

Appendix 9.2 AECOM Drainage Strategy

Shetland Space Centre Drainage Strategy

Project Number: 60617516

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Quality information

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Checked by



Verified by



Approved by



Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

# Hard Copies	PDF Required	Association / Company Name

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1. Introduction

The proposed Shetland Space Centre (SSC) is located to the east of Holsens Road on the headland of Lamba Ness on the island of Unst, Shetland and is indicated on drawing 60617516-ACM-XX-00-DR-CE-0092(-). In addition to the main site, there will be a Launch and Control Centre based at the existing Saxa Vord Resort approximately 3km south-west of the SSC.

Access to the SSC and Saxa Vord sites will be via the existing road network where public road improvement works will also be carried out to accommodate construction\site traffic. A section of new road is also proposed to link Northdale and Holsens Road.

2. Site description

The main site extends east from the unclassified Holsens Road to the headland of Lamba Ness. Large coastal cliffs form the perimeter of the peninsula, some extending to a height of approximately 50m above sea level. The peninsula covers an area of approximately 185 hectares and was previously utilised by RAF Skaw as an early warning radar station during WW2.

The ground levels across the site fall from west to east, with the ground levels at the access to the site on Holsten Road starting at approximately 65m above ordnance datum (m AOD) and falling to approximately 10m AOD at its lowest point before rising again to approximately 30m AOD at the eastern tip.

To the west of the site, the land rises steeply to the Ward of Norwick at approximately 186m AOD and then on again to the present RAF Radar Station at Saxa Vord which is at a level of approximately 285m AOD.

The eastern area of the site slopes from south to north and the western higher ground from north to south.

The site has several short watercourses which discharge to the cliff edges, and numerous man made ditches associated with agricultural and former RAF activities. There are also small areas of standing water typically in the areas of peaty soils.

An existing drainage analysis has been carried out and is shown on drawing 60617516-ACM-XX-00-DR-CE-0065(-) in Appendix A of this report

The site is generally covered in rough grass with the superficial geology predominantly comprising of glacial till. These deposits vary in lithology and are typically poorly sorted sandy, silty clay with possible laminated sand layers and coarse granular material. There is an area of blown sand approximately half way along the peninsula. Where the top of the cliff faces are exposed, a thin layer of superficial material overlies the exposed rock.

Based on the site investigation study, the area comprises thin superficial soils overlying rock with some local areas of peat deposits particularly on flat lying areas to the western side of the site. It is also expected that made ground associated with the historic development across the site will be present in areas previously developed.

The bedrock geology is formed from the Skaw Intrusion – a Porphyritic Microgranite which can be described as a medium-grained intrusive igneous rock with several dyke intrusions of North Britain Siluro-Devonian Calc-Alkaline Lamprophyre. There is a fault recorded approximately $\frac{3}{4}$ of the way along the peninsula.

Saxa Vord – Launch Control and Range Control Centres

Saxa Vord consist of a mixture of private\public dwellings surrounded by fields used mainly for sheep grazing.

It is intended to use an existing former brewery building on the south side of the Valsgarth Road for these activities

3. Drainage strategy

Surface Water

Launch Site

The main site will consist of three launch pads with associated support areas consisting of Administration, Assembly, TEL and ancillary buildings located throughout the site together with a Satellite Tracking Area, all of which will interlinked by new or upgraded access roads.

Due to the distances between each area, localised strategies will be adopted for each and is described in detail below. All of the site is drained by small watercourses directly to the sea at various locations. No attenuation is therefore proposed for any of the new works.

A site layout drawing 60617516-ACM-XX-00-DR-CE-0037(N) is contained in Appendix A of this report

Launch Pad Areas – Launch Pads 1, 2, & 3

General

The launch pad areas will consist of a central launch area with commodities (gasses) and fuel and control areas either side to provide separation.

The operations strategy for Space Centre and its components is described in detail in the Environmental Statement and this drainage strategy follows these requirements for both normal daily operations and launch operations.

Fuels and gasses are not permanently stored at these locations and will be brought to the launch pad site from external storage in ISO haulage road containers. The fuel and gas containers will remain on their trailers to allow fuelling and de fuelling. Tractor units will not be parked at these locations after delivery.

Some small containerised facilities will be off loaded onto the ground at the control area. These are for electrical and mechanical support together with local welfare for staff carrying out preparatory work.

The launch pads are designed to suit multi-user requirements, in particular the provision of flame pit and launch deluge water for some launches.

Launch Pad Construction

The launch area will comprise of a concrete slab with a flame pit and surrounded on three sides by an upstand wall to contain any immediate deluge water if required by the user during launch. The slab will be constructed with falls towards the launch pit and any surface water will discharge into this pit which in turn connects into a culvert. This method gathers the surface water from the pad and deluge water for treatment.

This flame deflection culvert below the launch pad is sloped such that all surface and deluge water from the launch pad will fall towards the launch pit as indicated on drawings 60617516-ACM-XX-00-DR-CE-0054(B), 0060(C) and 0072(A).

During non-operational periods the launch pit surface water outlet will discharge to the surface water drainage via a manhole into a filter trench or ditch before discharging to a sea outfall.

The discharge manhole will have a penstock valve which will permit the surface water during fuelling and deluge water during launch operations to be diverted to an interceptor/storage tank for collection for off site treatment.

The associated Storage and Control areas will be drained as follows:

Launch Pad Control Area

Surface water run-off from the Control Area will discharge into drainage channels or into a ditch\filter trench before discharging to a sea outfall.

Launch Pad Fuel Storage Area

This area will store Fuel mainly RP-1 Kerosene). The area will have a contained concrete surface laid to falls into the drainage system. Due to the risk of spillages the channels will discharge into full retention alarmed interceptor before discharging into either a filter drain or drainage ditch.

The interceptor capacity will be sized to accommodate a tanker cell burst into the system (700 litres)

Launch Pad Commodities Storage Area

This area will store mainly gasses in liquified and gaseous form (Oxygen Nitrogen)

The area will have a compacted stone surface laid to falls into the drainage system.

Drainage will discharge into either a filter drain or drainage ditch.

Launch pad general spaces

Areas between the Launch Pad and the Storage and Control Areas will be drained via. a series of filter trenches or ditches.

TEL Buildings

Roof drainage, surrounding roads and granular surfaced hardstanding areas will discharge into an adjacent filter trench system to provide SuDS treatment prior to discharging into the existing ditch system Where no existing ditches are present, new ditches will be formed to tie into the existing outfalls to the sea.

Satellite Tracking Area

The Satellite Tracking Area will consist of four concrete pad areas surrounded by security fencing. Satellite dishes are not understood bring any risk of contamination however basic SuDS has been provided

Surface water drainage from each pad will be in the form of filter trenches to provide SuDS treatment which will discharge into the existing ditch system via new filter drains and ditches

Administration Gate house, Assembly Buildings, Hazardous Store and Pyro Store.

Roof drainage from the Administration building and the Assembly buildings will be drained separately to yards and roads. Surface water from these will be passed through rainwater harvesting tanks to provide grey water for toilets and other non-potable uses.

Surrounding roads and granular surfaced hardstandings areas will discharge into an adjacent filter trench system to provide SuDS treatment prior to discharging into the existing ditch system Where no existing ditches are present, new ditches will be formed to tie into the existing outfalls to the sea.

Hazardous Store and Pyro Store buildings are small, and roofs will discharge direct to the filter trenches and adjacent ditches.

Foul drainage Launch site.

There is no permanent foul drainage on the site available for use.

Permanent facilities will be provided in the following buildings, Gate house, Administration building, Assembly Buildings (2) and TEL Building

Facilities from the Gate house, Administration building, assembly buildings (2) will be collected together through a small drainage network initially to a sewerage storage tank which will be emptied as required.

The development of buildings will be phased in line with the programme and will only be in use during launch cycles. It is not considered feasible to use septic tanks or small treatment works for these early phases until adequate and consistent flows would support small treatment works for this area

For the TEL building a limited number of personnel will be active during preparations for launches. Provision has been made for this sewerage to be drained to a single tank which will be emptied as required.

When the launch cadence increases and adequate and consistent flows are available, a septic tank is proposed to be added with filter distribution pipework and final discharge to existing drainage ditches.

Temporary welfare facilities will be provided at each launch pad when in use. These will consist of portable cabins with toilet tanks which will be emptied as required.

Saxa Vord Launch control and range control centre

The Launch and Control Centre will be located within the existing Saxa Vord Resort and it is the intention to utilise the existing foul and surface water systems for our drainage strategy.

Surface Water

We understand that the existing surface water system discharges into a soakaway to the west of the resort however further investigation will be required to determine the precise arrangement. Any surface water discharge to the existing system will be at a similar rate as existing to ensure the existing system is not surcharged.

Foul Drainage

The existing foul drainage system consists of a private/public gravity fed piped system discharging into a 48 m³ holding tank at Clibberswick, situated approximately 1.1km south-east of Saxa Vord. The tank, which has an overflow which discharges to a sea outfall, is regularly emptied by Shetland Islands Council, with the contents taken to the sewage treatment works in Lerwick for disposal. Further investigation is required to determine the design parameters for this tank to determine whether the foul discharge rates from the proposed Launch and Control Centre can be accommodated by the existing system. Where it is found that the existing system cannot accommodate the additional flows, then a cesspool or septic tank will be considered to accommodate the excess flows.

Foul drainage will be from permanent toilets within the buildings, draining to an external cesspool tank with tanker removal at regular intervals. If a more permanent facility is needed later, then a septic tank could be added draining to the ground.

Appendix A

A.1	Drawing 60617516/0092(-)	Planning Application Site Boundary
A.2	Drawing 60617516/0065(-)	Existing Watercourses and Drainage Ditches
A.3	Drawing 60617516/0037(N)	Overall Site Plan
A.4	Drawing 60617516/0057(C)	Assembly \ Storage Area – Drainage Strategy
A.5	Drawing 60617516/0066(A)	Satellite Tracking Area – Drainage Strategy
A.6	Drawing 60617516/0056(C)	Transport Holding Building – Drainage Strategy
A.7	Drawing 60617516/0054(B)	Launch Pad 1 - Drainage Strategy
A.8	Drawing 60617516/0072(A)	Launch Pad 2 - Drainage Strategy
A.9	Drawing 60617516/0060(C)	Launch Pad 3 - Drainage Strategy

Notes

- LEGEND**
- WATERCOURSE (AS SHOWN ON OS MAPS)
 - DITCHES
 - DIRECTION OF FLOW
 - LOCHAN
 - PLANNING APPLICATION SITE BOUNDARY

LOCATION OF EXISTING WATERCOURSES AND DITCHES TAKEN FROM ORDNANCE SURVEY DIGITAL MAP IMAGERY. FURTHER INVESTIGATION MAY BE REQUIRED TO DETERMINE THE ACCURACY OF THIS DRAWING.

ISSUE/REVISION

No	Date	Description	Drawn/Checked
1	14/12/20	PLANNING APPLICATION SUBMITTED	DR/DOV
2	17/02/21	REVISION	DR/DOV

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

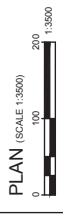
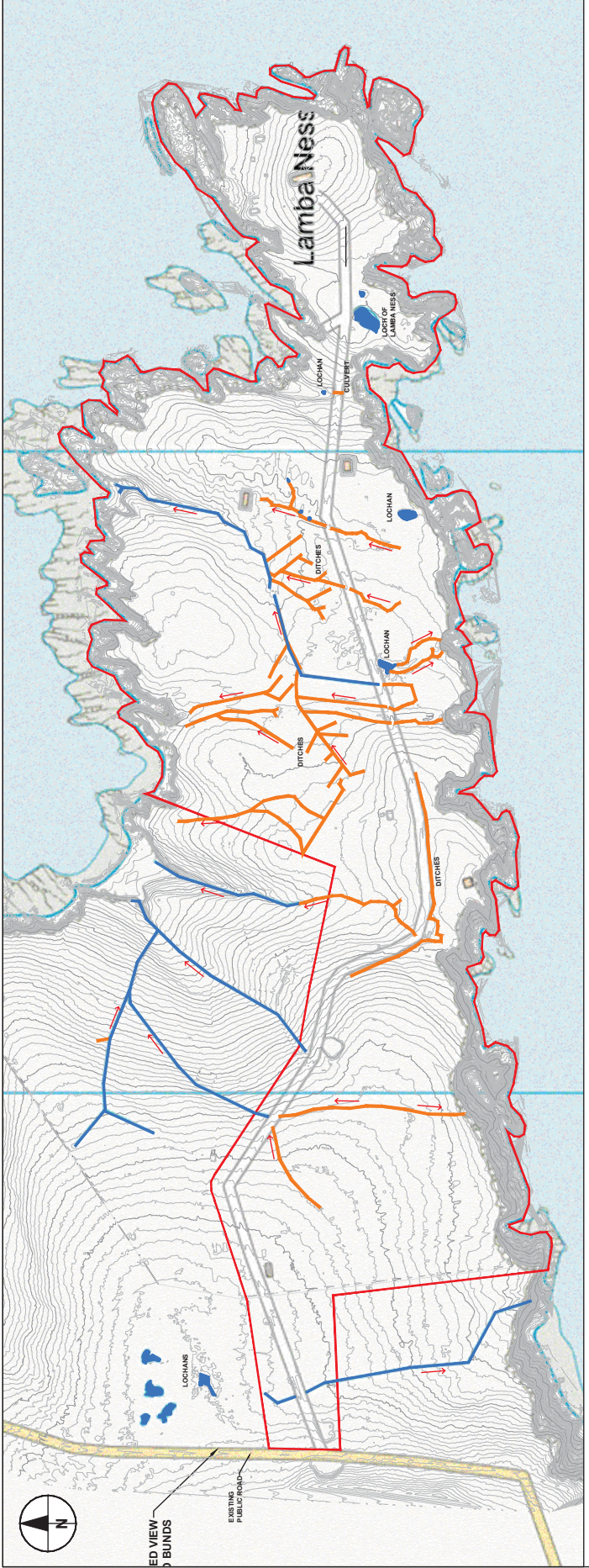
EXISTING WATERCOURSES AND DRAINAGE DITCHES

Sheet Number

60617516-ACM-XX-00-DR-CE-0065

Scale: 1:3500

Rev: A



PLAN (SCALE 1:3500)

Client



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Notes

- LEGEND**
- PROPOSED SURFACE WATER
 - PROPOSED FILTER DRAIN AND DITCH
 - PROPOSED HEADWALL AND DITCH
 - PROPOSED FOUL WATER
 - PROPOSED MANHOLE (SURFACE WATER)
 - PROPOSED MANHOLE (FOUL WATER)
 - PROPOSED RODDING EYE

ISSUE/REVISION

Issue	Date	Description	Drawn/Checked
C	10/12/20	ISSUED FOR PUBLIC CONSULTATION	(ISSUE/DATE)
B	08/11/20	ISSUED FOR PUBLIC CONSULTATION	(ISSUE/DATE)
A	14/10/20	ISSUED FOR PUBLIC CONSULTATION	(ISSUE/DATE)
1	27/03/20	ISSUE/DATE	(ISSUE/DATE)

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

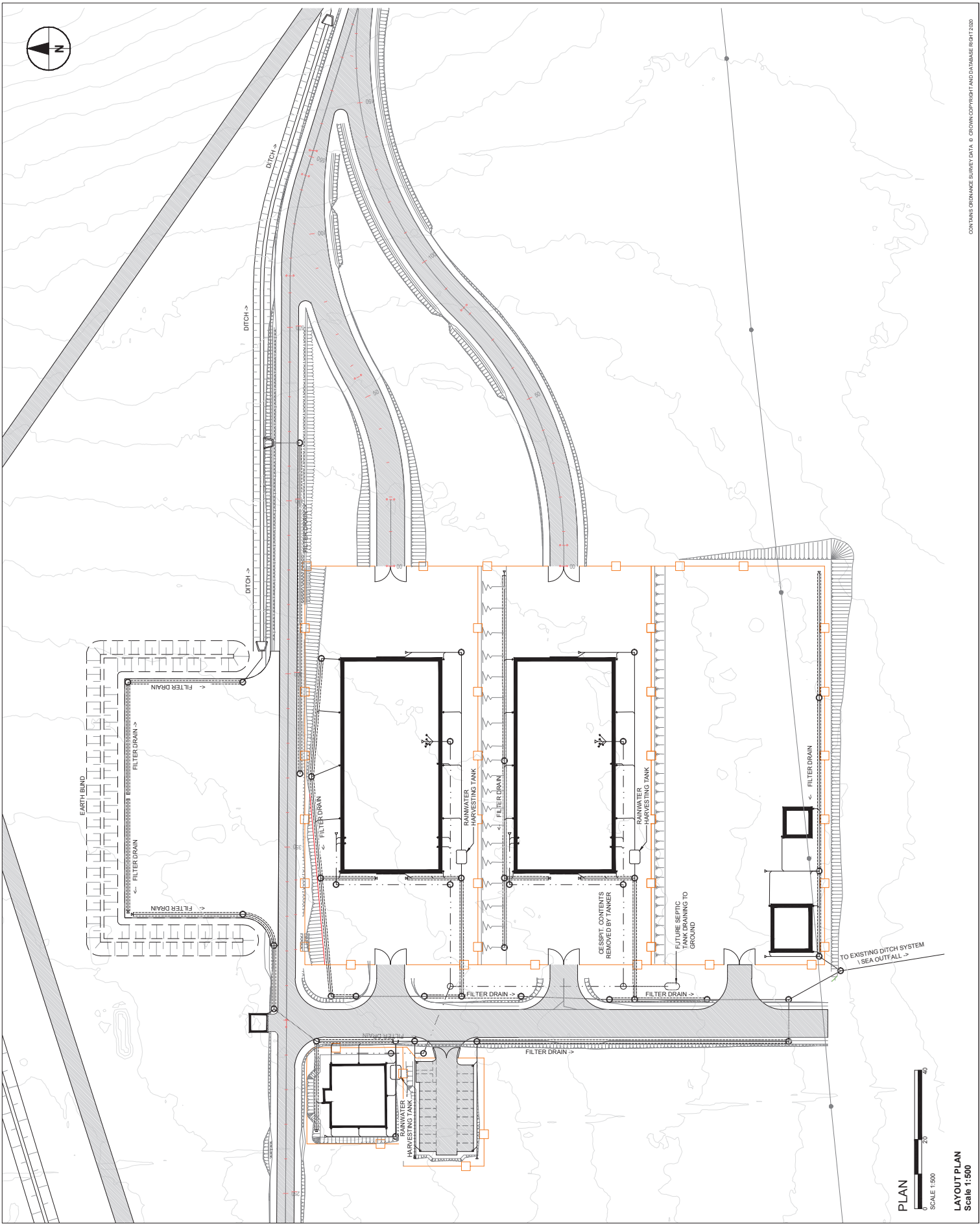
ASSEMBLY AND STORAGE AREA
PROPOSED DRAINAGE
STRATEGY

Sheet Number

60617516-ACM-XX-00-DR-CE-0057

Scale: 1:500

Rev: C



LAYOUT PLAN
Scale 1:500

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Notes

LEGEND

- PROPOSED SURFACE WATER
- PROPOSED FILTER DRAIN
- PROPOSED HEADWALL AND DITCH
- EXISTING DITCH SYSTEM
- PROPOSED MANHOLE (SURFACE WATER)
- PROPOSED RODDING EYE

ISSUE/REVISION

No	Date	Description	Drawn/Rev
A	10/12/22	FOR PLANNING REVIEW	0000/0001
B	27/02/23	FOR ISSUE	0000/0001

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

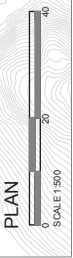
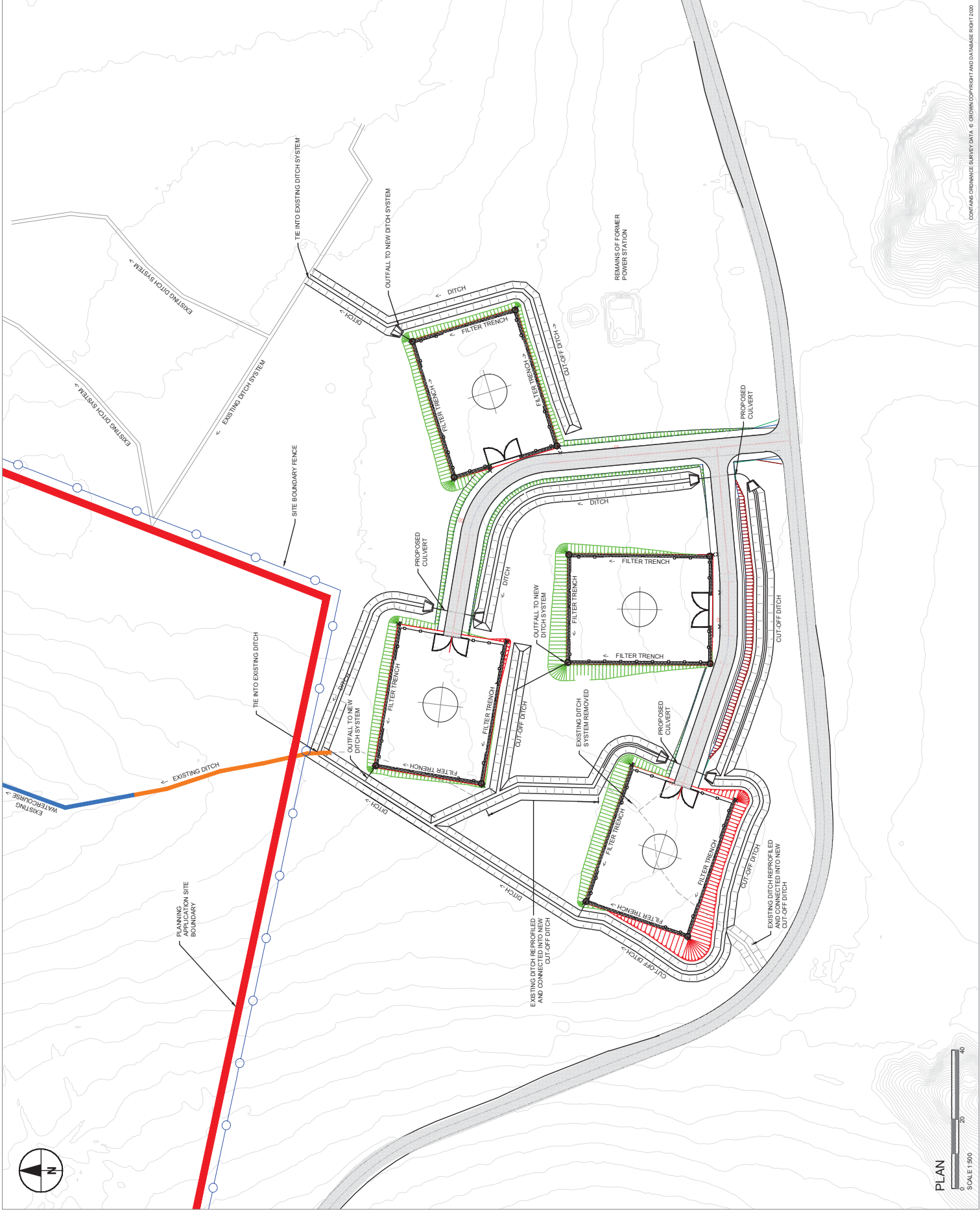
SATELLITE TRACKING AREA
DRAINAGE STRATEGY

Sheet Number

60617516-ACM-XX-00-DR-CE-0066

Scale: 1:500

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LEGEND	
—	PROPOSED SURFACE WATER
—	PROPOSED FILTER DRAIN
—	PROPOSED HEADWALL AND DITCH
○	PROPOSED FOUL WATER
○	PROPOSED MANHOLE (SURFACE WATER)
○	PROPOSED MANHOLE (FOUL WATER)
—	PROPOSED RODDING EYE
—	PROPOSED SURFACE WATER DRAINAGE CHANNEL

ISSUE/REVISION

No	Date	Description
C	20/11/20	EXISTING CULVERT EXTENDED
B	18/11/20	LAYER UNDATED
A	14/10/20	DIRT LAYER REVISED
	20/02/20	FIRST ISSUE
Rev	Date	Description
1		DRN/CH/AN/04

Key Plan

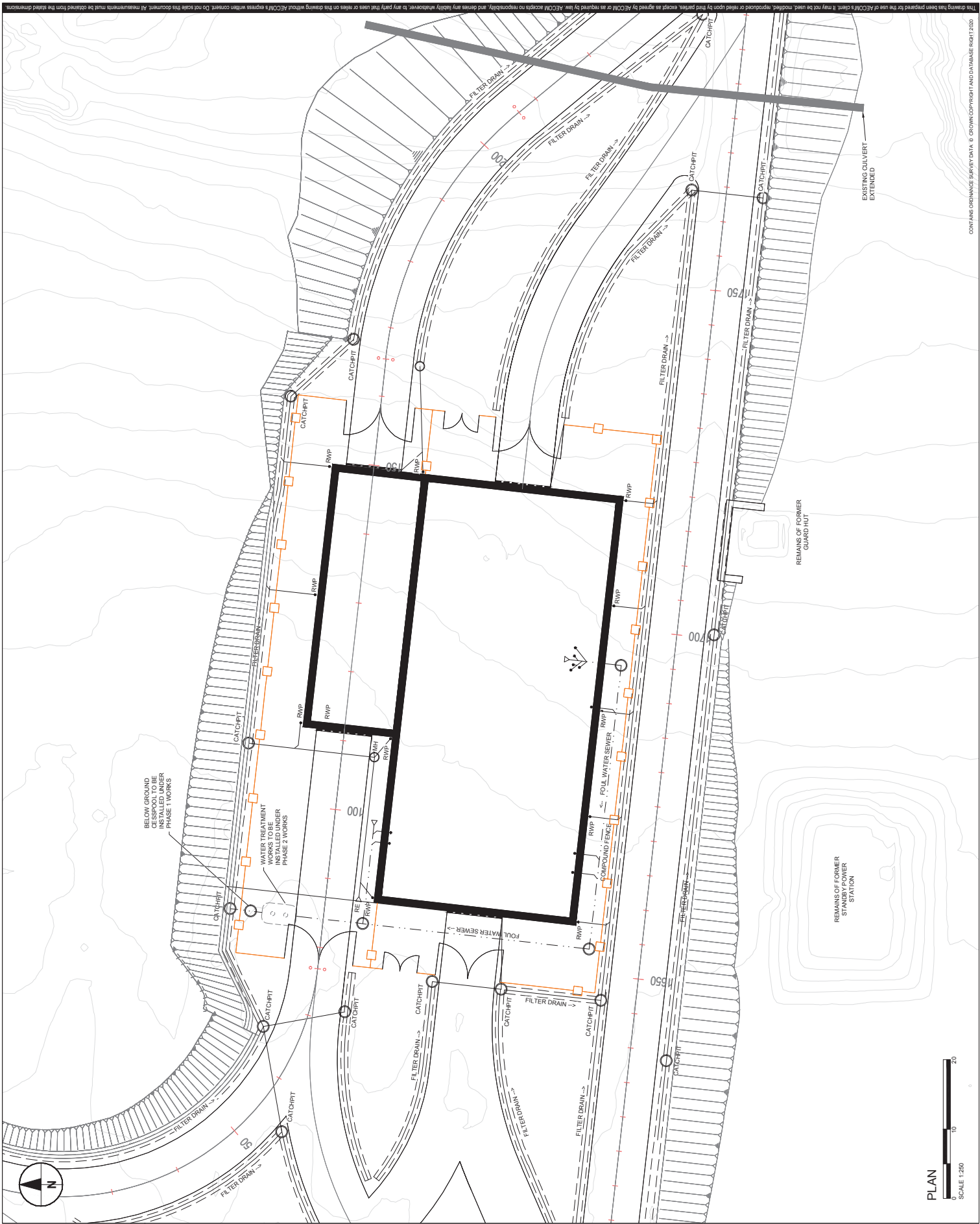
Purpose Of Issue
FOR PLANNING

Project Number
60617516

Sheet Title
TRANSPORT HOLDING BUILDING
DRAINAGE STRATEGY

Sheet Number
60617516-ACM-XX-00-DR-CE-0056

Scale: 1:250



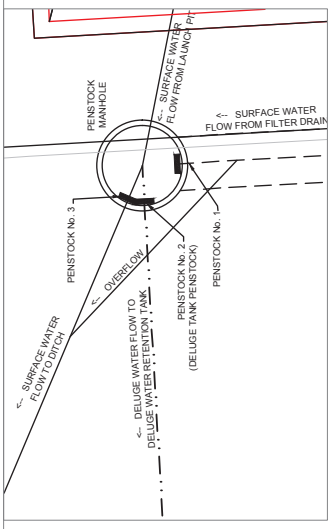


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LEGEND

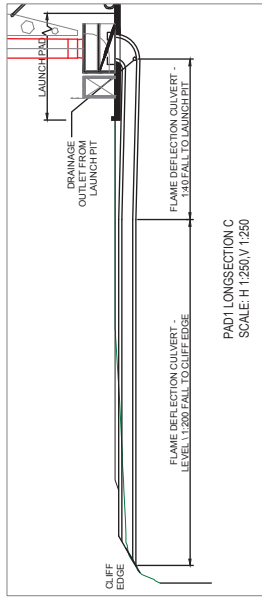
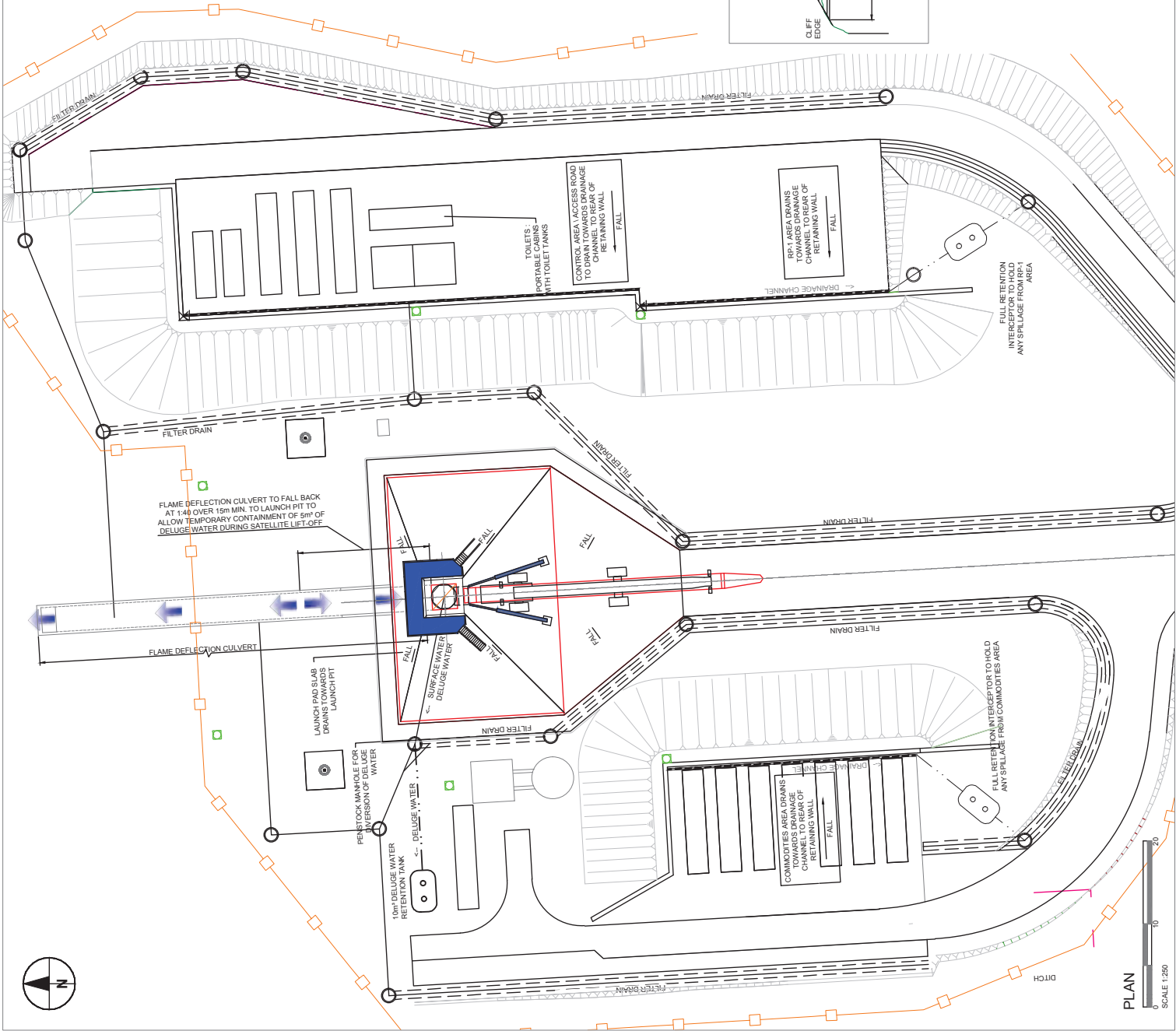
- PROPOSED SURFACE WATER
- PROPOSED FILTER DRAIN
- PROPOSED HEADWALL AND DITCH
- PROPOSED POUL WATER
- PROPOSED MANHOLE (SURFACE WATER)
- PROPOSED MANHOLE (FOUL WATER)
- PROPOSED RODDING EYE
- PROPOSED SURFACE WATER DRAINAGE CHANNEL
- PROPOSED FOUL WATER DRAINAGE CHANNEL

No	Date	Description	Drawn/Checked/Approved
B	10/12/20	ISSUE FOR PERMIT	(SIGNED/DATE)
A	14/12/20	REVISIONS TO PERMIT DRAWINGS	(SIGNED/DATE)
1	15/12/20	REVISIONS TO PERMIT DRAWINGS	(SIGNED/DATE)



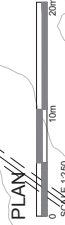
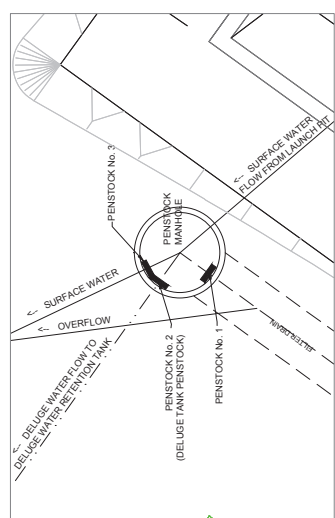
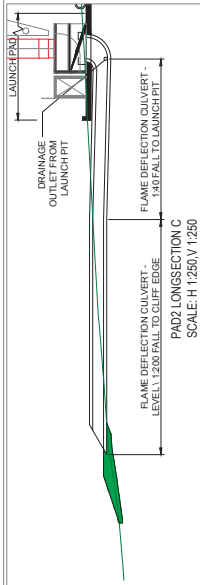
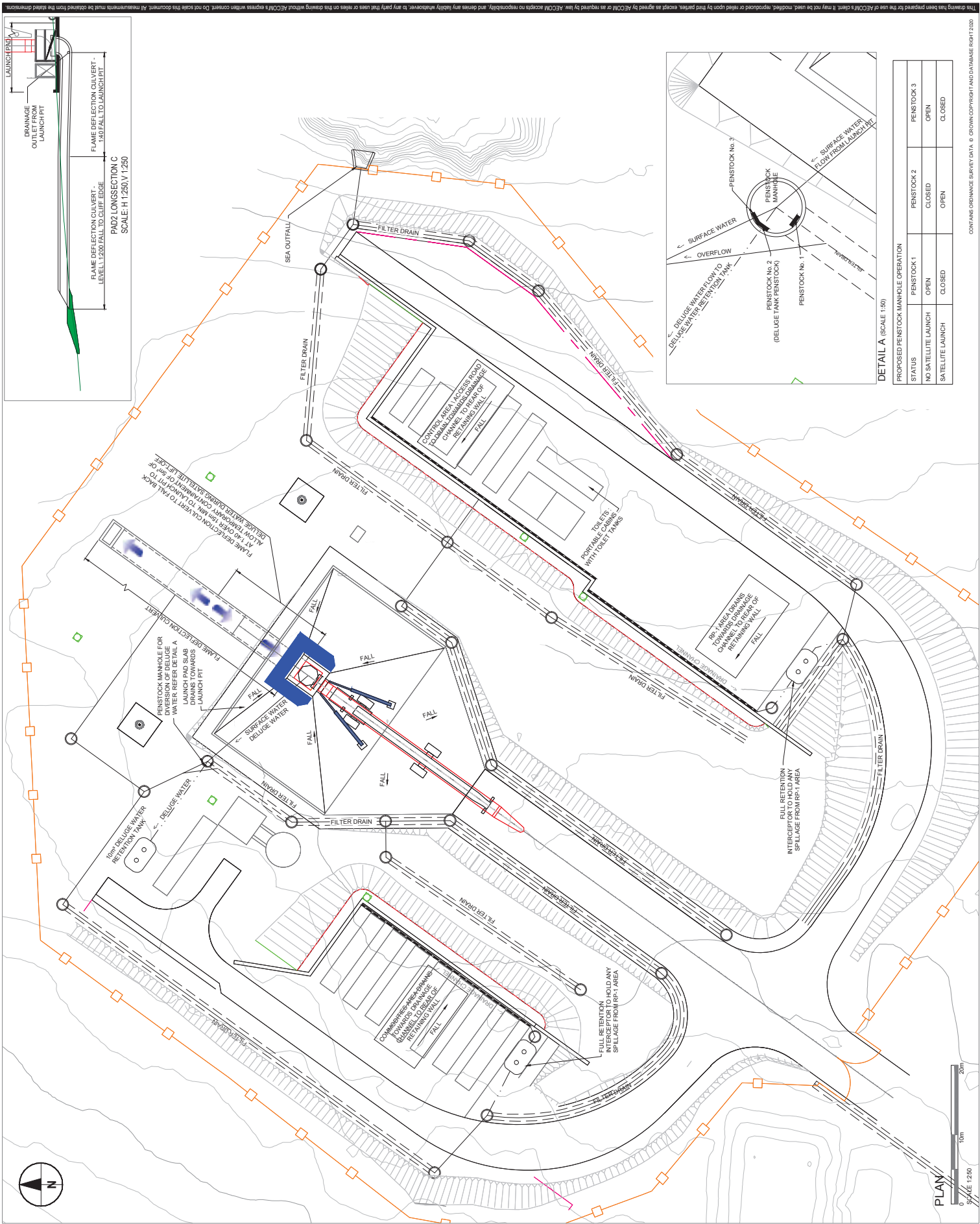
PROPOSED PENSTOCK MANHOLE OPERATION

STATUS	PENSTOCK 1	PENSTOCK 2	PENSTOCK 3
NO SATELLITE LAUNCH	OPEN	CLOSED	OPEN
SATELLITE LAUNCH	CLOSED	OPEN	CLOSED



—	PROPOSED SURFACE WATER
—	PROPOSED FILTER DRAIN
—	PROPOSED HEADWALL AND DITCH
—	PROPOSED FOUL WATER
○	PROPOSED MANHOLE (SURFACE WATER)
○	PROPOSED MANHOLE (FOUL WATER)
—	PROPOSED RODDING EYE
—	PROPOSED SURFACE WATER DRAINAGE CHANNEL
—	PROPOSED FOUL WATER DRAINAGE CHANNEL

No.	Date	Description	Drawn/No.	Checked/No.
A	10/12/20	ISSUE FOR RFI	DR/200707	DR/200707
B	14/12/20	FOR ISSUE	DR/200707	DR/200707



LEGEND

- PROPOSED SURFACE WATER
- PROPOSED FILTER DRAIN
- PROPOSED HEADWALL AND DITCH
- PROPOSED FOUL WATER
- PROPOSED MANHOLE (SURFACE WATER)
- PROPOSED MANHOLE (FOUL WATER)
- PROPOSED RODDING EYE
- PROPOSED SURFACE WATER DRAINAGE CHANNEL
- PROPOSED FOUL WATER DRAINAGE CHANNEL

ISSUE/REVISION

No.	Date	Description
C	10/12/20	ISSUE FOR PERMITS
B	10/12/20	REVISED DRAWING
A	16/12/20	REVISED DRAWING
-	27/02/21	PERMITS

Key Plan

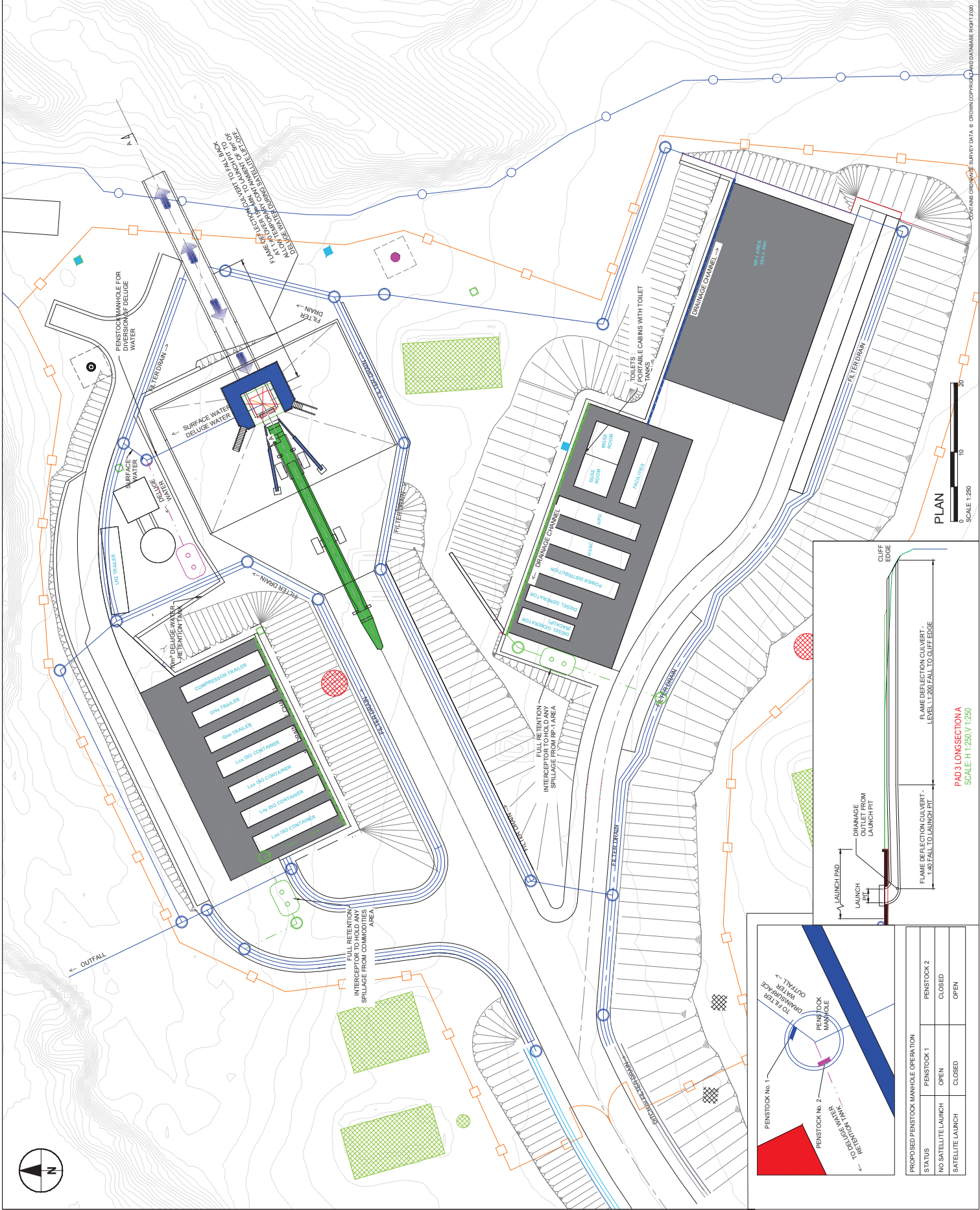
Purpose Of Issue
FOR PLANNING

Project Number
60617516

Sheet Title
LAUNCH PAD 3
DRAINAGE STRATEGY

Sheet Number
60617516-ACM-XX-00-DR-CE-0060

Scale: 1:250



PLAN
SCALE 1:250

PAD 3 LONGSECTION A
SCALE: H 1:250, V 1:250

PROPOSED PENSTOCK MANHOLE OPERATION	PENSTOCK 1	PENSTOCK 2
NO SATELLITE LAUNCH	OPEN	CLOSED
SATELLITE LAUNCH	CLOSED	OPEN





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