Greenfield vs Brownfield
Pharmaceutical Facilities

Nic van der Nol

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GMP FORUM

Introduction

Finding and establishing a site for a GMP manufacturing facility is one of the first and most important decisions in the life cycle of a manufacturing project.

Typically driven by the demands of business expansion or augmentation.

Site selection has major (legacy) implications for project feasibility and economics and should be guided by the premises within the business planning.

Options for either a greenfield development (undeveloped site) and brownfield site (previously developed site) require careful consideration.

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Greenfield Project

- **"Greenfield"** is a term from construction industry that refers to **undeveloped land**.
- Greenfield projects build on an undeveloped site.
- 'Lacking constraints'
- 'Start from scratch'
- Vacant, available site
- Maximum (design and operational) opportunity
- Larger scale (typically)
- Less complexity
- 'Macro' considerations
- Exposed to weather/conditions

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Brownfield Project

- **"Brownfield"** is a term from construction industry that refers to **already developed land**
- Brownfield projects redevelop previously developed land
- "Having constraints"
- Occupied site, existing structure(s)
- Compromises
- Limited (design and operational) opportunity
- Smaller scale (typically)
- Greater complexity
- 'Micro' considerations
- Less exposed to weather/conditions

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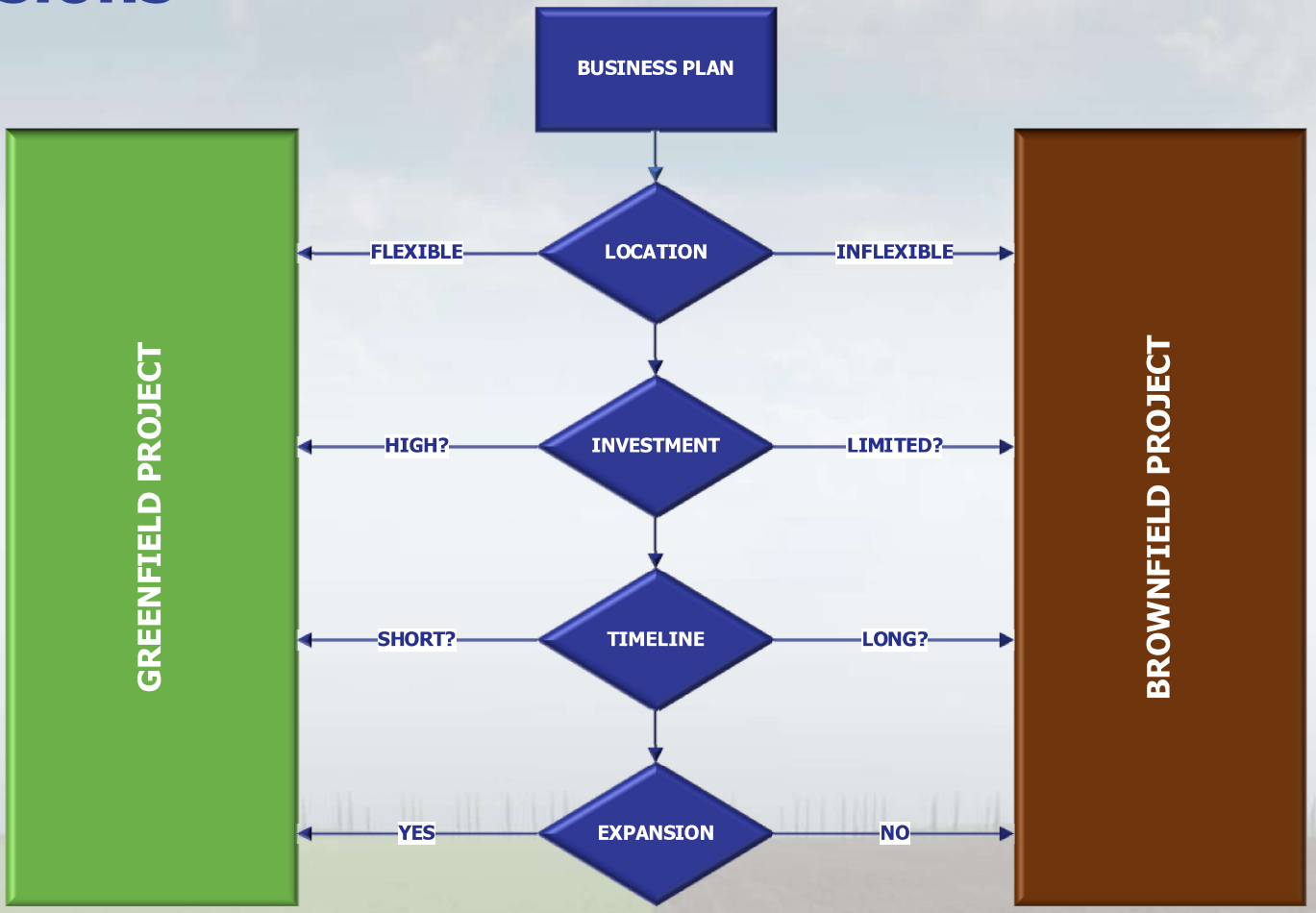
Key decisions



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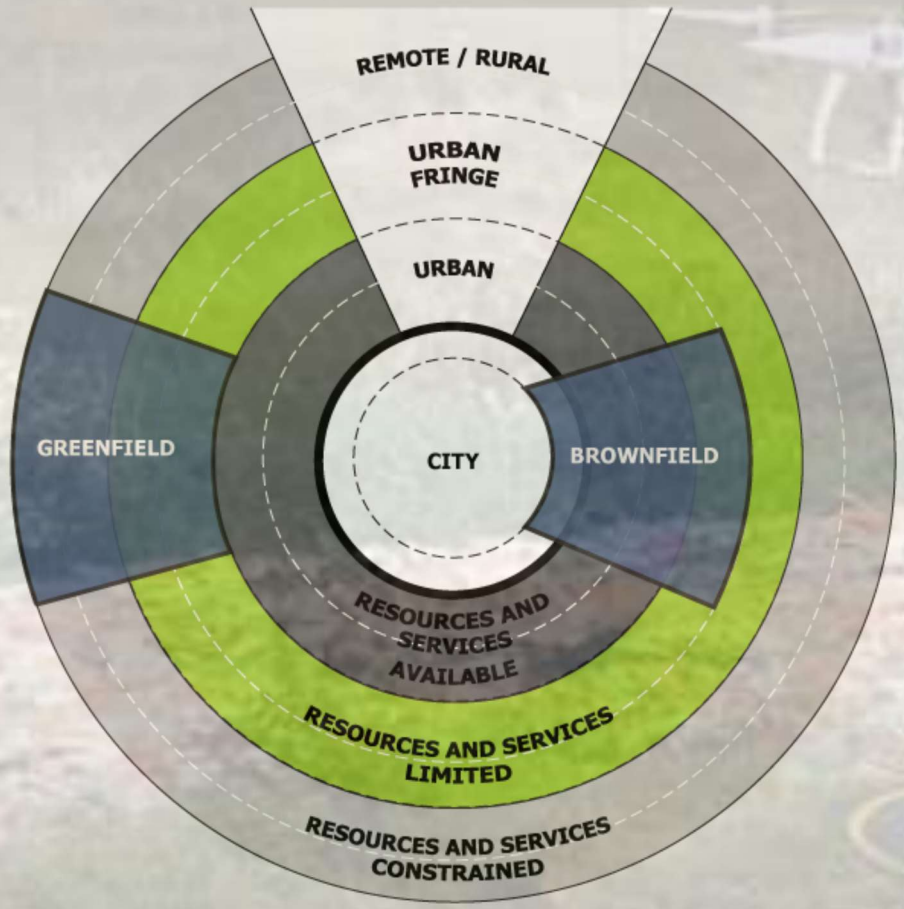
Key Site Considerations



- Site availability
- Site masterplanning
- Competitive pricing
- Project timeline
- Location (Urban cf Rural)
- Land zoning (allowable use)
- Land size
- Existing (infra) structure
- Land restrictions (easements)
- Site services
- Resource availability
- Transport links, parking
- Site conditions (fall of land)

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Site Assessment (due diligence)

- Land: size, shape, slope, soil classification
- Location: resource, travel, proximity to residential
- Town Planning: council approval for the proposed land use, clause 53.10
- Site services: power, water, natural gas, sewer, comms
- Existing building: structure, building height, infrastructure
- Site hazards: soil contamination, hazardous materials, bushfire

Tools for Site Assessment

- Property information search, property valuation(s)
- Local council (planning scheme ,development enquiries etc)
- Site survey (Civil/structural, hazardous materials, etc)
- Environment testing (soil contaminants), Environment Protection Agency (EPA)
- Designer/builder guidance

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Brownfield sites

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Brownfield sites
Advantages

- ✓ Often a good strategic location
- ✓ Shorter project timelines
- ✓ Low investment for established site
- ✓ (Part of) urban renewal projects (well supported)
- ✓ Existing approvals and licences may be in place
- ✓ Potentially faster occupancy (without lead times for DA, ODC etc)
- ✓ Opportunity for lower cost for the works (**but** dependent on remediation works etc)
- ✓ Unrecognised opportunities may exist that may suit the business (e.g. automotive)
- ✓ Funding and grants by virtue of a wider industry/community contribution

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Brownfield sites
Disadvantages

- ✓ Physical design constraints e.g. lower springing height for roofs
- ✓ Maintenance costs
- ✓ Compliance upgrades required (DDA, steps, safety barriers etc)
- ✓ Harder to achieve environmental/sustainability standards
- ✓ Higher risk of cost/schedule overrun
- ✓ Possible operational difficulties affecting "amenity" – e.g. 1km radius/distance from residential neighbourhoods in Victoria
- ✓ Likely limited structural capacity – e.g. to suspend ceiling panels, photovoltaic panels or AHUs (from existing roof which may already be at load limits). Additional structure e.g. new pad footings might be required.
- ✓ Insurance for old structures – e.g. EPS panelling vs PIR panelling

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Brownfield sites
Disadvantages

- ✓ Building design may be based on outdated code requirements (e.g. NCC) that may require updating in the event of a significant amount of work. e.g. existing egress paths may be blocked by new works
- ✓ Limited parking for staff (e.g. requiring and limited access
- ✓ Poor accessibility, possibly requiring ramps and vertical transportation (lifts)
- ✓ Latent conditions i.e. unknowns – higher risk of additional costs
- ✓ Site contamination
- ✓ Cost of underground or concealed works e.g. drainage for wash bays
- ✓ Restricted site and/or construction access, especially if maintaining 'business as usual' operations
- ✓ Risks to existing security (having contractors on operational site)
- ✓ Design & operation efficiency is often compromised to suit existing constraints.

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Brownfield sites

Challenges: "Business as Usual" (BAU)

- **MAINTAIN PRODUCTION FLOW:** Staging. After hours work. Internal partitioning. Scheduled deliveries. Temporary corridors.
- **HYGIENE MAINTAINED:** Temporary hygiene screens. Levels of physical containment. Vermin proofing. Access paths & controls.
- **SAFETY OHS:** Accreditation. Safety plan. HAZOP & HACCP. WHSO Site Managers. Risk analysis.
- **BUILDER'S ACCESS:** Scheduled deliveries. Waste management. Site layout. Lay down areas. Builder's compound. Coordination with shifts. Access for process equipment installation.
- **MAINTAIN SERVICES:** Identify existing services. Temporary service installation. Micro-programming and sub-trade coordination. Vacuum excavation. Cable locator equipment. Services cut-in.
- **SECURITY:** Scheduled deliveries. Hired security. Temporary hoarding.
- **STRUCTURAL INTEGRITY:** Pre-engineered solution. Remediation. X-ray post tensioned slabs. Supplementary bracing support.
- **ENVIRONMENTAL MANAGEMENT:** Environmental Management plan. Waste management. Noise control. Dust control.

Source Credit: Wiley Project Management

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Brownfield sites

Examples: Testing laboratories, Dandenong South

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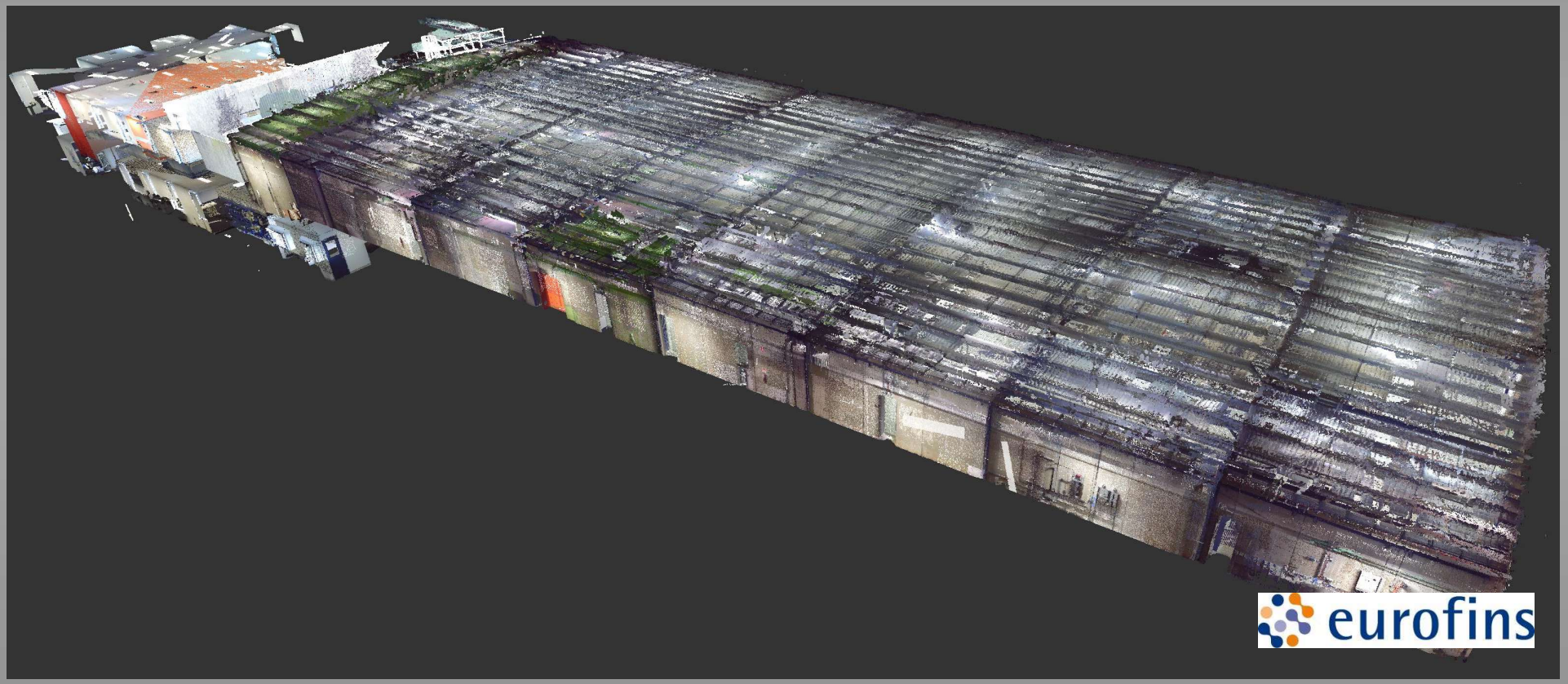

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Brownfield sites

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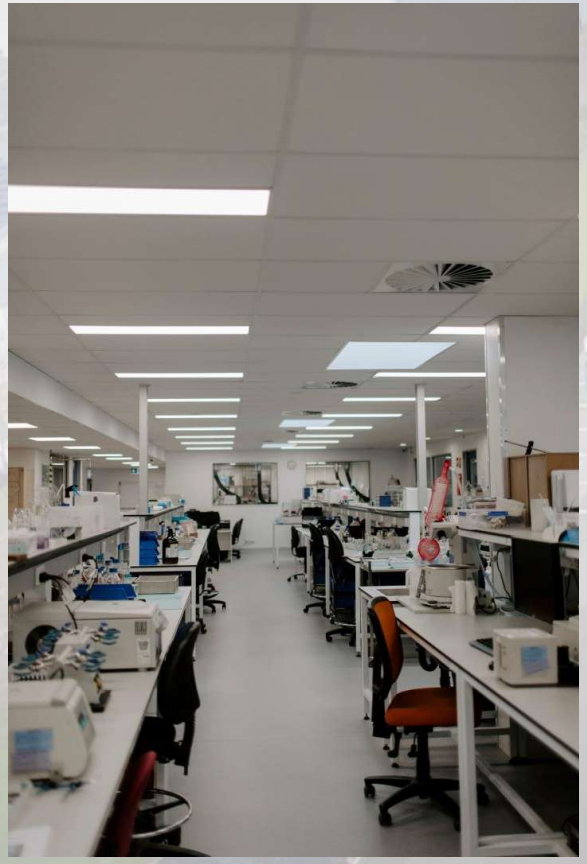

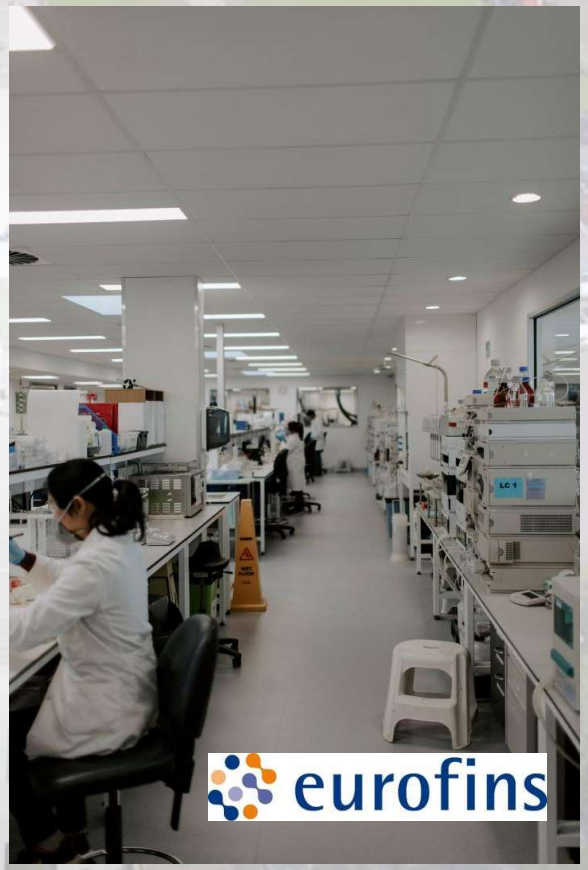

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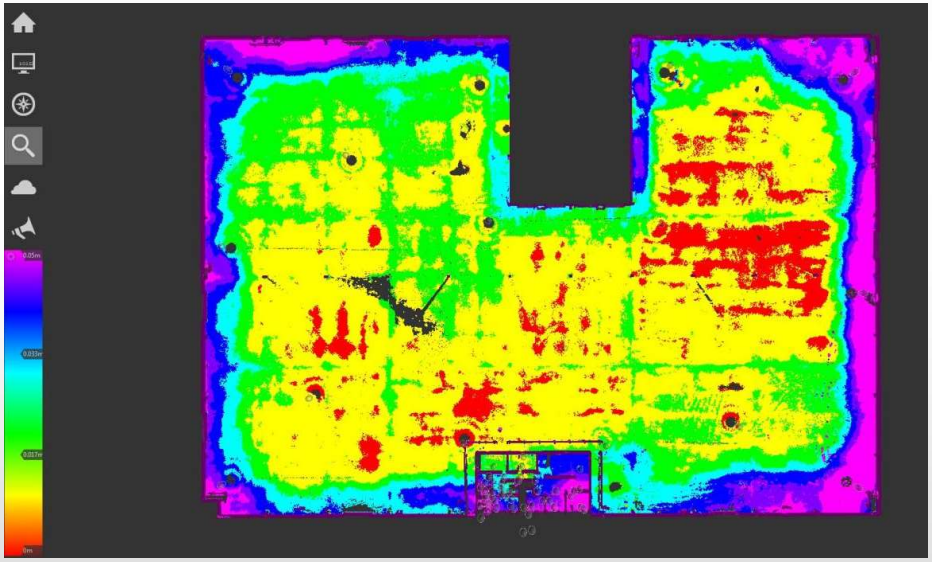
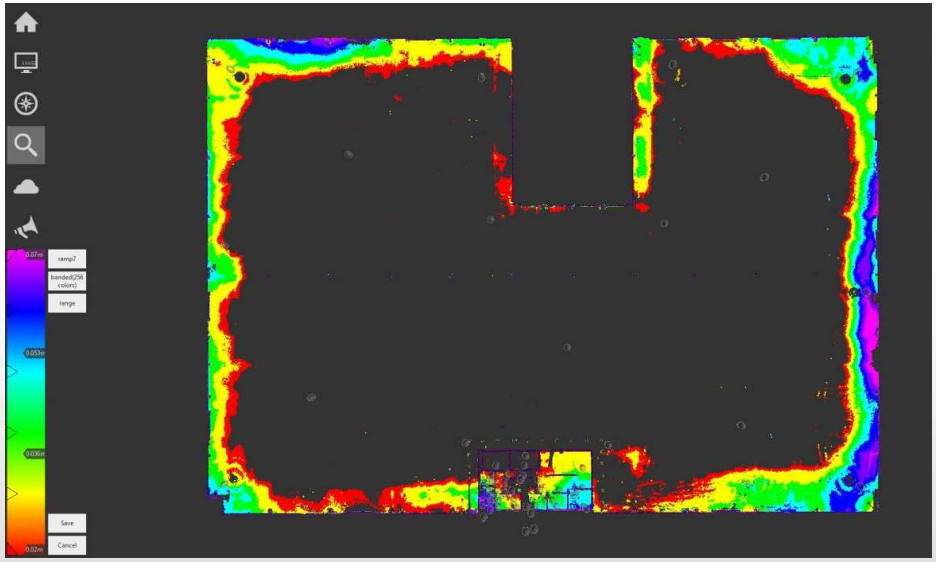
Brownfield sites

Examples: Manufacturing facility, Altona

The construction of a “digital twin” critically begins with the accurate representation of the existing conditions, performed through a three-dimensional laser scan. These digital engineering techniques can be used (e.g.) to accurately establish the floor levels of an existing building.



0-50mm range for slab height variance



20-70mm range for slab height variance

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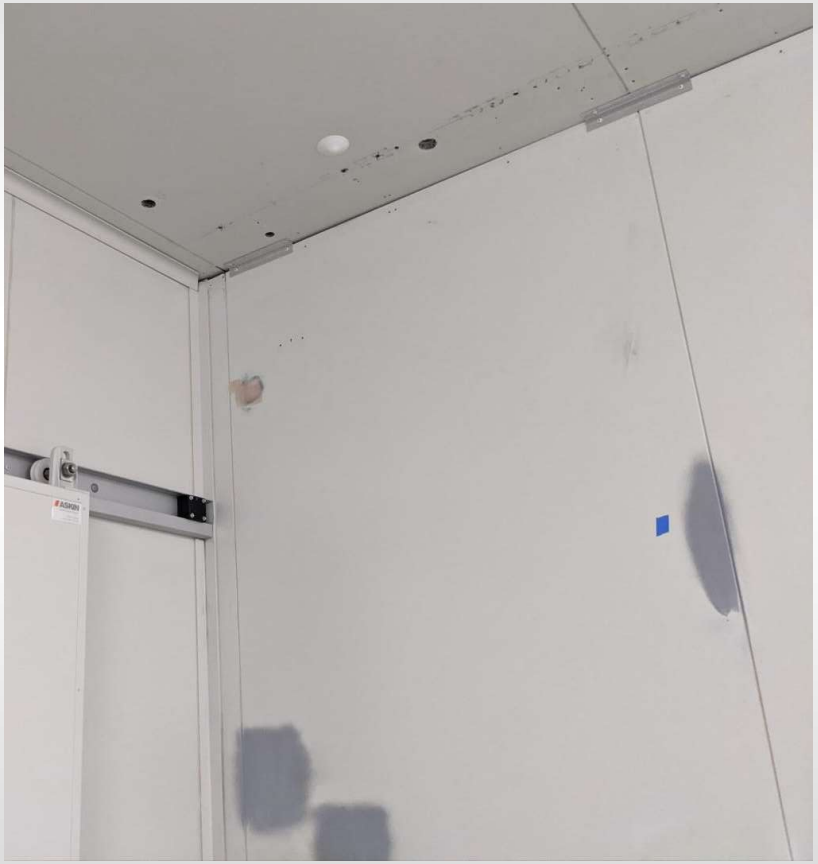
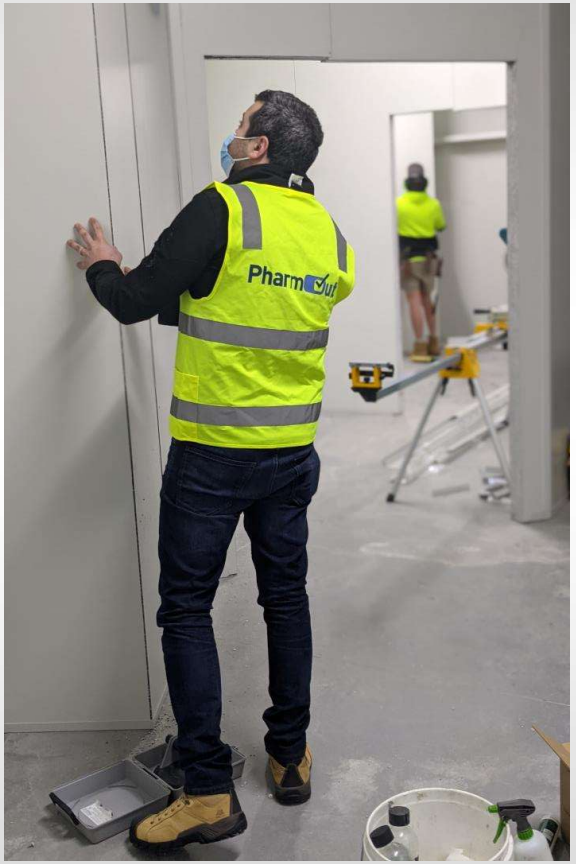
Brownfield sites

Examples: Primary packaging facility, Melbourne





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Examples: Primary packaging facility, Melbourne

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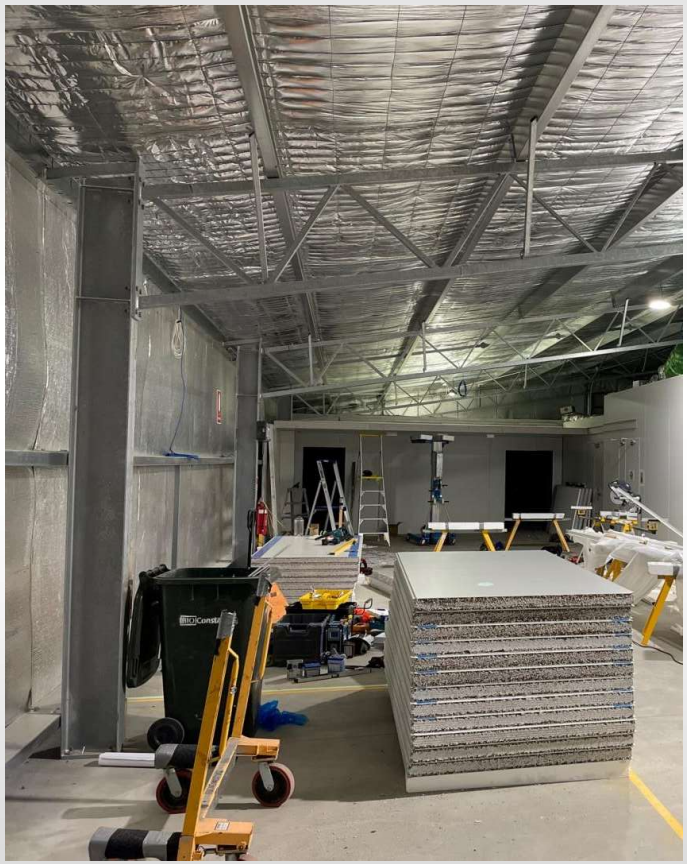
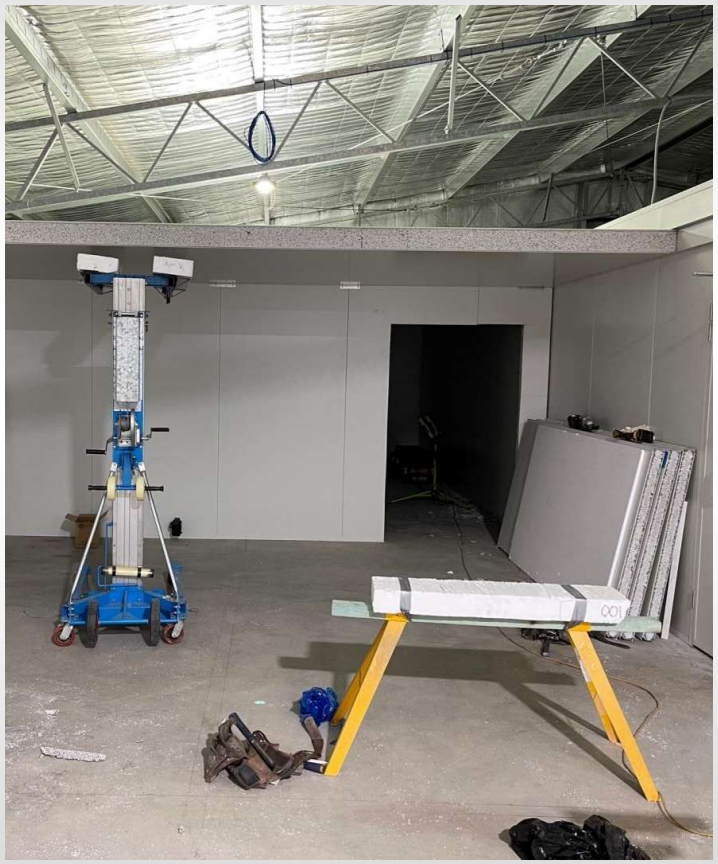
Brownfield sites

Examples: Manufacturing facility, regional Victoria





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Brownfield sites

Examples: Manufacturing facilities

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Greenfield sites

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Greenfield sites
Advantages

- ✓ Fewer limitations, enabling design flexibility
- ✓ Reduced maintenance costs
- ✓ Ease of compliance with environmental/sustainability standards, as opposed to upgrades
- ✓ Low risk development
- ✓ Lease or own (or hybrid) options available
- ✓ Designed to meet current and future needs

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Greenfield sites
Disadvantages

- ✓ Likely away from the city and services
- ✓ Finding skilled employees (far away from the city)
- ✓ Longer project timelines (i.e., building and planning permits)
- ✓ Limited land/building supply increases likelihood of site constraints
- ✓ Under-developed sites may have additional development costs

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Greenfield sites

Examples: Cannabis facilities

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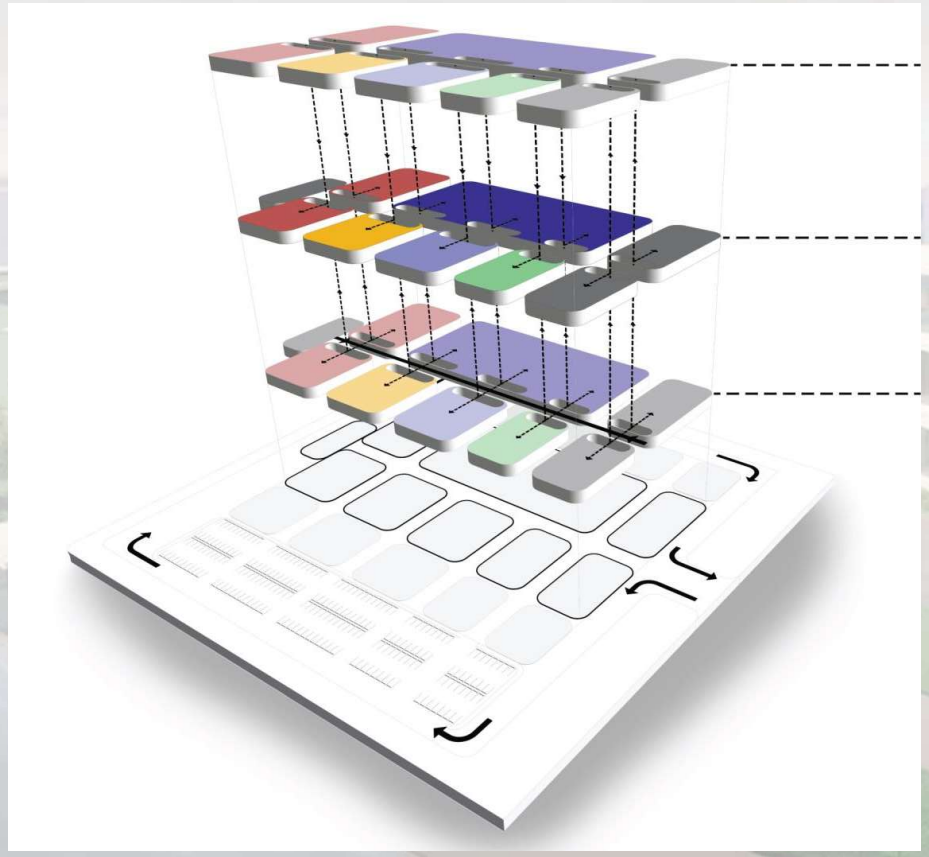
Greenfield sites

Examples: Large manufacturing facilities



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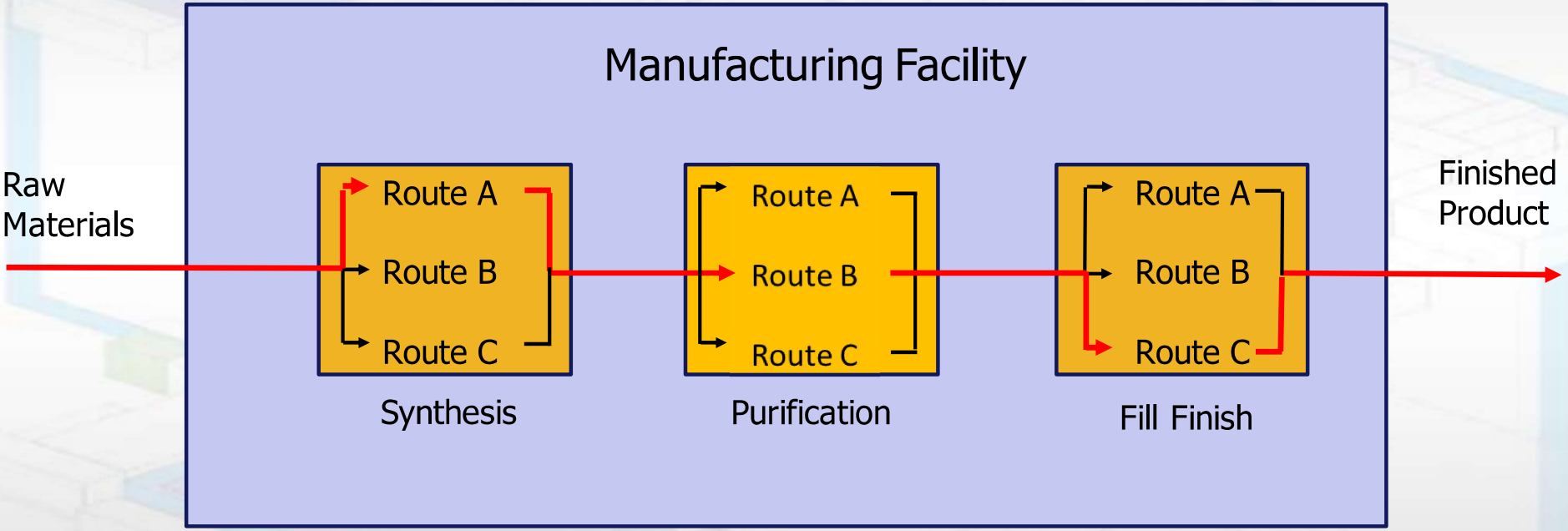
Multi-modal facilities



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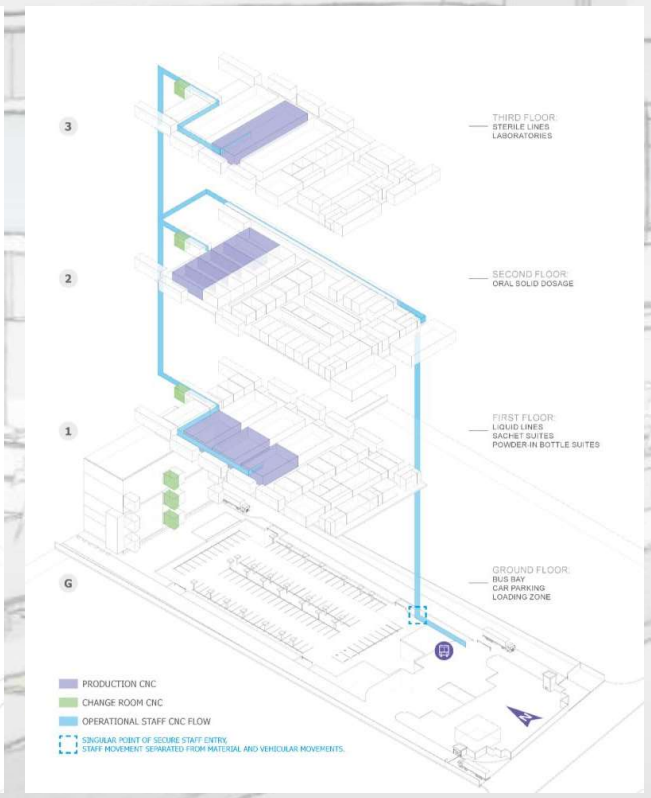
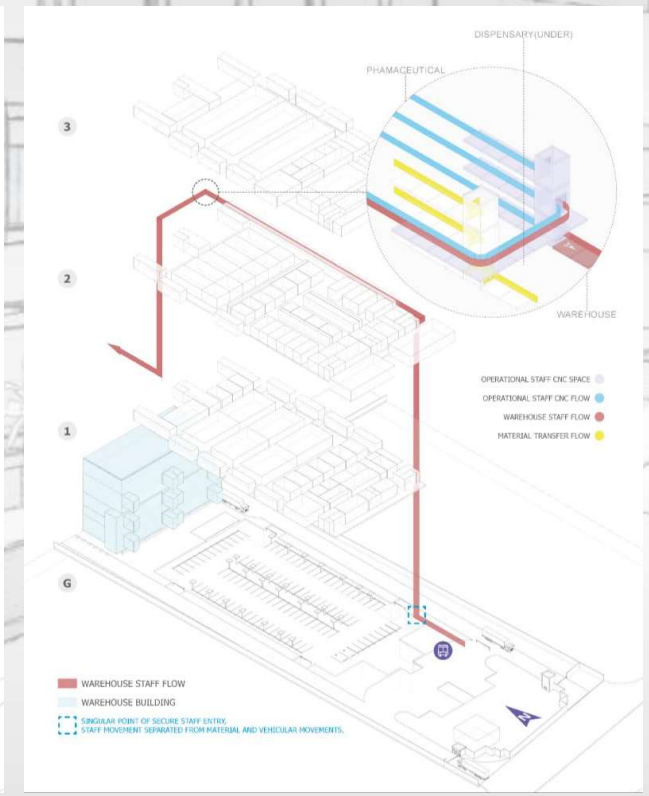
Greenfield sites

Examples: Large manufacturing facilities





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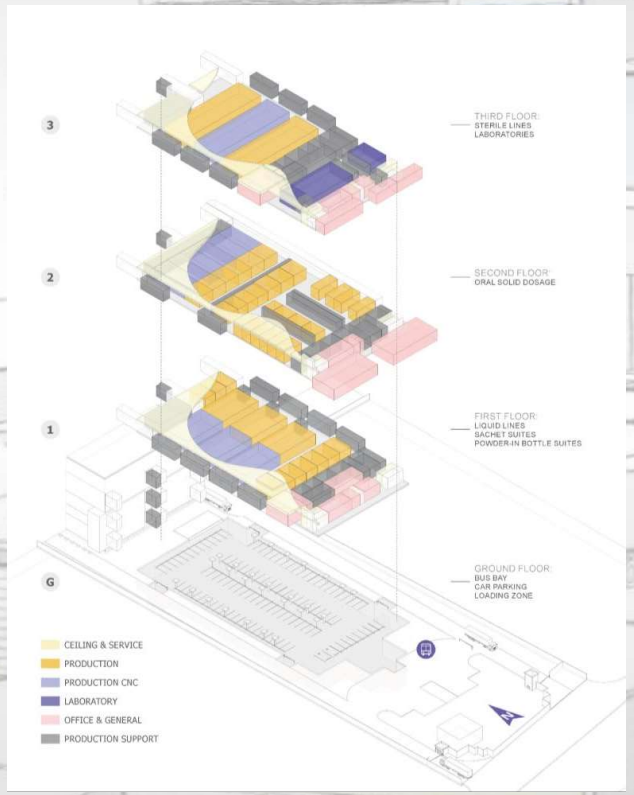
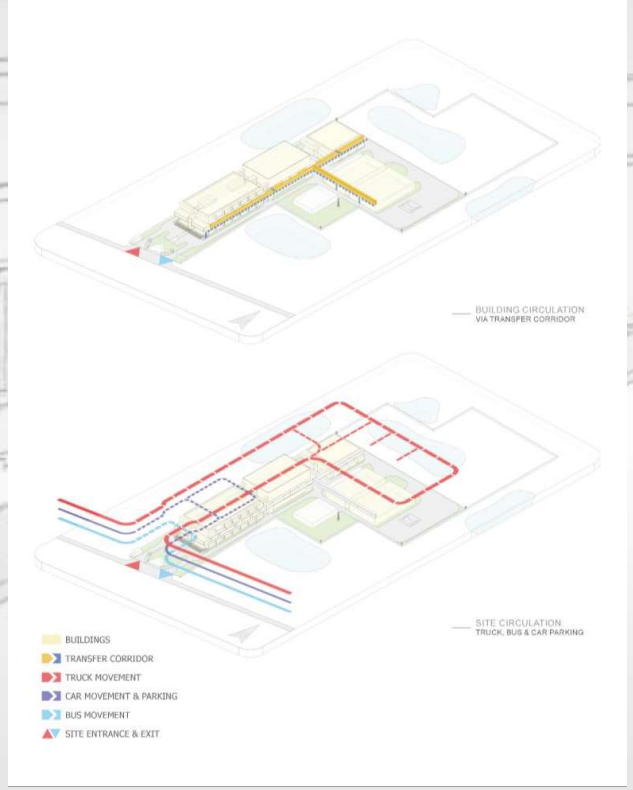
Examples: Large manufacturing facilities





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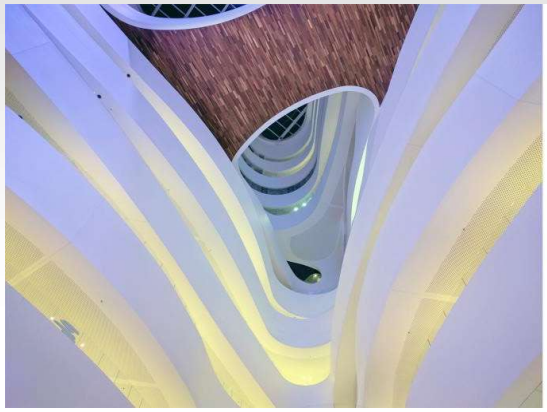
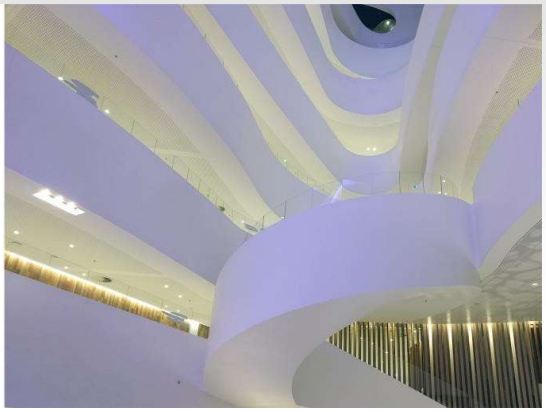
Greenfield sites

Examples: VCCC Melbourne Victoria

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Greenfield sites

Examples: Pharmaceutical Facilities

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Brownfield vs Greenfield: Common Pitfalls

- Underestimating the cost of building modification/refurbishment
- Delays due to unknown site conditions
- Purchasing old infrastructure with the intent to re-use
- Inadequate due diligence before purchase
- Insurance (i.e., EPS sandwich panels…)
- Site with missing service(s)
- Remote location

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Q: So. Greenfield or Brownfield?

A: That depends.

(Sorry, the consultant's answer…)

- An existing manufacturing site with space for development is generally considered the clear decision, but where the scope of work is limited, the development iterative and the constraints are not significant
- If a new site is required, then options analysis looking at brownfield/greenfield options could be required, which can quickly become the preferred option
- Certainly not a rule and seldom can be used engineering "rules of thumb"

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Q: Which is the most cost-effective?

A: It depends.

Facility Type	Approx. Footprint	Indicative build/fit-out price (excluding process equipment)
Small basic BF cleanroom in existing facility	100 sqm	$10,000/sqm +
BF fit-out in existing warehouse shell	3,000 sqm	$5,000 – 10,000/sqm (basic – high end)
Large scale GF high end (e.g. vaccines)	25,000 sqm	$10,000/sqm +

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Q: Is a Brownfield project quicker?

A: You guessed it. It depends.

Additional complexity/considerations:

- Proximity to existing services, repurposing of existing structures
- Time for due diligence
- Demolition and "make good" works
- Building/planning permits
- Building surveyor requests
- Risk of latent conditions e.g. soil contamination, asbestos
- Disruption to site operations

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Conclusions

Greenfield vs Brownfield

- The choice depends on the project
- Site Assessment is critical (due diligence) – understand the constraints
- Site location is a key consideration
- Consider project timeline and cost
- Speak to your designer / developer early

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Thank you

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Architecture and Engineering Services Director

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