; specialized civil/MEP scope may offset land or amenity value.	Independent estimator, scope-matched alternatives, contingency and lifecycle model; gate 7.
Equipment access/maintenance constrained	High	Large transformers, racks or chillers may be difficult to replace; operations risk persists.	Full-size delivery/removal templates, staging, lifts, maintainable access, dust/vibration protocols.
Water/cooling constraints	Medium-high	Drought, supply, energy, discharge, blowdown or discharge permits affect operations.	Water balance, dry/evaporative alternatives, utility letters, permits and drought analysis.
Community opposition / park overpromising	Medium-high	Noise, construction trucks, loss of public access or maintenance failures undermine approval.	Early engagement, transparent baselines, binding performance and park-maintenance funding.

Park cap leaks, loading or lifecycle burden	Medium-high	Waterproofing failures can be costly and surface uses may exceed design loads.	Certified load plan, access easements, inspection/repair funding, limits and closures.
Permit schedule / legal changes	Medium	Federal/state/local rule changes and public proceedings affect schedule.	Jurisdiction matrix, agency pre-applications, schedule float, current-law verification at filing.
Market/lease/financing mismatch	Medium-high	Demand growth does not guarantee a tenant premium or lender acceptance.	Tenant RFP/prelease, lender feedback, site-specific lease pricing and conservative phase case.

11. Development roadmap and decision gates

Stage	Work product	Gate / proceed condition
0. Define concept	Target market; required IT load; business model; conventional comparator; desired park outcomes; power configuration options.	Approve a short list of regions and 3–5 candidate parcels; no marketing claim of "zero impact."
1. Desktop screen	Geology/mine history, flood, groundwater, brownfield, zoning, roads, fiber, utility and water screening.	Reject fatal geology, title, access, zoning or environmental constraints before expensive design.
2. Pre-application + site access	Joint agency meetings; utility/RTO capacity and tariff request; preliminary park/portal; neighboring-receptor map.	Written pathway for land use, fire/building, power, air, water, roads and park ownership.
3. Site investigations	Borings/geophysics, groundwater monitoring, mine survey, Phase I/II, flood/hydrogeology, noise/traffic baselines.	Demonstrate manageable ground/water; define geotechnical basis and cost/schedule confidence.
4. Concept engineering	30% concept layouts, loads, routes, cooling, plant, microgrid, fire/smoke, park cap and operating model.	AHJ confirms viable code path; utility confirms credible power path; plant has plausible permit/fuel route.
5. Commercial / environmental	Matched contractor estimate; tenant market test; preliminary permits; park agreement; community commitments; insurer/lender review.	Acceptable risk-adjusted economics under downside and delay cases; no unsupported underground savings.
6. Detailed design / approvals	Final design, permit applications, public hearings, utility agreements, financing, procurement and construction controls.	All required approvals and binding service/fuel/water/lease terms before irreversible spend.
7. Construction / commissioning	Excavation or conversion, monitoring, shell/MEP, plant tests, integrated systems and park handover.	Independent life-safety, load, water, emissions, noise and resilience verification before operation.

Power delivery should be treated as a separate schedule line from construction. A national lab report describes typical data-center load ramps of 12–24 months versus 3–5 years for utility reinforcements; actual site timelines vary. Phase construction and energization only if common infrastructure, tariffs, plant permits and lease ramp support it. [S19]

12. Go / no-go criteria and immediate next steps

Proceed only if all hard gates are satisfied

- A named parcel has acceptable title, geology, groundwater/flood exposure, mine history, access and permitted discharge routes, validated by site investigation—not just maps.
- The utility and/or onsite plant can supply the required dependable load with a documented energization schedule, firm fuel, viable tariffs, legally permitted operating profile and resilience configuration.
- The local building/fire officials confirm a viable underground occupancy, egress, smoke-control, fire protection and emergency-response path.
- A parcel-specific permit matrix covers zoning, air, water, wetlands, roads, construction, hazardous materials, federal nexus and community process; no fatal issue is deferred to after procurement.

- A real tenant and lender case supports the capacity, rent, lease structure, schedule and funding; underground premium and park obligations are explicitly priced.
- The park is engineered and funded for actual public uses, easements, operations, repairs, safety and long-term maintenance, with community commitments measurable and enforceable.

First 90 days after selecting a region

1. Select 2–3 candidate parcels, one conventional comparator and the target utility/RTO; request written large-load capacity, study, upgrade, tariff and energization information.
2. Hold a joint concept meeting with planning, building/fire, parks, road authority, water/wastewater and air agencies; provide underground depth, truck portal, park program and onsite plant alternatives.
3. Secure site access for desktop review, mine records, geophysics/borings planning, water monitoring, title, environmental assessment and traffic/noise baselines.
4. Ask an independent data-center engineer, geotechnical engineer, power-system engineer, environmental/permitting counsel and cost estimator to prepare comparable concept scopes and risk ranges.
5. Talk to prospective tenants and lenders before optimizing the surface amenities; verify willingness to accept underground operating topology, maintenance constraints, lease terms and commissioning timing.
6. Hold an early community listening session before a rezoning/design decision; ask residents which surface uses, monitoring, hours, access and community benefits would be meaningful.

Conclusion

The strongest version of the proposal is not “bury a data center and promise a park.” It is a site-specific, power-secured, geotechnically proven, code-compliant facility whose surface remains genuinely useful to residents and whose industrial impacts are measured and enforceable. The concept warrants a disciplined, staged pre-feasibility program. An existing mine may be the best first test case if its structure, water, access, utility and title are verified; a new underground excavation should face a higher proof threshold. A self-contained power plant is possible, especially as part of an islandable microgrid, but it introduces a second major industrial project—fuel, air, noise, water, safety and tariff approvals—rather than making the campus impact-free.

Appendix A — curated source register

Sources were reviewed for this concept-level U.S. study and accessed November 8, 2026 unless a publication date is shown. Regulatory applicability can change; verify current agency rules, state/Tribal/local programs, adopted code editions and parcel-specific determinations before relying on any entry. Operator and commercial market sources are identified as such in the report.

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S13 U.S. Environmental Protection Agency, "Stormwater Discharges from Construction Activities" (updated Aug. 10, 2026). https://www.epa.gov/npdes/stormwater-discharges-construction-activities

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Appendix B — concept image files

The four concept images are embedded in Section 7 and included as separate files with the deliverable package. They should be treated as visual inspiration only; no subsurface dimensions, engineering capacity, jurisdictional compliance, or actual property conditions are represented.