Riskcon engineering

Dangerous Goods Report

Project Duke Data Centre

Goodman Limited
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Dangerous Goods Report

Project Duke Data Centre

Goodman Limited

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Quality Management

Rev	Date	Remarks	Prepared By	Reviewed By
A	12 July 2024	Draft issue for comment	Ezra Bagaskara	Renton Parker
0	23 September 2024	Final issued		
1	29 October 2024	Updated per DPHI comments		
B	22 April 2025	Updated for 120 MVA variation		
2	19 May 2025	Rev B SSDA Amendment		

Executive Summary

Background

This Dangerous Goods (DG) Report has been prepared by Riskcon Engineering Pty Ltd (Riskcon) to accompany a State Significant Development Application (SSDA) for the construction and ongoing operation of a data centre facility at 2 & 10-22 Kent Road and 685 Gardeners Road, Mascot NSW in the Bayside Council Local Government Area (LGA). The site is legally described as Lot 1 DP529177 and Lot 1 DP1009083.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the Kent Road Data Centre project (SSD-71368959) dated 31 May 2024.

This report concludes that the proposed data centre is suitable and warrants approval subject to the implementation of the following standards to address the hazard requirements of the Work Health and Safety Regulations and the SEARs:

- AS/NZS 4681 – Storage and handling of Class 9 (Miscellaneous) Dangerous Goods and Articles
- UL9540A – Test Method for Evaluating Thermal Runaway Fire propagation in Battery Energy Storage Systems in lieu of AS IEC 62619
- AS 1940 – Storage and Handling of Flammable and Combustible Liquids
- FM Global Property Loss Prevention Data Sheet 5-32

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

Conclusions

A review of the hazardous chemical storages within the proposed Goodman data centre at 2 & 10-22 Kent Road and 685 Gardeners Road, Mascot NSW was conducted to determine compliance with the Work Health and Safety Regulation 2017 (Ref. [1]) and all relevant design standards. A review of the standards determined that the diesel storages are to be governed by AS 1940:2017 (Ref. [2]) based on diesels classification as a combustible liquid. The Li-ion batteries are to be governed by AS/NZS 4681:2000 (Ref. [3]) based on their classification as a Class 9 substance and tested in accordance with UL9540A. Additionally, a risk assessment approach has been adopted for reviewing the current design against the FM-Global Datasheet 5-32. These standards were used to create a series of requirements to guide the design of the stores.

Additionally, a review of the WHS Regulation determined that the site would operate at manifest quantities; hence, additional documentation is necessary to comply with the requirements of the Regulation.

Recommendations

The following recommendations have been made for the facility.

Design Requirements:

- The design requirements detailed within this report shall be adhered to in the development of the design for the facility.

- The cell manufacturer shall ensure that the Li-ion battery modules and BMS are compliant with the testing requirements of UL9540A, or the more contemporary version (Ref. [4]).
- FM Global Datasheet 5-32 shall be adopted as the design basis for the facilitation with respect to the lithium ion batteries, as appropriate as determined and agreed with FRNSW through the Fire Safety Study Process.
- Personnel shall be trained to ensure that the inactive leaf remains in the closed position when not in use.
- At least one (1) carbon dioxide portable fire extinguisher shall be provided on each floor.

Documentation Requirements:

- A Fire Safety Study shall be prepared in accordance with HIPAP No. 2.
- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- Placard Schedule.
- A Manifest and notification shall be submitted to SafeWork NSW.
- A DG Risk Assessment of the storage and handling areas.
- An Emergency Response Plan (ERP).

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Abbreviations

Abbreviation	Description
ASD	Aspirated Smoke Detection
BCA	Building Code of Australia
BMS	Battery Management System
CBD	Central Business District
DS	Datasheet
EWIS	Emergency Warning and Intercommunication System
FMG	FM-Global
FSS	Fire Safety Study
Li-ion	Lithium Ion
PHA	Preliminary Hazard Analysis
SDS	Safety Data Sheet
SEARs	Secretary's Environmental Assessment Requirements
SFAIRP	So Far As Is Reasonably Practicable
SoC	State of Charge
SoH	State of Health
WHS	Work Health and Safety
VEWFD	Very Early Warning Fire Detection
UPS	Uninterruptable Power Supply

1.0 Introduction

1.1 Background

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- AS 1940 – Storage and Handling of Flammable and Combustible Liquids
- FM Global Property Loss Prevention Data Sheet 5-32

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

1.2 Objectives

The objectives of the design report are to assist Goodman in designing and constructing a hazardous chemical storage which complies with the Work Health and Safety Regulation 2017 (Ref. [1]) and all applicable standards. Additionally, the design report will seek to address the Preliminary Hazard Analysis (PHA) requirement of the SEARs.

1.3 Scope of Services

The scope of work is to prepare an assessment for the DG stores at the proposed Goodman site at 2 & 10-22 Kent Road and 685 Gardeners Road, Mascot NSW. The assessment does not include any other sites nor additional work which may be identified in the course of the assessment.

2.0 Methodology

The following methodology has been adopted in this assessment:

- The proposed design of the site was reviewed, including details of hazardous chemical which will be stored and handled on site.
- The applicable design standards were identified based upon the class review.
- Draft Reporting – On completion of the assessment, a draft report was prepared for review and comment by the project team.
- Final Report – On completion of the review of the draft report, any comments were incorporated into the finalised version.

3.0 Project and Site Description

3.1 Project Description

The proposed development (SSD-71368959) will seek approval for the construction of an 120MVA Data Centre. The proposal seeks to demolish existing structures on the site, construct, fit out and the 24/7 operation of a Data Centre, with associated works.

The works subject to SSD-71368959 include the following:

- Site preparation works including demolition, bulk excavation, and removal of existing structures on the site, tree and vegetation clearing, and bulk earthworks,

  Construction, fit out and 24/7 operation of a 120 MVA data centre with a maximum building height of 40m (from natural ground level) and total gross floor area of approximately 26,052m^2 comprising:

  - At-grade parking for thirty-four (34) car parking spaces and one (1) accessible car parking spaces,
  - Two (2) 12.5m loading dock spaces,
  - Four (4) levels of technical data hall floor space with one data hall on ground level, three (3) data halls on levels one and two (2) data halls on level three.
  - Secure entrance lobby on ground level and ancillary office space on each level and mezzanine level,
- Provision of required plant and utilities, including:
  - Six (6) 33kV switch rooms on ground level
  - 1,172,000L above ground diesel storage tanks,
  - 5,125kL above ground water storage tanks,
  - 72 diesel generators
- Acoustic screen parapet,
- Vehicle access provided via Gardeners Road and Ricketty Street,

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) and accompanying cover letter issued for the Kent Road Data Centre project (SSD-71368959) dated 31 May 2024

Specifically, this report has been prepared to respond to the SEARs requirement issued and summarised in **Table 3-1** below.

Table 3-1: SEARs Addressed

Item	Requirement	Report Section
Preliminary Hazard Analysis (PHA)	• Where there are dangerous goods and hazardous materials associated with the development provide a preliminary risk screening in accordance with Chapter 3 of SEPP (Resilience and Hazards) 2021. • Where required by SEPP (Resilience and Hazards) 2021, provide a Preliminary Hazard Analysis prepared in accordance with Hazardous Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis and Multi-Level Risk Assessment. • If the development is adjacent to or on land in a pipeline corridor, report on consultation outcomes with the operator of the pipeline, and prepare a hazard analysis.	**Section 0**

Item	Requirement	Report Section
Hazards and risk	• It must also demonstrate the development would comply with AS IEC 62619 – Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications and AS/NZS 4681 – Storage and handling of Class 9 (miscellaneous) dangerous goods and articles.	**Section 4.4**
	• The EIS must demonstrate the relevant aspects of the FM Global Property Loss Prevention Data Sheet 5-32 – Data Centres and Related Facilities have been considered and could be implemented as part of the development.	**Section 4.6**
	• It must also demonstrate the development would comply with AS 1940 – Storage and handling of flammable and combustible liquids.	**Sections 4.2, 4.3**

3.2 Site Description

The project is located on land known as 2 and 10-22 Kent Road, and 685 Gardeners Road, Mascot, legally referred to as Lot 1 DP529177, Lot 1 DP1009083 and Lot 2 DP529177. The site is located on Country of the Gadigal people within the local government area of Bayside Council.

It has a land area of approximately 23,470m^2 with frontages to Ricketty Street, Kent Road and Gardeners Road, all of which are classified roads.

The site forms part of the Mascot West Employment lands which comprises a mix of land zoned for industrial, commercial and business park uses. To the east of the site is Mascot Station Town Centre which comprises a mix of retail, commercial, residential and recreational open space land uses.

Surrounding land uses in the immediate vicinity of the include:

- **North**: Gardeners Road, which is the LGA boundary with the City of Sydney. Further to the north is existing industrial development with Alexandra Canal beyond.
- **South**: Ricketty Street is immediately south, with predominantly one (1) to four (4) storey commercial and industrial development beyond.
- **East**: Kent Road is immediately to the east, with four (4) to 14 storey high density residential development beyond.
- **West**: To the west is light industrial development typically one (1) to two (2) storey in height.

The site is zoned E3 Productivity Support under the Bayside Local Environmental Plan 2012 (**BLEP 2021**). The proposal is permissible with development consent in the E3 zone and meets the zone objectives.

In its existing state, the site itself contains two large warehouse buildings which are currently leased out to multiple tenants. Large extents of the site consist of hardstand for vehicle circulation and parking with a number of mature trees are located along the site's boundaries.

A summary of the site is provided in **Table 3-2** below.

Table 3-2: Site Description Summary

Item	Description
Site Area	23,470m^2
Ownership	Goodman

Item	Description
Legal Description	Lot 1 in DP529177, Lot 1 in DP1009083 and Lot 2 DP529177

3.3 Quantities of Dangerous Goods Stored and Handled

The classes and quantities of DGs to be stored at the facility are summarised in **Table 3-3**, alongside a brief SEPP-RH assessment.

Table 3-3: Maximum Classes and Quantities of Dangerous Goods Stored & SEPP-RH Screening

Class	Packing Group (PG)	Description	Quantity (L or kg)	SEPP-RH Applicable? (Y/N)
8	III	Valve Regulated Lead Acid Battery (VLRAs)	17,400 kg	Y
9	n/a	Li-ion batteries	667,200 kg	N
C1	n/a	Combustible liquids	1,172,000 L	N

Note that the classes stored (9 and C1) are not applicable to the SEPP-RH risk screening process (Ref. [5]). Additionally, the development is not adjacent to or on land in a pipeline corridor; thus, the site does not require a PHA. Provided in **Figure 3-2 to Figure 3-7** are the locations of DGs on site. Note, the site layout for levels not containing DGs has been omitted from this report.

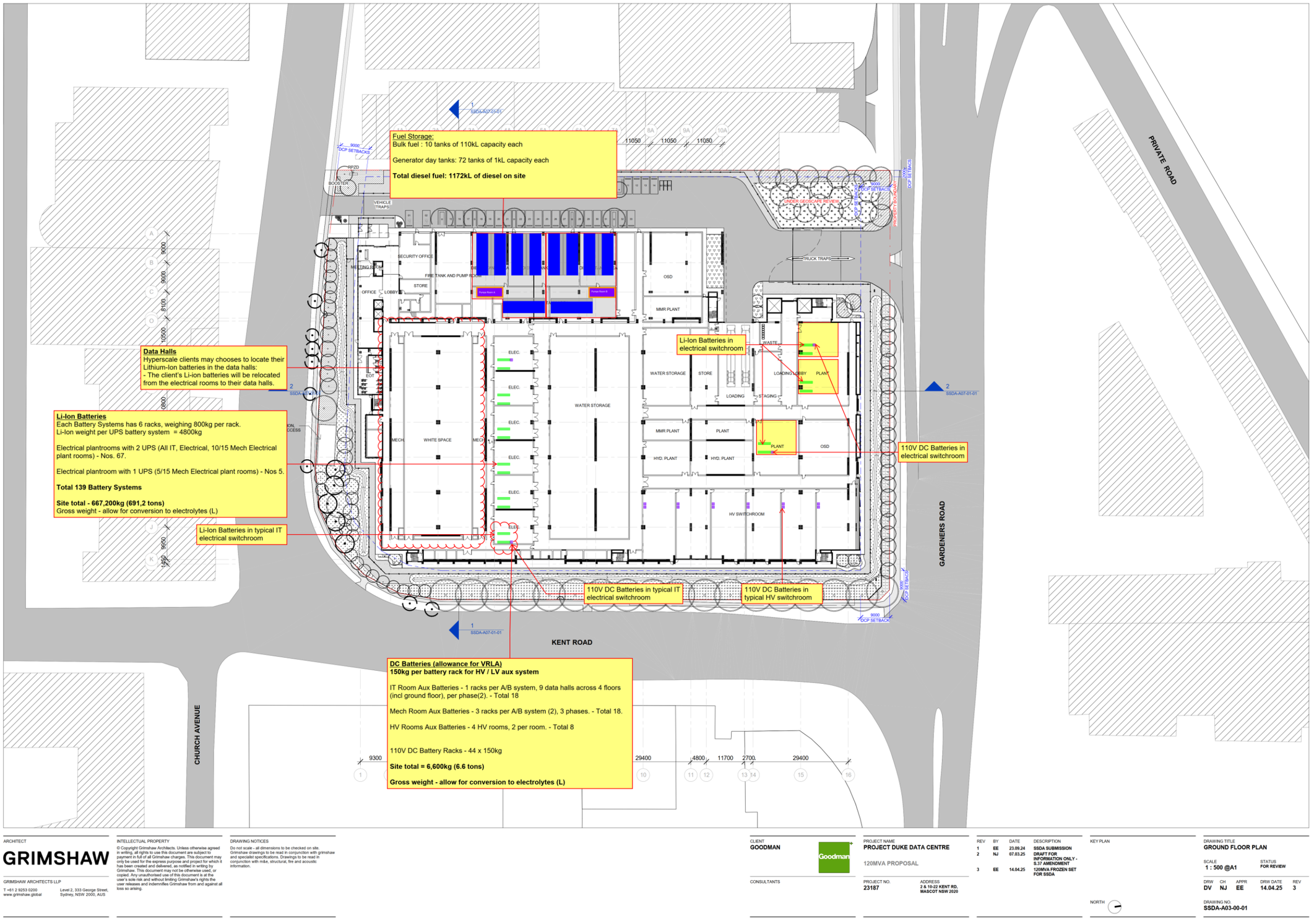


Figure 3-1: Site Layout – Ground Floor

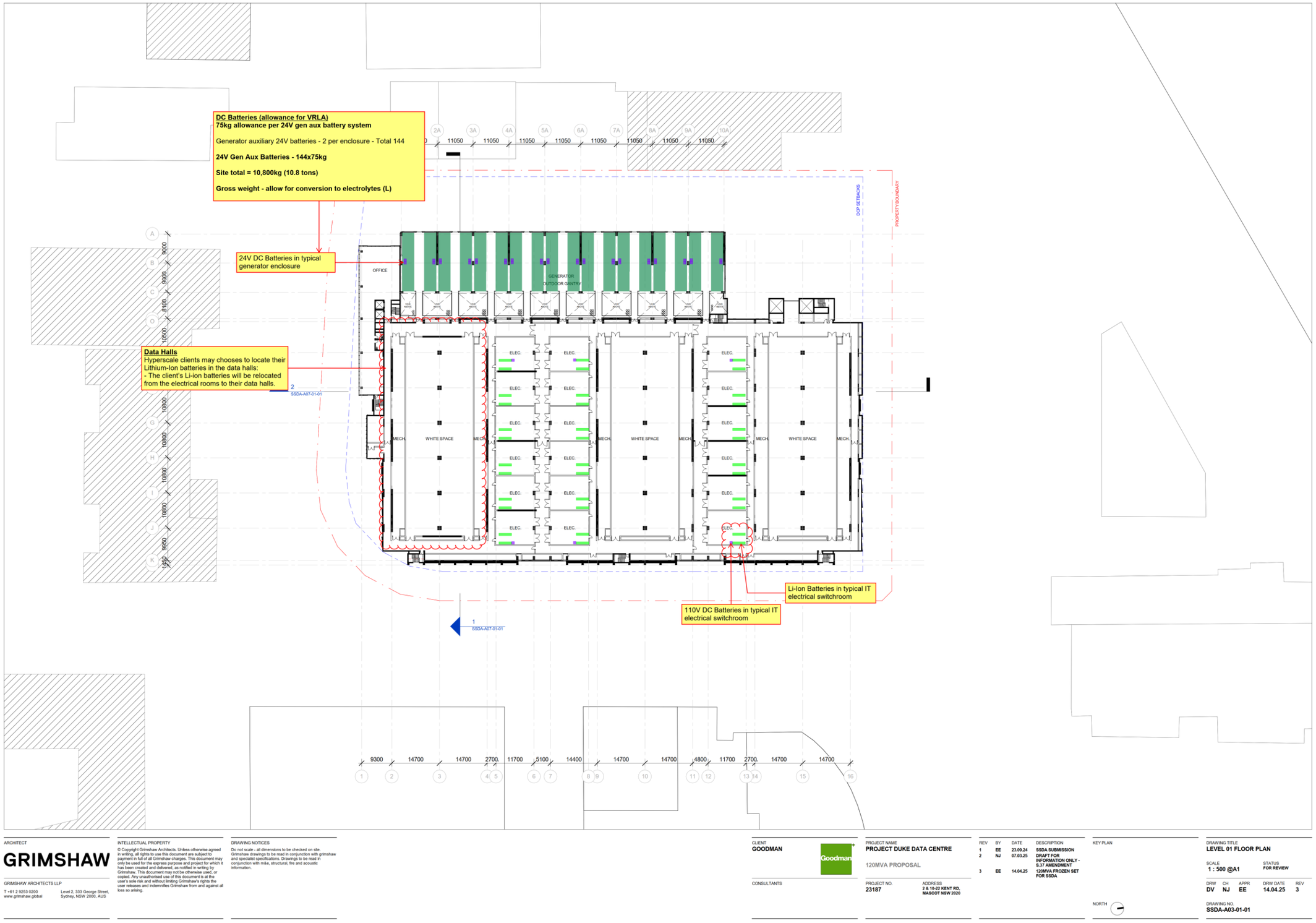


Figure 3-2: Site Layout – Level 1

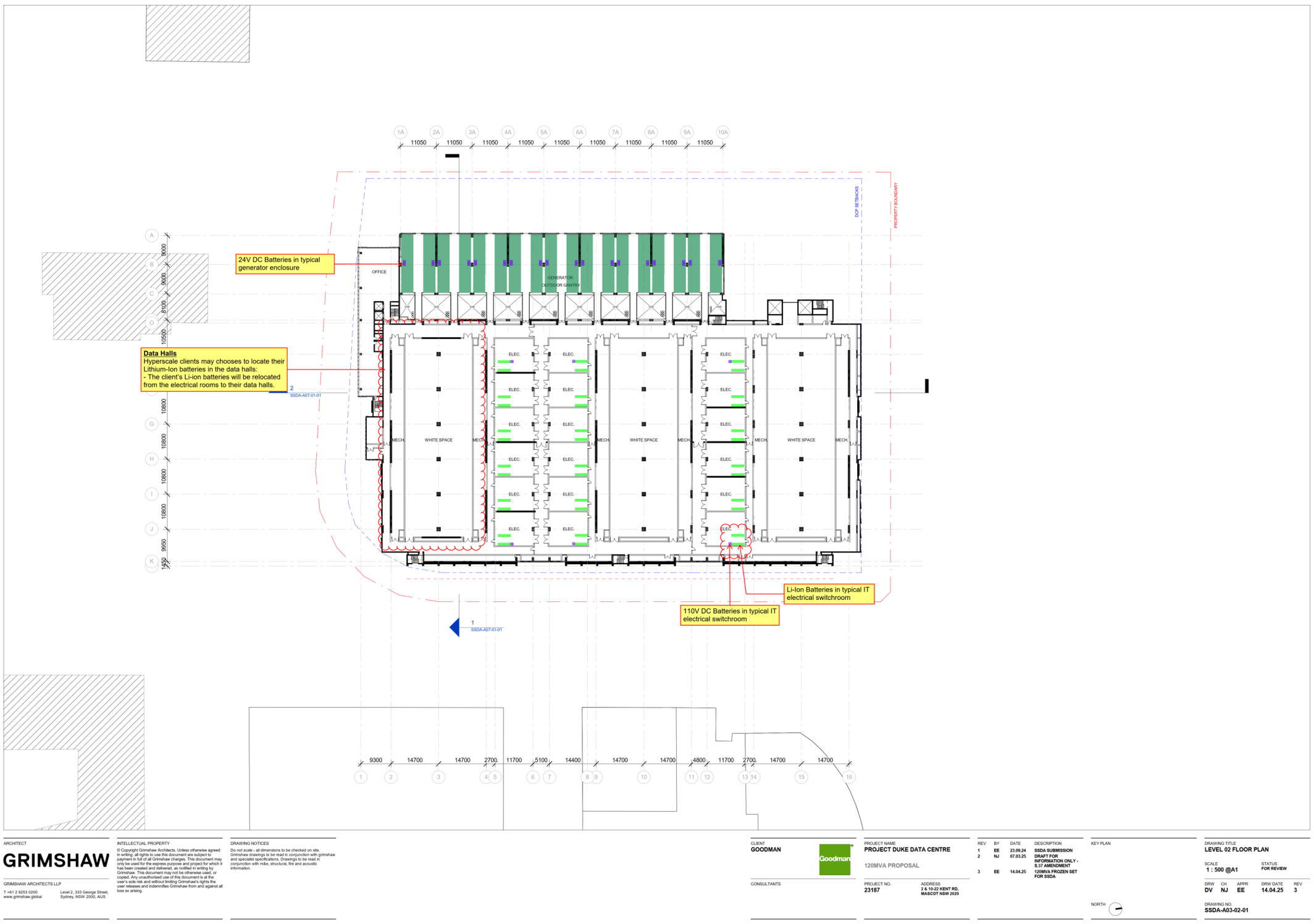


Figure 3-3: Site Layout – Level 2

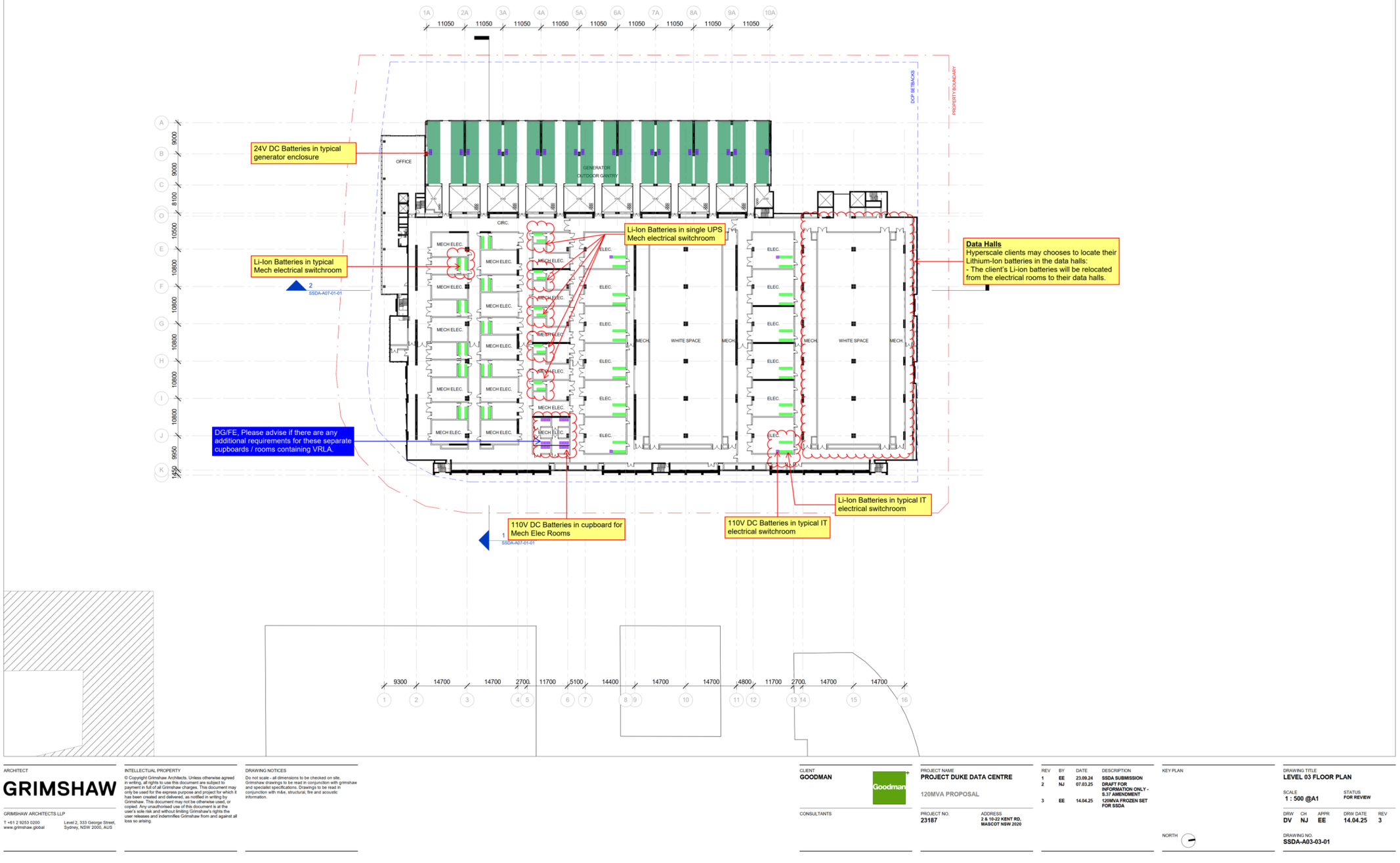
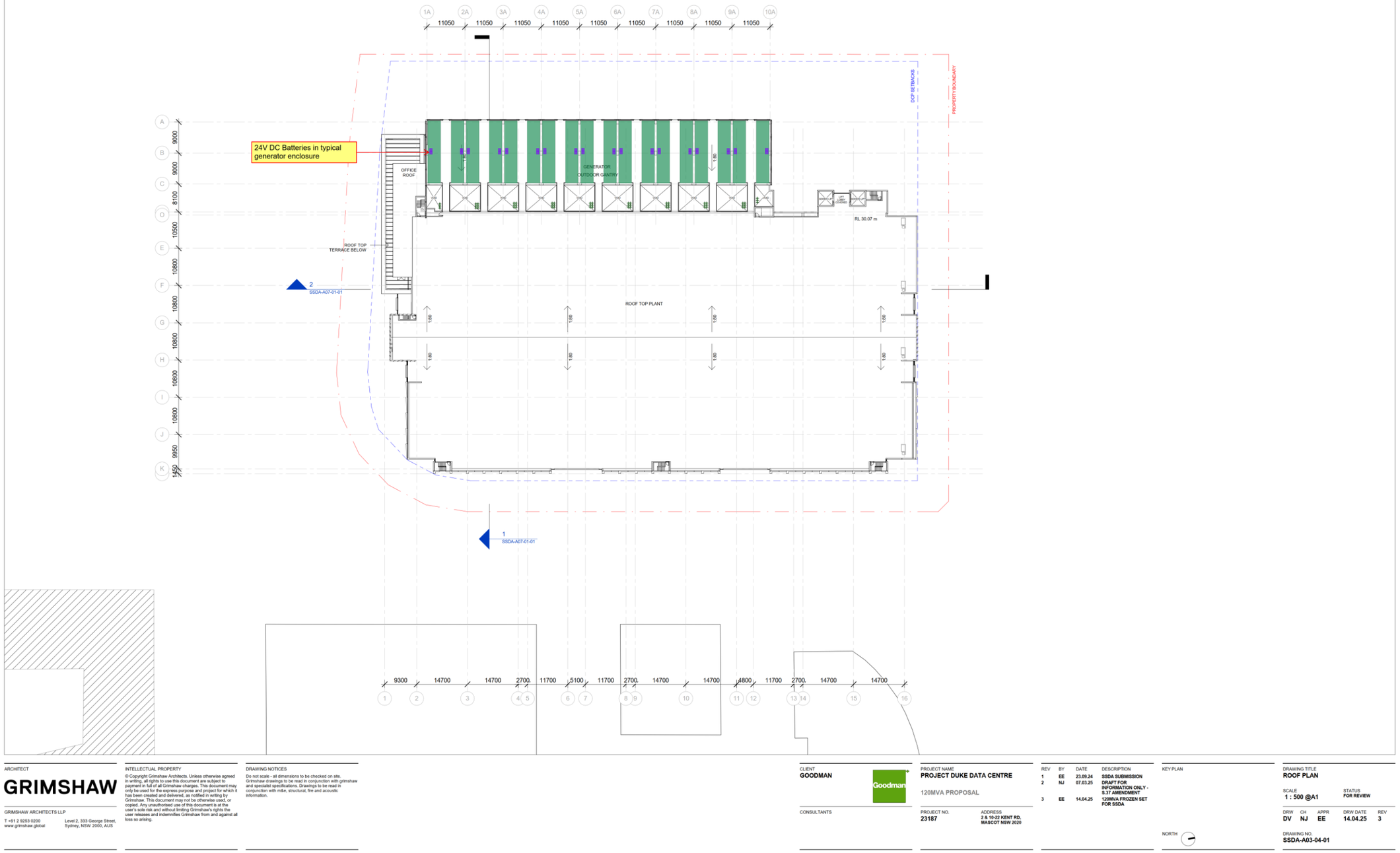


Figure 3-4: Site Layout – Level 3



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PROJECT NAME
PROJECT DUKE DATA CENTRE
120MVA PROPOSAL
PROJECT NO. 23187
ADDRESS 2 & 10-22 KENT RD, MASCOT NSW 2020

REV	BY	DATE	DESCRIPTION
1	EE	23.09.24	SSDA SUBMISSION
2	NJ	07.03.25	DRAFT FOR INFORMATION ONLY - S.37 AMENDMENT
3	EE	14.04.25	120MVA FROZEN SET FOR SSDA

KEY PLAN
NORTH

DRAWING TITLE
ROOF PLAN
SCALE 1 : 500 @A1
STATUS FOR REVIEW
DRW DV CH NJ APPR EE DRW DATE 14.04.25 REV 3
DRAWING NO. SSDA-A03-04-01

Figure 3-5: Site Layout – Level 4 Roof

4.0 DG Design Assessment

4.1 Introduction

The following DG storage areas were identified for assessment:

- Bulk Diesel Tank
- Day Tanks (Indoor Diesel Generators)
- Lithium-Ion Batteries (UPS)

Each of these areas have been assessed in detail in the following sections.

4.2 Bulk Diesel Tank

4.2.1 Introduction

Diesel will be stored in 10 above ground bulk tanks. The bulk tanks are connected to a delivery system that feed the day tanks attached to generator units located throughout the site. Diesel is classified as a combustible liquid; hence, the appropriate standard to assess the storage is AS 1940:2017 (Ref. [2]). Section 5 of the standard outlines the requirements for storage above tanks. The proposed quantity of the diesel bulk tank is summarised in **Table 4-1**.

Table 4-1: Proposed Quantity of Diesel in the Bulk Tank Stored and Handled

Class	Description	PG	Quantity (L)
C1/C2	Diesel bulk tank	n/a	1,100,000

4.2.2 Design

The design requirements for above ground diesel tanks based on AS 1940:2017 have been summarised in **Table 4-2**.

Table 4-2: Above Ground Diesel Tank Design Requirements, in accordance with AS 1940:2017

Item	Requirement
Tank construction and installation	• The tank shall be designed and constructed to comply with AS 1692. • Means to monitor the integrity of the primary tank shall be provided. • The tanks shall be located in a tank compound that is enclosed by walls that have a FRL of at least 240/240/240. Additionally, the floors shall be of masonry or reinforce concrete, or equivalent. • The tanks shall be wholly below the lowest floor level of the building. • The tanks and their associated piping shall be protected from corrosion by protective coatings, cathodic protection or be constructed of corrosion-resistant materials (e.g. FRP).
Fill Points	• The tank fill point shall, where practicable, be in a readily accessible location (outside), on areas that are impervious to diesel (i.e. fill point located on hardstand area), and protected from impact damage by bollards, armco barriers, etc. The proposed tank position is compliant with this requirement. • The fill, dip and vapour recovery point for each tank shall be marked to identify it. • A spillage containment that has a minimum capacity of 15 L shall be provided for the fill points.

Item	Requirement
Level Indication	• The tank fill level shall be able to be monitored or gauged. This gauge or monitor shall also show the normal fill level of the tank. • A high-level alarm (LAH) shall be set to no more than 97% of the maximum fill level. The alarm shall be set to warn when the normal fill level has been exceeded.
Venting	• The vent shall discharge outside and be separate from the filling pipe. • The vent pipe shall be protected from physical damage by bollards or other barriers. • The vent shall discharge at least 2 m from an opening to any building (including doorways, windows, etc.) and at least 4 m above ground. • The discharge end of a vent shall be protected from the ingress of foreign materials by means of a protective cage or fitting.
Separation Distances	• **To site boundary** at least 2 m. • **To building foundations:** the tanks shall be located with respect to building foundations and supports so that the building loads cannot be transmitted to the tank. It has been noted in the design that the tank will be located within a 4-hour rated enclosure; hence, a review of the location of the tanks indicates that the location is compliant with the above separation distances.
Fire Protection	**Tank** • Per Clause 11.10, the tanks are located in a fire rated enclosure such that no additional fire protection other than that which is specified by the BCA is required. **Tanks vehicle delivery location** • The location where a tank vehicle will refill tanks shall be provided with at least two powder-type fire extinguishers.

4.3 Day Tanks (Indoor Diesel Generators)

Diesel will also be stored in day tanks attached to generator units located across the different levels of the data centre. The site will contain approximately 72 generators , each containing 1 m^3 of diesel fuel. As previously discussed, diesel is classified as a combustible liquid; hence, the appropriate standard to assess the storage is AS 1940:2017 (Ref. [2]). As the day tanks are connected to the generator units, they are outside the scope of the DG report per Clause 1.2.2(g) of AS 1940:2017.

4.4 VRLA Batteries

4.4.1 Introduction

It is proposed that VRLA batteries will be used as part of the operations in the IC3W Data Centre. These are a sealed type of lead-acid battery which limits inflow and outflow of gas to the cell providing additional safety to traditional lead-acid batteries. An acidic liquid electrolyte (sulphuric acid) is sealed within the battery which contains layers of lead alloy plates. It is due to the electrolyte that VRLA batteries are classified as corrosive substances; hence, designated as Class 8 under the ADG Code. The applicable standard in this case is AS 3780:2023 (Ref. [6]) which outlines requirements for the storage and handling of corrosive substances.

The proposed quantity of VLRA batteries has been summarised in **Table 4-3**.

Table 4-3: Proposed Quantity of VLRA Batteries Stored and Handled

Class	Description	PG	Quantity (kg)
8	VLRA batteries (sulphuric acid)	III	17,400

4.4.2 Design

The design requirements for the VRLA batteries based on AS 3780:2023 have been summarised in **Table 4-4**.

Table 4-4: VRLA Design Requirements, in accordance with AS 3780:2023

Item	Requirement
Separation Distances	• The minimum separation distance to other protected places for the batteries is: 3 m. • However, note that VRLA batteries are used and these inherently differ from traditional flooded lead acid batteries in terms design and safety. VRLA batteries are designed to be fully sealed in its casing and has a pressure relief valve that only vents gases. Additionally, the electrolyte liquid is immobilised (via inclusion of a fiberglass mat or mixing of silica) which prevents it from spilling through a leak in the housing. • As the risk of corrosive substances release is highly unlikely due to the design of the VRLA batteries, it is considered that the separation distances are compliant in this instance.
Segregation	• No other DGs (diesel) is incompatible with sulphuric acid; hence, the requirements for segregation have been complied with.
General	• Materials used for the construction of the batteries shall be resistant to corrosion. • Adequate lighting shall be provided. • Adequate ventilation shall be provided to dilute any potential accumulations of vapour that may be potentially released from the VRLA batteries (i.e., hydrogen).
Spill Containment	• As the VRLA batteries are virtually spill-proof, no spillage containment is required as stated in Clause 5.4(h).
Ignition Sources	• There is potential for hydrogen generation to occur in VRLA batteries due to thermal runaway, overcharging, and/or faulty battery. It must be noted that hydrogen releases from the batteries are not considered to be 'normal operation' as it is designed to be recombined internally with oxygen to produce water in the battery (hence, its sealed nature in comparison to its traditional counterpart). As this is not considered to be normal operating conditions for the VRLA batteries, the hazardous area classification study is not appropriate to identify hazardous zones for the batteries. • Nevertheless, in lieu of the study, any sources of ignition shall not be located within 0.5 m of the VRLA batteries.
Firefighting	• Firefighting equipment shall be kept readily accessible and its media compatible with the corrosive substance (sulfuric acid).

4.5 Lithium-Ion Batteries (UPS)

4.5.1 Introduction

The Uninterruptible Power Supply (UPS) systems include a set of Li-ion battery cabinets per UPS. Each cabinet will have an integral Battery Management System (BMS) which will monitor the status and health of the batteries, with a variety of features to facilitate a shutdown or isolation of various parts of the system in the event that a fault is detected. Additionally, provisions in the design will be made to allow for in-rack batteries within the data halls should hyperscalers (clients) require it in the future.

The proposed quantity of Li-ion batteries to be installed is summarised in **Table 4-5**.

Table 4-5: Proposed Quantity of Li-ion Batteries Stored and Handled

Class	Description	PG	Quantity (kg)
8	Li-ion batteries	n/a	667,200

Li-ion batteries are classified as Class 9 DGs, which is only a transport classification and is not strictly applicable during storage; hence, it is not subject to the Work Health and Safety Regulation 2017 (Ref. [1]). Notwithstanding this, Li-ion batteries have the potential for thermal runaway, which may result in fires or explosions. Therefore, it is necessary to demonstrate that the products are stored appropriately to minimise the potential for incidents to occur so far as is reasonably practicable (SFAIRP) as required by the Regulation. The applicable standard to govern the storage and handling of the Li-ion batteries is AS/NZS 4681:2000 (Ref. [3]).

It is noted that compliance with the relevant aspects of AS IEC 62619 is required. However, after discussion, it was decided that the testing method UL9540A will be used in lieu of AS IEC 62619 due to the former being more readily available. The UL9540A testing standard is an industry recognised and credible test method for evaluating thermal runaway propagation in battery energy storage systems. The results from the testing will address key issues associated with Li-ion battery energy storage system (one of them being the UPS), such as: installation instructions, ventilation requirements, fire protection effectiveness, thermal propagation measures, and fire service strategies. Hence, a recommendation has been made:

- The cell manufacturer shall ensure that the Li-ion battery modules and BMS are compliant with the testing requirements of UL9540A, or the more contemporary version (Ref. [4]).

A review of this standard indicates that the Li-ion batteries to be stored at the site would be classified as a minor store as the standard does not place a threshold limit for Li-ion batteries above which the quantity ceases to be a minor store. Nonetheless, for conservatism the UPSs have been assessed as a package store under Section 3 of AS/NZS 4681:2000.

4.5.2 Design

The design requirements for Li-ion batteries based on AS/NZS 4681:2000 have been summarised in **Table 4-6.**

Table 4-6: Li-ion Battery Storage Requirements, in Accordance with AS/NZS 4681:2000

Item	Requirement
Separation Distances	• No specific separation distances apply to stores of Li-ion batteries
Ventilation	• Adequate mechanical or natural ventilation shall be provided. • As the batteries are sealed, they are unlikely to release any vapours; hence, ventilation in accordance with the BCA is considered sufficient.
Spillage Containment	• Where liquids are stored, spillage containment shall be provided. • Li-ion batteries contain solid anodes and cathodes as well as a liquid electrolyte. The whole unit is sealed to provide containment within the battery. Furthermore, the batteries are individual cells stacked together to form an overall unit resulting in low volumes of electrolyte within a solitary unit. Failure of an individual cell within a unit does not result in large volumes of liquid release and total failure of all cells within a unit is incredibly unlikely. • Therefore, any spills which occur would be contained within the immediate vicinity of the batteries. Hence, spillage containment is not considered to be required for this storage.

Item	Requirement
Fire Protection	• The standard requires a dry chemical fire extinguisher to be provided for the data halls; however, this type can potentially corrode electrical equipment. Hence, this requirement can be omitted. • It is noted in the design that an automatic sprinkler system and fire hose reels will be used as additional fire protection measures for the Li-ion batteries.

In addition to the requirements above, there is planned for additional protection measures to be installed for the data halls to further mitigate the risks associated with the UPS system and Li-ion batteries. These are as follows:

- An automated sprinkler system shall be installed in accordance with increased design density and area of operation to comply with FM Global DS 5-32 for the data halls and FM Global DS 5-33 for the battery rooms.
- A VEWFD system, which is the Aspirated Smoke Detection system, shall be designed and installed.
- Battery Management System (BMS) shall be provided to monitor and protect the Lithium-ion batteries, shutting them down on fault / over temperature to prevent thermal runaway.
- Off gas detection system in the battery room shall be provided to provide early detection and will be linked to the FIP. The system will automatically alert the fire brigade upon alarm. Additionally, on activation, the exhaust fans will run in emergency mode.
- An automatic mechanical ventilation system shall be provided.

4.6 FM-Global Datasheet 5-32 Compliance

4.6.1 Introduction

It is noted that a condition set by the Department was to consider the relevant aspects of FM Global DS 5-32 – Data Centres and Related Facilities which contains the design requirements concerning the main hazards associated with data centres, which is the UPS system. The risks posed by the lithium-ion batteries in the UPS require an increased level of fire safety that is not adequately addressed in the standard of performance utilised for a building containing DGs; hence, the DPHI has requested that the data centre project be assessed against FM Global DS 5-32.

In principle, the design complies with FM Global DS 5-32; however, it is important to note that FM-Global DS 5-32 adopts a distinct approach to establishing its requirements, as the context of the document is centred around the U.S. industry. As such, fully complying with some of the clauses for the data centre were considered to be not commensurate with the risk of the UPS system, as it required specific equipment and procedures that not appropriate for implementation in Australia. Nevertheless, as lithium-ion batteries will be stored on-site, additional fire safety measures (i.e., FM sprinkler design with respect to design density and area of operation, fire sprinkler design, UPS separation barrier, fire/smoke detection, etc) have been included in the design to mitigate the risk of the UPS SFRAIP.

Additionally, the additional fire safety measures will be further explored through the FSS and FEBQ process with Fire and Rescue NSW (FRNSW) which this Project will be subject to. Nevertheless, to capture this in the report, several recommendations have been made:

- A Fire Safety Study shall be prepared in accordance with HIPAP No. 2.

- FM Global Datasheet 5-32 shall be adopted as the design basis for the facilitation with respect to the lithium ion batteries, as appropriate as determined and agreed with FRNSW through the Fire Safety Study Process.

This section contains a risk assessment on whether the relevant designs of the Data Centre comply with the requirements set out in the FM Global DS 5-32 by principle; hence, establishing the same level of protection as required by the DPHI.

4.6.2 Design

An assessment of the proposed design against the requirements of FM Global DS 5-32, noting that this shall be further considered and assessed in consultation with FRNSW as part of the FSS, is provided in **Table 4-7**.

Table 4-7: Summary of Design Assessment against Related FM Global Data Sheet 5-32 Recommendations

Item	Related Recommendations	Compliant?	Assessment
Construction and Location	• Construct data centers of non-combustible materials.	The design is compliant. The data center readily complies with the BCA which sets requirements on constructing the data center with non-combustible building elements.	N/A
	• Protect data centers against external fire exposure. Do not allow combustible material to expose the building or the air intake(s) for the building. • Provide blank masonry walls or other suitable protection when there is an unfavorable exposure or the potential for vandalism from outside the building.	The design is compliant. Protection against outdoor elements and external fire exposure has been accounted for in the BCA compliance.	N/A
	• Do not locate data centers in multistory buildings that have inadequately sprinklered or unprotected areas of the building.	The design is compliant. Sprinkler systems will be installed throughout the building.	N/A
	• Provide prevention and mitigation associated with a liquid release and the potential damage in accordance with Data Sheet 1-24, *Protection Against Liquid Damage*.	The design is compliant. Any liquid release from generators, transformers, and combustible liquid tank will be contained within the bunding.	N/A
	• Locate data centers so they are not exposed to damage from any hazardous process, storage, corrosive or ignitable liquid or vapor, industrial pollutants, or mechanical equipment such as overhead cranes.	The design is compliant. This has been considered in the design stage of the project.	N/A
	• Provide one-hour fire rated interior walls, partitions, and floors in accordance with Data Sheet 1-21, *Fire Resistance of*	The design is compliant.	N/A

Item	Related Recommendations	Compliant?	Assessment
	Building Assemblies, for all of the following: ○ Data processing equipment rooms ○ Battery power rooms, UPS rooms ○ Network/fiber optic rooms	The data hall (containing UPS and data processing equipment) will be contained in the primary structure which is four-hour fire rated.	
	• Provide fire-rated interior walls, partitions, and floors for power equipment rooms (standby generator and AC power) in accordance with Data Sheet 5-23, *Design and Protection for Emergency and Standby Power Systems*.	The design is compliant. The above ground fuel rooms are four-hour fire rated with two-hour rated penetrations in accordance with AS1940-2017. All other walls are two-hour fire rated in the facility.	N/A
	• Have fire-rated interior walls built from the structural floor of the room to the structural floor above (or to the roof).	The design is compliant.	N/A
	• Minimize interior windows and doors to the data processing equipment room. For essential interior windows and doors, use tempered or wired glass for windows and minimum 3-hour fire-rated doors.	The risks these codes aim to address are managed via the installation of a sprinkler system, the inclusion of 2-hour fire rated doors, and compliance with the local codes/standards. Subsequently, the design does not comply with these FM data sheets but is managed by an equivalent design approach.	The doors in the walls enclosing the data halls are rated to only FRL -/120/30. It must be noted that the point of the fire resistance is to prevent radiant heat egress from a potential fire and that doors should be rated to prescribed level so as to not compromise the performance of the fire walls. However, an automatic sprinkler system, installed and designed in accordance with increased design density and area of operation to comply with FM Global DS 5-32 for the data halls, FM Global DS 5-33 for the battery rooms and AS 2118.1:2017, is provided throughout the entirety of the data halls and battery rooms. The sprinkler system will attenuate radiant heat from a fire thereby either reducing the radiant heat that impacts a door or by providing cooling

Item	Related Recommendations	Compliant?	Assessment
			where the sprinkler activation results in indirect water spray on the door. The building is subject to fire engineering requirements which detail evacuation of occupants. It is expected that occupants will have evacuated the facility prior to the 2-hour duration of the proposed walls. It is considered that complying with the 3 hour rated doors would not result in observable risk reduction; hence, adoption of 2 hours provides an acceptable level of risk reduction when considering the radiant heat reduction from the sprinkler system.
	• If doors are held open intermittently or permanently, provide an electromechanical or electromagnetic holding mechanism interlocked to close the door on smoke detector actuation.	The design is compliant once the recommendation has been actioned.	The fire doors in the building do not possess electromechanical or electromagnetic holding capability, however these are installed with a self-closure mechanism that keep these closed when unused. Hence, this is considered appropriate for the purposes of this clause. However, it has been noted that lockable bolts will be installed in the door leaf which may inhibit the self-closing mechanism if it were to be engaged when the door is open. Therefore, a recommendation has been made: • Personnel shall be trained to ensure that the inactive leaf remains in the closed position when not in use.
	• Any penetration in a fire rated wall must be provided with an FM approved penetration seal with a fire-resistance	The design is compliant. All fire rated walls and slabs are rated to the same equivalent per National Construction Code (NCC).	N/A

Item	Related Recommendations	Compliant?	Assessment
	rating equivalent to the rating of the wall or floor.		
	• Limit the maximum height of ceilings in data centers to 30 ft (9 m).	The design is compliant. The ceilings of the data halls do not exceed 9 m.	N/A
	• Construct floors, raised floors, and structural supporting members for raised floors of noncombustible materials.	The design is compliant. No combustible materials were part of the building material for the building.	N/A
	• If the facility is located in FM Global 50-year through 500-year earthquake zones as defined in Data Sheet 1-2, *Earthquakes*, adhere to the recommendations in this section.	The design is compliant. The site is not located in a 50-year through 500-year earthquake zones as indicated by FM-Global's Natural Hazard Map.	N/A
	• Design buildings, roof-mounted equipment, and ground-mounted equipment for wind forces in accordance with Data Sheet 1-28, *Wind Design*, and Data Sheet 1-29, *Roof Deck Securement and Above-Deck Roof Components*.	The risks these codes aim to address are managed via compliance with the BCA. Subsequently, the design does not comply with these FM data sheets but is managed by an equivalent design approach.	The BCA details requirements that address the measures documented in the referenced FM data sheets. Subsequently, the risks the FM data sheets aim to address are adequately managed by compliance with the BCA.
	• Select a building site that is above the predicted 0.2% annual exceedance (500-year) flood elevation and includes 1 to 2 ft (0.3 to 0.6 m) of freeboard. Ensure the building site is at least 500 ft (152 m) from direct wave impacts and/or high flood-flow velocities.	The design is compliant. A flood risk assessment prepared by Taylor Thomson Wittling NSW has indicated that the site is located above the 1% annual exceedance probability and contains 500 m freeboard extents.	N/A.
	• Protect data centers, critical systems, and equipment of the facility and related facilities against storm water runoff in accordance with Data Sheet 1-40, *Flood*.	The design is not compliant with Data Sheet 1-40; however, a storm water design has been adopted which addresses the risks this data sheet aims to address. Subsequently,	The design does not currently consider the FM-Global Datasheet 1-40 for storm water runoff protection; however, in lieu of that, a civil engineering report incorporating water management plan has been commenced as

Item	Related Recommendations	Compliant?	Assessment
		the intent of the Data Sheet has been met by the local design approach.	part of the SEARs. Following the implementation of these measures, it is considered that the risk of damage due to storm water runoff and flooding have been minimized so far as is reasonably practicable, in conjunction with the prior flood risk assessment.
	• Provide water-removal capability for all below-grade areas subject to flooding from storm water runoff or sewer back up.	The design is compliant. There are no below-grade (or below ground level) areas on-site.	N/A
Occupancy	• Do not store or stage combustible materials in the data processing rooms.	The design is compliant. No combustible materials will be stored in the data halls.	N/A
	• Do not store combustible materials in electrical or mechanical equipment rooms.	The design is compliant. No combustible materials will be stored in electrical or mechanical equipment rooms.	N/A
Protection	• Provide automatic sprinkler protection throughout all building spaces associated with this occupancy for the appropriate hazard classification in accordance with Data Sheet 3-26, *Fire Protection Water Demand for Nonstorage Sprinklered Properties*, hazard-specific data sheet, in addition to the recommendations in this section.	The design is compliant for building spaces other than areas where Li-ion batteries will be stored. Additionally, the data halls and electrical rooms will be protected by an early response fire sprinkler system with densities of National Fire Protection Association (NFPA) 855 (12.2 mm / 230 m^2), which aligns with FM Data Sheet 5-32.	The site does not consider the Data Sheet 3-26 for the installation and design of the automated fire sprinkler system; however, it will be designed in accordance with AS2118.1:2017 for places other than the data halls and electrical rooms. Nevertheless, the FM-Global Data Sheet 3-26 requires more stringent specification of the sprinkler systems which may not be SFAIRP with the risks associated with the Lithium-ion battery. It should be noted that if lithium-ion batteries experience thermal runaway, the chemical reactions can continue even in the

Item	Related Recommendations	Compliant?	Assessment
			presence of water; therefore, the aim of a sprinkler system is to attenuate radiant heat emitted from the resultant fire and cool other battery modules to prevent propagation (not to extinguish). Additionally, there will be off-gas detection sensors that enable early detection and recognition of the thermal runaway process. Furthermore, a BMS will be installed to monitor the batteries and can commence shutdown procedures to prevent thermal runaway. The sprinkler system has been designed by a certified fire services engineer (with increased design density and area of operation which will comply with FM Global DS 5-32 for the data halls, FM Global DS 5-33 for the battery rooms, and AS 2118.1:2017) and is expected to be able to provide effective radiant heat mitigation. Moreover, in Clause 3.4.1.2 of Datasheet 5-32, it has been stated that there is currently no way to extinguish a Li-ion battery module fire with sprinklers; thus, opting for FM approved sprinklers will introduce more stringent requirements which will result in undue costs (maintenance, testing, replacement of parts, etc.) and does not result in extinguishment of the fire. Therefore, it considered that the current sprinkler design is appropriate for the purposes of this clause.
	• Install fire detection in areas that are adjacent to the data processing equipment room and in rooms containing	Design is compliant.	N/A

Item	Related Recommendations	Compliant?	Assessment
	systems or equipment critical to the continued operation of the data processing facility.	Fire detection, designed in accordance with AS1670.1, will be provided throughout including discrete zoning for corridors bounding the subject data halls.	
	• Install fire detection in accordance with Data Sheet 5-48, *Automatic Fire Detection.*	The design is not compliant with Data Sheet 5-48; however, the detection system has been designed according to the local standard and engineering design which aims to address the same requirements that Data Sheet 5-48 covers.	Fire detection is to be designed in accordance with AS 1670.1. Although there are differences inherent with the specifications of the FM Global Data Sheet 5-48 and AS1670.1, the fire detection system has been designed by a fire services engineer with the current situation in mind (data center with UPS) and will be tested accordingly. Hence, for the purposes of this clause, the current fire detection system is appropriate.
	• Limit cooling air velocities in data processing equipment rooms and utility rooms upon activation of the pre-alarm for the FM Approved Very Early Warning Fire Detection (VEWFD) system.	The requirement does not apply in this instance.	No FM approved VEWFD system has been installed. However, in lieu of this, off-gas detection for the Li-ion battery which is linked to the BMS will be implemented, in addition to an Aspirated Smoke Detection (ASD) system. These are considered adequate for the purposes of this clause. Additionally, this requirement is in place due to the installation of cleaning agents or inert gas systems which require the maintaining of a certain concentration of the extinguishing agent in the room. An automatic smoke exhaust system could reduce the effectiveness of the fire suppression system. However, the site does not use a clean agent or inert gas fire suppression system (only wet or mist sprinklers); hence, this clause is not applicable

Item	Related Recommendations	Compliant?	Assessment
			for in this instance, thus the current design is considered appropriate.
	• Do not install automatically operated smoke exhaust systems in the data processing equipment rooms.	The requirement does not apply in this instance.	This requirement is in place due to the installation of cleaning agents or inert gas systems which require the maintaining of a certain concentration of the extinguishing agent in the room. An automatic smoke exhaust system could reduce the effectiveness of the fire suppression system. However, the site does not use a clean agent or inert gas fire suppression system (only wet or mist sprinklers); hence, this clause is not applicable for in this instance, thus the current design is considered appropriate.
	• Install fire alarm systems in accordance with Data Sheet 5-40, *Fire Alarm Systems*.	The design is not compliant with Data Sheet 5-40; however, the fire alarm system has been designed according to the local standard and engineering design which aims to address the same requirements that Data Sheet 5-40 covers.	An Emergency Warning and Intercommunication System (EWIS) will be provided throughout all parts of the building and designed in accordance with the prescriptive requirements of provision E4D9 of NCC 2022. This is considered adequate for the purposes of this clause, which is to provide an alarm to all occupants in case of a fire.
	• Do not use aerosol generator fire extinguishing system units for the protection of the data center, related areas, or electronic equipment.	The design is compliant. No aerosol generator fire extinguishing system units have been included in the design.	N/A
	• Do not use oxygen-reduction systems for the protection of the data center, related areas, data processing equipment, or electronic equipment.	The design is compliant. No oxygen-reduction systems have been included in the design.	N/A

Item	Related Recommendations	Compliant?	Assessment
	• Do not provide oxygen-reduction systems for protection of the data center, related areas, data processing equipment, or electronic equipment using Li-ion batteries.	The design is compliant. No oxygen-reduction systems have been included in the design.	N/A
	• Provide at least one carbon dioxide or clean agent portable fire extinguisher listed to protect electronic equipment in accordance with Data Sheet 4-5, *Portable Fire Extinguishers*.	The design is compliant once the recommendation has been actioned.	It is not known at this stage if these specific types of fire extinguisher will be provided; hence, a recommendation has been made: • At least one (1) carbon dioxide portable fire extinguisher shall be provided on each floor. Note that this is not to be used for data hall protection.
	• Do not use dry chemical fire extinguishers in data processing equipment rooms with data processing equipment or electronic equipment.	The design is compliant. Note that the AS4681 standard requires a dry chemical fire extinguisher; however, given that dry chemical can corrode electrical or electronic equipment, this recommendation by the 5-32 Data Sheet will take precedence over AS4681.	N/A
	• Locate a portable fire extinguisher at each entrance of the data processing room.	The design is compliant.	N/A
	• Locate a sign adjacent to the portable fire extinguisher to identify the type of fire it is intended to extinguish.	The design is compliant.	N/A
	• Provide training to staff working in the area on the selection and safe use of use of portable fire extinguishers.	The design is compliant. It is expected that staff is trained to use the fire extinguishers should an early response to a fire be necessary.	N/A

Item	Related Recommendations	Compliant?	Assessment
	• Provide FM Approved VEWFD in the data processing equipment room and HVAC return air systems.	The VEWFD in the design is not FM Approved; however, an ASD for the data halls and off-gas detection for the server racks will be utilised; hence, which achieves the same requirements that the clause covers.	In lieu of an FM approved VEWFD, an ASD system will be installed and designed in accordance with AS 1670.1. The ASD provides a very early warning smoke detection by continuously sampling the air. It is expected that the system will be maintained and tested routinely for adequacy per the relevant requirements of AS 1670.1. This is considered adequate for the purposes of this clause.
	• Where Li-ion battery back-up units are installed in a server rack as a distributed power system, the recommendations in this section are to be applied if the following conditions exist: o Maximum power capacity of 20 kWh per server rack as a distributed power configuration. o No more than 2 shelves containing BBU modules should be located together in the same area of the rack. Aisle spacing between server rows is a minimum of 4 ft (1.2 m) o Maximum 30 ft (9 m) ceiling height. o No limitation on the building/room size	The design is compliant once the recommendation has been actioned.	It is unknown at this stage if the UPS system is designed in such a way that it complies with this clause. Nevertheless, the system will be tested in accordance with the UL9540A testing standard which will address key issues in battery storage, such as: thermal propagation, installation instructions, ventilation requirements, fire protection effectiveness, and fire service strategy. The UL9540A is considered to be the more definite standard in this instance as it uses data gathered from primary experiments conducted on the UPS system that will be used in the data halls. To further capture this, a recommendation has been made: • The cell manufacturer shall ensure that the Li-ion battery modules and BMS are compliant with the testing requirements of UL9540A, or the more contemporary version (Ref. [4]).

Item	Related Recommendations	Compliant?	Assessment
	• Do not use halocarbon or inert gas (clean agent) fire extinguishing systems or water mist systems to provide protection for the data halls.	The design is compliant. No halocarbon, inert gas, or water mist system will be used to provide protection.	N/A
	• Use FM Approved quick-response sprinklers.	The design is compliant for building spaces other than areas where Li-ion batteries will be stored. However, the data halls and electrical rooms will be protected by an early response fire sprinkler system with densities of National Fire Protection Association (NFPA) 855 (12.2 mm / 230 m^2), which aligns with FM 5-32.	The site does not consider the Data Sheet 3-26 for the installation and design of the automated fire sprinkler system; however, it will be designed in accordance with AS2118.1:2017 for places other than the data halls and electrical rooms. Nevertheless, the FM-Global Data Sheet 3-26 requires more stringent specification of the sprinkler systems which may not be SFAIRP with the risks associated with the Lithium-ion battery and with the level of protection currently in mind. It should be noted that if lithium-ion batteries experience thermal runaway, the chemical reactions can continue even in the presence of water; therefore, the aim of a sprinkler system is to attenuate radiant heat emitted from the resultant fire and cool other battery modules to prevent propagation (not to extinguish). Additionally, there will be off-gas detection sensors that enable early detection and recognition of the thermal runaway process. Furthermore, a BMS will be installed to monitor the batteries and can commence shutdown procedures to prevent thermal runaway. The sprinkler system has been designed by a certified fire services engineer (with increased design density and area of operation which will

Item	Related Recommendations	Compliant?	Assessment
			comply with FM Global DS 5-32 for the data halls, FM Global DS 5-33 for the battery rooms, and AS 2118.1:2017) and is expected to be able to provide effective radiant heat mitigation. Moreover, in Clause 3.4.1.2 of Datasheet 5-32, it has been stated that there is currently no way to extinguish a Li-ion battery module fire with sprinklers; thus, opting for FM approved sprinklers will introduce more stringent requirements which are difficult to implement in Australia (maintenance, testing, replacement of parts, etc.) and is not SFAIRP. Therefore, it considered that the current sprinkler design is appropriate for the purposes of this clause.
	• Provide vertical barriers in all server rack rows where Li-ion distributed power systems are used or expected to be used, irrespective of the power capacity. Provide vertical barriers as follow: ○ Spaced every third rack along the entire length of server rows, ○ Use a minimum 20-gauge (0.9 mm) solid sheet metal for the vertical barriers on the side of every 3rd rack to limit the fire spread. ○ Completely cover the side of the server rack and fit the rack profile. ○ Installed in a way that will not reduce the effectiveness of the hot/cold aisle arrangement.	The design is compliant once the recommendation has been actioned.	It is unknown at this stage if the UPS system is designed in such a way that it complies with this clause. Nevertheless, the system will be tested in accordance with the UL9540A testing standard which will address key issues in battery storage, such as: thermal propagation, installation instructions, ventilation requirements, fire protection effectiveness, and fire service strategy. The UL9540A is considered to be the more definite standard in this instance as it uses data gathered from primary experiments conducted on the UPS system that will be used in the data halls. To further capture this, a recommendation has been made: • The cell manufacturer shall ensure that the Li-ion battery modules and BMS are

Item	Related Recommendations	Compliant?	Assessment
			compliant with the testing requirements of UL9540A, or the more contemporary version (Ref. [4]).

4.7 Summary of Additional Measures

An assessment of the current design against FM Global DS 5-32 was conducted in **Section 4.6** and additional measures were implemented to provide the same level of protection that is required by the datasheet. A summary of **Table 4-7** has been provided in the list below, which are as follows:

- A floodwater and stormwater risk assessment shall be performed for the site.
- A Fire Safety Study shall be prepared in accordance with HIPAP No. 2.
- FM Global Datasheet 5-32 shall be adopted as the design basis for the facilitation with respect to the lithium ion batteries, as appropriate as determined and agreed with FRNSW through the Fire Safety Study Process.
- An automated sprinkler system shall be installed in accordance with increased design density and area of operation to comply with FM Global DS 5-32 for the data halls and FM Global DS 5-33 for the battery rooms.
- Personnel shall be trained to ensure that the inactive leaf remains in the closed position when not in use.
- A VEWFD system, which is the Aspirated Smoke Detection system, shall be provided in accordance with AS1670.1.
- Battery Management System (BMS) shall be provided to monitor and protect the Lithium-ion batteries, shutting them down on fault / over temperature to prevent thermal runaway.
- Off gas detection system in the battery room shall be provided to provide early detection and will be linked to the FIP. The system will automatically alert the fire brigade upon alarm. Additionally, on activation, the exhaust fans will run in emergency mode.
- An Emergency Warning and Intercommunication System (EWIS) will be provided throughout all parts of the building and designed in accordance with the prescriptive requirements of provision E4D9 of NCC 2022.
- The cell manufacturer shall ensure that the Li-ion battery modules and BMS are compliant with the testing requirements of UL9540A, or the more contemporary version (Ref. [4]).
- At least one (1) carbon dioxide portable fire extinguisher shall be provided on each floor.
- An automatic mechanical ventilation system shall be provided.
- No gaseous fire suppression system will be utilised in the design.

Lastly, the post-approval Fire Safety Study will cover the fire safety designs in more detail and will contain a commitment of implementation.

5.0 Work Health and Safety Regulation

5.1 Introduction

In addition to meeting the requirements of the relevant standards, the Work Health and Safety (WHS) Regulation 2017 (Ref. [1]) requires additional documentation to be prepared based upon the quantity of DGs stored on site. Provided in **Table 5-1** is a comparison of the quantities being stored at the site against the thresholds detailed in Schedule 11 of the WHS Regulation. It should be noted that Li-ion batteries are classified as Class 9 DGs, which is only a transport classification and is not strictly applicable during storage; hence, it is not subject to the Work Health and Safety Regulation 2017 (Ref. [1]).

Based on the quantities of goods being stored, the site would be classified as a Manifest site.

Table 5-1: Placard and Manifest Thresholds

Class	Description	PG	Quantity (kg or L)			Classification
			Stored	Placard	Manifest	
8	VLRA	III	17,400	1,000	10,000	Manifest
9	Lithium-Ion Batteries	n/a	279,600	n/a	n/a	n/a
C1	Diesel (combustible liquid)	n/a	783,000	10,000	100,000	Manifest

5.2 Applicable WHS Clauses

The applicable clauses from the Work Health and Safety Regulation 2017 for a placard site are outlined in **Table 5-2**.

Table 5-2: Relevant WHS Clauses and Requirements

Clause	WHS Requirement
346	A Hazardous Chemicals [*Dangerous Goods*] register shall be prepared which must include: • A list of hazardous chemicals stored, used or handled. • The current Safety Data Sheet (SDS) for DGs stored, used or handled. The register must be readily accessible to workers involved in handling or storing the chemicals, and anyone who is likely to be affected by the chemicals.
347	A manifest of chemicals stored on site shall be prepare in accordance with Schedule 12 of the regulation.
348	A notification shall be made to the regulator of the DGs that exceed the manifest quantities detailed in Schedule 11 of the Regulation.
349 & 350	An outer warning placard shall be prominently displayed at the site. The placard is to show the words “HAZCHEM” in red lettering on white or silver background and must have minimum dimensions 120 mm x 600 mm, in compliance with Schedule 13, as shown in **Figure 5-1**. PCBU shall ensure placards are displayed for all chemicals which exceed placard quantity of Schedule 11, and that placards comply with Schedule 13, as shown in **Figure 5-2**. A Placard Schedule shall be prepared to indicate the placard requirements (type and location).
351	A PCBU must manage the risk to health and safety associated with using and storing a hazardous chemical [*Dangerous Good*] and have regard of the following: • Hazardous properties of the chemical.

Clause	WHS Requirement
	• Reactions between chemicals (physical) or between the chemical and other substances/materials. • The nature of the work to be carried out with the hazardous chemical. • Any structure, plant or system of work used in the handling, generation or storage of the hazardous chemical [Dangerous Good] or that could react with the hazardous chemical [Dangerous Good] at the workplace. In order to comply with this requirement, it is necessary to conduct a risk assessment and to identify those hazards and risks associated with the storage and handling of the hazardous chemicals [*Dangerous Goods*]. The following recommendation has been made: • A risk assessment of the hazardous chemical [*Dangerous Good*] storage areas be conducted, including the use of the chemicals in the manufacturing areas; or • If there is an existing risk assessment, it should be reviewed.
358	A PCBU must ensure containers of hazardous chemicals are protected against impact damage and damage from excessive load.
361	A PCBU must prepare an emergency response plan (ERP) and submit it to the primary service organisation (Fire and Rescue NSW)

Figure 5-1: HAZCHEM Placard

Figure 5-2: Combustible Liquid Placard

5.3 Summary of Requirements

In summary, a Manifest site will require the following:

- A Manifest and notification to SafeWork
- A DG Risk Assessment of the storage and handling areas
- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- An Emergency Response Plan (ERP)
- Placards shown in **Figure 5-1** shall be affixed to the site entrance(s) and in **Figure 5-2** to be affixed to the diesel tanks.

6.0 Conclusion and Recommendations

6.1 Conclusions

A review of the hazardous chemical storages within the proposed Goodman data centre at 2 & 10-22 Kent Road and 685 Gardeners Road, Mascot NSW was conducted to determine compliance with the Work Health and Safety Regulation 2017 (Ref. [1]) and all relevant design standards. A review of the standards determined that the diesel storages are to be governed by AS 1940:2017 (Ref. [2]) based on diesels classification as a combustible liquid. The Li-ion batteries are to be governed by AS/NZS 4681:2000 (Ref. [3]) based on their classification as a Class 9 substance and tested in accordance with UL9540A. Additionally, a risk assessment approach has been adopted for reviewing the current design against the FM-Global Datasheet 5-32. These standards were used to create a series of requirements to guide the design of the stores.

Additionally, a review of the WHS Regulation determined that the site would operate at manifest quantities; hence, additional documentation is necessary to comply with the requirements of the Regulation.

6.2 Recommendations

The following recommendations have been made for the facility.

Design Requirements:

- The design requirements detailed within this report shall be adhered to in the development of the design for the facility.
- The cell manufacturer shall ensure that the Li-ion battery modules and BMS are compliant with the testing requirements of UL9540A, or the more contemporary version (Ref. [4]).
- FM Global Datasheet 5-32 shall be adopted as the design basis for the facilitation with respect to the lithium ion batteries, as appropriate as determined and agreed with FRNSW through the Fire Safety Study Process.
- Personnel shall be trained to ensure that the inactive leaf remains in the closed position when not in use.
- At least one (1) carbon dioxide portable fire extinguisher shall be provided on each floor.

Documentation Requirements:

- A Fire Safety Study shall be prepared in accordance with HIPAP No. 2.
- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- Placard Schedule.
- A Manifest and notification shall be submitted to SafeWork NSW.
- A DG Risk Assessment of the storage and handling areas.
- An Emergency Response Plan (ERP).

7.0 References

[1] SafeWork NSW, “Work Health and Safety Regulation,” SafeWork NSW, Lisarow, 2017.

[2] Standards Australia, AS 1940:2017 - Storage and Handling of Flammable and Combustible Liquids, Sydney: Standards Australia, 2017.

[3] Standards Australia, “AS/NZS 4681:2000 The Storage and Handling of Class 9 (Miscellaneous) Substances and Articles,” Standards Australia, Sydney, 2000.

[4] UL Solutions, “UL 9540A - Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems,” UL Solutions, Chicago, 2022.

[5] Department of Planning, “Applying SEPP 33,” Department of Planning, Sydney, 2011.

[6] Standards Australia, “AS 3780:2023 - The storage and handling of corrosive subtances,” Standards Australia, Sydney, 2023.