

DECISION NOTICE - APPROVAL

Given under Section 282 of the Planning Act 2016 for a Decision Notice (Approval) under Section 63(2) of the Planning Act 2016

Approval Number:	030 035.2024.836.001
File References:	A12651, LG7.6.1 and LG7.9.1 DMB:ALO
Council Contact:	Dominic Bradley PLANNING OFFICER DEVELOPMENT ASSESSMENT
Officer's Contact Details:	Ph: (07) 4679 4331 Email: dominic.bradley@wdrc.qld.gov.au
Date of Decision Notice:	March 2025
Applicant's Name:	Queensland BESS Pty Ltd
Applicant's Postal Address:	C/- GHD Pty Ltd GPO Box 668 Brisbane Qld 4001
Applicant's Email Address:	Laura Shobbrook
Applicant's Reference No:	12646897

Dear Madam

RE: DEVELOPMENT APPLICATION FOR MATERIAL CHANGE OF USE TO ESTABLISH A MAJOR ELECTRICITY INFRASTRUCTURE (BATTERY ENERGY STORAGE SYSTEM) AND RECONFIGURING A LOT (ACCESS EASEMENT TO A FORMED ROAD) ON LAND DESCRIBED AS LOT 1 ON RP117442 AND LOT 32 ON SP232241 AND SITUATED AT 16 MILE HALL ROAD AND 106 FREES ROAD HOPELAND

I advise that on 26 February 2025, it was decided to issue a Development Permit for the above Development Application. This application was approved in full with conditions (refer to the conditions attached).

1. Further Permit

The following Permit is required to be obtained before the development can be carried out:

- f Development Permit for Operational Work
- f Development Permit for Building Work; and
- f Compliance Permit for Plumbing Work.

2. Approved Plans and Documents

The following Approved Plans and Documents for this development approval are attached:

MATERIAL CHANGE OF USE

Plan No./ Document Reference	Title and Details	Dated
12646897-GHD-00-00-DRG-CV-0001, Rev PO3	Locality Plan - General Arrangement and Road Typical Section, prepared by GHD	18.11.24
12646897-GHD-00-00-DRG-EL-0001, Rev P02	275/33kV Substation and BESS Overall Site GA, prepared by GHD	10.10.24
12646897-Rep_AGL Queensland Battery_SWMP, Rev 1	Preliminary Stormwater Management Plan, prepared by GHD	12.12.24
12646897-Rep_AGL Queensland Battery_Hazard and Risk Report_Rev 1	Queensland Battery Hazard and Risk Report, prepared by GHD	16/12/24
7-36-12_RP_BMP_Queensland BESS 1_v2.1	Bushfire Hazard Assessment and Management Plan, prepared by Ecosystems Management	5/12/2024

RECONFIGURING A LOT

Plan No., Revision	Title and Details	Dated
Sheet 1 of 2	Plan of Easement A in Lot 32 on SP232241, prepared by Collett Survey Holdings Pty Ltd	8-11-2024
12646897-GHD-00-00-DRG-CV-0001, Rev PO3	Locality Plan - General Arrangement and Road Typical Section, prepared by GHD	18.11.24

3. Currency Period for the Approval (Section 85)

This development approval will lapse at the end of the period set out in Section 85 of the Planning Act 2016:

f For Material Change of Use -

This approval lapses if the first change of use does not happen within six (6) years of the date of this Notice.

f For Reconfiguring a Lot -

This approval lapses if the plan for the reconfiguration is not given to Council within four (4) years of the date of this Notice.

4. Appeal Rights

The rights of an applicant to appeal to a tribunal or the Planning and Environment Court against a decision about a development application are set out in Chapter 6, Part 1 of the Planning Act 2016. For particular applications, there may also be a right to make an application for a declaration by a tribunal (refer Chapter 6, Part 2 of the Planning Act 2016).

The Appeal Rights are attached to this Decision Notice.

Should you have any queries in regard to this matter, please contact Council's Planning Officer Development Assessment, Dominic Bradley via email dominic.bradley@wdrc.qld.gov.au or telephone (07) 4679 4331.

Yours faithfully

Bridget Moodley
PRINCIPAL PLANNER

Encls

SCHEDULE OF CONDITIONS

MATERIAL CHANGE OF USE

APPROVED PLANS AND DOCUMENTS

1. The development shall be carried out generally in accordance with the Approved Plans and Documents listed below, subject to and modified by the conditions of this approval:

Plan No./ Document Reference	Title and Details	Dated
12646897-GHD-00-00-DRG-CV-0001, Rev PO3	Locality Plan - General Arrangement and Road Typical Section, prepared by GHD	18.11.24
12646897-GHD-00-00-DRG-EL-0001, Rev P02	275/33kV Substation and BESS Overall Site GA, prepared by GHD	10.10.24
12646897-Rep_AGL Queensland Battery_SWMP, Rev 1	Preliminary Stormwater Management Plan, prepared by GHD	12.12.24
12646897-Rep_AGL Queensland Battery_Hazard and Risk Report_Rev 1	Queensland Battery Hazard and Risk Report, prepared by GHD	16/12/24
7-36-12_RP_BMP_Queensland BESS 1_v2.1	Bushfire Hazard Assessment and Management Plan, prepared by Ecosystems Management	5/12/2024

2. Where there is any conflict between the conditions of this development approval and the details shown on the Approved Plans and Documents, the conditions of this development approval must prevail.
3. The Approved Plans are to be amended in accordance with the conditions of this approval and as outlined below:
 - 3.1 Provide details of all proposed buildings and structures to be retained on-site for the life of the project. Building Floor Plans and Elevations must also be provided.

Note: Infrastructure charges will be levied for the gross floor area of all administration and control buildings including storage sheds and site offices. Once detailed plans are provided, an Infrastructure Charges Notice will be issued by Council.
 - 3.2 Update the Site Plan to illustrate the location of all proposed buildings and structures on the property.
4. The following further Development Permits must be obtained prior to commencement of any work associated with the process:
 - 4.1 Building Works
 - 4.2 Operational Work
 - 4.3 Plumbing Works

APPROVED DEVELOPMENT

5. The approved development is a Material Change of Use for Major Electricity Infrastructure (Battery Energy Storage System) as illustrated by the Approved Plans and Documents.

TERM OF APPROVAL

6. The use of the land for the purpose of Major Electricity Infrastructure (Battery Energy Storage System) is approved for a period of thirty (30) years only, from commencement of the use.

COMPLIANCE, TIMING AND COSTS

7. All conditions of the approval shall be complied with prior to commencement of the use and whilst the use continues, unless otherwise noted within these conditions.
8. All costs associated with compliance with these conditions shall be the responsibility of the developer unless otherwise noted.

MAINTENANCE

9. The development (including parking, driveways and other external spaces) shall be maintained in accordance with the Approved Plans and Documents, subject to and modified by any conditions of this approval.

FEES AND CHARGES

10. All fees, rates, interest and other charges levied on the property, shall be paid in full, in accordance with the rate at the time of payment.

LANDSCAPING – MISCELLANEOUS

11. The land owner must ensure compliance with the requirements of the Land Protection (Pest and Stock Route Management) Act 2002 and any subsequent legislation.
12. Apart from declared weeds and pests, trees, shrubs and landscaped areas currently existing on the subject land must be retained where possible, and action taken to minimise disturbance during construction work.
13. Landscaped areas must be maintained and the site must remain in a clean and tidy state at all times.

REHABILITATION AND EXIT PLAN

14. One (1) year prior to decommissioning, the Operator must submit to Council for endorsement, a Rehabilitation and Exit Plan prepared by a suitably qualified person that, at a minimum:
 - 14.1 demonstrates that the site will be restored to a standard capable of the level of productivity that was available prior to the Material Change of Use upon decommissioning of the Battery Energy Storage System;
 - 14.2 identifies possible land use (eg grazing, cropping) following cessation of the approved use;
 - 14.3 clearly establishes the objectives of the Plan;
 - 14.4 adopted performance criteria for rehabilitation efforts;
 - 14.5 includes an Action Plan, with timing for remedial work such as structure removal, removal of imported materials such as gravel, any soil erosion, drainage, and vegetation cover work, along with weed and pest animal control activities required to meet the adopted rehabilitation performance criteria; and
 - 14.6 outlines a program for monitoring rehabilitation success using appropriate indicators.
15. Post-operational rehabilitation of the site is to be carried out generally in accordance with the strategies identified in the Approved Rehabilitation and Exit Plan.
16. Rehabilitation work must commence immediately upon cessation of the approved use and be carried out in accordance with the endorsed Rehabilitation and Exit Plan for the length of time included in the Action Plan.

ACOUSTIC AMENITY - NOISE LIMITS

17. Noise from activity associated with the use of the site must not exceed the Acoustic Quality Objectives listed in the Environmental Protection (Noise) Policy 2019 when measured at any sensitive place or commercial place.

ACOUSTIC AMENITY - MECHANICAL PLANT

18. All regulated devices as defined by the Environmental Protection Act 1994 must be installed, operated and maintained to comply with the noise limits as specified within the Environmental Protection Act 1994.

AIR QUALITY AND AMENITY - AIR RELEASE LIMITS

19. Odours or airborne contaminants which are noxious or offensive to public amenity or safety, likely to cause environmental harm or environmental nuisance, or exceed the Air Quality Objectives listed in the Environmental Protection Policy (Air) 2019 as measured at any sensitive place or commercial place, must not be released into the atmosphere.

OUTDOOR LIGHTING IMPACT MITIGATION

20. Outdoor lighting associated with the use must be designed, sited, installed and tested to comply with Tables 2.1 and 2.2 of Australian Standard 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting Using a Control Level of 1.

VISUAL AND GENERAL AMENITY

21. Any graffiti on the buildings or structures must be immediately removed.
22. The buildings and the site must be maintained in a clean and tidy manner at all times.
23. The external finishes of the buildings on-site shall comprise neutral, low reflective colours consistent with the surrounding environment.

FENCING

24. Fencing shall be erected as indicated on the Approved Plans.
25. Fencing installed around the boundary of the development footprint must be maintained in a good state of repair.

WASTE MANAGEMENT

26. All waste generated from construction of the development must be effectively controlled on-site before disposal. All waste must be disposed of in accordance with the Environmental Protection (Waste Management) Regulation 2000.
27. All waste generated on-site must be managed in accordance with the waste management hierarchy as detailed in the Waste Reduction and Recycling Act 2011.

OPERATING HOURS - DURING CONSTRUCTION

28. Construction work shall occur only between the hours of 6:00am and 6:00pm Monday to Sunday.

FIRE HAZARD AND RISK MANAGEMENT

29. The developer and Operator of the development are to implement the strategies and recommendations as outlined in the Approved Queensland Battery Hazard and Risk Report prepared by GHD for the construction and operation of the development.
30. The developer and Operator of the development are to implement the bushfire strategies and recommendations outlined in the Approved Bushfire Assessment and Management Plan, prepared by Ecosystems Management for the construction and operation of the development.

FIRE FIGHTING REQUIREMENTS

31. Fire fighting equipment and materials for electrical and electronic equipment fires must be installed at appropriate locations.
32. The applicant shall maintain a perimeter fire break around the development footprint of the approved development.
33. Ensure the Emergency Access to the development remains unobstructed for emergency vehicles at all times.

ENGINEERING WORKS

34. Submit to Council, an Operational Work application for all work that will become Council infrastructure, and for earthworks.
35. Complete all works approved and works required by conditions of this development approval and/or any related approvals at no cost to Council, prior to commencement of the approved use, unless stated otherwise.
36. Undertake Engineering designs and construction in accordance with Council's Planning Scheme, Development Manual and Standard Drawings, and relevant Australian Standards.
37. Be responsible for the full cost of any alterations necessary, to easements and/or other public utility installations in connection with the development.

LOCATION, PROTECTION AND REPAIR OF DAMAGE TO COUNCIL AND PUBLIC UTILITY SERVICES INFRASTRUCTURE AND ASSETS

38. Be responsible for the location and protection of any Council and public utility services infrastructure and assets that may be impacted during construction of the development.
39. Repair all damage incurred to Council and public utility services infrastructure and assets, as a result of the proposed development immediately should hazards exist for public health and safety or vehicular safety. Otherwise, repair all damage immediately upon completion of work associated with the development.

STORMWATER MANAGEMENT

40. Provide stormwater management generally in accordance with the Approved Preliminary Stormwater Management Report, prepared by GHD dated 12 December 2024.
41. Discharge any surface water collected from the proposed battery storage development in a northerly direction, to maintain the behaviour of the existing overland flow paths.
42. Ensure that adjoining properties and roadways are protected from ponding due to any site works undertaken.
43. Do not construct any temporary laydown or storage areas such that these areas would obstruct any major stormwater flow paths.
44. Divert upstream clean stormwater run-off around the temporary laydown and storage areas.

WATER SUPPLY

45. Provide a potable water supply for the use of staff and visitors.

ON-SITE WASTEWATER DISPOSAL

46. Prior to commencement of Stage 1, connect the staff amenities to an on-site wastewater disposal system, in accordance with AS1547 Onsite Domestic Wastewater Management and the Queensland Plumbing and Wastewater Code.
47. Obtain a Development Permit for Plumbing Work for the on-site sewerage treatment system.

PARKING AND ACCESS - GENERAL

48. Design and construct a vehicle turnout to 16 Mile Hall Road from Lot 32 on SP232241 as shown on the Approved Plans generally in accordance with Council's Standard Drawing No. R-004, between the property boundary and the edge of the 16 Mile Hall Road road pavement. Ensure that crossover splays are designed to accommodate left only turning movements of a B-double vehicle.
49. Design and construct an emergency access vehicle turnout to Lot 1 on RP117442 as shown on the Approved Plans generally in accordance with Council's Standard Drawing No. R-004.

50. Provide adequate on-site parking for all vehicles including staff, deliveries and visitors. All vehicle parking shall be internal to the development.
51. Provide signage that indicates the locations of parking and flow of traffic through the site.
52. Ensure loading and unloading operations are conducted wholly within the site.

TRANSPORT ROUTE AND VEHICLE ACCESS

53. The approved transport route to/from the site shall be from the nominated access point to the site along 16 Mile Hall Road directly to Kogan-Condamine Road and vice versa. The transport route shall be upgraded per the Road Upgrades requirements below.

ROAD UPGRADES

54. Prior to commencement of construction of the BESS, construct 16 Mile Hall Road, from Kogan-Condamine Road to the site access, to provide an all-weather 7 metre wide gravelled pavement on an 8 metre formation (Rural Access 2) for a Rural Access Non-bitumen Road, with a minimum gravel depth of 125mm, generally in accordance with Council's Standard Drawing R-002, Rev F.

Comment: There are currently multiple developments occurring that require the use of the 16 Mile Hall Road transport route. It is recommended that the applicant communicate with the other nearby developments in relation to maintaining a suitable road standard at all times.

55. Prior to commencement of construction, a road geometry design in accordance with Austroads' and the Department of Transport and Main Roads' Road Planning and Design Manual is to be submitted to Council for endorsement, to ensure the safety of traffic expected on 16 Mile Hall Road, and certified by a suitably qualified Registered Professional Engineer Queensland (RPEQ).
56. During the construction phase, sufficient signage shall be installed and maintained, advising road users of the increased traffic (both light and heavy vehicles).
57. Provide a roadworks maintenance bond/bank guarantee of \$200,000.00 to Western Downs Regional Council to be used by Western Downs Regional Council for any road maintenance, upgrade or road damage repair required as a result of traffic generated by the development on 16 Mile Hall Road.
58. If, during and upon completion of the construction phase of the BESS Facility, another development is proposed or approved that requires heavy vehicle usage of 16 Mile Hall Road between the Kogan-Condamine Road intersection and the furthest access point to the Battery Storage Facility, discussions are to be conducted with the third party regarding road maintenance repairs.
59. Upon completion of construction of the Battery Storage Facility or for any period where construction between stages is paused for more than three calendar months, the approved transport route shall be left in the condition as required by Condition 54, unless otherwise agreed by Council's Planning and Environment Manager or an authorised delegate.
60. The applicant is responsible for the carrying out of, and cost of maintenance, including dust suppression of unsealed sections of approved transport routes for the duration of the construction phase of the Battery Storage Facility.
61. In the event that road maintenance work is not carried out in a timely manner, Council reserves the right to use part or all of the bond money to carry out the necessary maintenance work.
62. All road maintenance work must be conducted with prior approval from Council.

ELECTRICITY

63. Connect the development to electricity services.

EARTHWORKS - GENERAL

64. Undertake any earthworks in accordance with the provisions of AS3798 Guidelines on Earthworks for Commercial and Residential Developments.

EROSION AND SEDIMENT CONTROL - GENERAL

65. Ensure that all reasonable action is taken to prevent sediment or sediment laden water from being transported to adjoining properties, roads and/or stormwater drainage systems.

ENVIRONMENTAL HEALTH

66. Undertake operations and construction work associated with this development to the requirements of Council, including the following:
 - 66.1 do not cause nuisance to adjoining residents by the way of smoke, dust, stormwater discharge or siltation of drains, at any time, including non-working hours; and
 - 66.2 remove immediately, any material spilled or carried onto existing roads to avoid dust nuisance and to ensure traffic safety.

Timing: During the construction and on-maintenance period and the establishment period of the landscaping or areas disturbed during construction.

RECONFIGURING A LOT

APPROVED PLANS

1. The development shall be carried out generally in accordance with the Approved Plan listed below, subject to and modified by the conditions of this approval:

Plan No., Revision	Title and Details	Dated
Sheet 1 of 2	Plan of Easement A in Lot 32 on SP232241, prepared by Collett Survey Holdings Pty Ltd	8-11-2024
12646897-GHD-00-00-DRG-CV-0001, Rev PO3	Locality Plan - General Arrangement and Road Typical Section, prepared by GHD	18.11.24

2. Where there is any conflict between the conditions of this development approval and the details shown on the Approved Plans, the conditions of this development approval must prevail.

APPROVED DEVELOPMENT

3. The approved development is Reconfiguring a Lot (Access Easement to a Formed Road) as shown on the Approved Plans.

COMPLIANCE, TIMING AND COSTS

4. All conditions of the approval shall be complied with before Council's endorsement of the Plan of Survey (Form 18B), unless otherwise noted within these conditions.
5. All costs associated with compliance with these conditions shall be the responsibility of the developer unless otherwise noted.
6. The Plan of Survey (Form 18B) shall not be executed until a letter of compliance is received demonstrating the development's compliance with all conditions of this approval.

MAINTENANCE

7. The development shall be maintained in accordance with the Approved Plans, subject to and modified by any conditions of this approval.

LOT NUMBERING

8. The numbering of all approved lots shall remain as indicated on the Approved Plans (unless otherwise amended/approved by Council).

FEES AND CHARGES

9. All fees, rates, interest and other charges levied on the property, shall be paid in full, in accordance with the rate at the time of payment.

ENGINEERING WORKS

10. Complete all works approved and works required by conditions of this development approval and/or any related approvals at no cost to Council, prior to Council's endorsement of the Survey Plan (Form 18B) unless stated otherwise.
11. Undertake Engineering designs and construction in accordance with Council's Planning Scheme, Development Manual and Standard Drawings, relevant Australian Standards, Codes of Practice, and relevant design manuals.
12. Be responsible for any alteration necessary, to easements and/or other public utility installations resulting from the development or from road and drainage works required in connection with the development.

LOCATION, PROTECTION AND REPAIR OF DAMAGE TO COUNCIL AND PUBLIC UTILITY SERVICES INFRASTRUCTURE AND ASSETS

13. Be responsible for the location and protection of any Council and public utility services infrastructure and assets that may be impacted during construction of the development.
14. Repair all damage incurred to Council and public utility services infrastructure and assets, as a result of the proposed development immediately should hazards exist for public health and safety or vehicular safety. Otherwise, repair all damage immediately upon completion of works associated with the development.

STORMWATER MANAGEMENT

15. Provide overland flow paths that do not adversely alter the characteristics of existing overland flows on other properties or that create an increase in flood damage on other properties.
16. Discharge all minor storm flows that fall or pass onto the site to the lawful point of discharge in accordance with the Queensland Urban Drainage Manual (QUDM).

ADVISORY NOTES

NOTE 1 - Currency Periods

"A part of a development approval lapses at the end of the following periods (the currency periods)—

- (a) for any part of the development approval relating to a Material Change of Use —if the first change of use does not happen within—
 - (i) the period stated for that part of the approval; or
 - (ii) if no period is stated—6 years after the approval starts to have effect.
- (b) for any part of the development approval relating to Reconfiguring a Lot - if a plan for the reconfiguration that, under the Land Title Act, is required to be given to a Local Government for approval is not given to the Local Government within-
 - (i) the period stated for that part of the approval; or
 - (ii) if no period is stated - 4 years after the approval starts to have effect."

NOTE 2 - Aboriginal Cultural Heritage

It is advised that under Section 23 of the Aboriginal Cultural Heritage Act 2003, a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage (the "cultural heritage duty of care"). Maximum penalties for breaching the duty of care are listed in the Aboriginal cultural heritage legislation. The information on Aboriginal cultural heritage is available on the Department of Aboriginal and Torres Strait Islander and Partnerships' website www.datsip.qld.gov.au.

NOTE 3 - General Environmental Duty

General environmental duty under the Environmental Protection Act 1994 prohibits unlawful environmental nuisance caused by noise, aerosols, particles, dust, ash, fumes, light, odour or smoke beyond the boundaries of the development site during all stages of the development including earthworks, construction and operation.

NOTE 4 - General Safety of Public During Construction

The Work Health and Safety Act 2011 and Manual of Uniform Traffic Control Devices must be complied with in carrying out any construction works, and to ensure safe traffic control and safe public access in respect of works being constructed on a road.

NOTE 5 - Property Note (Audit of Conditions)

An inspection of the property to ascertain compliance with conditions will be undertaken twelve (12) months after the approval takes effect. If the works are completed prior to this time, please contact Council for an earlier inspection. A property note to this effect will be placed on Council's records.

NOTE 6 - Duty to Notify of Environmental Harm

If a person becomes aware that serious or material environmental harm is caused or threatened by an activity or an associated activity, that person has a duty to notify Western Downs Regional Council.

A P P E A L R I G H T S

An applicant may elect to appeal against Council's decision in accordance with the relevant Section of the Planning Act 2016, which states:

"Chapter 6 Dispute Resolution

Part 1 Appeal Rights

229 Appeals to Tribunal or P&E Court

(1) Schedule 1 states -

(a) matters that may be appealed to -

- (i) either a tribunal or the P&E Court; or
- (ii) only a tribunal; or
- (iii) only the P&E Court; and

(b) the person -

- (i) who may appeal a matter (the appellant); and
- (ii) who is a respondent in an appeal of the matter; and
- (iii) who is a co-respondent in an appeal of the matter; and
- (iv) who may elect to be a co-respondent in an appeal of the matter.

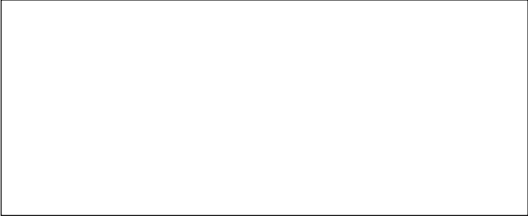
(2) An appellant may start an appeal within the appeal period.

(3) The appeal period is -

- (a) for an appeal by a building advisory agency - 10 business days after a Decision Notice for the decision is given to the Agency; or
- (b) for an appeal against a deemed refusal - at any time after the deemed refusal happens; or

- (c) for an appeal against a decision of the Minister, under Chapter 7, Part 4, to register premises or to renew the registration of premises - 20 business days after a Notice is published under Section 269(3)(a) or (4); or
- (d) for an appeal against an Infrastructure Charges Notice - 20 business days after the Infrastructure Charges Notice is given to the person; or
- (e) for an appeal about a deemed approval of a development application for which a Decision Notice has not been given - 30 business days after the applicant gives the Deemed Approval Notice to the Assessment Manager; or...
- ...(g) for any other appeal - 20 business days after a Notice of the decision for the matter, including an Enforcement Notice, is given to the person.

Note - See the P&E Court Act for the Court's power to extend the appeal period."



Queensland Battery

Preliminary Stormwater Management Plan

Queensland BESS Pty Ltd

December 16, 2024

The Power of Commitment

Project name		AGL Queensland Battery					
Document title		Queensland Battery Preliminary Stormwater Management Plan					
Project number		12646897					
File name		12646897-REP_AGL Queensland Battery_SWMP					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	Hugo 2 ¶ % U L H	A. Priory	DRAFT	A. Douglas	DRAFT	11.11.24
S4	0	+ X J R 2 ¶ % U	A. Priory	A.P	A. Douglas		21.11.24
S4	1	+ X J R 2 ¶ % U	A. Priory	A.P	A. Douglas		12.12.24

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Abbreviations and acronyms

Acronym Definition	Acronym Definition
GHD	GHD Pty Ltd
AGL	AGL Power Generation (Wind) Pty Ltd
AHD	Australian Height Datum
BESS	Battery Energy Storage System
CEMP	Construction Environmental Management Plan
IECA	Internal Erosion Control Association
MCU	Material Change of Use
MUSIC	Software determining potential site runoff
NEM	National Electricity Market
PET	Potential Evapotranspiration
QUDM	Queensland Urban Drainage Model
SMWP	Stormwater Management Plan
SPP	State Planning Policy
SQID	Stormwater Quantity Improvement Device
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
WDRC	Western Downs Regional Council
WQO	Water Quality Objectives

Terminology

Term	Definition
Proposed development / The Project	The proposed development/Project is for a BESS (Battery Energy Storage System) (Project W L W @ C o n s a n d B a t t e r y # R Q / R W 5 3 Z L W K W K H D F F H V V G I southern portion of Lot 32 SP232241
Project area	The Project area encompasses the entire area associated with the Project footprint, which includes all of Lot 1 on RP117442 and part of Lot 32 on SP232241. This also covers the section of 16 Mile Hall Road from the southwestern corner of Lot 1 RP117442 to the access driveway location.
Project footprint	The Project footprint represents the areas subject to direct disturbance for the proposed BESS and includes the extent of proposed access works within the Project area.
BESS footprint	The BESS footprint represents the areas subject to direct disturbance for the proposed BESS.

1. Introduction

GHD Pty Ltd (GHD) has been engaged by Queensland BESS Pty Ltd, a wholly owned subsidiary of AGL Power Generation (Wind) Pty Ltd (AGL) for environmental, engineering and planning services associated with the proposed development of the Queensland Battery Energy Storage System (BESS) 1 (the Project) at 16 Mile Hall Road, Hopeland. The Project area encompasses Lot 1 on RP117442 and part of Lot 32 SP232241 and is located within the Western Downs Regional Council (WDRC) local government area.

The Project is expected to result in initial capacities of 500MW/2000MWh of storage and is anticipated to be deployed across the National Electricity Market (NEM), initially with high capacity - lower duration systems. The BESS includes infrastructure related to:

- ± The BESS substation and on-site infrastructure
- ± Access driveway from Project area entrance to the BESS.

1.1 Purpose of this report

GHD has been commissioned to prepare a preliminary Stormwater Management Plan (SWMP) for the proposed Queensland Battery Project area. A preliminary SWMP for the BESS footprint is part of the technical studies UHTXLUG WR Water & Catchment Use (MCU) Development Application (DA). This SWMP is generally in accordance with the Western Downs Planning Scheme 2017, Queensland Urban Drainage Manual (QUDM) (2016), and Project-specific objectives.

1.2 Scope and limitations

1.2.1 Scope of work

The scope of work for the SWMP includes the following:

- ± Review potential surface water, stormwater, and groundwater receptors relative to the Project area to inform potential impacts to water quality, erosion, and sedimentation during the construction and operational phase of the BESS and measures to avoid and/or mitigate impacts to water quality.
- ± Development of a runoff quality model using MUSIC software to determine the potential BESS footprint runoff pollution, and to investigate and quantify a runoff treatment train to mitigate pollutants to comply with runoff pollutant reduction targets nominated by the Planning Scheme requirements.
- ± Preparation of a preliminary SWMP:
 - x Describe the measures to convey and transfer stormwater runoff within the Project area, minimise flooding and prevent adverse impacts on the downstream environment
 - x Consider any requirements known to have been nominated by Council
 - x Outline measures to improve water quality of the BESS footprint runoff
 - x Analysis of stormwater runoff quantity and quality using outputs from MUSIC modelling, including recommendations for stormwater re-use
 - x Provision of an indicative stormwater layout.

1.2.2 Limitations

This report: has been prepared by GHD for Queensland BESS Pty Ltd and may only be used and relied on by Queensland BESS Pty Ltd for the purpose agreed between GHD and Queensland BESS Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Queensland BESS Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

* + ' KDV SUHSDUHG WKH 086, & PRGHO 30RGHO' IRU Queensland BESS Pty Ltd to support this stormwater management plan and must not be used for any other purpose or by any other person

The Model is a representation only and does not reflect reality in every aspect. The Model contains simplified assumptions to derive a modelled outcome. The actual variables will inevitably be different to those used to prepare the Model. Accordingly, the outputs of the Model cannot be relied upon to represent actual conditions without due consideration of the inherent and H[SHFWHG LQDFFXUDFLHV 6XFK FRQVLGHUDWLRQV DUH EH\RQG *+'¶V VFRSH 7KH LQIRUPDWLRQ GDWD DQG DVVXPSWLRQV 3,QSXWV' XVHG DV LQSDXWLRQV LQWR V by or on behalf of the Queensland BESS Pty Ltd, (including possibly through stakeholder engagements). GHD has not LQGHSHQGHQWO\ YHULILHG RU FKHFNHG ,QSXWV EH\RQG LWV DJUHHG VFRSH RI Z update of the Model as further Inputs becomes available.

The Model is limited by the mathematical rules and assumptions that are set out in the Report or included in the Model and by the software environment in which the Model is developed.

The Model is a customised model and not intended to be amended in any form or extracted to other software for amending. Any change made to the Model, other than by GHD, is undertaken on the express understanding that GHD is not responsible, and has no liability, for the changed Model including any outputs.

GHD has prepared this report on the basis of information provided by Queensland BESS Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Assumptions

This preliminary SWMP is to be conceptual only. Sizing of stormwater infrastructure is to be confirmed during future detailed design stages.

No hydraulic or stormwater quantity assessment has been prepared as part of this SWMP as the objective of this SWMP is to address the stormwater management and quality provisions of the Planning Scheme. A detailed flood assessment is currently being prepared separately to this study by GHD (2024) as part of the hydraulic assessment of the Project area which assesses the potential flood impacts of the proposed development.

1.4 Design criteria

The following design criteria has been adopted for the SWMP:

- ± The proposed Project area is zoned rural. There are specific design requirements for water quality, erosion and sediment control (Total Suspended Solids (TSS) value) during operational and construction phases under the WDRC Planning scheme Amendment 1, 2017, rural zone code - Table 6.2.10.2 - Construction

Phase - Stormwater Management Design Objectives. These design objectives of the rural zone stormwater requirements include:

- x Minimising exposure of disturbed soils at any time
- x Diverting water run-off from undisturbed areas around disturbed areas
- x Determining the erosion risk rating using local rainfall erosivity, rainfall depth, soil loss rate or other acceptable methods
- x Implementing erosion control methods corresponding to identified erosion risk rating
- x Avoiding wind-blown litter; remove gross pollutants
- x Ensuring there is no visible oil or grease sheen on released waters
- x Disposing of waste containing contaminants at authorised facilities.

2. Site description

2.1 Existing Project area

The Project area consists of 316 hectares and encompasses the entire area associated with the Project footprint, which includes all of Lot 1 on RP117442, the southern part of Lot 32 on SP232241 and the section of 16 Mile Hall Road from the southwestern corner of Lot 1 RP117442 to the access driveway location. The Project area is approximately 20 km south-east of Chinchilla and 60 km north-west of Dalby.

There is currently no infrastructure within the Project area or surrounding land, which is dominated by rural grazing areas, natural vegetation, and few small farm dams. Access to the Project area is via an unsealed gravel road.

There are no major creeks or rivers nearby or impacting the Project area. Minor overland flow paths are located south of the Project area which drain flows into 16 Mile Creek, located approximately 2 km west and 7 km south of the Project area. The Project area drains from west to east with an elevation ranging from 322.5 m Australian Height Datum (AHD) to 321.3 m AHD. The existing Project area and neighbouring locality are illustrated in Figure 1.

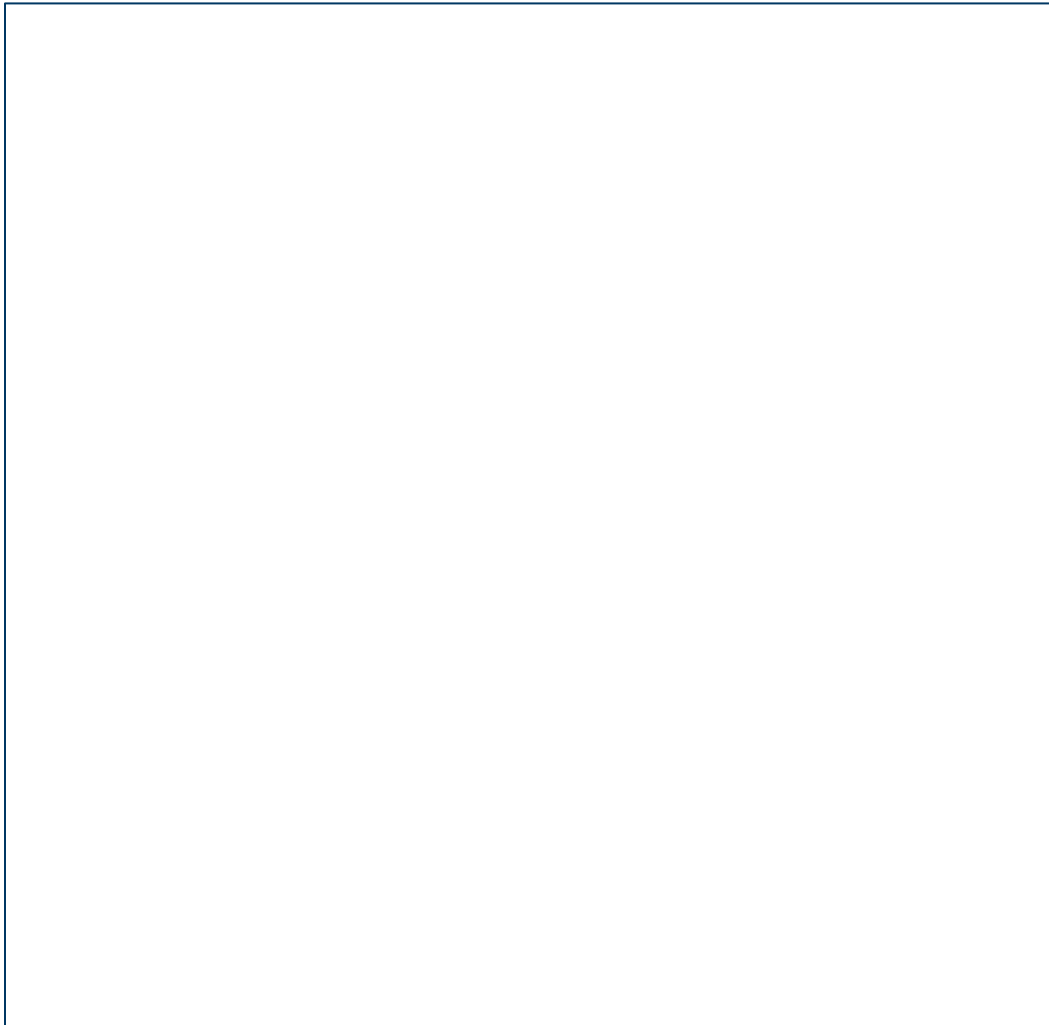


Figure 1 Existing Project area

2.2 Proposed Project area

The proposed development includes the following infrastructure:

- ± BESS and on-site infrastructure
- ± Sealed access road from the Project area entrance to the BESS area
- ± Paved access roads within the BESS footprint.

A bio-retention basin is proposed as part of this SWMP to reduce the exportation of pollutants via stormwater from the Project area. For this assessment, the bio-retention basin has been located in the south-western corner of the BESS development area (selected as this is the low point of the grading for the proposed site). The characteristics of the basin are detailed in Section 3.3.2.5 of this report.

The proposed Project area layout is illustrated in Figure 2. Detailed concept design plans are provided in Appendix A.

3. Stormwater quality

3.1 Construction phase

3.1.1 Pollutant export

Typical pollutants exported from construction sites are noted in Table 1:

Table 1 Pollutant generation parameters

Pollutant	Sources
Litter	Paper, construction packaging, food packaging, cement bags, off-cuts
Sediment	Unprotected exposed soils and stockpiles during earthworks and building
Hydrocarbons	Fuel and oil spills, leaks from construction equipment
Toxic Materials	Cement slurry, asphalt prime, solvents, cleaning agents, brine, wash waters
pH altering substances	Cement slurry and washwaters

3.1.2 Erosion and sediment control

During construction, the construction contractor will be responsible for developing, implementing and maintaining erosion and sediment control measures and environmental management measures to prevent adverse impacts on the surrounding environment. During the detailed design phase, an erosion and sediment control plan will be submitted as part of an operational works application.

The erosion and sediment controls should be outlined in the Construction Environmental Management Plan (CEMP). Noting that controls may alter to suit the phasing of the construction work. The following measures shall be undertaken to mitigate water quality impacts during construction:

- ± Temporary sediment fences erected at the base of all stockpiles to prevent sediment transportation off-site
- ± Check dams placed in swales to improve sediment capture and reduce the risk of sediment transport into the downstream waterway
- ± All sediment control structures to be maintained in an effective manner and inspected after each storm event
- ± A monitoring program will be established during construction to maintain capture capacity
- ± The remaining exposed areas of the Project area are to be damped down as deemed necessary by the Project area supervisor to prevent dust
- ± Establishment of vegetation as soon as practicable. All sediment control devices are to be maintained until the establishment of vegetation is complete.

3.1.3 Sediment controls

With reference to the International Erosion Control Association (IECA) Guidelines and current best practice, there are three fundamental sediment control principles that have been identified as suitable for use within this Project area. These are as follows:

- ± Site entry and exit controls
- ± Sediment fences
- ± Check dams.

Site entry and exit controls

At the Project area entry and exit point for vehicles a treatment should be established to facilitate the removal of soil, mud, dust and debris from the tyres of vehicles prior to leaving the existing Project area. The entry and exit can comprise of a gravel pad design or placement of hardwood logs, constructed and maintained in accordance with the IECA Guidelines. Alternatively, a vibratory grid system can be hired or constructed. The advantages of the grid system include ease of movement to suit construction phasing.

Sediment fences

Sediment fencing is to be established down slope of any exposed earthworks and stockpiles where there is a risk of contaminated water leaving the Project area. Sediment fencing may be required at regular spacing down the disturbed grade to limit rutting caused by concentration of sheet flow. Sediment collected from sediment fences is to be regularly removed from the Project area.

Check dams

Check dams shall be used for silt and sedimentation trapping to mitigate against sediment laden runoff entering the adjacent waterways. The construction contractor at commencement of the works shall provide, on the construction drawings and within a CEMP, more specific details and notes.

3.2 Operational phase

3.2.1 Water quality objectives (WQOs)

In accordance with the State Planning Policy (SPP), during the operational (post-construction) phase of the proposed development, key pollutants from the Project area are required to be reduced to the levels detailed in Table 2 at the point of discharge into the receiving environment.

Table 2 Water Quality Objectives for Central Queensland (south) climatic region (sourced from Table B Appendix 2 SPP (2017))

Parameter	Design objective Mean annual load reductions (%)
Total suspended solids (TSS)	85
Total phosphorus (TP)	60
Total nitrogen (TN)	45
Gross pollutants >5mm	90

3.3 MUSIC water quality modelling

3.3.1 Model development

Stormwater runoff quality was assessed using MUSICX 1.1.0 software. This was achieved by evaluating the pollutant load anticipated to be generated by the proposed BESS footprint compared to the existing Project area condition. This was followed by quantifying and assessing the performance of a runoff treatment train to mitigate pollutants to comply with runoff pollutant reduction targets nominated by the State Planning Policy (SPP) (2017).

Modelling was undertaken in accordance with the Healthy Waterways MUSIC Modelling Guidelines, Version 1.0 ± 2018 (MUSIC modelling guidelines).

3.3.2 Model input parameters

3.3.2.1 Climate data

Rainfall data with a six-minute timestep from 1/01/1980-31/12/1989 from rainfall station 41140 Dalby was obtained from eWater Rainfall Runoff Library in accordance with the Water by Design MUSIC Modelling Guidelines (2018). This was the closest rainfall gauge to the Project area (located 60 km away) with adequate meteorological records and has a mean annual rainfall of 685.1mm.

Mean Potential Evapotranspiration (PET) values were obtained from Tara Monthly Aerial Evapotranspiration as provided by the eWater MUSIC library. This was selected due to W K H Goldwindy to Project area and was considered applicable.

3.3.2.2 Land use parameters

Land use parameters were selected in accordance with Water by Design MUSIC Modelling Guidelines Version 3, 2018 (Water by Design, 2018) based on land use type. The proposed Project area is considered industrial land use due to frequency of vehicle movements and type of vehicles within the Project area and the general use as well as the pollutants likely to be produced from Project area. Land use parameters utilised in the model are summarised below in Table 3.

Table 3 Rainfall runoff parameters SEQ (sourced from Table A1.2 from MUSIC (2018))

Parameter	Industrial Land Use
Rainfall Threshold (mm)	1
Soil Storage Capacity (mm)	18
Initial Storage (%)	10
Field Capacity (mm)	80
Infiltration Capacity Coefficient a	243
Infiltration Capacity Exponent b	0.6
Initial Depth (mm)	50
Daily Recharge Rate (%)	0
Daily Base Flow Rate (%)	31
Daily Deep Seepage Rate	0

3.3.2.3 Site impervious area

The proposed BESS infrastructure will result in an increase in impervious area within the Project area. The existing Project area is rural land and is fully pervious. The approximate impervious surface areas on the Project area are shown in Table 4. Approximately 3% of the Project area is anticipated to become impervious. This increase in impervious area is expected to increase the magnitude of flows or result in an increase in peak flow within receiving watercourses.

Table 4 Site impervious surface area

Impervious surface type	Area (h a)	Impervious ness (%)
Roof areas ±Transformers, solar panels, sheds, tanks, hardstands	5.23	90
Sealed surface - Access roads	3.67	85

Impervious surface type	Area (h a)	Impervious ness (%)
Unsealed surface ±Gravel perimeter track	0.81	50
Unsealed surface ±Vegetation	3.46	0

3.3.2.4 Pollutant generation parameters

The pollutant export parameters were adopted in accordance with Section 3.3.5 of the MUSIC modelling guidelines Version 3 (Healthy Land and Water 2018). The proposed Project area will have an industrial land use which includes being trafficked by heavy and light vehicles as well as handling of potentially hazardous materials around the Project area.

The values displayed in Table 5, represent the pollutant export values adopted from MUSIC modelling guidelines Version 3 for an industrial land type. Relevant parameters for baseflow were applied in accordance with MUSIC JXLGHOLQH V WR DGGUHV V DQ\ EDVH IORZ T X D G H O L Q H V U X Q R I. The parameters have been calculated by MUSIC for event flows and baseflows that apply to Southeast Queensland.

Three source nodes were utilised within the model to represent the different types of runoff that will be generated by the different impervious surfaces which have been identified above in Table 4. The pollutants expected to be generated include Total Suspended Solids (TSS) from vehicle movement and soil disturbance, as well as Total Nitrogen (TN) and Total Phosphorous (TP) potentially occurring from vegetation management.

Table 5 Pollutant generation parameters

Flow Type	TSS LOG ¹⁰ Values		TP LOG ¹⁰ Values		TN LOG ¹⁰ Values	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Base Flow	0.78	0.45	-1.11	0.48	0.14	0.20
Stormflow	1.92	0.44	-0.59	0.36	0.25	0.32

3.3.2.5 Stormwater quality treatment

To reduce the exportation of pollutants via stormwater from the Project area, a Stormwater Quality Improvement Device (SQID) is required to be integrated into the development. A bio-retention basin is proposed as the primary SQID to treat stormwater runoff from the Project area to meet the WQOs. The bio-retention basin is proposed to be located in the north-western corner of the BESS development area as illustrated in Figure 2. The bio-retention basin characteristics are presented in Table 6.

Table 6 Treatment device parameters (Bio -retention basin)

Parameter	Bio-retention basin
Extended detention depth (m)	0.3
Surface Area (m ²)	1600
Filter area (m ²)	1600
Filter depth (m)	0.6
Lower flow bypass (m ³ /s)	0
High flow bypass (m ³ /s)	6
Saturated hydraulic conductivity (mm/hr)	200
Overflow weir width (m)	5

3.3.3 Results

The analysis from the MUSIC model simulations have resulted in the pollutant generation values in Table 7. The results indicate that through the incorporation of the bio-retention basin, the proposed development achieves the required WQOs in accordance with the SPP. Detailed civil design is required in the detailed design phase of the Project to adequately size and locate the bio-retention basin within the Project area. The surface area extent of the basin could be optimised in future design phases through the addition of other SQIDs.

Runoff of sediment has the potential to be mitigated through silt fence and sediment traps during construction. An Erosion and Sediment Control Plan will be developed in future detailed design phases to provide mitigation measures for potential erosion and sediment runoff from Project activities and infrastructure at all phases of the Project.

Table 7 Pollutant values simulated by model in comparison to design objectives

Potential Pollutant	Source Load (kg/year)	Residual Load (kg/year)	WQO (%)	Achieved Reduction (%)
Total Suspended Solids (kg/yr)	8822	1317	>85	85
Total Phosphorus (kg/yr)	23	5	>60	78
Total Nitrogen (kg/yr)	150	65	>45	56
Gross Pollutants (kg/yr)	1552	0	>90	100

3.4 Maintenance

The ongoing maintenance, including but not limited to the collection of litter and clearing of sediment disposal and maintenance of the bio-retention vegetation, will be the responsibility of the BESS owner/operators and should be undertaken as outlined below.

3.4.1 Bio-retention systems

This maintenance plan is for an established bio-retention system and sediment forebay and detention basin. A bio-retention filter should only be installed once the majority of the sediment producing activities for the proposed development has been completed.

Short term (weekly ±monthly)

Short term maintenance of bio-retention systems shall be undertaken by the property owner and it should comprise mainly of:

- ± Weeding
- ± Watering
- ± Mowing.

Medium term (half yearly/yearly)

To be completed by the property owner or a consultant on a biannual/annual or event based trigger. Items to be checked and/or maintained include:

- ± Erosion
- ± Grass condition
- ± Flow conveyance/blockage

- ± Sedimentation
- ± Evidence of ponding
- ± Back-washing of filter material
- ± Cleanout of sediment forebay.

Long term (replacement)

Triggered by the results of medium term assessment, the long term replacement of bio-retention systems will occur from gross failure caused by large storm events or long term use. Replacement and/or rectification works shall be completed by the property owner or an approved sub-contractor. This work should generally include some or all of the following:

- ± Removal of accumulated sediment
- ± Replacement of underdrain system
- ± Replacement of filter material
- ± Grading of basin invert
- ± Replacement of surface vegetation.

4. Conclusion

GHD has been commissioned by AGL to prepare a preliminary stormwater management plan (SWMP) for the proposed Queensland Battery Project area. A stormwater quality analysis was undertaken using MUSICX software for the proposed development to determine the pollutant load contributions from the BESS footprint and to size a Stormwater Quality Improvement Device (SQID).

A bio-retention basin with a filter media area of 1600 m² was selected as an appropriate SQID for the BESS footprint to achieve the Water Quality Objectives nominated in the State Planning Policy. The bio-retention basin is proposed to be located in the north-western corner of the BESS development area.

Detailed civil design is required in the concept design phase of the Project to adequately size and locate the bio-retention basin within the Project area. The surface area extent of the basin could be optimised in future design phases through the addition of other SQIDs.

Runoff of sediment has the potential to be mitigated through silt fence and sediment traps during construction. An Erosion and Sediment Control Plan will be developed in future detailed design phases to provide mitigation measures for potential erosion and sediment runoff from Project activities and infrastructure at all phases of the Project.

The development as proposed in this report therefore demonstrates that the required stormwater quality can be appropriately managed.

5. References

Department of Infrastructure, Local Government and Planning, 2017. State Planning Policy.

Healthy Land and Water, 2018. MUSIC Modelling Guidelines.

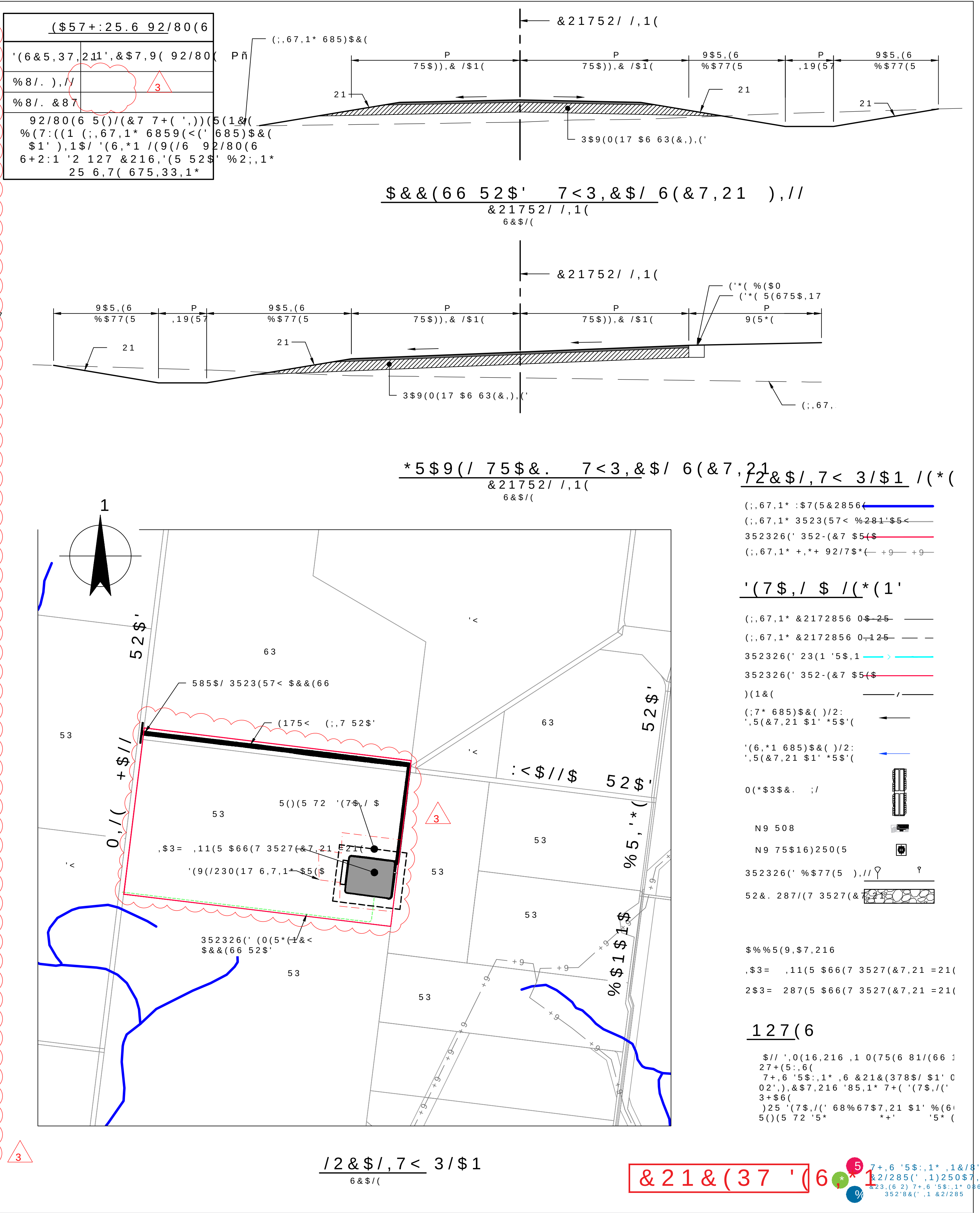
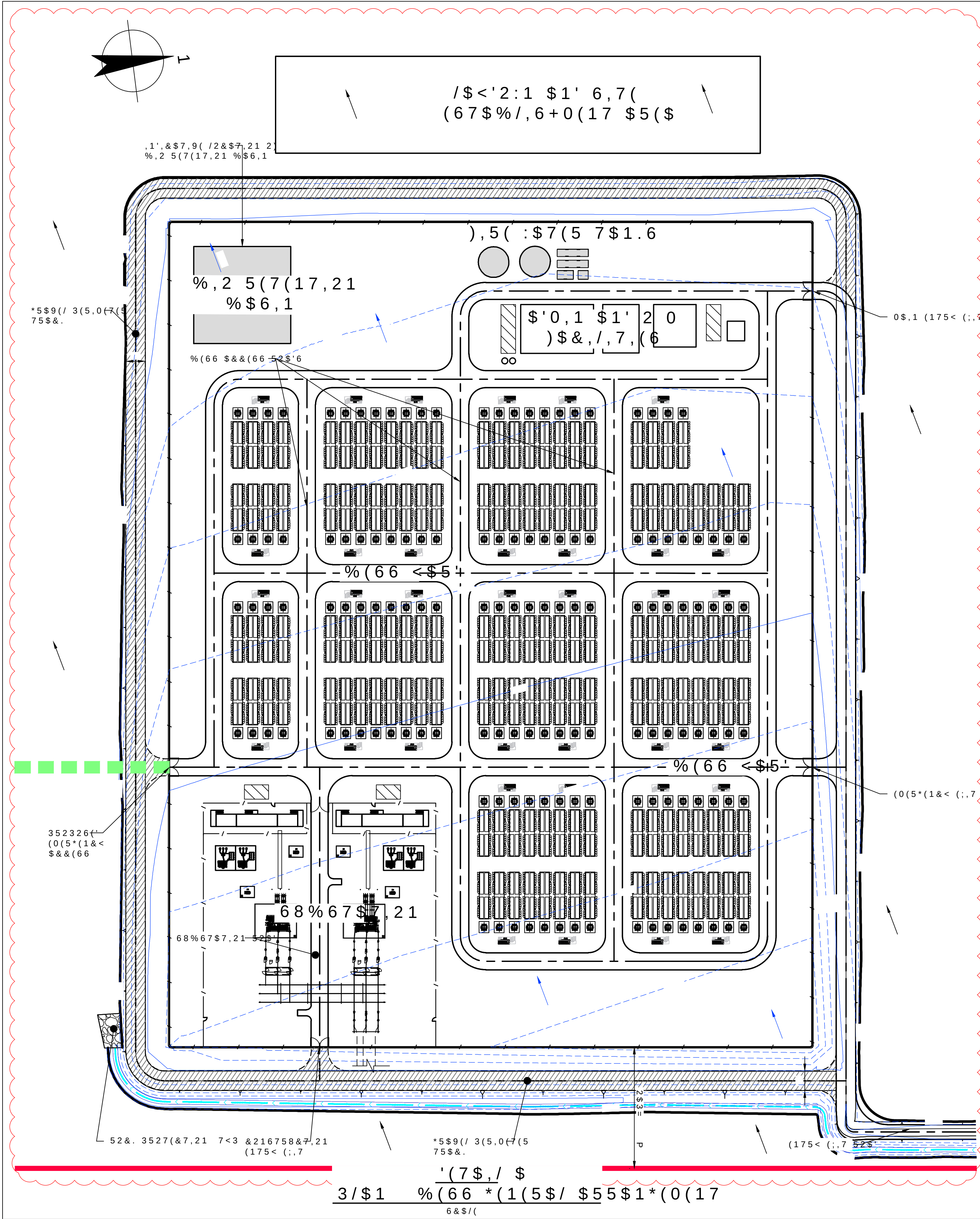
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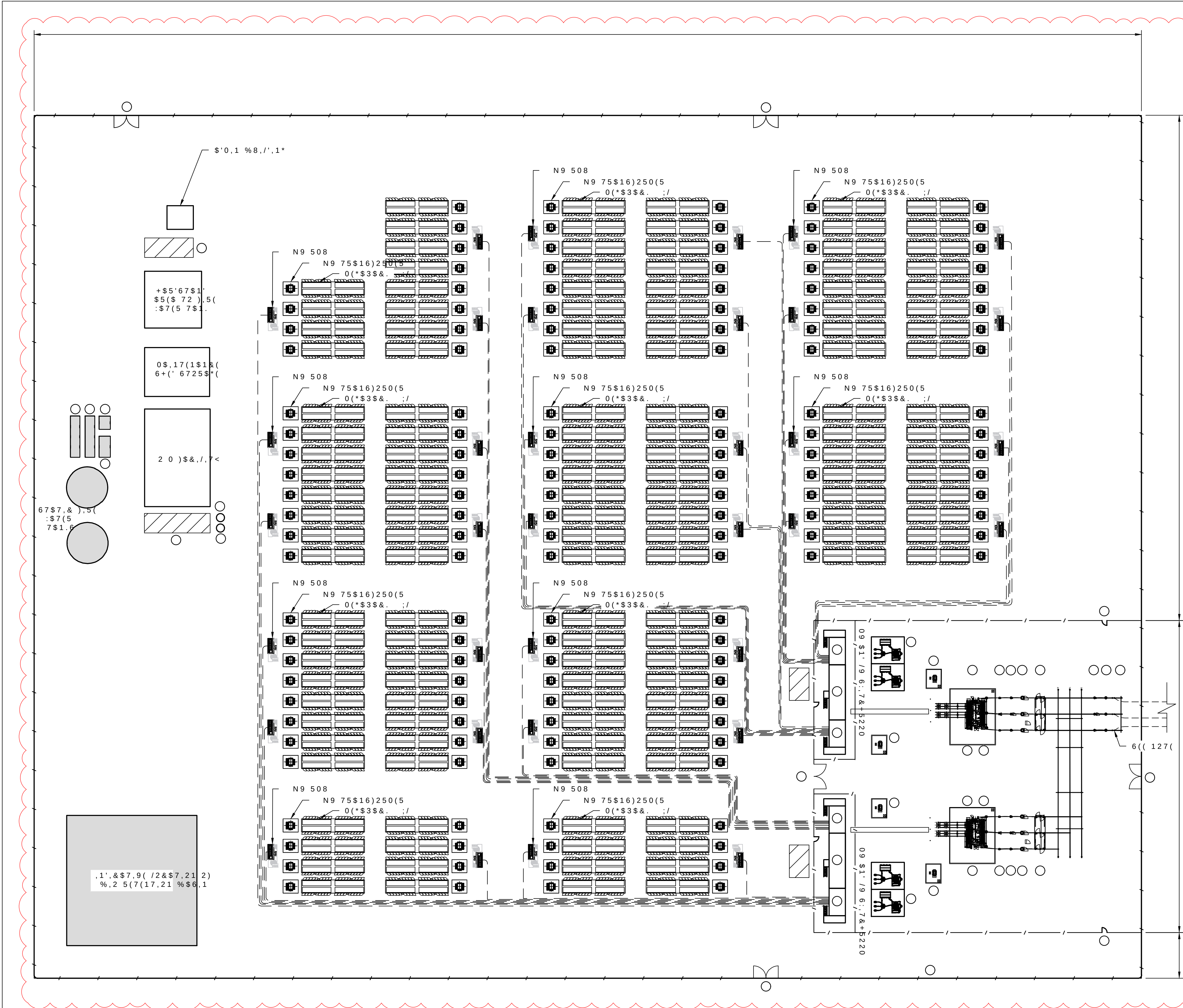
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Appendix A

Concept development approval plans





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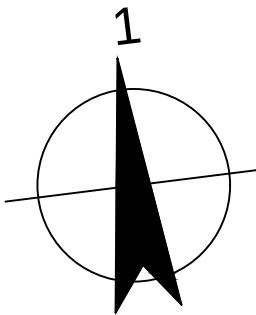
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7KHUPDO UDGLDWLRQ FRQVHTXHQFH WKUHVKROGV
7R[LF JDV FORXG FRQVHTXHQFH WKUHVKROGV
2YHUSUHVXUH FRQVHTXHQFH WKUHVKROGV
0RGHOOLQJ VRIWZDUH
,QSXW GDWD DQG DVVXPSWLRQV
*HQHUDO DVVXPSWLRQV
7KHUPDO UDGLDWLRQ
7R[LF JDV H[SRVXUH
%DWWHU\ H[SORVLRQ
7UDQVIRUPHU SRRO ILUH
5HVXOWV
7KHUPDO UDGLDWLRQ
7R[LF JDV H[SRVXUH
%DWWHU\ H[SORVLRQ
%(66 WUDQVIRUPHU SRRO ILUH
5HFRPPHQGDWLRQV
0DQDJHPHQW RI KD]DUGV
&RQVWUXFWLRQ DQG RSHUDWLRQDO PDQDJHPHQW
&KHPLFDO DQG VSLOO PDQDJHPHQW
%DWWHU\ PDQDJHPHQW
&XPXODWLYH ULVN
&RQFOXVLRQ
5HIHUUHQFHV

7DEOH LQGH[

7DEOH	7HUPLQRORJ\
7DEOH	6XPPDU\ RI SRWHQWLDOO\ GLVWHUULRXV IRQV FRQVWUXFWLRQ
7DEOH	6XPPDU\ RI LQGLFDWLYH GLVWHUULRXV IRQV FRQVWUXFWLRQ
7DEOH	+D]DUG LGHQWLILFDWLRQ
7DEOH	7KHUPDO 5DGLDWLRQ &RQVHTXHQFH 7KUHVKROGV
7DEOH	\$(* /HYHOV IRU &2 +&O +) DQG +&1
7DEOH	2YHUSUHVXUH &RQVHTXHQFH 7KUHVKROGV
7DEOH	*HQHUDO PRGHO DVVXPSWLRQV DQG LQSXW
7DEOH	3DVTXLOO ZHDWKHU VWDELOLW\ FODVV GHILQLWLRQV
7DEOH	0RGHOHG ZHDWKHU FRQGLWLRQV
7DEOH	7KHUPDO UDGLDWLRQ FRQVHTXHQFH DVVXPSWLRQV
7DEOH	2II JDV FRPSRVLWLRQ IURP WKHUPDO UXQDZD\ RI OLWHEDWWHULHV

7DEOH 7R[LF JDV FRQVHTXHQFH DVVXPSWLRQV
7DEOH &DOFXODWHG 2II *DV FRPSRVLWLRQ DGMXVWHG IRU DV

7DEOH %(667UDQVIRUPHU SRRO ILUH DVVXPSWLRQV
7DEOH 6XPPDU\ RI KHDW UDGLDWLRQ FRQVHTXHQFHV
7DEOH 5HVXOW\LF *DV 'LVSHUVLRQFH GRZQZLQG WR \$(*/
7DEOH 6XPPDU\ RI EDWWHU\ VWRUDJH H[SORVLRQ RYHUSUHV
7DEOH 7UDQVIRUPHU SRRO ILUH KHDW UDGLDWLRQ GLVWDQFH

)LJXUH LQGH[

)LJXUH 3URSRVHG ORFDOLW\ SODQ GHSLFWLQJ 3URMHFW DUHD
)LJXUH 3UHOLPLQDU\ %(66 JHQHUDO OD\RXW
)LJXUH 'DOE\ \$LUSRUW :LQG 5RVH DP
)LJXUH 'DOE\ \$LUSRUW :LQG 5RVH SP
)LJXUH 'LVSHUVLRQ SURILOH IRU &2 WR \$(*/
)LJXUH 'LVSHUVLRQ SURILOH IRU +&/ WR \$(*/
)LJXUH 'LVSHUVLRQ SURILOH IRU +) WR \$(*/
)LJXUH 'LVSHUVLRQ SURILOH IRU +&1 WR \$(*/
)LJXUH %DWWHU\ VWRUDJH H[SORVLRQ FLPSDWHZV RYHUSUHV]RQH
,
)LJXUH %DWWHU\ VWRUDJH H[SORVLRQ FLPSDWHZV RYHUSUHV]RQH
,
)LJXUH %DWWHU\ VWRUDJH H[SORVLRQ FLPSDWHZV RYHUSUHV]RQH
,
)LJXUH %(66 7UDQVIRUPHU SRRO ILUH FDN\SUIRWHQPSDW\WYHWZR UHVW FV
ZHDWKHU ' ,
)LJXUH 7UDQVIRUPHU SRRO ILUH FDN\SUIRWHQPSDW\WYHWZR UHVW FV
]RQH ZHDWKHU ' ,
)LJXUH 7UDQVIRUPHU SRRO ILUH FDN\SUIRWHQPSDW\WYHWZR UHVW FV
EXLOGLQJ HZHHDW]RQH ' ,
)LJXUH 7UDQVIRUPHU SRRO ILUH FDN\SUIRWHQPSDW\WYHWZR UHVW FV
HIIHFW±ZHDWKHU ' ,

\$SSHQGLFHV

\$SSHQGL[\$KHUPDO UDGLDWLRQ FDOFXODWLRQ VXPPDU\
\$SSHQGL[7UDQVIRUPHU VSHFLILFDWLRQ

\$EEUHYLDWLQGRQVURQ\PV

\$EEUHYLDWLR	'HVFULSWLRQ
\$&	\$OWHUQDWLQJ &XUUHQW
\$(* /	\$FXWH ([S*XLXGHH LQHV /HYHO
\$*/	\$*/3RZHU *HQH:ULQVLRQWG
\$3=	\$VVHW 3URWHFWLRQ =RQH
\$6	\$XVWUDOLDQ 6WDQG DUG
\$6 1=6	\$XVWUDOLDQ DQG 1HZ =HDODQG 6WDQG DUG
%(66	%DWWHU\ (QHUJ\ 6WRUDJH 6\VWHP
%06	%DWWHU\ 0DQDJH PHQW 6\VWHP
f&	'HJUHHV &HOVLXV
'19	'HWURUVNH 9HULWDV
(3%&	(QYLURQPHQW 3URWHFWLRQ DQG %LRGLYHUVLW\ &RQVH
(7/	(OHFWULFLW\ 7UDQVPLVVLRQ /LQHV
)0	)DFWRU\ 0XWXDO
J	*UDP
*+'	*+' 3W\ /WG
KD	+HFWDUH
+,3\$3	+D]DUGRXV ,QG XVWU\ 30DQQQLQJ \$GYLVRU\ 3DSHU
+9	+LJK YROWDJH
,%&	,QWHUPHG LDWH %XON &RQWDLQHU
,&1,53	,QWHUQDWLRQDO &RQYLYHQ \$RQDWRQ 3URWHFWLRQ
,62	,QWHUQDWLRQDO 2UJDQLVDWLRQ IRU 6WDQGDUGLVDWL
NJ	.LORJUDP
NJ V	.LORJUDPV SHU VHFRQG
N/	.LOROLWUH
NP	.LORPHWUH
N3D	.LORSDFDO
N9	.LORYROW
N9\$	.LORYROW \$PSUHV
N:K	.LORZDWW KRXU
N: P	.LORZDWW SHU VTXDUH PHWHU
/	/LWUH
/)3	/LWKLXP ,URQ 3KRVS KDWH
/3*	/LTXLG 3HWUROHXP *DV
P	0HWHU

\$EEUHYLDWLR	'HVFULSWLRQ
P	&XELF PHWHU
PP	0LOOLPHWUH
0&8	0DWHULDO &KDQJH RI 8VH
0+)	0DMRU +D]DUGRXV)DFLOLW\
09\$	0HJDY\$PSMUHV
0:	0HJDZDWW
1(0	1DWLRQDO (QHUJ\ 0DUNHW
1)3\$	1DWLRQDO)LUH 3URWHFWLRQ \$VVRFLDWLRQ
10&	/LWKLXP 1LFNHO 0DQJDQHVH &REDOW 2[LGHV
16:	1HZ 6RXWK :DOHV
2(0	2ULJLQDO (TXLSPHQW 0DQXIDFWXUHU
3+\$67	3URFHVV +D]DUG \$QDO\VLV 6RIWZDUH 7RRO
30DQQLQJ \$F\	30DQQLQJ \$FW
33(	3HUVRQDOY3(UTSPHFWL
SVL	3RXQGV SHU VTXDUH LQFK
4/'	4XHHQVODQG
508	5LQJ PDLQ XQLW
V	6HFRQG
6)\$53	6R)DU \$V ,V 5HDVRQDEO\ 3UDFWLFDEOH
633	6WDWH 30DQQLQJ 3ROLF\
8/	8QGHUZULWHUV /DERUDWRULHV
86\$	8QLWHG 6\$PHWHU V DRI
9	9ROW
: '5&	:HVWHUQ 'RZQV 5HJLRQDO &RXQFLO
: +6	:RUN +HDQGV KHW\

7HUPLQRORJ\

7KH WHUPLQRORJ\ XVHG LQ WDEOHUHSRUW LV RXWOLQHG LQ
7DEOH 7HUPLQRORJ\

7HUP	0HDQLQJ
3URSRVH GHYHORS 3URMHFW	7KH SURSRVHG GHYHORS PHQW 3URMHFW LV IRU D3%(66HFWW 4XHHQVODQGRIWU5\ ZLWK WKH DFFHVV GULYHZD\ S SRUWLRQ RI /RW 63
3URMHFW	7KH DUHD HQFRPSDVV DUHDRIHQWU5\ZLWKRIWU5\ ZKL RI /RW RQ 53 DQG SDUW RI7RIW DORQ6BRYHUV WKH DUHD 5RDG IURP WKH VRXWKZHVWHUQ FRUQHU RI /RW 53 WR
3URMHFW IRRWSULQ	7KH 3URMHFW IRRWSULQW UHSUHVHQWV WKH DUHDV VXEMHF LQFOXGHV WKH H[WHQW RI SURSRVHG DFFHVV ZRUNV ZLWKL
%(66 IRRWSULQ	7KH %(66 IRRWSULQW UHSUHVHQWV WKH DUHDV VXEMHFV W

* + ' 4XHHOVODOG %(66 3W\ /4XGHOVODO

/HJLVODWLYH DQG SROLF\ FR

'HYHORSPHQW BSSOLDFDWRQJ \$FW DQQLQJ \$FW
VSHFLILFDOO\ YLD D GHYHORSPHQW DSSOLFDWLRQ IRU ODWHULDO &KD
WKH GHILQHGXVH DQG 5MFRQ(66 KULQJ D /RW 5\$/IURP :DFFHHUQH'RZQPH
5HJLRQDO &'5&QFLO

:RUN +HDOWK DQFW 66HJWODWLRQ

7KH 4XHHQVODQG+HDOWK D:Q 6 \$FWHWDQSHJXODWLRQV FULEH WKH GXWLHV
FRQGXFWLQJ EXVLQHVHV RU XQGHUWDLQJV WKDW GHVLJQ VXSOL
ZRUNSODFHV

:LWKLQH6 \$FWWKHUH LV WKH UHTXLUPHQW FVWL RQDQJ 66G RZXH WKHLO MWK
(0+) EDVHG RQ WKH TXDQWLW\ RI GZQWKULRXW KHR 30 RZURQW DQQLQJ QRW
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:HVWHUQ 'RZQV 5HJLRQDO &RXQFLO
6FKHPH

7KH UHOHYDQW ORFDO JRYHUQPHQW SODQQLQJ VFKHPH XQGHU 6WDWH
5HJLRQDO &'5&QFLODQQLQJ 6FKHPHFKQHZ GRDMMU DPHQGPH:QV& IRU WKH
3ODQQLQJ 6FKHPH LQF DQGHUJHWRQV DZKLH\HQVXUHV WKDW EDWWHU\ V
GHVLJQHGX ORFDWHG DQG RSHUDWHG LQ D PDQQHU WKDW SURWHFWV
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GHVLJQHGX FRQWDLQHGX DQG VHSDUDWHG WR DYRLG KDUP :KHUH KDUP
WR PLWLJDW HDVQGHUHQVIRH[SORVLRQ WKHUPDO HPLVLRQ RU FRQW
KDUP WR VHQVLWLYH ODQG XVHV DQG WKH HQYLURQPHQW

\$OWKRXXJK WKH :5& 3ODQQLQJ 6FKHPH SURYLGHV DQ RYHUYLHZ LW GR
WROHDEOH ULVN OHYHOV 7KHUHIRUDYHREHHQHWDQVGHSSODQQLQJ IUF
3ODQQLQJ 6330HFKLUHPHQWV

6WDWH 3ODQQLQJ 3ROLF\ 633

7KH 633 DGGUHVHVHUGHHWRVDEQWVKLQJ SODQQLQJ FRQVWUDLQWV ED
DVVHVVPHQW GHMDQWFRGH WKDW FRQLGDQVDFLQJHQVGHVH &RGH

4XHHQVODQG DQWH &RGH

7KH 4XHHQVODQG *RYHUQPHQW KDV DQWULGXFLGHV DQHQFKQDFUNV FIRGHWKH
KDJDUGRXV FKHPLFDO IDFH WKUHWKH QFOYHGLRSPHQW LV GHVLJQHGX DQG
SUDFWLFDEOH WR HQVXUH

+XPDQ KHDOWK DQG VDIHW\ DQG WKH EXLOW WQYLLURQPHQWXDWHLQ
SKIVLFDO RUKD]DUGVDO

+DJDUGRXV FKHPLFDO IDFLOLWLHV DUH SURWHFWHG IURP

D 2IIVLWH KDJDUG VFHQDULRV DW H[DQWQWLDJDUGRXV FKHPLF

E 1DWXUDO KDJDUGV

6WDWH &RGHFLILHV WKDW GHYHORSHPHQWV VKDOO QRW FUHDWH D GDQJ
H[SORVLRQ DQG WR[LF RU FRUURVLYH JDV HIIHFWRXV,QKD:GGHWRLEQ:WR
+D]DUGRXV ,QGXVWU\ 3ODQLQJ,3\$YLVRUUBIDSUHQFHGHVWRUUXURKQ/HW
W\SLFDO HIIHFWV WR SHUVRQQHO DQG HTXLSPHQW DW YDULRXV KHDW
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ZKHQVHVHVWKQJODQG XVH VDIHW\ LPSOLF DWLRQV RI SRWHQWLDOO\ KDJD
7KH 6WDWH &RGH SURYLGHV WKH IROORZHQWUHQGDQFH KZJLWUG UHWDH
ZKLFK KDV EHHQ WDNHQ LQWR FRQVLGHUDWRQ LQ WKH SUHSDUDWRQ
3,W LV D IXQGDPHQWDO SULQFLSOH RI 6WDWH &RGH WKH DXWKRULVL
VDIHW\ OHJLVODWRQ WKDW KDJDUGRXV FKHPLFDO IDFLOLWLHV DUH GI
UHOHYDQW \$XVWUDOLDQFRQDQGSUHWLQSBWWKHULPLQDWH RU PLQLPLV
ULNVN VR IDU DV UHDVRQDEO\ SUDFWLFDEOH 6)\$53 \$ KDJDUG DVVHV
LGHQWLILHV IRUHVHHDEOH KDJDUG VFHQDWRVSKLWKFDOFDSRWHHQFWLDS
RIVLWH LPSDFW VKDOO EH HVWLPDWHG'XVLQJ VXLWDEOH VRIWZDUH PR

2WKHU OHJLVODWRQGRFXPHQWYODV

2WKHU DVVRFLDWHG OHJLVODWRQ DQG UHJXODWRQ GRFXPHQWV LQF
± %DWWHU\ 6WRUDXHG)DEELWUHRFDO *RYHUQPHQW
± (OHFWULFDO 6DIHW\FWULFDO 6DIHW\ 5HJXODWRQ

0 H W K R G R O R J \

7KH SURFHVV RI ~~DDWH~~~~DDWH~~~~DDWH~~WG WKH UH~~HF~~~~HF~~~~HF~~PSHQ~~DD~~~~DD~~~~DD~~Q~~Q~~~~Q~~GR~~RR~~~~RR~~KPHQWV DV \

6HF~~WL~~~~WL~~~~WL~~W~~Q~~ GHWHUPLQH WKH SRWHQW~~UD~~~~UD~~~~UD~~FM~~HH~~~~HH~~~~HH~~J~~JB~~~~JB~~~~JB~~BS~~SD~~~~SD~~~~SD~~H~~Q~~~~Q~~~~Q~~GL~~V~~~~V~~~~V~~U~~U~~~~U~~BN~~WW~~~~WW~~~~WW~~K~~FW~~

3URM~~DU~~~~DU~~~~DU~~F~~HH~~~~HH~~~~HH~~R~~X~~~~X~~~~X~~Q~~GD~~~~GD~~~~GD~~U\

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'DQJHURXV JRRGV VFUHHQLQJ

7KH ULVN VFUHHQLQJ SURFHVW W\SLFDOO\ FRQFHQWUDWHV RQ WKH VW
 WKH SRWHQWLDO IRU VLJQLILFDQW RIIVLWH HHHFWV 6SHFLILFDOO\ W
 DQG TXDQWLWLHV ~~FRDOVRDQMHURHG~~ SURGXVHG WKH ~~ULVNHQ~~ DUHD
 LQGLFDWLQJ RI VWRUDJH ORFDWLQJ

+ D] D U G G H Q W L I L F D W L R Q

\$ KDJDUG LGHQWLILFDWLRQ DQZDCH WIKVBUWKNHFG SRVGBMWHUQLQMRDQW UL
WKH SXZELV UHTXLUHV LGHQWLILFDWLRQ RI SRWHQWLDO KDJDUGV WR K
RI WIKVBUWKNHFW ZLWK WKH VXUWRKHQDGLQVWHQPDWRQSHUQWHVV WR LGHQWLIA
LPSDFWV

7KH KDJDUG LGHQWLILFDWLRQ LV D GHVNWRS TXDOLWDWLYH DVVHVVP
FRXOG OHDG WR SRWHQFLDOO\ HVVPHQW WKHQ OLVWV DOO SRWHQWLDO
LGHQWLILFDWLRQ RI RSHUDWLRQDO DQG RUJDQLVDWLRQDO VDIHJDUG
WKH LPSDFW

7KH KDJDUG LGHQWLILFDWLRQ SURFHVV VLVWLFHQVWUXFNLQGRQSDGRPSDULRQ

+ D] D U G V H V V P H Q W

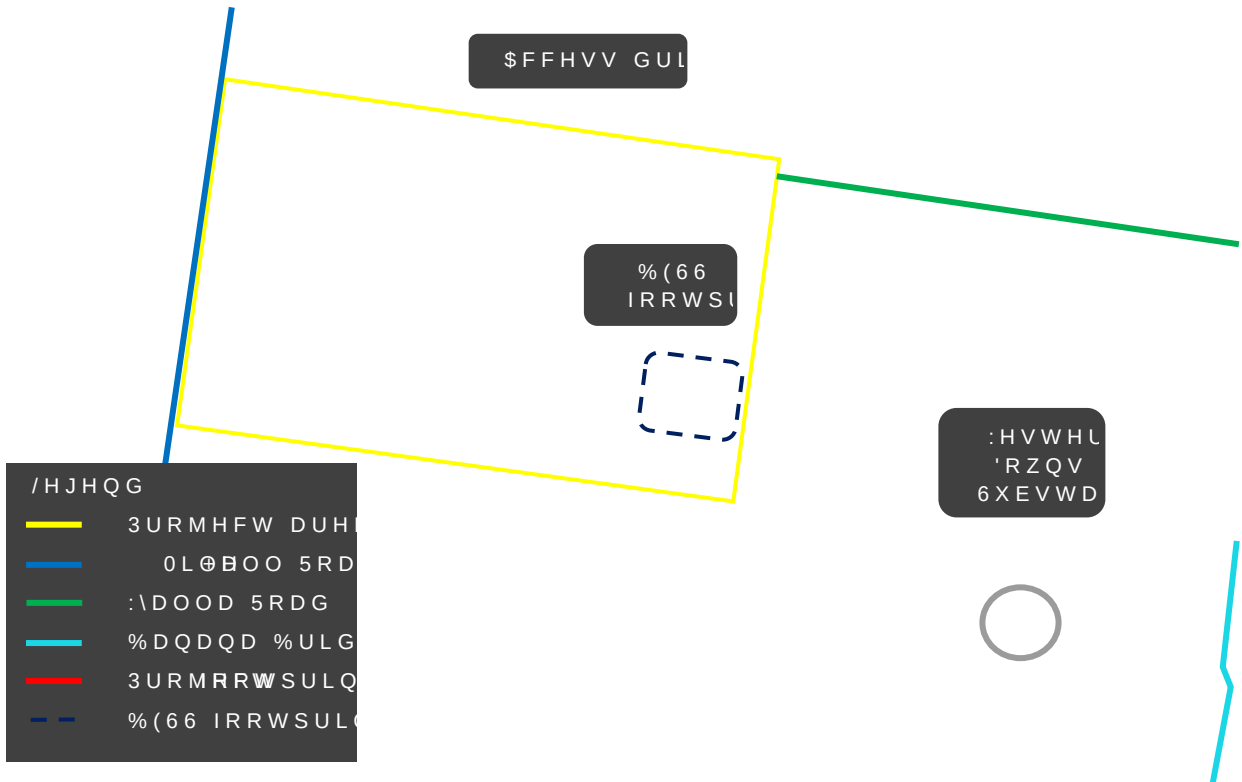
,W LV D IXQGDPHQWDO SULQFMSCHDXW6KRDUMMLQF6HWDG6HZBDNQQLDQWBRQ
 VDIHW\ OHJLVODWLRQ WKDW KDJDUGRXV FKHPLFDO IDFLOLWLHV DUH GI
 UHOHYDQW \$XVWUDOLDQ 6WDQG DUGV DQG RWKHU JRRG LQGXFVWU\ SUD
 VR IDU DV UHDEVREODE\ SUDFWLFD

/HJLVODWLRQ UHF~~KDPD~~~~IQG~~~~DWK~~~~DW~~~~FD~~~~HQ~~W VKRXOG EH FRPSOHWHG WR LG
VFHQDULRV ZLWK WKH ~~SLRWHQ~~~~SKL~~~~VO~~~~FD~~~~R~~ RWHE~~KWH~~~~IR~~~~FD~~~~HO~~ LPIS~~DF~~~~W~~~~V~~~~S~~~~DO~~~~R~~ IEH
HVWLDPDW~~F~~~~B~~~~Q~~~~W~~~~L~~~~T~~~~Q~~~~R~~~~G~~~~H~~~~O~~~~X~~~~L~~~~W~~KHU LQIRUPDW~~D~~~~R~~~~Q~~~~X~~~~P~~~~S~~~~J~~~~L~~~~R~~~~Q~~~~L~~~~Q~~~~J~~~~D~~~~Q~~~~K~~~~H~~~~P~~~~H~~~~W~~~~K~~~~R~~~~G~~
XVHG LQ WKH KD~~J~~~~D~~~~U~~~~G~~ DVVHVVPHQW DQG FRQVHTXH~~Q~~~~F~~~~H~~ PRGHOOLQJ FDC

3 U R M V F R W S H

/ R F D W L R Q

4XHHQVODQG %(66 SURVUWVKHQGHYHORSPHQW RIRDQ SURSRVHG 5RD(66
+RSHODQGSURSRVHG 3URMHFW DUHD LV YDFDQW ODQG ORFDWHG DSSU
NP QRUWKZHVW RI .RJDQ RQ /DQFFHQV3HVDVHZHQW SURSRVHG WR WUI
SRUWLRQ RI /RW RQ 63 7KH VXUURXQGLQJ DUHD LVFRPRXGLWV 5X
IDFLODQGHVHDVQSRQGSDFHFKH ORFDQWHDG OOD 5RDG 3RZ:HVWLQUNQ 'RZQV
6XEVDWLRQ .RJDQ &UHHN &RDO 0LQH DQG .RJDQ &UHHN 3RZHU 6WDV
\$GGLWLRQDOO\ WKH SURSRVHG GHYHORSPHQW ZLOO LQFOXGH DQFLOO
FRQWURDQGRREVDWLRQ LQIUDDWUFRQGHF WZWKFK %Z(66WR WKH QHUU
:HVWHUQ 'RZQV 6XEVDWLRQ YLD XQGHUJURXQG WUDQVHVFKLQFODQGH
UHSRUWLRQDQG UHJXODWRIRWISSHQWDOHW\ RI WKHWRDQIPWVSDQQRQ
SURSRVHGLV%(66RZLQXQH



)LJXUH 3URSRVHG ORFDOLW\ SODQ GHSSURVLQJDUHMFW DUHD DQG

% D F N J U R X Q G

4XHHQVODQ3W%(66 HUDWH D GLYHUVH SRZHQGHFWRVSRGWRORH[BW
ILUHG JHQHUDWLRQ IURP WR DQG DUHVKLQDQGHYHORSPHQW
\$V SDUW 4RHWKQVODQ3W%(66 SURSRVLQJDQWUFRQGHF WZWKFK
DELOLWFWDBK\$QWKHXXHQVODQGHYHORSPHQW LV DQWFLSDWHG WR UHVXO
0: 0:K RI VWRUDJH DQG LVH[SHFWHG WR EH GHSORHG DFURVV
LQLWLDOO\ ZLWDBK\$QGHSSDFLRQEDWWHPULHV ZLOO FRQQHFWRUWR LQYH
EDWWHU\ FRQWLRQLFUDWLYH XQGHQXQDQGHYHORSPHQW /RFDOLW\ 3ODQ *HQHUI
\$UUDQJHPHQWHDQGS\SLFDO 6HFWLRQ '5* &9 5HY DQ H[FHUSWR
ZKLFKLVZLQJLJXUH

)LJXUH 3UHOLP%Q66HQH0D0XW

*+' _4XHHQVODQG %(66 3W\ _4XG HQVODQ

'HVFULSWIDRQORWLHV

7KH SURSRVHG GHYHORSRQWVZLORQFRPSRQWVWUENMQYVDOGHFRQWURO
VIVWBRG LQFOXGH DOO DVVRFLDWHG SRZHU GHOLYHU\ LQIUDVWUXFWX
UHWLFXWKH%(66QDZRW DOVR LQFOXGH DGPLQLVWUDWLRQ RSHUDWLQJ
WDQNV DLGHVHQWVRQ EDVLQ

%(66GHVFULSWLRQ

7KH %(66 LV DQWLFLSDWHG WR KDYH DQ LQLWLDO FDSDFLW\ RI 0:
'RZQV 3RZHUOLQN 6XLELQDQVWUHQHFKQHUQHIIHU WR 6HFWLQ%(66 ZLOO
RFFXS\ DUHD ZLWKLQWVWUHQHFKWR I RQ 53 7KH %(66 RMHFWDHSDFWHG W
LQFOXGH WKH IROORZLQJ NH\ LQIUDVWUXFWXUH HOHPHQWV

± \$SSUR[LPDWHEDWWHU\ FROHESQR[LPDWHO\ P ORQJ P ZLGH DQG F
± RII 9 NVWWSWUDQVIDQSHU5LQJ PDLQ XQLWV 508
± LQYHUWHUV
± 7ZR VZLWFK URRPV +9 DQG FRQWURO URRPV
± &RQQHFWRQWKH N9 VXEVWDWLRQ VZLWFK IDUG
± (OHFWULFDO FRQWUDWLG FRQQHFWRQ
± \$GPLQLVWUHDWLRQ QDO DQG PIDQLQWLDQDQFH
± ([WHUQDO VLWH DFFHVV
± ,QWHUQDGLFHHZDV
± 'UDLQDJH LQIUDVWUXFWXUH
± :DWHU WDQNV IRU ILUHIDQGLQJWHUHQWLBQVRRQV PZDWHU
± &DU 5DUN
(DFK FRQWDELOMVHVNISDFH ZLQ(66 FRQWDLQ XS WR /)3 EDWWHU\ PRG
WKHUPDO ED\ DQG DVVRFLDWHG WKHUPDO URRI FRPSRQHQWV WR FRQ
D VHW RI FXVWRPHU LQWHUIDFH WHUPLQDOV DQG LQWHUQDO FRQWUR

&RQVWUXFWLRQ

\$ VXPPDU\ RI DQWLFLSDWHG FRQVW3RPMHFQDQWDLQHGVEIRORWKH %(6
± \$FFHVV IRUPDOLVDWLRQ
± 0RELOLDWLRQ DQG VLWH HVWDEOLVKPHQW
± &RQVWUXFWLRQ RIILFHV DQG FRPSRXQG
± 9HJHWDWLRQ FOHDULQJ DQ3RPMHFQDQWDLQJ%(66 SRVHG OD\GRZQ
± (URVLRQ DQG VHGLPHQW FRQWURO
± %XGDUWKZRLQDWDWLRQ DQG ILOOLQJ
± &RQFUHWLQJ DQ3RPMHFQDQWDLQJ
± ,QVWDOODWLRQ RI WKH %(66 VXEVWDWLRQ DQG RWKHU HTXLSPHQW
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± 'HPRELOLDWLRQDQ DQG VLWH
± 7KH %(66 ZLOO EH VXPDQXQFHGLFKFKDLQ ZLUH VHFUXLW\ IHQFH *D
SURYLGHG DQG ORFNHG WR DOORZ HQWU\ EQDQWKRULVHG YHKLFOHV
± \$GGLWLRQDO LQIUDVWUXFWXUH
± 6WRUPZDWHU GUDLQDJH ZLOO EH LPSOHPHQWHG ZLWKLQ WKH %(66 I

7KH GHYHORSRPHQSVDFHV V GUDQGSZDDU SDUNLQJ IDFLOLXWLLQJ ZLVWKHLQ W
FRQVWUXFWLRQ DQG RSHUDWLRQ SKDVHV RI WKH GHYHORSPHQW LW L
FRQVLGHUHG PLQRU DQG GRHV QRW UHSUHVHQW DQ\ VLJQLILFDQW LQF
7UDIILF ,PSDFW \$VVEHMPHQWPSOHWHG

2SHUDWLRQDORI %(66

\$IWHU FRPSOHWLRQ RI FRQVWUXFWLRQ DQG FRPPLVLRQ QQWIRH WUKRM%
DUHDGDFUHDVH VXEVDWLDWLRQKRXUDLQ\$URSHWIDFWLRQIRU PDLQWHQDQF
VFKHGXOHG LQVSHFWLRQV RI WKH %(66 DQG DFFHV V WUDFQRVGHSLHGH
WKH DFFHV V WUDFQRVSHFWLRQV SDWUROV DUH E\ YHKLFOH \$GGLWLR
SHUIRUP DFXHVLWRH VJHQF\ UHSDLUV

,W LV H[SHFWHG WKDW DSSUR[LPHW WKH RSHUDWLRQDORIRPHQW
KDV DOORZHG IRDVSQHUV WKH UDGPLQLVWUDWLRQ EXLOGLQJ RSHUDWLR
WKH VXEVDWLRQ

6XEVDWLRQ GHVFULSWLRQ

7KH SURSRVHG GHYHORSPHQW LQFOXGHV WKH FRQVWUXFWLRQ RI D QH
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7KH VXEVDWLRQDORIRPHQWZLVWQDQJLXUDWLRQV DQG LQFRUSRUDWH

± 6WKS WUDQVIRUPHU V

± \$VVRFLDWHG VZLWFKJH DU DQG SURWHFWLRQ VVWHPV

± 5HTXLUH G FLYLO ZRUNV DQG IRXQG DWLRQV

± 6HFXULW\ IHQFLQJ DQG DFFHV V SURYLVLRLQV

7UDQVIRUPHU ILUH ULVN PDQDJH PHQW PHDVXUHV ZLOO EH LPSOHPHQW
DSSURSULDWH EXQGLQJ DQG ILUH FRQWDLQPHQW VVWHPV IRU WUDQV
WUDQVIRUPHU RLO SRRO IGHUWBNQDULWZLW QMDJHQ DOO QHFHVVDU
PLWLJDWLRQ PHDVXUHV ZLOO EH LQFRUSRUDWHG LQWR WKH GHWDLOH

7UDQVPLVLRQ

7KH 3URMHFWFRQWUXFWLQJ DLQDQJGMYHRLSURJUHVVHQWEDQG
%(66W\ WGDNHKROGHU SDUHQSIUR3SDFWLRQWKH SURSRVHG WUDQVPLV
DUHD ZLOO UHTXLUH YHJHWDWLRQ UHPRYDOVDORJUVLGHGFWNRW
LQFOXGHUHQWLPQDIFWV IURP WKH WUDQVPLVLRLQ OLQH

'DQJHURRGRGV VFUHHQLQJ

&RQVWUXDFWLRQLWLHV

\$ VXPDPDU\ RI WKH LQGLFDWLYH DQGHURXV JRRGV FODVV LQ SRFWHG WR EH KDO
VWRUHGWRHQDV D UHVXOW RI WKH RQGLWLRQV WUXFWDERQ DUH VKRZQ LQ

7DEOH 6XPPDU\SRWHQVDDQGHURXV JRRGV FODVV LQ FRQVWUXFWLRQ

&KHPLFDO SURGXF	81	'DQJHURRGRGV FODVV	3DFNLQJURXS	,QGLFDWLYH VW TXDQWLW\	,QGLFDWLRQ TXDQWRQQ
/3*			1 \$	F\OLQGHUVWLW	
\$FWH\QRZHHOGLQJ		SUHV VXU	1 \$	[PF\OLQGHUVWRUHGWRHQ	
3DLQW RLO EDVHG FDVH			,,	0LQLPDO DPRXQRQLWH	
6ROYHQWV	PXOWL		,,	0LQLPDO DPRXQRQLWH	
(SR\ UHVLQV	PXOWL		,,,	0LQLPDO DPRXQRQLWH	
2[\JHQZHHOGLQJ			1 \$	F\OLQGHUVWLW	
&OHDQLQJ SURGXFW	PXOWL		,,	0LQLPDO DPRXQRQLWH	
'LHVHO &			,,,	0LQLPDO DPRXQRQLWH	
*HQHUDO RLOV DQG			,,,	0LQLPDO DPRXQRQLWH	
6HDODQWV MRLQW	1 \$	1RW FODVVLILHG GDQJHURXV JRRGV		0LQLPDO DPRXQRQLWH	
'HWHUJHQW	1 \$	1RW FODVVLILHG GDQJHURXV JRRGV		0LQLPDO DPRXQRQLWH	

2SHUDWRQLYLWLHV

'XULQJ RSHUDWRQLYLWLHV (SRWHQVDDQGHURXV JRRGV FODVV LQ SRFWHG WR EH KDO
UHTXLUPHQWV \JHQZHHOGLQJ (SRWHQVDDQGHURXV JRRGV FODVV LQ SRFWHG WR EH KDO
FRQDLQHG ZLWKLQ WKH RQGLWLRQV WUXFWDERQ DUH VKRZQ LQ
GDQJHURXV JRRGV ZLOO EH (SRWHQVDDQGHURXV JRRGV FODVV LQ SRFWHG WR EH KDO

\$ VXPDPDU\ RI WKH LQGLFDWLYH WISH DQG TXDQWLW\ RI GDQJHURXV JRRGV FODVV LQ
VWRUHGWRHQDV D UHVXOW RI WKH RQGLWLRQV WUXFWDERQ DUH VKRZQ LQ
FRQVLGHUHGDQGHURXV JRRGV FODVV LQ SRFWHG WR EH KDO
JRRGV FODVV

7DEOH 6XPPDU\LRQGLFEDVQYHURXV JRRGV BQULQJ RSHUDWLRQ

&KHPLFDO SU	81	'DQJHUR JRRGV F	3DFNLQJ JURXS	0D[LPXP VWRUDJH	4XDQWL WRQQH
6SUDI\ SDLQW			1 \$	0LQLPDO DPRXQLW [J FDQV	
5 \$ UHIULJH			1 \$	XQLWV NJ SHU 0HJDSDFN KRUVWHP	LQVL 0HJDSDFN
*HQHUDO SDL EDVHG FRQVL ZRUVW FDVH			,,	0LQLPDO DPRXQLW [/ GUXPV	
,VRSURSIO DC			,,	0LQLPDO DPRXQLW [/ GUXPV	
&OHDQLQJ DJ	PXOWLS		,,	0LQLPDO DPRXQLW ,%&	
/LWKLXPQ 3KRVS KDWHW			1 \$	0HJDSDFN 1RW NJ/ RIFHSDU XC	,QVL 0HJDSDFN
(WK\OHQH *OV RI 0HJDSD FRRODQW		1RW FODVVLILHG JRRGV		0HJDSDFN V XQLV SHU XQLW	,QVL 0HJDSDFN
+HUELFLGHV	1 \$	1RW FODVVLILHG JRRGV		0LQLPDO DPRXQLW ,%&	
7UDQVIRUPHU	1 \$	1RW FODVVLILHG JRRGV&ODVV IOXLC		2LO LQ WKH YDULRX 9 N9 WUDQVIRU [/ 0DLQ 6857SUDQVIRU [N/	

1RWH)RU WKH SXUSRVHG RI WKLV UHSRUW WKH 7HVOD 0HJDSDFN ;/ KDV EHHQ VHOHFWHG DV WKH UHIHUA

+D]DUGRXV PDWHULDOR

)XUWKHU GHWDLOV RQ WKH WKD]DUGRXV LQFOXGHG R RSHUDQVH LQWHUFRQVLQ WKH I
VHFWLRQV

/LWKLXPQ 3KRVS KDWHW EDWWHULHV

/)3 EDWWHULHV DUH UHJXODWHG DV &ODVV 0LVFHOODQHRXV GDQJHUR
DQG KDYH WKH SRWHQWLDO WR FFDXVH RRI UHOHDVH RI WKHLU FRQWHD
HOHFWURO\WH DQG OLWRQXZLQYDULRXV R RSHUDQVH)3 EDWWHULHV XVH
WKH HOHFWURGH PDWHULDO FRPSDUHG WR OLWKLXP QLFNHO PDQJHQ
OLWKLXP EDWWHULHV WKH DOLQRF IRRYWKHQWZR HOHFWURGHV DQG WK
VHSDUDWRU DUH WKH NH\ EDVSRQH QVHO RI DQ /)3

/)3 EDWWHULHV FDQ SRVH XQLTXH VDIHW\ KD]DUGV VLQFH WKH\ FRQWHD
SUHVXULVHG ,I D EDWWHU\ FHOO LV FKDUJHG WRR TXLFNO\ LW FDQ I
SRWHQWLDO H[SORVLHQV %DQXDVH WKHLU HULVNOLW\ RQVWHDQ

4XHHQVODQ3W% (S63 QV W BUXVHVFD0H EDI R W H A K P B R V X O R N V) F U W W K H
SXUSRVHV RI WKL V UHSRUW WKH 7HVOD 0HJDSDFN ; / EDWWHU\ V\ VW H
HVWDEOLVK EDVHOLQH FDOFXODWLRQV DQG ULVN PRGHOOHQJ SDUDPHV
ODWJHDOH EDWWHU\KXQQLW FZLQWKHQEQJ EDWWHU\ PRGXOHV LQWHJU
PDQDJHPHQW V\ VWHPV LQFOXGLQJ WKHUPDO ED\ DQG URQW H B P S H Q H Q
WHUPLQDOV DQG LQWHUQDWH FHRUDV BOWF DUEXPWDS SDUENVEOH 7HVOD HT
XWLOLVHG DQG UHIHUHQFHG IRU WKH FRQVHTXHQH DQG OLNHOLKRRG
7KH UHIULJHUDQW XVHG LQ WKHVH EDWWHULHV D UHQODSPEDEOH\ DQGDQJ
1RQR[LF JDV E\ YLUWXH RI WKH SUHV VXUH DW ZKLFK LW LV VWRUHG +
FRXOG IRUP VPDOO TXDQWLW\ DUEXPWDS RULF DFLG LQ WKH
7KL V FRXOG FDXVH D ORFDOLVHG HQYLURQPHQWDO LPSDFW WKDW ZRX
VXLWDEOH PDQQHU

\$ WKHUPDO UXQDZD\ LQFLGHQW LV ³ZKHUH RQH H[RWKHUPDO SURFHV
XQFRQWUROODEOH LQFUHDVH LQ WHPSHUDWXUH 7KLV FDQ UHVXOW L
7KHUPDO UXQDZD\ RI D FDELQHW RI EDWWHULHV ZLWKLQ D FRQWDL
JDVHRXV UHOHDVH RI HOHFWURO\WH UHIULJHUDQW FRRODQW RU FRF
IOXRULQDWHG K\GURFDUERQXQDG7KWKHULWB\LVFRVRSRSRVVLELOLW\ R
DGMDFHQW PRGXOHV

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± (OHFWPULLVFDXDHJ RYHU RU XQGHU FKDUJLQJ
± 7KHUFDVQHHVJ RYHU KHDWLQJ
± 3K\VLFDQ GHDJDJH\WHUQDO LPSDFW
± ([LVWLQJ ODPHQW GHIHFWV H J HOHFWURO\WH OHDNV IDXOW\ FR
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7KHUH KDYH EHHQ QXQDZD\ LQFLGHQWV DW JU
SDVW GHFDGH +HQFH H[WHQVLYH VWXGLHV KDYH EHHQ FRQGXFWHG W
SURPRWH WKHUPDO UXQDZD\ SHQWLRQKHGHOH HHHFWV RI W
OLWKREPDWWHHVHWHVQDWHVWHG ZLWK VPDOOHU EDWWHU\ DVVHPEOLHV IR
WKHUPDO HYHQWV DVVRFLDWHG ZLWK WKH RUHJULRPH SHHQWV KDYH
KDSSHQHG DW D ODUJHU FRPHHQMDVDFDWWHWHWDSZKLEK LQMXUH
WHDP RI ILUHDQGVWV ORRUDERRO 9LFWRULD %LJ %DWWHU\ %(66 IDF

7UDQVIRUPHUV

6WXS WUDQVIRUPHUV
&XUUHOW WUDQVIRUPHU

% (6 6 W U D Q W I R U P H U

6 W H S X S W U D Q W I R U P H U

7KISULPDVWHS WUDQVIRUPHU SHUIRUPV YROMSDVHNVIRUQVIRUFEBQVWRQIQJ
GLVWDQFH WUKQVDPQVIRUQHQUXVH ODUJH TXDQWLWLHV RI LQVXODWLRQ
7KLV RLO LV IODPPDEOH DQG LI LW OHDNV RU LV HMFHVKHGHGWHKHWRLD
HVVHQWLDO IRU RSHUDWLRQ LWV IODPPDEOH QDWXUH SUHVHQWV D VL
LQGXFHG HMFHWLRQ 7KH UHVXOWLQJ SRRO ILLQFDSDEGJHRIHGDWDJLQ
DGMDFHQW LQIUDVWUXFWXUH

\$6 SURYLGHV FRPSUHKHKQVLYHX\$HTUKDQMPHLPWVILQVWVDS DWLRQV LC
EXQGLQJ VHSDUDWLRQ GLVWDQFHV DQG ILUH SURWHFWLRQ PHDVXUHV
HVWDEOLVKHG VWDQGDUG PRGHWHULQWGHMFRQVHTXHQFHU LV QRW LQFO
DVVHVVPHQW

&XUUHQW DQG DX[LOLDU\ WUDQVIRUPHUV

&XUUHQW DQG DX[LOLDUI\ WUDQVIRUPHUV RSHUDWH DW ORZHU YROWDJ
SRZHU IXQFWLRQV ZLWKLQ WKH VXEVDWLRQ 7KHV\W\SH DQDORJPHU
LQVXODWHG XQLWV LQV\W\SH IUDPHWHG XULQJXGBWBGXIGLWVNL
VHOHFWHG WKH\ ZLOO FRQWDLQ VLJQLILFDQWO\ VSDOORJVRROPHU
FRPSO\ ZLWK DOO UHOHYDQW \$6 UHTXLW\SRUHVFWLRQLO FRQWDLQ

*LYHQ WKHLU VWDQGDUGLJHG DSSOLFDFWLRQ LQ VXEVWDWLRQV HVWDE
UHODWLYHO\ VPDOLQVXODVWLYH QDWLRQV VHOHFWHG WKHWH WUDQV
ULVNV WKDW DUH ZHOORXG MUKVVRIG HQG WPDQQ LQGXVWU\ SUDFWLFHV
IURP GHWDLOHG PRGHV RI QDWLRQV VWXG\

% (6 6 M D Q V I R W P H Q) N 9

8QOLNH WUDGKSWFRQDQWHSU DX[LOLDU\ MUDQFORVRHGVXQGDW \$DUH ZI
UHTXLUHPPHQWV %(66 WUDQVIRUPHUV SUHVHQW XQLTXH FRQVLGHUDWL
PRGHOOLOQJ 7KH NH\ GLIIHUHQWLDWLQJ IDFWRUV DUH

3UR[LPLW\ WR %DWWHU\ 6\ VWHPV %(66 WUDQVIRUPHUV ~~WU~~ EDWH\ SLFD
EDWWHU\ LQVWDOODWLRQV FUHDWLQJ SRWHQWLDO FRPSRXQG ULVN
VWDQG DUGV

5HJXODWRUI\)UDPHZKUSNFXLUHQVWHSQ G DX[LOLDUI\ WUDQVIRUPHUV K
RSHUDWLRQDO SDUDPHWHUV XQGHU \$6 % (66 WUDQVIRUPHUV UHS
DSSOLFDWLRQ WKDW LV VWLOO HYDROMLOGLQDWHPVU HRTXLHJHPHQWRU

5LVN 3URILC\RF7KMLRQ RI %(66 WUDQVIRUPHUV ZLWK HQHUJ\ VWRUD.
ULVN IDFWRUV QRW W\SLFDOO\ SUHVHQW LQ WUDGLWLRQDO WUDQVI
UXQDZD\ SURSDJDWLRQ DQG Q\UH VDIHW\ FRQVLGHUDWLR

7KHUHIRUH FRQVHTXHQFH PRGHOOLQJ IRU %(66 WUDQVIRUPHUV LV QH
DQG HQVXUH FRPSUHKHQVLYH VDIHW\ DVVHVVPHQW JLYHQ WKH FXUUH
UHJXODWLRQV IRU WKLV VSHFLILF DSSOLFDWLRQ

7KH UHIHUHQFH GHVLJQ VWUDQWRFNPHWHPSODSRQHGXWR RQH 09\$ UD
9 N9 WUDQRUHHHVVXUOXQLWV WRVIDOQLQJN9 WUDQVIRUPHUV
VXSSOLHU IRU WKHVH WUDQVIRUPHUV KDVWQSVPDOWOEHHQVRKRVHDQQEIXM
N9\$ 9 %(66 VNLG DUH\$SRRGGHG% LQ

+ D]D U G H Q W L I L F D W L R Q

7KH KDJDUG LGDQWIDFDXDRQKH FRQWUROOHG SSURVADFH LQ
7KH VDIHJXDUGV DUH UHTXLUHG WR HQVXUH WKH ULVN VFHQDULRV WKH
FRQWUROOHG WR DQDQXHQWV DQGHQWV KDJDUGHLIRORZLQJ DWRXPSW
ZHUH PDGH

- ± \$OO SODQW DQGHQWV DQG RSHUDWHG LQ DFFRUGDQFH ZLWK
FRGHQGLGHOLQHV
- ± 'DQJHURXV JRRGV DUH VWRUHG LQ DFFRUGDQFH ZLWK WKH \$XVWUDQ
VWDQGHQGLGHOLQHV QRW DQDQXHQWV
- ± \$OO HTXLSPHQW DQGHQWV DQGHQWV DQGHQWV DQGHQWV DQGHQWV
RU PLQLPL]H KDJDUGV WKURXJK HQJLQHULQJ FRQWUROV DQG SURW
- ± 3HUVRQQHO DUH WUDLQHG DQG FRPSHWHQW WR SHUIRUP WKHLU DV
- ± 3HUVRQQHO DWWHQG ZRUN IUHH IURP WKH LQIOXHQFH RI GUXJV DO
- ± 6XSHUYLVLRQ DUUDQJPHQWV DUH LQ SODFH IRU DOO ZRUNV SHUIR

7DEOH +D]DUG LGHQWLILFDWLRQ

	+D]DUG VFHQDULR	&DXVHV	&RQVHTXHQF	3RWHQW RIVLWH LPSDFW	3RWHQWILFDUGV
&RQVWUXFWLRQ 3KDVH					
	9HKLFOH LQWHUFD SXEOLF U	± 9HKLFOH PRYHPH IURP 3URMHFW D DGMDFHQW WR S	± 3HUVRQDO IDWDOLW\	<HV	± 3UHSDUH WUDIILF PDQDJHHPHQW SODQV LQFOX IRU FRQVWUXFWLRQ DQG RSHUDWLRQ ± /LFHQVHG DQG LQFOXWHG DUGVHU
	9HKLFOH LQWHUFD ZLWKLQ V 3URMHFW	± 9HKLFOH PRYHPH YLFLQLW\ RI SHU	± 3HUVRQDO	1R	± 3UHSDUH WUDIILF PDQDJHHPHQW SODQV LQFOX IRU FRQVWUXFWLRQ DQG RSHUDWLRQ ± ,PSOHPHQW DQG DOLPLWV ± 3URYLGH GHVLJQDWHG SHGHVWULDQ DUHDV IR ± /LFHQVHG DQG LQFOXWHG
	1DWXUDO KD]DUGV	±)ORRGLQJ HDUW H[WUHPH ZLQG EXVKILUH	± 3HUVRQDO ± \$VVHW GDP ± 6LWH VKXW	1R	± 2SHUDWLRQDURQPHQWDO PDQDJHHPHQW SODQ ± 'XV PDQDJHHPHQW DQG 3URWHFWLYH DTXLSP ± 'RRU KDUGZDUH WR SUHYHQW XQFRQWUROOHG ± /LJKWQLQJ SURWHFWLRQ ± %(66 VLWH ZLQV DERRG OHYHOV ± \$VVHW 3URWHFWLRQ =RQHV DURXQG WKH IDFL ± 2QVLWH)LUH :DWHU DQG)LUH ILJKWLQJ HTXLS ± 6WUXFWXUHV EXLOW WR \$XVWUDOLDQ 6WDQG
	)LUH VWD ZLWKLQ V 3URMHFW	± +RW ZRUNV	± 3HUVRQDO IDWDOLW\	<HV	± 0DQDJH IXHO IRU YHKLFZLWKLQ GWKDF 3URMHFW VWDQGDUGV ± +D]DUGRXV JRRGV VWRUDJH DUHDV DUH WR EH ± 'HVLJQ %(66 WRILQLPLWHFWLQJ VXULQFOXGLQJ ± %XVKLQJ DQJHHPHQW 3ODQ ± &RQVWUXFWLRQ HQYLURQPHQW DQFODXGLQPHQW SHUPLW SURFHVV ± +RW :RUN 3URWHFWLYH :RUN 3HUPLWV 'HVLJQ 1R KRW ZRUN SHUPLWWHG RQ ILUH EDQ GDV
	/RVV RI FRQWDLQ FKHPLFDQ LQFOXGLQ GDQJHUR JRRGV	± 'DPDJH WR VWRU FRQWDLQHUV H H[WUHPH LPSDFW ± +XPDQ HUURU	± (QYLURQPH GDPDJH ± 3HUVRQDO	1R	± 6WRUH FKHPLFDQV LQ OLQH ZLWK DSSURSULDY ± ,PSOHPHQW D UHJXODU LQVSHFWLRQ DQG PDL DUHDV ± ,PSOHPHQW VWDQGDUG KDQGOLQJ SURFHGXUH ± 3URYLGH D 6DIH :RUN 0HWKRG 6WDWHPHQW GH KDQGOLQJ SURFHGXUH ± 3URYLGH VSLOO NLWV WR EH XVHG LQ WKH HY FKHPLFDQV

*+ '_4XHHQVODQG %(66 3W\ _4XHHQVODQG

	+D]DUG VFHQDULR	&DXVHV	&RQVHTXHQF	3RWHQW RI\LVH IPSDFW	3RWHQW\HDIQDUGV
					± ,PSOHPPHQW VWDQGGDUG WUDQVIHU DQG KDQGO ± 3URYDSSURSUL\WVHMDQIGOLQJ GDQJHURXV DQG ± 0LQLPLVH XVH RI GDQJHURXV\WVHMDQIGOLQJ D
	&RQWDFW FKHPLFDO LQFOXGLQ GDQJHUR JRRGV	± *HQHUDO FRQVW DFWLYZMLGMQJ UHIXHOOLQJ ± 9HJHWDWLRQ PD	± 3HUVRQDO	1R	± 6WRUH FKHPLFDOV LQ OLQH ZLWK DSSURSULDV ± ,PSOHPPHQW D UHJXODU LQVSHFWLRQ DQG PDL DUHDV ± ,PSOHPPHQW VWDQGGDUG KDQGOOLQJ SURFHGXUH ± 3URYLGH D 6DIH :RUN 0HWKRG 6WDWHPHQW GH KDQGOOLQJ SURFHGXUHV ± 3URYLGH VSLOO NLWV WR EH XVHG LQ WKH HY FKHPLFDOV ± ,PSOHPPHQW VWDQGGDUG WUDQVIHU DQG KDQGO ± 3URYDSSURSUL\WVHMDQIGOLQJ GDQJHURXV DQG ± 6'6 IROGHU WRV\HVNHSRQWQLQLQJ D FRS\ RI W KDJDUGRXV FKHPLFDO VXEVDQFH VWRUHG D '* &RGH
	&RQWDFW HOHFWUL	± &RQWDFW ZLWK VRXUFH ± &UDQLPSDFWLQJ RYHUKHDG OLQH ± &RQQHFWLRQ WR RYHUKHDG SRZH	± 3HUVRQDO IDWDOLW\	1R	± ,PSOHPPHQW D :RUNSODFH +HDOWK DQG 6DIHW\ ± 8QGHUWDMDDL OHG 6DIHW\ LQ 'HVLJQ SURFHVV ± ,PSOHPPHQW LVROD\WRUQUSWRFHGXUHQDQFH R ± 8VH SRWWHU IRU FUDQH RSHUDWLRQ ± ,QVWDOO ILW IRU SXUSRVH HOHFWULFDO V\VW ± 6XSSO\ DQD\WVRK SURWHFWLYH 33(± 6HFX3UHRMHFW DUHD DQGIHQ66QRVDSWHLQSMUVR ± (PHUJHQW UHVSQRVH SURFHGXUHV ± 8QHQUJLJHG VLWH XQWLO FRPPLVVLRQLQJ ± &OHU LGH\QWHQLFHWLRQDQJHMDHFWDQJHJ ± 3HUPLW WR :RUNWQRXWRSRFHVVHV ± 'HVLJQH WR DSSURSULDWH VWDQGDUGV ± /RZ YROWDJH UHVF\WVHMDQIGOLQJ DQGHX HTXL
2SHUDWLRQ 0DLQWHQDQFH					
	7KHUPDO UXQDZD\ /)3 EDWW	± 2YHU DQG YRQGVH GXULQJ GLVFKDU EDWWHULHV ± 7KHUPDO UXQDZD\ ± 2YHU GLVFKDUJH ± ,QWHUQDFQVFRW	± 7KHUPDO U HYHQW OH EDWWHU\ I ± 7R[LF JDV JHQHUDWL	<HV	± 7KHUPDO FRQWURO DQG WKHUPDO UXQDZD\ ± %DWWHULHV WR EH VWRUHG DV SHU VXSSOLHU ±)XVLEOH VHSUDWRUV LQVLGH FHOOV ± 6OHFWLRQ RI DSSURSULDWH EDWWHU\ FKHPL SRWHQWLDO ± 3URYLGH LQVXODWLRQ DURXQG EDWWHULHV

*+'_4XHHQVODQG %(66 3W_4XGHQVODQG

	+D]DUG VFHQDULR	&DXVHV	&RQVHTXHQF	3RWHQW RI\LVH LP SDFW	3RWHQW\HJX DUGV
		± 'DPDJHG EDWWHU ± &RRODQW OHDN ± &\EHUWWDFN XQ UHPRWH RSHUDW PRGXOHV	± 3HUVRQDO IDWDOLW\ ± \$VVHW GDP		± %DWWHU\ 0DQDJHPPHQW 6\ VWHP %06 WR SURS FKDUJH ± ,QWHJUDWHG FLUFXLW FRQWURO V\ VWHPV WR ± &XUUHQW VHQLVQJ FLUFXLWV WR DYRLG VKRU ± %DWWHU\ EDODQFLQJ GHYLFHV WR DYRLG GH YROWDJH ±)DFWRU\ FHOO PDWFKLQJ FDSDFLW\ EDODQFL FHOO RYHUFKDUJH VLWXDWLRQV ± \$GRSWLRQ RI LQWHJUDWHG EDWWHU\ VROXLW ± ,QFRUSRUDWH WKH SRWHQWLDO IRU WR[LF JD LQWR WKH (PHUJHQF\ 5HVSRLQV 3URFHGXUHV H[FOXVLRQ]RQHV IRU HPHUJHQF\ UHVSRLQGHU ± 'HWDLOHG DQG 6VLQ\QWDOODWLRQ WR 1)3\$ DQG ± 8VH RI %(66 FRPSOLDQW ZLWK 8/ DQG WHV
	)LUH SURSDJDV RWKHU ED	± 7KHUPDO UXQDZ LQ QHDUE\ EDWW	± 7KHUPDO U HYHQW OH EDWWHU\ I ± 7R[LF JDV JHQHUDWL ± 3HUVRQDO IDWDOLW\ ± \$VVHW GDP	<HV	±)LUH 5LVN \$VVHVVPHQW 6DIHW\ 6WXG\ LQFO GLVWDQFHV WR SUHYHQW HVFDODWLRQ ± 'HWDLOHG DQG 6VLQ\QWDOODWLRQ WR 1)3\$ DQG ±)LUH WHVWLQJ DQDO (TXLSPHQW (DQXQ) DFWRU 8/ \$ ± 6HOHFWLRQ RI %(66 2(0 ZLWK DGYDQFHG ILUH
	0HFKDQLF FKHPLFDO GDPDJH R)3 EDWW DVVHPEO FDXVLQJ WKHUPDO UXQDZD\	± 5DSLQ KHDWLQJ FHOOV H J ODF WKHUPDO UXQDZ ± 9HKLFOH LP SDFW EDWWHULHV	± 7R[LF JDV JHQHUDWL ± 3HUVRQDO IDWDOLW\ ± \$VVHW 'DPE	<HV	± (QVXUH EDWWHU\ 5LVN XUHNG WR ,62 \$6 SUHYDLOLQJ EDWWHU\ PDQXIDFWXULQJ VWDQ ± 3K\VLFDQ PHDVXUHV WR PLWLJDWH SRVVLEOH ± %DWWHULHV WR EH VWRUHG DV SHU VXSSOLHU ± ,PSOHPPHQW D UHJXODU LQVSHFWLRQ DQG PDL DVVHPEOLHV ± 8QLWV ZLOO EH JURXQG PRXQWHG WR D IRXQG VXSSRUW WKH ZHLJKW RI WKH HTXLSPHQW DQ ± 6LWH WUDIILF PDQDJHPPHQW SODQ
	%DWWHU\ ([SORVLR	± %DWWHU\ WKHUP DQG JHQHUDWL JDVHV WKDW DUK ± ,JQLWLRQ RI RII HQFORVXUH UHV LQ FRQILQHNG H[S	± 7R[LF JDV JHQHUDWL ± 3HUVRQDO IDWDOLW\ ± \$VVHW 'DPE	<HV	± 3URYLGH WKHUPDO FRQWURO V\ VWHPV LQVLGH ± 3UHVVXUH VHQLVLWL\FRQWUROHQW %06 WR GLV ORFDWLRQV ± %DWWHU\ 0DQDJHPPHQW 6\ VWHP %06 WR SURS FKDUJH

	+D]DUG VFHQDULR	&DXVHV	&RQVHTXHQF	3RWHQW RI\LVH IPSDFW	3RWHQW\HJX DUGV
	(OHFWUR LF 5DGLD (05	± (05 JHQUHDWHG %(66 +LJK 9ROW OLQHV *ULG LQI	± 3HUVQRDO IDWDOLW\	1R	± \$OO GHVLJQV ZLOO EH LQ DFFRUGDQFH ZLWK V 7LPH YDU\LQJ (OHFWULF 0DJQHWLF DQG DQGHF UHOHYDQW FRGHV DQG LQG XVWU\ EHVW SUDFV ± \$OO UHOHYDQW SURFHGXUHV LQ UHODWLRQ W WR WKURXJKRXW WKH OLIH RI WKH 3URMHFW ± 7KH VHFUXULW\ V\WURPH FALOWKH DGLQJ VDIHW\ IH RI JDWHV ZLOO EH PDLQWDLQH WKURXJKRXV SURLGH VDIH H[SRVXUH GLVWDQFHV WR WKH ± 5HVWULFWHG DFFRUGDQFH DFFHVV RQO\ WR VDIH SHUVRQQHO
	1DWXUDO +D]DUGV	±)ORRGLQJ HDUW OLJKWQLQJ EXV	± 3HUVQRDO IDWDOLW\ ± \$VVHW 'DPI ± 3URMHFWKX GRZQ	<HV	± 'HVLJQ VWUXFWXUHV WR DSSURSULDWH FRGHV ± 0DQDJH IXHO IRU YHKLFZLWKDQGWRDFFRQDSSW VWDQGDUGV ± 'HVLJQ EXLOGQLQJV WR DSSURSULDWH FRGHV ± 3URLGH ILUH SURWHFWLRQ V\WHPV ± 3UHSDUH D EXVKILUH PDQDJHPHQW SODQ LQ F 6HU\LFH ± /LJKWQLQJ SURWHFWLRQ ± %(66 VLWH EXLOW DERYH \$(3 IORRG OHYHOV ± \$VVHW 3URWHFWLRQ =RQH DURXQG WKH IDFL ± 2QVLWH)LUH :DWHU DQG)LUH ILJKWLQJ HTXL ± 6LWH VSHFLILF HPHUJHQF\ PDQDJHPHQW SODQ DLGHUV ILUH H[WLQJXLVKHUV ILUVW DLG NLV
	,QWHUQD 3URMHFW ILUH	± 5HIXHOOLQJ RI V GLHVHO JHQUDY RSHUDWLRQV PL TXDQWLWLHV IU GLHVHO WDQN	± 3HUVQRDO IDWDOLW\ ± \$VVHW 'DPI ± 3URMHFWKX GRZQ	<HV	± 5HIXHOOLQJ V\WHPV GHVLJQ WR \$6 IRU G ± (PHUJHQF\ 5HVSQRVH 3ODQ
	([WHUQDC	±)LUH RU H[SORVL VRXUFHV H[WHUC %(66	± 3HUVQRDO IDWDOLW\ ± \$VVHW 'DPI ± 3URMHFWKX GRZQ	<HV	± 'HVLJQ VWUXFWXUHV WR DSSURSULDWH FRGHV ± 0DQDJH IXHO IRU YHKLFZLWKDQGWRDFFRQDSSW VWDQGDUGV ± 'HVLJQ EXLOGQLQJV WR DSSURSULDWH FRGHV ± ,PSOHPHQWLQJ PLQLXPVSHUWVWKH DFXWKILUH - DQG %XVKILUH 0DQDJHPHQW SODQ H[WHUQDC DV PLWLJDWLRQ RI SURSDJDWLRQ RI H[WHUQD ERXQGDU\

*+ '_4XHHQVODQG %(66 3W\ _4XHHQVODQG

	+D]DUG VFHQDULR	&DXVHV	&RQVHTXHQF	3RWHQW RI\LVH LP SDFW	3RWHQW\HJX DUGV
					± ,PSOHPPHQLQJ LQFUHDVHG \$3=V IRU WKH %(66 VWDWLRQ DQG SRVLWLRQLQJ RXWVLGH RI WK WKH %XVKILUH \$VVHVVPHQW ± 6LWH VSHFLILF HPHUJHQF\ PDQDJHPHQW SODQ DLGHUV ILUH H[WLQJXLVKHUV ILUVW DLG NLV
	/RVV RI FRQWDLQ FKHPLFDO LQFOXGLQ GDQJHUR JRRGV	± 'DPDJH WR VWRU FRQWDLQHUV H J H[WHUQDO LP SDFW ± :H DU DQG WHDU ± 7KHUPDO UXQDZ	± (QYLURQPH GDPDJH ± 3HUVRQDO	1R	± \$YRLG OLPLW VWRUDJH ZLWK\QVSHFWLRQ ± 6WRUH FKHPLFDOV DQG KD]DUGRXV PDWHULDQ H J KHUELFLGHV ± ,PSOHPPHQW D UHJXODU LQVSHFWLRQ DQG PDL DUHDV ± ,PSOHPPHQW VWDQGDUG KDQGOLQJ SURFHGXUH ± 3URYLGH D 6DIH :RUN 0HWKRG 6WDWHPPHQW GH SURFHGXUHV ± 3URYLGH VSLOO NLWV WR EH XVHG LQ WKH HY FKHPLFDOV ± ,PSOHPPHQW VWDQGDUG WUDQVIHU DQG KDQGO ± 3URYDSSURSULDY\KDQGO ± 6HOI EXQGLQJ IODPPDEOH JRRGV FDELQHWV E
	&RQWDFW FKHPLFDO LQFOXGLQ GDQJHUR JRRGV	± 0DLQWHQDQFH R	± &RQWDFW Z FKHPLFDOV LQFOXGLQJ GDQJHURXV	1R	± 6WRUH FKHPLFDOV LQ OLQH ZLWK DSSURSULDY ± ,PSOHPPHQW D UHJXODU LQVSHFWLRQ DQG PDL DUHDV ± ,PSOHPPHQW VWDQGDUG KDQGOLQJ SURFHGXUH ± 3URYLGH D 6DIH :RUN 0HWKRG 6WDWHPPHQW GH KDQGO ± 3URYLGH VSLOO NLWV WR EH XVHG LQ WKH HY FKHPLFDOV ± ,PSOHPPHQW VWDQGDUG WUDQVIHU DQG KDQGO ± 3URYLGH 33(WR DOO VWDII
	3RZHU FRQYHUW H[SORVLR	± ,QWHUQDO IDLOX FDSDFLWRU ± 2YHUYROWDJH D RYHUKHDWHG ± 2YHUFXUUHQW D RYHUKHDWHG ± \$UF)DXOW	± 3HUVRQDO IDWDOLW\ ± \$VVHW 'DP ± 3URMHFWKX GRZQ	1R	± (TXLSPHQW FHUWLILHG DQG LQVSHFWLRQ PDWFK PD[LPPX RSHQ FLUFXLW YROWDJH ± 2YHUFXUUHQW WULS LI PD[LPPX FXUUHQW H[F ± 4XDOLW\ FKHFNV RI LQVWDOODWLRQ EHIRUH F

	+D]DUG VFHQDULR	&DXVHV	&RQVHTXHQF	3RWHQW RI\LVH LP SDFW	3RWHQW RI\LVH LP SDFW
	,QYHUWH	± 2YHUYROWDJH ± 5HYHUVH SRODU KXPDQ HUURU	± 3HUVRQDO IDWDOLW\ ± \$VVHW 'DPI ± 3URMHFWKX GRZQ	1R	± 6\ VWHP WULS VKXWGRZQ ± 9ROWDJH UDWLQJ WR PDWFK PD[LPXP RSHQ FL ± (TXLSPHQWDOYDSVURGHG ± &HUWLILHG HOHFWULFLDQ ± 4XDOLW\ FKHFNV RI LQVWDOODWLRQ EHIRUH F ± 6\ VWHP FRQILXXHFWLRQWHJUDWHG EDWWHU\ V ZKHUHQYHUWHU VL]H LV UHGXFHG
	3RZHU 7UDQVIRU)LUH ZLW %(66	± &RRODQW OHDN ± 7UDQVIRUPHU RL RYHUKHDWLQJ ± (DUWK OHDNDJH ± \$UF IDXOW ±)LUH VSUHDG IUF	± 7UDQVIRUP ± ,QMXU\ WR SHUVRQQH YLFLQLW\ ± 3RWHQWLD HVFDODWL	1R	± 'HVLJQH WR \$6 ±3RZHU 7UDQVIRUPHU ±)LUH SURWHFWLRQ SURYLGHG ± 6HSDUDWLRQ GLVWDQFH ILUH LVRODWLRQ RI ± 'HVLJQ WR \$6 ± 6LWH VSHFLILF HPHUJHQF\ PDQDJHPPHQW SODQ DLGHUW\WILQHXLVKHUV ILUVW DLG NLWV
	7UDQVIRU H[SORVLR	± *DVHV JHQHUDWL WUDQVIRUPHU H K\GURJHQ	± 2YHUKHDWL WUDQVIRUP H[SORVLRQ RYHUSUHV\ ± 3HUVRQDO IDWDOLW\ ± \$VVHW 'DPI ± 3URMHFWKX GRZQ	1R	± 5HOLHI YDOYH RQ WUDQVIRUPHU WR YHQW RII ± +LJK WHPSHUDWXUH WULS ± 'HVLJQ WR \$6
	&RQWDFW HOHFWUL	± 9HUPLQ H[SRVLQ FRQGXFWRUV ± &RQWDFW ZLWK VRXUFHV ± &UDQHV LP SDFW RYHUKHDG OLQH	± 3HUVRQDO IDWDOLW\ ± 3HUVRQDO IDWDOLW\ ± \$VVHW 'DPI ± 3URMHFWKX GRZQ	1R	± 3HUPLW WR :RUW RLOVLRQ SURFHGXUHV ± ,QVWDOO ILW IRU SXUSRVH HOHFWULFDO V\ VW ± 6XSSO\ DQG XVH RI DUF IODVK SURWHFWLYH 3 ± 3UHYHQWLRQ RI XQDXWKRULVHG XQQHFHVVDU ± 0HFKDQLFDO LQWHUORFNLQJ RI HOHFWULFDO ± (DUWKLQJ RI VZLWFKJH DU FLUFXLW ERDUGV D ± 7UDLQLQJ RI RSHUDWLRQDO VWDII ± /RFXW RLOVLRQ SURFHGXUHV
	9HKLFOH FROOLVLF RQ\LVH LQIUDVWU	± 9HKLFOH PRYHPP WKHFLQLW\ RI S ± 9HKLFOH LP SDFW LQIUDVWUXFWXU	± 3HUVRQDO IDWDOLW\ ± \$VVHW 'DPI	1R	± 3UHSDUH WUDIILF PDQDJHPPHQW SODQV LQFOX IRU FRQVWUXFWLRQ DQG RSHUDWLRQ ± ,PSOHPPHQWHSBHHBOLPLWV ± 3URYLGH GHVLJQDWHG SHGHVWULDQ DUHDV IR ± 'ULYHU FRPSHWHQF\ ± ,QVWDOODWLRQ RI EROODUGVLSNRDUHFWL YHV ES

+ D] D U G V H V V P H Q W

+ D] D V G H Q D U L R V

7KH NH\ KD]DUGV7DEOH QW DM H P L Q D W H R R Q W B U X H Q E V W D H Q G E O H O E Z H
D V V H V V W K H S U L P D U \ K D] D U G I R U % (6 6 L V W K M H B D E A B X E Q D B K D Z K J L R Q J L V F R D
R U R Y H U K H D W L Q J D L Q G F R Q Q V D H Q D G U W R

- ±) L U H
- ± 7 R [L F J D V H [S R V X U H
- ± % D W W H U \ H [S O R V L R Q

\$ G G L W L R Q D O O \ W W H U D Q V L R D P U L L R M F O S R L R Q J I W K H 9 W U D Q W 9 R U (B B U

& R Q V H T X M Q U H V K R O G V

5 L V N D V V H V V P H Q W F R Q V H T X H Q F H W K U H V K R O G V V H U Y H D V W K H F U L W H U
K D] D U G R X V F K H P L F D O I D F L O L W L H V R Q K X P D Q K H D O W K V D I H W \ D Q G W K
6 W D W H & R G H D Q G V S H F L I Z E D O O \ D G G U H V V W K H I R O O R

- ± ([S R V X U H W R 7 K H U P D O 5 D G L D W L R Q 7 K L V U H O D W H V W R W K H H I I H F W V
- ± ([S R V X U H W R ' D Q J H U R X V ' R V H V R I + D] D U G R X V & K H P L F D O V 7 K H V H G R
([S R V X U H * X L G H O L Q H V / H Y H O \$ (* /
- ± ([S R V X U H W R 2 Y H U S U H V V X U H 7 K L V S H U W D L Q V W R W K H H I I H F W V R I D

(D F K O D Q G X V H R U O D Q G X V H] R Q H K D V V S H F L I L F S H U I R U P D Q F H R X W F R
W K U H V K R O G V 7 K H S X U S R V H L V W R H Q V X U H W K D W W K H K D] D U G R X V F K H
U H D V R Q D E O \ S U D F W L F D E O H F W L Q K X P D Q K H U D O W K D W S U R W M H D Q G W K W H E X L O
U L W N

7 K H U P D O 5 D G L D W L R Q F R Q V H T X H Q F H W K U H V K R O G V

6 H F W L R Q R I K W 3 O D Q Q L Q J * X L G H O L Q H 4 X H H Q V H T X H Q G H W D W D W & W K H D U H D V
I D F L O L W \ E R X Q G D U \ V K D O O Q R W E H H [S R V H G W H F K H S D W L Q D G X D W L D Q H [D
V K R X O G Q R W H [F H H S V S H U : 7 D E O H L Q 6 W D W H & R G H W K H V H W K H U P D O
W K H I R O O R Z L Q J S R Q V H T X H Q F H Q

7 D E O H 7 K H U P D O 5 D G L D W L R Q & R Q V H T X H Q F H 7 K U H V K R O G V

+ H D W D G L D V N : P	(I I H F W
	± : L O O F D X V H S D V F R Q G V D Q G L Q M X U \ D I W H U V H F R Q G M U E X U Q V Z L O O R F F X U
	± 6 L J Q L I L F D Q W F K D Q F H R I I D W D O L W \ I R U H [W H Q G H G H [S R V ± & D X V H V W K H W H P S H U D W X U H R I Z R R G W R U L V H W R D S R L O R Q J H [S R V X U H ± 7 K L Q V W H H O Z L W K L Q V X O D W L R Q R Q W K H V L G H D Z D \ I U R P H Q R X J K W R F D X V H V W U X F W X U D O I D L O X U H
	± / L N H O \ I D W D O L W Q G H R U H [S R V X U H D Q G F K D Q F H R I I D W D O L W ± 6 S R Q W D Q H R X V L J Q L W L R Q R I Z R R G D I W H U O R Q J H [S R V X U H ± 8 Q S U R W H F W H G V W H H O Z L O O U H D F K W K H U P D O V W U H V V W ± 3 U H V V X U H Y H V V H O H Q L R E M I O L F X U H Z R X O G R F F X U

7R [LJB V O R X R Q V H T X W Q F H K R O G V

'HSHQGLQJ RQ WKH FRQFHQWUDWLRQ WKH QDWXUH RI WKH PDWHULD
UHVSLUDWRU\ WUDFW OXQJV VNLQ RU LQJHVWLRQ WKH HIIHFWV RI V
OXQJV DQG UHVSLUDWRU\ WUDFW OXQJV VNLQ RU LQJHVWLRQ WKH HIIHFWV RI V
WKURXJK WR D QXLVDQFH HIIHFW (IIHFWV FDQ DOVR EH FODVVLILHG D
6HFWLRQ 3ODQQLQJ *KWDWOLQJHHTXLUHV WKDW D TXDQWLWDWLYH DVV
FRQVHTXHQFHV H J GLVSHUVLRQ PRGHOOHQJ RI D WR[LFXPH LV X
GDQJHURXV GRVH WR KXPDQ KHDOWK ,W UHTXLGHV WKDW WKH GLVWD
\$(* /V DUH GHILQHGV DV IROORZV

- ± \$(* / 1RWDEOH GLVFRPIRUW LUULWDWLRQVRIU\FHIIHFWV D RZSWHRP
HIIHFWV DUH QRW GLVDEOLQJ DQG DUH WUDQVLHQW DQG UHYHUVLEO
- ± \$(* / ,UHYHUVLEOH RU RWKHU VHULRXV DGYHUVH KHDOWK HIIHFWV
- ± \$(* / /LIH WKUHDWHQLQJ KHDOWK HIIHFWV RU GHDWK

7KLV VWXG\ ZLOO FDOFXODWH WKH FROSHQWUDQGRQWDRQFHWRDWF\$(*HP
EDWWHU\ RII JDV FRPSRVLWLRQ ZKLFKLVGLWEQVHCHLZLWKFWWRQU LF
ZKHUH 6WDWH &RGH UHTXLUH WKH LPSDFWWRWKH OLPLWHQ *VRXQG/
/HYHOV IRU &2 +&O)+ DQGDEH DUH VKRZQ LQ

7DEOH \$(* /HYHOV IRU &2 +&O +) DQG +&1

1R	1DPH	6\PERO	\$(* / PLQ
	&DUERQ 0RQR[LGH	&2	SSP
	+ \GURJHQ &KORULGH	+& ,	SSP
	+ \GURJHQ &RULGH	+))	SSP
	+ \GURJHQ &DQLGH	+&1	SSP

2YHUSUHFRQVHTXWQFHKROGV

6HFWLRQ 3ODQQLQJ *KWDWOLQJHHTXLUHV WKDW WKH RYHUSUHVVXUH H
H[SORVLRQV H[SORVLYH UHDFWLRQV DQG VLPLODU PXVW EH HVWLPDWH
ERXQGDU\ DUH QRW H[SRVHG WR DQ RYHUSUHVVXUH JZKLFKHVKDQDQRV
H[FHHG N3D
6WDWH &RGH SURYLGHV WKH IROORZLQJ LQIRUPDWLRQ SURJHQRQJW
7DEOH

7DEOH 2YHUSUHVVXUH &RQVHTXHQFH 7KUHVKROGV

([SORVLRQ RYHUS		(IIHFW
N3D SVL		± JODVV EUHDNDJH
		± 1R IDWDOLW\ DQG YHU\ ORZ SUREDELOLW\ RI LQM
N3D SVL		± 'DPDJH WR LQWHUQDO SDUWLWLRQV DQG MRLQHU
		± 3UREDELOLW\ RI LQMXU\ LV 1R IDWDOLW\
N3D SVL		± +RXVH XQLQKDELWDEOH DQG EDGO\ FUDFNHG
N3D SVL		± 5HLQIRUFHG VWUXFWXUHV GLVWRUW
		± 6WRUDJH WDQNV IDLO
		± FKDQFH RI IDWDOLW\ WR D SHUVRQ LQ D EXLO

0RGHOOLQJ VRIWZDUH

7KH FRQVHTXHQFIHUPRGHOOLQJDUGV H[FHSW EDDWWSHUWFKHBDXVUXQDZWD
9HULWDV3U'EHVV +DJDUG \$QDO\B+\$679HWZD BQ 7RRO
3+\$67 LV UHFRJQLJHG DV WKH LQG XVWU\ VWDQGDUG IRU SURFHVV KDJD
H[SORVLRQ DQG WR[LF KDJDUGV ,W LV XVHG WKH VWHFVWHIURQGHRWW
FRQWDLQPHQW VFHQDULRV

,QSXW GDWD DQG DVVXPSWLRQV

*HQHUDO DVVXPSWLRQV

7KH JHQHUDO DVVXPSWLRQV DQG LQSXWVDEOHWKHPVCKDVB+\$67KREZQV
FRQVBDGRMHFWSDEHDF WRSRJUDSKI\ WKHUHIRUH DOO KHLJKWV DUH PHD

7DEOH *HQHUDO PRGHO DVVXPSWLRQV DQG LQSXWV

3DUDPHWHU	,QSXWV GHVFULSWLRQ
5HOHDVH ORFD	\$OO UHOHDVHV DUH DVVXPHG WR EH RXWGRRU UHOHDV
7HUUDLQ	)ODW WHUUDLQ
\$PELHQW WHPS	f&\$YHUDJH PD[LPP WHPSHUDWXUH DW WKH FORVHVW
6XUIDFH WHPS	f & \$YHUDJH PD[LPP WHPSHUDWXUH DW WKH FORVHV
5HODWLYH +XP	
6XUIDFH URXJK	P 5HSUHVHQWLQJ UHJXODU ODUJH REVWDFOH FRYHUDJH 7KH VXUIDFH URXJKQHV RI XSZLQG WHUUDLQ DIIHFWV UHOHDVH

4XHHQVODQG 6WDWHT&RGHHV WKDW FRQVHTXHQFH PRGHOOLQJ VKRXOG
ZHDWKHU FRQGLWLRQV DQG GHWHUPLQH WKRVH WKDW UHVXOWV LQ WK
7KH FORVHVW ZHDWSDURMHFWLQFWRHGLQ .RJDQ +RZHYHU WKH ZHDV
WKLV VWDWLRQ LV OLPLWHG \$V D UHVXOW WKH %XUHD RI OHWHRURC
ZLQG VWDWLRQ ZKLFK LV 'DOE\ \$LUSRUW 7KHGRUH'DOEL\$GUSRUHFWV
)LJXUDIQ)LJXUIRU WKH DP DQG SP UHFRUGHG ZLQG VSHHG UHVSHFWLY

)LJXUH 'DOE\ \$LUSRUW :LQG 5RVH DP

)LJXUH 'DOE\ \$LUSRUW :LQG 5RVH SP

*+' _4XHHQVODQG %(66 3W\ _4XHHQVODQ

8VLQJ WKH 'DOE\ \$LUSRUZH ZW WKH FRQGLWLRQV UHMHFOR DNDYHQ
EHHQ HVWLQDEOHGVLQ3DWKXLOO VWDELOLW\FKHPRQO\ XVHG WR GHV
WKH DPRXQW RI WXUEXOHQFH LQ WKH DWPRVSKHUH IRU FRQVHTXHQFH
7DEOH 3DVTXHDWKHU VWDELOLW\ FODVV GHILQLWLRQV

&ODVV	7\SH	'HVFULSWLRQV
\$	8QVWDEOH	'D\ WLPHXQQ\ OLJKW ZLQGV
%	8QVWDEOH	'D\ WLPHRGHUDWHQ\ OLJKW WR PRGHUDWH ZLQGV
&	8QVWDEOH	'D\ WLPHRGHUDWH ZLQGV RYHUFDVW RU ZLQG\ DQ
'	1HXWUDO	'D\ WLPHZLQG\ DQG RYHUFDVW 1LJKW \ZLQ\
(	6WDEOH	1LJKW \PRGHUDWH ZLQGV ZLWK OLWWOH FORXG
)	6WDEOH	1LJKW \OLJKW ZLQG OLWWOH FORXG

7KH ZHDWKHU FODVVLILFDWLRQV XVHG LQWKH LGHSHUHVHQWDDHU\SRJRI
FRQGLWLRQV WKDW FRXOG EH H[SHULHQFHG DW WKH VHOHFWHG VLWH
7DEOH 0RGHOHDKWKHU FRQGLWLRQV

:HDWKHU FRQGLWLRQV	6WDELOLW\ FODVV	\$YHUDJH ZLQG VSHHG
&DWHJRUI)	)	
&DWHJRUI \$	\$ %	
&DWHJRUI '	'	

7KHUPDO UDGLDWLRQ

7KH UDGLDWLRQ FRQVHTXHQFHV RGHWWKDNQDOLQXQD%06ZLIQH EHQ ZKLF
HQWLUH %(66 XQLW LV DVVXPHG WKH XQPHUWRVSRFXVWLQWHYDMRZRUJW
VLWH FRQVHTXHQFHV DQG KHOSV WR LGHQWL\ VSHFLILF VHSDUDWLRQ
HTXLSPHQW
7KH DVVXPSWLRYHG IRU FRQVHTXHQFH FDOODJLQVFRQV6RQDWWHOLVWHG
LQDEOH

7DEOH 7KHUPDO UDGLDWLRQ FRQVHTXHQFH DVVXPSWLRQV

3DUDPHWHU	9DOX	8QLW	&RPPHQW
6XUURXQGLQJ DLU		f &	\$YHUDJH DLU WHPSHUDWXUH
\$VVXPHG DYHUDJH VXUIDFH WHPSHUI WKHUPDO UXQDZD		f &	7ULJJHU WHPSHUDWXUH IRU WKHUPDO 7KH LQGLYLGXDO FHO\&V PD\ H[FHHG f& LV PHOWLQJ SRLQW DGDORFLQLYD DVVXPHG WR EH HTXDO WR WKH H[WHU
1XPEHU RI 7HVOD XQLWV RQ ILUH			6HSDUDWLRQ GWDNQRWR EHHUHDWHU UHFRPPHQGHG VSDFLQJ SURYLGHG E\ 7 WR QHLJKERXULQJ 0HJDSDFN XQLWV
+HLJKW RI 7HVOD		P	+HLJKW RI D 7HVOD 03
/HQJWK RI 7HVOD		P	/HQJWK RI D 7HVOD 03

7KH GHWDLOHG FDOFXODWLRQ ERUWKHUHQVWDEOLPHEDLPS\$QQL[K\$VL
LV WKH RQQ\ VFHQDULR WKLQJZ+\$6QRW PRGHOOHG

7R[LF JDV H[SRVXUH

(RU WKH PR)VE DSDWWDUHLQHRW VLRQUMRFDEWGDQ D FRPSDUEXWOWSHOHVW
 WKH SRWHQWLDO IRU ORZ FRQFHQWUDWLRQ\$ WILPROHFRBSRVLXWJEDQVHIV
 IUR/P3EDWWHUUAOLUWDEGHLQ 7KLV FRPSDOWLEHLRQDIRVUXVHKGODJDSDFN
 ;/DV LW FR)QEDWQHOOV

7DEOH 2II JDV FRPSRVLWLRQ IURP WKHURDGSRXVSKZEDWFWHULLWKLXP

&KHPLFDOPXOD	1DPH	LQWR[RFIJDV
&2	&DUERQ 'LR[LGH	
&2	&DUERQ 0RQR[LGH	
&+	0HWKDQH	
&+	(WKDQH	
&+	(WK\OHQH	
&+	3URSDQH	
+&O	+\GURJHQ &KORULGH	
+))	+\GURJHQ)OXRULGH	
+&1	+\GURJHQ &\DQLGH	
&+	%HQ]HQH	
&+	7ROXHQH	
&+2+	(WKDQRO	
&+2+	0HWKDQRO	
7RWDO		
\$YHUDJH 0ROHFXODU :HLJKW		

7KMRWBDF JDV FRQFHQWBBDWJRQKLV VXP RI WKH&2WR[&G F)PDSRQH+QWV
:KLOH EHQ]HQH DQG WROXHQH DUH DQV R WKR DUT HJ WK HOLRZ \$ P QVH QH W L D W L
VR KLV WKDW WKH\ KDYH QRW EHHQ FRQVLGHUHG LQ WKLV DQDO\VLV

*D VGLVSHUVLRQ LFD Ø 7 H G D W R F C H W H U P L Q H W K H D P R X Q W R I J D V F R P L Q J I I
7 K H ' 1 9 * / 7 H F K Q L F D Q 5 H L F H Q % Q D F W H I R W \ / (L S O R V L R Q 5 L V N \$ Q F Y) L G H V 6 X S S U
U H I H U H Q F H I R U W \ S L F D Q U H O H D V H U D W H V D Q G J D V F R Q G L W L R Q V X V H G
, Q D G G L W L F R Q S R V W K L I R Q Y I H H Q S X W V D Q G D V E X P S M L R Q V H L Q I R U W K H W
J D V H \ S R V X U H F R Q V H T X H Q F H P R G H O O L Q J

7DEOH 7R[LF JDV FRQVHTXHQFH DVVXPSWLRQV

3DUDPHWHU	9DOX	8QLW	&RPPHQW
2II JDV JHQUHDWL		NJ V	0D[LPXP UHOHDVH UDW H W\SLFDOO\ EHLQJ XVHGLDKWVVRJHQHUDWKLHQHURW ZRUDWHVFHQDULR
7RWDO WLPH		V	KRXU PD[LPXP
,QYHQWRU\		NJ	,QYHQWRU\ *HQHUDWLRQ UDW H [WRW

,W LV H[SHFWHG WKDW WKH WUDQVIRUPHU SRRO ILUH DVVXPSWLRQV
FRPSRVLW&DQVM IOXLGV LV FRPSOH[DQG YDULHV GHSHQGLQJ RQ WKH
FKHPLFDO FRPSRVLWLRQZDWHFQ&WGDDYVLWDDEVSRLQDW &RGHFDQWK& IOX
WKH PRGHOOLQJ\$XWV DQG DVVXPSWLRQVHLQIRU WKH WUDQVIRUPHU SRRO
PRGHOOLQJ

7DEOH % (667UDQVIRUPHU SRRO ILUH DVVXPSWLRQV

3DUDPHWHU	9DOXH	8QLW	&RPPHQW
%XQG HD		P	%XQG ZLGWK [EXQG OHQJWK
%XQG :LGWK		P	7UDQVIRUPHU 6SH%LILFDW&SRHQGL[%
%XQG OHQJWK		P	7UDQVIRUPHU 6SH%LILFDW&SRHQGL[%
%XQG KHLJKW		P	7UDQVIRUPHU 6SH%LILFDW&SRHQGL[%
3RRO)LUH 'LDP		P	%DVHG RQ WKH HTXLYDOHQWHLQDPMKH GLDPHWHU RI D FLUFOH ZLWK WKH VD
0DWHULDO	'RGHFD	& +	\$.FODVV IOXLG FRXOGQDWH&LFDOMHOQ GRGHFDQDHEHHQ XVHG DV LMDMDRID&RE N- J
7UDQVIRUPHU	PHQX	/	7UDQVIRUPHU 6SH%LILFDW&SRHQGL[%

5HVXOWV

7KHUPDO UDGLDWLRQ

\$ VXPPDU\ RDWKH&DMMGDGLDWLRQRFRQVHTWK&ERDO UXQDZD\ RI DOO W
%(66 XQLW&URYLGECHQWDLW&LDFXOD&SLRYQL&SRHQGL[\$

7DEOH 6XPPDU\ RI KHDW UDGLDWLRQ FRQVHTXHGFHV

5HOHDVH 6FHQDU	0D[LPPX 'LVWDQFH 'RZQZLQG RI 5HOHDVH WR +HDW 5		
	N: P KHDW UDGLDW WKDW FDQ FDX	N: P KHDW UDGLDW WKDW FDQ FDX	N: P KHDW UDGLDWLRQ OHY FDXVH SURSHUW\ GD
6LQJEDHWWRQWDL WKHUPDO UXQDZ	P	P	1RW UHDFKHG 0D[LPPX WKHUPDO U P LV N: P

7KHVH UHVXOWVWLKH&HVVWQVHWRWKDW R&FW&SLH&OD&QJHQRVWKHUPDO UD
IURP D EDWWHU\ XQLW DV WKH UDGLDW&XWQLGHYR&V&H&UD&LW&QU&D&F&W&D
EHWZHHQXQLWFRPSO\ ZLWK \$6 DQG DUH HTXDO WR RU JUHDWHU WK
E\7HV&DLV V&R&QL&H&FDODWLRLQ WR QHLJKERXULQJ 0HJDSDFN XQLWV

7R[LF JDV H[SRVXUH

,I D)3EDWWHU\ JRHV LQWR WKHUPDO UXQDZDVWKHQWRS[DR&D&G&G&D&P&PD
7DEOH7KLDVVHVPHQWRQV&R&H&EOH FRQVHTXHQ&R&V&R&LF FKHP&F&H&U&D&Q&C
UHOH\$DQWFRQFHQWUD&R&Q&WLRLQKH WR[LF GLVSHUVLRQJUDSKV VKRZL
DQG GLVWDQFH&R&Z&L&Q&+&R&D&Q&+&M&R&Z&L&Q&H&L&J&X&U&H&L&J&X&U&H&Q&G
)LJXUH&H&V&S&H&F&W&L&Y&H&O\



)LJXUH 'LVSHUVLRQ SURMHLIRU



)LJXUH 'LVSHUVLRQ SURMHLIRU +



)LJXUH 'LVSHUVLRQ SURILQH IRU



)LJXUH 'LVSHUVLRQ SURILQH IRU +&1 WR

7KH UHVXOWV LQGLFDWH WKH PD[LQXP GLVWDQFH GRZQVUHDP RI WKH
DERYH WKH \$HYHO 7KLV DEOH GRZQ LQ

&KHFD O	\$(* / PLQ	0D[LPXP 'LVWDQFH 'RZQZLQG P
&2	SSP	P IURP(66 YHQW RWXOHDVE RYHIL J K WRXIWOHQW
+&O	SSP	P IURP(66 YHQW RWXOHDVE RYHIL J K WRXIWOHQW
+))	SSP	P IURP(66 YHQW RWXOHDVE RYHIL J K WRXIWOHQW
+&1	SSP	P IURP(66 YHQW RWXOHDVE RYHIL J K WRXIWOHQW

SOWKRXJK LW LV QRW DQWLFVLSDM HFB QWHTW HMQFHVH HZPDDJBR FRIMHUYLFI
FRQWDLQH EUHDWKLQJ DSSDUDWXV LI HQWHULQJ WKH XQLW RU EHLQ

```
7KH H[SORVLRQ RYHUSUHVXUHV RHQDFDQWIGRQWDLQQLGLZQWRK WKH %(6
DUH FDOFXODWHG XVLQJ WKH 717 H[SORQLWQRQRBHQKQFHDQDGHV
RFFXUV WKHQ WKH H[SORVLRQ RYHUSUHVXUHV JHQHUDWHG LV VXPPDU
```

5HOHDVH 6FHQDUL	'LVWDQFH IURP % (66WRFHQWDERQHBU DOO WRKUHOOHRS			
	N3D	E	N3D	E
6WRUQDM\WHU\ H[S	P		P	

* + ' 4XHHOVODOG %(66 3W\ /4XGHHOVODO



)LJXUH %DWWHU\ VWRUDLPS FSW RQRQ ID FLDHFWHJZHQWKHU '



)LJXUH %DWWHU\ MVRUDLPS FSW RQRQ ID FLDHFWHJZHQWKHU



)LJXUH %DWWHU\ VWRUDJHSDFWRLWQH MKEFWBZHQYKHU ' ,W PXVW EH DQWRIGWKKDW(66 FRQWDLQHUV FWRKGRYHSRGNVDQGRKQW RFFXU DQRZKHWHSHQGLQJ RQ ZKLFK %(66 FRQWDLQURBQSDQGHV)LJXUHDQGXUHDUHSUHVHQWDWLRHODXFWWLBQWKWKH GILHHFWHQMRUFHQD RQLWHUVLWHULVN DQG LPSDFW RQ WKH VXEVDWLRQ 7KH N3D RYHUSUHVXUH FRQVHTXHGFH JRQH LEQULFDWVHCHZHQWVWX ZKHUH D VWRUDJH WDN FRXOG SRWHQWLDODIDLO DYMOMKUIHLHG E\ FRQWLQXHG DYDLODELOLW\ RI ILUDODZDWHUGXULRUJDQWFBQWKQXOG P IURP DQ\ %(66 XQLWV \$GGLWLRQDOO\ WKHUHFLUDHODSRJHGLSUHFWBQGRHQGINFDWHG E\ WKH FLUFOH DW :KLOHDWKLVSUHVXUH OHYHO LV XQOLNHO\ WR FDXVH GLU JODVV EUHDNDJH ZLWKLQ WKLV JRQH 7KHUHIRUH WR PHHW WKH 6WDWH &RGH RYHUSUHVXUH FRQVHTXHQ DW OHDVW P LQ DQ\ GLUHFWRURQHUPRXDHO %RQHFRQWDLQGLQJ WKH IRRWBRQV DUL HQVXUHV FRLVWDQEB ZLWK

% (66WDQVIRUPHU SRRO ILUH

\$ VXPPDU\ RDWFKHDDWGDGLDWLRQFRQVHTXHQHV LV SURYLGHG LQ 7DEOH 7UDQVIRUPRQKHDW UDGLDWLRQ GLVWDQFHV

5HOHDVH 6FHQDU	0D[LPXP 'LVWDQFH 'RZQZLQG RI 5HOHDVH WR +HDW 5		
	N: P KHDW UDGLDWLF FDQ FDXVH LQMX	N: P KHDW UDGLDWLF FDQ FDXVH IDWD	N: P KHDW UDGLDWLRQ FDQ FDXVH SURS GDPDJH
6LQJEDHWFRQWDLQ WKHUPDO UXQDZ ,	P	P	P

% (6 6 7 U D Q V I R U P H U I S H R I R J O V L G U I S

RO WKH DODOLVLY I W I

HTXHOEH VIRDEFOM (RWHU



7UDOVIRUPHU SURHSO HILVHIO WDFV

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* + ' 4XHHOVODOG %(66 3W\ /4XGHHOVODOC
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)LJXUH 7UDQVIRUPHU SRHSDUHLVUHQWDFWVYHIZBULPBDFWV WR HDGHEW HXQDVKLIQ ' ,



)LJXUH 7UDQVIRUPHU SRHSDUHLVUHQWDFWVYHIZBULPBDFWV WRIRHFKWVYHNDWLRIQU

,W PXVW EH QRWHDG WIDBNDWRIRQV FRXOG RFFXU DQ\ZKHUH ZLWKLQ WKH
VKRZQ)RQXUH)LJXUHDQGXUHDUHSUHVHQWDWLH WREBWLRIQIHUHQW VFH
7KBURMHFWQDONGHPVDEXUIIRUURXQ% (WKHRRVZSUEQWQWKDQVWVKHUPDO
UDGLDWRDSQWHQWDDQIRZRXGBLERHQWDLQH SURMFXQGVDKHW DOLJQV ZLW
WKH UHTXLUHPHQW3OBQVDDQHSHHQWVHDQG 6WDVZKL&RGHDQGDWHV WKD
3URMHFW PXVW QRW SRVH DQ\ XQDFFHSWDEOH RIIVLWH ULVN WR SXEON

5HFRPPHQGDWLRQV

0DQDJHPPHQW RI KDJDUGV

)ROORZLQJ WKH KDJDUG LQGHQWLKLFUDWLRQ FRQVWUXFWLRQ WKDW VKRXOG EH
KDJDUGV LQ OLQH ZLWK WKH UHOHYDWHV DQWDFUDWLRQV LQ OUPH WKH GHV
NH\ KDJDUGV PDERFUDWLRQ HRDQGVH LQSDUWV LQGHQWLQV UHFRPPHQGHG WKH
WKHFRQWUROFSDOPHQWVWKWRLSHUHQWQHQBQDFRFLFXULQJ

&RQVWUXFWLRQ DQG RSHUDWLRQDO PD

7KH FRQVWUXFWLRQ DQG RSHUDWLRQDO PDQDJHPPHQW SURFHVVHV VKR
3URMHFRQVWUXFWLRQ DQG RU LQVWDOODWLRQ DQG RU RSHUDWLRQ R
VLWXDWLRQV RU UHVXOW LQ KDJDUGV LQVWDOODWLRQV LQGHQWLQV UHFRPPHQGHG WKH
SRWHQW DQDQW WKH FRQWURO PHDVXUHV UHTXLUH WR PLWLJDWH ULV
GXULQJ HDFK SKDVH

7KH PDQDJHPPHQW SURFHVVHV VKRXOG SURGXFH D ULVN UHJLVWHU ZK
UHJXODUO\ UHYLHZHG GXULQJ HDFK SKDVH \$Q\ LQIRUPDWLRQ FRQVLGH
FDUULHG IRUZDUG LQ WKHQDWLRQJRVWKHFRQWURO PHDVXUHV LGHQV
DVVHVVPHQW SURFHVV VKRXOG XVH DSSURSULDWH GRFXPHQDWLRQV
HQYLURQPHQWDO PDQDJHPPHQW SODQV VXSSODVHG E\ VSHFLILF PDQDJ

&KHPLFDO DQG VSLOO PDQDJHPPHQW

,I FKHPLFDOV DUHWKHFRQWUROVFRQVWUXFWLRQ DQG IRU PDLQWHQD
EH VWRUHG LQ DFFRUGDQFH ZLWK \$XHHQVODQG&RQVWUXFWLRQ 0DQDJ
KDJDUGRXV FKHPLFDOV\,LQWKHFRQWUROVFRQVWUXFWLRQ WKDW HDFK FKHPLFDO KDY
VHSDUDWLRQ ZKHUHQHFRQVWUXFWLRQVFRQVWUXFWLRQV LQGHQWLQV UHFRPPHQGHG WKH
VHU\LFHV UHTXLUH DFFHVV WR WKH VDIHW\ GDWD RQHWHUJLVWHU R
\$GGLWLRQDOO\ DSSURSULDWHFRQVWUXFWLRQVFRQVWUXFWLRQV IRU WKH KDQ
FKHPLFDOV\XGLQJ WUDQVIHU VWRUHQVFRQVWUXFWLRQV SUHYHQWLRQ

%DWWHU\ PDQDJHPPHQW

,WV UHFRPPHQGHG WKDW D EDWWHU\ PDQDJHPPHQW SODQ EH GHYHORSH
NH\ EDWWHU\ VDIHW\ UHTXLUPHQWV

± 6WRUDJH DQG ,QVWDOODWLRQ %DWWHULHV VKRXOG EH VWRUHG DV
TXDOLILHG SHUVRQQHO

± &HUWLILFDWLRQ DQG &RPSOLDQFH (QVXUHQ,EDWWHULHVQDQGH
RWKHU UHOHYDWHVWKVWDQGDUGV

± 8/ \$ 7HVW 0HWKRG IRU (YDOXDWLQJ 7KHUPDO 5XQDZD\)LUH 3U
6WRUDJH 6\VWHPV

± \$6 ,(& 6WDQG DHERQDULRQVFRQVWUXFWLRQV DQG EDWWHULHV IRU XVH
DSSOLFDWLRQV

± 8/ \$GGUHWLWLRQDQDQWVWUXFWLRQVWKHLU DELOLW\ WR RSHU
DQG DEQRUPDO FRQGLWLRQV UHODWHG WR HOHFWULFDO PHFKDQLF

± 1)3\$)RFXVHV LQVWDOODWLRQ RI VWDWLRQDU\ HQHUJ\ VWRUDJH
DQG H[SORVLRQ KDJDUGV DVVRFLDWHG ZLWK EDWWHU\ V\VWHPV VX

EDWWHU\ HQHUJ\ VWRUDLJ\$SV\VW\$PVL% (66 VWULQJHQW OLPLWV IRU F
VHSDUDWLRQ GLVWDQFHV WR FRQWURO WKHVH KDJDUGV
± 6DIHW\ 0HQDQXWDOO SURWHFWLYH EDUULHUV PDLQWDLQ VDIH GLVWD
SURWHFWLRQV DQG FLUFXLW FRQWUROV
± 7KH ORFDWLRQ RI WKH %(66 VKRXOG EH DW OHDVW WRUHQPVWKH FR
WKDW SRWHQWLDO UDGLDQW KHDW H[SRVXUH WR WKH SXEOLF UHPD
WKH VHFUXHG IHQFHG SHULPHWHU
± 6HSDUDWLRQ GLVWDQFHV EHWZHHQ EDWWHU\ FRQWDLQHUV VKRXOG
WKURXJK DSSURSULDWH WKHUPDO WHVWLQJ PRGHOOHQJ DQG FRPS
± &RPSOLDQFH ZLWK WKH HJXODWLRQ
± %DWWHU\ 0DQDJHPHQW 6\VWHP %06 0DQDJH WKH EDWWHULHV¶ VW
± 0DLQWHQDQFH DQG ,QVSHFWLRQ 5HJXODU LQVSHFWLRQ DQG PDLQW
DVVRFLDWHG HTXLSPHQW
± (PHUJHQF\ 5HVSQRVH 3SDQW, RFFOXGQQSODFH IRU GDPDJHG EDWWHUL
IROORZLQJ DFWLRQV
x ,PPGLDWHO\ UHPRYH D EDWWHU\ IURP VHUYLEH
x 0RYH WKH GDPDJHG EDWWHU\ WR DQ DUHD DZD\ IURP IODPPDEOH F
SUHVHQW \$ GDPDJHG EDWWHU\ VKRXOG DOVR EH PRQLWRUHJ DIW
OHDNDJH RI HOHFWURO\WH OHDNDJH RI FRRODQW RU VLJQV RI KH
x \$ EDWWHU\ HPHUJHQF\ UHVSQRVH SODQ WR EH HQDEOHG LQ WKH H
UHJXODUO\ UHYLHZHG RQGHQWLYHG ZLWK ORFDO HPHUJHQF\ VHU
x %HIRUH PRYLQJ D GDPDJHG EDWWHU\ ZDLW D SHULRG RI WLPH WR
EH DQ LQGLFDWLRQ WKDW D WKHUPDO UHDFWLRQ LV LQ SURJUHVV
x)ROORZ WKH PDQXIDFWXUHU¶V JXLGDQFH UHJDUGLQJ DOORZLQJ D
RQ LWV RZQ LQ D FRQWUROOHG DQG VDIH PDQQHU XVLQJ ZDWHU V
DGMDFHQW FRQWDLQHUV

& X P X O D W L N Y H

7KH FRQVHTXHQFH DQDO\VLV LQGLFDWLRQV WKH SLURFW RQGLWVH RSRQV
QRW UHWRLH YDOXHV RI WPSERLQH QMNDVLRQ SODQQHG GHYHORSPHQW
+RZHYHU WKHUH DUH RWKHU H[LVWLQJ IDFLOLWLHV XHHQV SBQG QWLDWH
VLWKDW PD\ LPSDFW RQ WKH SURSRWHQW LGTYHOISPHQV ZIFR DQDWLRQ
DVVRFLDWHG KIGURJHQ GHPRQVWUDWLRQ SODQW ORFDWLRQV DSQR[LPH
%DWVREDDWLRQ 3RWHQWLDOV LWWHW FRROG LQYROYH ILUH RU RYHUSUH
LPSDFWUWHFW DUHD RU KLQGHU DFFHWLRQ HPHUJHQF\ UHVSQRVH
&RQVLGHUDWLRQ RI WKHVH ULVN PXVW EH LQFRUSRUDWHG LQWR WKH
4XHHQVODQG HPHQVBBHQW

&RQFOXVLRQ

7KLV UHSRUW DGGUHV VHG DWK\HR KLD]WUHG HZQQMDWQNH% DWRSFHLQWUHSRUW
LQFOXGHVNDVFUHHQDQJHRU RXDQGRGLQWLDO KD]DUGRLGLDQWIGLZFDWKLWQH
FRQVWUXFWLRQ DQG% (RSHUDWLRQDORZHGKE\ D KD]DRUG WKRM MVRPH]QWGV W
KDYH LPSDFWV H[WHQJHHEHEDQG DWKH

7KH NH\ KD]DUG LGHQWLIFYHG EFWWKH\ WKHUPDHHUHQDQLZB\FLDWHG ZLWK
EDWWHU\ WKHUPDO UXQDZD\ DQG RQH DIRGLXURQDWRDQDQWLL\ ZKHUHL
DIIHFWV

± +HDW UDGLDWLRQ IURP EDMUPHUA ULXQDZDDXVHG E\ W

± 7R[LF JDU H[FDXVHEDWWHU\ WKHUPDO UXQDZD\

± %DWWHU\ H[SORVLRQ

± 7UDQVIRUPHU RLO SRRO ILUH

\$ FRPSUHKHQVLYH KD]DUG DVVHV VPHQW LQFOXGLQJ FRQVHTXHQFH PR
7KLV LQYROYHG TXDQWL\LQJ SRWHQWLDWRPSEDFWV DQKHDSVHHVOLIPQDQW
FRPSOLHV ZLWK WKH\UHWLW\H RSHQMV RIZLWK UHVSHFW WR QRW FDXVLQ
WKH SXEOLFH RSHUDWLRQDO ULNVN LQFOXGH WKH SRVVLEOLHFWWRDULH
UXUDO ORFDWLRQ VXJJHVWV D ORZ OLNHOLKRRG RI KDUP IURP VXFK LO

,W LV UHFRPPHQGHG WKDW PDQDJHFDQQWRSURFHGRQDMEEDQGO LXUWHGHUQ
GLVFXVVHG LQDQHWLW\EDSSURSULDWWHFLGHUQW\HFBQDUL\$Q\ RFFXUULQ
FKDQJHV WRVWQHWDWDLPSDFSWLWQHJHGHKDWUHSRUW VKRXOG UHVXO
WKH UHSRUW DQG XSGDWH DV UHTXLUH

5 H I H U H Q F H V

3ODQQQLQJ \$FWH HQVODQG *RSHHQHQWFXUUHQW IURP \$XJXVW WR
2FWREHU

6WDWH RI 4XHRQMO+HDG WK DQG 6DOWKXSHQWODQG *RYHUQPHQW
:HVWHUQ 'RZQV 5HJLRQDOW&RXQ'RLZQV 5HJLRQDO &RXQSLGODQQLQJ
:RUNSODFH +HDOWK DQG 6DOWKXSHQWODQG *RYHUQPHQW
IDFLOOLWLXVHQVODQG *RYHUQPHQW

'HSDUWPHQW RI 6WDWH 'HYHORSPHQW ,QIUDVWUXFWXUDWH HFFDOWR BDB
)DFLO±*XKLG VQFH IRU /RFDO *R4XH HUPH QDQGV* RYHUPHQW

6WDWH RI 4XH(00170DQGD0 6D&XWUSHQW DV DW \$XJXVW

² (OHFWULFDO 6DIH&XU5HHJQVDDWLPRQ 6HSWHPEHU

7HVQOGXVWULDRQ/LWDLWPHU\ (PHUJHQF\ 5HVSQRVH *XLGH IRU 7HVOD ,
LQFOXGLQJ 0HJDSDFN DQGS3SZHUSDFN

7HVOD 0R7WROD 3RZHUSDFN)LUH &RGH)\$4 S S 5HY

```
%DWWHU\ 8Q18HDV6W\HW\ &RQFHBRQV>ZLOCKLQH@ >&LWHG )HEUXDU
KWWSV EDWWHU\XQLYHDVDDWFMFQPHDLOQLFQH EX
```

```

6DXHU6HFRQGDU\ %/DMD$FUGHA VVQFFVORSHGLD RI (OHFWURFKHPLFDO
V O(OVHYLDU          SS  SS

```

```
$ ' WKHUPDO UXQDZD\ SURSDJDWLRQ PRGHO IRU D; OPHUJH IRU XPDW O
2X\DQJ - /L DQGO;(QHUI\ SS SS
```

)0 \$SSUR7H0QVIRUPHUV DQG 7UDQVIRUPHU)OXLGV >2QOLQH@
 KWWSV ZZZ IPDSSURYD0FH0RPLS0R0X0M0M IOLD0R0D0D0H0 HGV
 HTXLSPHQW WUDQVIRUPHU

```
.LWFKHQLF&WRULD V $%&'()*+,-./:;<=>?@ABCD EFGHIJ KLMNOPQRSTU VWX YZ [ \ ] ^ _ ` { | } ~ > & L W H G
@ KWWSV ZZZ HQUHJ\FRXQ\PSYERWFEKEDQNDCHV LV KRW
```

```
*8,'(/,1(6 )25 /,0,7,1* (;32685( 729$50(1* (/(&75,& 0$*1(7,& $1'
(/(&7520$*1(7,& ),(/'6 83 72 ,QWJHUQDWLRQDO &RP,PLQMLRQ SDGLRQWLR
3URWHFWLRO($/7+ 3+<6,&6 9RO
```

8,'(/,1(6)25 /,0,7,1 (;32685(729\$50(1* (/(&75,& \$1' 0\$*1(7,&),(/'6
+] 72 N+DWHUQDWLRQDO &RP,FLYLRLRQ RQG1DQ WLRQV3ORW/HFWLRQ
3+<6,&6 9RO

```
(FRV\VWHPV 0DQDJHPHQW %$XVKLU3W0DQDJHPHQW 3ODQ 4XHHQVODQG
53B%03B4XHHQVODQG%(66 BY
```

8QLWHG 6WDWHV (QYLURQPHQW DOWHUR (SRVWLROXSLGHQFLQH /HYHOV >
)HEUXDU\ @ KWWSV ZZZ HSD JRY DHJO

```
'19 &RQVHTXHQH $QDO\VLV 3+$67 6RIWZDUH >2QOLQH@ >&LWHG  
KWWSV ZZZ GQY FRP VRIWZDUH VHQBDSKDWSDXOWFRQVHTXHQH
```

* + ' _4XHHQVODQG %(66 3W\ _4XGHHQVODQ

%XUHDX RI 0HWHRU6XPPDU%RVWDWLWLVFV&IRUPDWHV\$LD\$BVWLVFV IRU
ORFDWLRQV >2QOLQH@ KWWS ZZZ ERP JRY DX

:RUNSODFH +HDOWK DQW DWHWRG4/' +DJDUGRXV FKHPLFDO IDFLOLV

)LVKHU (QJLQHMODQHJDSDFN)LUH 3URHFWLRQ (QJLQHHULQJ \$QDO

+LOO 'DOFLORQNHQ %DWWHU\ (QHUJ\ 6WRUDJH 6\VWHP (YHQW 7HFKQL
5HFRPPHQGVWL'RV (QHUJ\ ,QVLJKWV 86\$

'19*/ 7HFKQLFDO 5HIHQQ%DWRWV\([SORVLRQ 5LVN+DQGN)LURHUSSUHY
*/ \$6 0DULQWPH (QYLUQPHQW \$GYLVRU\ 5HY 5HSRUW 1R

+DOH\ DQG \$OGDFKUGQ&FRQVHTXHQH \$QDOEULR5H%DWWHU\ (QHUJ\ 6R
IRU ,QIOHQFHJR &DOLIRUQLD1R6\$PEHU 5HSRUW 1R

8/ 81'(5:5,7(56 /\$%25\$725,(67H&W 0HWKRG IRU (YDOXDWLQJ 7KHUPDO
3URSDJDWLRQ LQ %DWWHU\ (QHUJ\ 6WRUDJH 6\VWHPV

6WDQGDUGV \$XFRQDOLD FHOOV DQG EDWWHULHV FRQWDOQEQJBONDR
6DIHW\ UHTXLUPHQWV IRU VFRQGDUI\ OLWKLXP FHOOV DQ\$6E,DWWHUL

8QGHUZULWHUV /DERUD\$RULH%DWWHULHV IRU 8VH LQ 6WDWLRQDUI\ DO
\$\$SOLFOWLRQV

1\$7,21\$/),5(3527(&7,21 \$662&67DQGDUG IRU WKH ,QVWDOODWLRQ RI
6WRUDJH 6\VWHP\$

6WDQGDUGV \$XVWUDOLDQV DQG KLJK YROWDJH LQVW\$OODWLRQV H[

\$XVWUDOLDQ \$WDQGDQBFWULFDO LQVWDOODWLRQV VDIHW\ RI EDWW
FRQYHUVLRQ HTXLSPHQW

,QWHUQDWLRQDO (OHFWURW(HFKQLF&DWRQDUL(QHUJ\ 6WRUDJH 6\V
/LWKLXP %DWWHULSHVHTXLUPHQWV

8QGHUZULWHUV /DERUD\$WDQGDUG IRU 6DIHW\ RI (QHUJ\ 6WRUDJH 6\

)LVKHU (QJLQHHULQJ ,QF DQG (QHUJ\ \$DFMRU5BQ\$RQ%DWRW\)LUH
5HSRUW RI WHFKQLFDO ILQGLQJV

6DIH:RUN \$XVWUDOLDQ ZRUNSODFH H[SRVXUH VW(DQ\$DULGIZ DQG DO
1HZ \$GYLVRU\ 1RWDWLRQ 3URSRVDO ,PPHGLDWHO\ 'DQJHURXV WR
5HFRPPHQGLQEDKHGOZKUNSODFH H[SRVXUH VWDQGDQGDOLQQ QRYHWULPR
,6%1

([SHULPHQWDO \$QDO\VLV RI 7KHUPDO 5XQDZD\ 3UR\$D%DWWHULQ\5LRGXZ
* =KRQJ + /L & :DQV Q-RQQQDO RI (OHFWURFKHPLFDO 6RFLHW\

'HSDUWPHQW RI 3ODQDQGRXV3,QGXVWU\ 3ODQQLQ\$LSQY&VRWH\$D\$HUR
/DQG 8VH 6DIHW16:ODQQLQJ

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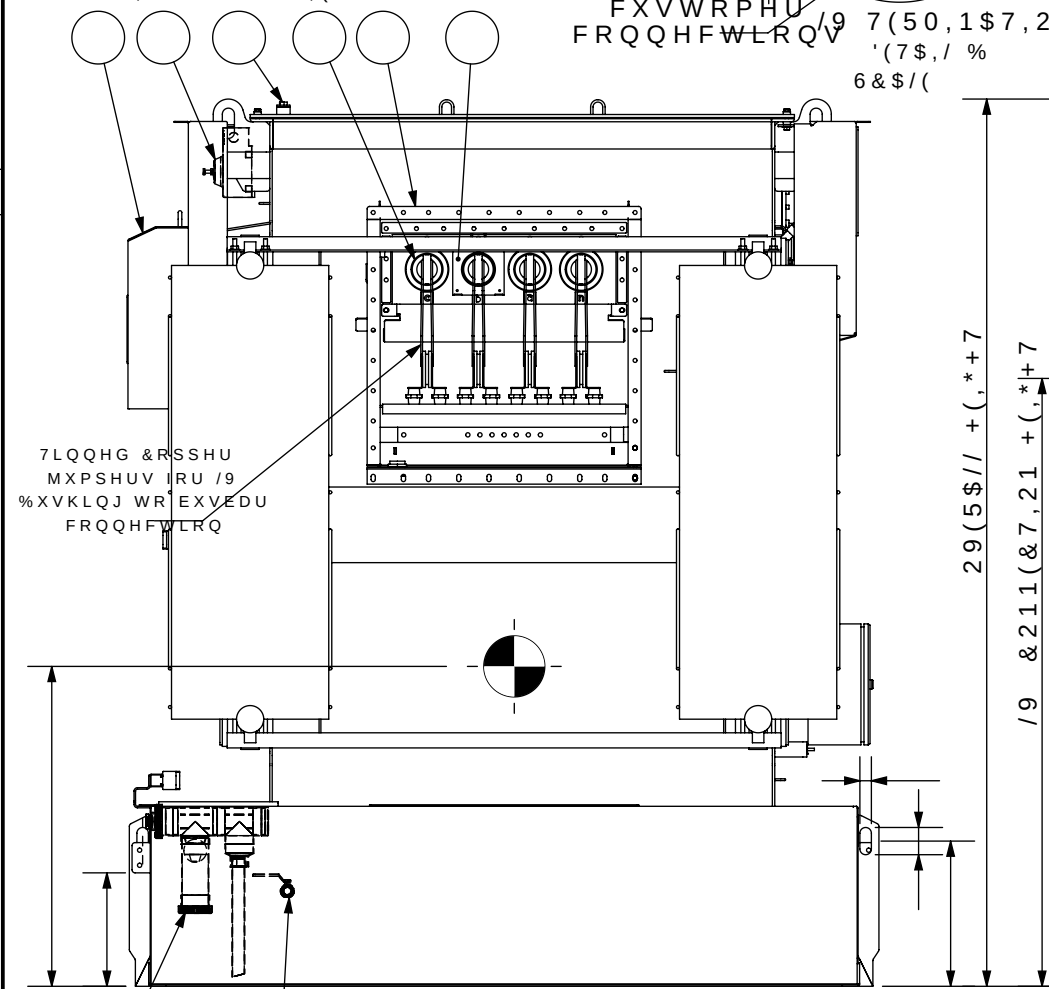
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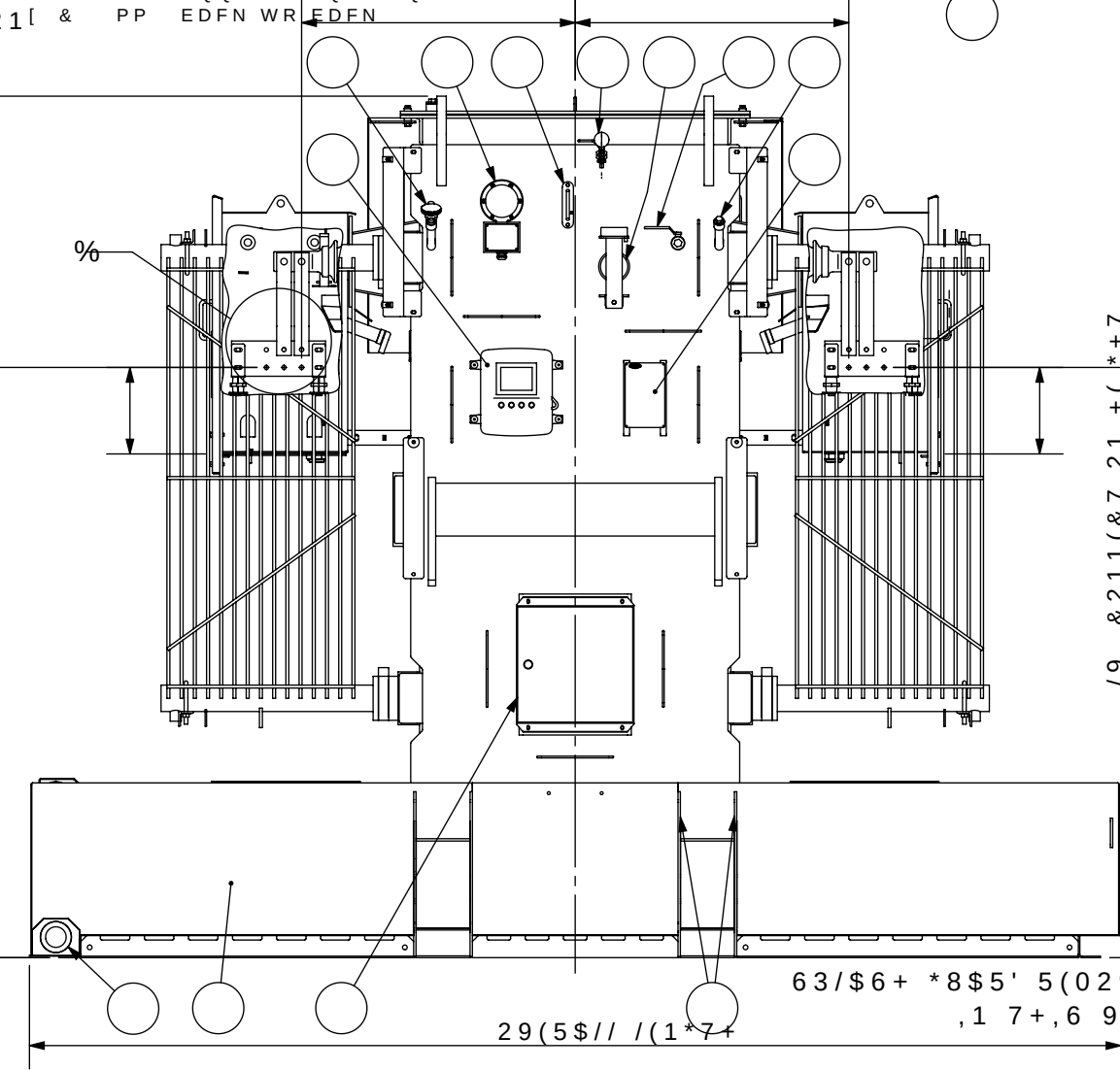
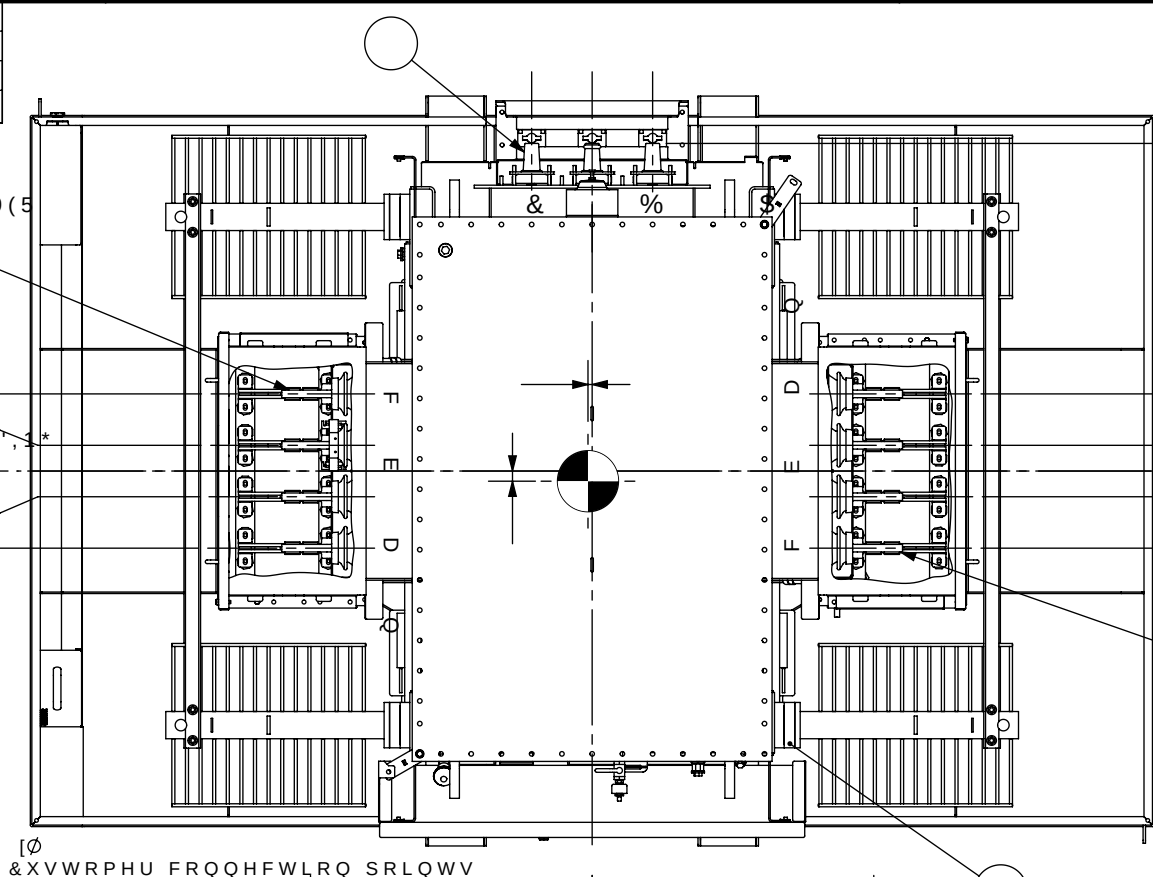
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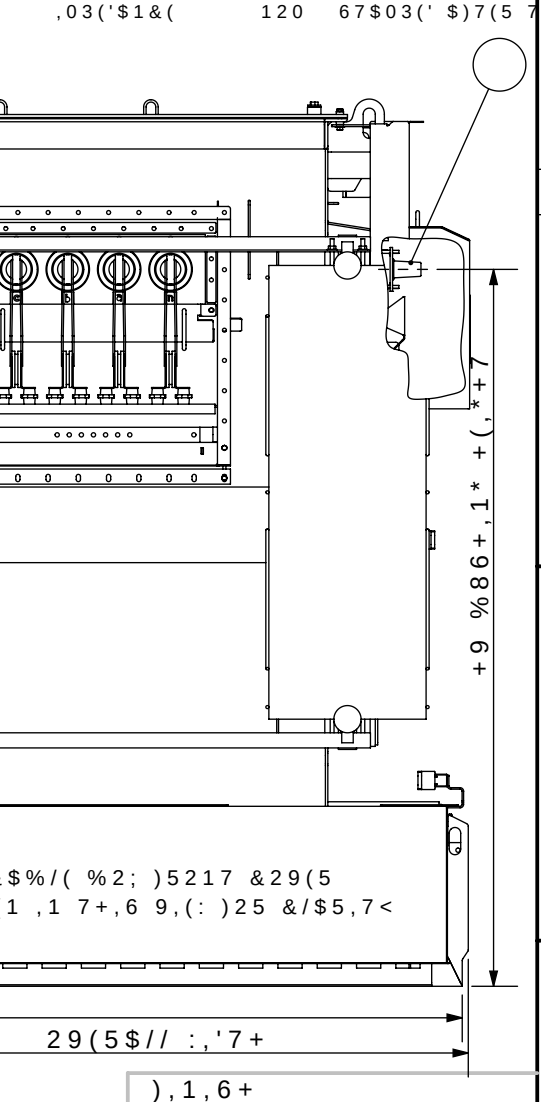
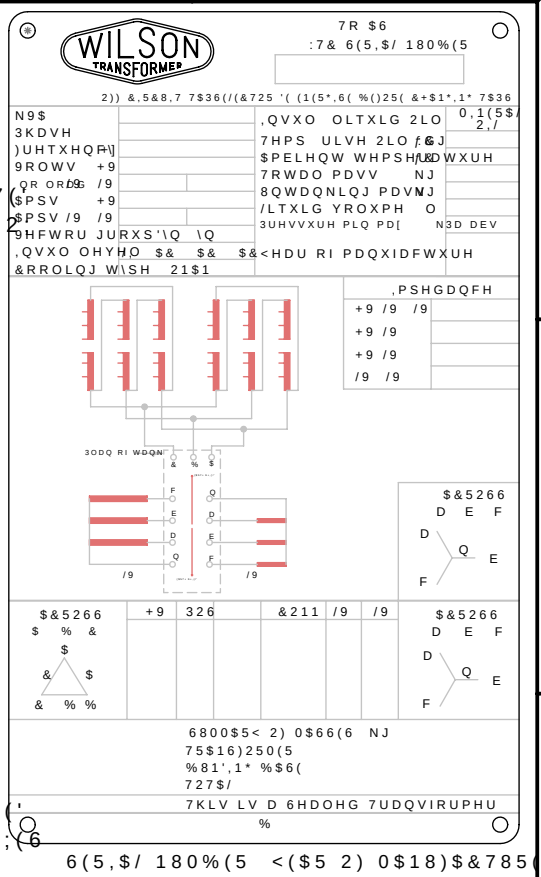


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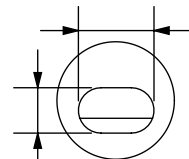
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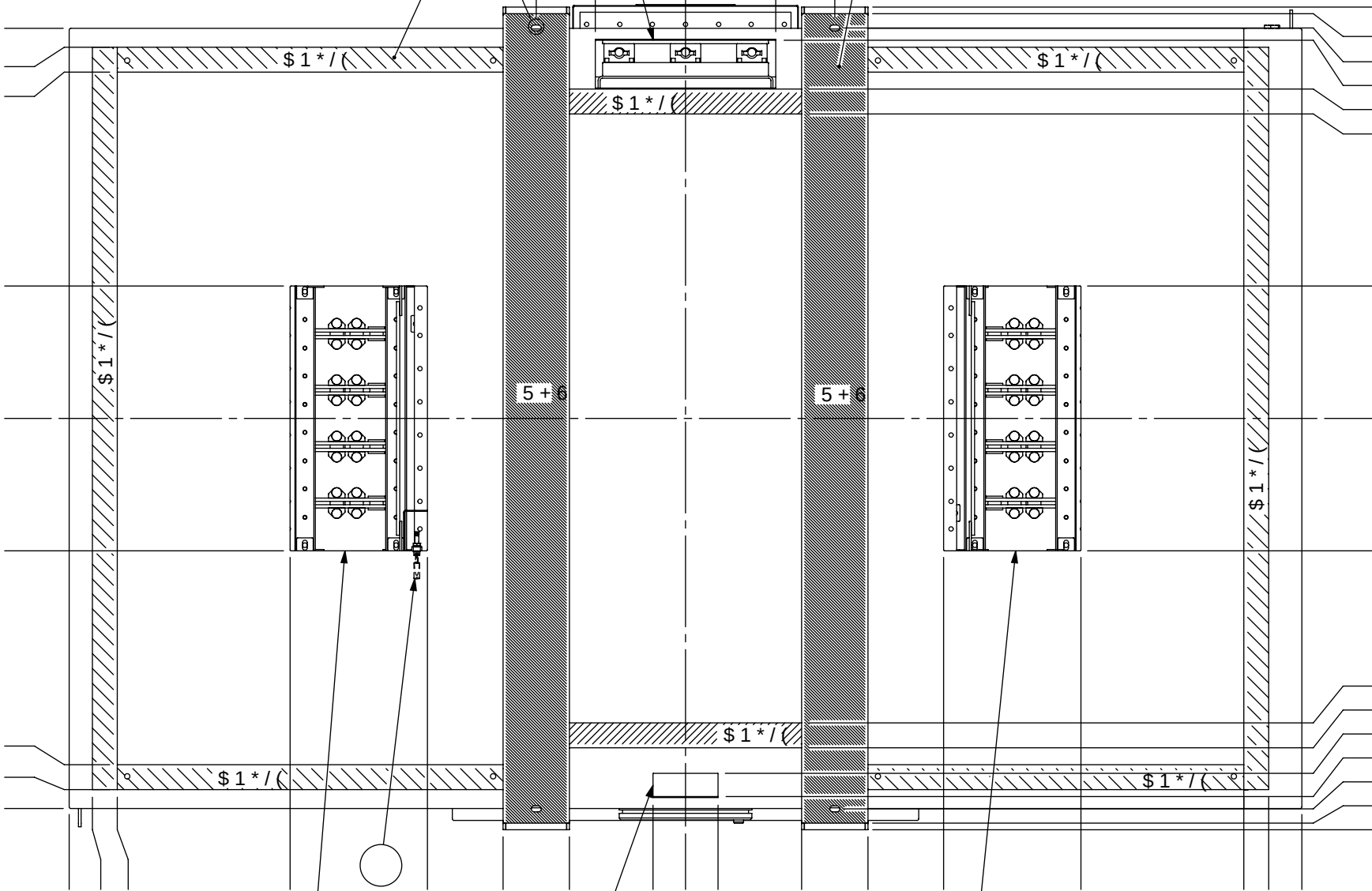
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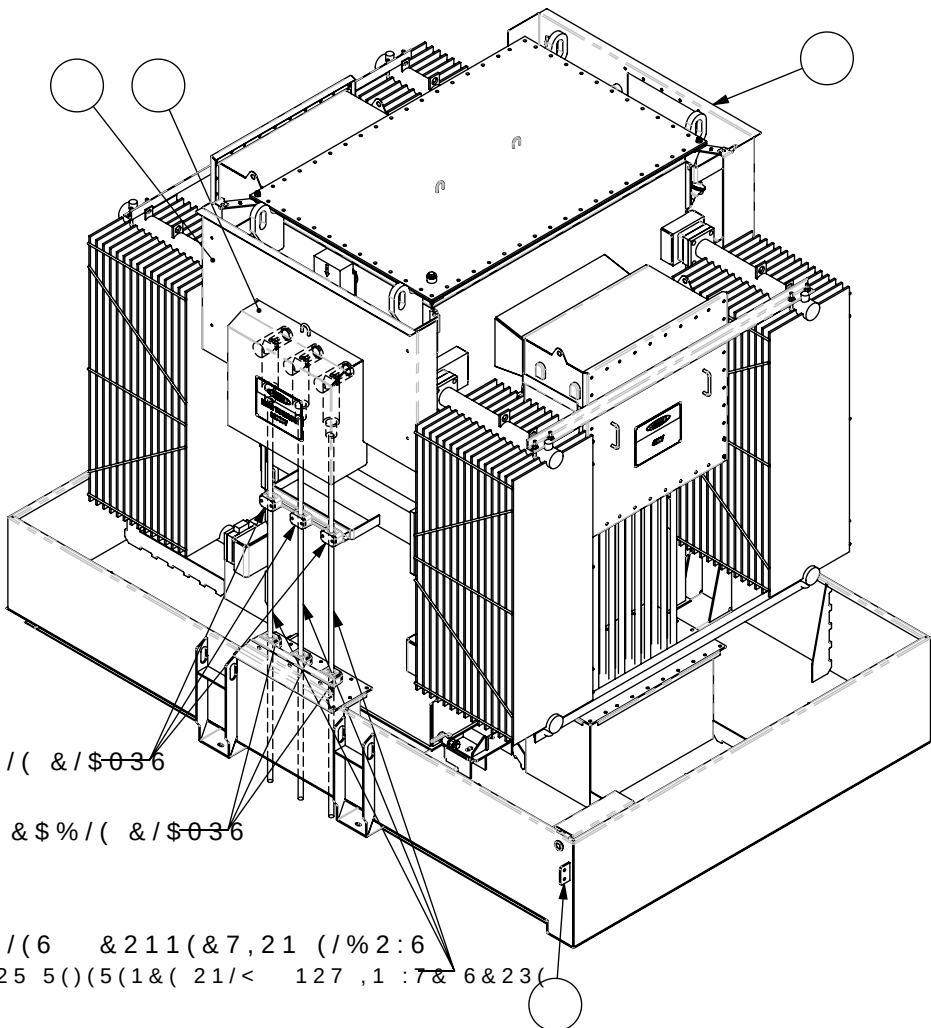


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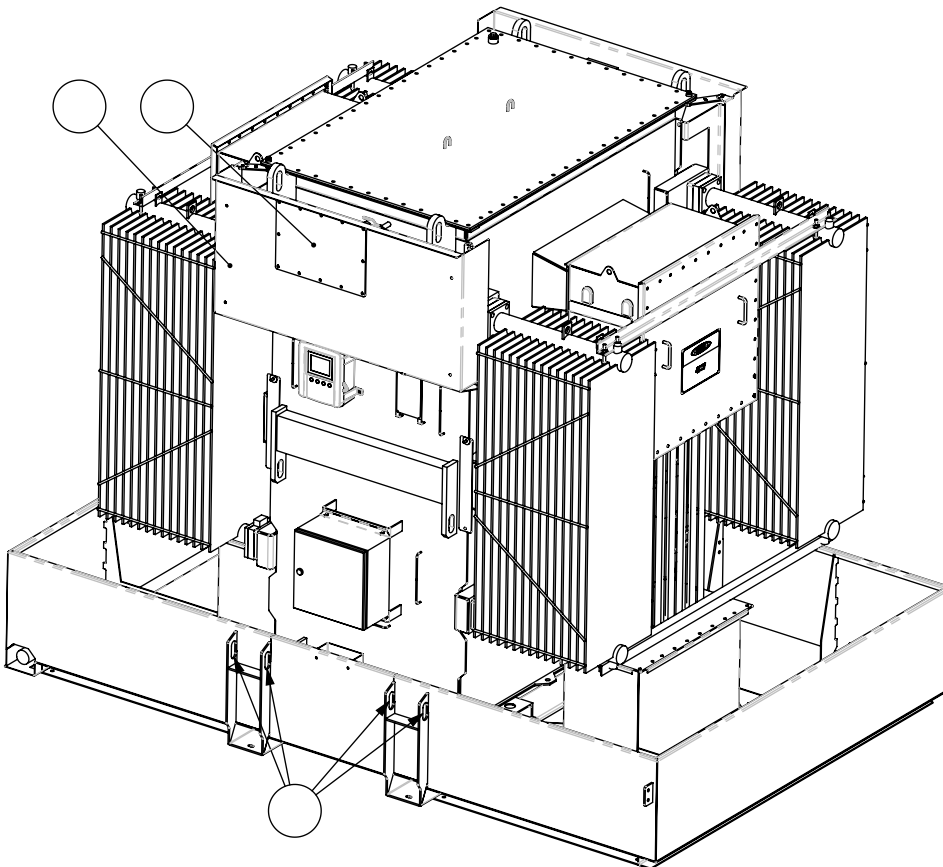
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FM APPROVED DISTRIBUTION TRANSFORMER SOLUTIONS

Wilson Transformer Company (WTC) offers a wide range of FM Approved distribution transformer solutions that comply with ANSI/IEEE C57.12.00 and FM Approval Standard 3990 for liquid insulated transformers. These solutions offer substantial fire safety with high flash and fire points of $>300^{\circ}\text{C}$; the increased resilience of this type of additional protection may lower your property insurance costs.



THE TRANSFORMER
PEOPLE

KEY FEATURES

- > Increased fire safety
- > Reduced clearance and transformer installation footprint
- > Reduced civil engineering costs
- > Extended transformer life
- > Increased transformer overloading limits above nameplate
- > Increased environmental protection

FM Approvals are worldwide certification and testing services that assure FM Approved products and services have been objectively tested and conform to the highest international standards.

WTC's Distribution Transformer Business Unit located in regional Victoria has extensive experience in supplying FM Approved transformer solutions to a variety of customers and industries around Australia. These transformers provide higher safety protection, cost and environmental benefits and are widely used in defence, infrastructure, industrial and mining applications.

Our product range of FM Approved transformer solutions includes three phase distribution transformers up to 8000kVA with system voltages up to 72kV and cooling class KFWF/ KNAN/KNAF.

The transformer tanks built to this standard are capable of withstanding an internal pressure of 20 psi (140 kPa) for cylindrical type, 15 psi (105 kPa) for rectangular type, without rupture and are equipped with pressure relief devices.



KEY FEATURES

Increased fire safety

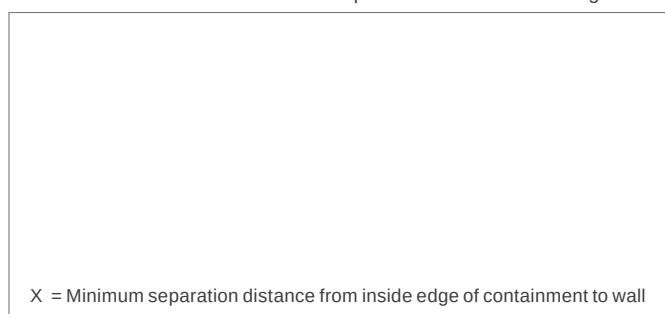
As many distribution transformers are installed near or inside buildings in urban areas or next to critical infrastructure, it is paramount to ensure that fire safety measures are taken to avoid catastrophic failures with long-lasting consequences.

Our FM Approved distribution transformers use FR3® or MIDELE dielectric fluids, both of which are classified as K-class fluids with a high fire point of >300°C. These FM Approved less flammable transformer fluids represent a low fire hazard and can prevent or significantly reduce the extent of damage in the event of a transformer failure.

Reduced clearance and installation footprint

The FM Approved distribution transformers can be installed next to a building or other transformers with a significantly reduced transformer separation clearance requirement of only 0.9 metres. There is no requirement for fire-rated or non-combustible segregation walls. As a result, these transformer solutions substantially reduce the transformer installation footprint and civil engineering costs.

Figure 1. Minimum horizontal separation distance between outdoor liquid-insulated transformers and exposed walls of main buildings



Source: Transformers - FM Global Property Loss Prevention Data Sheets 5-4, p.22, 2019-2020. Posted and reprinted with permission

Table 1. Separation for exposure protection of main building walls

Fluid or Tx type	Fluid volume, m³	Min horizontal distance from containment to exposed building wall (X in Figure 1)		
		2-hour C u ; J u - wall, m	Non-com- ; 7 0 t v ž 0 t ; wall, m	Com- 0 t v ž 0 t ; wall, m
FM Approved Tx	Per Approval b v ž m]	0.9		
FM Approved liquid in non-Approved Tx	<38	1.5		7.6
	>38	4.6		15.2
Non-Approved Tx liquid	<1.9	1.5	4.6	7.6
	½ • : – J • –	4.6	7.6	15.2
	>19	7.6	15.2	30.5

Source: Transformers - FM Global Property Loss Prevention Data Sheets 5-4, p.23, 2019-2020. Posted and reprinted with permission

Table 2. Minimum separation distances between adjacent transformers

Liquid Type	FM Approved Tx?	Liquid Volume, m³	Distance, m
FM Approved Tx Fluid	YES	N/A	0.9
FM Approved Tx Fluid	No	½ ' v	1.5
		>38	7.6
Non - Approved Tx Fluid	N/A	<1.9	1.5
		½ • –	7.6
		>19	15.2

Source: Transformers - FM Global Property Loss Prevention Data Sheets 5-4, p.25, 2019-2020. Posted and reprinted with permission

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Extended transformer life

The life expectancy of a transformer is largely determined by the condition of its insulation system. The degradation of the cellulosic materials due to its reaction to water can significantly reduce the life of a transformer and lead to its failure.

The rate of degradation is much lower when natural ester transformer fluids are used. Natural ester fluids can hold significantly more water (ppm) than mineral oil, and thus extend the insulation life of a transformer to five to eight times.

Graph 1. Moisture saturation rates for mineral oil and FR3 fluid

Source: Cargill, <https://www.cargill.com/bioindustrial/fr3-fluid/superior-performance> (Accessed: 5 July 2021). Posted and reprinted with permission.

Image 1. Moisture saturation rates for mineral oil and FR3 fluid

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4000 hr @ 170 ž

Source: Cargill, <https://www.cargill.com/bioindustrial/fr3-fluid/superior-performance> (Accessed: 5 July 2021). Posted and reprinted with permission.

Increased environmental protection

The FM Approved distribution transformers are filled with FM Approved transformer fluids that are non-toxic, non-hazardous and readily biodegradable in 28 days. They present a much lower risk to the environment if spillage occurs, thus significantly reduce the chance of environmental harm.

WILSON TRANSFORMER COMPANY PTY LTD

Distribution Transformer Business Unit
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Vic 3690 Australia
T: +61 (0) 2 6024 5944
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BUSHFIRE HAZARD ASSESSMENT AND MANAGEMENT PLAN

QUEENSLAND BATTERY
16 MILE HALL ROAD, HOPELAND
(LOT1 ON RP117442, LOT 32 ON SP232241)

TECHNICAL REPORT 36-12

Technological Solutions for Sustainable
Natural Resource Management

Queensland Battery16 Mile Hall Road, Hopeland Lot 1 on RP117442, L32 on SP232241

Ecosystems Management (Aust) Pty Ltd
ACN: 168 049 885
38 Darling Road
Jensen
QLD 4818

STATEMENT OF QUALIFICATION

This BAL • • • u v š Z % } Ć š Z • v % Ć % Ć Ć D Ć] ' Ć] v } Á X / Z À } À Ć í management and environmental management, practicing in Victoria, New South Wales and Queensland. I have a Bachelor of Environmental Science (Management) from Charles Sturt University, and the Postgraduate Diploma in Bushfire Protection from the University of Western Sydney. I am suitably qualified and experienced to undertake bushfire hazard assessment and bushfire management plans.

Marcia Griebenow BEnvSc GradDip (Bushfire Protection) MEIANZ

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ABBREVIATIONS

AFDRS	Australian Fire Danger Rating	OM-003	Overlay Mapping 003
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AEP	Annual Exceedance Probability	PFI	Potential Fire Intensity
APZ	Asset Protection Zones	PFL	Potential Fuel Load
ASL	Above Sea Level	PFLI	Potential Fire-Line Intensity
BESS	Battery Energy Storage System	PPRR	Prevention, Preparedness, Response and Recovery
BMP	Bushfire Management Plan	QERMF	Queensland Emergency Risk Management Framework
BVG	Broad Vegetation Groups	QFES	Queensland Fire and Emergency Services
EMA	Ecosystems Management (Aust) Pty Ltd	QPWS	Queensland Park and Wildlife Service
FDI	Fire Danger Index	RFS	Rural Fire Service
FFDI	Forest Fire Danger Index	SFMZ	Strategic Fuel Management Zone
GFDI	Grass Fire Danger Index	SPP	State Planning Policy
HV	High Voltage	VHC	Vegetation Hazard Classes
LGA	Local Government Association		

TERMINOLOGY

Project area	The Project area encompasses the entire area associated with the Project footprint, which includes all of Lot 1RP117442 and part of Lot 32SP232241. It also covers the section of 16 Mile Hall Road from the southwestern corner of Lot 1RP117442 to the access driveway location.
Project footprint	The Project footprint represents the areas subject to direct disturbance for the proposed BESS and includes the extent of proposed access works within the Project area.
BESS footprint	The BESS footprint represents the areas subject to direct disturbance for the proposed BESS.
Development siting area	The designated area within which the proposed BESS can be situated, including associated temporary laydown area for construction activities.
Property	All of Lot 1RP117442 and the area of Lot 32SP232241 within the Project area boundary.

1. INTRODUCTION

Ecosystems Management (Aust) Pty Ltd (EMA) has been engaged by Queensland BESS Pty Ltd, a wholly owned subsidiary of AGL POWER GENERATION (WIND) PTY LIMITED ACN 120 355 210 (AGL), to prepare a Bushfire Hazard Assessment, and subsequently prepare a Bushfire Management Plan (BMP) for the Queensland Battery Project area. The Project area principally consists of the property known as 16 Mile Hall Road, Hopeland (Lot 1 RP117442) and adjacent portion of 16 Mile Hall Road and includes part of Lot 32 SP232241, to support the development of a Battery Energy Storage System (BESS) renewable energy facility. This bushfire hazard assessment addresses the concept design by GHD identified by drawing 12646897GHD00-00-DRGEL0001 (Rev: PO2) and 12646897GHD00-00-DRGCV0001 (Rev: PO3).

According to the Western Downs Regional Council Bushfire Hazard Overlay Mapping (OM-003), the subject lot is identified as being either partially within, and adjacent to Medium bushfire hazard areas. Under the Western Downs Regional Council planning scheme, land encumbered under the Bushfire Hazard Overlay must have a Bushfire Hazard Assessment conducted to ensure that the development does not increase the risk to life, property, community and the environment in accordance with the purpose of the Bushfire Hazard Overlay Code. Where sufficient risk is identified, a Bushfire Management Plan is required to manage the identified risk.

This bushfire hazard assessment is prepared with regard to

- x 8.2.3 of the Bushfire Hazard Overlay Code of the Western Downs Regional Council Planning Scheme
- x State Planning Policy guidance material
- x Design Guidelines and Model Requirements for Renewable Energy Facilities (SFA 2023).

2. PROPOSED DEVELOPMENT

The proposal is for development of a battery energy storage facility comprising of battery energy storage systems (BESS) and supporting connectivity to the power grid to be developed within the agricultural (pastoral) parcel, and into the connecting easement. The Hopeland area is typified by rural living, agricultural predominantly grazing with some cropping, coal seam gas and native forestry.

3. DEVELOPMENT APPROVAL AND CONDITIONS

Development approval is sought under state planning legislation. The relevant planning scheme under state planning legislation is the Western Downs Regional Council Planning Scheme (WDRP 2019). This Bushfire Management Plan addresses the requirements of 8.2.3 of the Bushfire Hazard Overlay Code.

3.1. STATE PLANNING POLICY

The State Planning Policy (SPP) addresses development in relation to the risk from natural hazards, by establishing planning constraints based on a statewide risk assessment. Where local government planning schemes do not prepare a bushfire hazard overlay code specifically for their LGA, planning controls default to the statewide hazard mapping and the SPP requirements for development in bushfire prone areas.

The Queensland Government has produced a technical manual Bushfire Resilient Communities (QFES, 2019) to support the state planning policy, describing the methodology used for statewide hazard mapping and providing a guideline for preparing localized bushfire hazard area maps.

3.2. PLANNING SCHEME

The property is partially encumbered by the Bushfire Hazard Overlay, otherwise adjacent to encumbered areas (Planning scheme map OM03), and therefore requires assessment against the Bushfire Hazard Overlay Code. Figure 1 shows the subject property with reference to the Bushfire Hazard Overlay.



FIGURE 1 SUBJECT SITE WITH MEDIUM AND HIGH BUSHFIRE HAZARD ACCORDING TO DROPLANNING SCHEME OVERLAY. PROJECT AREA INDICATED IN SOUTH EAST QUADRANT (2019)

4. BUSHFIRE HAZARD ASSESSMENT

This section contains the information required to complete the Bushfire Hazard Assessment. Principal factors influencing fire behaviour are bushfire fuels, fire weather and topography (slope).

Fire will spread faster, with higher intensity, when travelling upslope. Conversely, rate of spread and potential intensity is lower when traveling downhill. High fuel loads, particularly fine fuels such as grass and small (< 6mm diameter) twigs and branches) will promote a faster rate of spread and higher intensity than a lower fuel volume; longer grass will promote higher intensity and rate of spread than shorter grass. Vertical connectivity of vegetation encourages flame development into higher vegetation strata and can result in crown fires in extreme fire weather conditions. Crown fire is the situation where bushfire engulfs and travels in the tree crown or canopy, not just through ground and elevated fuels.

4.1. PROJECT AREA DESCRIPTION

4.1.1. Location

The Project area encompasses the entirety of Lot 1 RP117442 and the southern part of Lot 32 SP232241. It covers an area of 23 hectares and is located 20 km southeast of Chinchilla, and 236 km east of Brisbane. The Project area is accessed from the 16 Mile Hall Road, a minor local road (unsealed), accessed at either end from the Warrego Highway (the main transport link of the area) and Kogan Condamin Road (see Project area Location Map in Appendix A). The Project area is otherwise bounded by land used for agricultural purposes, both cleared and uncleared. The Project area does not contain any coal seam gas infrastructure.

The Project area is located in a largely undeveloped landscape, characterised primarily by agricultural land uses and coal seam gas extraction, however there is an increasing intensity of energy generation from gas and solar with a farm established on 16 Mile Road (1.5 km to the southwest) and the Kogan Creek Power station 2 km to the east along Banana Bridge Road. There is also an additional BESS project under development directly adjacent to the south within Lot 2 RP117442.

4.1.2. Proposed Development and Operation

The proposed BESS footprint will be located generally in the southeast section of the Project area and will occupy 12 hectares of the property. Transmission lines will connect the facility directly to the Western Downs Substation close proximity to the east. It is understood that the transmission line scope is being undertaken by Powerlink and is not part of the scope of this report.

The proposal involves the installation of BESS units, with energy transmission into and out of the facility via a substation for transformation of voltage. The BESS footprint will also house ancillary facilities with an office, amenities, control room, workshop, stores, and carparking. Primary access for the Project area is via the 16 Mile Hall Road. The location of infrastructure with the property is shown in Figure 2, and is detailed in the Project area Location and Configuration Map in Appendix A.

FIGURE 2 SITE LOCATION AND CONFIGURATION

4.2. TOPOGRAPHY AND HYDROLOGY

The Project area is located within the Western Downs area, characterised as flat plains with most slopes associated primarily with hydrological features and rocky scarps. The development footprint is located on an area of almost entirely flat ground within the property with the surrounding area continuing to be typically flat ground. The ground elevation is highest at 24m ASL in the north eastern corner of the property and drops to 39m ASL on the western side of the property. Slope across the Project area is generally less than 2 degrees (and typically less than 1 degree for the proposed BESS location), however increases up to 20 degrees in associated with the banks of the dam areas established within the Project area (see Topography and Hydrology Map in Appendix A).

The property encompasses no watercourse or drainage features, with several dams present acting as a water source to support the cattle present. The western section of the Project area, as the low point, does appear to be susceptible to waterlogging following rainfall events.

The landscape to the north and south of the property exhibit very similar characteristics with the addition of minor drainage lines to the east, south and west (all greater than 100m from the Project area).

4.3. FIRE WEATHER

Fire weather refers to the suite of conditions that contribute to the propagation of bushfire. This includes temperature, humidity, rainfall, days since rain and wind. The nearest Bureau of Meteorology weather station is Dalby Airport (Station number 041522 located at Dalby Airport (BOM, 2024)), located 59km south east of the Project area.

The Project area is within the hot arid region of inland Queensland. This area is characterised by summers and cold winter nights, frosts may occur. Rainfall nevertheless is greatest during the summer months. The fire season is usually

recognised as occurring during spring and mid-summer, where over-winter drying combines with periods of increased wind speed and temperature and ending with the onset of summer rains.

4.3.1. Temperature

Mean maximum temperatures occur in January (32.6°C), and mean minimum temperatures occur in July (4.1°C) (Figure 3).

4.3.2. Humidity and Rainfall

The climate can generally be classified as ~~sub-tropical~~, with the minimum humidity occurring in October with a mean 3pm relative humidity of 37%. Mean 3pm humidity reaches a maximum in February at 49% (Figure 4).

Rainfall is lowest during April with a typical low rain period from April to September. On average 73% of annual rainfall occurs in between October and March (Figure 4). Significant drying of grasses and increased leaf drop can be observed throughout winter and early spring as soil moisture declines and plant growth slows with lower temperatures. Evaporation (Figure 5) increases during early spring as daily temperatures and solar exposure increase. Low humidity and increased drying from wind exacerbates grass and fine fuel curing throughout the spring period.

4.3.3. Wind

The predominant winds throughout the year vary considerably (Figure 6), with summer predominantly featuring winds from the east, autumn and spring showing variability, while winter develops stronger westerly and south westerly winds (Table 1). These winds vary in their moisture content, but westerly winds are typically more drying, drawing dry air from inland regions. Wind strength is highest from August to October, increasing the rate at which fine fuels may dry (Figure 4).

Wind direction and strength is also a consideration for fire suppression in terms of bushfire behaviour. A bushfire will travel quicker in strong winds, and potentially demonstrate higher intensity due to the increase in air availability to the seat of the fire. Higher strength winds throughout spring and early summer can increase fire danger across the region.

TABLE 1 WIND DIRECTION BY MONTH (STATION 1041522) (BOM, 2024)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
E	E	E	E / SE	E / W / SW	E / W / SW	W / SW	W / SW	W / SW / N	W / E / N	E / W / N	E

FIGURE 3 MEAN MAX AND MEAN MIN TEMPERATURES FOR AIRPORT STATION 041522 (BOM, 2024)

FIGURE 4 MEAN 3PM RH AND MEAN 3PM WIND SPEED AT STATION 041522 (BOM, 2024)

FIGURE 5 MEAN DAILY EVAPORATION (MM) AND MEAN MONTHLY RAINFALL (STATION 041522) (BOM, 2024)

FIGURE 6 ROSE OF WIND DIRECTION VERSUS WIND SPEED IN KM/H (5 JAN 1992 TO 10 AUG 2023) (STATION 041522) (BOM, 2024)

4.3.4. Continental Effects of Seasonal Variation

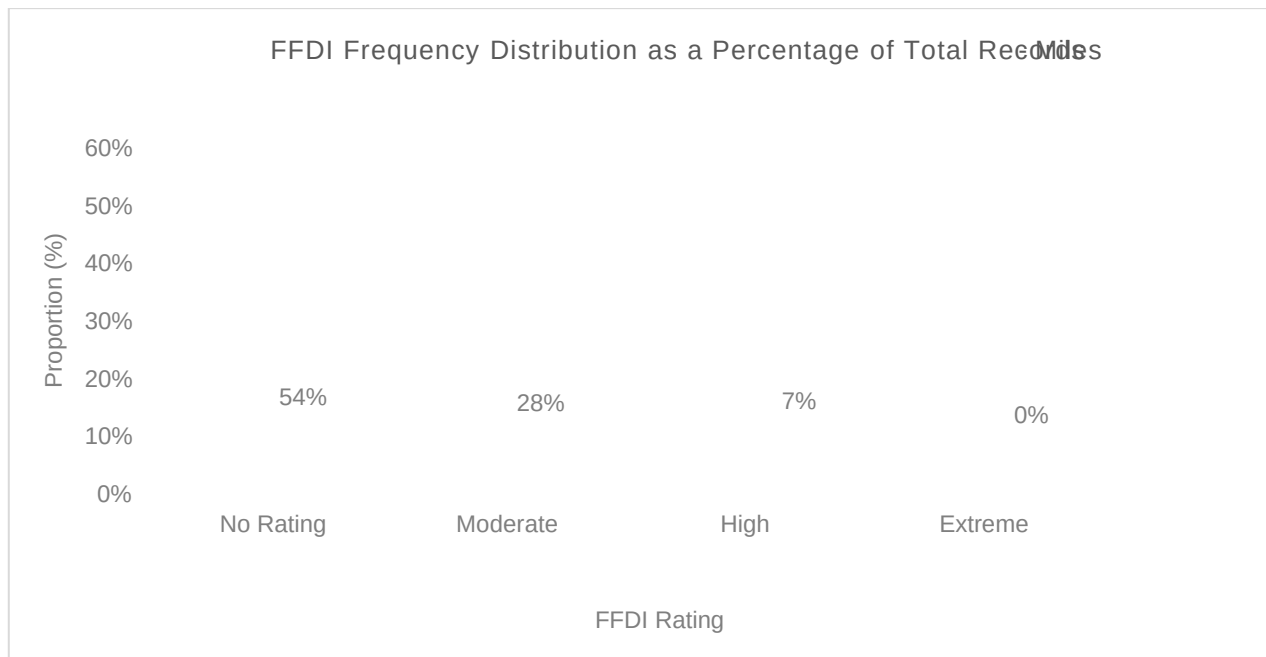
While climate averages provide an overview of the weather characteristics contributing to identified fire seasons, and annual trends that influence the general expected severity of a given season, nationwide weather patterns effect the extreme fire weather conditions experienced from time to time in different parts of the country.

While the conditions generally experienced in the region can be described as with hot summers and cold winters, widespread national weather patterns such as prolonged drought or persistent rainfall deficits, particularly in the interior, can influence the weather in all regions. These weather patterns result in the occurrence of extreme conditions that can (and have) resulted in Severe and Extreme fire weather conditions (using the now superseded QFES fire danger rating system), such as those experienced in the summer of 2018 (Mills, 2019). The Mills paper discusses current research into fire weather trends in south-east and coastal Queensland, acknowledging a recent trend in increasing extreme conditions over the last 20 years. This indicates that bushfire management planning should be conservative to minimise underestimation of risk associated with development.

4.3.5. Fire Danger Index

The Fire Danger Index (FDI) was developed to provide an indicator to fire managers of the probability of being able to contain and extinguish a fire once it started in a forest environment. FDI is calculated using inputs including recent rainfall, soil dryness, temperature, humidity and windspeed. The higher the FDI, the lower the probability of containment or extinguishment within 24 hours of the fire starting. Subsequent research and modelling derived the FFDI (Forest Fire Danger Index) and the GFDI (Grass Danger Index), as the calculations for flame length and rate of spread between forest vegetation structure and grassland vegetation structure are different. While the use of FDI is often used generally to refer to fire weather conditions, the application of FFDI and GFDI are pertinent to specific analysis of fire weather and relevant to fire behaviour model calculations.

AS3959:2018 identifies an applicable FDI of 40 for Queensland, which falls into the classification of High fire danger under the new Australian Fire Danger Rating System (AFDRS), effective from September 2022. Fire weather data from Miles (Station 042023) shows the proportion of High FFDI days over the period of the record (45 years starting in June 1972) at 7%. Fire hazard modelling in Queensland by CSIRO (Leonard et al, 2014) has mapped FDI across the state. FDI varies across the Western Downs region, with an FDI from 70 applying to the Project area which is classified as Severe on the fire danger index (599), and thus considered to provide an appropriately conservative fire weather scenario



GRAPH 1 FFDI FREQUENCY DISTRIBUTION

4.4. VEGETATION AND BUSHFIRE FUELS

Vegetation structure and arrangement are significant drivers of fire behaviour. Fuel hazard is described as the combined effect of fine surface fuels, elevated fuels and bark hazard in the ignition and propagation of fire. Traditional methods of fuel assessment require the individual assessment of all three fuel types to determine the Potential Fuel Load (PFL), described in tonnes per hectare (tph). This fuel weight can then be used to determine the potential fire intensity (PFI) in terms of kW/m.

The methodology endorsed by the Queensland Government is described in the technical reference *Bushfire Resilient Communities* (QFES, 2019). This methodology builds on the state wide bushfire hazard modelling method published by CSIRO in 2014 (Leonard et al. 2014). Leonard et al identified potential total bushfire fuel loads for Queensland Herbarium regional ecosystem vegetation classifications and aggregated these into Vegetation Hazard Classes (VHC) and was subsequently refined with detailed vegetation bushfire fuel data in 2017 (Newnham et al. 2017).

Vegetation hazard class mapping considers horizontal connectivity of bushfire fuels; VHCs with a continuous fuel load generally supports continuous flame spread, whereas VHCs with discontinuous fuels may interrupt or retard the progress of a fire front. In terms of crown fire development, vegetation communities with little to no elevated fuels connecting surface fuels to bark and canopy fuels will limit the potential for crown fire development, whereas significant volumes of near surface fuels (grasses high) and elevated fuels promote flame advancement into the canopy. Small patches of higher fuel load VHCs within a larger landscape of lower fuel load VHCs (up to 1ha), will locally increase fire intensity and rate of spread, however will not significantly influence the overall bushfire hazard in the wider landscape.

Broad Vegetation Groups (BVG) and Vegetation Hazard Classes (VHC) in or adjacent to the Project area are listed in Table 2. The potential fireline intensity is calculated (using flat ground) to provide context to the influence of fuel load on potential intensity.

TABLE 2 BVG AND VHC ASSOCIATED WITH THE PROJECT AREA

Broad Vegetation Group	BVG Description	Vegetation Hazard Class	Class Description	Total PFL (tph)	Potential Fireline Intensity (kW/m)
12a	Dry eucalypt woodlands to open woodlands, mostly on shallow soils in hilly terrain	12.1	Dry eucalypt open forests on sandstone and shallow soils	21	18,065
13a	Dry to moist eucalypt woodlands and open forests, mainly on undulating to hilly terrain of mainly metamorphic and acid igneous rocks	13.2	Dry to moist eucalypt woodlands on undulating metamorphics and granite	14.4	8571
16c	Eucalyptus spp. dominated open forest and woodlands drainage lines and alluvial plains	16.2	Eucalyptus dominated woodland on drainage lines and alluvial plains	11.6	5987
17a	Eucalyptus populnea (poplar box) or E. melanophloia (silver leaved ironbark) (or E. whitei (White's ironbark)) dry woodlands to open woodlands on sandplains or depositional plains	17.1	Dry open forests dominated by poplar box, silver-leaved ironbark or White's ironbark on sand or depositional plains	15	10,253
20a	Callitris glaucophylla (white cypress pine) or C. intratropica (northern cypress pine) woodlands to open forests	20.2	Woodlands dominated by white cypress pine or coast cypress pine	9	3676
29a	Heathlands and associated scrubs and shrublands on coastal dune fields and inland montane locations	29.3	Heathlands and associated shrubs and shrublands	20.1	78,733
n/a	n/a	38.5	Cropping and horticulture	2	186
n/a	n/a	40.4	Continuous low grass or tree cover	5	1046
n/a	n/a	41.4	Discontinuous low grass or tree cover	3	419
n/a	n/a	43.6	Water bodies	0	0

Very high (potential intensity) 40,000+ kW/m	High (potential intensity) 20,000 to 40,000 kW/m	3. Medium (potential intensity) 4,000 to 20,000 kW/m	4. Low Hazard < 4,000 kW/m
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*Potential Fireline Intensity is calculated using the methodology from Bushfire Resilient Communities (BRCES, 2019)

4.4.1. Bushfire Fuel Hazard on-site

A site evaluation of bushfire fuel hazard was undertaken across the Project area. This was conducted to validate the vegetation mapping and modelled PFL across the Project area. The results of field assessment are summarised in Table 3.

Vegetation hazard class mapping has been evaluated against aerial photography and considered in the context of the field assessment results. Field assessment was limited to the Project area and areas accessible from public roads. Private land access was not attempted for the Project. Generally, the vegetation within 100m of a site is considered for vegetation hazard assessment, however due to the large size of the Project area it was considered prudent to evaluate the vegetation within 500m of the Project area to ensure any fringing hazards were identified.

VHC mapping has been updated to more accurately reflect vegetation structure and extent in the landscape surrounding the subject area. Aerial imagery captured in 2022 was available through Queensland Globe, highlighting areas of regrowth in the landscape around the Project area. These areas have been mapped as mature vegetation communities consistent with adjacent remnant vegetation. Vegetation classification has been conservative so as to not underestimate the extent of potential bushfire fuels. Vegetation hazard class mapping is shown in the Vegetation

Hazard Class map Appendix A The current extent of native vegetation has been used for bushfire hazard modelling, as the development footprint is largely contained within an already cleared/ disturbed part of the property, therefore further clearing (other than for transmission easements, which are not part of this report's scope) is considered to be minimal.

As an agricultural property, the Project area is generally grazed with cattle present on the property at the time of the visit, with short grass present across the eastern half of the property due to differential grazing. The Project area was visited in September 2024. The land is grazed on an annual basis (provided the season produces suitable fodder), no fuel reduction burning is undertaken on the property, nor has it been a common practice previously. Grasses across the region generally cease to grow during the winter, and frosts (which may start in early May) cause premature curing through winter resulting in dry grass loads leading into spring. Grass growth does not recommence until some soil temperature is returned and the spring/ summer rain season starts, usually by November. This combination of seasonal factors indicates the peak fire season is from October through to when the summer rains start.

The sequence of extreme seasonal events over the last 15 years has contributed to the volume of standing deadwood, principally acacia, but also some of the mature eucalypt trees. The 2011/12 flood year caused a significant recruitment event, which then suffered during the drought of 2016-2019, subsequent good rainfall years over 2020-2023 have resulted in further recruitment of acacia in particular. This preconditions the Project area and its surroundings to be vulnerable to fire in uncontrolled conditions.

TABLE 3 FUEL HAZARD ASSESSMENT SUMMARY

Mapped VHC (PFL)	Observations /Discussion
12.1 (21tph)	VHC 12.1 is only identified in a small remnant patch away from the proposed BESS location, adjacent to the proposed powerline corridor. While overstorey species were observed to be typically consistent with the broad vegetation group, areas of this vegetation hazard class are exhibited dense sub-canopy of Callitris and Acacia, with these species being dominant from the perspective of tree density, however the eucalypt species present do form the overstorey, despite being sparse in some places and not exhibiting obvious recruitment. Dense sub-canopy growth increases the overall fuel hazard when taking woody vegetation mass into account (over and above fuel mass). Both Plates 1 and 2 show the eucalypt overstorey emergent from the dense sub-canopy of acacia and callitris. The vegetative patch identified in both of these plates is overall uniform, and on flat ground, separated from vegetation to the north and east by road reserve areas acting as functional firebreaks, but is contiguous with VHC 13.2 vegetation to the west and south.
PLATE 1. PHOTO POINT 29 t VIEW SOUTH	PLATE 2. PHOTO POINT 30 t VIEW SOUTH

Mapped VHC (PFL)	Observations /Discussion
13.2 (14.4tph)	VHC 13.2 is represented in the central and north eastern sections of the Project area, with additional areas adjacent to the south and east As with VHC12.1, the overstory species (particularly Poplar Bore) consistent with the broad vegetation group are present, areas of the property exhibited dense canopy of Callitris and Acacia, with these species being dominant from the perspective of tree density, however the eucalypt species present do form the overstory, despite being sparse in some places and not exhibiting obvious recruitment. Dense canopy growth increases the overall fuel hazard when taking woody vegetation mass into account (over broad fuel mass). Plate 3 shows an area of VHC 13.2 regrowth with dense grass and layer further to the north of the Project area. Plates 4 and 5 show more mature woodland, in an open structure, with a densely grassy groundcover and lacking elevated fuels in the midstory. This is due to the consistent high grazing pressure for these species of the Project area, with Plate 6 showing bare earth patches regularly amongst the grass cover. It is likely that in its current condition the fuel load of this hazard class present in the Project area is lower than the general definition, however, risk is determined from its greatest potential to inform management practice To the south and east of the Project area, this vegetation presents typically as more mature and with a high density. These vegetation areas meet the Project area boundary at two limited locations and is non-contiguous with woodland vegetation present within the Project area (adjoining managed grassland only)
PLATE 3. PHOTOPOINT 19 - VIEW SOUTH	PLATE 4. PHOTOPOINT 35 VIEW TO THE NORTH
PLATE 5. PHOTOPOINT 36 VIEW NORTH	PLATE 6. PHOTOPOINT 36 VIEW OF GROUND COVER

Mapped VHC (PFL)	Observations /Discussion
16.2 (11.6tph)	This vegetation type is identified on the Vegetation and Bushfire Fuels Map due to the scale of the Project area however, is located 1.6km north of the proposed powerline corridor in a single small patch, and as such is discounted from further consideration in this assessment.
17.1 (15 tph)	This vegetation type is identified on the Vegetation and Bushfire Fuels Map due to the scale of the Project area however, is located 1km south of the Project area and as such is discounted from further consideration in this assessment.
20.2 (9 TPH)	VHC20.2 is identified in a managed stand in the north eastern section of the Project area and adjacent to the northern east boundary Plate 1 shows both of these VHC 20.2 areas separated by a managed grassy corridor. Plate 8 shows the moderately dense woodland structure within the VHC20.2 vegetation present, reflected in the moderately dense canopy in Plate 9. However there is little to no elevated fuel present, with surface and surface fuels overall low as depicted in Plate 10. This is likely due to cattle trafficking of this area and additional grazing pressure.
PLATE 7. PHOTOPOINT 15 t VIEW NORTH	PLATE 8. PHOTOPOINT 16 t VIEW WEST
PLATE 9. PHOTOPOINT 16 t CANOPY VIEW	PLATE 10. PHOTOPOINT 16 t VIEW OF GROUND COVER

Mapped VHC (PFL)	Observations / Discussion	
29.3 (20.1tph)	VHC29.3 is only identified in a small remnant patch to away from the proposed BESS location, adjacent north of the proposed powerline corridor. While areas of this vegetation hazard class are observed to be typically consistent with the broad vegetation group present a significant proportion appears to be undergoing succession, Callitris, acacia and eucalypt species being dominant from the perspective of tree density. However, due to the varied structure within this patch and significant presence of elevated fuels, to ensure bushfire planning accounts for the greatest risk area is treated as 29.3 in its entirety Both Plates 1 and 12 show callitris, acacia and eucalypt overstory emergent from the dense scrub understory. The vegetative patch identified in both of these plates is on flat ground, separated from vegetation to the south and east by road reserve areas acting as functional firebreaks, but is contiguous with VHC 1 vegetation to the north.	
PLATE 1. PHOTOPOINT 1 VIEW EAST		PLATE 2. PHOTOPOINT 1 VIEW WEST
Mapped VHC (PFL)	Observations / Discussion	
38.5 (2tph)	VHC38.5 agricultural land used for cropping and horticulture is located adjacent to the north and west of Project area. These areas are highly managed in their entirety, and fully separated from any bushfire prone land further to the north and east. Plate 13 shows a prepared agricultural field contiguous with Project area to the north, with plate 14 showing an agricultural field to the west across the Mile Hall Road reserve.	
PLATE 3. PHOTOPOINT 2 VIEW NORTH		PLATE 4. PHOTOPOINT 2 VIEW WEST

Mapped VHC (PFL)	Observations /Discussion
40.4 (5 tph)	VHC 40.4 is identified as the major groundcover across the Project area and is the dominant groundcover in the surrounding area. This encompasses a wide range of rural land management and uses the wider landscape but predominantly encompasses managed grasslands utilised for cattle grazing. These vegetative areas were observed during winter, and typically had a reduced, low bushfire fuel load due to the level of grazing occurring.
PLATE 5. PHOTOPOINT 6 VIEW NORTH PLATE 6. PHOTOPOINT 8 VIEW EAST	
PLATE 7. PHOTOPOINT 10 VIEW WEST PLATE 8. PHOTOPOINT 11 VIEW OF GROUND COVER	
41.4 (3 tph)	VHC 41.4 is associated with the Kogan Power Station facility only in proximity to the Project area being located at the terminal end of the proposed power line corridor. This facility contains managed vegetation at its periphery only, with a buffer between all structures and the surrounding vegetation.

Mapped VHC (PFL)	Observations /Discussion
PLATE19. PHOTOPOINT 29 VIEW EAST	PLATE20. PHOTOPOINT 29 VIEW SOUTH
36 (0 tph)	The Project area contains a number of dams of varying sizes, distributed across the centre and eastern side of the Project area to provide water for the cattle present. These dams typically have an engineered bank of maintained bare earth surrounding them, increasing the area free of bushfire fuels each one represents.
PLATE21. PHOTOPOINT 19 VIEW WEST	PLATE22. PHOTOPOINT 38 VIEW WEST

4.5. FIRE HISTORY AND IGNITION SOURCES

Fire history mapping is available through the Queensland Spatial Catalogue. In the Darling Downs area, the available datasets are Queensland statewide fire scar mapping and the QPWS fire history mapping. The Queensland statewide fire scar mapping is derived at high resolution from 2017 onwards, using remote sensing techniques and Sentinel multispectral imagery. There is a risk that some areas captured in this dataset may not have been burned, but may have suffered from drought effects and thus been included in the vegetation indices in error. However, discussion with Kogan RFS Brigade First Officer identifies that fires have and do occur in the area, and are consistent with the statewide fire scar mapping. The QPWS fire history mapping is focused on the national park or public land estate and thus is less useful across the private land estate.

The fire scar mapping shows over 50 bushfire events within a 5km radius of the Project area from the period 2003 to 2023. The dataset does not define if these are planned or unplanned burns. Information from the Kogan RFS First Officer indicates these were not planned burns. The most recent fires are identified as occurring in 2011 and 2009, located along the southern boundary of the Project area and across the western half. These are more likely to

TABLE 4 BUSHFIRE HAZARD CLASSES CORRESPONDING TO POTENTIAL FIRE INTENSITY (FROM LEONARD ET.AL. 2014).

Potential Bushfire Intensity Class	Potential Fireline Intensity
1. Very high (potential intensity)	40,000+ kW/m
2. High (potential intensity)	20,000 to 40,000 kW/m
3. Medium (potential intensity)	4,000 to 20,000 kW/m
4. Low Hazard	< 4,000 kW/m

Bushfire hazard classification or threat level across the property and within the surrounding landscape (in terms of potential bushfire intensity) is Low to Medium (see Modelled Bushfire Hazard map Appendix A). The majority of the Project area is considered not bushfire prone, however an area of remnant vegetation within the property to the northwest of the Project footprint is considered medium hazard. Medium bushfire hazard vegetation exists to the east of the subject site; the potential impact buffer associated with this neighbouring vegetation extends to include part of the proposed development footprint.

The potential fireline intensity associated with the mapped Medium Bushfire Hazard vegetation (accounting for slope) is 8571 kW/m, with all vegetation being present on similarly flat ground. This fireline intensity is associated with VHC 13.2, which is the fringing vegetation occurring at the Project area boundary, and present in smaller areas of Project area. The potential fireline intensity associated with the Low Bushfire Hazard vegetation (accounting for slope) is 1046 kW/m, which is associated with the VHC 40.4 vegetation identified across the majority of the Project area. Overall, these values are considered Low (4000 kW/m) to Medium bushfire hazard (4000 to 20000 kW/m), however bushfire hazard does not mean bushfire will not occur, it does indicate the capacity for control of a fire at this level of intensity.

4.6.1. Asset Protection Zone Calculation

Bushfire Resilient Communities (QFES, 2019) identifies a minimum radiant flux level for vulnerable uses, storage or manufacture of hazardous materials and community infrastructure for essential services of 10 kW/m² or less at all development footprint boundaries where adjacent to medium, high or very high bushfire hazard.

The proposed facility is considered to be both a location containing hazardous materials (in the context of impact from bushfire) and provide essential services to the community as a renewable energy facility. The Asset Protection Zone calculator has been used to establish the radiant heat flux likely to impact the Project area for each identified vegetation type, even where bushfire hazard modelling has resulted in Low bushfire hazard, as the risk of bushfire is still present even though the intensity model indicates it is low.

The maximum heat flux exposure (which defines the minimum asset protection zone distance) can be calculated using the SPP Bushfire APZ Width-Calculator.xls produced by QFES. Table 5 shows the minimum APZ for BESS equipment.

TABLE 5 ASSET PROTECTION ZONE REQUIRED TO ACHIEVE 10 kW/m² RADIANT FLUX REFERENCE TO IDENTIFIED VEGETATION HAZARD CLASSES FOR BESS INFRASTRUCTURE

Vegetation Hazard Class	APZ	Radiant Heat Flux	Development aspect	Measurement to be taken from
13.2	38.0m	9.67	NW, E	NW corner of proposed infrastructure, directly to boundary of VHC 13.2 woodland vegetation to the NW
20.2	27.0m	9.83	N, E	N and E edges of proposed infrastructure directly to the boundary of VHC 20.2 woodland to the north and east
25.1	46.0m	9.77	W	W edge and SW corner of proposed infrastructure directly to the boundary of VHC 25.1 woodland vegetation to the W
40.4	16.0m	9.47	N, E, S, W	To be taken from all aspects of the proposed infrastructure essentially forming a 16m buffer of highly managed vegetation with minimised bushfire fuels around the BESS development.

TABLE 6 ASSET PROTECTION ZONE REQUIRED TO ACHIEVE 10kW/m² REFERENCE TO IDENTIFIED VEGETATION HAZARD CLASSES FOR ESSENTIAL INFRASTRUCTURE (CONSIDERED AS BUILDINGS AND CONSTRUCTION LAYDOWN)

Vegetation Hazard Class	APZ	Radiant Heat Flux
12.1	21.5m	28.35
13.2	15.5m	28.05
20.2	10.5m	28.02
25.1	19.5m	28.69
29.3	22.0m	28.69
40.4	6.0m	26.56

The average setback for BESS technology within the Project area from the outer extent of the Project footprint is in excess of 40m, which achieves the APZ objectives for 10kW/m² radiant heat flux exposure threshold

4.6.2. Bushfire Scenario

The Project area is located in a largely undeveloped landscape, characterised primarily by agricultural land uses and coal seam gas extraction, however there is an increasing intensity of energy generation from gas and solar, with Kogan Creek Power station 2km to the east along Banana Bridge Road and a large scale solar farm and accompanying BESS facility currently under development directly to the south of the Project area

The historical record confirms the recent frequent occurrence of bushfire in the regional landscape, although the immediate vicinity of the Project area escaped impacts from large-scale bushfire events of the Black Summer of 2019. This is potentially attributable to the nature of bushfire fuels (reasonably moderate fuel loads), and active risk mitigation by a largely rural landowner base in the form of fire breaks and bushfire fuel minimisation through fuel reduction burning and effective grazing regimes

The proposed development is located in the best position on the property, situated within an area of almost entirely flat landscape mostly surrounded by cleared land maintained with a low fuel load through grazing. Potential for bushfire impacts associated with the Project area must be considered due to the nature of the facility, for both the construction and operational phases of the Project. The significance of impacts to this infrastructure that may result from poor bushfire protection and the flow on effects to the community in the event of service interruption should not be understated.

The bushfire season is considered to peak in September, October and November when mean daily evaporation increases and mean 3pm humidity is at its lowest for the year. This period experiences variable wind direction associated with the changing seasons, and thus the conditions on any given day may vary as to the likelihood of bushfire conditions, and effect of prevailing winds on bushfire behaviour (backing wind or head wind). Topography is not considered a significant influence on bushfire behaviour within the Project area. In the context of likely ignition sources, accidental ignitions are most likely associated with roadways or activities within the Project area during development of Project area infrastructure

Based on fire history, the most likely direction of attack of a bushfire is from the south, as it is highly likely that high FDI conditions during the spring will be accompanied by westerly winds, which would maximise the potential fire behaviour (intensity and rate of spread). However, the land parcels to the west of the Project area are typically utilised for agriculture and grazing, featuring low fuel loads overall, and more hazardous vegetation classes occurring in corridors. It is also noted that the establishment of a BESS on the property to the south of the Project area improves bushfire hazard by extending the area of fuel reduced land in proximity to the Project area. 16 Mile Hall Road forms an effective fire break for low intensity fires that may occur from this discontinuous vegetation. A high intensity fire (resulting from a change in land management practices) may spot over, and ignite a new fire within the Project area or within the property to the south of the Project area. The threat posed by an ignition with the subject property (such as from a spot over from another bushfire) should be defensible with the implementation of bushfire management measures. A bushfire approaching from the south to south west/west will progress across flat ground only, although if

accompanied by a backing wind are likely to reach maximum predicted fireline intensities of 10,000 kW/m (medium bushfire hazard) at the property boundary. Within the property boundary, provided open grasslands are maintained, PFL at the facility boundary are likely to be less than 4000 kW/m.

A fire approaching from the north or east may pose a more significant threat due to the ability of an interrupted run towards the Project area based on the denser presence of woodland vegetation hazard types. Although the likelihood is considered less based on the reduced likelihood of prevailing winds occurring in association with peak Winda Road and Banana Bridge Road form firebreaks, bushfires spread into this area and fire history indicating little to no fire occurring in the woodland areas to the north and north east of the Project area. A bushfire approaching from the north or east will progress cross flat ground and approach to the Project area and thus can be expected to conform to the predicted potential fireline intensity calculation (up to 10,000 kW/m) at the property boundary, and at least 4000 kW/m at the eastern boundary of the facility.

The nature of bushfire attack will initially be in the form of smoke and ember attack, then radiant heat and potentially flame contact if fire breaks are not effective. The indicated APZ is not maintained free of vegetation.

5. RISK ASSESSMENT

A Bushfire Risk Assessment requires identification of hazard, determination of likelihood, vulnerability and consequence. A matrix is used to derive risk, based on these factors. The process used in this risk assessment is documented in the Queensland Emergency Risk Management Framework (QERM) Assessment Process Handbook (QFES, 2018). The use of a risk matrix also facilitates the evaluation of management measures to demonstrate risk reduction.

The risk matrix implemented in the QERM rates risk from Very Low (0) to Catastrophic (13). The risk assessment for proposal is 11 (High), prior to implementation of bushfire management measures, and risk is reduced to 8 (Moderate) for the BESS, and 5 (Low) for ancillary infrastructure after evaluation of bushfire management measures.

Table 9 addresses the risk posed by bushfire, firstly in the absence of any mitigation measures, and then demonstrates the risk reduction based on proposed measures, which are detailed on the Bushfire Management plan map.

HAZARD

Hazard is the identification of potential, regardless of any other factors. The preliminary hazard assessment undertaken as part of this Bushfire Hazard Study has identified Low and Medium across different parts of the Project area. The significant contributing factors to this hazard are vegetation classification.

LIKELIHOOD

Likelihood is a description of the probability of an event occurring. It is commonly presented in terms of Annual Exceedance Probability (AEP), based on the number of events that have occurred over a period of time. In order to establish likelihood for identified at risk assets, fire history information is necessary. QPWS fire history is disregarded for this evaluation, whereas the Fire Scar record provides more relevant incidents in proximity to the Project area. Fire history indicates 10 fires within 5 km of the Project area over 7 years from 2017 to 2023. Based on this premise, 10 events in a 7 year period is an Annual Exceedance Probability (AEP) of 1.43% or considered to be Almost Certain.

VULNERABILITY

Vulnerability is an assessment of the resilience of a community or asset to the identified hazard. It considers service interruption and reconstruction capacity and cost, options for evacuation, topographical features as barriers to addressing the hazard, occupant capacity for preparedness and response, and emergency services capacity.

TABLE 7 VULNERABILITY

Aspect	Vulnerability
BESS	Loss of storage capacity and feed in capability through bushfire impacts to BESS infrastructure. Vulnerable to running grass fire and ember attack from external bushfire activity. The worst-case scenario includes causation of thermal runaway.
Buildings and ancillary infrastructure	Vulnerable to running grass fire and ember attack from external bushfire activity.

In the absence of any mitigation measures, the property is considered to be highly vulnerable to the impacts of bushfire, as the loss of infrastructure may result in limited service provision impacting on the availability of electricity, possibly impacting the cost of supply. The proposed Project area design has only one access point indicated, (with respect to the Project area generally, not the BESS compound within the Project area). The Project area will be required to conform to fire engineering requirements associated with renewable energy facilities with respect to monitoring and suppression systems.

CONSEQUENCE

The consequence is a description and measure of the impact of a potential event on people, finance and economy, community, public administration and the environment. The degree of interruption of daily routines, loss of life or property, cost of recovery and resources required for this, and continuation of services (such as electricity and waste management), and damage to environmental values is evaluated on a scale of severity. Mitigation measures should be aimed at reducing this consequence.

TABLE 9: CONSEQUENCE

Aspect	Consequence
BESS	Damage to the BESS infrastructure may impact supply capacity for a period of time until repairs are affected. This may impact overall power supply to the network particularly in peak load times and have flow on effects for users including costs and tariff limitations. May cause reputational damage to the organisation or the industry.
Buildings and ancillary infrastructure	Likely to cause disruption to internal operations for a period of time until repairs are affected. Less likely to impact power generation and network supply.

The Consequence of bushfire impact within the Project area (in the absence of any mitigation measures) is considered to be Major, with critical injuries occurring from a bushfire event impacting the Project area disruption to normal operations (of 12 months or more) requiring financial inputs beyond the allocated budget to rectify asset damage and potential for damage to the environment including heavy metals and chemical contamination of soils and surface waters. There may be negative representation or criticism in the media.

Bushfire risk within the Project area is considered High (11). Mitigation measures are discussed in the next section, and the risk assessment is summarised in Table 9.

5.1. MITIGATION MEASURES

The Queensland Fire and Rescue Service is yet to provide direct guidance regarding bushfire safety measures for solar energy facilities or battery energy storage systems. The Victorian Country Fire Authority (CFA) has prepared design guidelines for renewable energy facilities in response to multiple incidents involving renewable energy facilities, [v o μ] v P • [P v] () v š Å v š š s] š } E] This is considered a good starting point of reference for mitigation measures relating to the Project area. While this risk assessment focuses on bushfire risk, the bushfire risk is considered both from the context of ingress from outside the Project area and as a result of equipment or facility related incident, and thus there is some cross over between the objective of fire engineering measures and bushfire mitigation measures, and the discussion regarding bushfire safety and mitigation measures.

5.1.1. Asset Protection Zone and Strategic Fuel Management

The principal measure is to create distance between the facility structure and bushfire prone vegetation with a potential to generate a radiant heat flux of 10kW/m² or greater. This is achieved by establishing infrastructure with a setback distance according to the calculated Asset Protection Zone for the identified vegetation hazard classes, and the maintenance of these asset protection zones. Identified Asset Protection Zones are shown on the Bushfire Management Measures Map (Appendix A).

5.1.2. Water Supply

The facility will be required to establish static water supply in the Project area. All water supplies are to be provided according to AS2419:2005 A bushfire fighting volume of 15,000 Lt should be provided to the facility.

BATTERY ENERGY STORAGE SYSTEM

CFA guidelines indicate a minimum water supply of 288kL for BESSs, however this volume is not practical and therefore not required to be provided at this site. Given the likelihood of Per- and polyfluoroalkyl substances (PFAS) contamination in firefighting water (due to the use of PFAS compounds within the BESS components), management of a large volume of contaminated water and obligations under Queensland state government environmental regulations regarding PFAS contaminated substances, it is not recommended to use water applied BESS units as a primary suppression or heat abatement technique. Water supplies within the Project area should be used to prevent ignition of bushfire fuels in the immediate surrounding area, and firefighting techniques should avoid water application directly to BESS infrastructure.

5.1.3. Access and Egress

The facility must be provided with all weather (gravel sheeted) access tracks. Perimeter vehicle access must allow firefighting vehicles to access around the perimeter of the BESS facility without requirement for U-turns or 3 point turns for larger vehicles. Asset protection zones may be located between this vehicle access and bushfire prone vegetation.

The Project area should be provided with an alternative access point from the public road network that allows for straight through vehicle access (without requirement for U-turns or 3 point turns for large vehicles). This access point should also provide an alternative direction of access and egress, to avoid forcing vehicle passage through or adjacent to bushfire prone vegetation.

5.1.4. Hazardous Goods and Flammable Materials

Hazardous goods and flammable materials are considered not to include BESS components. Hazardous goods and flammable materials may include fuels, lubricants, herbicides and other materials required for the construction and operation of the BESS and maintenance of the Project area. Only those quantities required for construction and operational purposes are to be stored within the Project area and must conform to all relevant standards for storage and handling. Suitable separation distances must be established between laydown and storage facilities and BESS facilities to prevent an incident in one part of the facility impacting or incorporating other areas. Hazardous goods storage areas are to be kept free of vegetation.

5.1.5. Incident Response and Cooperation with Rural Fire Brigades

Discussions with representatives of the Rural Fire Service (Kings) indicate a willingness of fire brigades to be involved to manage bushfire risk associated with the landscape generally, however it is also acknowledged that incidents involving facility infrastructure exceed the current capability of the rural brigades. The nearest urban brigade is located at Chinchilla, followed by Dalby, both of which are auxiliary brigades relying on volunteers. An emergency response plan must be developed for the facility including Bushfire. Further discussion and cooperation with the rural fire service in this regard increases active bushfire mitigation measures and builds local relationships and local knowledge which may improve emergency response measures when necessary.

6. BUSHFIRE HAZARD OVERLAY CODE

Western Downs Regional Planning Scheme Overlay Code 8.2.3 defines the performance criteria for developments relating to bushfire hazard mitigation, and identifies acceptable outcomes. These performance criteria and acceptable outcomes are described in Table 10, and Table 11. Management actions are described to achieve the performance criteria.

TABLE 9 RISK ASSESSMENT

	Risk Assessment Prior to Controls						Risk Assessment after Implementation of Measures				
Aspect	Hazard	Likelihood	Vulnerability	Consequence	Risk	Mitigation Measures	Hazard	Likelihood	Vulnerability	Consequence	Residual Risk
BESS	Medium	Almost Certain	High	Major	High (11)	Fire breaks to prevent ingress of fire front to the BESS, separation distances (APZ) to minimise radiant heat flux impacts, separation of BESS containers/enclosures to mitigate transfer of fire from one to another, water supply for dedicated incident response. Installation and use of automated monitoring systems and suppression systems to support early incident detection and rapid response. Addition of secondary access for emergency access/ egress.	Low	Almost Certain	Low	Moderate	Moderate (8)
Buildings and ancillary infrastructure	Medium	Almost Certain	Low	Minor	Moderate (7)	Fire breaks to prevent ingress of fire front to the BESS, separation distances to minimise radiant heat flux impacts, water supply for dedicated incident response, installation and use of automated monitoring systems and suppression systems to support early incident detection and rapid response. effective evacuation to minimise non-essential personnel on site	Low	Almost Certain	Very Low	Insignificant	Low (5)

TABLE 10 WESTERN DOWNS REGIONAL COORDINATING SCHEME 2019 OVERLAY CODE 8.2 PERFORMANCE CRITERIA

Performance outcomes	Acceptable outcomes	Solution
PO1 Development does not increase the number of persons living or working on land subject to High Bushfire Hazard identified on Bushfire hazard overlay maps (OO3) unless it is demonstrated that: (a) the subject land is a Medium Bushfire Hazard (or less) or (b) development is for community Infrastructure and facilities are located and designed to minimise susceptibility to bushfire events; and (c) a Bushfire Emergency Management Plan is prepared by a suitably qualified person(s) and appropriately mitigates risk to life and property.	AO1.1 Development does not increase the number of lots in areas of High Bushfire Hazard as identified on bushfire hazard overlay maps (OO3).	AO1.1 Complies The development does not increase the number of lots, and is not identified as within a High Bushfire Hazard area. Project design can minimise susceptibility to bushfire events and a bushfire management plan has been prepared to support the development of the Project area
	AO1.2 Uses within the following Activity groups are located outside of a High Bushfire Hazard identified on bushfire hazard overlay maps (OO3): (a) Accommodation activities group (b) Business activities group (c) Community activities group and (d) Entertainment activities group	AO1.2 Complies The proposed development is not a part of the listed activity groups, and is not identified as being within a High Bushfire Hazard Area Project design can minimise susceptibility to bushfire events and a bushfire management plan has been prepared to support the development of the Project area

Performance outcomes	Acceptable outcomes	Solution
PO2 In Medium Bushfire Hazard Areas as identified on Bushfire hazard overlay maps (OMD03), vehicular access is designed to mitigate against bushfire hazard by: (a) ensuring adequate access for firefighting and other emergency vehicles; (b) ensuring adequate access for the evacuation of residents and emergency personnel in an emergency situation, including alternative safe access routes (should access in one direction be blocked in the event of a fire); (c) providing for the separation of developed areas and adjacent bushland. Note - Where it is not practicable to provide firebreaks in accordance with A03.1 Fire Maintenance Trails are provided in accordance with the following: i. located as close as possible to the boundaries of the lot and the adjoining hazardous vegetation; ii. the minimum cleared width not less than 6 metres; iii. the formed width is not less than 2.5 metres; iv. the formed gradient is not greater than 15%; v. vehicular access is provided at both ends; vi. passing bays and turning areas are provided for fire fighting appliances either located on public land or in an access easement that is granted in favour of the local Government and QFRS.	AO2.1 The road design is capable of providing access for firefighting and other emergency vehicles, in accordance with SC6.2t Planning Scheme Policy 1 t Design and Construction Standards AO2.2 In areas of Medium Bushfire Hazard as identified on Bushfire hazard overlay maps (OMD03), roads are provided in accordance with the following: (a) Roads are designed and constructed with a maximum gradient of 12.5%; (b) Cul-de-sacs are not used except where: - a perimeter road designed in accordance with AO3.3 isolates the development from hazardous vegetation; and - the cul-de-sac are provided with alternative access linking the cul-de-sac to other through roads; and - the maximum length of the cul-de-sac is 200 metres AO3.3 In areas of Medium Bushfire Hazard as identified on Bushfire hazard overlay maps (OMD03) and development is for the purpose of Reconfiguring a lot, the design incorporates a perimeter road break that: (a) is located between the boundary of the lot and stands of native vegetation; (b) has a minimum cleared width of 20 metres; (c) has a constructed road width of six metres; and (d) is constructed to an all-weather standard.	PO2 Complies The proposed development will be required to meet SC6.2t Planning Scheme Policy t Design and Construction Standards, and will feature: - x Multiple access points to the operational facility (please see Bushfire Management Measures Map for access recommendations Appendix At subject to variation based on final infrastructure layout - x Access points and roads will accommodate emergency vehicles - x The proposal does not involve reconfiguration of a lot firebreaks and APZs are defined in Section 7.2.1 to address bushfire hazard associated with identified bushfire hazard and state planning policy objectives for community infrastructure. - x Separation distance between individual battery units will be stipulated by manufacturers recommendations The Operational Area will be maintained in a vegetation free state to mitigate transmission of fire between battery units, to the advantage of energy production and asset protection/business continuity objectives - x Gradients of 12.5% or greater are not present within the development footprint. The development will avoid cul-de-sac development with respect to internal Project area access ways.

TABLE 1 WESTERN DOWNS REGIONAL COUNCIL PLANNING SCHEME 2019 OPERATIONAL WORKS CODE 8.4.3 PERFORMANCE CRITERIA

Performance outcomes	Acceptable outcomes	Solution
PO1 Premises have an adequate volume and supply of water that: (a) meets the needs of users; (b) is adequate for firefighting purposes; (c) ensures the health, safety and convenience of the community; and (d) minimises adverse impacts on the receiving environment.	Where within an Urban Zone or Rural Residential Zone (Rural Residential 4000 Precinct, Rural Residential 8000 Precinct) AO1.1 Water supply reticulation is designed and constructed in accordance with SC6.2 Planning Scheme Policy 1 Design and Construction Standards Where within the Rural Zone or Rural Residential Zone (Rural Residential 2000 Precinct) AO1.2 A safe and adequate on-site water supply is designed and constructed in accordance with SC6.2 Planning Scheme Policy 1 Design and Construction Standards	AO1.1 Not applicable The development does not take place within the urban or rural residential zone, and is not within the range of the water reticulation network. AO1.2 Complies The development will feature a safe and adequate on-site water supply to meet the needs for firefighting purposes, with strategically located tank storage: - x Minimum 45,000L dedicated bushfire fighting supply - x Tanks to be located adjacent to access points and operational areas of the facility - x All water supplies provided according to AS2419.1 2005

7. BUSHFIRE MANAGEMENT PLAN

A bushfire management plan (BMP) has been prepared to address the identified bushfire hazard associated with the development of the Queensland Battery located on Lot 1 RP117442, and additional access infrastructure within immediately adjacent land on Lot 32 SP232241. Operational bushfire management measures are shown on the Bushfire Management Measures map in Appendix A.

This bushfire management plan is intended to address the hazard associated with the project area in its final developed form, and during the construction of the proposed facilities, to demonstrate the ability to achieve bushfire management objectives required under the planning framework.

The Queensland Disaster Management Guideline (QFES, 2017) utilises and defines the Prevention, Preparedness, Response and Recovery (PPRR) approach to natural hazard risk identification, mitigation, response and recovery. The guideline is written to address disaster management from the State level to Local Government level, and should be applied in general terms to maintain consistency with emergency response organisations and enable integration with local government or local disaster management groups in bushfire management planning where relevant.

7.1. PREVENTION

Prevention is the prescription and implementation of measures to reduce the likelihood of an event occurring or reducing the severity of an event should it occur. In addressing prevention, the specific hazard must be identified to develop objective, measurable and achievable mitigation measures.

7.1.1. Project Design

Appropriate project area design is principal in reducing the likelihood or severity of a bushfire event. This is achieved by strategic placement of roads and asset protection zones to provide adequate separation distances or defensible space for infrastructure subject to bushfire hazard. Defensible space requirements are relevant to the degree of hazard and explicit radiant heat impacts modelled on identified hazard.

7.1.2. Fuel Management Measures

FUEL MANAGEMENT ZONES

Fuel management zones are areas within the landscape that are managed to minimise or remove bushfire fuels, providing a defensible space, and linear separation from the main bushfire threat. Fire breaks may be located within Asset Protection Zones.

FIRE BREAK

A fire break is a strategically located linear fuel break intended to obstruct the path of a fire, provide an anchor point for back burning and active fire suppression. Fire breaks may be located close to assets (such as around a property boundary) or may be located in a strategic location in the landscape (such as at the foot of a slope) to inhibit the passage of a fire into difficult terrain or a higher risk area.

STRATEGIC FUEL MANAGEMENT ZONE

Strategic fuel management zones (SFMZ) are areas around an asset where fuels are managed by slashing, mowing or fuel reduction burning to minimise the total volume of fine fuels with two primary objectives:

- x reducing the likelihood of a fire igniting and developing, and
- x in the event a fire does develop, minimising potential rate of spread and intensity of a going fire.

Fire breaks may be classified as SFMZs, as they are frequently associated with fire management access trails that facilitate both maintenance activities and active fire suppression.

ASSET PROTECTION ZONE

Asset Protection Zones are areas closer to an asset, where landscaping and fuel management is quite intensive, and consists of tree maintenance, lawn maintenance, selective removal or placement of large plants (trees and shrubs) to minimise canopy connectivity. The objectives of the APZ are:

- x Provide separation distance from the bushfire hazard
- x Provide a defensible space where active fire suppression may be undertaken.
- x An area from where backburning may be conducted

FUEL MANAGEMENT TECHNIQUES

There are numerous fuel management techniques that can be applied to the Project area to achieve fire prevention and preparedness objectives, described in detail in Table 12. These techniques can be applied to varying degrees, in specific ways or as general prescriptions dependent on the nature of the Project area and the hazard.

TABLE 12 FUEL MANAGEMENT TECHNIQUES

Action	Description
Slashing	Slashing is the maintenance of grasses to a height of 10cm or less, which is achieved with a tractor drawn slasher or with brush cutters (whipper snipper) in areas with limited or difficult access.
Mowing/ Whipper Snipping	
Raking or manual removal of fine fuels	Raking and removal of fine dead fuels <6mm in diameter.
Lopping / pruning	Removal of low hanging branches, thinning of canopy, selective removal of branches overhang buildings or connecting the canopy with other trees.
Ploughing / Grading	Preparation of mineral earth fire breaks by ploughing / grading. Erosion management may be required either by surface sheeting with stable cover material (gravel) or hard landscaping permanent access features (walking trails).
Grazing	Grazing is an effective fuel reduction technique for large areas of grass fuels. The most effective application is to stock with a high number of beasts for a short period (days) to knock down the of fine fuels.
Fuel Reduction Burning	Hazard reduction burning is a method of removing ground litter and fine fuels by fire. Hazard reduction burning of vegetation is often used by land management agencies for broad area bush control, or to provide a fuel reduced buffer around urban areas.

7.2. PREPAREDNESS

Preparedness is the implementation of operational management plans to achieve the prevention objectives. Annual maintenance prior to the commencement of the fire season, training, community awareness and where appropriate, mutual aid agreements between organisations and agencies with common interests in asset protection and community safety that may work together across tenure in the event of a disaster event.

7.2.1. Fire Breaks and Fuel Management Strategy

The fuel management strategy is shown in the Bushfire Management Measures map in Appendix A

FIRE BREAKS AND ASSET PROTECTION ZONES

Fire breaks and APZs are specified for the BESS facility itself, to prevent vegetation fires within the BESS facility compound.

TABLE 13 - FIREBREAKS

Fire break	Specification
Perimeter Firebreak	6m wide mineral earth fire break (gravel or other nonvegetated trafficable surface), located outside the BESS, allowing for vehicle passage around the outside of the BESS infrastructure. To be located within the Boundary APZ

TABLE 14 ASSET PROTECTION ZONES (APZ)

APZ	Specification
Boundary APZ	Asset protection zones are identified around the perimeter of the facility including substation, BESS, Buildings and Laydown. The Asset Protection Zones have been established using the APZ width calculator are relevant to the adjacent vegetation type. The identified setbacks achieve the 10kW/m ² heat flux objective of Queensland State Planning Policy for BESS and Substations and 29kW/m ² for buildings & laydown. x 6m APZ for VHC 40.4 (Administration / O&M Facilities) x 16m APZ for VHC 40.4 (BESS adjacent substation)
Operational Area	Operational Area to be maintained free of vegetation at all times (gravel or other hardstand surface).

STRATEGIC FUEL MANAGEMENT

Strategic fuel management is identified for the BESS facility substation to mitigate risk arising from bushfire ingress to the Project area and propagation of bushfire from within the Project area

Broad area fuel minimisation is the principal recommendation for the Project area. Grazing annually, to minimise grass fuel loads will minimise the risk of fire impacting the infrastructure within the Project area. Although the property is generally considered to exhibit low bushfire hazard due to the nature of the vegetation across the property, grass vegetation should be managed to minimise the grassfire potential. Pasture grasses are known to become difficult to manage if left ungrazed for multiple seasons (aged grasses can be unpalatable to stock and increase the fine fuel biomass in the grassland).

The area to be maintained is indicated in the Bushfire Management Plan map in Appendix A. Table 15 details the treatment and timing for fuel management measures to be instated on an annual basis.

In any APZ or SFMZ areas, danger trees should be identified and removed. Danger trees are those that have hollow trunks or dead branches prone to ember attack and subsequent continued burning, and eventual failure (falling over or dropping limbs). Burning trees can also smoulder quietly for long periods and flare up unexpectedly during windy conditions creating a bushfire event.

TABLE 15 STRATEGIC FUEL MANAGEMENT ZONE TREATMENT AND JUSTIFICATION

SFMZ	Treatment/ Construction	Area	Timing	Premise/ Justification
15m APZ or VHC13.2 (Access Road)	Maintain grass < 30cm, no understory vegetation, tree branches removed to 2m above ground level	15m either side of road to the property boundary (it is noted that the access road is 4m from the eastern property boundary)	At all times	The primary access route to the BESS located immediately adjacent to medium bushfire prone vegetation. the potential for bushfire impact on vehicle access or vehicle passage should be minimised by removing fuels that may promote anything other than a surface grass fire (removal of low branches that may promote fire into trees and other elevated vegetation).
Property Generally	Grazing / Slashing	Balance of property not used for Energy Storage infrastructure	Annually prior to the fire season commencing	Maintenance of grass fuels to minimum height will reduce potential intensity of bushfire entering the Project area improving performance of SFMZ and APZ measures.

7.2.2. Water supply, Access and Egress

WATER SUPPLY

45,000Lt static water supply, dedicated for bushfire fighting is to be provided for the facility. A water supply point must be located near the entrance point and meet the requirements of AS2419. Water tanks must be concrete or steel construction and provide an area sufficient for a fire truck to turn around (8m minimum radius for 3 point turn, however through access is preferred). Turning circle (curb to curb) of 20.7m for 4x4 rural tanker (QFES, 2019) is recommended. The design refer to AS2419 and the Design Guidelines and Model Requirements: Renewable Energy Facilities (CFA, 2023) or as updated. The current design with a nominated boundary fire break trail and through access for both the BESS and Substation compound is an appropriate design.

ACCESS, EMERGENCY SERVICES AND INCIDENT RESPONSE

Access to and around the Project area must be provided with all-weather access routes, with turn radius suited to emergency vehicles. Turning circle (curb to curb) of 20.7m for 4x4 rural tanker (QFES, 2019). All access for emergency response across the property should provide through access. Dead end or cul-de-sac type road ends must be avoided and otherwise clearly signed as no through access. The current design with a nominated boundary fire break trail and through access for both the BESS and Substation compound is an appropriate design.

Where access is not wide enough for firefighting appliances to pass, passing bays must be provided at least once every 600m of road length. Road segments less than 600m long must have one passing bay provided within the road segment.

ACCESS/EMERGENCY EGRESS

The Project area to the public road network. Recommended access and egress points should be restricted for emergency response access/evacuation only to manage traffic volumes on rural roads and minimise entry points to the public road network under normal road use conditions. A recommended secondary access is indicated on the Bushfire Mitigation Measures map (Appendix A). The final alignment of this access may differ from that indicated, however should provide direct access to the public road network to the south west of the Project footprint.

7.2.3. Firefighting Equipment, Resources and Training

The Project area operator will need to ensure that the facility is serviced with appropriate suppression systems and firefighting resources commensurate with the occupation of Project area. As an unattended Project area (when the use is in operation), emergency response plans for the Project area must include scheduled maintenance for any firefighting equipment located within the Project area and considered available for RFS and QFES use. This may include:

- x Firefighting water supplies are full and maintained,
- x Firefighting appliances (trailer or vehicle mounted units) where provided are serviceable, stocked and checked regularly for the duration of the fire season
 - o Ensure pump fuel is fresh and topped up. Test starter at regular intervals to ensure serviceability.
 - o Check pump prime (preferably install a model with self-priming capability).
 - o Check fittings to ensure they are not fouled with mud, insect nests or other obstructions
- x Any plant that may be utilised in response measures is serviceable and fuel supplies are available.
- x Emergency services are able to access the site any time (24 hours/7 days per week)

It is recommended that suitable Project area induction and training regarding response scenarios involving hazardous materials and BESS infrastructure should be provided to local RFS and QFES personnel to enable them to provide effective support when required.

7.2.4. Awareness, Response Trigger and Evacuation Plan

Bushfire preparation includes identifying preconditions for response readiness and triggers for enactment of response measures. The Project area operator must address response and evacuation procedures in the Project area emergency management system consistent with the concept of Alert, Lean Forward, Stand Up and Stand Down. The following criteria are recommended for incorporation in the Project area procedures.

Bushfire hazard and risk assessment has been conducted using the Queensland's 85th percentile FDI for the region. FDI of 75 is within the classification of Extreme Fire weather condition messaging under the Australian Fire Danger Rating System.

AWARENESS

Project area operations must monitor the fire danger ratings as issued by the QFES. Readiness should increase with the FDR according to Table 16. Readiness includes making the necessary preparations regarding personnel and resources to move efficiently from Lean Forward to Stand Up.

TABLE 16 AFDR AND READINESS

Australian Fire Danger Rating		Readiness level
FDI	Messaging	
0-11	No rating	Alert
12-23	Moderate	
24-49	High	
50-99	Extreme	Lean Forward
100+	Catastrophic	Stand Up

Readiness Level Alert aligns with confirmation that all mitigation measures and response measures are in place and serviceable. A higher level of attention is given to public notifications and all personnel are aware of their role and responsibilities should readiness level be increased to lean forward.

Lean Forward is associated with an expectation that an incident is likely to occur, and preparations for transition to Stand Up should be in place. Hot works should be restricted at Lean Forward. All essential personnel should be evacuated from the Project area. Due to the nature of bushfire, once a fire has started within the local landscape, evacuation is not necessarily safe dependent on the location of fire and its proximity to the evacuation path taken by individuals.

RESPONSE TRIGGER

The response trigger for Stand Up may be the issuing of Catastrophic fire danger rating forecast occurrence of a bushfire incident in the immediate area, or an incident within the Project area. At Stand Up, all non-essential personnel should be excluded from the Project area. No non-operational visitation to the site should be undertaken during Stand Up.

Stand Down will occur when the fire danger rating is downgraded, or a bushfire incident is controlled or extinguished. At Stand Down, the recovery phase must commence and involves the return to normal operations, including replenishment of expended resources.

EVACUATION

The Project area must be provided with a muster point. The muster point must be the evacuation and shelter in place location for instances where Lean Forward has not occurred with sufficient time to remove essential personnel from the Project area.

7.2.5. Construction Phase

Construction activities must be cognisant of bushfire conditions, particularly during the fire danger period. An APZ and SFMZ should be established as part of the Project area early works program, providing primary bushfire mitigation and protection to the Project area during the course of construction. Minimum bushfire hazard mitigation measures for construction activities is detailed in Table 17.

TABLE 17 HAZARD MITIGATION FOR CONSTRUCTION ACTIVITIES

Construction Phase / Activity	Rationale	Required Actions
General Requirements	The absence of a reticulated water supply suitable for firefighting purposes requires a static supply be available at all times. Cigarette butts are a common cause of fire. Location, and provision of butt disposal containers removes this risk from the Project area.	A static water supply must be available on-site at all times during construction works during the dry season. Water supply must be a minimum of 10,000L equipped with a firefighting pump and hoses. Smoking must be restricted to designated smoking areas associated with workplace amenities, provided with appropriate waste receptacles for cigarette butts.
Site Preparation	The development Project area is currently vegetated. Minimisation of vegetation within the development footprint and establishing APZ and SFMZ during the early works phase will address bushfire hazard relating to construction of the Project area.	The development footprint must be cleared and APZ/SFMZ established during early works.
Hot Work (grinding / welding)	Grinding and welding activities produce hot swarf and sparks that may ignite light weight fuels under hot, dry conditions. Records indicate that grinding and welding accidents are responsible for a high proportion of accidental fire ignitions.	Do not undertake hot work on days of total fire ban. Where hot work is undertaken in an outdoors location, place shielding around the work site to limit the release of hot swarf and sparks. Avoid working in close proximity to dry grass, rubbish or other fine fuels. Do not undertake hot works in proximity to flammable and combustible materials (chemicals/ fuels/ oils). A fire extinguisher or water supply must be on hand at the site of hot works to knock down any accidental ignitions immediately.

Construction Phase / Activity	Rationale	Required Actions
Storage of flammable and combustible materials.	Flammable and combustible materials can accelerate fire behaviour; causing a controllable ignition to become uncontrollable, quickly and unnecessarily.	Only store minimum quantities of flammable and combustible materials at the work site. Store flammable and combustible materials in designated area removed from bushfire prone vegetation.
Mobile power supplies/ lighting towers.	Generator plant can produce sufficient heat (or sparks) to ignite fine fuels (grass) in hot, dry conditions.	Ensure all grass and other flammable vegetation is removed at least 2m around all mobile power supplies and other self-powered mobile plant
Training & Awareness	It is the responsibility for the owner or occupier of a site to contain any fire started within that property. Every effort must be made to contain any fire caused by construction activities within the worksite area. Construction personnel are considered to be able bodied and have capacity to take action against a fire ignition caused by construction activities.	Construction personnel should be trained in the use of fire extinguishers Fire awareness on days of high fire danger or when undertaking hot works must be addressed in prestart meeting discussions and toolbox talks. Plant operators should be trained in dry firefighting techniques

7.3. RESPONSE

Bushfire response is generally considered the specific actions in response to an immediate bushfire threat, either from outside the Project area or within the Project area. Bushfire response measures are considered to be consistent for both the construction and operational phase of the Project area.

Where fire outside the Project area threatens the Project area, the objective is to prevent it from entering the property, where fire occurs within the Project area, the objective is to protect other Project area assets, and prevent the spread of the fire outside of the Project area.

7.3.1. Ignition Source On-Site

It is considered that an ignition on-site will be triggered by a specific activity or failure of Project area infrastructure. Project area management should be aware of the ignition in a short timeframe, provided that sensor systems and SCADA is operating properly. This provides an opportunity to suppress the fire before it becomes uncontrollable.

- x Report the emergency to 000, and secure Project area until emergency services arrive.
- x Evacuate non-essential personnel to the on-site muster point
- x Attempt direct attack methods if possible (direct water application or extinguisher) or contain with a mineral earth fire break.

7.3.2. Ignition Source Off-Site

Where a fire approaches the property from the surrounding landscape, it is considered that this will be a larger, going fire and direct attack methods using available resources on-site are unlikely to be effective or safe.

- x Report the emergency to 000, and secure Project area
- x Evacuate non-essential personnel if safe to do so otherwise shelter in place
- x Enact active fire protection through wetting of perimeter lines within the boundary asset protection zones
- x Undertake direct attack measures as necessary to prevent any ignitions
- x Undertake asset protection as necessary to prevent damage to site infrastructure.

7.3.3. Rural Fire Service & QFES Response

In regard to bushfire response, the volunteer Rural Fire Service is the primary response agency for Project areas located within the boundary of Kogan and District Rural Fire Brigade and is adjacent to Hopton Fire Brigade area. For structural fires (including power generation, storage and transmission equipment) the QFES is the primary response agency. The nearest QFES brigade is Chinchilla followed by Dalby and Tara. These brigades are auxiliary brigades, operated by volunteers and not always manned. Turn out times of 30 minutes should be expected, and on-site capacity should take this into consideration.

The Project areas located within the Kogan and District Fire Warden District Rural Fire Service (RFS) contact details for emergency reporting and direct brigade contact are listed in Table 18.

TABLE 18 EMERGENCY AND FIRE STATION CONTACT DETAILS

To report a bushfire, or for any other emergency	000
RFS General enquiries Kogan & District Fire Warden Public education, property bushfire management plans, planned burn permits etc.	0429681775
Kogan & District Fire Brigade (RFS)	0429 659 646
Hopeland Rural Fire Brigade (RFS)	(07) 4665 4178
Chinchilla Fire Station (Auxiliary) (QFES)	07 4596 9400
Dalby Fire Station (Auxiliary) (QFES)	07 4662 2333
Tara Fire Station (Auxiliary) (QFES)	07 4665 3789

7.3.4. Combustion Products and Water Contamination

The Project areas located in a rural and agricultural landscape. Combustion of BESS infrastructure will result in the release of contaminants (heavy metals, plastics and persistent pollutants) to soils and suppression waters. Where possible, combustion products and suppression waters associated with BESS infrastructure must be contained on site, and not permitted to enter surface waters or migrate off site via other means. Application of water to BESS infrastructure involved in combustion should be minimized.

7.4. RECOVERY

Disaster recovery can be complex and sometimes a lengthy process. It is described simply as the restoration of normal operations.

Recovery of the Project area from a bushfire event will depend on the level of impact on the landscape, equipment and infrastructure.

1. Ensure fire area is safe and extinguished (burn area blacked out)
2. Identification of damage to assets or infrastructure
3. reinstatement of essential services (water, electricity) necessary,
4. Secure hazards in work area or public access areas (removal of any hazards caused by bushfire (burnt trees at risk of falling over etc))
5. reinstatement of bushfire hazard mitigation measures that were damaged or expended during the fire event (ensure fire breaks are clear of material that may contribute to bushfire activity (fallen trees etc).
6. safe access and egress from Project areas re-established, or conversely, access to Project areas is restricted

8. CONCLUSIONS & RECOMMENDATIONS

8.1. BUSHFIRE HAZARD ASSESSMENT AND RISK ASSESSMENT

An assessment of the Project area and its surrounding environment has demonstrated a bushfire hazard across the development footprint is low, however some areas of the property, and significant areas of adjacent land, feature Medium hazard with the development footprint falling just within the 100m potential impact buffer of modelled medium bushfire hazard vegetation. The identified potential bushfire impacts are likely to consist of smoke and ember attack in the absence of any mitigation measures.

The risk assessment identifies that the proposed use and the nature of the infrastructure to be developed on the Project area can carry a high degree of risk in the absence of appropriate bushfire management, particularly given the bushfire hazard identified in the immediate surrounding landscape. The application of fit for purpose mitigation measures effectively minimises the risk associated with bushfire at the Project area through separation distance from

native vegetation and bushfire fuel minimisation within both the area on site being developed and the balance of the property.

Establishing operations according to bushfire management measures, and engagement with local bushfire brigades will ensure the ongoing safe operation of the Project area

8.2. BUSHFIRE HAZARD OVERLAY CODE

The proposal complies in principle with the Bushfire Hazard Overlay Code

8.3. BUSHFIRE MANAGEMENT PLAN

A Bushfire Management Plan has been prepared for the Project area. Bushfire management measures are intended to be simple and achievable. There are elements of the Project area subject to detailed design, which may require revision of some aspects of the bushfire management plan or bushfire safety measures. This may be undertaken by a suitably qualified bushfire management practitioner, or in consultation with QFES.

Preparedness and response aspects should be incorporated into the Project area emergency response plans by the Project area operator. This should include details such as identification of roles and responsibilities for the Project area management structure, warning systems and a communications plan.

The bushfire management plan identifies fire management measures appropriate to the nature of the landscape, occupancy, and activities within the Project area. The principal objectives of fire management measures are to minimise bushfire fuels across the property, and provide fire breaks appropriate in the context of bushfire hazard within the Project area. The consideration to evacuate the Project area in the event a significant incident impacts the Project area is necessary to prevent injury to personnel not considered essential for the purposes of response.

8.4. RECOMMENDATIONS

The following recommendations are made to support the development and operation of the Project area and achieve bushfire hazard mitigation with minimal impact to the core operations of the Project area and ensure the development meets the objectives of the Bushfire Hazard Overlay Code.

8.4.1. Bushfire Management Plan

- x Project area management systems must address emergency management, and include bushfire management within the system.
- x The bushfire management plan should be reviewed on a regular basis (no less than every 5 years, or in response to significant changes in the surrounding landscape, including development or altered agricultural practices)
- x Engagement with the Rural Fire Service to achieve bushfire management objectives that are complimentary to the area and do not place an undue expectation on volunteer fire services

RESOURCES

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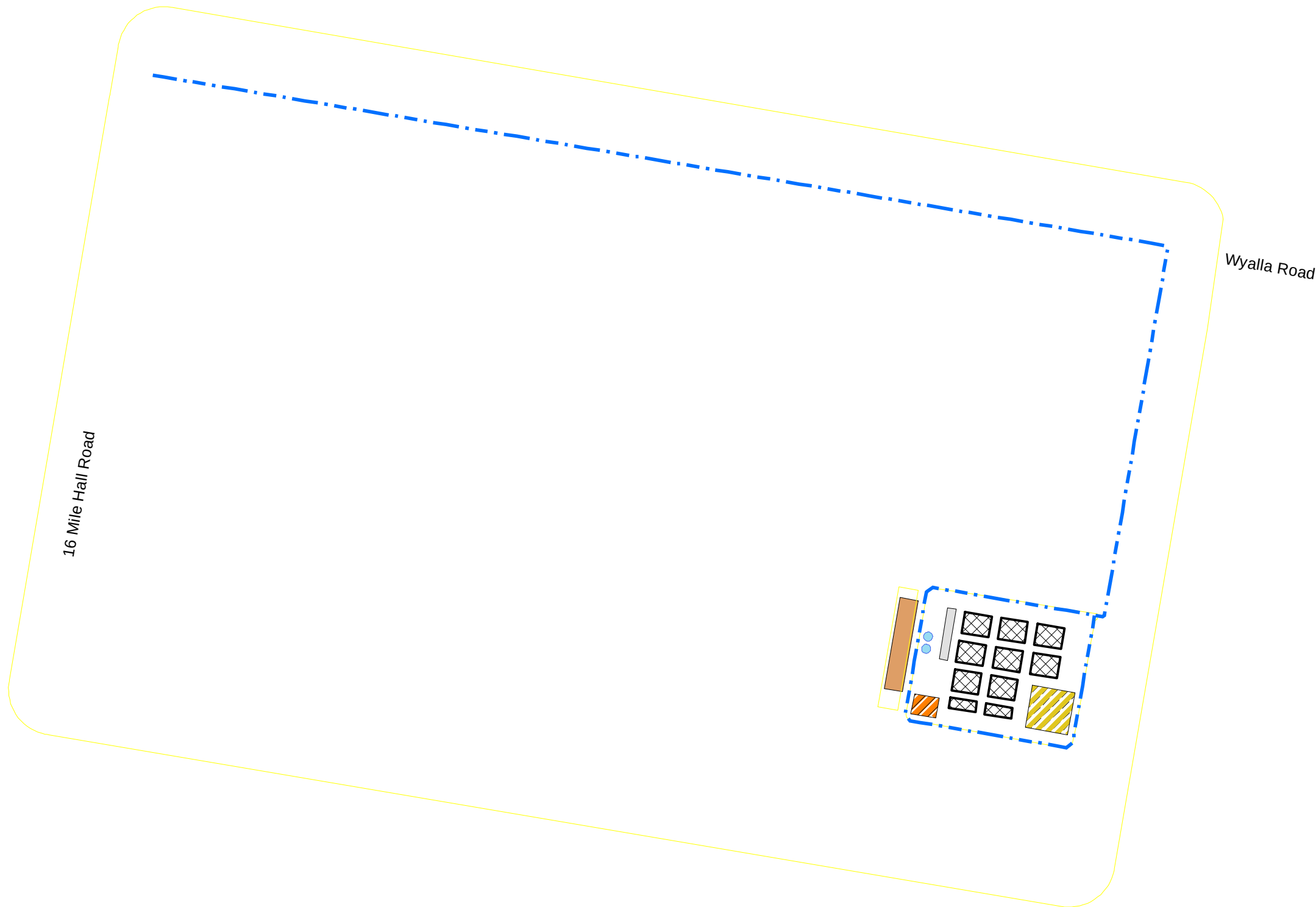
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APPENDIX A MAPS



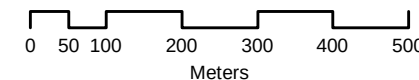
BUSHFIRE HAZARD ASSESSMENT

QUEENSLAND BATTERY
(1RP117442, 32SP232241)

SITE LOCATION

Legend

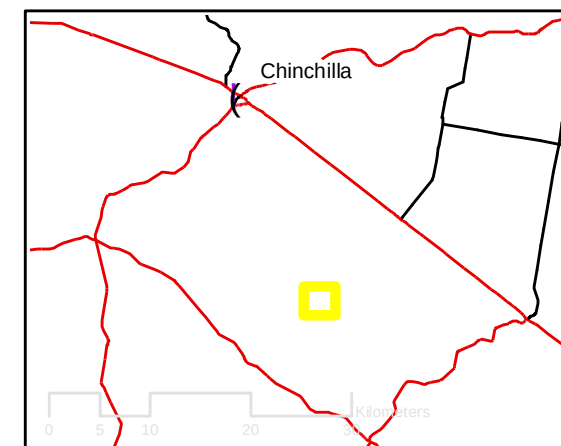
- Roads
- Watercourses
- Property Boundaries
- 1RP117442
- Assessment Area
- BESS Facility Infrastructure
 - Administration and O&M Facilities
 - ▨ BESS
 - ▨ Laydown and Site Establishment Area (Construction Phase Only)
 - ▨ Bioretention Basin
 - Proposed Fire Water Tanks
 - ▨ Substation
- Principal Site Access Road



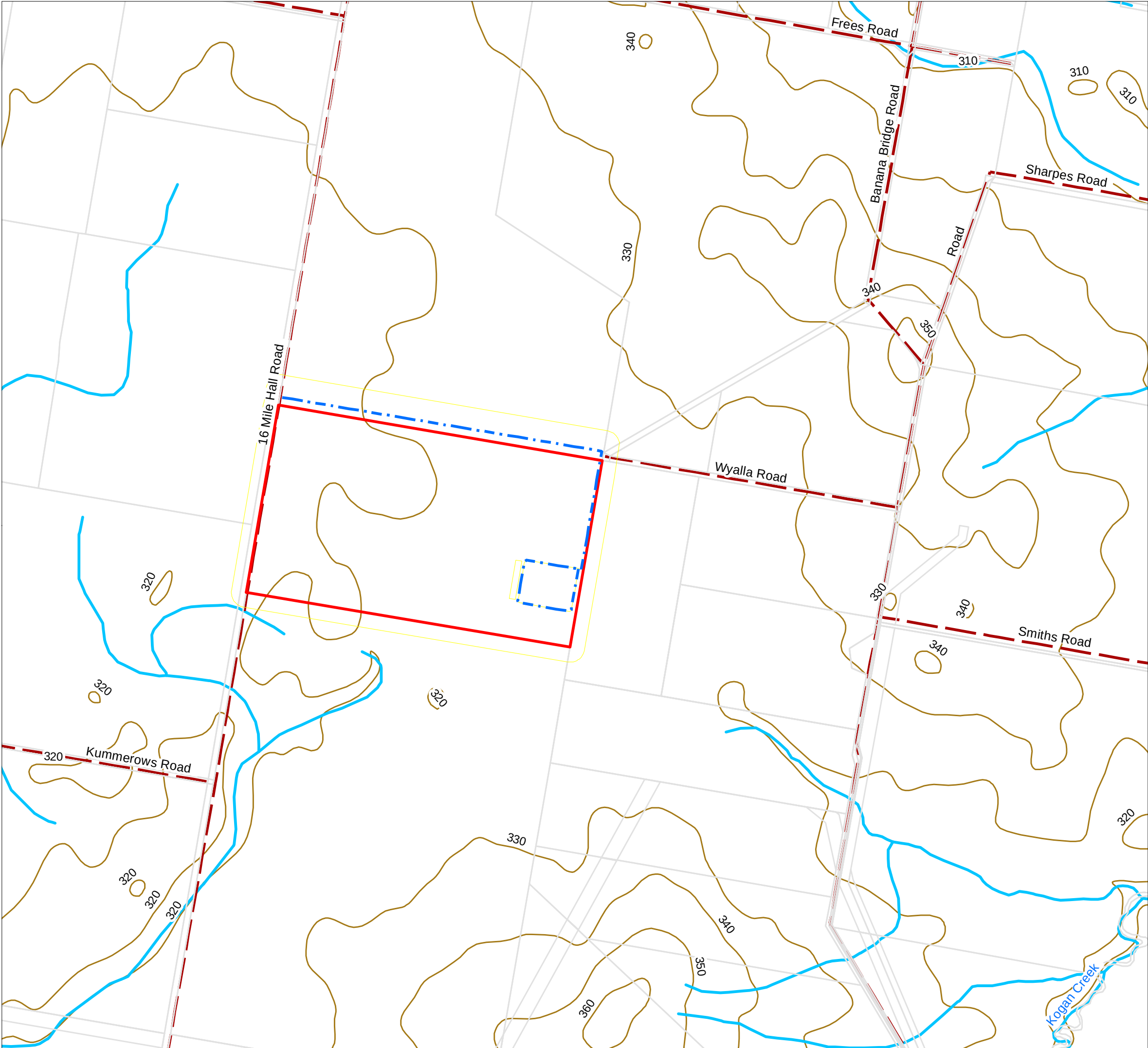
Coordinate System: GDA 1994 MGA Zone 55

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drainage_feature_map_100k@Queensland Government
Airphoto from TimeSeriesAerialOrtho_AllUsers@Queensland Government



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BUSHFIRE HAZARD ASSESSMENT

QUEENSLAND BATTERY
(1RP117442, 32SP232241)

TOPOGRAPHY AND HYDROLOGY

Legend

Property Boundaries

1RP117442

Assessment Area

Contours (10m)

Roads

Watercourses

BESS Facility Infrastructure

Principal Site Access

Slope (Degrees)

0 - 5

5 - 10

10 - 15

15 - 20

>20 degrees

Coordinate System: GDA 1994 MGA Zone 55

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Vegetation_management_watercourse_and_
drainage_feature_map_100k)©Queensland Government
Slope derived from 1s DEM from Queensland LiDAR Data
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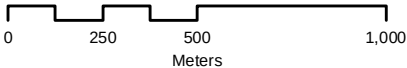
BUSHFIRE HAZARD ASSESSMENT

QUEENSLAND BATTERY
(1RP117442, 32SP232241)

VEGETATION
AND
BUSHFIRE FUELS

Legend

- Roads
- Watercourse
- Property Boundaries
- 1RP117442
- Assessment Area
- BESS Facility Infrastructure
 - Administration and O&M Facilities
 - BESS
 - Laydown and Site Establishment Area (Construction Phase Only)
 - Bioretention Basin
 - Proposed Fire Water Tanks
 - Substation
- Principal Site Access Road



Coordinate System: GDA 1994 MGA Zone 56

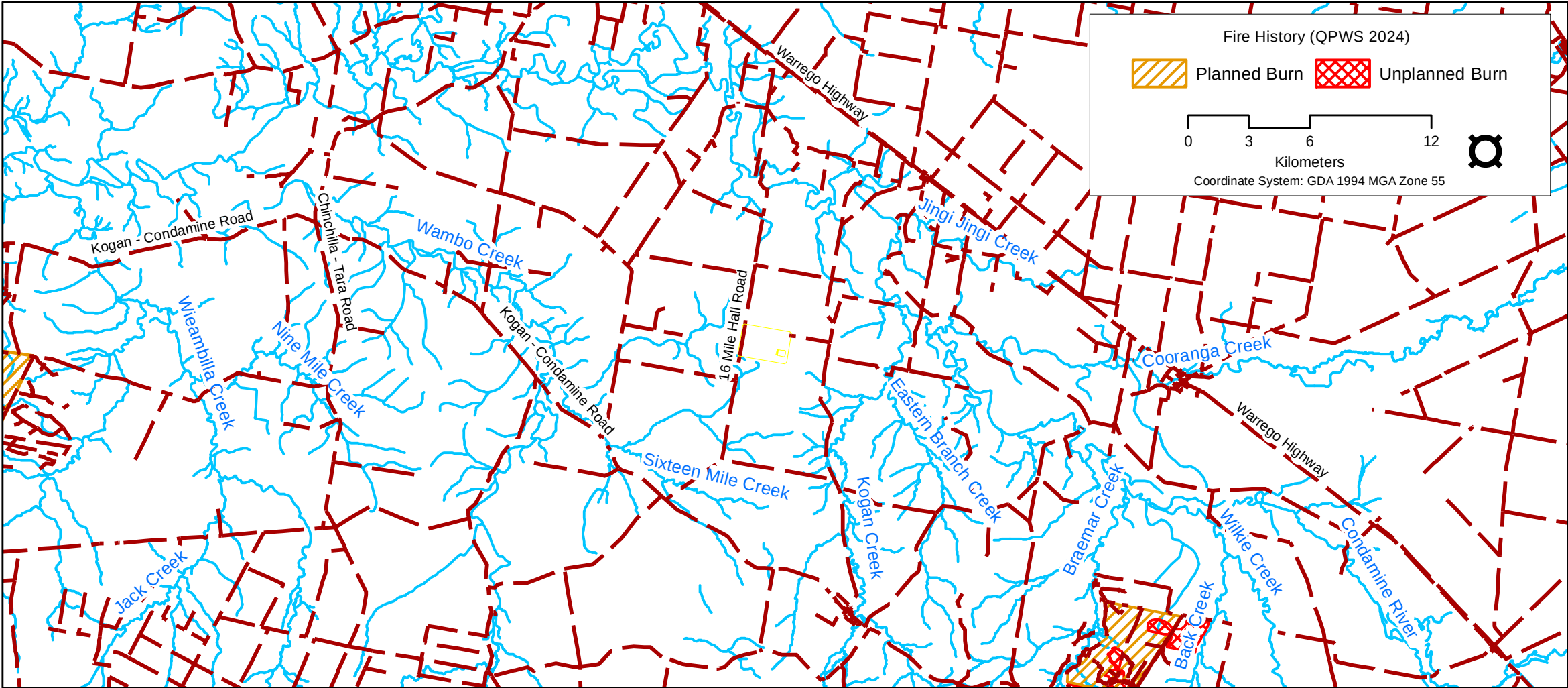
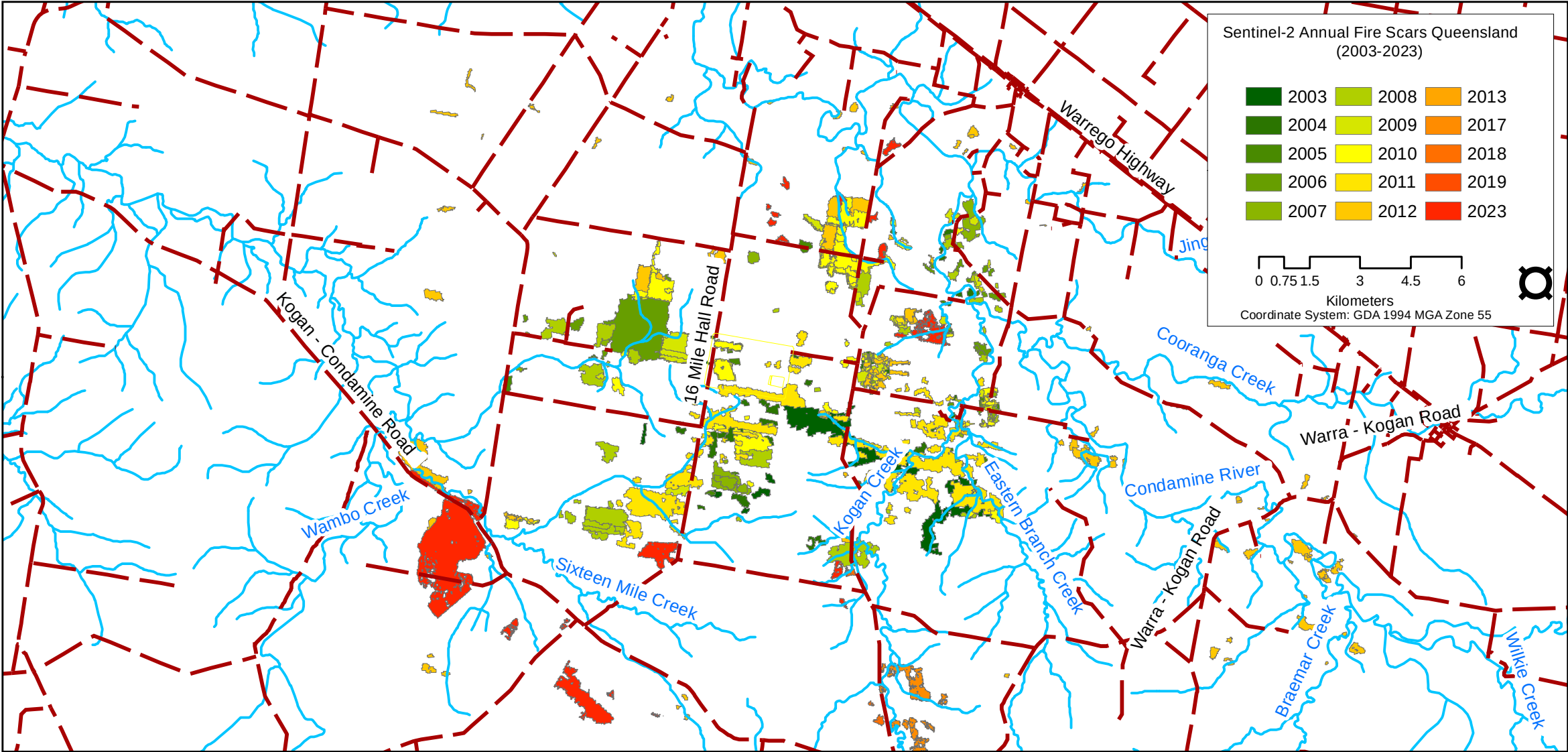
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Vegetation Hazard Class (Potential Fuel Lod (tonnes per hectare))	
43.6	Water bodies or very low vegetation cover (0 tph)
38.5	Cropping and horticulture (2 tph)
41.4	Low grass or tree cover in built-up areas (3, tph)
40.4	Low grass or tree cover in rural areas (5 tph)
20.2	Woodlands dominated by white cypress pine or coast cypress pine (9.3 tph)
16.2	Eucalyptus dominated woodland on drainage lines and alluvial plains (11.6 tph)
13.2	Dry to moist eucalypt woodlands on undulating metamorphics and granite (14.4 tph)
25.1	Brigalow belah open forests on heavy clay soils (15 tph)
17.1	Dry open forests dominated by poplar box, silver-leaved ironbark or White's ironbark on sand or depositional plains (15 tph)
29.3	Heathlands and associated scrubs and shrublands (20.1 tph)
12.1	Dry eucalypt open forest on sandstone and shallow soils (21 tph)

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BUSHFIRE HAZARD ASSESSMENT

QUEENSLAND BATTERY
(1RP117442, 32SP232241)

FIRE HISTORY

Legend

- Roads
- Watercourses
- Assessment Area

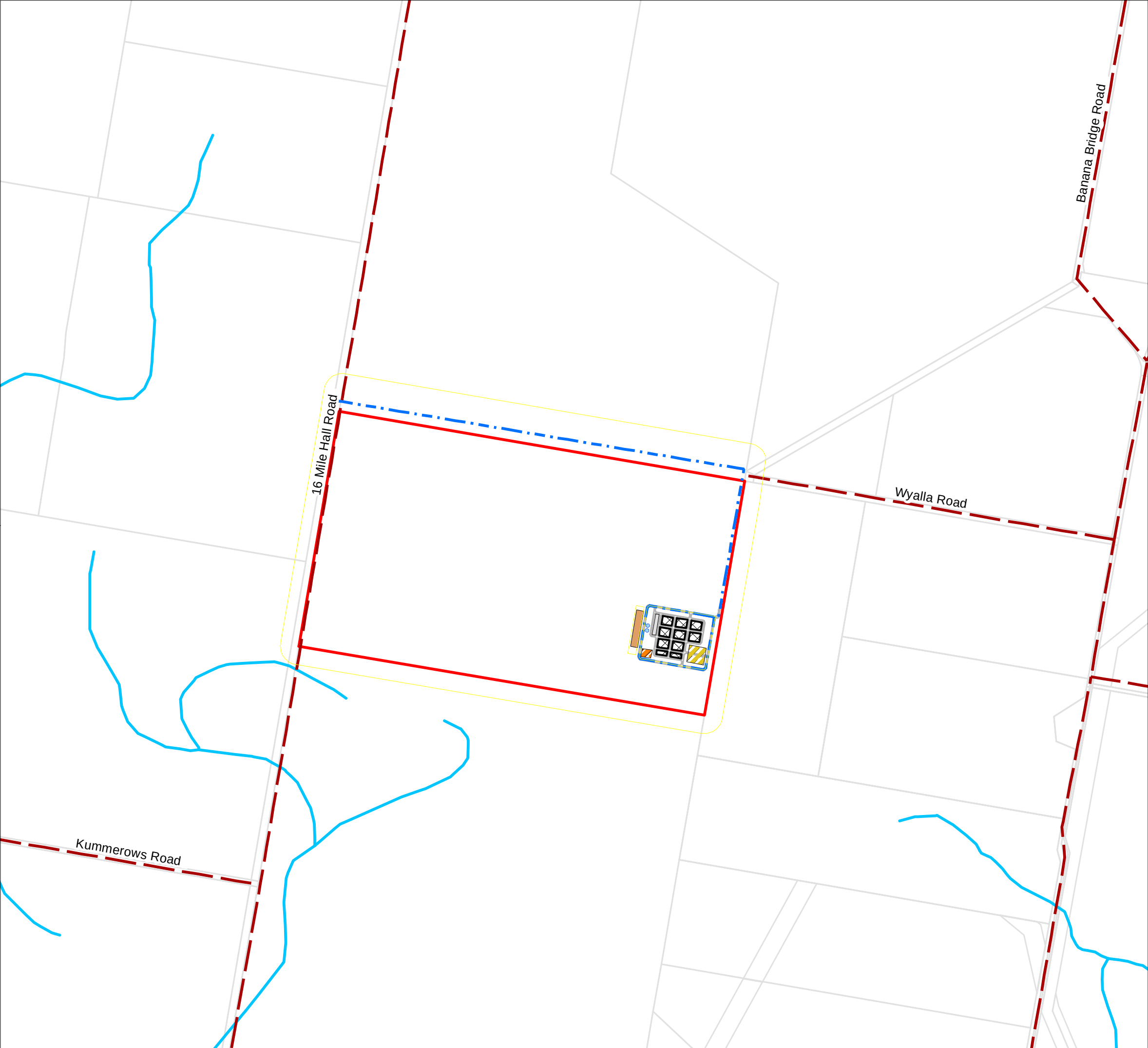
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Fire Frequency and Time since last burn from NAFI (2023)
Fire History (QPWS) © State of Queensland (Department of Environment and Science), 2023
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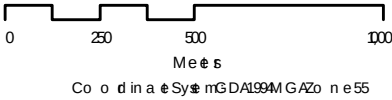
BUSHFIRE HAZARD ASSESSMENT

QUEENSLAND BATTERY
(1RP117442, 32SP232241)

BUSHFIRE HAZARD MODEL

Legend

- Property Boundaries
- 1RP117442
- Roads
- Watercourses
- Assessment Area
- BESS Facility Infrastructure
 - Administrative and MF facilities
 - BESS
 - Laydown and Establishment Area (Construction Phase Only)
 - Bio-ecological Basin
 - Proposed Firewater Tanks
 - Substation
 - Proposed Access Road
- Bushfire Hazard Model
 - Medium Potential Bushfire (1000-2000k W_{in})
 - High Potential Bushfire (2000-4000k W_{in})
 - Potential Impact Buffer (100m)



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Notes
Property boundaries and development potential shown are based on the Queensland Department of Natural Resources and Environment's Queensland Cadastral Database (QCAD) and the Queensland Department of Natural Resources and Environment's Queensland Road and Infrastructure Database (QRID). The assessment was conducted using the Queensland Department of Natural Resources and Environment's Bushfire Hazard Assessment System (BHAS) and the Queensland Department of Natural Resources and Environment's Bushfire Hazard Assessment System (BHAS) using the Queensland Department of Natural Resources and Environment's Bushfire Hazard Assessment System (BHAS).
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- Bushfire Management Measures
- Water Supply and Access Points
- !

Administration / O&M Facilities Access Point

k

Alternative Firebreak Access

#

Principal Property Access Point

*

Recommended Secondary BESS Access Point

20

Water Supply 45,000Lt (Dedicated bushfire fighting supply)
- Proposed Access Arrangements
- BESS Internal Access Road

- - -

Principal Site Access Road

Perimeter Access (and firebreak)

BESS Roads

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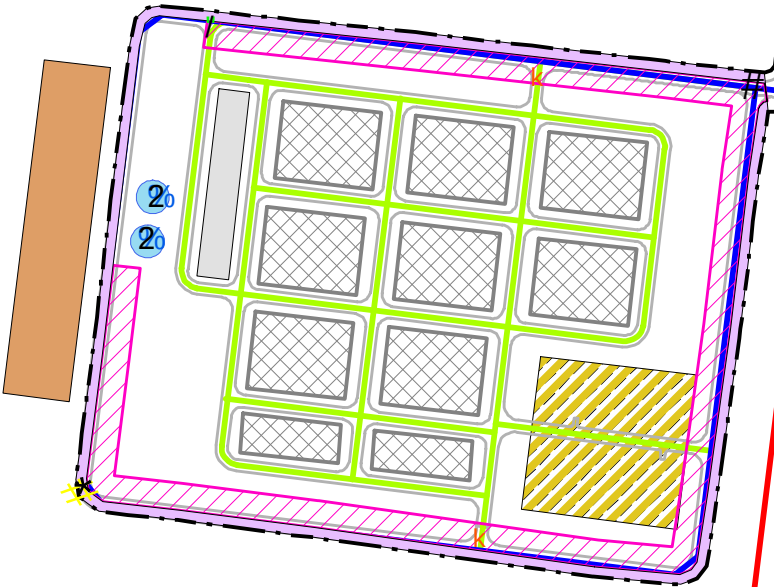
Recommended Additional Emergency Access / Egress
- Firebreak
- Mineral earth firebreak with all weather trafficable surface, inside Asset Protection Zone.
- Construction Phase APZ
- Maintain in low fuel state (grass < 10cm),no trees or shrubs - 10m wide
- Operational Phase APZ
- Boundary APZ - 16m (BESS & Switch Station Infrastructure)

Boundary APZ - 6m (non BESS Infrastructure)
- Strategic Fuel Management Zone
- Operational area free of all vegetation at all times

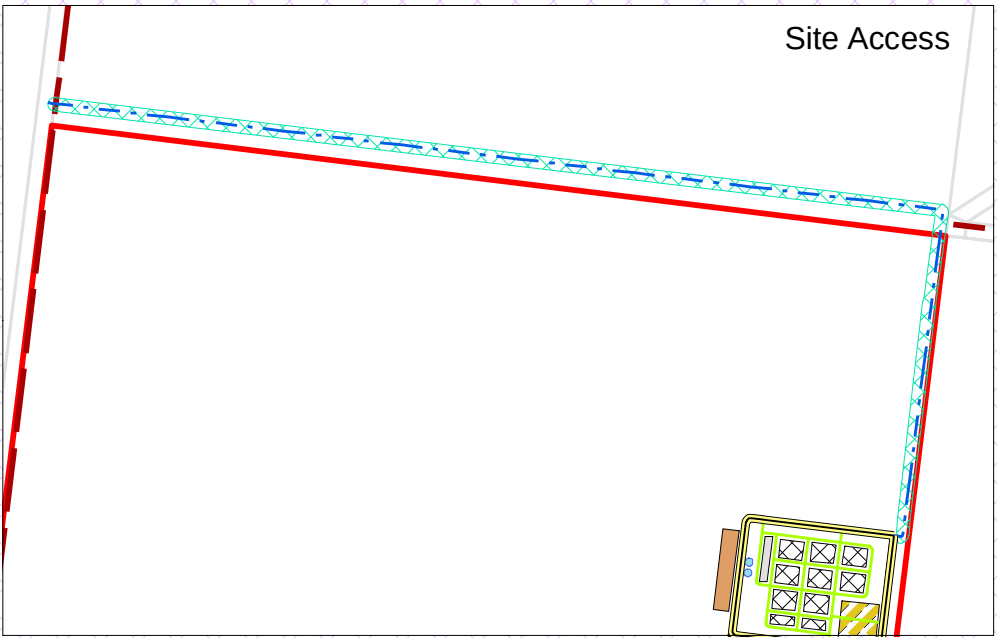
Principal Access - Maintain grass < 30cm, no understory, tree branches removed to 2m, dead trees removed.

To extend 15m from the track edge or to the property boundary (east side).

Asset Protection Zones



Site Access



BUSHFIRE HAZARD ASSESSMENT

QUEENSLAND BATTERY
(1RP117442, 32SP232241)

BUSHFIRE MITIGATION MEASURES

Legend

- Roads

Property Boundaries

1RP117442

BESS Facility Infrastructure

Administration and O&M Facilities

BESS

Laydown and Site Establishment Area (Construction Phase Only)

Bioretention Basin

Proposed Fire Water Tanks

Substation
- 0 25 50 100 150 200
Meters
- Coordinate System: GDA 1994 MGA Zone 56
- Limitation & Disclaimer:
Data presented is for information only, and is not to be used for navigation.
Map prepared to support technical report 7-36-12
No liability is accepted for use outside of the intended purpose.
Notes:
Property Boundaries and Development Properties from
QLD_CADASTRE_DCDB@Queensland Government
Roads from Queensland Roads and Tracks@Queensland Government
Bushfire Mitigation Measures address concept design by GHD:
12646897-GHD-00-00-DRG-EL-0001
Airphoto from TimeSeriesAerialOrtho_AllUsers@Queensland Government
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