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Proposed Industrial Development
57-69 Tattersall, Kings Park
Sydney NSW 2148

Fire Engineering Brief – SSD

Prepared for:	Garry Rush Rush Metal Recyclers Pty Ltd 57-69 Tattersall Road Kings Park NSW 2148
Prepared by:	RED Fire Engineers Pty Ltd
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			Prepared by:	Reviewed by:	Approved by:
		Name:	**Johan Dahl**	**Magdalena Angerd**	
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			Prepared by:	Reviewed by:	Approved by:
		Name:	**Johan Dahl**	**MC Hui**	**Magdalena Angerd**
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			Prepared by:	Reviewed by:	Approved by:
		Name:	**Magdalena Angerd**	**MC Hui**	**Magdalena Angerd**
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		Name	**Magdalena Angerd**	**MC Hui**	**Magdalena Angerd**
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		Signature:			

Executive Summary

RED Fire Engineers Pty Ltd has been appointed by Rush Metals Recyclers Pty Ltd to undertake a fire engineering assessment for the proposed works at the Metal Recovery and Recycling Facility at 57-69 Tattersall Road, Kings Park, NSW 2148. This FEB relates to the whole site of Lot 100 in DP792731 which is subject to the State Significant Development application (SSD 8375). Note that a separate FEB has been prepared for the north-western part of Lot 100 subject to the development application DA-18-01273. A separate complying development certificate (CDC) application (CDC 180201) approved the concrete slab and building in the north-west corner of the site.

The total land area of Lot 100 is approximately 60,000 m^2 and is to contain a pre-shedder, hammer mill/pre-shredder and shear for processing scrap metal, a copper granulator for processing copper wire (building B), workshop areas used for draining end-of-life vehicles of fluids and storing vehicular parts (building C and D), external car and tyre storage areas, an administration building and reception building (building A) and a reception used as an office for the pick and pay area (building E).

The State Significant Development application (SSD 8375) for the whole site has been lodged for the following works:

- Permission to process 130,000 tons of scrap metal per year,
- Operation of shear and a copper granulator,
- Consolidation of all existing approvals and current applications, and
- Internal site layout and circulation amendments.

The BCA report for the industrial development prepared by Philip Chun, dated 7 August 2019 states that BCA Clauses E1.10 and E2.3 should be assessed as well as address comment from Fire & Rescue NSW (FRNSW). The guideline "*Fire Safety in Waste Facilities Guideline*" published by FRNSW on 20 August 2019 (FRNSW, 2019) has been considered to address comments by FRNSW regarding the fire safety at the site.

Clauses E1.10 and E2.3 of the BCA relate to provision of special hazards. It has been identified that requirements for smoke exhaust and sprinklers are to be assessed for building B, C and D. Building B, C and D are interconnected and therefore for the purpose of this report and the BCA are deemed a united building. The united building has an area of 2,157 m^2 and is therefore also deemed a large isolated building. Sprinklers will be provided within this building, however smoke exhaust is not proposed. Buildings A and E are office buildings and the provision for special hazards have therefore not been assessed for these buildings.

The FRNSW guideline referenced above and the National Construction Code (NCC) 2019 Volume One: Building Code of Australia (BCA) Class 2 to Class 9 Buildings, are therefore applicable to the works related to the State Significant Development Application (SSDA).

The intent of this Fire Engineering Brief (FEB) is to outline the proposed fire safety measures in relation to the FRNSW guideline for waste facilities (FRNSW, 2019) for the proposed development of Lot 100 in DP792731 which is subject to the State Significant

Development application (SSD 8375). The FEB will also present any proposed fire safety related Performance Solution and how it will be assessed against the Performance Requirements of the BCA.

The following BCA Deemed-to-Satisfy (DtS) departures (refer to Table 1) have been identified and are proposed to be addressed by formulating a Performance Solution.

Table 1: Identified BCA Deemed-to-Satisfy (DtS) departures

Item	Description of Deemed-to-Satisfy departures	DtS Provisions	Relevant Performance Requirements
1	Fire hydrant booster and sprinkler booster location being within 10 m of a building and is not protected in accordance with AS 2419.1:2005 Note 1) and AS 2118.1:2017.	Clause E1.3 and E1.5	EP1.3 and EP1.4
2	Additional smoke hazard management and additional provisions for fire fighting may be necessary due to special hazards. Sprinklers are proposed for building B, C and D. No smoke exhaust system is proposed throughout building B, C and D.	E1.10 and E2.3	CP9, EP1.3, EP1.4 and EP2.2
3	The combined area of united building B, C and D is greater than 2,000 m^2 and as such it has been defined as a large isolated building. Fire brigade vehicular access is not proposed in accordance with Clause C2.4(b).	C2.3(a)(ii) and C2.4(b)	CP9

Note 1: All other aspects of the hydrant system will be fully compliant with AS 2419.1:2005 and AS 2419.1:2017. As the hydrant system complies with both versions of the standard no Performance Solution to adopt AS 2419.1:2017 is required.

Table 2 provides a summary of design aspects to be considered as per the FRNSW guideline for waste facilities (FRNSW, 2019) within Lot 100 in DP792731. Note that not all requirements have been reproduced.

Table 2: FRNSW Waste Facility Guideline Summary

Description of relevant design aspects	
The following items identified in the FRNSW guideline for waste facilities (FRNSW, 2019), in relation to Lot 100 in DP792731, are considered in this Fire Engineering Brief:	
Item (A)	Stockpile size and separation distances between external stockpiles
Item (B)	Fire brigade accessibility
Item (C)	Fire hydrants water capacity
Item (D)	Water run-off
Item (E)	Fire services and equipment

The 'Trial Concept Design' is located in Section 3 of this FEB. It outlines the key Fire Safety Measures to be implemented for Lot 100 in DP792731 of the industrial development in relation to the BCA and the FRNSW guideline for waste facilities (FRNSW, 2019).

Table of Contents

1 Introduction

1.1 Background

1.1.1 The total land area of Lot 100 in DP792731 is approximately 60,000 m² (refer to Figure 1) and is to contain a pre-shedder, hammer mill/pre-shredder and shear for processing scrap metal, a copper granulator for processing copper wire (building B), workshop areas used for draining end-of-life vehicles of fluids and storing vehicular parts (building C and D), external car and tyre storage areas, an administration building and reception building (building A) and a reception used as an office for the pick and pay area (building E).

Figure 1: Aerial photo of Lot 100 in DP792731 subject to the SSD application ©2019 Google

1.1.2 This FEB relates to the whole site of Lot 100 in DP792731 which is subject to the State Significant Development application (SSD 8375). Note that a separate FEB (refer to *1907010_JN19-00080_57_69 Tattersall Road_Kings Park_FEB4,* dated 26 July 2019) has been prepared for the north-western part of Lot 100 subject to the development application DA-18-01273. A separate complying development certificate (CDC) application (CDC 180201) approved the concrete slab and building in the north-west corner of the site.

1.1.3 The State Significant Development application (SSD 8375) for the whole site has been lodged for the following works:

- Permission to process 130,000 tons of scrap metal per year,
- Operation of shear,
- Consolidation of all existing approvals and current applications, and
- Internal site layout and circulation amendments.

1.1.4 The BCA report for the industrial development prepared by Philip Chun, dated 7 August 2019 states that BCA Clauses E1.10 and E2.3 should be assessed as well as address comment from Fire & Rescue NSW (FRNSW). The guideline "Fire Safety in Waste Facilities Guideline" published by FRNSW on 20 August 2019 (FRNSW, 2019) has been considered to address comments by FRNSW regarding the fire safety at the site.

1.1.5 Clauses E1.10 and E2.3 of the BCA relate to provision of special hazards. It has been identified that requirements for smoke exhaust and sprinklers are to be assessed for building B, C and D. Building B, C and D are interconnected and therefore for the purpose of this report and the BCA are deemed a united building. The united building has an area of 2,157 m^2 and is therefore also deemed a large isolated building. Sprinklers will be provided within this building, however smoke exhaust is not proposed. Building A and E are office buildings and the provision for special hazards have therefore not been assessed for these buildings.

1.1.6 The FRNSW guideline referenced above and the National Construction Code (NCC) Series 2019 Volume One: Building Code of Australia (BCA) Class 2 to Class 9 Buildings, are therefore applicable to the works related to the State Significant Development Application (SSDA).

1.1.7 The intent of this Fire Engineering Brief (FEB) is to outline the proposed fire safety measures in relation to the FRNSW guideline for waste facilities (FRNSW, 2019) for the proposed development of Lot 100 in DP792731 which is subject to the State Significant Development application (SSD 8375). The FEB will also present any proposed fire safety related Performance Solutions and how they will be assessed against the Performance Requirements of the BCA

1.1.8 The 'Trial Concept Design' is located in Section 3 of this FEB. It outlines the key Fire Safety Measures to be implemented for the proposed waste metal recycling facility on Lot 100 in DP792731.

1.2 Report Applicability

1.2.1 This report addresses only the identified Performance Solution in relation to the BCA and the items identified in Table 2 relating to the FRNSW guideline for waste facilities (FRNSW, 2019). This FEB is based on the information referenced in this report and on the premise that all other aspects of the design, with regard to fire and life safety, adopting the BCA Deemed-to-Satisfy (DtS) Provisions, the requirements in the FRNSW guideline for waste facilities (FRNSW, 2019), the FRNSW guideline for storage of tyres (FRNSW, 2014) and Tyre Stewardship Australia Best Practice Guidelines for Tyre Storage and Fire and Emergency, version 1, May 2017.

1.2.2 This report is for the use by Rush Metal Recyclers Pty Ltd and the design team on this project. The report will need to be updated if there are any changes to the information relied upon in the preparation of this report.

1.2.3 The findings and opinions expressed within this report are based on the information reasonably available at the date of issue of this document, and are applicable only to the detailed circumstances envisaged herein.

1.3 Applicable Legislation

1.3.1 The primary legislation applicable to the development is the Environmental Planning and Assessment (EP&A) Act 1979. The whole site of Lot 100 in DP792731 is subject to a State Significant Development application.

1.3.2 The north-western part of Lot 100 is subject to a development application DA-18-01273. The EP&A Regulations require construction work to be designed in accordance with the National Construction Code Series (NCC) 2016 Volume One: Amendment 1: Building Code of Australia (BCA) Class 2 to Class 9 Buildings, which is the applicable BCA for the works related to the DA approval.

1.3.3 The DA (DA-18-01273) was an application for use only and does not involve construction works. A separate complying development certificate (CDC) application (CDC 180201) approved the concrete slab and building in the north-west corner of the site. The CDC included a condition pertaining to fire safety systems in accordance with clause 136AA of the EP&A Regulation 2000.

1.3.4 FRNSW has provided comment on the SSD 8375 application. We have been provided with a copy of the FRNSW letter (ref BF17/1422) dated 19 July 2017. FRNSW has recommended that Clauses E1.10 and E2.3 of Volume One of the National Construction Code (NCC) Series, Building Code of Australia (BCA), are to be complied with. In particular the following aspects of the development are to be assessed and appropriately addressed:

- That stockpile storage within any building and/or open yard storage on the allotment be limited in size and volume and arrange to minimise the likelihood of fire spread,
- That the arrangement of stockpiles of combustible material, stored externally, on the allotment be sufficiently separated to permit (FRNSW) vehicle access between stockpiles,
- That the site is served by a fire hydrant system that has a minimum water supply capacity appropriate to the site's largest stockpile fire load,
- That significant buildings used to process recyclable material are provided with a smoke management system that facilitates FRNSW fire-fighting operations,
- If deemed necessary, by virtue of applying Clauses E1.10 and E2.3 to the development, that any significant building used to process recyclable materials is provided with an appropriate automatic fire suppression system,
- That the site is provided with an effective means to contain an appropriate volume of contaminated fire water run-off. The capacity of containment to be

commensurate with the concurrence discharge rate of the facility's hydraulic fire systems.

1.3.5 Comments on this FEB prepared for the SSD stage will be sought from FRNSW.

1.3.6 The BCA provides a set of prescriptive DtS Provisions. The DtS Provisions are defined within the BCA as building solutions deemed to comply with the Performance Requirements of the BCA. Deviations from the DtS Provisions are an acceptable option to comply with the BCA if the Performance Requirements of the BCA are met. The alternative method to demonstrate compliance is called a 'Performance Solution' (formerly known as an 'Alternative Solution').

1.3.7 The assessment of a Performance Solution can be undertaken using a variety of methods. These are defined in Clause A2.2(2) of the BCA. One or more, or a combination of these methods can be adopted to determine whether the Performance Solution complies with the Performance Requirements of the BCA. The relevant Performance Requirements have been determined in accordance with Clause A2.2(3) of the BCA. Compliance with Performance Requirements is to be in accordance with Clause A2.1 of the BCA.

1.3.8 Similarly, the FRNSW guideline for waste facilities (FRNSW, 2019) contains requirements for:

- Consideration of fire safety during all stages including planning, design, assessment and operation of the facility.
- Fire safety systems suitable for the special hazards identified in the waste facility and which also meet the operational needs of fire fighters.
- Storage and stockpiling of combustible waste material based on combustibility and maximum pile size.
- Workplace fire safety and fire safety planning, including procedures to be implemented in the event of an emergency.

1.3.9 The FRNSW guideline for waste facilities (FRNSW, 2019) states that, when following the guideline, the likelihood and severity of fire should be reduced, assisting with firefighting intervention and protecting life, property and environment from fire.

1.4 Fire Engineering Process

1.4.1 In accordance with the International Fire Engineering Guidelines (IFEG) (ABCB, 2005), the fire engineer should prepare a Fire Engineering Brief (FEB) for every project carried out. The FEB is required to include the objectives, proposed trial designs, methods of analyses and acceptance criteria for the proposed Performance Solution. This FEB follows these principles.

1.4.2 Following approval of the FEB a detailed Fire Engineering Report (FER) will be prepared. The FER is to contain the relevant design calculations and justification to demonstrate that the proposed Performance Solution contained within the FER complies with the Performance Requirements of the BCA and that the design meets the intent of the FRNSW guideline for waste facilities (FRNSW, 2019).

1.5 Scope and Objectives

1.5.1 The client's objective is to construct a functional development that complies with the BCA and meets the intent of the NSW Fire Safety Guideline – Fire Safety in waste facilities Version 01, issued 19 November 2018 by FRNSW (FRNSW, 2019).

1.5.2 Fire & Rescue New South Wales (FRNSW) is the referral agency for this project. FRNSW has objectives regarding the protection of life, property and the environment. For this development, we expect that their main activities during a fire will include fire extinguishment using the fire hydrant system.

1.5.3 The Secretary's Environmental Assessment Requirements (SEARs) dated 21 July 2017 requires that consultation with Fire & Rescue is undertaken as well as consideration of issues discussed in Attachment 2. Attachment 2 includes comments from FRNSW on the SSD 8375 application. It is considered that the clauses E1.10 and E2.3 - *Provisions for special hazards* of the BCA are applicable to project. It is therefore our opinion that this FEB prepared for the SSD stage shall be submitted to FRNSW for comments.

1.5.4 A meeting was held (not including RED Fire Engineers) with the FRNSW on 24 January 2019. A copy of the meeting minutes including attendees can be found in Appendix E. The meeting was part of the consultation requirements for the SSD application and related to the entire site. An additional meeting with the FRSNW was held (including RED Fire Engineers) on the 21 May 2019. Refer to meeting notes from 21 May 2019 and email response from the FRNSW in Appendix E to this report.

1.5.5 Key features of this report that should be reviewed and agreed upon amongst stakeholders include proposed fire safety measures, assumptions and limitations, design fire scenario and design fires, occupant characteristics, methods of analyses and the proposed overall design philosophy.

1.6 Stakeholders and Documentation

1.6.1 The stakeholders associated with this project are listed in Table 3.

Table 3: Project stakeholders

Organisation	Role	Representative
Rush Metal Recyclers	Client	Garry Rush
Northern Group	Project Manager	Geoff Davis
Philip Chun	BCA consultant	Frank De Pasquale
TBC – Still to be engaged	Principal Certifying Authority	TBC
Liquid Hydraulics	Hydraulic Engineer	David Wood
Barker Ryan Stewart	Project Manager	Kim Stamper
FRNSW	Referral authority	Nathan Everett Duke Ismael
RED Fire Engineers	Fire Safety Engineer	Magdalena Angered MC Hui

1.6.2 Site inspections have been undertaken by Johan Dahl and Carl Pettersson on 3 April 2019, by Carl Pettersson on 15 April 2019 and by Johan Dahl, Magdalena Angerd and Zeth Soderlund on 4 July 2019.

1.6.3 The relevant documents and drawings on which this FEB is based are listed in Table 4.

Table 4: Relevant documentation

Organisation	Title	Project number/ ref	Date	Revision
Barker Ryan Stewart	Building B, C & D Plan and Building C, D & E Elevations	CC160136BCA rev A	26/02/19	A
Blacktown City Council	Notice of determination of a development application	DA-18-01273	29/03/19	-
FRNSW	Fire Safety Guideline – Fire Safety in waste facilities	-	20/08/19	02
Barker Ryan Stewart	Site Master Plan	CC160136SSD REV H	03/09/19	H
Liquid Hydraulics	Fire Hydrant & Hose Reel Systems/Part Site Plan	18536 / H01/P2	05/07/19	P2
Simsmetal Ltd	D.A Layout	NBT - 0002	18/3/96	-
BenBow Environmental	Preliminary Hazard Analysis	181112_PHA_Rev6	22/01/19	6
NSW Planning & Environment	State Significant Development – Secretary's Environmental Assessment Requirements Pick n Payless Metal Recovery and Recycling Facility 57-69 Tattersall Road, Kings Park (SSD 8375).	SSD 8375	21/7/17	-
Autorecyclers Pty Ltd	State Significant Development – Request for Secretary's Environmental Assessment Requirements – Kings Park Waste Metal Recovery, Processing and Recycling Facility 57-69	SSD 8375	22/06/17	-

	Tattersall Road, Kings Park – SEARS Request			
Proust & Gardner Consulting Pty Ltd	Ceiling Profile Plan 57 Tattersall Road Kings Park	23798-CPP	24/04/2019	B

1.6.4 Citations and references used throughout this report are listed in section 11.

1.7 Assumptions and Limitations

1.7.1 This FEB relates to the whole site of Lot 100 in DP792731 which is subject to the State Significant Development application (SSD 8375). Note that a separate FEB (refer to *1907010_JN19-00080_57_69Tattersall Road_Kings Park_FEB4,* dated 26 July 2019) has been prepared for the north-western part of Lot 100 subject to the development application DA-18-01273 for the north-western part of Lot 100 subject to DA-18-01273.

1.7.2 The site is not on bushfire prone land.

1.7.3 Assumptions that are critical to the analysis and therefore need to be considered and agreed to by stakeholders at the FEB stage are as follows. This list will be expanded if necessary and confirmed in the FER:

(a) All essential equipment and services will be maintained to the operational capacity to which they were designed, installed, commissioned and certified in accordance with the manufacturer's instructions. Therefore, our design assumes they will be functioning correctly during a fire situation.
(b) All other components of the industrial development not addressed within this document will be compliant with the BCA Performance Requirements , the requirements in the FRNSW guideline for waste facilities (FRNSW, 2019) and the requirements in the FRNSW guideline for storage of rubber tyres (FRNSW, 2014) that were applicable at the time of application for construction certificate / CDC (either DtS or formulating a 'Performance Solution') and/or remain as required within the existing construction certificate / CDC condition/design approach.
(c) All codes and standards referred to are the current version at the time of application of construction certificate / CDC (or equivalent) or an alternative approved edition as indicated in this report. This also includes any buildings designed to international codes providing an equivalent or better level of safety and having been approved by the Authority Having Jurisdiction (AHJ).

1.7.4 This report is consistent with the fire safety provisions, objectives and limitations of the BCA and the FRNSW guideline for waste facilities (FRNSW, 2019).

(a) Our design is based on the information referenced in this report and on all other aspects of the design, with regard to fire and life safety, adopting the BCA Deemed-to-Satisfy (DtS) Provisions, the requirements in the FRNSW guideline waste facilities (FRNSW, 2019) and the requirements in the FRNSW guideline for storage of rubber tyres (FRNSW, 2014).

(b) This report excludes the analysis and design of fires including incendiary ones involving accelerants, explosives and/or multiple ignition sources, or acts of terrorism.

(c) The concepts outlined in this report assume a complete and operational development, and do not address protection of the current development or of the site during construction, renovation or demolition.

(d) Unless stated otherwise, protection of property (other than adjoining property), business interruption or losses, personal or moral obligations of the owner/occupier, reputation, environmental impacts, broader community issues, amenity or non-fire related matters in the building such as health, security, energy efficiency, and occupational health & safety or the re-installation and costs associated with any damages from fire are specifically excluded from this analysis.

1.7.5 Whilst RED Fire Engineers has used reasonable care and judgement in performing the fire engineering assessments, a fire with a severity exceeding the design inputs may still occur.

1.7.6 It is impossible for a building or development to have a 'zero risk' or be 'risk free'. Regardless of whether a Performance Solution, DtS solution or fire safety measures as per with the FRNSW guideline (FRNSW, 2019), are adopted for the subject development, this does not and cannot eliminate all possibilities of a fire starting, and nothing in this report lay claims to achieving a zero risk, making the site risk free, or eliminating all fire and life risks from the project.

1.7.7 Any substitution of fire safety measures, fire protection equipment and/or products nominated in this report without prior approval of RED Fire Engineers Pty Ltd may render this report invalid, and RED fire Engineers Pty Ltd should be contacted to assess the potential impact of the proposed substitution.

2 Principal Site and Dominant Occupant Characteristics

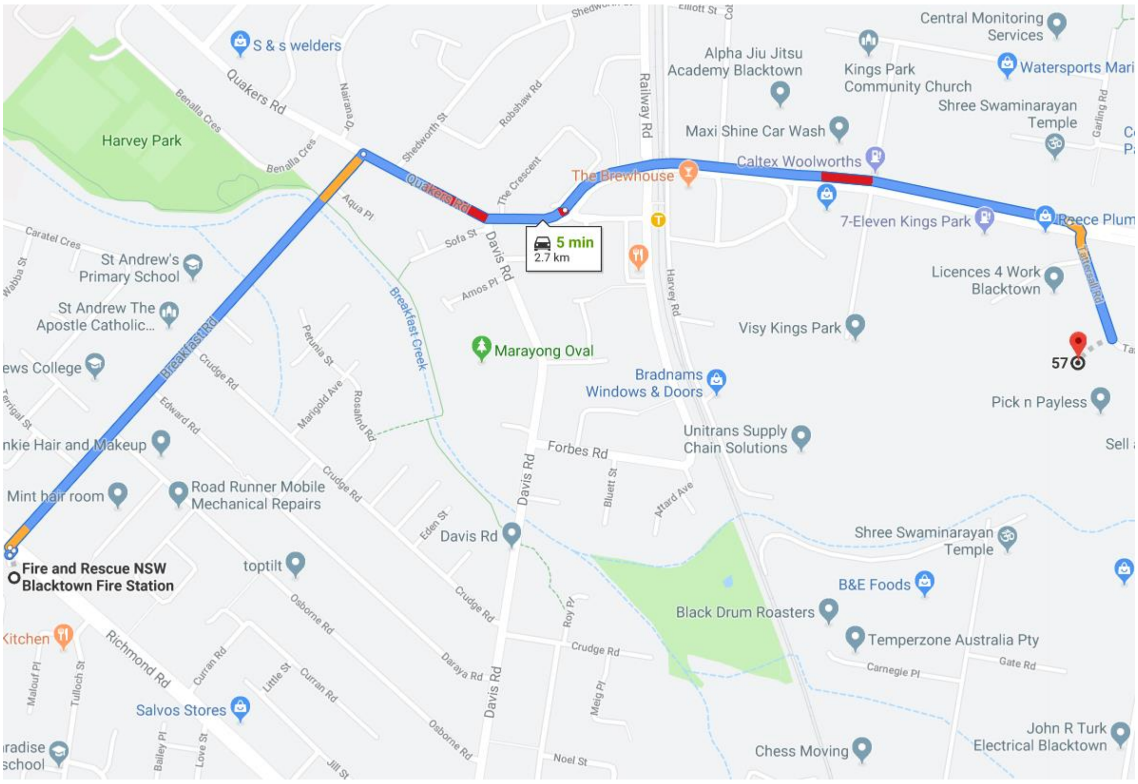
2.1 Principal Site Characteristics

2.1.1 The principal building characteristics are shown in Table 5.

Table 5: Principal building characteristics

Building characteristics			
Building Name	**Occupancy**	**Height**	**DtS minimum construction type**
Building A	Class 5	Rise in Storeys – Two	Type C construction
Building B, C, D	Class 8 (considered a united building)	Rise in Storeys – One	Type C construction – large isolated building
Building E	Class 5	Rise in Storeys – One	Type C construction
Drawings	Refer to Appendix A and Table 4 for drawings.		

Location



This map identifies the location of the industrial development at 57-69 Tattersall Road, Kings Park, NSW 2148 (red pin), and its proximity to the Heidelberg Fire Station (222 Richmond Road, Blacktown NSW 2148), approximately 3 km away.

2.1.2 Figure 2 shows the location of buildings A to E.

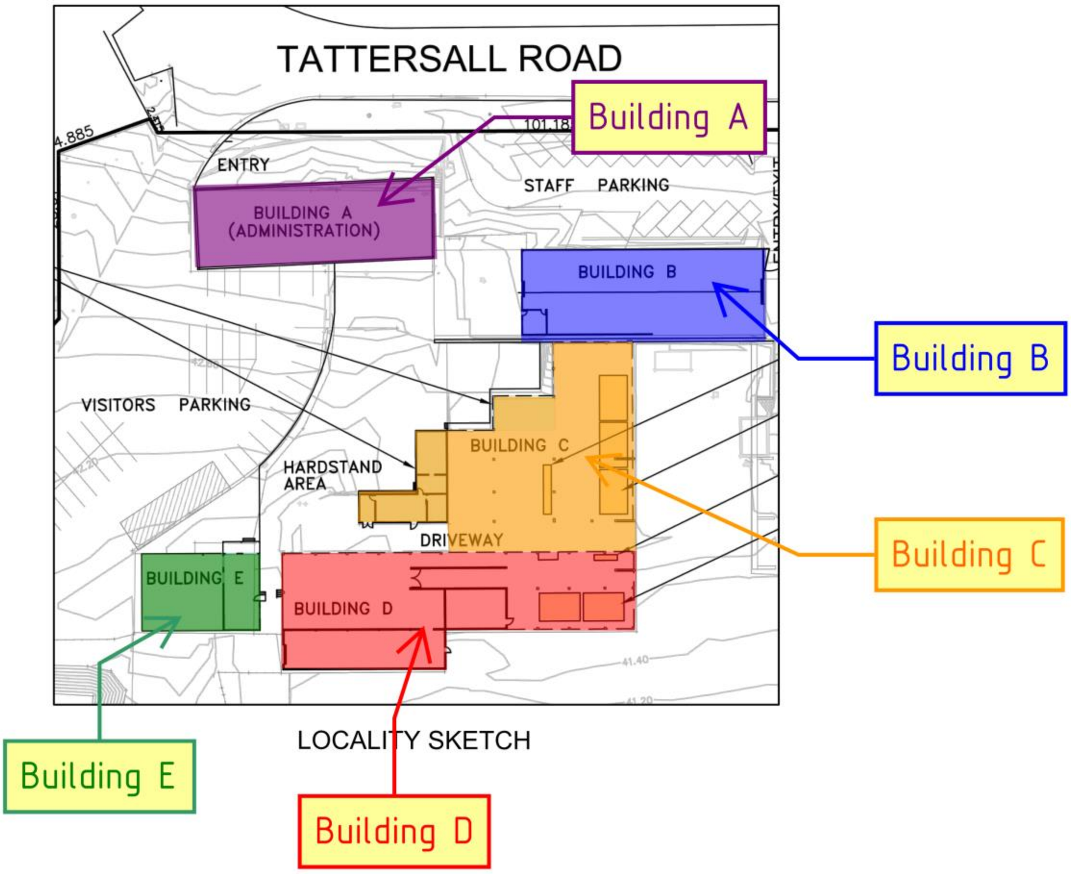


Figure 2: Location of buildings A to E

2.1.3 The use of the buildings is presented in Table 6. Note that building B, C and D are deemed a united building. Building B, C and D have a total floor area of 2,157 m^2 and is deemed a large isolated building. Note that the use as outlined in Table 6 and layout of the buildings in Figure 2 must not change as part of the SSD application.

Table 6: Description of use of building A to E.

Building name	Use
Building A	Administration and office building.
Building B	The building contains a copper granulator machine to recycle copper from cables.
Building C, D	Workshop areas used for demolition of cars, drainage of fluids such as oil and fuel from the vehicles. Limited storage with a maximum height of 2.2 m.
Building E	Reception used as an office for the pick and pay area.

2.1.4 Figure 3 shows the site plan for Lot 100 in DP792731 and Table 7 presents all of the proposed stockpiles and usage of the areas on the site for the SSD stage.

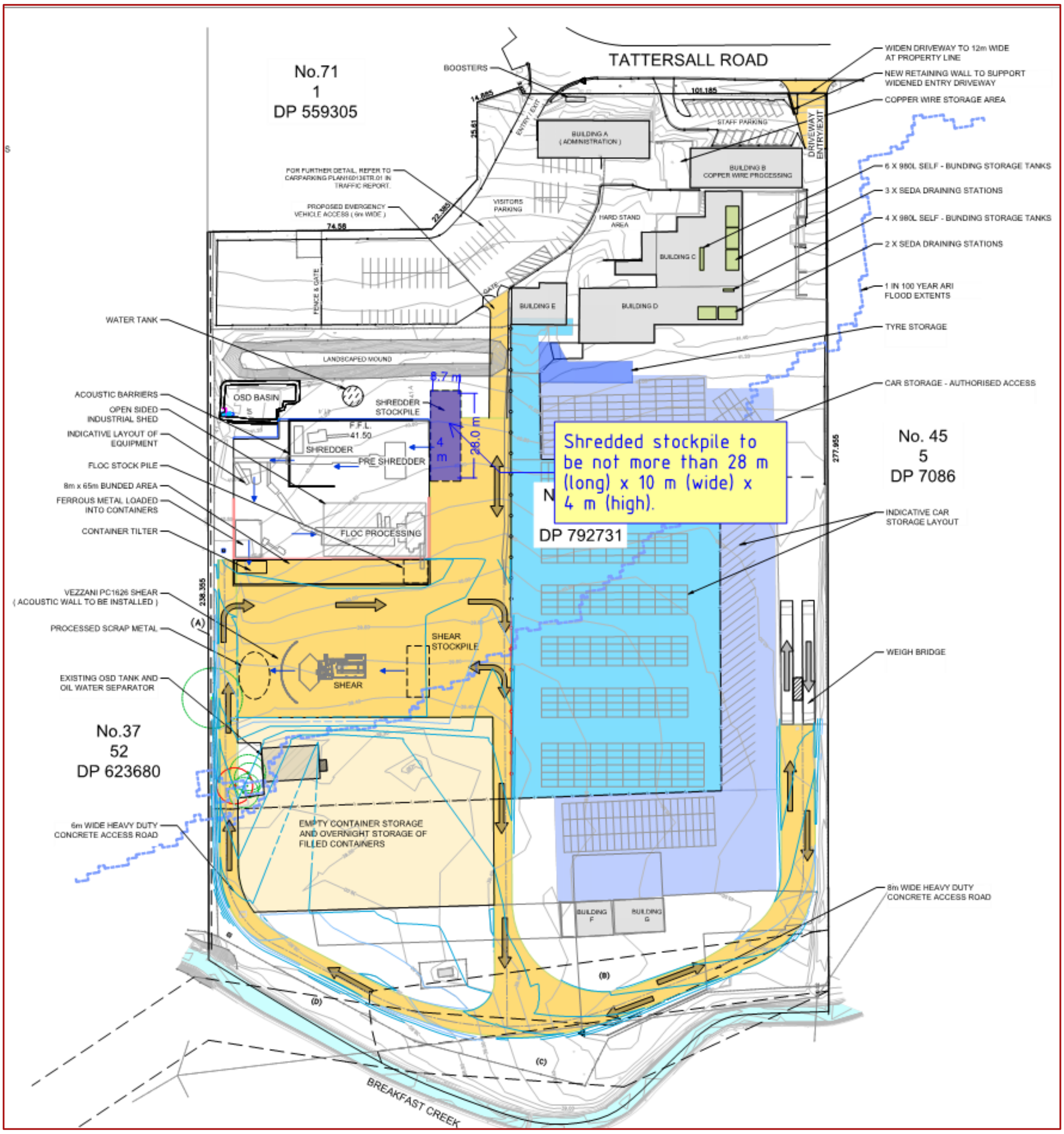


Figure 3: Site plan for Lot 100 in DP792731

2.1.5 Table 7 presents all of the proposed piles and usage of the areas on the site for the SSD stage.

Table 7: Descriptions of proposed piles and usage of external areas of the site

Area	Description
North-western part of Lot 100	Mobile hammer mill/pre-shredder/shredder machine to recycle general scrap metal, motor vehicles, light gauge metals and whitegoods.
Raw-feed material stockpile (shredder stockpile).	Comprises raw feed materials, such as cars and white-goods etc. This pile contains combustible materials. The pile needs to be limited in size to be not more than 28 m (long) x 10 m (wide) x 4 m (high). The maximum slope angle is not proposed to be limited to 45 °.

Floc Stockpile	More fine and higher density material than the raw feed material. This pile contains combustible materials. The pile needs to be limited in size to be not more than 8 m (length) x 8 m (width) x 4 m (height), as well as adapting a maximum slope angle of 45 °.
Container Tilter	Recycled metal from the pre-shredder and the shredder machine. This material is stored in metal containers and contain metal only.
Material Storage Bays	Recycled metal from the pre-shredder and the shredder machine. The storage bays contain metal only.
Shear Stockpile	The pile contains heavy gauge metal.
Processed Scrap Metal	Finer heavy gauge metal than the Shear Stockpile. This is the shredded material that comes out from the shear machine. This pile contains metal only.
Empty Container Storage and Overnight Storage of Filled Containers.	This area will be used as a redundancy for materials stored in the Container Tilter. Hence, the containers stored here contain metal only.
Pick N Payless (Public Area) and Car Storage Area	Area used for vehicle storage. After the vehicles have been disassembled, drained of fluids such as oil and fuel in the workshop building they are stored at the public area to allow the public to buy parts of the cars that they find valuable.
Tyre storage	Less than 400 tyres for sale at a time to be stored on racks. Storage must comply with the FRNSW guideline for storage of rubber tyres (FRNSW, 2014).
Copper wire storage area	Located outside building B. Copper cabling located in 2 tonne metal skip bins or 1 m^3 bulk bags before it is shredded in granulator.

2.1.6 There will be an internal stockpile of copper cables to be processed in Building B. Stockpiles will be copper cabling before it is shredded in granulator, copper granules once shredded and then the plastic / rubber insulation which is shredded off the copper wiring. It is proposed to process one tonne per day, and store it in within 1 m^3 bags within the building. A maximum of 20 bags processed material is allowed in the building. When there are 20 bags of processed material it gets picked up.

2.2 Dominant Occupant Characteristics

2.2.1 The dominant occupant characteristics are presented in Table 8.

Table 8: Occupant characteristics

Characteristic	
State	We expect staff to be awake and mobile and their response time to a possible fire scenario is likely to be short. We expect staff will be present at the site at all times when any machinery is operating.
Level of assistance required	We expect that the majority of the occupants will not require physical assistance to egress out of the site in an emergency.

Emergency training	We assume that staff are trained in appropriate actions during an emergency, such that they are aware of exit locations and procedures to be undertaken. An operations plan in accordance with clause 8.6 as per the FRNSW guideline (FRNSW, 2019) and an emergency plan (in accordance with AS 3745:2010) is required to be established. A Health, Safety and Environmental Management System (HSE) Policy that has also been prepared and adopted for the site, and forms part of the documentation submitted with the SSD application.
Familiarity	Occupants will have differing levels of familiarity with the site. We expect that the employees/staff will be more familiar, know the exit routes and procedures to be taken during a fire event. As stated above, staff is expected to be present at the site at all times when machinery is operating. We assume customers to have knowledge of the point of entry, and would be likely to display a preference toward egress via their path of entry. Visitors are expected to be accompanied by trained staff.

3 Trial Concept Design

3.1 Introduction

3.1.1 Our trial concept design detailed in this section is to support the proposed Performance Solution that has been formulated to address the BCA DtS departure identified in the executive summary. Our design does not account for any other departures from DtS Provisions of the BCA related to fire safety.

3.1.2 The trial concept design also outlines proposed fire safety measures to support the items, in relation to storage and stockpile sizes, separation distances between stockpiles, fire hydrants, provision of on-site water tanks, water run-off and fire brigade accessibility, in regards to the FRNSW guideline for waste facilities (FRNSW, 2019). Our design does not account for any other items from the FRNSW guideline for waste facilities (FRNSW, 2019) related to fire safety.

3.2 Fire Resisting Construction and Compartmentation

3.2.1 Building B, C and D are to comply with the requirements of BCA Clause C1.1 and Specification C1.1 for a building of Type C construction. Building B, C and D is to be treated as a united building and is to comply with the requirements for a large isolated building within Clause C2.3(a)(ii) of the BCA with the exception that the perimeter vehicular access need not to comply with Clause C2.4(b) of the BCA. The vehicular access must comply with item 3.2.2 below.

3.2.2 Access is to be provided at the perimeter of the site, around buildings and access roads between any external stockpiles. Figure 4 outlines a proposed driveway to allow for emergency vehicular to access in the event of a fire brigade intervention. The proposed driveway with one entry and one exit must comply with the FRNSW guideline "*Access for emergency vehicles*" (FRNSW, 2010). The driveway is required to have a width of not less than 6 m for straight carriageways. Curved carriageway must have a minimum inner radius of 7.3 m and an outer radius of 14.6 m with a minimum distance between the inner and outer arcs not less than 7.3 m. Note that the proposed driveway requires acceptance from FRNSW.

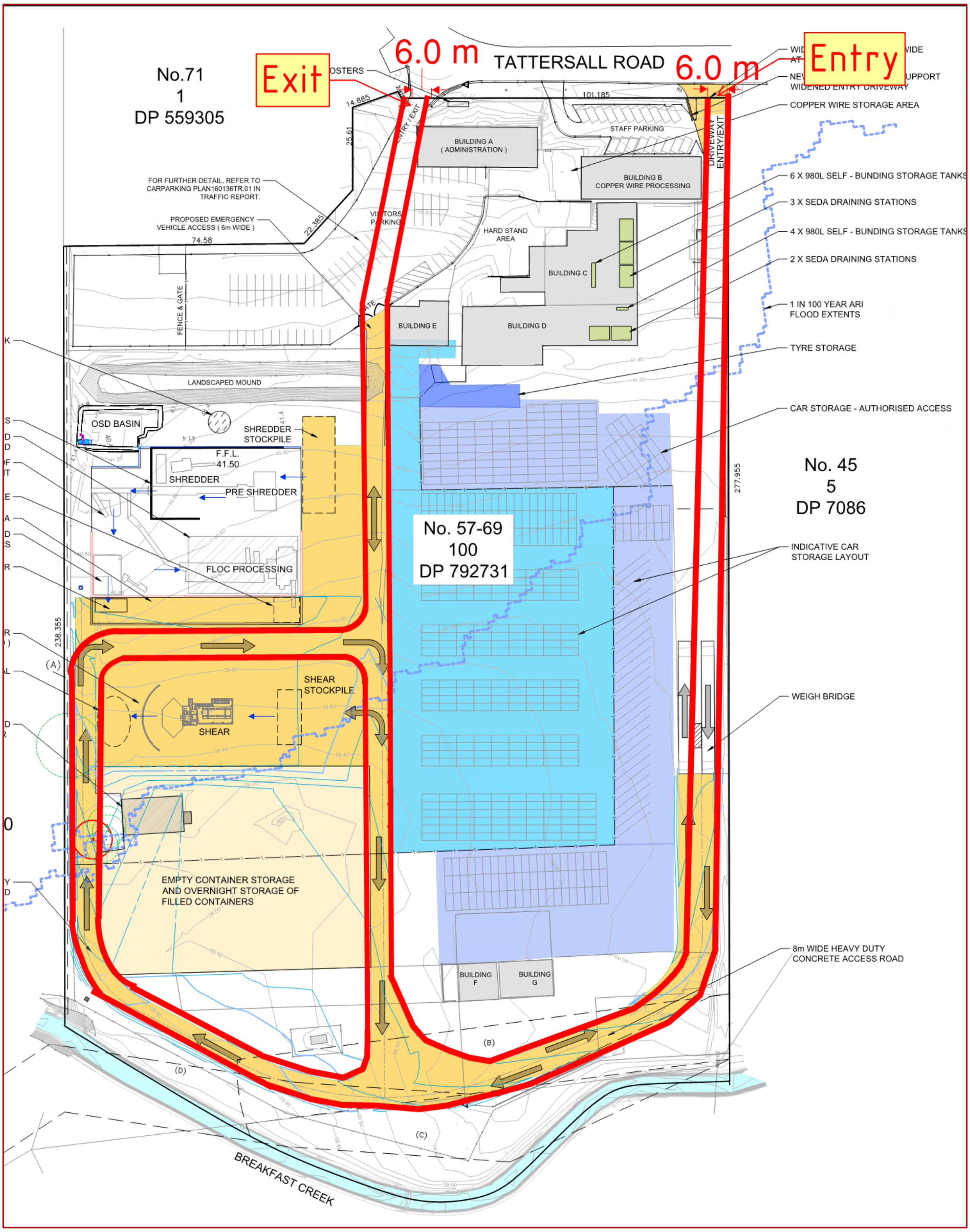


Figure 4: Proposed driveway for emergency vehicles

3.3 Stockpiles, Tyre Storage and Car Storage

3.3.1 The only external stockpiles containing significant amount of combustible material on the site are the shredder stockpile and the floc stockpile. The maximum allowed stockpile size has been assessed for the largest combustible pile on site and is the one located adjacent to the shredder machine in the north-western part of Lot 100, which comprises raw feed materials, e.g. raw material such as cars and white-goods. This pile will have a maximum stockpile size of 28 m (length) x

10 m (width) x 4 m (height). The additional combustible stockpile (floc) located at the north-western part of Lot 100 is shown in Figure 5. This stockpile consists of shredded material with a maximum allowed size of 8 m (long) x 8 m (wide) and 4 m (high). The maximum slope angle of the shredded pile must not exceed 45 °.

3.3.2 The shear stockpile and processed scrap metal pile must consist of metal material only and have a maximum size of 17 m (long) x 10 m (wide) x 4 m (high).

3.3.3 Stockpile boundary limits shall be permanently marked to clearly identify limits that maintain maximum stockpile size and minimum separation distances as required by Clause 8.2.7 of the FRNSW guideline (FRNSW, 2019).

3.3.4 Only storage of metal is allowed in the material storage bays and the Empty Container Storage and Overnight Storage of Filled Containers.

3.3.5 The minimum separation distance between the combustible external piles and the separation distance between external combustible piles and any building or boundary, at the north-western part of Lot 100 are indicated in Figure 5. The minimum distance from the raw feed material pile and building E must be at least 30 m and the distance from the raw feed material to another stockpile must be at least 26 m. No storage is allowed in this area and the fence within this area must be constructed of Dunewall type acoustic barrier (fibre cement covering and EPS core) or of fully non-combustible material. No storage is allowed within 15 m of the floc stockpile.

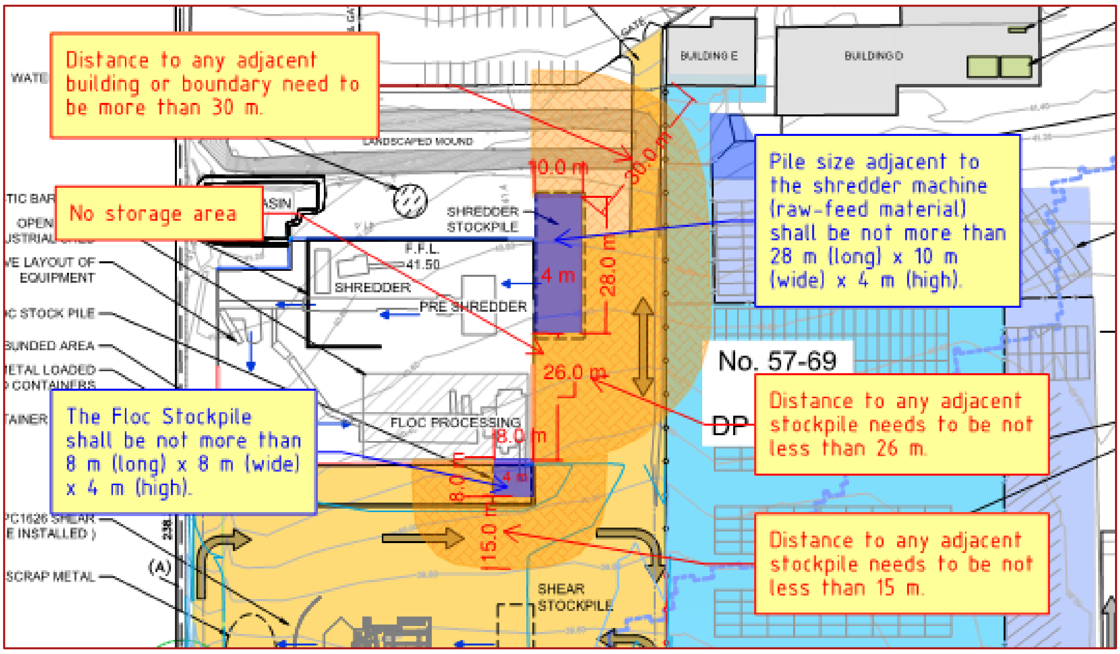


Figure 5: Proposed layout of the stockpiles at the north-western part of Lot 100

3.3.6 Currently, tyres are stored in the green area highlighted in Figure 6 which is located directly adjacent to building E. The tyres are required to be moved and be located at least 26 m from the raw material stockpile. The tyres must be stored in accordance with FRNSW Guideline for bulk storage of rubber tyres (FRNSW, 2014) and the Tyre Stewardship Australia Best Practice Guidelines for Tyre Storage and Fire and Emergency, version 1, May 2017.

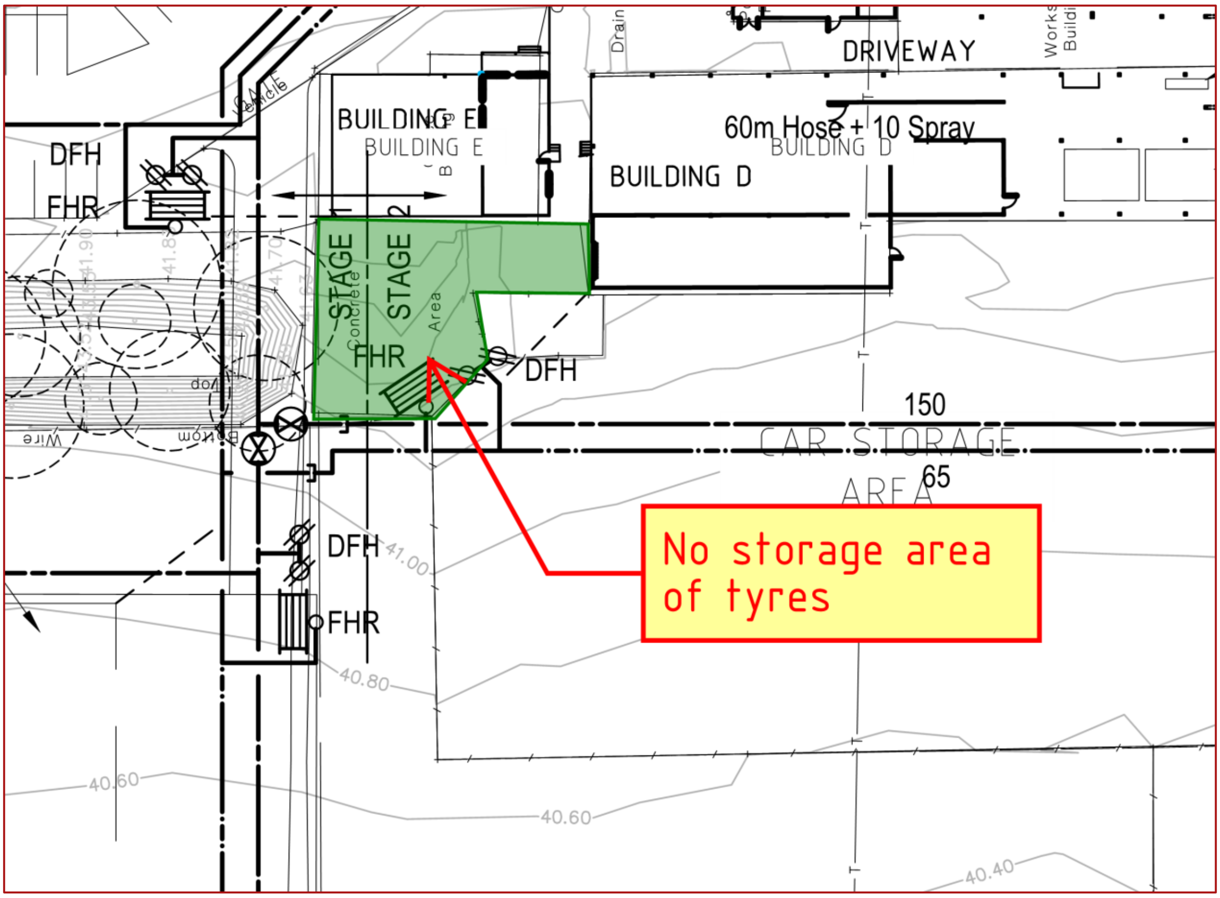


Figure 6: Current location of tyres

3.3.7 The following items are the proposed fire safety measures that are applicable to the external car storage areas:

a) The vehicles must not be stored on top of each other.
b) Hydrant coverage must be provided to all areas, including all external areas of the site considering two lengths of hoses (60 m) to be used as per AS 2419.1:2005 and AS 2419.1:2017. The layout of the car storage areas and any fences must be considered when determining that hydrant coverage is achieved throughout all areas.
c) Aisles must be provided between vehicles on the external storage areas to allow for fire brigade intervention[1].

3.3.8 The only internal stockpiles are located within Building B. Stockpiles contain copper cabling before it is shredded in granulator, copper granules once shredded and then the plastic / rubber insulation which is shredded off the copper wiring. The material is to be stored within 1 m^3 bags within the building. A maximum of 20 bags processed material is allowed in the building. Exact location to be included in Fire Engineering Report. Due to the small quantities of stored material no internal separation distances have been applied. The stockpiles must be

[1] This FEB will be sent for approval to FRNSW.

maintained and area be marked up with line marking on the floor, so that all building egress points and required paths of travel are not blocked or impeded.

3.4 Fire Services and Equipment

3.4.1 The location of the fire hydrant booster and the sprinkler booster are within 10 m (approximately 7.5 m) of the external wall of Building A. The hydrant and sprinkler boosters are required to be protected by a non-combustible construction with an FRL of -/90/90 located directly behind the boosters. The dimensions of the non-combustible construction must be not less than 2.2 m high, extend 5 m from the boosters in the eastern direction and not less than 2 m on the western side of the boosters. Figure 7 shows the location of the boosters and the required protection.

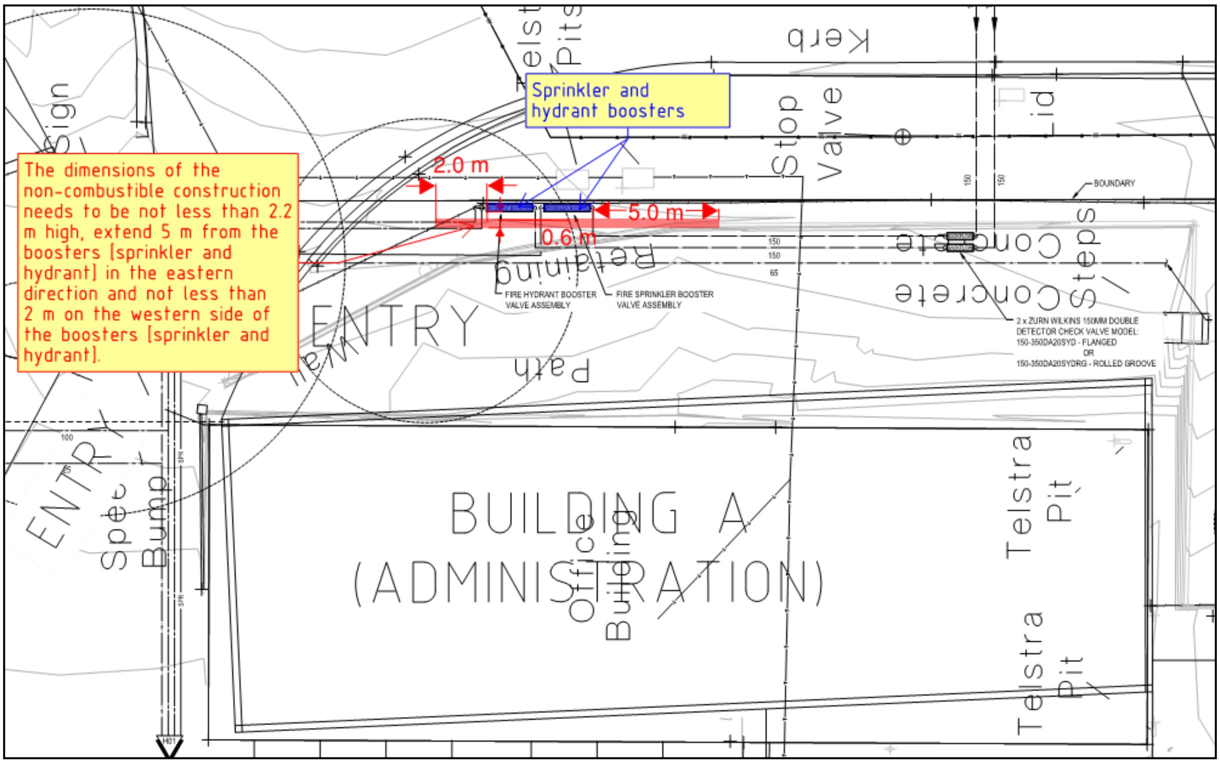


Figure 7: Protection of the fire hydrant and sprinkler boosters

3.4.2 A fire hydrant system complying with AS 2419.1:2005 and AS 2419.1:2017 with the exception of the location of the booster as outlined in item 3.4.1 is to be provided to serve the whole site of lot 100 in in DP792731. Note that compliance with the latest standard is required as well as compliance with AS 2419.1:2005. A ring main must be provide to allow for water supply redundancy. In addition to compliance with AS 2419.1:2005 and AS 2419.1:2017, the following requirements are to be achieved:

a) Hydrant coverage must be provided to all areas, including all external areas of the site considering two lengths of hoses (60 m) to be used as per AS 2419.1:2005 and AS 2419.1:2017. The layout of the car storage areas and any fences must be considered when determining that hydrant coverage is achieved throughout all areas.

b) The fire hydrant system shall deliver not less than 50 L/s from the town water main.

c) Fire hydrants are not to be located within 10 m of any combustible stockpiled storage and must be accessible to fire fighters entering from the designated entry point.

3.4.3 Fire hose reels are also to be provided to the site in accordance with Clause E1.4 of the BCA and AS 2441:2001. The system will have to be monitored by Sydney Water as per requirement by Sydney Water.

3.4.4 The waste facility is to have effective and automatic means of containing fire water run-off, with primary containment having a net capacity of not less than 320,000 L, which is the estimated total water discharge from the automatic sprinkler system installed in the workshop building (building B, C and D) together with two hydrants operating simultaneously.

Note: It is understood that separate tank/s will serve the DA stage. The required containment capacity for stage 1 (DA stage) is 270,000 L. Water storage capacity and location of storage tanks to be confirmed in FER.

3.4.5 Shut-off valve to stop containment water to reach the stormwater must be provided in a location that is not impacted by a stockpile fire. This can be achieved by providing remote shut-off or by locating the main valve in a location away from buildings and stockpile.

3.4.6 The pre-shredder, shredder machines and the shear machine shall be provided with fire extinguishers to mitigate the risk of fire spread in the early stages of a fire. Extinguishers that are located next to machinery with electronic and electrical equipment that is sensitive to water should be provided with CO_2 (carbon dioxide) type portable fire extinguishers to limit the risk of electric shock to the extinguisher operator or damage to devices. For other areas, AFFF (Aqueous Film Forming Foam) fire extinguisher AB is recommended. This is to be confirmed by the fire contractor.

3.4.7 Building B, C and D will not be provided with a smoke exhaust system. Smoke from a fire in Building C and D will be naturally discharged via the external walls as these will be fully open in the locations shown in Figure 8.

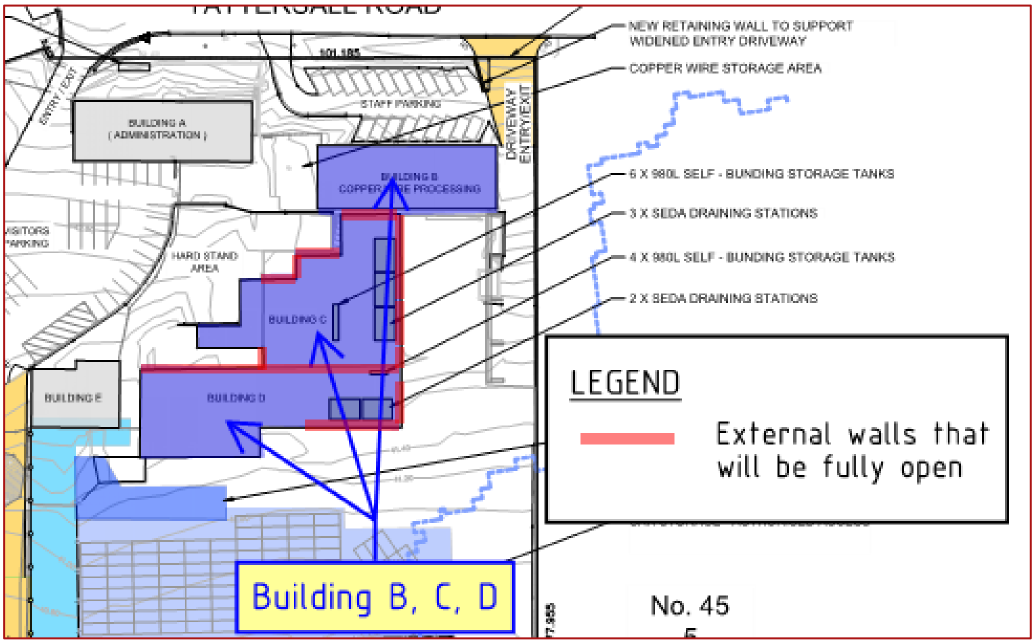


Figure 8: Location of openings Building B, C and D

3.4.8 Building B, C and D are to be provided with a sprinkler system in accordance with AS 2118.1:2017 and Specification E1.5 of the BCA. Storage height must be limited to 2.2 m. The sprinkler system must be connected to a building occupant warning system as per clause 8 of Specification E1.5.

3.5 Proposed Maintenance and Management in Use Measures

3.5.1 Stockpiles or combustible waste material are to be rotated to dissipate any generated heat and minimise the risk of auto-ignition. The maximum duration of idle storage should not exceed six months unless determined otherwise through a risk assessment.

3.5.2 An operational plan must be developed outlining the final location of stockpiles and emergency vehicle access. The operational plan must define procedures that ensure stockpile limits are not exceeded by daily operations and contain all required information as per section 8.6 of the FRNSW guideline (FRNSW, 2019) and fire safety measures within this report.

3.5.3 Staff shall practice fire evacuation procedures on a regular basis. Procedures to be undertaken (if safe to do so) include:

(a) Keeping a constant record of occupants and visitors within the building. Where possible, these records shall be taken outside by a staff member during any evacuation.
(b) Manual fire fighting, if properly trained.
(c) An Emergency Management Plan complying with AS 3745:2010 is to be developed.

3.5.4 Good housekeeping throughout the site and regular fire prevention practices are to be carried out by management of the site to minimise the risk of unnecessary sources of ignition.

4 Safety in Design

4.1 Work Health and Safety Hazards

4.1.1 This FEB requires fire safety measures (as per Section 3) to be implemented in the design to meet the relevant Performance Requirements of the BCA, the intent of the FRNSW guideline for waste facilities (FRNSW, 2019) and the intent of FRNSW guideline for bulk storage of rubber tyres (FRNSW, 2014). We have undertaken a preliminary safety in design review to assess if these proposed fire safety measures could reasonably be expected to introduce new hazards associated with the particular design, i.e. hazards that would not otherwise be expected to be present during the construction, installation and/or maintenance of the site.

4.1.2 It is not within our scope to undertake the detailed design of the proposed fire safety measures specified within Section 3 of this report. Therefore, the fire safety measures in Section 3 are to be incorporated by other consultants into their designs. The designers performing the detailed design are responsible for how the proposed fire safety measures are designed to achieve compliance with the specifications in Section 3 and the safety in design for their detailed design.

4.1.3 This review is limited to identifying hazards that could reasonably be foreseen by a fire safety engineer considering our scope and involvement in the project. Further hazards may be identified by other parties involved in the design, installation and/or maintenance of the building.

4.1.4 No unique or unusual hazards associated with the proposed fire safety measures in Section 3 were identified as a result of the preliminary safety in design review.

5 DtS Departure Issue #1: Fire Hydrant and Sprinkler Boosters

5.1 Introduction

5.1.1 Table 9 provides a summary of the DtS departure, the relevant BCA DtS clauses and the relevant BCA Performance Requirement.

Table 9: Summary of DtS departure issue #1

<table>
<tr><th>Issue</th><th colspan="2">Description of DtS departure</th><th>DtS Provisions</th><th>Relevant Performance Requirement</th></tr>
<tr><td rowspan="10">#1</td><td>Item (a)</td><td>Fire hydrant booster and sprinkler booster location being within 10 m of a building and is not protected in accordance with AS 2419.1:2005 and AS 2118.1:2017.</td><td>Clause E1.3 and E1.5</td><td>EP1.3 and EP1.4</td></tr>
<tr><td>Key hazards</td><td colspan="3">The fire brigade might get exposed to excessive radiant heat when they use the hydrant booster.</td></tr>
<tr><td>BCA approach</td><td colspan="3">A2.2(1)(a) A Performance Solution complying with all relevant Performance Requirements</td></tr>
<tr><td>BCA Assessment Method</td><td colspan="3">A2.2(2)(b)(ii)– Use of Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements</td></tr>
<tr><td>IFEG sub-systems</td><td colspan="3">Sub-system A – Fire initiation & development & control
Sub-system F – Fire Services Intervention</td></tr>
<tr><td>Methodology</td><td colspan="3">☒ Absolute ☐ Comparative | ☒ Quantitative ☐ Qualitative | ☒ Deterministic ☐ Probabilistic</td></tr>
<tr><td>Assessment tools</td><td colspan="3">Quantitative radiation heat transfer assessment using TRA computer software (refer to Appendix B for a description of the program) to calculate the radiant heat exposure to a fire fighter operating the fire hydrant booster.</td></tr>
<tr><td>Relevant design fire scenarios</td><td colspan="3">Fire inside the building located within 10 m of the boosters.
A simple and conservative model of the fully developed fire that can be represented by an emitter with the area of the opening(s), assuming a temperature of 1000 °C, and emissivity of 0.9 (Spearpoint, 2008; Drysdale, 1998).
Stockpiles are not located at the vicinity of the boosters.</td></tr>
<tr><td>Sensitivity/ robustness</td><td colspan="3">Conservative input data are to be assumed throughout the assessment.</td></tr>
<tr><td>Relevant egress scenarios</td><td colspan="3">Not applicable.</td></tr>
<tr><td></td><td>Acceptance criteria</td><td colspan="3">The fire hydrant and sprinkler boosters are to be adequate to facilitate the fire brigade's fire fighting operations. Radiation shall not exceed 3 kW/m^2 at a height of 1.8 m above ground level, representing a fire fighter operating the booster (Society of Fire Safety, 2014).</td></tr>
</table>

5.2 Discussion and Intent of the Building Code of Australia

5.2.1 AS 2419.1:2005 states that a fire brigade booster assembly shall be separated from the building by a construction with a fire resistance level (FRL) of not less than 90/90/90 for a distance of not less than 2 m each side of and 3 m above the upper hose connections in the booster assembly, or located greater than 10 m from the building. AS 2118.1:2017 also requires a sprinkler booster to be protected in accordance with AS 2419.1:2005 if the located within 10 m of a non-sprinklered building.

5.2.2 The Guide to the BCA sets out that the intent of Clause E1.3 is to require the installation of suitable fire hydrant systems to facilitate the fire brigade's fire fighting operations. They are basically needed for fire brigade use and are not intended for use by occupants. Properly trained people and special equipment are needed for effective fire fighting using a fire hydrant system.

5.2.3 The Guide to the BCA sets out that the intent of Clause E1.5 is to require the installation of suitable sprinkler system where necessary to address specific hazards.

5.2.4 The purpose of AS 2419.1:2005 prescribing the location and size, and protective features to fire hydrant booster cabinets is so that the fire hydrant system can be safely used by the attending fire brigade without fire fighters being delayed in accessing the hydrant system due to being prevented by heat due to a fire adjacent to the fire hydrant booster.

5.2.5 The guide to the BCA states that the intent of Performance Requirement EP1.3 is to install a fire hydrant system to provide adequate water, under sufficient pressure and flow, to allow the fire brigade to fight fires.

5.2.6 Performance Requirement EP1.4 requires an automatic fire suppression system to be installed to the degree necessary to control the development and spread of fire.

5.3 Proposed Building Solution

5.3.1 The location of the fire hydrant booster and the sprinkler booster are within 10 m (approximately 7.5 m) of the external wall of Building A. The hydrant and sprinkler boosters are required to be protected by a non-combustible construction with an FRL of -/90/90 located directly behind the boosters. The dimensions of the non-combustible construction must be not less than 2.2 m high, extend 5 m from the boosters in the eastern direction and not less than 2 m on the western side of the boosters. Figure 9 shows the location of the boosters and the required protection.

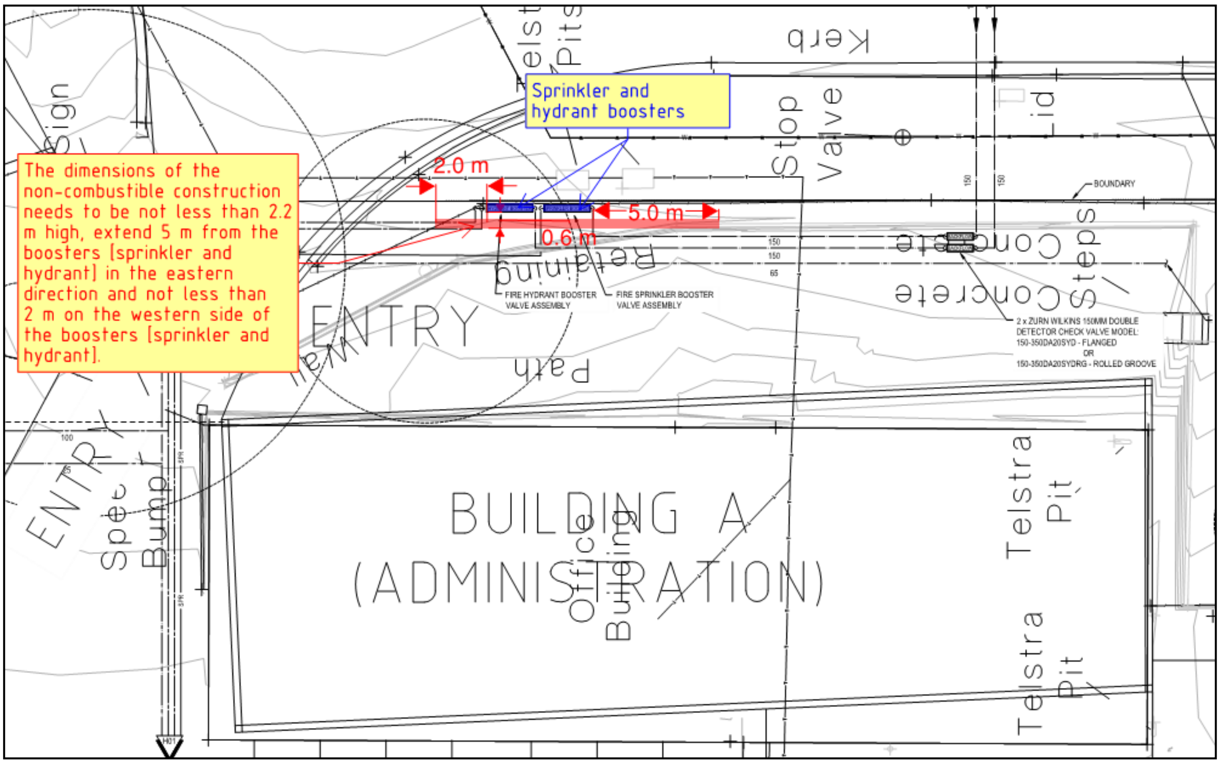


Figure 9: Proposed location of the fire hydrant booster

6 DtS Departure Issue #2: Provisions for special hazards

6.1 Introduction

6.1.1 Table 10 provides a summary of the DtS clauses and the relevant BCA Performance Requirement that that is relevant to the provisions for special hazards. Refer to Section 7 for Performance Solution regarding for vehicular access.

Table 10: Summary of DtS departure issue #2

Issue	Description of DtS departure		DtS Provisions	Relevant Performance Requirement
#2	**Item (a)**	Additional smoke hazard management and additional provisions for fire fighting may be necessary due to special hazards. Sprinklers are proposed for building B, C and D. No smoke exhaust system is proposed throughout building B, C and D.	E1.10 and E2.3	CP9, EP1.3, EP1.4 and EP2.2
	Key hazards	Fire brigade may not be provided with suitable provisions for firefighting and occupants may face untenable condition during evacuation due to special hazards associated with the use of the building.		
	BCA approach	A2.2(1)(a) A Performance Solution complying with all relevant Performance Requirements		
	BCA Assessment Method	A2.2(2)(b)(ii)– Use of Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements		
	IFEG sub-systems	Sub-system A – Fire initiation & development & control Sub-system B – Smoke development & spread Sub-system C – Fire spread & impact & control Sub-system D – Fire detection, warning & suppression Sub-system E – Occupant evacuation & control Sub-system F – Fire services intervention		
	Methodology	☒ Absolute ☐ Comparative	☐ Quantitative ☒ Qualitative	☒ Deterministic ☐ Probabilistic
	Assessment tools	Qualitative discussion regarding the building occupant characteristics, the characteristics of the building B, C and D, the use of the building, quantity and type of material stored and the fire safety measures installed as well as the natural ventilation provisions. Fire hydrant provisions and brigade access is also to be considered. Qualitative discussion regarding the sprinkler systems reliability and efficacy.		
	Relevant design fire scenarios	Sprinkler controlled fire within building B, C and D.		
	Sensitivity/ robustness	Sprinkler failure scenario will be discussed.		

	Relevant egress scenarios	Full building evacuation.
	Acceptance criteria	The proposed Performance Solution is proposed to be acceptable if it is demonstrated that suitable fire fighting facilities and additional fire safety measures have been provided to the building to address special hazards associated with the use of the building.

6.2 Discussion and Intent of the Building Code of Australia

6.2.1 BCA Clause E2.3 - *Provision for special hazards* specifies that additional smoke hazard management measures may be necessary due to the—

(a) special characteristics of the building; or
(b) special function or use of the building; or
(c) special type or quantity of materials stored, displayed or used in a building; or
(d) special mix of classifications within a building or fire compartment,

which are not addressed in Tables E2.2a and E2.2b.

6.2.2 BCA Clause E1.10 - *Provision for special hazards* does also specify that suitable additional provision must be made if special problems of fighting fire could arise because of—

(a) the nature or quantity of materials stored, displayed or used in a building or on the allotment; or
(b) the location of the building in relation to a water supply for fire-fighting purposes.

6.2.3 The intent of BCA Clause E2.3 is to specify that that some special hazards may require additional smoke hazard management measures.

6.2.4 The Guide to the BCA also states that Clause E2.3 do not apply to open-deck carparks or open spectator stands and that EP2.2 does not apply to such buildings because the smoke and hot gases can vent naturally. The Guide further states that the provisions of E2.3 regarding smoke exhaust systems and smoke and-heat vents do not apply to small areas used for short periods. This is due to that a small area will be easily evacuated before smoke build-up and if the area is only used for short periods, the risk of occupants being trapped in it during a fire is low.

6.2.5 The intent of BCA Clause E1.10 is to require the installation of additional fire safety measures where special hazards exist and it is stated that it is not possible to take account of every possible hazard in the current BCA clauses. The Guide to the BCA further states that additional provision for special hazards must be made to allow for effective firefighting operations taking into consideration:

- the nature of the materials stored, displayed or used in the building or on the allotment; or
- inadequate water supply for firefighting.

6.2.6 The guide outlines that the BCA Deemed-to-Satisfy Provisions do not specify what the special provisions must be. Each case must be assessed on its own merits.

6.2.7 CP9 states that access must be provided to and around a building, to the degree necessary, for fire brigade vehicles and personnel to facilitate fire brigade intervention appropriate to the function or use of the building, the fire load and intensity, the fire hazard, any active fire safety systems installed in the building as well as the size of any fire compartment.

Note: Fire brigade access is also discussed within section 7 addressing the departure with vehicular access for large isolated building.

6.2.8 EP1.3 specifies that a fire hydrant system must be provided to the degree necessary to facilitate the needs of the fire brigade appropriate to fire-fighting operations, the floor area of the building and the fire hazard.

6.2.9 EP1.4 states that an automatic fire suppression system must be installed to the degree necessary to control the development and spread of fire appropriate to the size of the fire compartment, the function or use of the building, the fire hazard; and the height of the building.

6.2.10 The intent of BCA Performance Requirement EP2.2 is to specify the requirements for minimising the risks associated with smoke spread through an enclosure. The intent of EP2.2 also that occupants must be given time to evacuate before the onset of untenable conditions.

6.3 Proposed Building Solution

6.3.1 Building B, C and D (refer to Figure 10) will not be provided with a smoke exhaust system. Building C and D will be naturally ventilated via the external walls as these will be fully open in the locations shown in Figure 10.

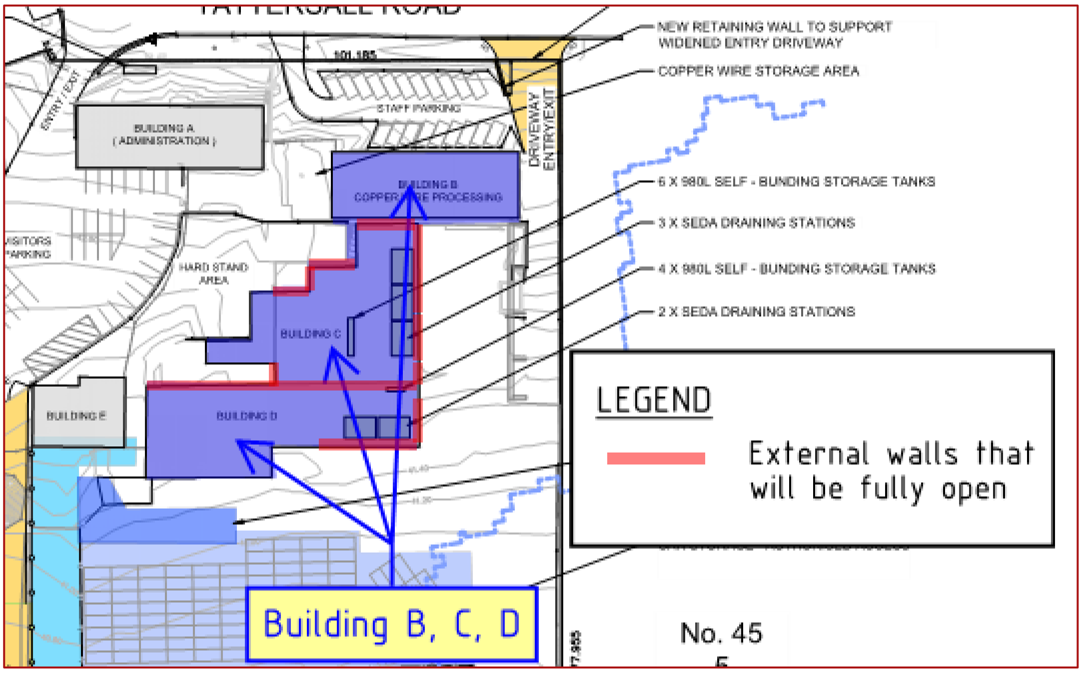


Figure 10: Location of Building B, C and D

6.3.2 Building B, C and D is to be provided with a sprinkler system in accordance with AS 2118.1:2017. Storage height must be limited to 2.2 m.

6.4 Preliminary Assessment

6.4.1 It is proposed to not provide building B, C and D with a smoke exhaust system.

6.4.2 The key hazard is that fire brigade may not be provided with suitable provisions for firefighting and occupants may face untenable condition during evacuation due to special hazards associated with the use of the building.

6.4.3 The guide to the BCA states that a smoke management system will play an important part in occupant safety during a fire in large fire compartments. The guide to the BCA further states that smoke and toxic gases are the main causes of death in building fires and therefore management of the smoke and toxic gas hazard is crucial for occupant safety. The management of the smoke is according to the guide best achieved through a combination of active and passive measures, such as:

- building materials and finishes;
- compartmentation;
- egress;
- smoke and toxic gas detection;
- fire suppression.

6.4.4 The building is required to be provided with a sprinkler system as it is a large isolated building and is not provided with open space complying with Clause C2.4(a) of the BCA and it may be considered an 'occupancy of excessive hazard' under Clause E1.5 of the BCA. A sprinkler system is to be provided in accordance with AS 2118.1:2017. The provision of a sprinkler system is expected to limit the fire size and improve occupant's safety as well as facilitating brigade intervention as the amount of smoke and heat generated by a fire is expected to be limited by the sprinklers when they operate and achieve the design objectives.

6.4.5 The contribution of a sprinkler system is further discussed in Appendix F. It is expected that in the event of a fire the sprinkler system is to control if not suppress the fire (Buchanan, 2001). Some shielding may occur if a fire starts in machinery or cars, however it is expected that the sprinkler system will control the fire.

6.4.6 As stated above BCA Clause E2.3 specifies that additional safety provisions (which are not addressed in Tables E2.2a and E2.2b) may be necessary due to the—

(a) special characteristics of the building; or
(b) special function or use of the building; or
(c) special type or quantity of materials stored, displayed or used in a building; or
(d) special mix of classifications within a building or fire compartment

6.4.7 The sections below deal with the four items specified in BCA Clause E2.3.

Special characteristics and special function or use of the building

6.4.8 In addition to the use of the building presented in Table 6, a more detailed description of building B, C and D are presented below.

Table 11: Building characteristics (B, C and D).

Building name	Use	Safety provisions
Building B	The building contains a copper granulator machine to remove copper from cables etc. The building has a height and floor area of approximately 5 m and 485 m^2 respectively.	The united building will be sprinkler protected in accordance with AS 2118.1:2017. Items stored in racks are limited to 2.2 m as per the sprinkler system water supply document by Liquid hydraulics Engineers, dated 31st May 2019
Building C, D	The building is used as workshop areas for demolition of cars, drainage of fluids such as oil and fuel. The building has a relatively high ceiling height (around 5 m) and the walls are substantially open to the outside. The building has an area of approximately 1,670 m^2.	

6.4.9 The building has a relatively small floor area and have a low occupancy. Travel distances are short, generally being less than 20 m.

6.4.10 Figure 11 to Figure 15 shows pictures of building B, C and D This demonstrates typical fuel load and use of building and show that the walls of building C and D are substantially open. Note that the storage height in area will be limited to a maximum of 2.2 m. It is not considered that the use or characteristics of the building presents special hazards requiring special provisions above the provided sprinkler system.

Figure 11: Building B showing copper granulator with the picture facing east

Figure 12: Building C with openings facing east

Figure 13: Building C with openings facing north

Figure 14: Building C with openings facing west Note 1)

Note 1: Current storage shown is to be reduced to a maximum height of 2.2 m.

Figure 15: Picture taken from Building C towards building D with openings facing south

6.4.11 Based on the pictures presented above, it is our opinion that the building C and D are significantly open to the outside and that smoke is likely to be naturally discharged to the outside in the unlikely event of a fire inside building C and D. The proposed sprinkler system to this building in accordance with AS 2118.2017 will facilitate occupant egress and fire brigade intervention. Upon activation the sprinkler system is expected to control if not suppress the fire (refer to Appendix F).

Special type or quantity of materials stored, displayed or used in a building

6.4.12 Building B has a floor area of approximately 485 m² and a ceiling height of approximately 5 m but does not have any permanent openings. Based on Figure 11 above, it can be seen that the fuel load in this building is limited. Building B is to be provided with a sprinkler system in accordance with AS 2118.2017.

6.4.13 As stated in Table 11, building C and D is used as workshop areas for demolition of cars, drainage of fluids such as oil and fuel. The building has a relatively high ceiling height (around 5 m), the walls are substantially open to the outside and there is no significantly storage inside any of these buildings. The open walls will allow smoke and heat to vent directly to the outside and the provision of a mechanical smoke exhaust system is not considered to provide any significant additional benefit given the large amount of natural ventilation provided.

6.4.14 Based on that the building does not contain a high fuel load and the provision of a sprinkler in accordance with AS 2118.2017 occupant egress and fire brigade intervention are considered to have been facilitated.

6.4.15 Further to this, the hydrant system provided to the site will have a capacity of 50 L/s and a ring main will be provided. This is due to the provision of stockpiles on the site and exceeds the requirements for the building.

Special mix of classifications within a building or fire compartment

6.4.16 The building (building B, C and D) is Class 8 and will only be accessed by staff. As stated in Table 8, we expect staff to be awake and mobile and their response time to a possible fire scenario is likely to be short. Staff will be provided with emergency training and as such we expect that staff will be familiar with the exit routes and procedures to be taken during a fire event. Hence, we expect the building to be evacuated in the early stages of a fire inside the building.

6.4.17 In relation to BCA Clause E1.10 - *Provision for special hazards* specify that suitable additional provision must be made if special problems of fighting fire could arise because of—

(a) the nature or quantity of materials stored, displayed or used in a building or on the allotment; or
(b) the location of the building in relation to a water supply for fire-fighting purposes.

6.4.18 As stated above, it is noted that the building C and D are more like sheds and are significantly open, which will aid in discharge of smoke in the unlikely event of a significant fire (due to provision of sprinkler). Based on the natural ventilation of the building C and D, the sprinkler system throughout building A, B and D and the hydrants system which incorporates a ring main and a flow capacity of 50 L/s suitable provisions have been made for fire fighting. Fire brigade access is also provided around the site as discussed further in section 8.4 and Performance Solution 3 in section 7. The limited fuel load in Building B together with the provision of a sprinkler system and a hydrant system is considered to allow for suitable provisions made for fire fighting.

Conclusion

6.4.19 Based on the preliminary assessment above, it is considered that that suitable fire fighting facilities and additional fire safety measures will be provided to the building to address special hazards associated with the use of the building. Hence, it is our opinion that Performance Requirements CP9, EP1.3, EP1,4 and EP2.2 will be met.

7 DtS Departure Issue #3: Vehicular access

7.1 Introduction

7.1.1 Table 12 provides a summary of the DtS departure, the relevant BCA DtS clauses and the relevant BCA Performance Requirement.

Table 12: Summary of DtS departure issue #3

<table>
<tr><th>Issue</th><th colspan="3">Description of DtS departure</th><th>DtS Provisions</th><th>Relevant Performance Requirement</th></tr>
<tr><td rowspan="8">#3</td><td>Item (a)</td><td colspan="2">The combined area of the united building B, C and D is greater than 2,000 m^2 and as such it has been defined as a large isolated building. Fire brigade vehicular access is not proposed in accordance with Clause C2.4(b).</td><td>C2.3(a)(ii) and C2.4(b)</td><td>CP9</td></tr>
<tr><td>Key hazards</td><td colspan="4">The fire brigade not being able to intervene and provide an initial attack on a developing fire from all sides of the building. Potential risk of larger fire and fire spread between buildings.</td></tr>
<tr><td>BCA approach</td><td colspan="4">A2.2(1)(a) A Performance Solution complying with all relevant Performance Requirements</td></tr>
<tr><td>BCA Assessment Method</td><td colspan="4">A2.2(2)(b)(ii)– Use of Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements</td></tr>
<tr><td>IFEG sub-systems</td><td colspan="4">Sub-system A – Fire initiation & development & control
Sub-system B – Smoke development & spread
Sub-system C – Fire spread & impact & control
Sub-system D – Fire detection, warning & suppression
Sub-system F – Fire services intervention</td></tr>
<tr><td>Methodology</td><td>☒ Absolute
☐ Comparative</td><td colspan="2">☐ Quantitative
☒ Qualitative</td><td>☒ Deterministic
☐ Probabilistic</td></tr>
<tr><td>Assessment tools</td><td colspan="4">Qualitative discussion regarding the fire safety systems installed and perimeter access provided as well as the fuel load within the large isolated building. The following will be considered:
• Reliability and efficiency of the sprinkler system.
• Risk of fire spread between buildings will be discussed considering the distance to the boundary and the active and passive fire safety measures provided.
• The building area will be considered, being marginally larger than 2,000 m^2. Although buildings B, C and D are considered a united building it is unlikely that the whole building area would be involved in a fire given the sprinkler system and limited fuel load in the areas. The combined area of building B, C and D is 2,157 m^2.
• The hydrant capacity is in excess of what would be required when considering the building B, C and D in isolation. The building is separated from external stockpiles in accordance with FRNSW guideline Fire Safety in waste facilities (FRNSW, 2019).
• Fire brigade intervention facilitated via the natural ventilation provided to building C and D.</td></tr>
</table>

		• Limited fuel load, as discussed in section 6.4. Not consistent with a typical Class 8 building which could include high rack storage and have a considerably higher fuel load. • Vehicular access is provided around the site and as such although vehicular access is not provided around each of the buildings it is not expected that fire brigade would be trapped or need to reverse.
	Relevant design fire scenarios	Sprinkler controlled fire within building B, C and D.
	Sensitivity/ robustness	Sprinkler failure scenario will be discussed.
	Relevant egress scenarios	Full building evacuation.
	Acceptance criteria	The proposed Performance Solution is deemed acceptable if it can be shown that sufficient vehicular access is provided to the responding fire brigade given the expected fire hazard and the fire safety systems installed to serve building B, C and D. It is to be demonstrated that risk of fire spread between buildings has been mitigated to the degree necessary considering the active and passive fire safety measures provided. Access to the main entries to the building and boosters to be available from the public road (Tattersall Road).

7.2 Discussion and Intent of the Building Code of Australia

7.2.1 Clause C2.3(a)(ii) of the BCA states that the size of a fire compartment in a building may exceed that specified in Table C2.2 where –

(ii) the building is Class 5, 6, 7, 8 or 9 and does not exceeds 18,000 m^2 in floor area or 108,000 m^3 in volume, if it is –

i. protected throughout with a sprinkler system complying with Specification E1.5; and
ii. provided with perimeter vehicular access complying with C2.4(b).

7.2.2 Clause C2.4(b) of the BCA states that vehicular access required by this part –

(i) must be capable of providing continuous access for emergency vehicles to enable travel in a forward direction from a public road around the entire building; and
(ii) must have a minimum unobstructed width of 6 m with no part of its furthest boundary more than 18 m from the building and in no part of the 6 m width be built upon or used for any purpose other than vehicular or pedestrian movement; and
(iii) must provide reasonable pedestrian access from the vehicular access to the building; and
(iv) must have a load bearing capacity and unobstructed height to permit the operation and passage of fire brigade vehicles; and
(v) must be wholly within the allotment except that a public road complying with (i), (ii), (iii) and (iv) may serve as the vehicular access or part thereof.

7.2.3 The Guide to the BCA states that for large isolated buildings, the reason for the fire brigade vehicular access is to enable the brigade to intervene to fight the fire, assist with evacuation, and stop the spread of a fire to another building. The vehicular access also provides other emergency services personnel, such as ambulance officers, with the ability to access the building as necessary.

7.2.4 Building B, C and D has been deemed a united building as building B and building C and D are located less than 6 m apart. The combined area of the buildings is 2,157 m^2 and as such it is greater than the 2,000 m^2 allowed for a class 8 Type C building within Table C2.2 of the BCA. A sprinkler system complying with Specification E1.5 of the BCA will be provided throughout building B, C and D. Due to the existing nature of the site vehicular access cannot be provided around the buildings and between buildings A and B and D and E. Access Road is also further than 18 m from building D. Refer to Figure 16 for proposed vehicular access.

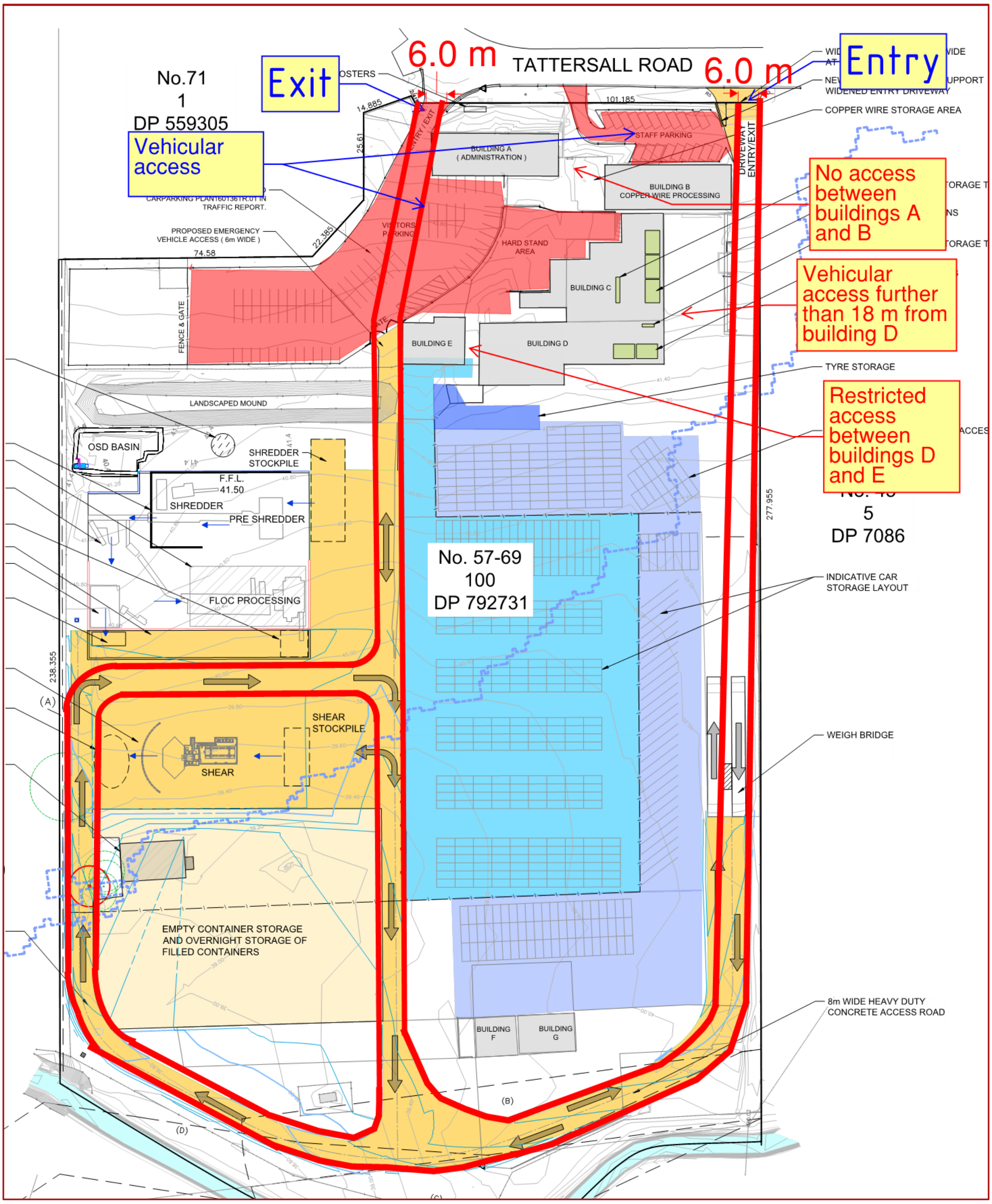


Figure 16: Vehicular access and proposed driveway for emergency vehicles

7.3 Proposed Building Solution

7.3.1 Building B, C and D are to comply with the requirements of BCA Clause C1.1 and Specification C1.1 for a building of Type C construction. Building B, C and D is to be treated as a united building and is to comply with the requirements for a large isolated building within Clause C2.3(a)(ii) of the BCA with the exception that the perimeter vehicular access need not to comply with Clause C2.4(b) of the BCA. The vehicular access must comply with item 3.2.2 below.

7.3.2 Access is to be provided at the perimeter of the site, around buildings and access roads between any external stockpiles. Figure 18 outlines a proposed driveway to allow for emergency vehicular to access in the event of a fire brigade intervention. The proposed driveway with one entry and one exit must comply with the FRNSW guideline "*Access for emergency vehicles*" (FRNSW, 2010). The driveway is required to have a width of not less than 6 m for straight carriageways. Curved carriageway must have a minimum inner radius of 7.3 m and an outer radius of 14.6 m with a minimum distance between the inner and outer arcs not less than 7.3 m. Note that the proposed driveway requires acceptance from FRNSW.

7.3.3 A fire hydrant system complying with AS 2419.1:2005 and AS 2419.1:2017 with the exception of the location of the booster as outlined in item 3.4.1 is to be provided to serve the whole site of lot 100 in in DP792731. Note that compliance with the latest standard is required as well as compliance with AS 2419.1:2005. A ring main must be provide to allow for water supply redundancy. In addition to compliance with AS 2419.1:2005 and AS 2419.1:2017, the following requirements are to be achieved:

a) Hydrant coverage must be provided to all areas, including all external areas of the site considering two lengths of hoses (60 m) to be used as per AS 2419.1:2005 and AS 2419.1:2017. The layout of the car storage areas and any fences must be considered when determining that hydrant coverage is achieved throughout all areas.
b) The fire hydrant system shall deliver not less than 50 L/s from the town water main.
c) Fire hydrants are not to be located within 10 m of any combustible stockpiled storage and must be accessible to fire fighters entering from the designated entry point.
d) Fire hose reels are also to be provided to the site in accordance with Clause E1.4 of the BCA and AS 2441:2001. The system will have to be monitored by Sydney Water as per requirement by Sydney Water.

7.3.4 Building B, C and D will not be provided with a smoke exhaust system. Smoke from a fire in Building C and D will be naturally discharged via the external walls as these will be fully open in the locations shown in Figure 17.

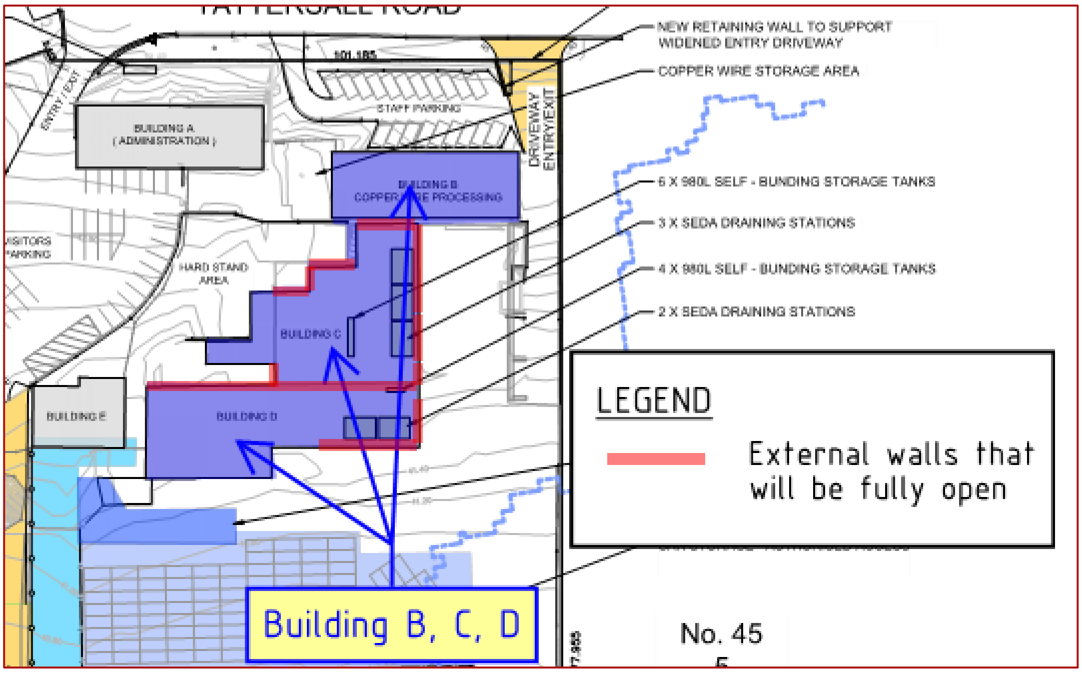


Figure 17: Location of openings Building B, C and D

7.3.5 Building B, C and D are to be provided with a sprinkler system in accordance with AS 2118.1:2017 and Specification E1.5 of the BCA. Storage height must be limited to 2.2 m. The sprinkler system must be connected to a building occupant warning system as per clause 8 of Specification E1.5.

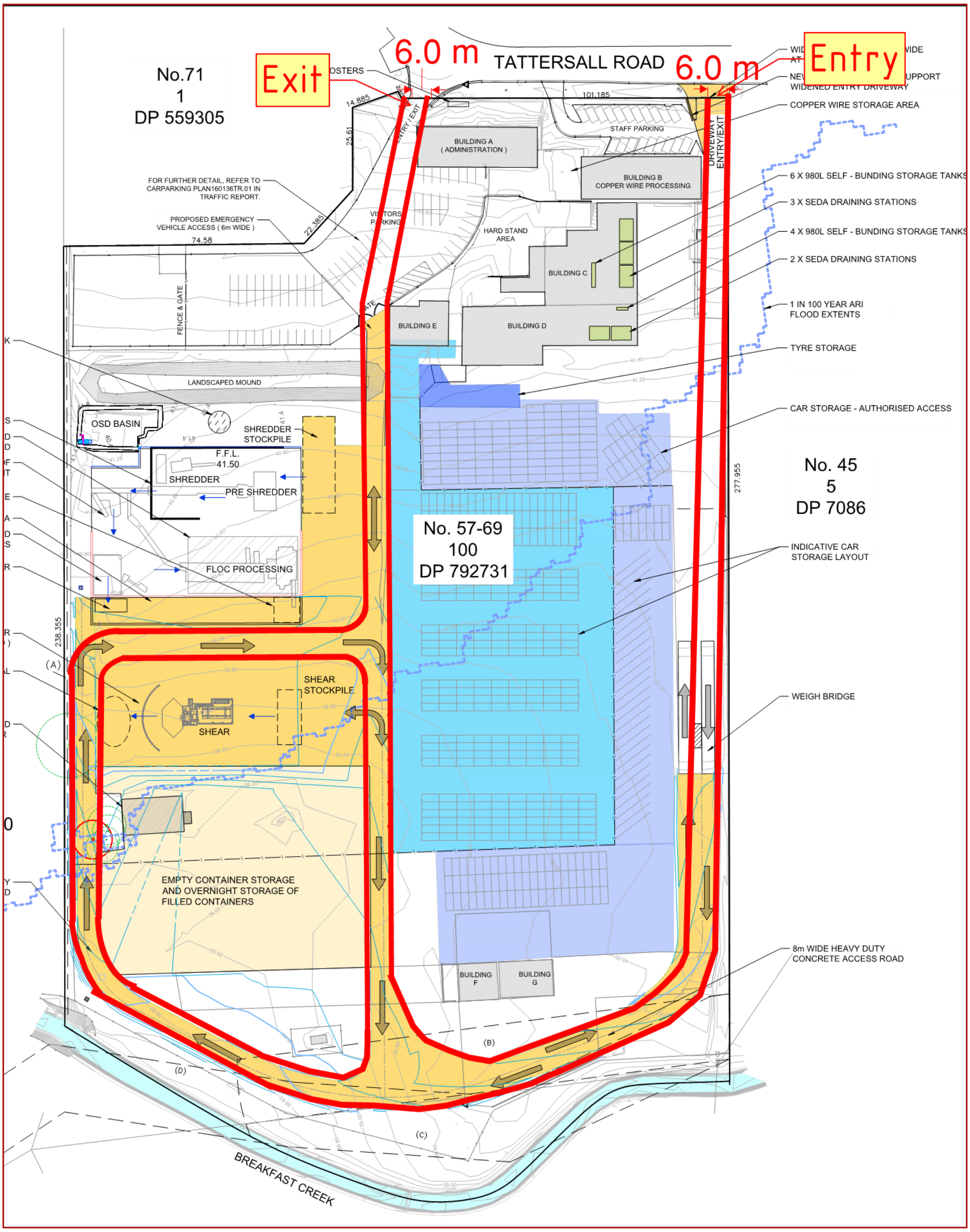


Figure 18: Proposed driveway for emergency vehicles

8 FRNSW Guideline – Waste facility

8.1 Introduction

8.1.1 This section provides a suggested fire safety design for the north-western part of Lot 100 that contains a mobile hammer mill/pre-shredder/shredder machine. This is the only area of the site that contains external stockpiles. The design will adhere to the FRNSW guideline (FRNSW, 2019). Note that not all requirements have been reproduced.

8.1.2 Table 13 provides a summary of design aspects of the FRNSW guideline (FRNSW, 2019) that have been considered. These are further discussed in sections 8.3-8.7.

Table 13: FRNSW Waste Facility Guideline Summary

Description of-of relevant design aspects	
The following items identified in the FRNSW guideline (FRNSW, 2019), in relation to the north-western part of Lot 100, that contains a mobile hammer mill/pre-shredder/shredder machine are considered in this report.	
Item (A)	Stockpile size and separation distances between external stockpiles
Item (B)	Fire brigade accessibility
Item (C)	Fire hydrants water capacity
Item (D)	Water run-off
Item (E)	Fire services and equipment

8.2 Discussion and Intent of the FRNSW Guideline for waste facilities

8.2.1 The purpose of the FRNSW guideline (FRNSW, 2019) is to provide guidance on how fire safety in waste facilities can be achieved, including adequate provisions for fire safety and facilitate fire brigade intervention to protect life, property and the environment.

8.2.2 The following fire safety measures outline a summary of proposed fire safety measures that are provided to support a fire safety solution that will meet the intent of the FRNSW guideline (FRNSW, 2019). Note that all requirements from the FRNSW guideline has not been reproduced and these fire safety measures are to be read in conjunction with the FRNSW guideline (FRNSW, 2019).

8.3 Item A - Stockpile size and separation distances between external stockpiles

8.3.1 The maximum stockpile size should comply with the following as per the FRSNW guideline (FRNSW, 2019):

- The maximum stockpile height should not exceed 4 m.
- The stockpile is to recede a slope not more than 45° to minimize collapse and fire spread as well as providing accessibility to the fire brigade.

- The width of the stockpile should not exceed 20 m (if emergency vehicles have access on both sides) or 10 m (if the emergency vehicles have access on one side only). For reference, see Figure 19.
- The stockpile should not exceed 50 m in length (independent of access for emergency vehicles on both sides or not).

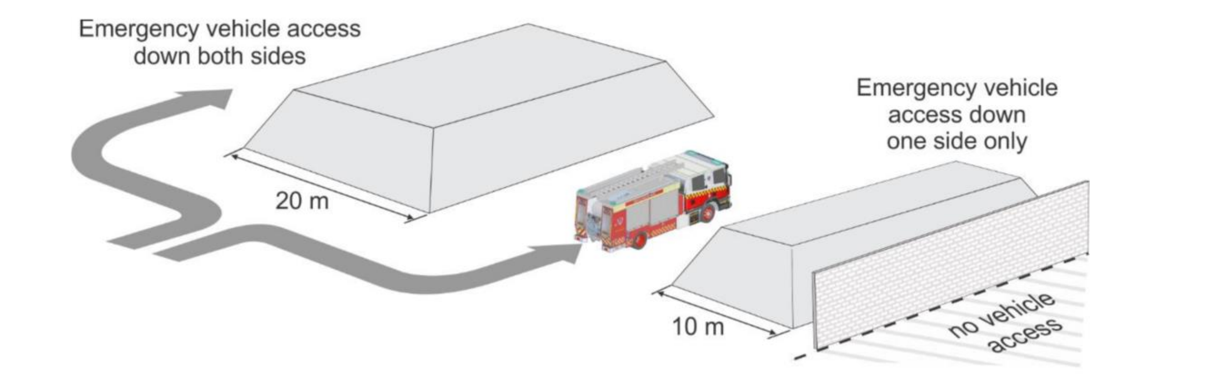


Figure 19: Maximum external stockpile size (FRNSW, 2019)

8.3.2 The maximum stockpile size allowed will also need to be limited by the available fire hydrant water supply. The fire hydrant water design is presented in Section 8.5 (Item C - Fire hydrants and water capacity).

8.3.3 Stockpiles or combustible waste materials are to be rotated to dissipate any generated heat and minimise the risk of auto-ignition. The maximum duration of idle storage should not exceed six months (based on version 01 of guideline) unless determined otherwise through a risk assessment. We have not conducted any risk assessment to keep idle storage for more than six months.

8.3.4 The waste facility will have a chain of raw feed into the pre-shredder. The raw feed is mainly entire cars, car parts or white goods which are to be recycled. The pre-shredder has an efficiency of processing up to six cars in one minute. Hence, the pile of raw feed will be very transient and need a relatively large area of temporary storage of the raw feed as it is being processed.

8.3.5 The pile of raw feed will be located to the east side of the shredder machine in the north-western part of Lot 100. The proposed location has a maximum width of approximately 27 m, as shown in Figure 20.

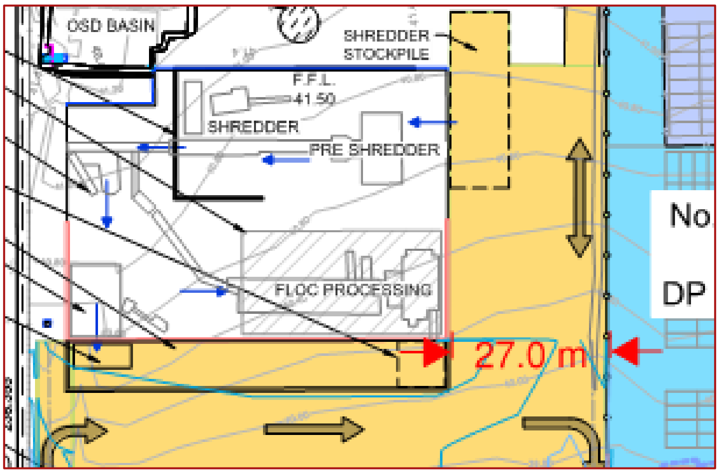


Figure 20: Width of the proposed location for the raw feed pile on the east side of the shredder machine

8.3.6 Based on the current layout of the north-western part of Lot 100, and the proposed location of the raw feed pile, the fire brigade will only be provided with emergency vehicle access down one side due to the width of the proposed pile location and in consideration to the fire brigade access requirements.

8.3.7 It is our opinion that the raw feed pile on the east side of the pre-shredder machine in the north-western part of Lot 100 needs to be limited in size to be not more than 28 m (long) x 10 m (wide) x 4 m (high), resulting in a total maximum volume of 1,120 m^3. The limitation for this requirement is that the free space only allows access for the fire brigade from one side of the pile as well as maintains the required separation distances between piles and building in accordance with FRNSW guideline for waste facilities (FRNSW, 2019). Figure 21 provides a proposed layout of the largest stockpile at the north-western part of Lot 100 that complies with the FRNSW guideline (FRNSW, 2019). Note that only two piles on the site contain significant amounts of combustible material (raw-feed material pile and the floc stockpile). Separation distances have not been applied around metal piles.

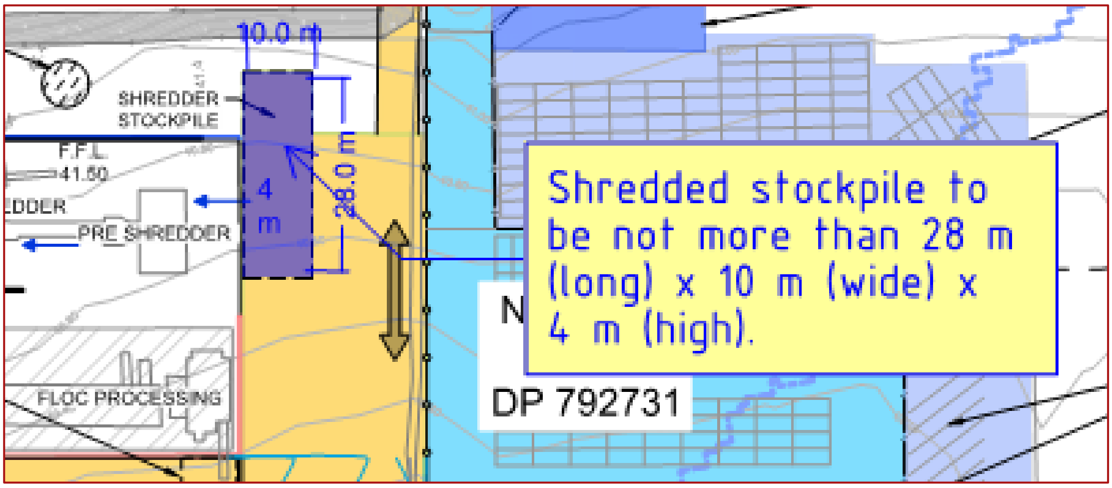


Figure 21: Proposed location and size of the pile adjacent to the shredder machine

8.3.8 In relation to separation distances between external stockpiles, between stockpiles and any building or boundary, the metal recovery and recycling facility is conservatively considered to be of high Heat Release Rate (HRR) as per the FRNSW guideline (FRNSW, 2019), since the waste includes plastic, rubber etc.

8.3.9 The separation distances between external stockpiles for loose piles are to comply with the distances in Table 14. Baling is a process that compresses the material into blocks (bales) which are secured by plastic or wire strapping. Our understanding is that the processed (shredded) material onsite will be stored in 'loose' stockpiles.

Table 14: Minimum distance between external stockpiles (FRNSW, 2019)

	High HRR
Length of stockpile (m)	**The separation distance for loose pile (m)**
5	10
10	15
15	18
20	23
30	26
50	31

8.3.10 Based on the separation distances between stockpiles in Table 14, the same separation distances are applied to the raw feed pile located on the east side of the shredder machine in the north-western part of Lot 100. Considering the length of the raw-feed material pile of 28 m, as per Figure 21, the distance to any adjacent stockpile needs to be not less than 26 m.

8.3.11 The external stockpiles are also required to have minimum separation distances from any building or site boundary as specified in Table 15.

Table 15: Minimum distance between external stockpiles and any building or boundary (FRNSW, 2019)

	High HRR
Length of stockpile (m)	**Separation distance for loose pile (m)**
5	13
10	18
15	22
20	25
30	30
50	38

8.3.12 The machinery located on site are metal encased, have low amount of potential fuel load within them and limited potential of igniting from an external fire. Hence, we do not consider any separation distances being necessary between the stockpile and the machinery in the north-western part of Lot 100. Furthermore, the stockpile needs to be located adjacent to the machinery to achieve an efficient operation.

8.3.13 There is also a fence located 17 m away from the raw material stockpile. This fence is required for acoustic reasons and consists of a Wallmark Dunewall type acoustic barrier. The fence consists of an outer fibre cement panel and an EPS core. Given the 17 m separation distance and that the combustible core is covered by a non-combustible outer fibre cement panel the inclusion of the fence within the 26 m separation area has been considered acceptable. Based on the separation distances between piles and buildings in Table 15 and the pile located on the east side of the pre-shredder machine in the north-western part of Lot 100 with a length of 28 m, as per Figure 21 , the distance to any adjacent building or boundary need to be more than 30 m (refer to Figure 22).

8.3.14 Figure 22 shows the minimum separation distance between external raw feed pile and any other storage, building or boundary for the proposed layout.

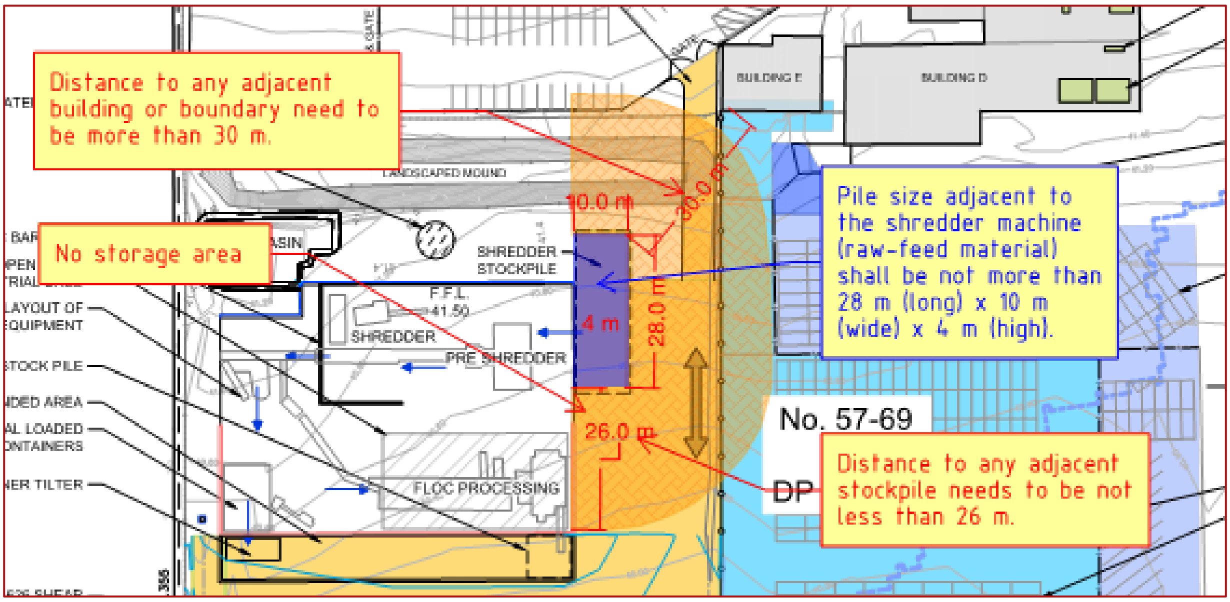


Figure 22: Separation distances between the raw feed pile and any other storage or building

8.3.15 Currently, tyres are stored in the green area highlighted in Figure 23, which is located directly adjacent to building E. The tyres are required to be moved as part of the DA stage to prevent fire spread between piles and the tyre storage. The tyres must be stored in accordance with FRNSW Guideline for bulk storage of rubber tyres (FRNSW, 2014).

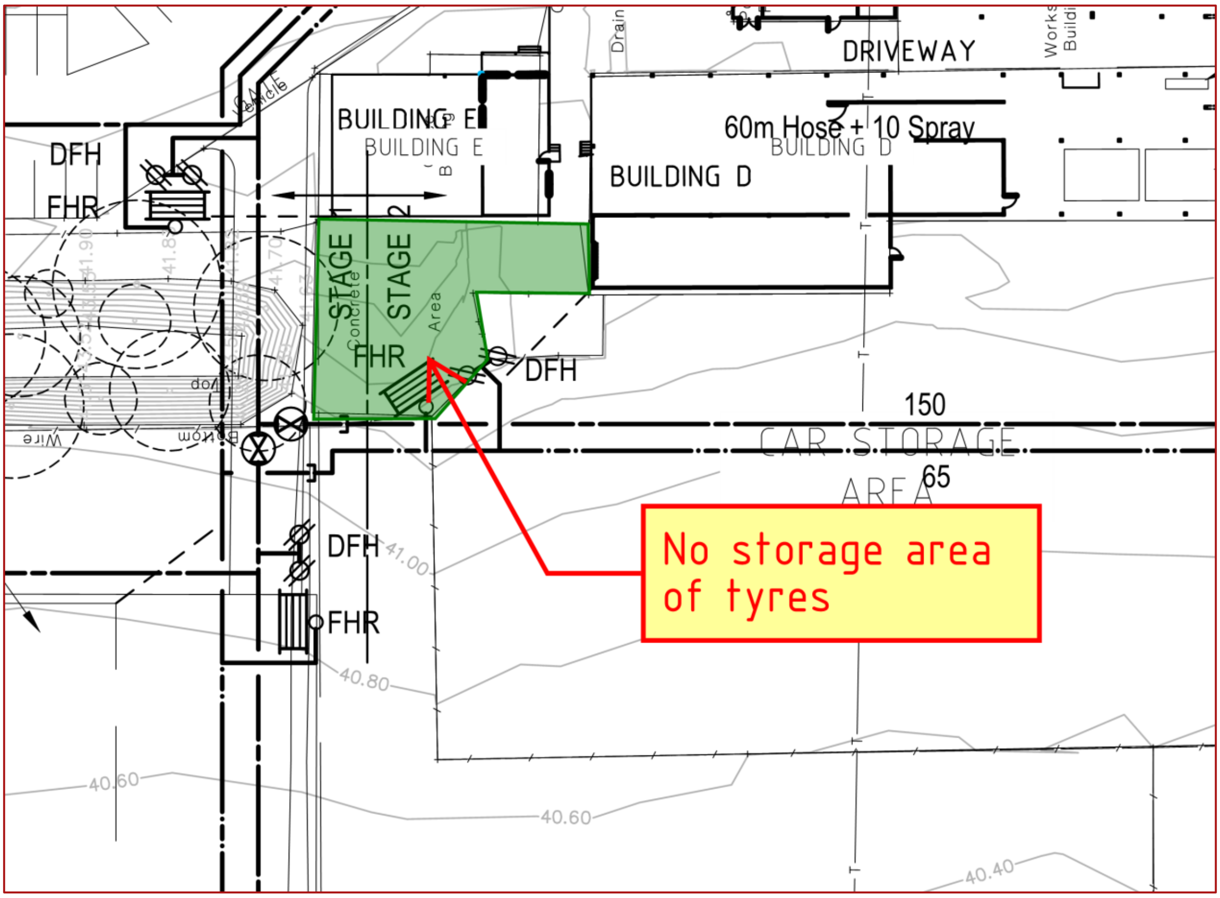


Figure 23: Current location of tyres

8.3.16 In addition, one stockpile of shredded material, referred as 'Floc Stockpile' is proposed within the north-western area. The floc stockpile has a maximum size of 8 m x 8 m x 4 m as shown in Figure 24. The separation distances for the shredded pile (refer to Figure 24) are adapted from Table 14 and Table 15 based on FRNSW guideline (FRNSW, 2019). Note that only two piles on the site contain significant amounts of combustible material (raw-feed material pile and the floc stockpile). No other combustible stockpiles are allowed on site, except for piles stated in this report.

8.3.17 The metal that is separated from other material within the floc processor is to be stored in metal containers. The material consists of metal only and as such no separation distances apply around the metal container. The shear stockpile and processed scrap metal pile also consists of metal only.

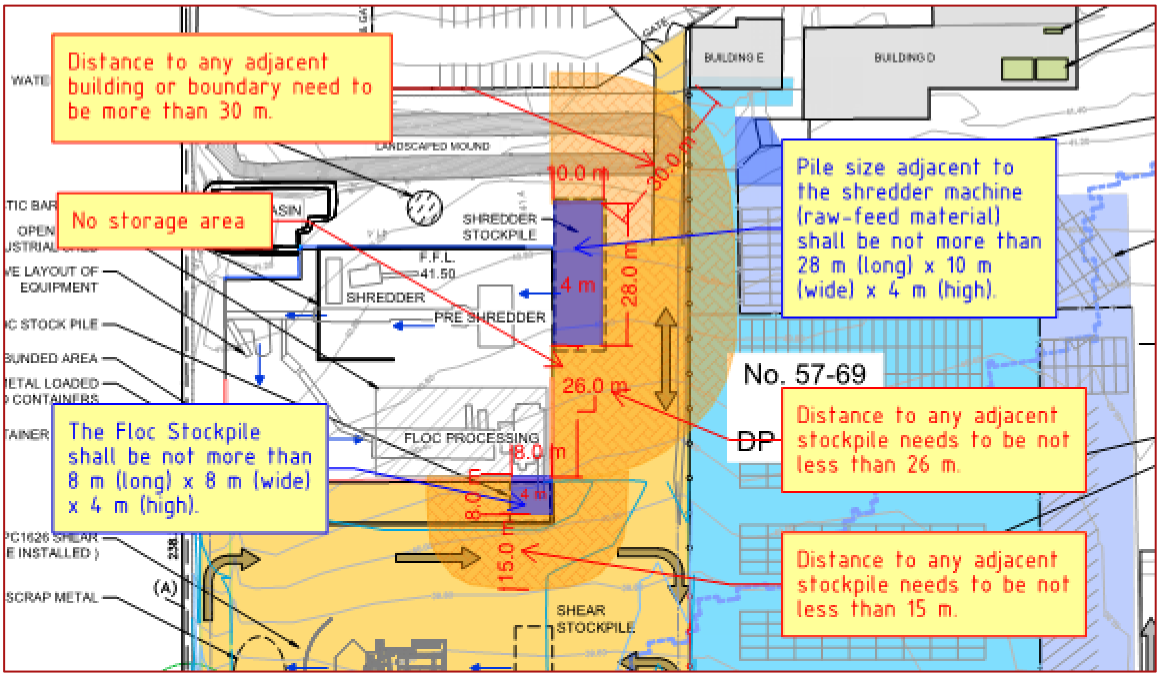


Figure 24: Proposed layout of the stockpiles at the north-western part of Lot 100

8.3.18 An operational plan must be developed outlining the final location of stockpiles and emergency vehicle access. The operational plan must define procedures that ensure stockpile limits are not exceeded by daily operations and contain all required information as per section 8.7 of the FRNSW guideline (FRNSW, 2019).

8.3.19 It is noted that there will be an internal stockpile of processed copper in Building B. Stockpiles will be copper cabling before it is shredded in granulator, copper granules once shredded and then the plastic / rubber insulation which is shredded off the copper wiring. It is proposed to process one tonne per day, and store it in 1 m^3 bags within the building. A maximum of 20 bags processed material is allowed in the building. When there are 20 bags of processed material it gets picked up. Due to the small quantities of stored material no internal separation distances have been applied. The stockpiles must be maintained so that all building egress points and required paths of travel are not blocked or impeded. Copper cabling is located outside building B in 2 tonne metal skip bins or 1 m^3 bulk bags before it is shredded in granulator. Given the small quantities separation distances as per the FRNSW guideline has not been applied around the skip bins and bulk bags.

8.4 Item B: Fire brigade accessibility

8.4.1 Enhanced emergency vehicle access for the fire brigade is to be provided at the waste facility due to the special hazards of the north-western part of Lot 100 that contain and use a mobile hammer mill/pre-shredder/shredder machine. Also refer to section 7 for proposed Performance solution for vehicular access.

8.4.2 Along straight carriageways for emergency vehicle access, minimum width of 4 m should be provided for general appliance and a minimum width of 6 m for areal appliances, as shown in Figure 25.

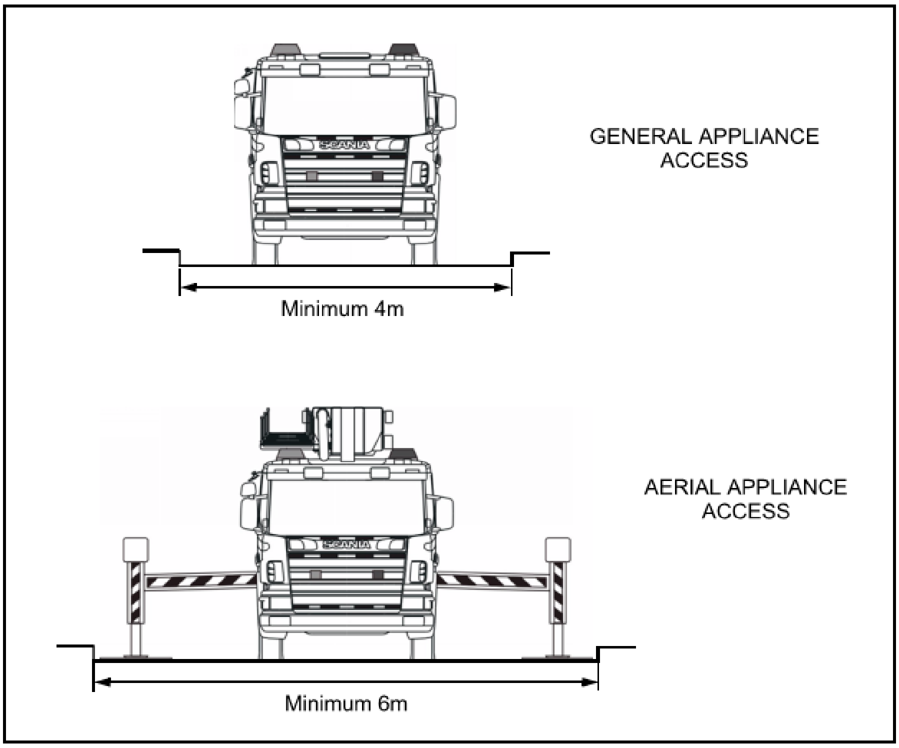


Figure 25: Minimum carriage widths - Straight Sections

8.4.3 Any curved carriageway for emergency vehicle access shall have a minimum inner radius of 7.3 m, an outer radius of 14.6 m and a minimum distance between the inner and outer arcs should not be less than 7.3 m (NSW Fire Brigades, 2010). For reference see Figure 26.

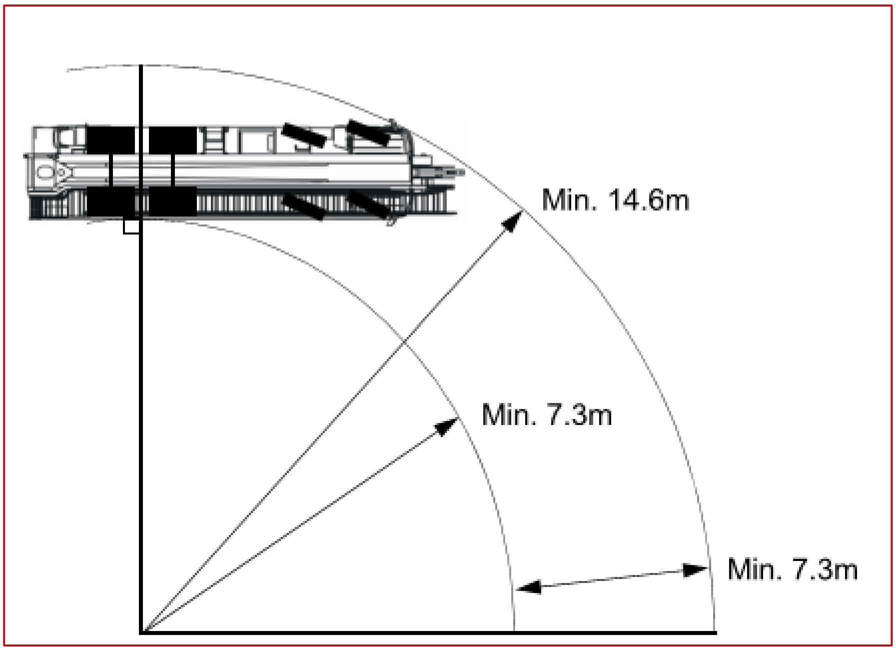


Figure 26: Minimum carriageway widths — curved sections

8.4.4 Perimeter vehicular access shall comply with Clause C2.4(b) of the BCA and FRNSW guideline "*Access for emergency vehicles*". It is our opinion that engagement with the FRNSW is necessary to determine compliance with this guideline and FRNSW requirement.

8.4.5 Access is to be provided at the perimeter of the site, around buildings and access roads between any external storage stockpiles. Figure 27 outlines a proposed driveway to allow for emergency vehicular to access in the event of a fire brigade intervention with one entry and one exit that complies with the FRNSW guideline "*emergency vehicles access*" (NSW Fire Brigades, 2010) in terms of the width of straight carriageways and radius for turns.

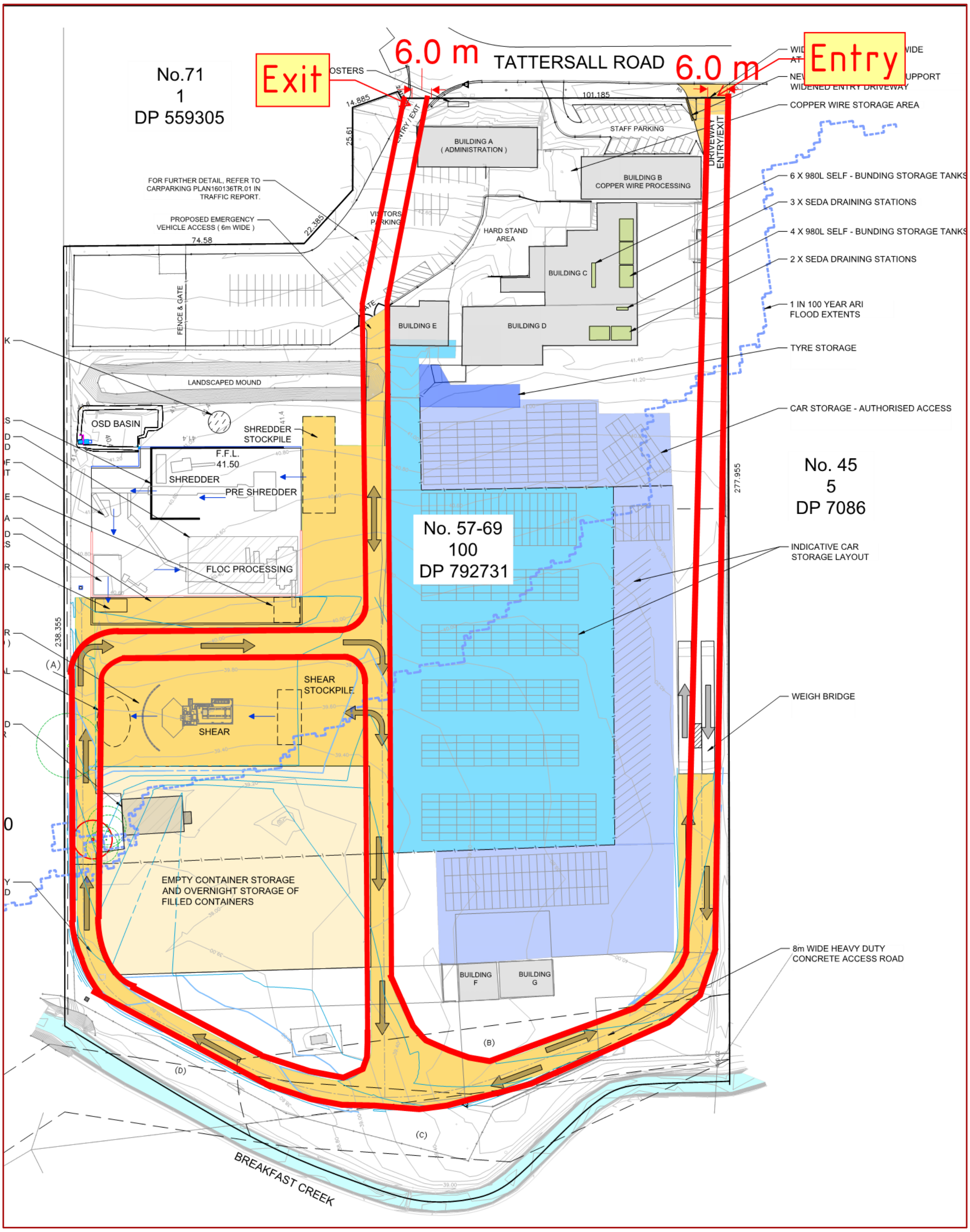


Figure 27: Proposed driveway for emergency vehicles

8.5 Item C: Fire hydrants water capacity - supply

8.5.1 FRNSW guideline (FRNSW, 2019) states that a fire hydrant system complying with AS 2419.1:2005 is to be provided throughout the site, including a ring main to allow for water supply redundancy. Note that the hydrant system for the development is also to comply with the requirements of AS 2419.1:2017.

8.5.2 Clause 7.4.7 and Clause 7.4.8 of Version 01 of the FRNSW guideline (FRNSW, 2018), states that the flow rate and capacity of the fire hydrant system shall be designed to satisfy the hydraulic demand for the worst-case credible fire scenario, but gives no guidance of how to determine the hydraulic demand. It recommends a minimum water tank capacity that is able to provide a minimum flow of 50 L/s for four hours, which results in 720,000 L tank volume. The updated FRNSW guideline (FRNSW, 2019) does not include a requirement for a tank if water supply can be provided for four hours and prescribes minimum requirements for hydrants for external storage are as per Table 16 below.

Table 16: Minimum fire hydrants for non-sprinklered buildings and external storage (FRNSW, 2019)

Fire compartment floor area of non-sprinklered buildings	Area of open yard (used for stockpiles)	No. of fire hydrants required to flow
≤ 500 m²	≤ 3,000 m²	2
> 500 m² ≤ 5,000 m²	> 3,000 m² ≤ 9,000 m²	3
> 5,000 m² ≤ 10,000 m²	> 9,000 m² ≤ 27,000 m²	4
> 10,000 m²	> 27,000 m²	5 (or more)

8.5.3 The guideline (FRNSW, 2019) does require all reasonably foreseeable combustible waste materials to be identified and considered in any alternative solution. Furthermore, it was discussed and agreed at the meeting held with FRNSW, refer to Appendix E, that assessment of a worst credible fire scenario is to be undertaken to determine the required water supply.

8.5.4 The proposed system will meet compliance with AS 2419.1:2017 as well as with AS 2419.1:2005. This without the provision of a water storage tank on-site as the water supply from the water main located north on Tattersall Road provides a flow of 50 L/s with a pressure of 72 pressure head m. Refer to Sydney Water flow and pressure approval in Appendix D.

8.5.5 Version 1 of the FRNSW guideline (FRNSW, 2018) also recommends full capacity tanks or reduced capacity tanks with infill from a town-main. We have been advised in the meeting with FRNSW held 21 May 2019, that if the water flow requirements can be achieved together with compliance to AS 2419.1, FRNSW does not require water storage tanks for the hydrant system (refer to meeting notes in Appendix E). This is also consistent with the current Version 2 of the guideline. Onsite water tanks are therefore not proposed for the water supply. The hydraulic engineer for the project has confirmed that the water main is capable of providing sufficient water supply for the hydrant system and the sprinkler system to be installed as part of stage 2 (SSD).

8.5.6 The assessment to calculate the water supply needed to fight a worst-case credible fire in the north-western part of the site is presented in Appendix C.

8.5.7 Two piles have been assessed. The first pile, which is the largest raw feed pile on site, has a maximum size of 28 m (length) x 10 m (width) x 4 m (height) and comprises raw feed materials, i.e. raw material such as cars and white-goods. The second pile comprises of a stockpile of shredded (more fine and higher density) material, which has a maximum size of 8 m (length) x 8 m (width) x 4 m (height). One of these piles will determine the water demand for the hydrants system needed for the site, whichever is the most. Note that only two piles on the site with significant amount of combustible material are allowed (raw-feed material pile and the floc stockpile). No other stockpiles are allowed on site, except for piles stated in this report.

8.5.8 Based upon the assessment in Appendix C it has been demonstrated that 21 L/s is required to extinguish the shredded stockpile and that 50 L/s is expected to be sufficient to extinguish a credible worst-case scenario in the raw material stockpile involving 17 cars burning simultaneously at their peak HRR. It is noted that a larger fire in the raw material stockpile is possible, however would burn out in a relatively short timeframe (18 minutes if all car burns at peak HRR simultaneously). For this scenario the separation distances between stockpiles and between stockpiles and buildings are considered sufficient to prevent fire spread.

8.6 Item D: Water run-off

8.6.1 According to the FRNSW guideline, the waste facility is to have effective and automatic means of containing fire water run-off, with primary containment having a net capacity not less than the total hydraulic and any fire sprinkler system discharge together.

8.6.2 We have assumed throughout this report that fire will only occur at one place at a time. It has been confirmed in meeting with FRNSW on 21 May 2019 that the water run-off containment does not need to be designed for both the worst-case hydrant demand (for an outdoor stockpile) and the sprinkler system demand (based on a building fire) occurring at the same time. Refer to meeting notes in Appendix E to this report.

8.6.3 The required water run-off containment capacity is 320,000 L for stage 2 (SSD) subject to this report based on the estimated total water discharge for the automatic sprinkler system installed to the workshop building (building B, C and D) together with two hydrants operating simultaneously.

8.6.4 The calculations for the shredded stockpile are based on the FRNSW guideline Version 1 (FRNSW, 2018) requirement of 720,000 L being required for a maximum stockpile of 50 m (length) x 20 m (width) x 4 m (height) with a slope that does not exceed of 45 °. The surface area of such pile is 1,000 m², considering the area of the top and sides of the stockpile. In the event of a fire, the combustion will be dependent on how large the area of combustible material that is exposed to oxygen (open air). Considering that the fire size will be directly correlated to the surface area, Table 17 presents water requirements for the proposed shredded stockpile described above. The values are interpolated from the FRNSW guideline. The appropriateness of this interpolation has been verified by calculating the required water supply demands based on equations for fire fighting water demand in the literature and base the containment water requirements on this. See calculations completed in Appendix C. 90 minute water storage of containment water has been allowed for. This was discussed with FRNSW at the meeting on 21 May 2019 and considered acceptable based on HIPAP 2 requiring a minimum of 90 minutes storage for firefighting water supply.

Table 17: Water requirements interpolated from the FRNSW guideline (FRNSW, 2018)

Pile	Height (m)	Length (m)	Width (m)	Surface Area (m^2)	Water Requirement (L)
FRNSW Guideline	4	50	20	1000	720,000
Shredded pile	4	8.0	8.0	64	46,080

8.6.5 To determine the containment water requirements for the raw stockpile we have determined the flow needed to fight a worst-case credible fire as presented in calculations completed in Appendix C to this report. The required flow rate has been determined to be 50 L/s resulting in a required water run-off containment capacity of 270,000 L (50L/s x 90 minutes x 60 s / minute) for stage 1. It is understood that separate tank/s will serve the DA stage. However, as stated above the required water run-off containment capacity is 320,000 L for stage 2 (SSD).

8.6.6 The hydraulic engineer has looked into water requirements considering the proposed sprinkler system to building B, C and D. The building is proposed to be provided with an automatic sprinkler system and the water requirements for the building also include the water demand of two hydrants operating for 90 minutes together with the automatic sprinkler system. The water flow demand for the automatic sprinkler system to be installed to the workshop building together with two hydrants operating simultaneously will be (2265 L/min + 2 x 10L/ x 60s) x 90 minutes = 311,850 L. Therefore, a water run-off containment of 320,000 L will be considered sufficient for the site.

8.7 Item (E): Fire services and equipment

8.7.1 The pre-shredder, shredder machines and the shear machine shall be provided with portable fire extinguishers to mitigate the risk of fire spread in the early stages of a fire. Extinguishers that are located next to machinery with electronic equipment that is sensitive to water should be provided with CO_2 (carbon dioxide) type to limit the risk of electric shock to the extinguisher operator or damage to devices. For other areas, AFFF (Aqueous Film Forming Foam) fire extinguisher AB is recommended. This is to be confirmed by the fire contractor.

8.7.2 Fire hose reels are also to be provided to the site in accordance with Clause E1.4 of the BCA and AS 2441:2001. The system will have to be monitored by Sydney Water as per requirement by Sydney Water.

8.8 Meeting the NSW Fire Safety Guideline – Fire Safety in Waste Facilities.

8.8.1 Based on the above, the intent of the FRNSW guideline (FRNSW, 2019) is considered to be met since:

FRNSW Guideline Criteria	Compliance
A fire hydrant system must be provided to the degree necessary to facilitate the needs of the fire brigade appropriate to—	
A - Stockpile size and separation distances between external stockpiles	The largest stockpile size proposed on site is within the limitations of the FRSNW guideline. The proposed separating between stock piles complies with the guideline.
B - Fire brigade accessibility	The emergency vehicular access to the site will be designed in accordance with the FRNSW guideline "*emergency vehicles access*" (FRNSW, 2010).
C - Fire hydrants water capacity	The fire hydrant water capacity needed is calculated as per Appendix C, based on the largest stockpile size being on fire. The fire hydrant system will be designed to provide a flow of 50 L/s provided from the town water main.
D - Water run-off	The water run-off will be designed to have the capacity to contain up 270,000 L for stage 1 (DA stage) based on the hydrants and up to 320,000 L for stage 2 (SSD stage) based on the workshop building (sprinklers and hydrants).
E- Fire services and equipment	Fire extinguishers will be provided around operating machinery.

9 FRNSW Guideline – External car storage areas

9.1 Introduction

9.1.1 This section provides a proposed fire safety design for the external car storage areas on site.

9.1.2 It is understood that the vehicles will be drained from fluids (oil, petrol etc. in the workshop areas (building C and D) and are then placed in the external car storage areas to allow the public to pick parts from the cars they think are valuable or useful before the cars are crushed.

9.1.3 Storage areas of the vehicles will be in accordance with the state significant development application, as shown in Figure 28.

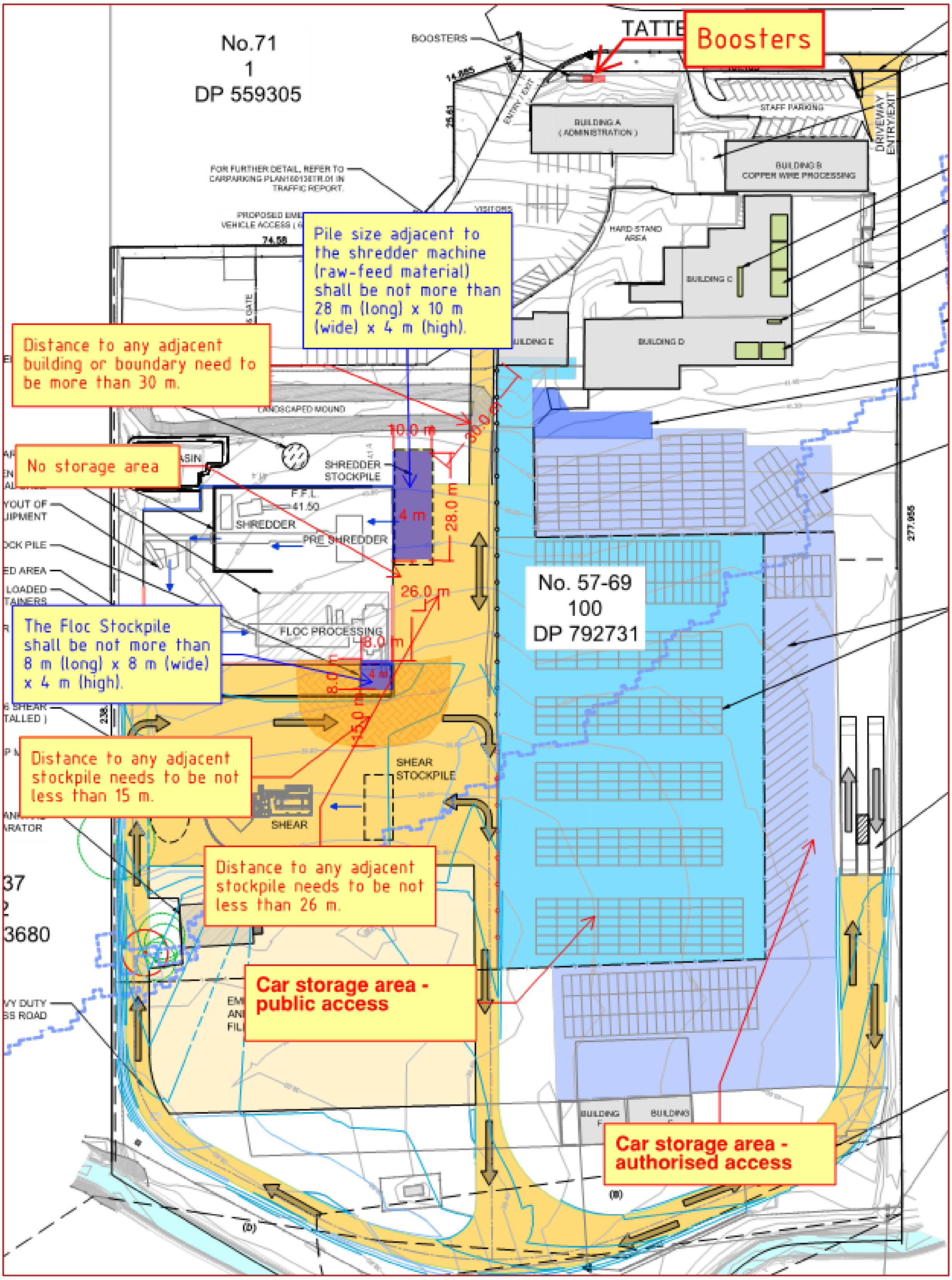


Figure 28: Proposed car storage areas

9.1.4 It is not considered that the FRNSW guideline for waste facilities "*Fire Safety in Waste Facilities Guideline*" (FRNSW, 2019) is applicable to the external car storage areas since there are no stockpiles.

9.2 Proposed fire safety measures – External car storage areas

9.2.1 The following items are the proposed fire safety measures that are applicable for the external car storage areas:

(a) The vehicles must not be stored on top of each other.

(b) Hydrant coverage must be provided to all areas, including all external areas of the site considering two lengths of hoses (60 m) to be used as per AS 2419.1:2005 and AS 2419.1:2017. The layout of the car storage areas and any fences must be considered when determine that hydrant coverage is achieved throughout all areas.

(c) Aisles must be provided between vehicles on the external storage areas to allow for fire brigade intervention[2].

[2] This FEB will be sent for approval to FRNSW.

10 Conclusions

10.1.1 Following stakeholder comments on the preceding FEB, the fire engineering analysis will be undertaken and documented in a Fire Engineering Report (FER). The FER will set the minimum standards of design, installation, commissioning and ongoing maintenance and inspection for the fire engineering assessments and the proposed Performance Solution to remain valid.

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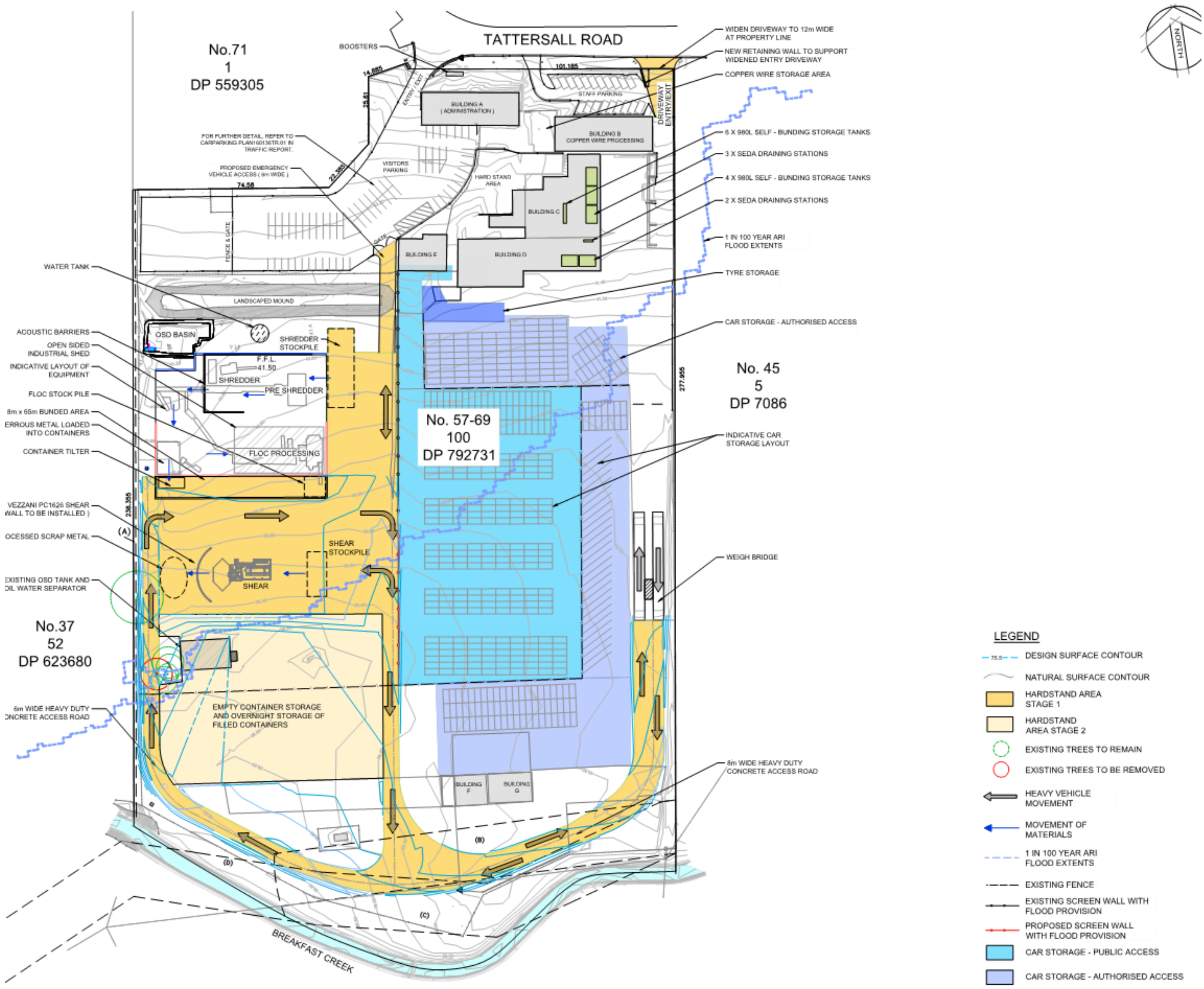
Appendix A. Drawings



Appendix B. TRA Computer Software

B.1.1. The Thermal Radiation Analysis (TRA) computer software is used to calculate thermal radiation between surfaces and provides a visual output. It is focused on fire engineering design and analyses radiation between hot emitter surface such as fires or compartment fire windows to cool receiver surfaces such as boundary walls or evacuation routes.

B.1.2. The theory or equation between surfaces used in the TRA computer software is as shown below which is widely used to determine the radiant heat intensity from a single opening of a building to a point some distance away. It takes into account of the configuration factor (shape factor or geometric factor) which determines the intensity of radiation received by a surface remote from an emitter.

$$q_r^{"} = F_{1-2} \times \varepsilon \times \sigma \times \left(T_{emitter}^4 - T_{receiver}^4\right)$$ **Equation 1**

Where:

$q_r^{"}$	radiant heat flux received by receiver [kW/m²]
F_{1-2}	configuration factor [-]
ε	emissivity [-]
σ	Stefan Boltzmann constant (5.67 x 10^{-8}) [W/(m² K⁴)]
$T_{emitter}$	temperature of emitter [K]
$T_{receiver}$	temperature of receiver [K]

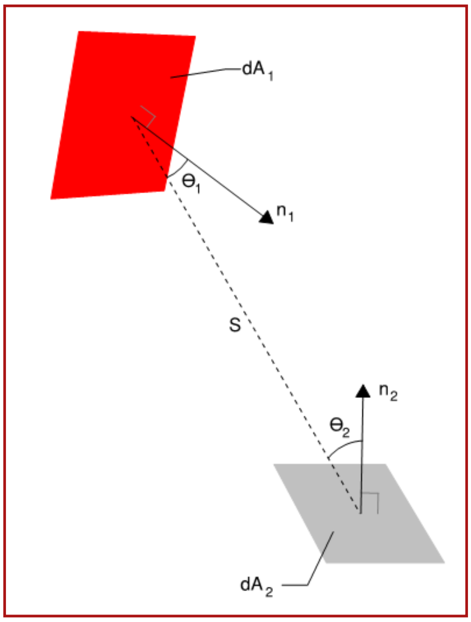


Figure 29: Configuration factor between surface A_1 and A_2

B.1.3. To determine both the average and maximum radiation in the TRA software, key parameters such as the temperature and emissivity are input. Emitting and receiving surfaces are described using four coordinates. The software performs numerical integration to calculate the radiation levels.

B.1.4. Further information regarding the TRA software can be found via the following website: http://www.fire-engineering-software.com/tra.html.

Appendix C. Fire Hydrant Water and Run-Off Containment Capacity

C.1. Fire Hydrant Water and Run-Off Containment Capacity

C.1.1. To meet the intent of the FRNSW guideline for waste facilities (FRNSW, 2019), the hydrant system is to be designed for the worst-case credible scenario in terms of required water supply demand. Calculations for both minimum flow capacity in litres per second and minimum volume in litres and has been assessed in this report.

C.1.2. The FRNSW guideline also requires the fire water run-off containment capacity to be determined based on hydraulic discharge from both the fire hydrant system and automatic sprinkler system.

C.1.3. The information within this assessment is considered to be reasonable approximations based upon literature obtained internationally.

C.1.4. The largest combustible pile on site, being the one located adjacent to the shredder machine in the north-western part of Lot 100, comprises raw feed materials, i.e. raw material such as cars and white-goods. This pile will have a maximum stockpile size of 28 m (length) x 10 m (width) x 4 m (height). The maximum slope angle is not proposed to be limited to 45 °, as per the FRNSW guideline (FRNSW, 2019). The reason for allowing this pile of raw-material to not have a greater slope angle than 45 ° is that the cars, white-goods etc will be piled on top of each other and the raw feed is not expected to collapse as finer materials may do. The high turnover frequency of the material in the raw-feed pile will limit the potential of the material being stored for a long period of time. We expect that the pile of raw-material with a maximum height of less than 4 m will not be stored such that collapse occurs, which also is the intent of the maximum angle requirement in the FRNSW guideline (FRNSW, 2019).

C.1.5. We also expect a fire in the raw-material pile to behave similarly to a fire in baled or racked storages or as cars placed in a car-stacker.

C.1.6. The largest stockpile size on site for the DA stage comprising shredded material will be located in the north-western part of Lot 100. This pile will have a maximum size of 8 m (length) x 8 m (width) x 4 m (height), as well as adapting a maximum slope angle of 45 °. A 45 ° angle cannot be achieved unless the pile is at least 8 m wide (considering a height of 4 m) and as such the width has been allowed to be 8 m, resulting in a maximum surface area of 64 m².

C.1.7. We have carried out calculations to estimate the water demand (volume [L] and flow [L/s]) for both of the raw-feed pile and the stockpiles identified above.

C.1.8. The calculations of the water volume required for the shredded piles for which the 45° angle is achieved is based on the FRNSW guideline version 1 (FRNSW, 2018) requirement of 720,000 L being required for a maximum stockpile of 50 m (length) x 20 m (width) x 4 m (height) with a slope that does not exceed of 45 °. The surface area of this pile is 1,000 m^2. In the event of a fire in the shredded pile, the combustion will be dependent on how large the area of combustible material that is exposed to oxygen (open air). Considering that the fire size will be directly correlated to the surface area, Table 18 presents water requirements for the piles described above.

Table 18: Water requirements interpolated from the FRNSW guideline

Pile	Height (m)	Length (m)	Width (m)	Surface Area (m^2)	Water Requirement (L)
FRNSW Guideline	4	50	20	1000	720,000
Shredded pile	4	8.0	8.0	64	46,080

C.1.9.The interpolated values from the FRNSW guideline indicates that the shredded pile requires 46,080 L water. This calculation does not consider the required flow consumption. As per meeting with FRNSW on 21 May 2019 the 50 L/s in the FRNSW Guideline (FRNSW, 2018) is a minimum requirement for the water flow. They considered the above approach a reasonable approach to determine required containment water tank volume, however further justification is required that the supply would be sufficient. Furthermore, the raw material pile will not comply with the 45° maximum slope and as such water demand has been calculated using a different methodology. Water supply demands based on equations found in the literature has been calculated. The requirements are also compared with the requirements of AS 2419.1.

C.2. Water flow consumption calculations (flow [L/s])

C.2.1.The required flow of water (L/s) provided to the site, correlates to how many hydrants that can operate at the same time. Subsequently, it will impact the effectiveness of the fire-fighting operations opportunity to control and extinguish a fire.

C.2.2.The following sections will calculate the water supply requirement (flow [L/s]) that can be expected to be required for fires in any of the two stockpiles described in the sections above.

Extinguishing capacity of water

C.2.3.Chapter 4 in '*FBIM - Assess heat release rate over time based on water application'* (FBIM, 2004), states that the actual performance of hand-held hose in extinguishing fires are very dependent on the operator. Factors such as skill, equipment, conditions, danger, fatigue, strength, experience, etc. need to be accounted for. These attributes cannot be easily modelled individually, so an efficiency factor has been introduced. The efficiency factor does also consider the amount of water which will not actually reach the fire target area.

C.2.4.The FBIM report also specifies that the fire extinguishment capability can be estimated theoretically by the heat absorption capacity of water applied to the fire, taking into account the efficiency of the application.

C.2.5. For most fires, water is used as the extinguishing medium. The extinguishing effect comes from the heat absorbed by the water as it is heated and vaporised. The heat absorption cools the flame down and when the adiabatic flame temperature falls below about 1600 K at stoichiometric conditions, the flame goes out.

C.2.6. The heat absorption capacity of 1 kg water to transform from 10 °C to steam at 100 °C is 2.64 MJ/kg.

C.2.7. It should be noted that water that is not vaporised, which can be seen flowing along the ground at many fire scenes, has a maximum absorption capacity of only 0.38 MJ/kg.

C.2.8. The FBIM report (FBIM, 2004) assumes that flashover has occurred in an enclosure when the temperature is above as 550 °C. The estimating energy input necessary to transform 1 kg of water at 10 °C to 550 °C is 3.5 MJ. Based on this it can be concluded that every L/s of water (assuming water having a density of 1 kg/L) can theoretically cool fire of 3.5 MW. Note that a fire containing plastic and rubber can reach a temperature of 1,200 °C (typical maximum burn temperature) (Waste, 2017). Hence, a maximum absorption capacity of 1 kg water of 3.5 MW is considered as a conservative assumption.

C.2.9. It is further stated in FBIM that it is sufficient to only remove 30 % to 35 % of the released energy from diffusion flames to gain extinguishment (FBIM, 2004). Hence, this results in a theoretical extinguishing capacity of 10.5 MW for each litre per second water applied.

C.2.10. It is further assumed in the FBIM that the efficiency of water applied is 15 % for interior fire-fighting and 5 % for fire-fighting external to a building. The research behind these values, (Särdqvist, 1996), does not consider fire-fighting externally at an open yard and specifies that one of the reasons for the 5 % efficiency factor for fire-fighting external to a building is that obstructions such as roofs may prevent the water to be used efficiently. The efficiency factor of 15 % for internal fires is based upon a fire in a small-scale room where the fire-fighter is standing in the opening of the room fighting the fire. Hence, no obstructions were preventing the water to reach the fire.

C.2.11. It is our opinion that the efficiency factor of 15 % can be used for firefighting on the raw feed pile and the shredded pile since there will be no obstructions such as walls, roofs, etc, that will prevent the water to be used in an efficient way.

C.2.12. Based on the above, it is our opinion that each litre per second water supplied has an extinguishing capacity of 10.5 MW * 0.15 = 1.575 MW. A flow of 50 L/s will then have the ability to extinguish a fire of approximately 79 MW.

Shredded pile – flow consumption

C.2.13. The raw pile will contain cars, white-goods and therefore will contain non-combustible material such as steel and aluminium. It has conservatively been assumed that the whole shredded stockpile (floc pile) consists of plastic. Three types of plastic make up approximately 65 % of the total high-performance plastics used in a car: polypropylene (32 %), polyurethane (17 %) and PVC (16 %) (Szeteiova, n.d.). These three plastic materials have been used in the following assessment.

C.2.14.The heat release rate can be estimated using Equation 2 from Enclosure Fire Dynamics (Karlsson B, 2000).

$$\dot{Q} = A \cdot \dot{m}'' \cdot X \cdot \Delta H_c \qquad \textbf{Equation 2}$$

Where,

A $[m^2]$	Horizontal fire area
$\dot{m}''$ $[\frac{kg}{m^2 s}]$	Mass loss rate
X [-]	Combustion efficiency factor
ΔH_c [MJ/kg]	Heat of combustion

C.2.15.The combustion efficiency factor indicates the ratio between the effective heat of combustion and the complete heat of combustion. For fuels that created sooty flames, the factor typically ranges between 0.6-0.7 (Karlsson B, 2000). As a conservative assumption, the combustion efficiency factor is chosen to be 0.7 for this assessment.

C.2.16.Table 19 below specifies the heat of combustion and the mass loss rate for the three most common plastic materials used for car processing used in this assessment.

Table 19: Thee most common plastics in a car

Fuel	m'' (kg/m²s)	ΔH_c [MJ/kg]	Reference m''	Reference ΔH_c [MJ/kg]
Polypropylene	0.024	43.31	(Karlsson, 2000) Table 3.2.	(Hurley, 2016) Table 5.3.
Polyurethane	0.02375	25.85	Average between values in (Karlsson, 2000) Table 3.2.	Average between values in (Karlsson, 2000) Table 3.2.
Poly-Vinyl-chloride (PVC)	0.016	16.43	(Karlsson, 2000) Table 3.2.	(Karlsson, 2000) Table 3.2.

C.2.17.The maximum HRR (MW) for the shredded stockpile has been calculated based upon Equation 2. The area is assumed to be 64 m² (refer to Table 18). The mass loss rate and the heat of combustion are calculated to reflect the percentages stated in C.2.13. The pile is assumed to contain 100 % of the three plastics stated above. Hence, the pile contains approximately 49 % (0.32/0.65) polypropylene, 26 % (0.17/0.65) polyurethane and 25 % (0.16/0.65) PVC. The heat release rate is calculated to 33 MW as per below:

HRR = 64 m2 x (0.49 x 0.024 kg/m2s x 43.31 MJ/kg + 0.26 x 0.02375 kg/m2s x 25.85 MJ/kg + 0.25 x 0.016 kg/m2s x 16.43 MJ/kg)) x 0.7 = 33 MJ/s = 33 MW.

C.2.18. Based on the above, the required flow for extinguishing the shredded stockpile being 64 m² (surface area) is 21 L/s. A hydrant flow of 50 L/s is sufficient to extinguish this shredded stockpile.

Raw material pile – flow consumption

C.2.19.A fire scenario in the pile of raw-material comprising cars, white goods, etc. is expected to behave as fire in baled or racked storages or as cars placed in a car-stacker.

C.2.20.In the report 'fires involving modern cars and stacking systems', it is stated that fire spread (between vehicles) is increased with stacking systems where cars are stacked on each other, in comparison to open carparks where generally fire spread between cars does not occur. The potential risk for the spread of fire to adjacent vehicles is also increased in enclosed car parks due to the greater temperatures generated inside the enclosure (Collier, 2011).

C.2.21.A test carried out on a stacker with two cars showed that, in the absence of any fire suppression, fire would spread quickly from the lower car to the upper car, developing an extensive and severe fire which might be expected to readily spread laterally to nearby cars and concluded that the potential risks from car stackers are clearly a concern (BRE, 2010).

C.2.22.The report also states where a number of cars are burning simultaneously, the fire is exacerbated by heat-feedback and heat release rates is highly increased (BRE, 2010).

C.2.23.Based on the above, it is our opinion that in the event of a larger fire starting in the raw feed pile, it can be expected that the fire would involve several cars (or raw feed).

C.2.24.The weight of a medium size car is approximately 1.600 kg (Miller-Wilson, n.d.) and the size is approximately 4.5 m (length) x 1.8 m (width) x 1.5 m (height) i.e. a volume of 12.15 m^3 (Automobiledimensions, 2019). Hence, the density of a medium size car is approximately 130 kg/m^3. Since the volume of the raw feed pile is 1,120 m^3, the pile will be able to contain approximately 93 cars as a maximum at one given time. The client has confirmed that the maximum expected number of cars within the stockpile is not expected to exceed 90 cars. Note that the shredder machine shreds 6 cars/minute so the turnover of cars can be very high in this area.

C.2.25.The fuel load in a passenger car is assumed to be 5 GJ. This is the 80^{th} percentile of the fuel load based on several full-scale tests that have been undertaken by the SP Swedish National Testing and Research Institute (Haukur Ingason, 2004). The pile of raw feed material mostly comprises of cars. The cars will be drained from fluids (oil, petrol etc. and the public can pick parts from the cars they think are valuable before the car is stacked and crushed. It is then shredded to recycle the metal they contain. Hence, a fuel load of 5 GJ for a passenger car, which relates to fully equipped cars, is considered a conservative assumption.

C.2.26. Several tests have been carried out to estimate the heat release rate (HRR) for a car. The test report from Michael Spearpoint (Spearpoint, 2017) outlines that the peak HRR for a car is approximately 4.7 MW.

C.2.27. At least 50 L/s water flow is proposed to be provided. As presented in Table 20, the water flow is sufficient to extinguish up to seventeen cars burning simultaneously at their peak heat release rate. It is our opinion that this would represent a credible worst-case fire scenario in this type of pile at the time of fire brigade intervention.

Table 20: Maximum extinguishing capacity

L/s	MW (15 % effectiveness)	Maximum cars in the raw feed pile	Number of hydrants flowing simultaneously
10	15.75	3	1
20	31.5	7	2
30	47.25	10	3
40	63	13	4
50	78.75	17	5
60	94.5	20	6

C.2.28. Notwithstanding, the maximum peak HRR for 93 cars is determined to be approximately 437 MW. Note that the calculation is based on that all of the cars in the raw feed pile are burning with their peak HRR at the same time. It is our opinion that it is not a credible fire scenario. It is unlikely that all cars would burn at peak HRR at the same time, but the fire would travel along the pile and consume the fuel over a longer period of time and subsequently with lower HRR. Furthermore, the cars have been stripped of fluids and valuables part and as such the peak heat release rate per car is expected to be lower.

C.2.29. In the unlikely scenario of all cars reaching peak HRR simultaneously and based on that each litre per second water supplied has an extinguishing capacity of 1.575 MW, a flow of 278 L/s would be required to extinguish cars on fire with a total HRR of approximately 437 MW.

C.2.30. In the unlikely scenario that the fire would burn with an HRR of 437 MW it is not considered feasible to use the fire hydrant system to extinguish the fire, however the fire would burn for a limited duration. The fire would burn out after approximately 18 minutes ((5000 MJ x 93 cars)/(4.7 MW/car x 93 cars) = 18 minutes). After 18 minutes, the fire will have consumed all of the energy contained in the 93 cars, and the fire will self-extinguish.

C.3. The total amount of water consumption calculations (volume [L])

C.3.1. The calculations are based on water being the extinguishing medium. Other extinguishment media such as foam may be used by the brigades.

C.3.2. There have been statistical analyses carried out into water consumption when fires have been extinguished manually. However, there is a very large scatter in the data available and one of the reasons for this stems from the definition of fire area (Särdqvist, 2002). Different studies (refer to Table 21) have developed equations to determine the required water demand.

Table 21: Summary of equations for water consumption (Särdqvist, 2002)

Equation		Reference and applicability
$V = 115 \cdot A^{1.1}$	Equation 3	1998 study on small fires in buildings in large cities in the UK. The emphasis is on extinguishing small fires using a fog nozzle on a certain reel.
$V = 123 \cdot A^{1,2}$	Equation 4	1972 study on medium-sized and large fires in the US.
$V = 940 \cdot A^{0.8}$	Equation 5	1959 study on major fires in the UK. The fires had a larger area than 200 m^2 and more than five jets were used.
Where,		
$V\ [Litres]$		Total water consumption
$A\ [m^2]$		Horizontal fire area

C.3.3. It is understood that the equations above are mainly based on fires in buildings and are not able to be fully be adopted to a stockpile fire located outdoors. Further to this, the fire is determined by its floor area and not the volume, which means that the water consumption is independent of the height of the burning object, which is one of the reasons for the large scatter in the data available (Särdqvist, 2002). The difference between the fuel area and the floor area was found to be at least a factor of two for office buildings and at a lumberyard, the difference is much higher (Särdqvist, 2000).

C.3.4. Based on the above, the pile of raw material containing cars, white-goods etc. is not able to be fully adaptable for the equations presented above in Table 21, since the raw-material will burn differently from a fire inside a building and the fire will not be independent of the height of the raw material pile. However, the stockpile of shredded goods will behave differently than the pile comprising raw material as it is mainly the surface area of the pile that will burn.

C.3.5. The maximum HRR for a stockpile that is compact and not provided with ventilating gaps or separate bales, will be limited by the surface area where the fire will gain oxygen for the combustion of the fuel. Hence, the surface area is the critical factor for the shredded stockpile and calculations are carried out based on the equations presented in Table 21 for the shredded stockpile. A fire scenario involving all surface areas is in our opinion considered the worst-case credible fire scenario for the shredded stockpile. As stated above, the shredded stockpile on site has a dimension of 8 m (length) x 8 m (width) x 4 m (height), which results in a surface area of 64 m², with consideration of a slope angle being 45 °.

C.3.6. Note that we have assumed that fire will only occur at one place at a time since the separation distances between piles and between piles and buildings/boundaries complies with the FRNSW guideline (FRNSW, 2019). This is further discussed in paragraph C.6.1 to C.6.3.

C.3.7. The following results (refer to Table 22), were obtained based on the surface area of the shredded stockpile described above.

Table 22: Calculation results for water consumption (Särdqvist, 2002)

Equation	Results (Shredded pile)
Equation 2	V = 11,156 L
Equation 3	V = 18,085 L
Equation 4	V = 26,186 L

C.3.8. The above equations are taken from the book 'water and other extinguishing agents' (Särdqvist, 2002) and are based on data from real fires. It is, however, acknowledge that there are limitations on how the statistic from real fires can be used to design for specific fire-fighting operations. The following are some reasons why the data in the study may not be appropriate (Särdqvist, 2000):

- The amount and distribution of fuel, which is not sufficiently described in fire brigade investigations, govern the fire spread and the energy release of the fire.
- There is little information about who is actually doing what at fire scenes and the extinction time is generally obscured by other events.
- There is a large spread in fire brigade statistics, depending on reasons not fully known or investigated.
- Status quo is encouraged when statistics are used, rather than development and improvement.

C.3.9. It should be stressed that this does not mean that statistics are unusable. Fire statistics are of great importance in determining, for example, failure frequencies of fire safety systems or in determining ignition sources (Särdqvist, 2000).

C.3.10. The water flow consumption has been calculated above for the raw material stockpile to be 50 L/s and for the Flocpile to 21 L/s. For the raw material stockpile the credible worst-case scenario has been estimated to 17 cars are burning simultaneously. Based on an energy of 5 GJ (5000 MW/s) per car and a peak heat release rate the estimated duration of the fire if controlled at this size rather than extinguished is 97 minutes ((5000 MW/s x 93 cars)/(4.7 MW/car x 17 cars) = 5820 s = 97 minutes).

C.3.11. As discussed with FRNSW a minimum 4 hour water supply must be provided, resulting in a maximum water supply requirement of 720,000 L. This is achieved from the water main and no supply tanks are required.

C.3.12. As per discussions with the fire brigade the water containment is based on 90 minutes. As per the calculations above this is consistent with the duration (97 minutes) of the fire in the raw material stockpile if the fire is controlled (rather than extinguished) when applying 50 L/s.

C.4. Requirements of AS 2419.1

C.4.1. The Australian Standard AS 2419.1:2005, regulates fire hydrant installations and requires that the hydrant system shall have a duration of not less than 4 hours and each hydrant shall deliver not less than 10 L/s.

C.4.2. Based on AS 2419.1:2005 and AS 2419.1:2017 standards for open yards, the standard specifies a different number of fire hydrant outlets to discharge simultaneously depending on the area (m²) of the open yard. It is our interpretation that the hydrant system shall be designed to the whole site (Lot 100), which has an area of approximately 60,000 m^2. Based on this area the AS 2419.1:2005 and AS 2419.1:2017 specifies four fire hydrant outlets to discharge simultaneously, which results in a water demand of 4 hydrants x 10 L/s x 3600 s x 4 h = 576,000 L. Note that this water demand does not consider the open yard as a special hazard nor does it consider the size of the storage.

C.4.3. The FRNSW guideline version 1 (FRNSW, 2018) also states that the design and construction of the fire hydrant system is to take into consideration factors relevant to any specific hazards, as outlined in Appendix B of AS 2419.1:2017. In relation to the fire hydrant system, Appendix B Clause B3(a) of AS 2419.1:2017 states that where a fire hydrant system is being designed for a special hazard area, further consideration should be given to the pressure, flow rates, and duration of water supply to address the specific hazard, but gives no guidance on how to calculate the water demand.

C.5. Hydrant Coverage

C.5.1. The hydrant coverage must be provided to all areas, including all external areas of the site considering two lengths of hoses (60 m) being connected to a hydrant. AS 2419.1 states that each hose has a spray length of 10 m. Based on the proposed layout of the fire hydrants that will comply with AS 2419.1, Figure 30 shows the hydrants that are within the reach of the raw feed pile on the east side of the shredder machine. Figure 31 shows the hydrants that are within the reach of the shredded stockpile in the north-western part of Lot 100. As part of the detailed design any obstacles will need to be considered and may impact on the coverage shown.

C.5.2. From the drawings, it is clear that practically using more than four hydrants to a pile that are not bigger than allowed for in the FRNSW guideline is not straightforward. If the fire brigade needs more than four hoses, they would have to connect their trucks or connect more than two hoses in length, in addition to the fire hydrant system in place. In order to give more coverage to the pile on fire.

C.5.3. It is proposed to provide at least 50 L/s flow in the fire hydrant system, which will allow up to five hoses running simultaneously. Considering the size of the piles and that the fire hydrants are installed to comply with AS 2419.1, the proposed water flow will allow for all the available fire hydrants to operate at the same time.

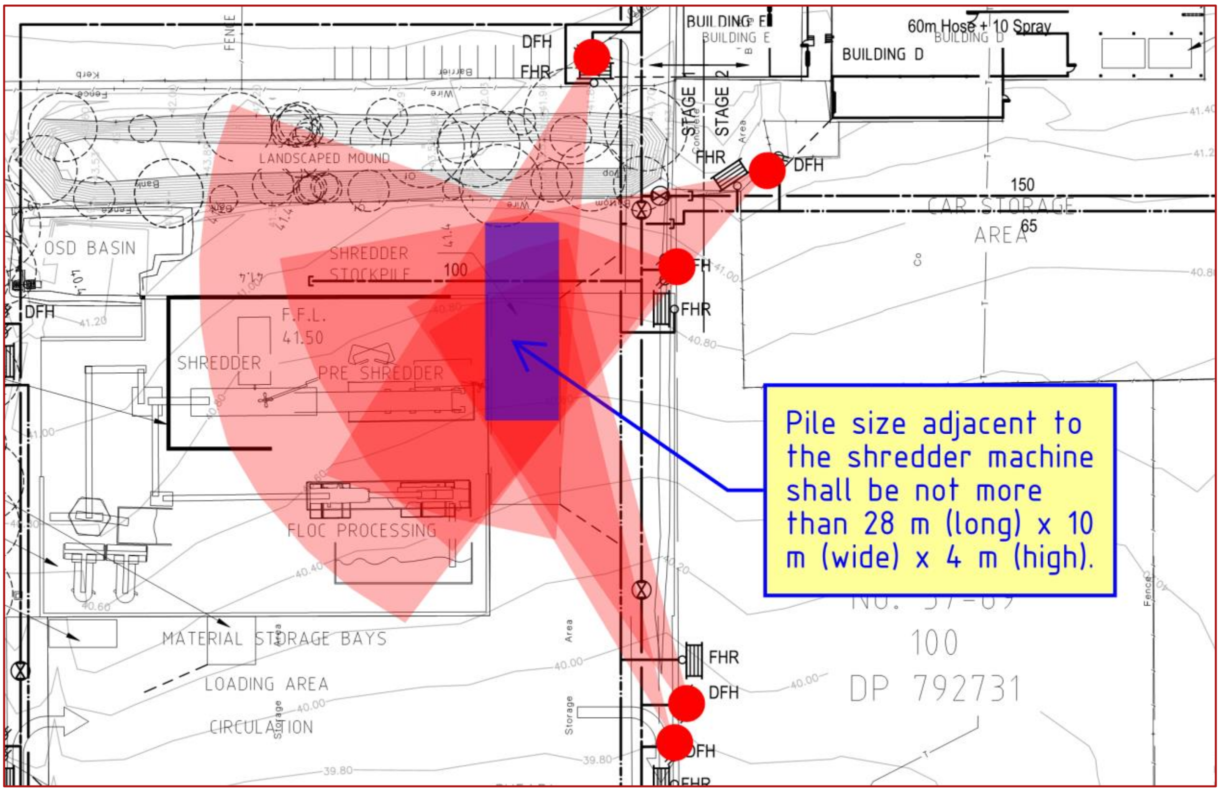


Figure 30: Hydrants (red dots) that are within the reach of the raw feed pile

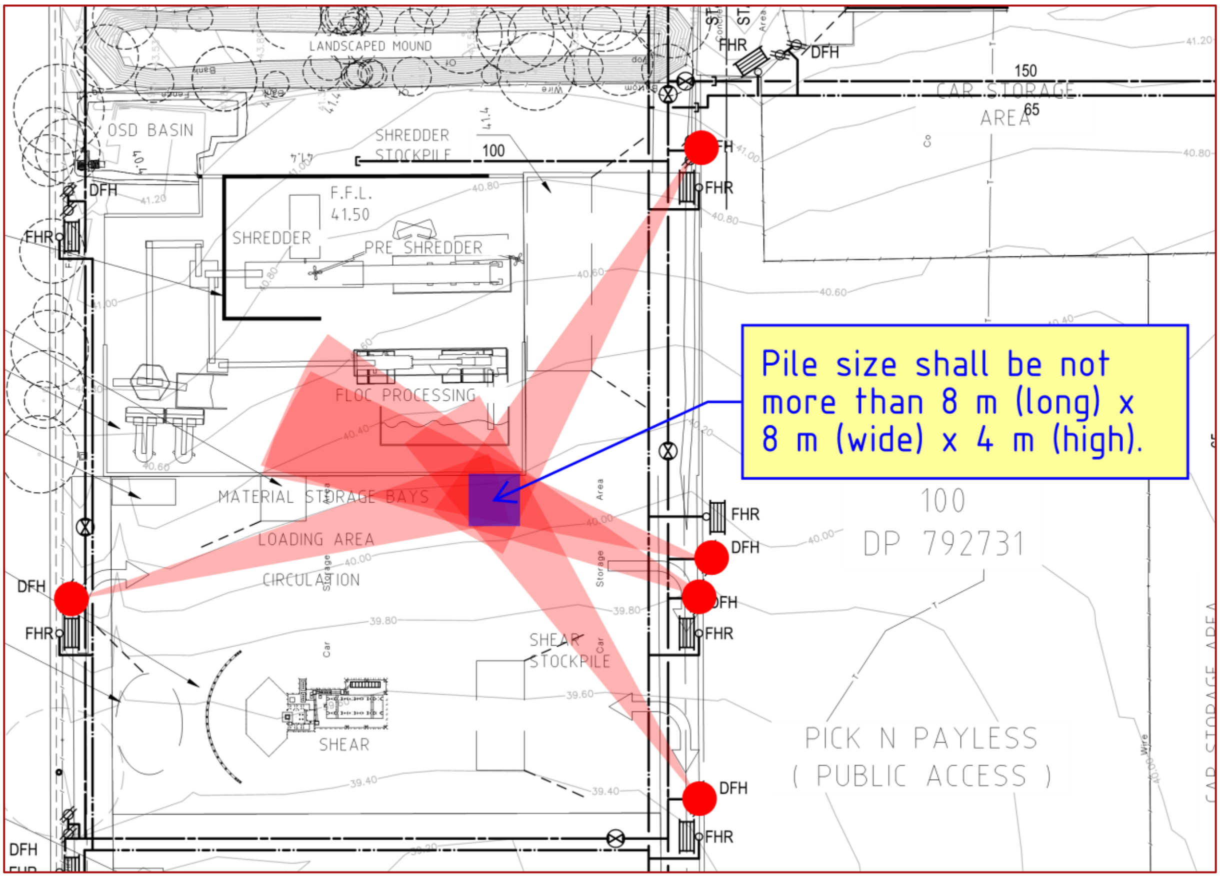


Figure 31: Hydrants (red dots) that are within the reach the shredded pile

C.6. Separation Distances

C.6.1. In the extreme event of all 93 cars in the raw pile will start to burn, it is our opinion that the separation distances to other piles and between piles and buildings/boundary is sufficient to prevent fire spread and that the fire hydrants are capable to control the fire to the pile. This argument is based upon that the FRNSW guideline for waste facilities (FRNSW, 2019) correlates with the separation distances specified in the publication 1667.2 guidelines for waste material (Government, 2018) and the WISH report, 'Reducing Fire Risk at Waste Management Sites' (Waste, 2017). It is noted that the numbers for separation distances in these guidelines are adaptable for waste management sites where the site only has a basic level of fire provision and where the operators do not want to engage a fire engineer to carry out calculations for fire spread. The WISH report indicates that a temperature of 1,200 °C (typical maximum burn temperature for plastic and rubber) has been used to determine the separation distances, to prevent fire spread between piles.

C.6.2. As stated above, the aim of Figure 32 below which specifies separation distances for various pile lengths is to give waste site operators practical and standard guidance they can use without the need to employ a specialist fire engineer to calculate bespoke separation distances. The separation distances are presented in Figure 32. The piles at the site is considered to be of loose type.

	Storage type			
	Loose pile to loose pile	Loose pile to building	Baled pile to baled pile	Baled pile to building
Pile length (m)	Separation distance (m)			
5	10	13	14	13
10	15	18	19	18
15	18	22	24	21
20	23	25	27	23
30	25	30	34	28
50	31	38	40	35

Figure 32: Separation distances for storage of plastic and rubber (Waste, 2017).

C.6.3.The separation distances presented in section 8.3 used in the FRNSW guideline (FRNSW, 2019) are very similar to the distances in (Waste, 2017) and (Government, 2018). Based on the above, it is our opinion that the separation distances to other piles and between piles and buildings/boundary are sufficient to prevent fire spread at the site.

C.7. Conclusion

C.7.1.As seen above, there is a large variation in the calculated water demand (both minimum volume in litres and minimum flow capacity in litres per second). The water supply requirement of 720,000 L in the FRNSW guideline version 1 (FRNSW, 2018) for waste facilities is considered conservative as the stockpile sizes on the proposed site are reduced compared to the largest stockpile in the FRNSW guideline (FRNSW, 2019) allows for. Furthermore, there is only a limited amount of stockpiles located in the north-western part of the site.

C.7.2.The calculations of water consumption are summarised in Table 23.

Table 23: Summary of calculation for water supply requirements

Equation/Calculation	Results
FRNSW guideline version 1 (maximum stockpile size)	720,000 L
Water requirements interpolated from the FRNSW guideline version 1 (shredded pile)	46,080 L
Equation 2	11,156 L
Equation 3	18,085 L
Equation 4	26,186 L
Fire Brigade Intervention Model (shredded pile)	21 L/s
Fire Brigade Intervention Model (raw feed pile) – 17 cars burning at peak HRR	50 L/s
The requirement from AS 2419.1 (4 hydrants for 4 hours)	576,000 L*

C.7.3.It has been demonstrated that the raw feed pile has the potential of creating the worst credible fire scenario. We are of the opinion that a water flow capacity of 50 L/s is sufficient for this type of waste facility. The water for supply for the hydrants will be provided from the town main and a ring main be provided. No water storage tank is therefore proposed. For the water containment it has been considered that the tank allowing for 90 minutes water containment is appropriate. This was discussed with FRNSW at meeting on 21 May 2019 and considered acceptable based on HIPAP 2 requiring a minimum of 90 minutes storage for firefighting water supply. Based on a flow of 50 L/s the required containment water tank volume is therefore 270,000 L (90 x 60 s x 50 L/s = 270,000 L). The separation distances have been shown to be adequate to prevent fire spread in the event of all cars in the raw feed pile burning simultaneously.

Appendix D. Statement of Available Pressure and Flow

Statement of Available Pressure and Flow

Sydney WATER

Kim Stamper
9 Montebello Street
Scofields, 2762

Attention: Kim Stamper Date: 04/12/2018

Pressure & Flow Application Number: 546512
Your Pressure Inquiry Dated: 2018-10-23
Property Address: 57-69 Tattersall Rd, Kings Park 2148

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Tattersall Road	Side of Street: North
Distance & Direction from Nearest Cross Street	250 metres South from Vardys Road
Approximate Ground Level (AHD):	46 metres
Nominal Size of Water Main (DN):	300 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	121 metre head
Minimum Pressure	71 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	72
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5	73
	10	73
	15	72
	20	72
	26	72
	30	72
	40	72
	50	72
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5	71
	10	71
	15	71
	20	71
	26	70
	30	70
	40	70
	50	69
Maximum Permissible Flow	120	65

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :

swtapin@sydneywater.com.au

Sydney Water Corporation ABN 49 776 225 038
1 Smith St Parramatta 2150 | PO Box 399 Parramatta 2124 | DX 14 Sydney | T 13 20 92 | www.sydneywater.com.au
Delivering essential and sustainable water services for the benefit of the community

General Notes

This report is provided on the understanding that (i) the applicant has fully and correctly supplied the information necessary to produce and deliver the report and (ii) the following information is to be read and understood in conjunction with the results provided.

1. Under its Act and Operating Licence, Sydney Water is not required to design the water supply specifically for fire fighting. The applicant is therefore required to ensure that the actual performance of a fire fighting system, drawing water from the supply, satisfies the fire fighting requirements.

2. Due to short-term unavoidable operational incidents, such as main breaks, the regular supply and pressure may not be available all of the time.

3. To improve supply and/or water quality in the water supply system, limited areas are occasionally removed from the primary water supply zone and put onto another zone for short periods or even indefinitely. This could affect the supply pressures and flows given in this letter. This ongoing possibility of supply zone changes etc, means that the validity of this report is limited to one (1) year from the date of issue. It is the property owner's responsibility to periodically reassess the capability of the hydraulic systems of the building to determine whether they continue to meet their original design requirements.

4. Sydney Water will provide a pressure report to applicants regardless of whether there is or will be an approved connection. Apparent suitable pressures are not in any way an indication that a connection would be approved without developer funded improvements to the water supply system. These improvements are implemented under the Sydney Water 'Urban Development Process'.

5. Pumps that are to be directly connected to the water supply require approval of both the pump and the connection. Applications are to be lodged online via Sydney Water Tap in™ system - Sydney Water Website – www.sydneywater.com.au/tapin/index.htm. Where possible, on-site recycling tanks are recommended for pump testing to reduce water waste and allow higher pump test rates.

6. Periodic testing of boosted fire fighting installations is a requirement of the Australian Standards. To avoid the risk of a possible 'breach' of the Operating Licence, flows generated during testing of fire fighting installations are to be limited so that the pressure in Sydney Water's System is not reduced below 15 metres. Pumps that can cause a breach of the Operating Licence anywhere in the supply zone during testing will not be approved. This requirement should be carefully considered for installed pumps that can be tested to 150% of rated flow.

Notes on Models

1. Calibrated computer models are used to simulate maximum demand conditions experienced in each supply zone. Results have not been determined by customised field measurement and testing at the particular location of the application.

2. Regular updates of the models are conducted to account for issues such a urban consolidation, demand management or zone change.

3. Demand factors are selected to suit the type of fire-fighting installation. Factor 1 indicates pressures due to system demands as required under Australian Standards for fire hydrant installations. Factor 2 indicates pressures due to peak system demands.

4. When fire-fighting flows are included in the report, they are added to the applicable demand factor at the nominated location during a customised model run for a single fire. If adjacent properties become involved with a coincident fire, the pressures quoted may be substantially reduced.

5. Modelling of the requested fire fighting flows may indicate that local system capacity is exceeded and that negative pressures may occur in the supply system. Due to the risk of water contamination and the endangering of public health, Sydney Water reserves the right to refuse or limit the amount of flow requested in the report and, as a consequence, limit the size of connection and/or pump.

6. The pressures indicated by the modelling, at the specified location, are provided without consideration of pressure losses due to the connection method to Sydney Water's mains.

Appendix E. Meeting Minutes with FRNSW 24/01/2019

E.1.1.Meeting notes from meeting 24 January 2019 are presented below.

FRNSW

24 Jan '19

- Nathan
- Brendan
- Duke
- Darryl
- Kim
- Frank
- David.

★ Adjust site plan to indicate awning. not wall.

Emergency Resp. Plan.

Buildings B, C, D:

- Prefer all buildings w/ high fire load to have sprinklers
  Smoke hazard managmt system.
- up to certifier as to whether they would recommend
- Smoke hazard managmt.

Water supply

50L/s.

FEBQ - after approval.
↓
Fire eng to model and compile a FEBQ brief.
advise on clearance.
Advise on req. of tanks.
Em.

Monitors? - where loading is - prob. not req.
hose reels
mechanical ventilation

Stockpiles - nothing over 50 million no bigger than 50m long.
ensure access around perimeters. of piles

FRNSW makes recommendations only.

radiant heat calcs to adjoining properties
mitigation strategies

credible fire scenario

waste managmt facilities guideline.

E.1.2.Meeting notes from meeting 21 May 2019 are presented below.

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Brighton VIC 3186
@: contact@redfireengineers.com.au
W: www.redfireengineers.com.au

Offices
Victoria
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T: +61 3 9079 4143

New South Wales
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T: +61 2 8096 2220

Queensland
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35 Astor Terrace
Spring Hill QLD 4000
T: +61 7 3832 0660

Ref: 190522_JN19-00080_57 Tattersall Rd Kings Park_Minutes

MINUTES OF MEETING

Project:	Waste Facility
Address:	57 Tattersall Rd, Kings Park, NSW
Reason for meeting:	Input from FRNSW
Date:	21 May 2019 | 10:30 am
Venue:	FRNSW headquarters, Amarina Avenue, Greenacre, NSW 2190

Present:

FRNSW	Nathan Everett (NE)
FRNSW	Duke Ismael (DI)
FRNSW	Darreb Bofinger (DB)
FRNSW	Michael Hakey (MH)
FRNSW	Justin Allan (JA)
RED Fire Engineers	Carl Pettersson (CP)
RED Fire Engineers	Magdalena Angerd (MA)
Liquid hydraulics	David Wood (DW)

RED FIRE ENGINEERS PTY LTD **ABN 52 164 239 212**
FIRE SAFETY ENGINEERING www.redfireengineers.com.au
RISK MANAGEMENT

Minutes of Meeting 57 Tattersall Rd, Kings Park, NSW

Minutes:

Item	Discussion	Action
1	• CP presented an overview of the site and confirmed that this meeting was for the north-west area subject to a DA for a new shredder machine. It was noted that a state significant development application has also been developed for the whole site. Although this meeting is for the north-west area the design is to be developed to cater for the whole site and in consideration of the SSD application. • CP informed that an FEBQ is not proposed to be issued but a FEB will be issued under Fire Report (other) application. The purpose is to seek comment from FRNSW regarding the required hydrant water demand, required tank size for contaminated water and fire brigade access. The intention is to be consistent with the FRNSW Fire Safety Guideline Fire safety in waste facilities.	
2	• CP stated that a ring main for the hydrant system will be provided to the part covered by the DA application and will be designed to provide a flow of a minimum of 50 L/s. This system will be expanded to the whole site as part of the SSD. DW confirmed that compliant pressure and flows can be achieved from the water main providing 50L/s at 72 metre head. No pumpset is therefore required to achieve required pressure and flow. CP sought confirmation from FRNSW if a hydrant tank is required in addition to the town main if required pressure and flow is achieved from the town main. FRNSW (DB) confirmed that water tank is not required if pressure and flow is provided from main and design complies with AS 2419.1. CP confirmed that design will comply with AS 24191.1 and that the required water flow under AS 2419.1 based on an open yard would be less, being 40L/s.	Hydrant system to be designed with a ringmain. No water tank required if the system complies with AS 2418.1 based on the water supply from the street.
3	• CP explained that the containment tank is not proposed to be designed to accommodate 720,000 L (50L/s for 4 hours) as per the FRNSW guideline. Instead, the stockpile size will be reduced to limit the hydrant water demand. CP explained that the water demand has been estimated by interpolating the water demand based on the maximum allowed stockpile size in the FRNSW guideline and the proposed stockpile sizes for the site. MA clarified that this has been undertaken based on the surface area of the stockpile rather than volume as this results in a more conservative (higher) water demand. CP explained that the water demand for the stockpile has also been verified against International guidance and by calculating the theoretical cooling capacity of water and the energy content of the worst case fire scenario. It was acknowledged that actual water demand will be higher than the actual and the	Further justification is to provided in the report to confirm that 50 l/s flow will be sufficient.

Item	Discussion	Action
	proposed water tank capacity allowed for an 18% water efficiency (i.e. 82% of the water applied would not be cooling the fire). • FRNSW (NE) agreed that this was an appropriate approach. FRNSW (DB) questioned how the minimum required flow rate had been determined and if this was based on the worst credible fire size. MA explained that it had been assumed that the 50L/s (based on the FRNSW guideline) was a sufficient water flow especially given the significantly smaller stockpile sizes and that the required water capacity had been estimated based on the total energy content of a credible worst-case scenario assuming that the whole stockpile area was burning to a depth of 20 cm (which is estimated to be approximately the equivalent of the energy of 44 cars burning). FRNSW (DB) confirmed that further justification should be provided for that 50L/s water flow is sufficient.	
4	• FRNSW questioned how long the water supply would last. MA confirmed that this will depend on how many hydrants are used simultaneously but based on 50L/s it would last for approximately 100 minutes. NE confirmed this is considered reasonable given that HIPAP 2 requires a 90 minute water supply.	
5	• MA explained that it is not proposed to design the containment water tank for both the worst credible stockpile fire and the sprinkler system activating simultaneously. FRNSW agreed with this, however, would need to consider that some hydrant water will still be required for a building fire – i.e. one or two hydrants.	Water containment does not have to account for the worst hydrant water demand + automatic sprinkler demand. However, for the sprinkler water demand, the use of two hydrants are to be considered. Automatic sprinkler design to consider this.
6	• CP confirmed that fire brigade vehicular access will be provided to the site and dimensions will comply with FRNSW guidelines. FRNSW confirmed they have no objections to the proposed access. FRNSW (DB) questioned if hydrants will be provided along the vehicular access road. MA confirmed this is the case and that full hydrant coverage will be provided to all areas.	
7	• FRNSW requested that a shut-off valve to stop contaminated water to reach the stormwater is provided in a location such that it would not be impacted by a stockpile fire. This could be achieved by providing automated shut-off in case of fire alarm or remote shut-off or possibly the main valve in one location away from piles and	Design and location of shutoff valves are to consider fire brigade intervention.

Item	Discussion	Action
	buildings. MA pointed out that automated shut-off on fire alarm is unlikely to be suitable given the stockpile are external. FRNSW agreed.	
8	• FRNSW (DI) questioned if smoke hazard management will be provided to the buildings on site. MA confirmed that this is not proposed given that the buildings are relatively small (less than 2,000 sqm) and that there is limited storage. The building is used to disassemble cars and there is no (significant storage). MA confirmed that sprinklers are proposed (other than to office building). CP pointed out the buildings are more like sheds and are significantly open. FRNSW raised no objections to not providing smoke exhaust. This will be further addressed as part of the SSD.	
9	• CP questioned if this meeting can be referenced to approval authority to demonstrate that consultation with FRNSW has been undertaken. FRNSW confirmed that it can. • MA questioned what the current timeframe to receive comments on the FEB from FRNSW is. FRNSW confirmed that it is likely to be in the order of two months. • FRNSW questioned when FEB will be lodged for comment. MA confirmed this is likely to be the end of this week or early next week.	

The meeting concluded ~11:20 am

Minuted by Magdalena Angerd, magdalena@redfireengineers.com.au

From: Nathan Everett <Nathan.Everett@fire.nsw.gov.au>
Sent: Thursday, 23 May 2019 3:23 PM
To: Carl Pettersson <carl@redfireengineers.com.au>
Cc: Duke Ismael <Duke.Ismael@fire.nsw.gov.au>; Michael Henly <Michael.Henly@fire.nsw.gov.au>; david@liquidh.com.au; Magdalena Angerd <magdalena@redfireengineers.com.au>; Kim Stamper <Kim@brs.com.au>; Geoff Davis <geoff@northerngroup.com.au>; Darren Bofinger <Darren.Bofinger@fire.nsw.gov.au>; Justin Allan <Justin.Allan@fire.nsw.gov.au>
Subject: RE: FRNSW meeting - Kings Park Metal Recycling | JN19-00080

Dear Carl,

Thank you for preparing the minutes for Tuesdays meeting. Following a review, FRNSW offer the following comments.

- Item 4 – This was in relation to containment of contaminated fire water, not firefighting water supply. It is understood that at 50L/s approximately 100 minutes of containment would be provided, which FRNSW have provided in-principle support for. It should be noted that HIPAP 2 requires a minimum 90 minute storage for firefighting water supply (in the case for the Facility storage may not be required, however this is to be confirmed subject to 50L/s being adequate for the worst credible fire scenario) but is less prescriptive in containment of firefighting water (refer to HIPAP 2, section 2.8).
- Item 5 – FRNSW recommend that an assessment be undertaken of a worst credible fire scenario to determine total firefighting water demand (sprinklers + hydrants).
- Item 8 – FRNSW would require suitable evidence that compliance is achieved with the performance requirements within Part E2 of the NCC relating to provisions for smoke hazard management.

Please do not hesitate to contact me should you have any queries regarding the above.

Regards,
Nathan

Appendix F. Automatic Sprinkler Systems

F.1. Provisions of the Automatic Sprinkler Systems

F.1.1. In buildings provided with an automatic sprinkler system it is expected that in the event of a fire the sprinkler system will control if not suppress the fire (Buchanan, 2001).

F.1.2. This rationale is supported by research conducted by CIBSE (CIBSE, 1995) and others (England, 2000) which show that upper layer temperatures are not likely to exceed 100 °C during a sprinkler suppressed fire and 200 °C for a shielded fire respectively.

F.1.3. Marryatt (Marryatt, 1988)) provides statistics on buildings fitted with automatic fire sprinkler systems between the years 1886-1986 in Australia and New Zealand. Based on Marryatt's work, the reliability of successful sprinkler control is estimated to be approximately 99.5 %. Marryatt reports that of these 9 022 fires in buildings fitted with automatic sprinkler systems only eleven deaths occurred – an average of just over one fatality every nine years.

F.1.4. The National Fire Protection Association (NFPA) also provides statistics on buildings fitted with automatic fire sprinkler systems between the years 2003-2007 in United States (Hall, 2010). When sprinklers are present in the fire area, they operate in 93 % of all reported structure fires large enough to activate sprinklers, excluding buildings under construction. When these sprinklers operated, they were effective 97 % of the time, resulting in a combined successful performance rate of 91 %.

F.1.5. Furthermore, the NFPA study also indicates that automatic sprinkler systems provide additional life safety, as well as an effective control against smoke production; by limiting fire size and potentially suppressing the fire, the volume of smoke produced is also limited.