



Cowman Stoddart Pty Ltd

PO Box 738

NOWRA NSW 2541

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11 June 2021

Attention: Mr. S Richardson

Dear Steve,

**Re: Flood Compliance Report for Proposed Modification Application to MP06-0228,
Shoalhaven Starches Expansion Project, Bolong Road, Bomaderry
Co-generation Plant (Mod 23) – June 2021 Revision**

This letter has been prepared by R W Dewar BSc, MEngSci, MIEAust CPEng Member No 477618 who has over 35 years of experience of floodplain management in NSW.

1 Introduction

Project Approval MP06_0228 for the Shoalhaven Starches Expansion Project made provision for a gas fired co-generation that would comprise two gas turbine generators that would deliver an anticipated net power output of 40 MW of power for the site.

Subsequently under Mod 16 the Independent Planning Commission approved an additional coal fired co-generation plant. This coal fired co-generation plant would generate a total of 15 MW of power for the site.

Neither the approved gas nor coal fired co-generation plants have been constructed to date.

Following the original Project Approval, Shoalhaven Starches have obtained approval and / or are seeking approval for a range of modifications to the original Project comprising a range of additional developments that were not envisaged as part of the original Project Approval. Shoalhaven Starches are forecasting that the electrical power load demand created by these and other additional works, subsequent to the original Project Approved development, will exceed the power supply capacity of the approved gas fired and coal fired co-generation plants.

Shoalhaven Starches now propose to construct a new gas-fired co-generation plant which will consist of two natural gas turbines that will generate an anticipated power output each of 30 MW, providing a total power to the site of 60 MW. The new gas fired co-generation plant will replace the approved gas fired and coal fired co-generators. In addition, Shoalhaven Starches also proposed to convert their existing coal fired boilers to gas as well. It is proposed to submit a Modification Application (Mod 23) to the Department of Planning, Industry and Environment seeking approval for these proposed works.

An aerial photograph of Shoalhaven Starches plant is provided on Image 1 and on Figure 1. The proposed works are shown on Figure 2 with detailed plans in Appendix A.

WMAwater Pty Ltd

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Image 1 – Google Map Aerial Photograph of Shoalhaven Starches Plant at Bomaderry

The proposed works (Figure 2) are inundated in the 1% Annual Exceedance Probability (AEP) flood event by floodwaters from the Shoalhaven River and this letter provides an assessment of the implications of this proposal on flood levels, flows and velocities.

WMAwater (formerly known as Webb McKeown & Associates) undertook the 1990 Shoalhaven River Flood Study and subsequent 2008 Floodplain Risk Management Study and Plan for Shoalhaven City Council. We have also undertaken many similar flood assessments for Shoalhaven Starches in the past and are therefore very familiar with flooding in the Shoalhaven River floodplain and the implications for flooding of further development in the northern floodplain and along Bolong Road.

2 Background

The proposal is to construct a gas-fired co-generation plant as described in Appendix A to occupy land that was previously partly occupied by a previously approved development and partly by open space (Figure 2). A detailed flood assessment for the existing approved works on this site was completed in WMAwater's report of 23rd May 2016.

This present report therefore provides an assessment of the likely flood impacts of the proposed changes compared to those provided in our report of 23rd May 2016.

3 Compliance with Chapter G9: Development on Flood Prone Land (DCP2014)

The following sections describe compliance with Chapter G9: Development on Flood Prone Land (DCP2014 Amended 1st July 2015). As the modifications will not involve fill, or subdivision of lands, compliance with these performance criteria has not been addressed.

3.1 Performance Criteria - General (Section 5.1 of DCP only)

PERFORMANCE CRITERIA	RESPONSE
P1 Development or work on flood prone land will meet the following:	
The development will not increase the risk to life or safety of persons during a flood event on the development site and adjoining land.	No additional workers will be on the site as a result of the proposed works.
The development or work will not unduly restrict the flow behaviour of floodwaters.	Refer Hydraulic Impact Assessment below.
The development or work will not unduly increase the level or flow of floodwaters or stormwater runoff on land in the vicinity. The development or work will not exacerbate the adverse consequences of floodwaters flowing on the land with regard to erosion, siltation and destruction of vegetation.	The proposed development is within existing built-up industrial land with minimal vegetation on the site. All runoff under existing and future conditions will reach the ground in nearly identical locations and thus the works will have no impact on erosion or siltation.
The structural characteristics of any building or work that are the subject of the application are capable of withstanding flooding in accordance with the requirements of the Council.	A separate structural report will be provided.
The development will not become unsafe during floods or result in moving debris that potentially threatens the safety of people or the integrity of structures.	A separate structural report on the potential failure of existing buildings and stored equipment and product will be provided.
Potential damage due to inundation of proposed buildings and structures is minimised.	Inundation of the site and the proposed plant and / or debris impact may cause damage to electrical and other components feeding the equipment as well as damage to the plant itself. These issues will be considered in an updated Shoalhaven Starches Flood Plan taking into account the proposed works.
The development will not obstruct escape routes for both people and stock in the event of a flood.	The proposed works will not occupy escape routes or cause workers to become trapped.
The development will not unduly increase dependency on emergency services.	The works will not increase the number of workers from Shoalhaven Starches who may be subject to flood risk as a result of the proposed works.
Interaction of flooding from all possible sources has been taken into account in assessing the proposed development against risks to life and property resulting from any adverse hydraulic impacts.	Refer Hydraulic Impact Assessment below.
The development will not adversely affect the integrity of floodplains and floodways, including	The works will be constructed on land that is partly designated as high hazard floodway in

PERFORMANCE CRITERIA	RESPONSE
riparian vegetation, fluvial geomorphologic environmental processes and water quality.	the 1% AEP event. The site is industrial land with limited existing vegetation and is beyond the influence of normal fluvial geomorphic processes. The works will have no impact on water quality.

3.2 Hydraulic Impact Assessment

Detailed hydraulic assessment and modelling was undertaken as part of our 23rd May 2016 report (*Proposed Modification Application To MP06-0228, Shoalhaven Starches Expansion Project, Modification To DDG Dryers and Container Store, Flood Impact Assessment*), thus the present assessment is only regarding whether the proposed works change the results from those provided in our 23rd May 2016 report.

3.2.1 Overview of Hydraulic Modelling

Ponding of water in low lying areas on the northern floodplain of the Shoalhaven River occurs following periods of heavy and continuous rain. Some parts of the land are only 1 m above high tide and consequently are frequently inundated. This results from direct rainfall over the area and also from overflow from the creeks which flow through the area. In larger floods, both Abernethy's Drain and Bomaderry Creek will overtop their banks and inundate the area. This would have occurred in March 1978 and the other floods which occurred in the 1970's (August 1974, June 1975 and October 1976) as well as the April 1988 event. According to residents' reports none of these floods overtopped the northern river bank, in the vicinity of the Shoalhaven Starches plant or the Paper Mill, to any significant extent.

The existing and proposed works, since approximately 1990, on the northern floodplain do not increase flood levels in these "small" floods as there is no significant velocity and the area is a very large storage basin. The largest of these events occurred in March 1978 which approximated a 5% AEP flood. For the above reasons, construction of the existing works since 1990 plus the proposed works on the northern floodplain will not cause any significant increases in flood levels for these events. These are the most frequent events that affect the area, and the above five historical events are typical examples.

However, floods larger than March 1978 will occur and they will overtop the bank, causing a significant inflow of floodwaters to the area. In these larger overtopping floods the proposed and existing works since 1990 on the northern floodplain will have an impact upon flood levels by restricting flow and reducing temporary floodplain storage. These are much rarer events and generally the majority of the northern floodplain is inundated by up to 3 m depth of water. Some parts of Shoalhaven Starches plant are already inundated by up to 1.5 m depth of water and consequently the small increase in level caused by the existing and proposed works since 1990 is unlikely to be significant. Hydraulic modelling is undertaken to assess the impacts on the northern floodplain of further development within the Shoalhaven Starches plant.

3.2.2 Overview of Hydraulic Modelling

The 1990 Lower Shoalhaven River Flood Study was commissioned by the NSW Government Public Works and determined design flood levels along the river and adjoining floodplain. From approximately the year 2000 to 2010 the hydraulic computer model, termed the CELLS model, established in that study was used by WMAwater, on behalf of Shoalhaven Starches, to evaluate the potential increases in flood level due to further works on the northern floodplain, including expansion of the plant itself and construction of the storage ponds.

The CELLS model of the Shoalhaven River represented the channel and floodplain as a series of interconnected cells, termed either river or floodplain cells. Since 1990 there have been significant advancements in the field of hydraulic modelling through the use of more complex computer software that allows the river and floodplain to be discretised into a grid. This is typically 15m by 15m on large rivers and up to 2m by 2m on small urban catchments. These models are termed 2 Dimensional (2D) in that they determine the flow direction between grid cells producing vector velocities. These models are thus able to more accurately define the topography and in turn can more accurately represent the hydraulic effects of even a small development on a large floodplain. In 2013, Shoalhaven Starches commissioned WMAwater to update the Shoalhaven River Flood Study to current best practice using the TUFLOW 2D hydraulic modelling software.

2D hydraulic models require detailed survey data and this has only become possible with the advent of what is known as Airborne Laser Scanning survey (ALS) or Light Detecting and Ranging (LIDAR). ALS uses laser technology that is emitted from a plane to define the ground levels (height in mAHD) and co-ordinates of points on the ground or on buildings. ALS cannot penetrate deep water in the Shoalhaven River and a detailed bathymetric survey of the river is therefore also required. Ortho-rectified digital aerial photography is also required in combination with ALS to ensure that buildings and other features on the floodplain are accurately accounted for.

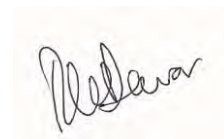
3.2.3 Results from TUFLOW Hydraulic Modelling

The proposed works as shown in Figure 2 and Appendix A were included in the TUFLOW hydraulic model and a comparison of results for the 1% AEP event is provided on Figure 3 as an impact map (i.e the change in the 1% AEP flood level due to the proposed works). The results on Figure 3 indicate that there is no change in the 1% AEP flood level outside the Shoalhaven Starches plant.

Should you have any questions or require further clarification regarding the above do not hesitate to contact the undersigned.

Yours Sincerely,

WMAwater

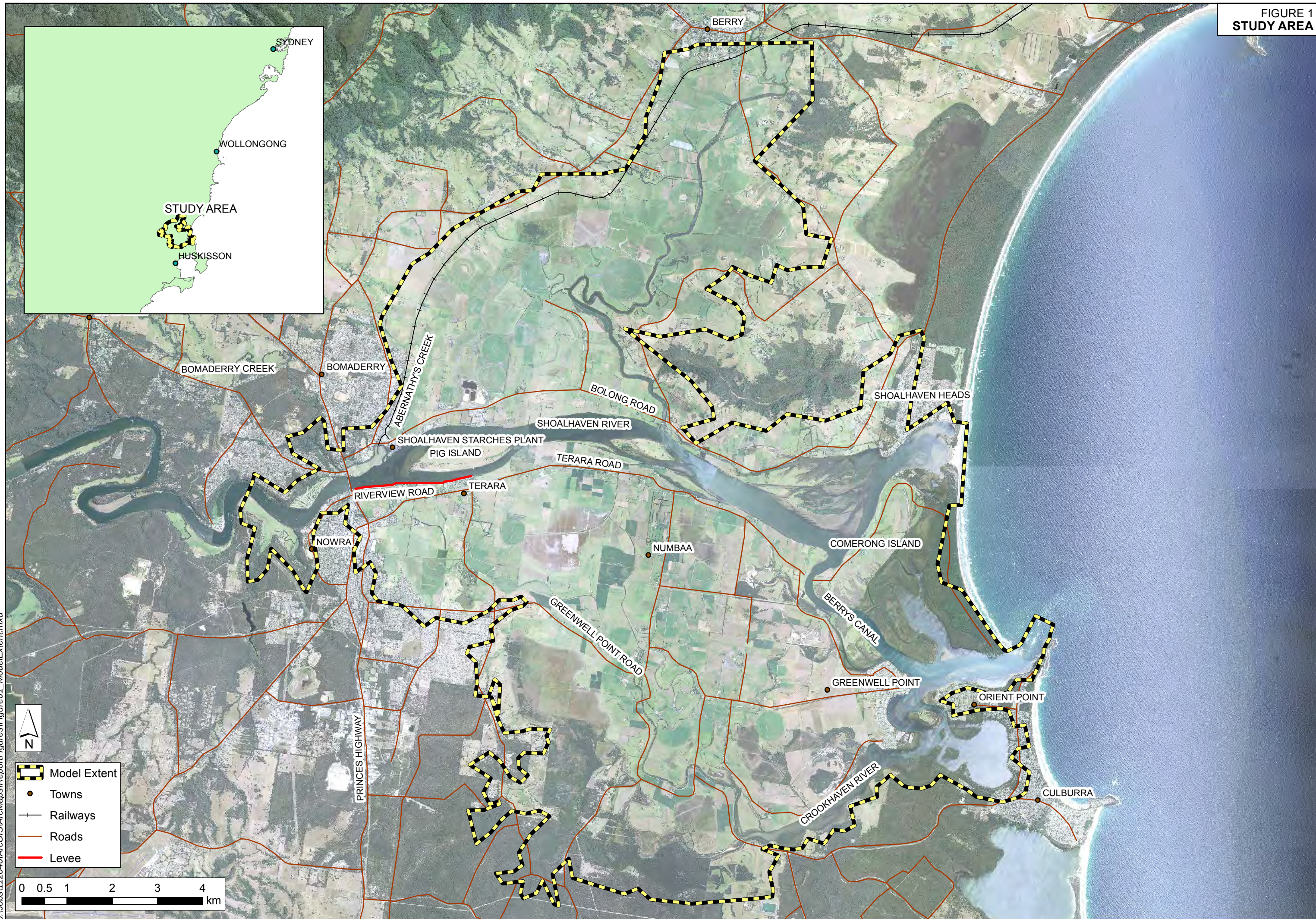
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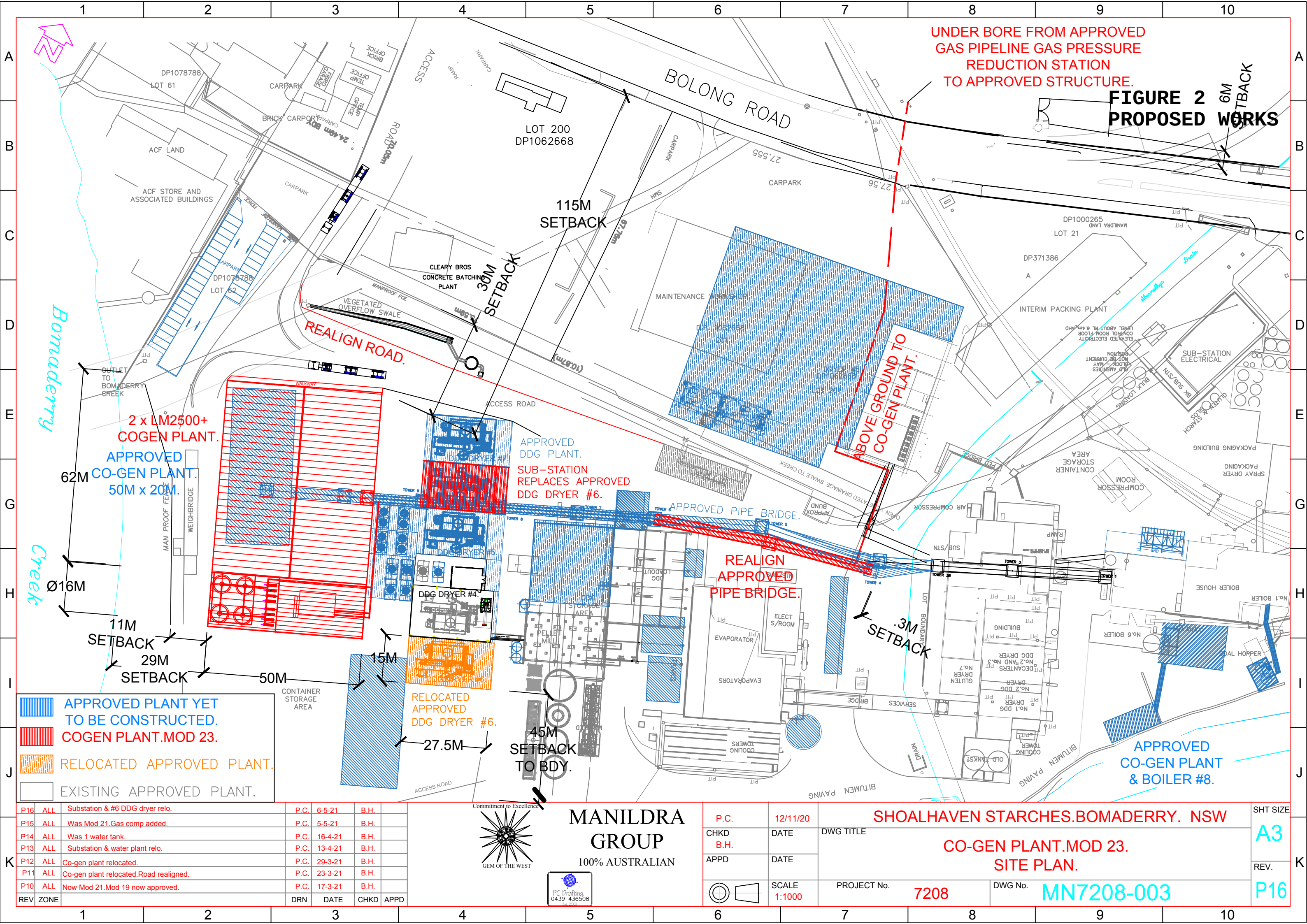
R W Dewar

Director



FIGURE 1
STUDY AREA





UNDER BORE FROM APPROVED
GAS PIPELINE GAS PRESSURE
REDUCTION STATION
TO APPROVED STRUCTURE.

**FIGURE 2
PROPOSED WORKS**

- APPROVED PLANT YET TO BE CONSTRUCTED.
- COGEN PLANT.MOD 23.
- RELOCATED APPROVED PLANT.
- EXISTING APPROVED PLANT.

P16	ALL	Substation & #6 DDG dryer relo.	P.C.	6-5-21	B.H.	
P15	ALL	Was Mod 21.Gas comp added.	P.C.	5-5-21	B.H.	
P14	ALL	Was 1 water tank.	P.C.	16-4-21	B.H.	
P13	ALL	Substation & water plant relo.	P.C.	13-4-21	B.H.	
P12	ALL	Co-gen plant relocated.	P.C.	29-3-21	B.H.	
P11	ALL	Co-gen plant relocated.Road realigned.	P.C.	23-3-21	B.H.	
P10	ALL	Now Mod 21.Mod 19 now approved.	P.C.	17-3-21	B.H.	
REV	ZONE		DRN	DATE	CHKD	APPD

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PC Drafting
0439 436508

P.C.	12/11/20	SHOALHAVEN STARCHES.BOMADERRY. NSW		SHT SIZE
CHKD B.H.	DATE	DWG TITLE		A3
APPD	DATE	CO-GEN PLANT.MOD 23. SITE PLAN.		REV.
SCALE 1:1000	PROJECT No. 7208	DWG No. MN7208-003	P16	

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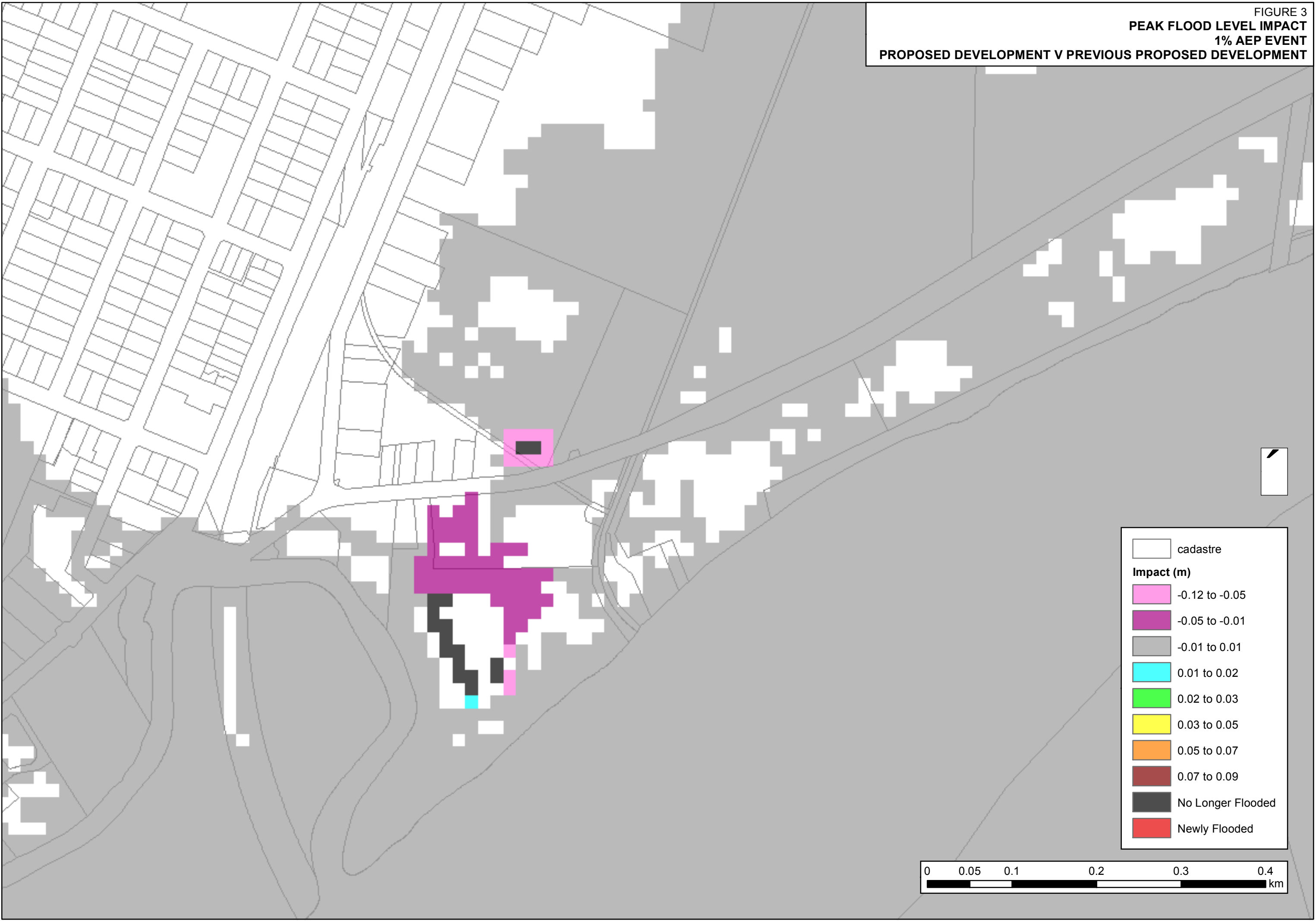
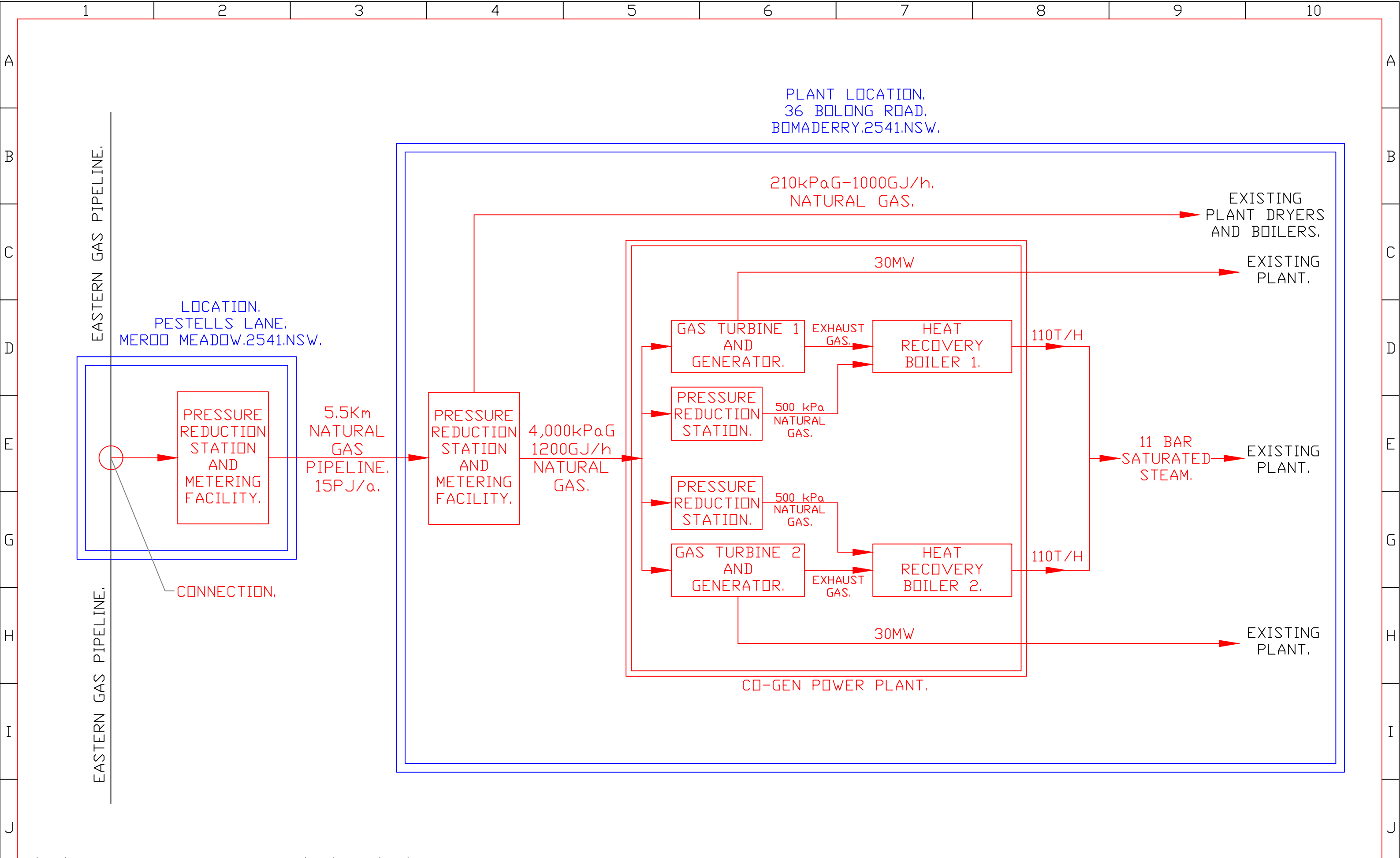


FIGURE 3



Appendix A: Plans of Proposed Works

Appendix A



REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P05	E4	Figure was 785GJ/h.	P.C.	20-04-21	B.H.	
P04	E5	Figures modified.	P.C.	23-03-21	B.H.	
P03	ALL	Split system shown.	P.C.	16-03-21	B.H.	
P02	ALL	Modified for co-gen.	P.C.	16-02-21	B.H.	
P01	ALL	First Issue.	P.C.	10-12-20	B.H.	

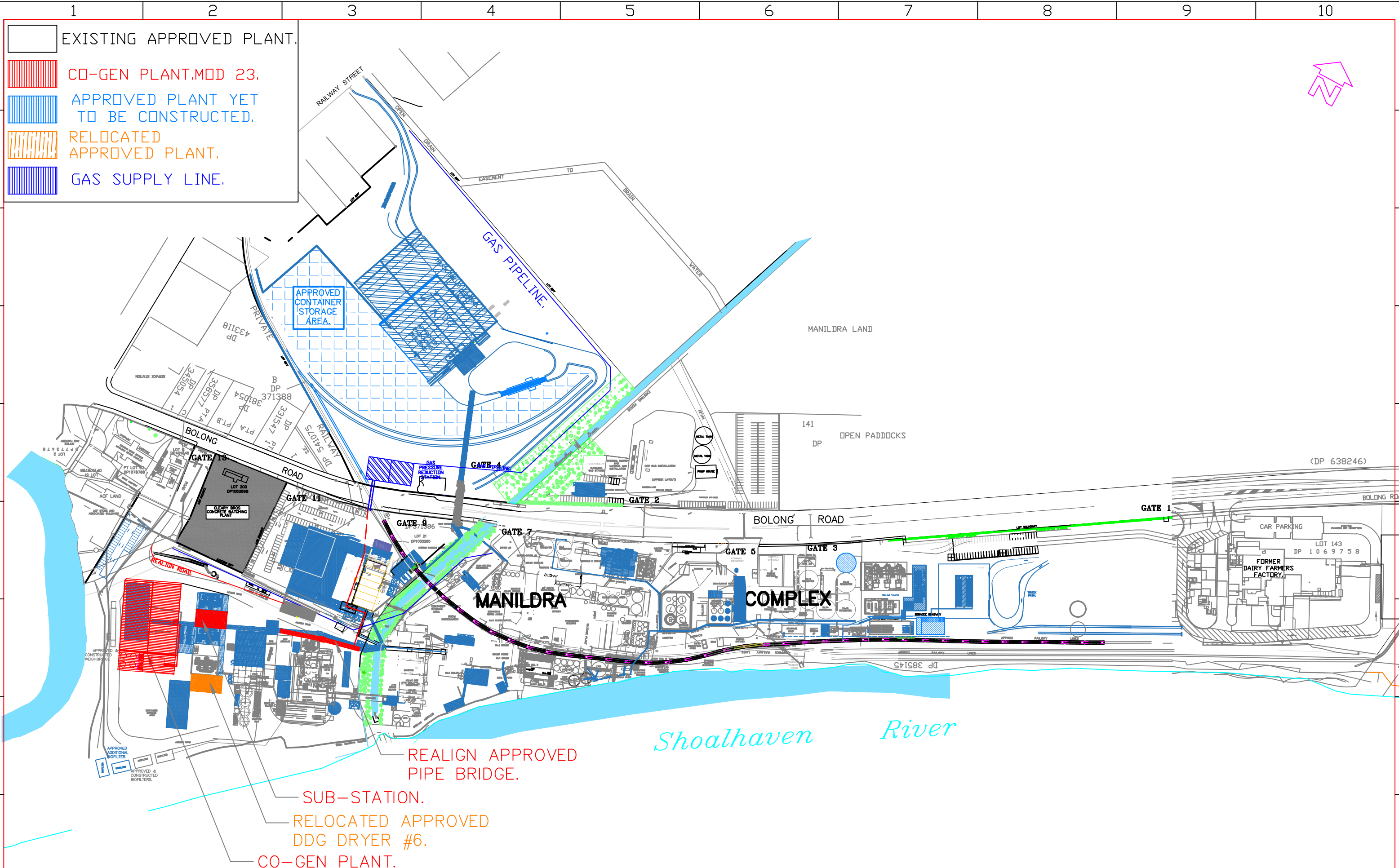
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P.C.	12/11/20	SHOALHAVEN STARCHES,BOMADERRY, NSW		A3
CHKD B.H.	DATE	DWG TITLE		
APPD	DATE	GAS PIPELINE,PRESSURE REDUCTION STATIONS AND METERING FACILITY FOR CO-GEN PLANT.		
	SCALE NTS	PROJECT No. 7208	DWG No. MN7208-000	P05



REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P07	ALL	Substation & #6 DDG dryer relo.	P.C.	6-5-21	B.H.	
P06	ALL	Was Mod 21,gas comp. added, relo cool towers	P.C.	5-05-21	B.H.	
P05	H2	Co-gen plant & sub-station relo. Was drw -005.	P.C.	15-04-21	B.H.	
P04	H1	Co-gen plant moved south.	P.C.	29-03-21	B.H.	
P03	H1	Co-gen plant moved north.	P.C.	24-03-21	B.H.	
P02	ALL	Now MOD 21.Mod 19 approved.	P.C.	17-03-21	B.H.	
P01	ALL	Layout revised.	P.C.	26-02-21	B.H.	

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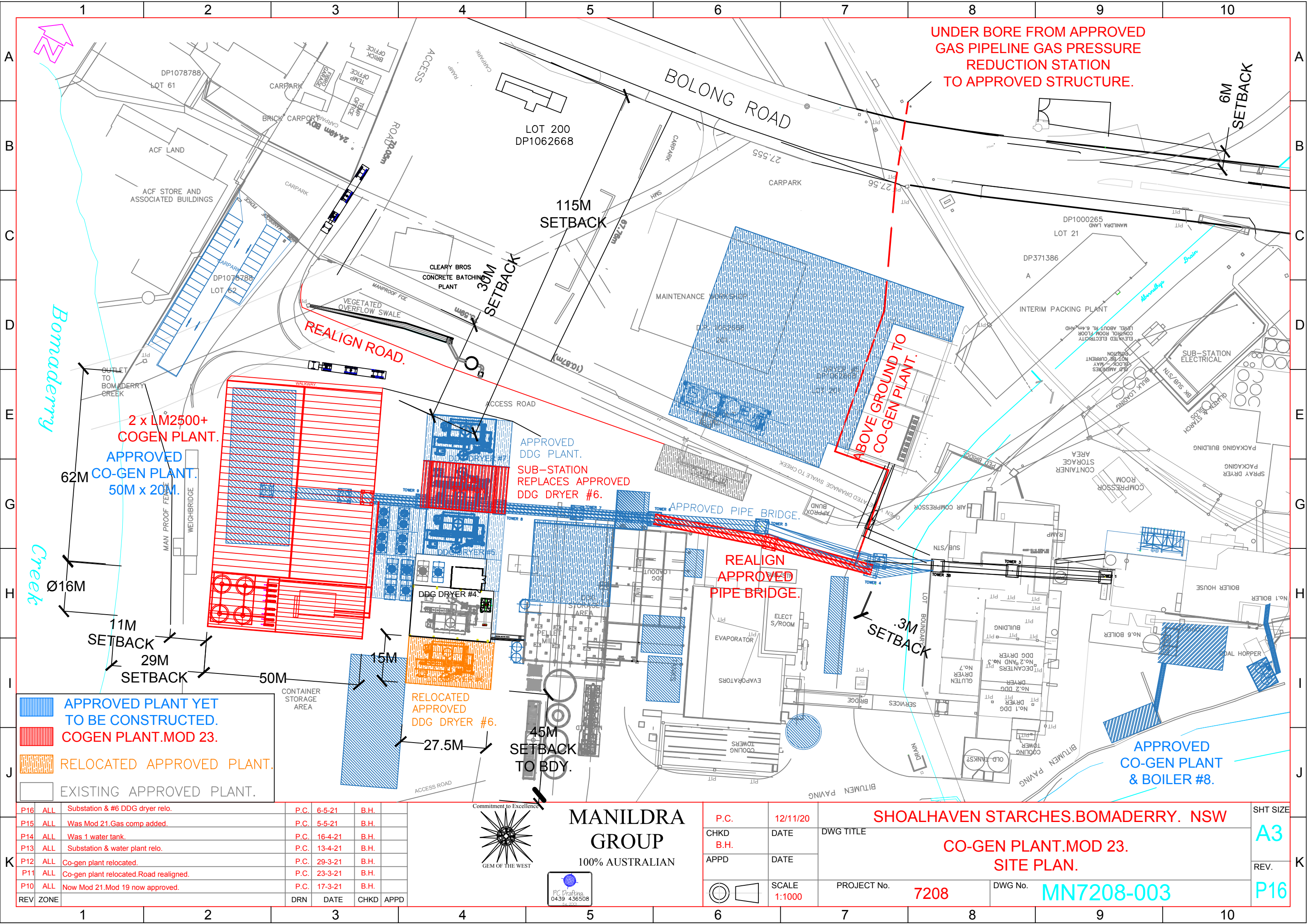
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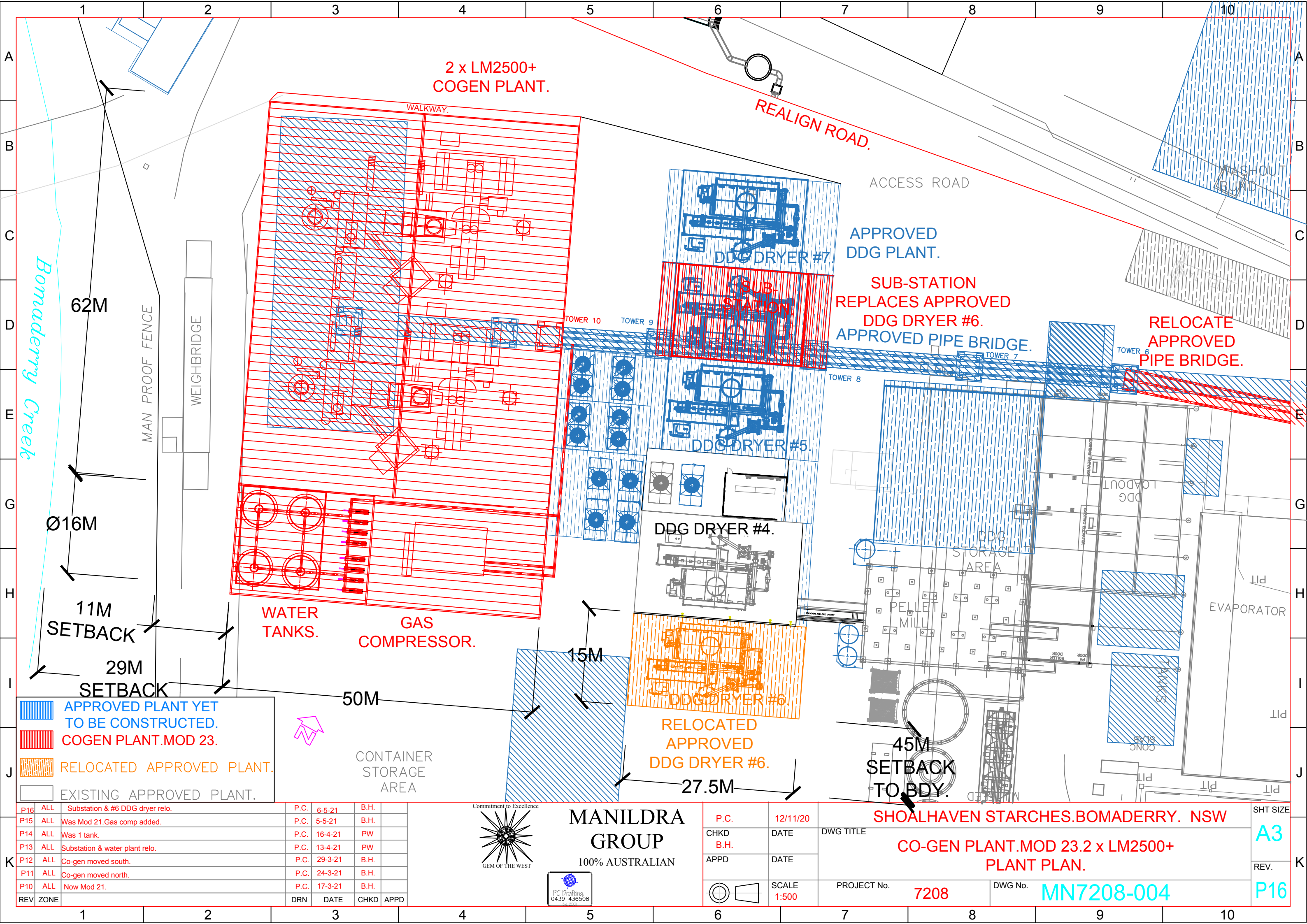
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DRAWN PC	DATE 26-02-21	SITE MANILDRA-SHOALHAVEN STARCHES PTY LTD		SHT SIZE A3
DESIGNED PW	DATE	JOB TITLE NOWRA PLANT.		SHEET
CHKD SR	DATE	DWG TITLE CO-GEN PLANT.MOD 23. OVER ALL SITE PLAN.		OF
APPD BH	DATE	PROJECT No. 7208A		REV. P07
	SCALE 1:3000	DWG No. MN7208-002		





- APPROVED PLANT YET TO BE CONSTRUCTED.
- COGEN PLANT.MOD 23.
- RELOCATED APPROVED PLANT.
- EXISTING APPROVED PLANT.

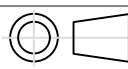
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P15	ALL	Was Mod 21.Gas comp added.	P.C.	5-5-21	B.H.	
P14	ALL	Was 1 tank.	P.C.	16-4-21	PW	
P13	ALL	Substation & water plant relo.	P.C.	13-4-21	PW	
P12	ALL	Co-gen moved south.	P.C.	29-3-21	B.H.	
P11	ALL	Co-gen moved north.	P.C.	24-3-21	B.H.	
P10	ALL	Now Mod 21.	P.C.	17-3-21	B.H.	
REV	ZONE		DRN	DATE	CHKD	APPD

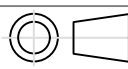
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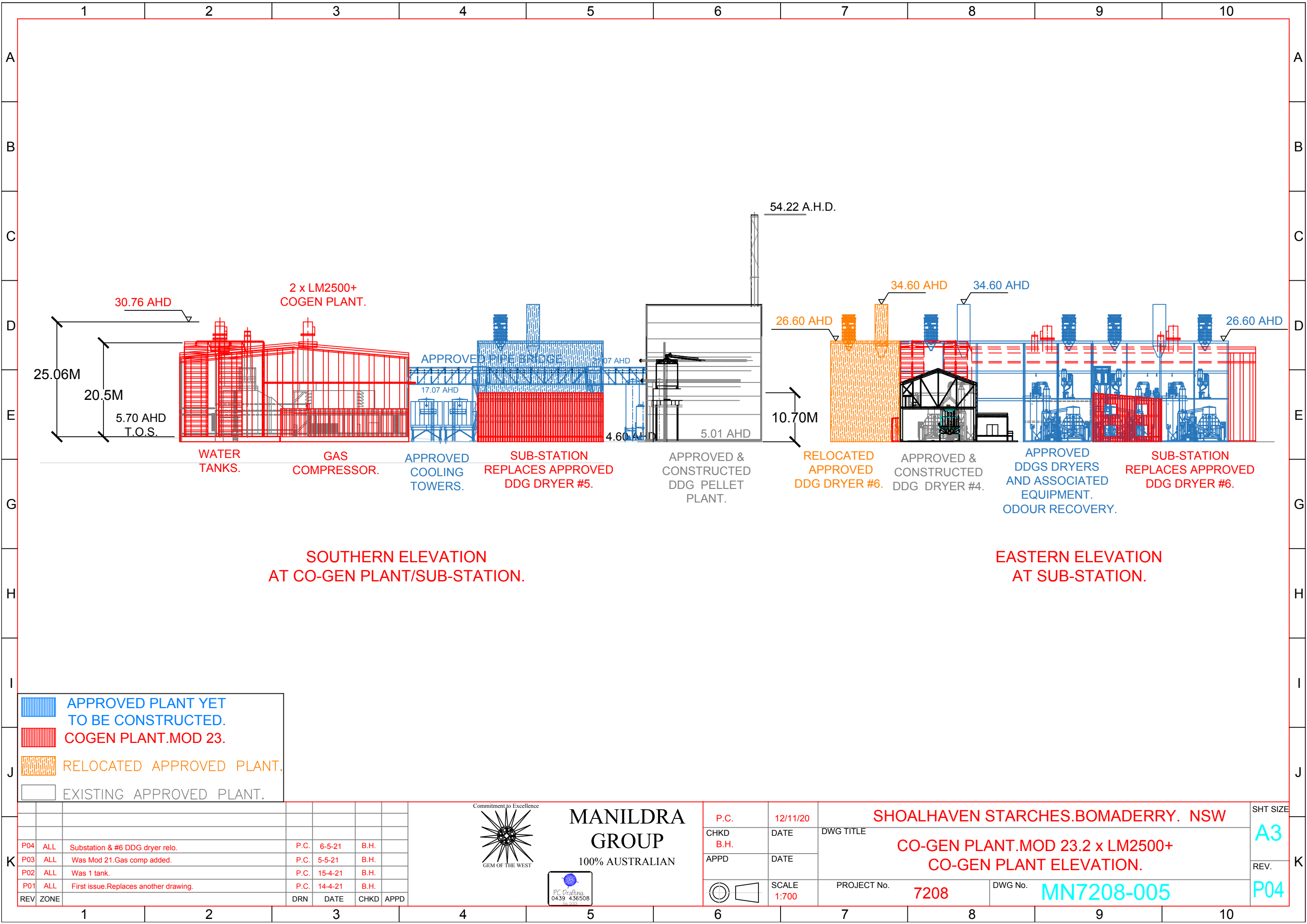


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P.C.	12/11/20	SHOALHAVEN STARCHES.BOMADERRY. NSW		SHT SIZE
CHKD B.H.	DATE	DWG TITLE		A3
APPD	DATE	CO-GEN PLANT.MOD 23.2 x LM2500+ PLANT PLAN.		REV.
		PROJECT No.	DWG No.	P16
		7208	MN7208-004	



SOUTHERN ELEVATION
AT CO-GEN PLANT/SUB-STATION.

EASTERN ELEVATION
AT SUB-STATION.

APPROVED PLANT YET
TO BE CONSTRUCTED.

COGEN PLANT.MOD 23.

RELOCATED APPROVED PLANT.

EXISTING APPROVED PLANT.

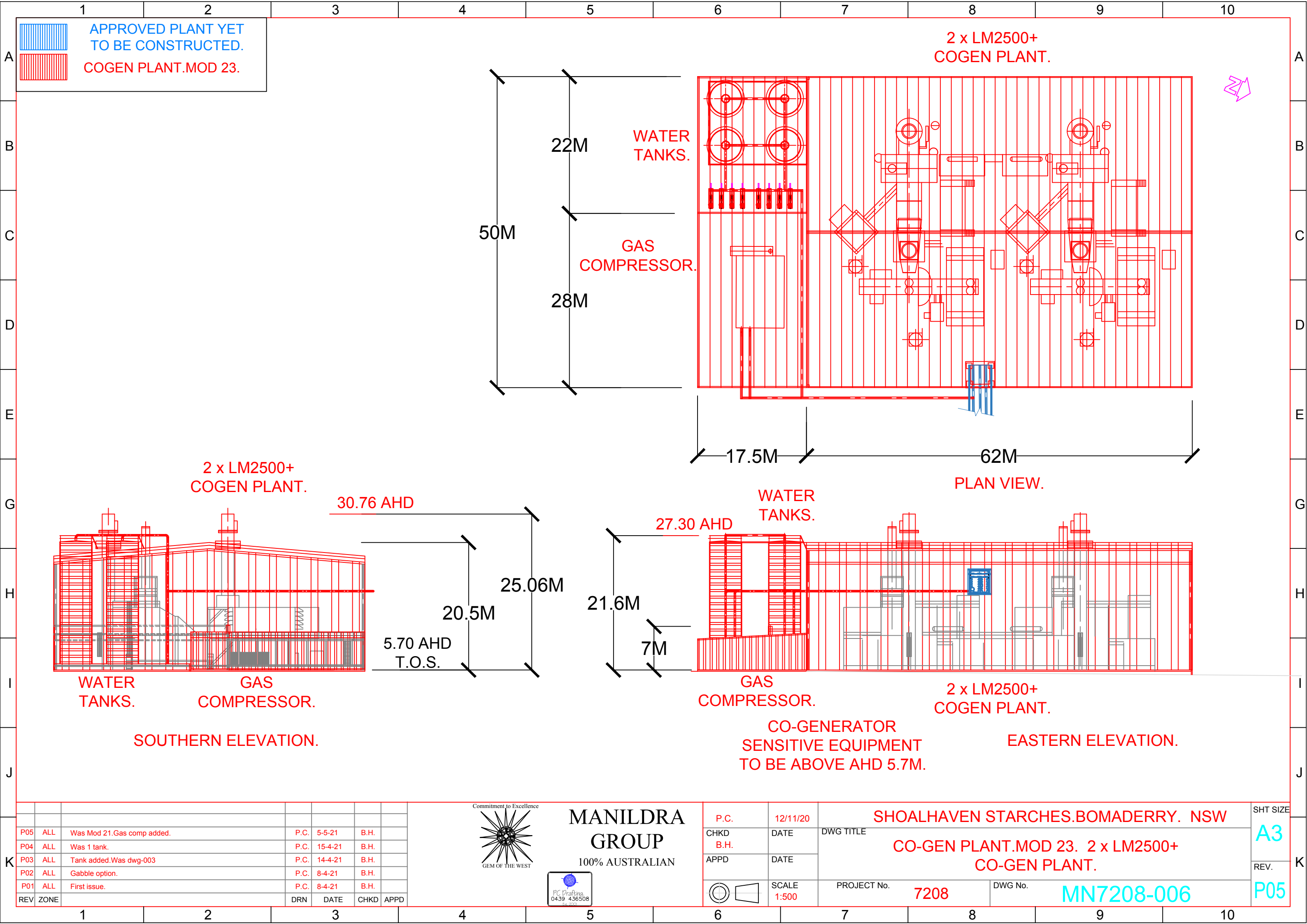
P04	ALL	Substation & #6 DDG dryer relo.	P.C.	6-5-21	B.H.	
P03	ALL	Was Mod 21.Gas comp added.	P.C.	5-5-21	B.H.	
P02	ALL	Was 1 tank.	P.C.	15-4-21	B.H.	
P01	ALL	First issue.Replaces another drawing.	P.C.	14-4-21	B.H.	
REV	ZONE		DRN	DATE	CHKD	APPD

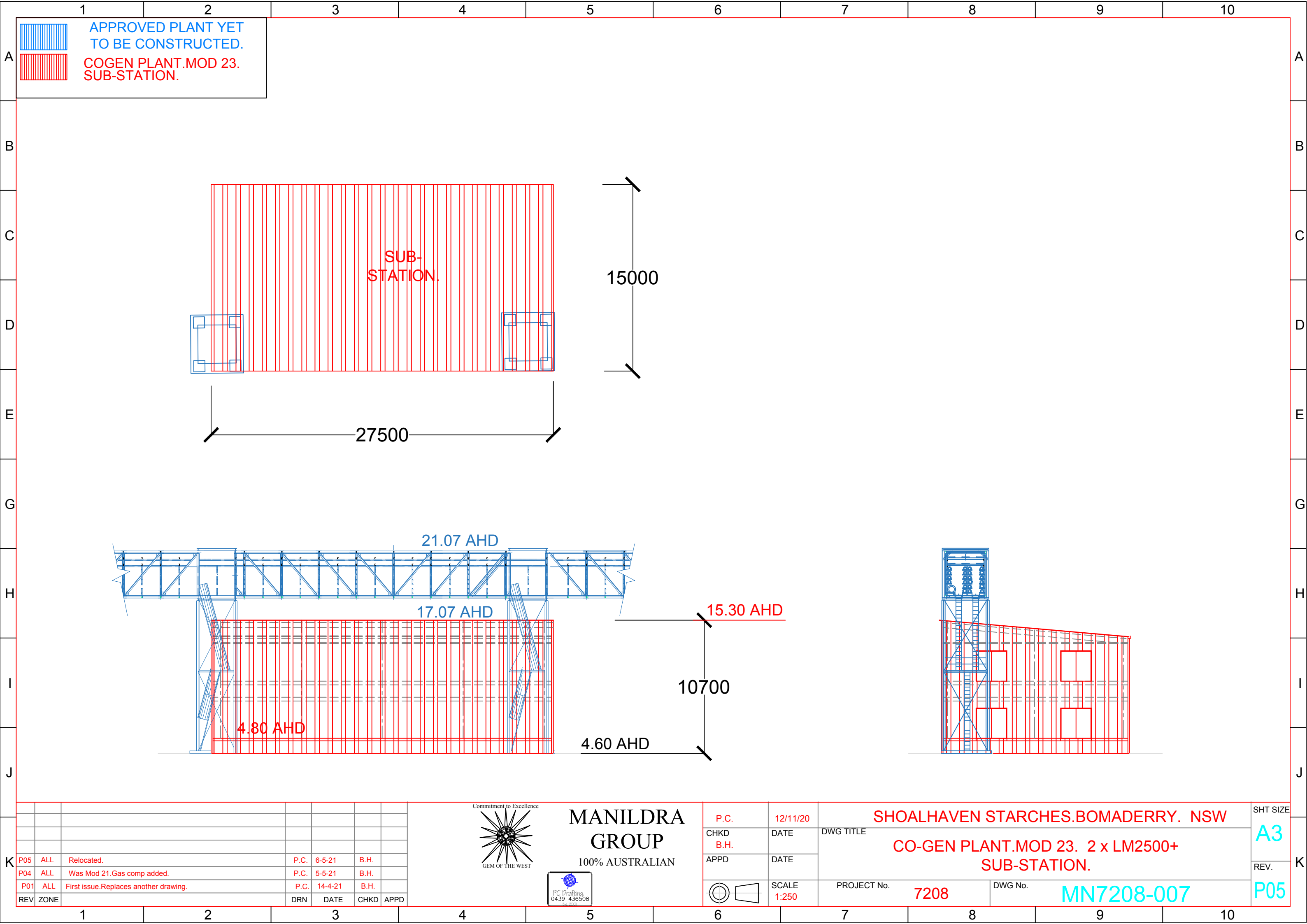


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P.C.	12/11/20	SHOALHAVEN STARCHES.BOMADERRY. NSW		SHT SIZE
CHKD B.H.	DATE	DWG TITLE		A3
APPD	DATE	CO-GEN PLANT.MOD 23.2 x LM2500+ CO-GEN PLANT ELEVATION.		REV.
SCALE 1:700		PROJECT No.	DWG No.	P04
		7208	MN7208-005	





APPROVED PLANT YET
TO BE CONSTRUCTED.

COGEN PLANT.MOD 23.
SUB-STATION.

REV	ZONE	DRN	DATE	CHKD	APPD
P05	ALL	Relocated.	P.C. 6-5-21	B.H.	
P04	ALL	Was Mod 21.Gas comp added.	P.C. 5-5-21	B.H.	
P01	ALL	First issue.Replaces another drawing.	P.C. 14-4-21	B.H.	

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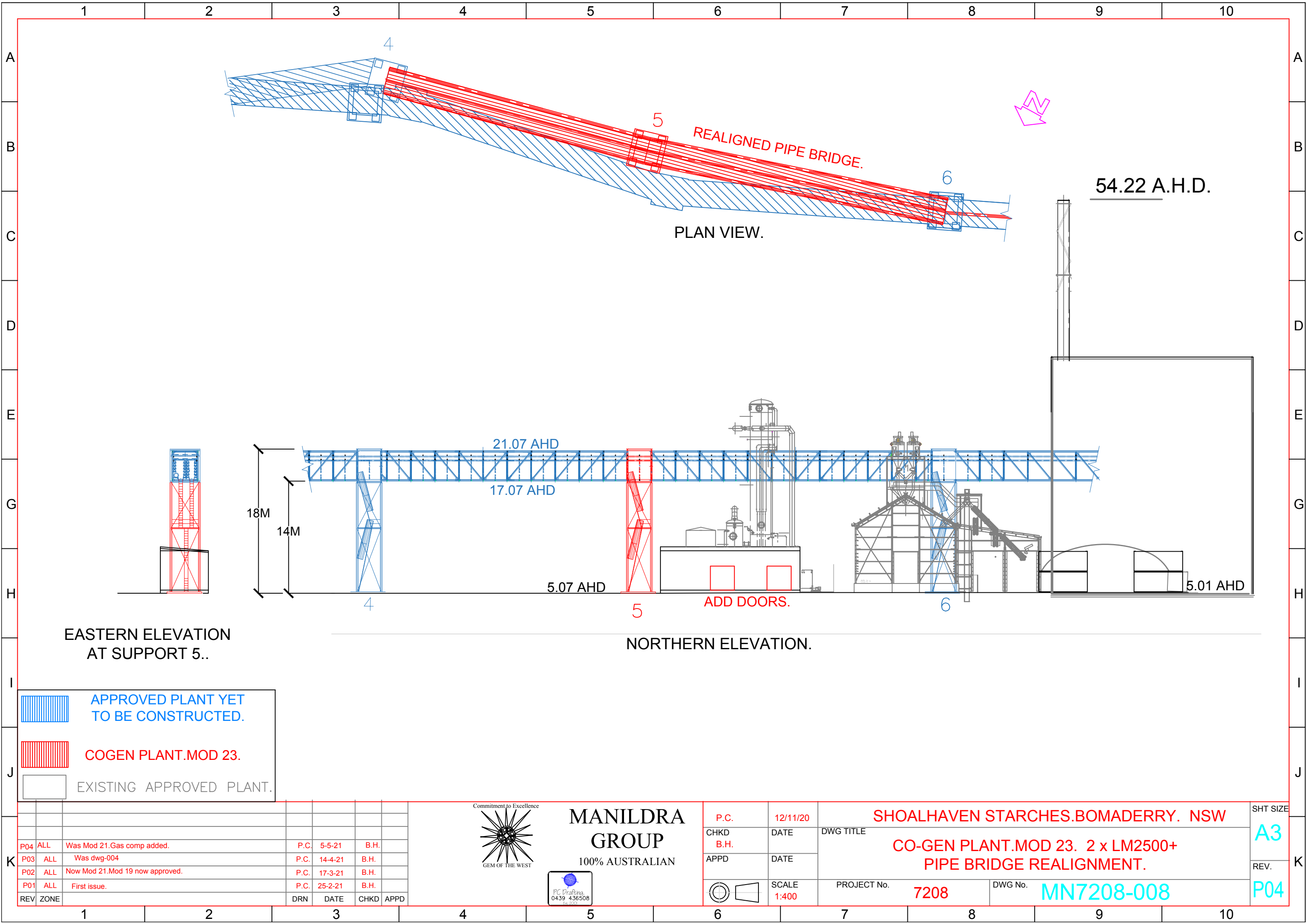
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P.C.	12/11/20	SHOALHAVEN STARCHES.BOMADERRY. NSW		SHT SIZE
CHKD B.H.	DATE	DWG TITLE		A3
APPD	DATE	CO-GEN PLANT.MOD 23. 2 x LM2500+ SUB-STATION.		REV.
	SCALE 1:250	PROJECT No. 7208	DWG No. MN7208-007	P05



APPROVED PLANT YET TO BE CONSTRUCTED.

COGEN PLANT.MOD 23.

EXISTING APPROVED PLANT.

P04	ALL	Was Mod 21.Gas comp added.	P.C.	5-5-21	B.H.	
P03	ALL	Was dwg-004	P.C.	14-4-21	B.H.	
P02	ALL	Now Mod 21.Mod 19 now approved.	P.C.	17-3-21	B.H.	
P01	ALL	First issue.	P.C.	25-2-21	B.H.	
REV	ZONE		DRN	DATE	CHKD	APPD



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P.C.	12/11/20	SHOALHAVEN STARCHES.BOMADERRY. NSW		SHT SIZE
CHKD	DATE	DWG TITLE		A3
B.H.		CO-GEN PLANT.MOD 23. 2 x LM2500+ PIPE BRIDGE REALIGNMENT.		REV.
APPD	DATE	PROJECT No.	DWG No.	P04
	SCALE 1:400	7208	MN7208-008	

CO-GEN PLANT, MOD 23.	PROJECT No. 7208 6/05/21
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CO-GEN PLANT, MOD 23.	PROJECT No. 7208 6/05/21
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CO-GEN PLANT, MOD 23.	PROJECT No. 7208 6/05/21
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