Underground Residential Development

Master Planning Guideline v5.0

Version Control

Version	Issued	Description
1.0	18/06/18	Initial issue for consultation
2.0	1/09/18	Revised with input from internal and external stakeholders
3.0	26/03/19	Revised process and other general updates.
4.0	26/06/20	Revised master plan requirements, links and appendix. Incorporated REFCL requirements.
5.0	7/03/25	Added new section ‘Prospective Fault Levels’ under LV arrangement, and general updates.

Table of Contents

1 Purpose

The intent of Powercor's approval process for Underground Residential Development (URD) master plans is to ensure that the proposed URD estate:

- complies with relevant Powercor standards;
- is approved in an efficient manner;
- does not hinder the provision of supply to neighbouring developments; and
- enables Powercor to efficiently meet the wider future planning needs of the surrounding distribution network.

The following sections outline the current process for approval of URD master plans along with the guiding principles for some of the key requirements.

Note: This document applies to URD and Underground Commercial/Industrial developments up to 25kVA per lot.

2 Abbreviations and Acronyms

See Appendix A.

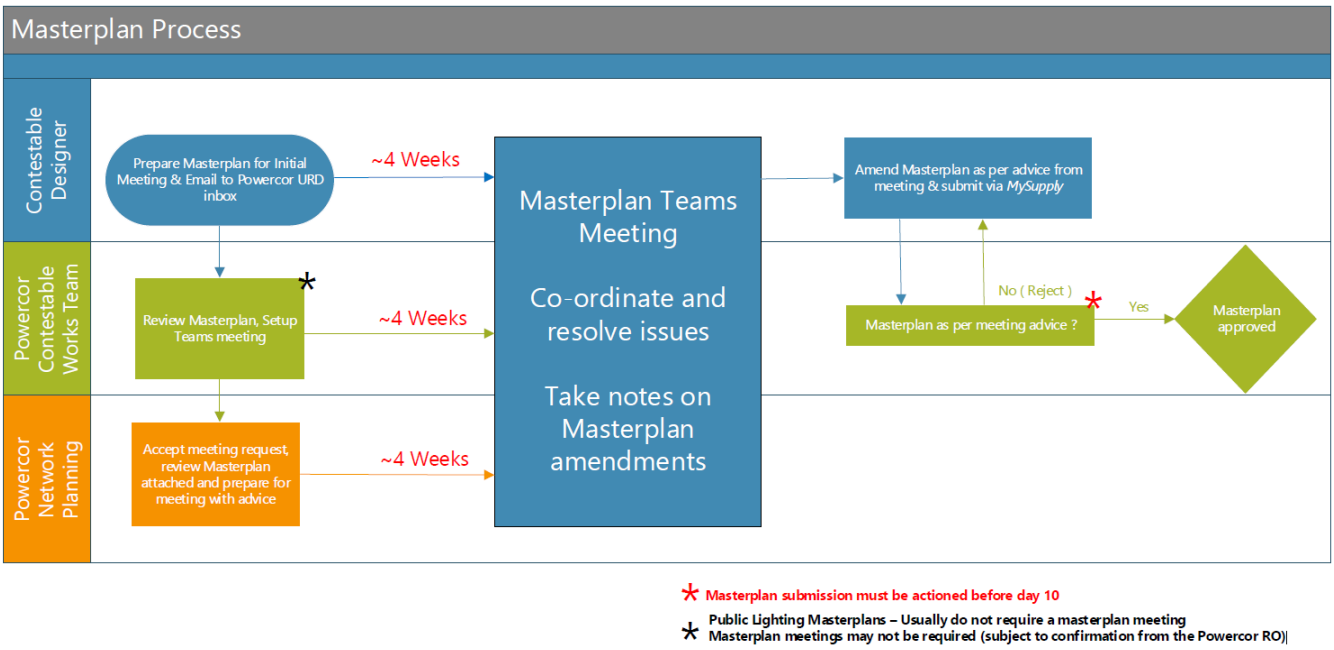
3 References

All reference documents are available in the CitiPower and Powercor website (www.powercor.com.au).

A summary of the core reference documents is in Appendix B.

4 Master Plan Approval Process

Powercor requires final approval rights of all URD master plans and associated stage scopes. The high level approval process is as follows:



Please note the following:

- If any change to an approved masterplan is required, whether requested by the developer or Powercor, a revised masterplan must be submitted for approval, unless agreed with Powercor as a minor masterplan variation.
- Masterplans will be valid for a period of 2 years from approval by Powercor, unless advised otherwise.

5 Master Plan Principles

5.1 General Arrangement and Documentation

The quality of information provided to Powercor is an essential part of providing timely approval of a proposed master planning arrangement. Lack of clarity or missing information will cause delays as clarifications are requested. Powercor require the following:

- Format: All drawings must be submitted in both CAD format (e.g. DWG format) and PDF format. All other documents shall be submitted in digital PDF format as a minimum, with any additional information in PDF format with a second version in the required native format.
- General arrangement: Drawings and supporting information showing the general arrangement of the URD must show the following:

- Ultimate Development: The final state of the URD estate with lots, roadways (including bridges, overpasses, etc.), community areas, display villages and any other relevant information. Stages must be marked clearly. Refer to Appendix C.
- Development Order: How the proposed development will be staged with supplementary tabulated information on the development timeframe for all stages from commencement to the ultimate completed URD. Refer to Appendix C.
- Interface to Surrounding Developments: Reference to surrounding masterplans must be included, and consideration given to how estates will tie together.

- Civil Drawings: Engineering drawings showing all in ground assets in areas where the Developer has specifically identified to have the potential to impact the electrical assets.
- Electrical Drawings: Engineering drawings showing connectivity of the proposed High Voltage (HV) network in a single line format, clearly showing any staging requirements. Engineering drawings showing the HV network and substations physically within the URD.
- Electrical Asset Detail: Tabulated data showing kiosk substations, customer numbers, low voltage (LV) circuit lengths, cable sizing, voltage drops and loading information in addition to identifying the lots supplied by each LV circuits and substation.
  Tabulated data showing HV cable information per cable as per the example below. Powercor will advise which cables require VLF TD and PD testing. For REFCL areas the expected energisation date for each HV cable will also be required.

CABLE SCHEDULE						
CABLE ID	VOLTAGE	CABLE LOCATION	CABLE DETAILS	APPROXIMATE CABLE LENGTH	D.C.C.C	VLF TD & PD TESTING
HV1	22kV CABLE	FROM (N) HV CHP AT (E) POLE 203 (LIS-111839) TO (N) KIOSK S/S "D"	240 3/c 22 a.x.h.c.h	123m		YES/NO
		FROM (N) KIOSK S/S "A" TO (N) KIOSK S/S "D"	240 3/c 22 a.x.h.c.h	261m		YES/NO
		FROM (N) KIOSK S/S "A" TO (N) KIOSK S/S "B"	240 3/c 22 a.x.h.c.h	415m		YES/NO
		FROM (N) KIOSK S/S "B" TO (N) KIOSK S/S "C"	240 3/c 22 a.x.h.c.h	485m		YES/NO

- Powercor Assets: Clearly highlighting any expected interaction (i.e. tie in works) with existing Powercor assets either above or below ground.
- Revision History: Include a table showing the revision history of the masterplan including CA number and drawing number.
- Stage Plans: All stage plans associated with a masterplan must include reference to the Powercor masterplan drawing number.

5.2 Powercor Standards and Information

A number of Powercor standards currently exist covering all aspects of electricity supply to a URD estate. All of these standards and requirements can be found via the Powercor Contractors Portal. Access is for registered users only, and registration can be requested via the Technical Standards and Work practice section of our website. This guideline is not a replacement for these standards, but provides high level detail and principles. URD Matrix is for quick reference for Developers to the relevant information contained within the standards. Refer to Appendix B.

Access to a version of Powercor's geographic information systems (GIS) will be via an external portal to MapInsights. This will give the Developer access to Powercor's HV and LV network data, which is solely to be used for the development of the proposed master plans.

5.3 Third Party Requirements

It is the Developers responsibility to ensure the master plans comply with any relevant third party requirements that may be applicable. These include, but are not limited to:

- Precinct Structure Plans for the area
- Council requirements
- Cultural heritage requirements
- VicRoads & VicTrack requirements
- Environmental assessment requirements

5.4 High Voltage Network Arrangement

The guiding principles for arrangement of the high voltage network in and around an estate are as follows

- General arrangement: All urban and rural multi stage URD's must be arranged with HV ring supplies to provide backup capacity during planned maintenance and outages.
- Capacity: HV assets must be sized to meet the relevant maximum demand (kVA per lot) requirements as stated in Powercor Standard DA411 for residential lots, or 25kVA per lot for commercial/industrial lots. HV assets must maintain cable ratings and not be de-rated due to either proximity to or crossing of any other services (e.g. water, gas, sewer, etc.), depth or congestion.
- Easements: Line easements up to 4.0m wide will be required to cover electrical assets in public land, council reserves or across specific lots. The width will be confirmed as part of the masterplan process.
- Conduits: All HV conduits are to be a minimum of 150mm diameter.

  The default minimum number of spare conduits in URD estates are as follows:

Minimum spare conduits when excavating and installing new underground cable	URD
On property	1 spare per installed cable
In street	0 depending on ultimate requirements
Road Crossing	1 spare per installed cable group[+]

Table 1: Minimum number of spare conduits when excavating and installing new underground cable

  - Note 1: [+]group is defined as being HV. I.e. one spare conduit will be required for a HV bank of cables;
  - Note 2: Network Planning is to confirm additional spare conduits for future planned augmentation works which may be in excess of the minimum number shown in the table above; and

    - Note 3: All spare HV conduits are to be 150mm diameter.
- Additional HV requirements: All additional HV requirements (such as spare conduits, tie ins, etc.), as requested by Powercor, must be incorporated into the developer's submission.

The applicable Powercor standards include DA411, GA001, GA070, GA211, GB101 and GC101.

5.5 URDs in REFCL areas

The Victorian Government has legislated changes to the Bushfire Mitigation regulations that require the introduction of REFCLs at zone substations supplying high consequence bushfire areas. With this introduction of REFCLs comes a performance requirement which must be maintained in order for the whole zone substation high voltage system to operate as required and reduce the likelihood of fire starts.

If your URD development is within an existing or future REFCL area, there may be a Powercor requirement that could impact the HV cable route and or type. Developers shall make provision for one or more HV isolation transformers, depending on the configuration of the estate. Isolation transformer sites shall be located within 200m of the entry into the estate. The reserve size required can be found in Powercor standard GL061. Further information will be provided at the Preliminary Meeting with Powercor.

5.6 Substation Sizing and Location

The guiding principles for selecting locations for substations within a URD are as follows:

- General arrangement: As far as practically possible, substations should be located at the centre of the area to be supplied to ensure balanced LV loading and to minimise voltage drop. A HV switching cabinet might be required to satisfy the area's HV reticulation and or development.
- Sizing: Substations must be sized to meet the relevant maximum demand (kVA per lot) requirements as stated in Powercor standard DA411 for residential lots, or 25kVA per lot for commercial/industrial lots. However, consideration needs to be made for any solar, commercial, super lot or display village requirements the Developer has. The standard size of a kiosk shall be 315kVA, any proposed alternative sized kiosks must be submitted for review and pre-approval by Powercor. Utilisation may be limited by Powercor for larger kiosks.
- Site Location: Substations must be located on a defined lot and not on public land, open spaces or within council reserves unless the relevant council can provide written agreement to this arrangement. It is the Developer's responsibility to obtain a Council approval letter prior to Master Plan approval.
- HV and LV Access: Site selection must give consideration to other in ground services and ensure that they do not limit access. Furthermore, where substations are located, avoid having other ground services in the area outside the Kiosk reserve and ensure minimum HV bending radius is per the Powercor standard GC021.

The applicable Powercor standards include DA411, DA421, DA431, GL051, GL001, GL021, GL031, GL201 and GL251.

5.7 Low Voltage Network Arrangement

The guiding principles for LV network plans are as follows:

- LV Parallels: Allowance shall be made for a minimum of three LV paralleling pillars for each substation to connect to neighbouring substations in the area.
- LV Loading: Where there are commercial, super lot or display villages being connected, the Developer must ensure that LV circuits are not overloaded.
- LV circuits: Wherever possible 5 LV circuits should be installed from all URD substations. LV circuits must be arranged such that there are no safety hazards for operations personnel, such as ambiguous circuit labelling, LV mains, service cables or public lighting cables passing paralleling pillars etc.
- Voltage Compliance: LV circuit lengths and sizing must be designed to ensure compliance with the Power Quality requirements of the Electricity Distribution Code of Practice, including voltage drop/rise. This is to apply under feasible loading scenarios including LV circuit parallels with neighbouring substations. Note that LV circuit lengths greater than 300m will require justification and approval from Network Planning (which will only be granted in exceptional circumstances).
- Prospective Fault Levels: The Victorian Service and Installation Rules 2014 (SIR) deem the LV fault levels at consumer terminals to be less than 6kA phase to earth and 10kA between the phases for transformers rated less than 500kVA. To enable future upgrade to larger transformers it is necessary to ensure minimum LV mains cable lengths between the substation and service tee joints and minimum lengths of service cable are maintained.

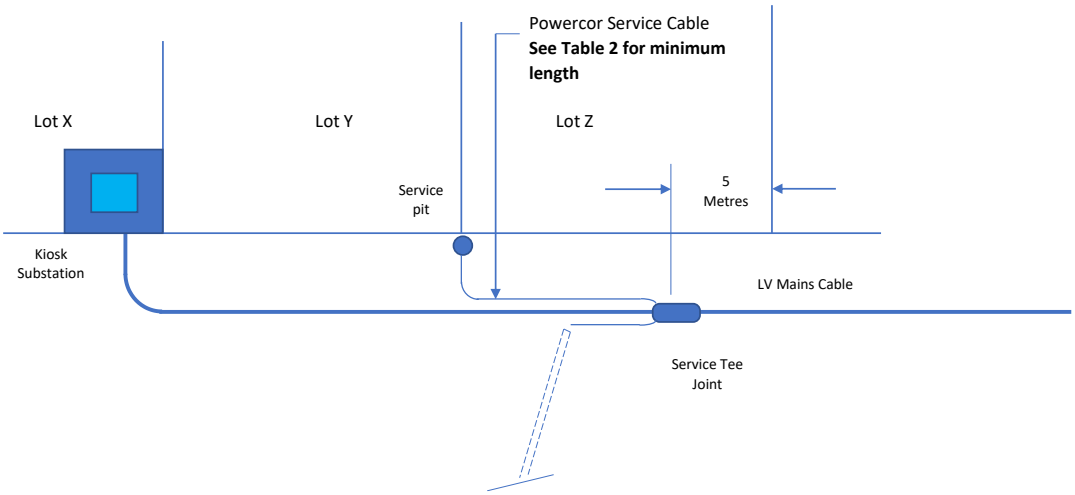
  The table below shows the allowable service tee joint and service cable combinations based on 16mm^2 service cable.

	Allowable ST/J and Service Cable Combinations (m)		
Substation to Service Tee Joint Length	>25	>45	>65
Minimum Service Cable Length	15	10	5

Table 2: Allowable ST/J and Service Cable Combinations

There must not be any service tee joints within the first 25m of LV mains cable length. New service pits in URD estates shall not be located directly adjacent to the kiosk reserve.

A typical arrangement is shown below.



- Public Lighting: Consideration shall be given to the provision of public lighting in compliance with any council requirements. Consideration shall also be given to potential spare HV conduits alongside public lighting LV cables.
- Spare Conduits: All spare LV conduits are to be a minimum of 100mm diameter unless otherwise advised by Powercor.

  For default minimum number of spare conduits in URD estates please refer to Table 1 and its notes above.
- Additional LV requirements: All additional LV requirements (such as spare conduits, tie ins, etc.), as requested by Powercor, must be incorporated into the developer's submission.

The applicable Powercor standards include DA311, FA001 – 101, GL031 and GS001 - GS421

6 Appendix A – Abbreviations and Acronyms

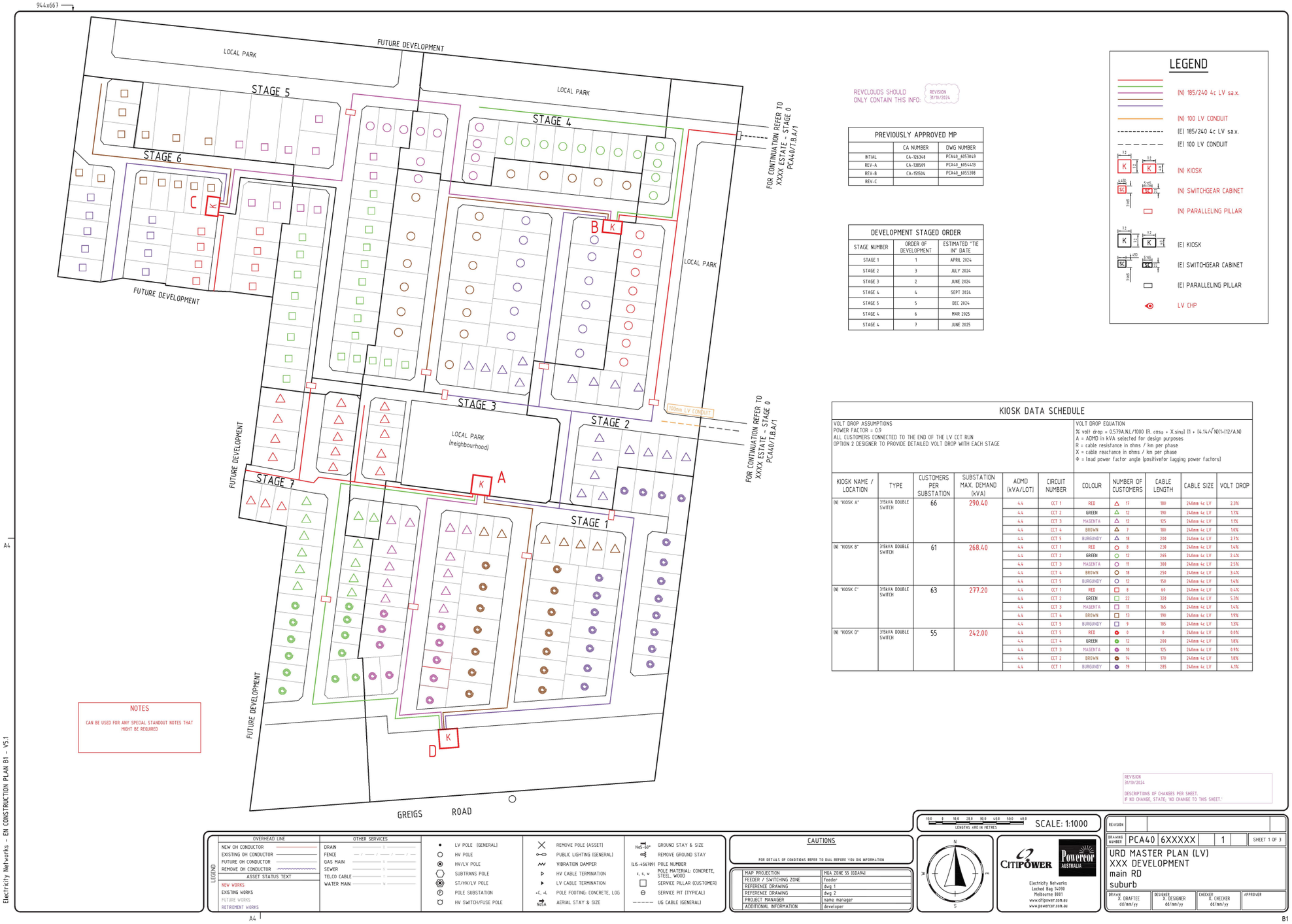
HV	High Voltage
K/S	Kiosk Substation
LV	Low Voltage
PAL	Powercor Australia Limited
REFCL	Rapid Earth Fault Current Limiter
ST/J	Service Tee Joint
URD	Underground Residential Development

7 Appendix B – References

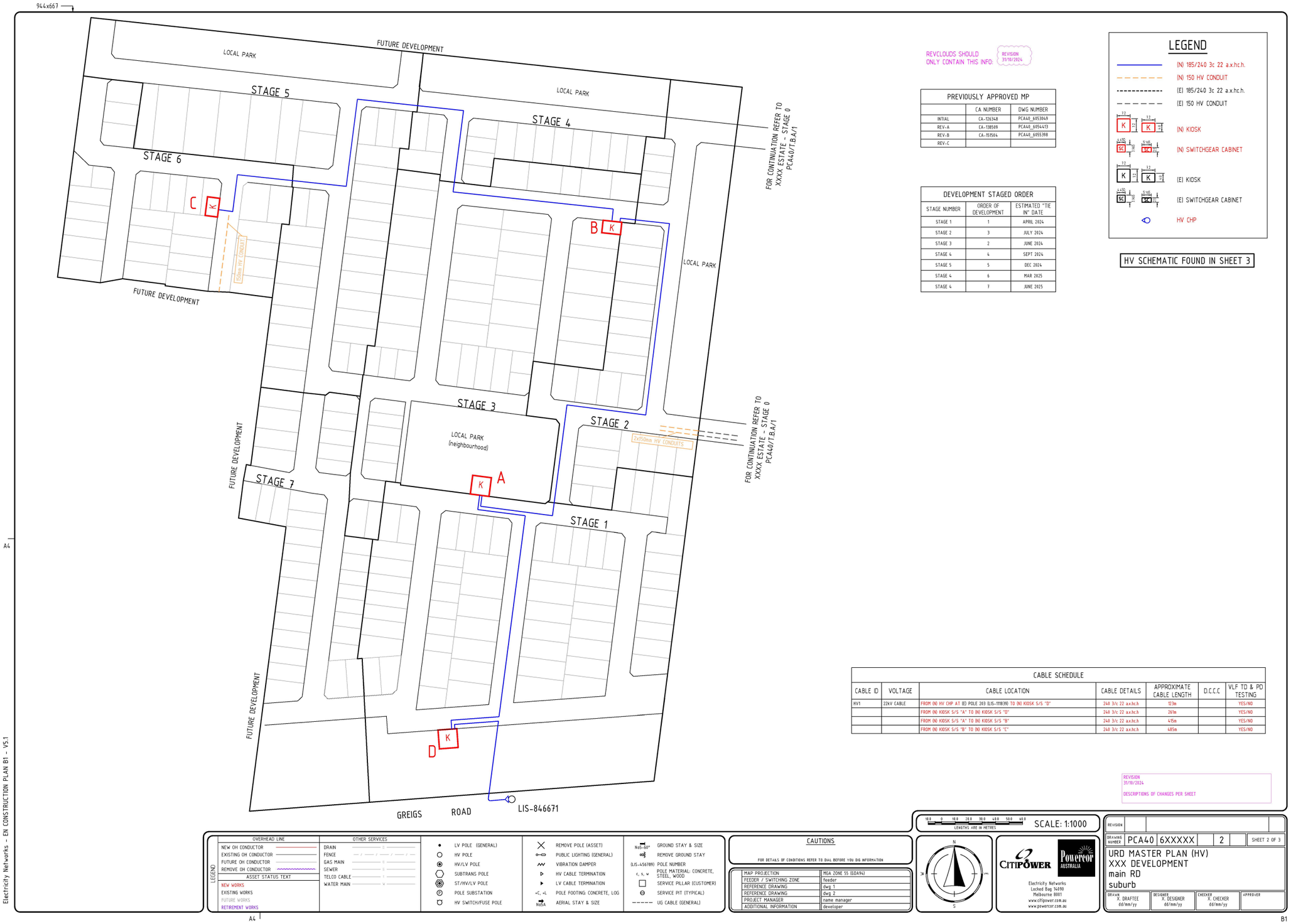
PAL Technical Standards:

URD REFERENCES:	TITLE:
CC	Insulated Cables
DA	Distribution Construction
DC	Clearances
DD	Drafting
DG	Earthing
EA	General Overhead
EJ	3 Phase Structures
EL	Overhead Transformers
EM	Switches and Fuse Mounts
ES	LV Bare Structures
ET	LV ABC and Servicing
FA	Public Lighting
GA	Underground
GB	HV Cable and Accessories
GC	Conduit and Cable Pulling
GE	Cable Head Poles
GL	Kiosk Substation
GS	UG LV Mains and Services

8 Appendix C –LV Master Plan



HV Master Plan



REVCLOUDS SHOULD ONLY CONTAIN THIS INFO: REVISION 31/10/2024

PREVIOUSLY APPROVED MP		
	CA NUMBER	DWG NUMBER
INTIAL	CA-126348	PCA40_6053049
REV-A	CA-138589	PCA40_6054413
REV-B	CA-151584	PCA40_6055398
REV-C		

DEVELOPMENT STAGED ORDER		
STAGE NUMBER	ORDER OF DEVELOPMENT	ESTIMATED "TIE IN" DATE
STAGE 1	1	APRIL 2024
STAGE 2	3	JULY 2024
STAGE 3	2	JUNE 2024
STAGE 4	4	SEPT 2024
STAGE 5	5	DEC 2024
STAGE 4	6	MAR 2025
STAGE 4	7	JUNE 2025

LEGEND

- (N) 185/240 3c 22 a.x.h.c.h.
- (N) 150 HV CONDUIT
- (E) 185/240 3c 22 a.x.h.c.h.
- (E) 150 HV CONDUIT
- (N) KIOSK
- (N) SWITCHGEAR CABINET
- (E) KIOSK
- (E) SWITCHGEAR CABINET
- HV CHP

HV SCHEMATIC FOUND IN SHEET 3

CABLE SCHEDULE						
CABLE ID	VOLTAGE	CABLE LOCATION	CABLE DETAILS	APPROXIMATE CABLE LENGTH	D.C.C.C	VLF TD & PD TESTING
HV1	22kV CABLE	FROM (N) HV CHP AT (E) POLE 203 (LIS-111839) TO (N) KIOSK S/S "D"	240 3/c 22 a.x.h.c.h	573m		YES/NO
		FROM (N) KIOSK S/S "A" TO (N) KIOSK S/S "D"	240 3/c 22 a.x.h.c.h	261m		YES/NO
		FROM (N) KIOSK S/S "A" TO (N) KIOSK S/S "B"	240 3/c 22 a.x.h.c.h	415m		YES/NO
		FROM (N) KIOSK S/S "B" TO (N) KIOSK S/S "C"	240 3/c 22 a.x.h.c.h	485m		YES/NO

REVISION
31/10/2024
DESCRIPTIONS OF CHANGES PER SHEET

LEGEND

OVERHEAD LINE	OTHER SERVICES
NEW OH CONDUCTOR	DRAIN
EXISTING OH CONDUCTOR	FENCE
FUTURE OH CONDUCTOR	GAS MAIN
REMOVE OH CONDUCTOR	SEWER
ASSET STATUS TEXT	TELCO CABLE
NEW WORKS	WATER MAIN
EXISTING WORKS	
FUTURE WORKS	
RETIREMENT WORKS	

LV POLE (GENERAL)	REMOVE POLE (ASSET)	GROUND STAY & SIZE	
HV POLE	PUBLIC LIGHTING (GENERAL)	REMOVE GROUND STAY	
HV/LV POLE	VIBRATION DAMPER	POLE NUMBER	(LIS-456789)
SUBTRANS POLE	HV CABLE TERMINATION	POLE MATERIAL: CONCRETE, STEEL, WOOD	c, s, w
ST/HV/LV POLE	LV CABLE TERMINATION	SERVICE PILLAR (CUSTOMER)	
POLE SUBSTATION	POLE FOOTING: CONCRETE, LOG	SERVICE PIT (TYPICAL)	
HV SWITCH/FUSE POLE	AERIAL STAY & SIZE	UG CABLE (GENERAL)	

CAUTIONS

FOR DETAILS OF CONDITIONS REFER TO DIAL BEFORE YOU DIG INFORMATION

MAP PROJECTION	MGA ZONE 55 (GDA94)
FEEDER / SWITCHING ZONE	feeder
REFERENCE DRAWING	dwg 1
REFERENCE DRAWING	dwg 2
PROJECT MANAGER	name manager
ADDITIONAL INFORMATION	developer

10.0 0 10.0 20.0 30.0 40.0 50.0 60.0 LENGTHS ARE IN METRES

SCALE: 1:1000

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REVISION						
DRAWING NUMBER	PCA40	6XXXXX		2		SHEET 2 OF 3

URD MASTER PLAN (HV)
XXX DEVELOPMENT
main RD
suburb

DRAWN	DESIGNER	CHECKER	APPROVER
X. DRAFTEE dd/mm/yy	X. DESIGNER dd/mm/yy	X. CHECKER dd/mm/yy	

A4 A4 B1

Electricity Networks - EN CONSTRUCTION PLAN B1 - V5.1

HV Schematic