REPORT NO:
237 Valley Closure Assessment Report – 2024

MineLock
Environmental Engineers

# Environmental Impact Management Services (EIMS)

# Closure and Financial Provision Assessment of Valley TSF at Harmony Gold mine, using the DMR Guidelines as at January 2024

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# 1. INTRODUCTION

## 1.1 Background

MineLock Environmental Engineers (MineLock) was commissioned by Environmental Impact Management Services (EIMS) to develop an premature DME closure quantum as part of the Basic Assessment, for the newly designed Valley tailings storage facility (TSF) at the Harmony Gold Mining Company Limited (Harmony), areas between the Free State North 1 (FSN) and Free State North 2 (FSN) TSFs.

A new deposition site will be required for Harmony One Plant to replace the FSS2 and St. Helena 4 TSFs. Several alternative sites were identified and assessed by Harmony as possible suitable deposition sites for the tailings from Harmony One Plant after June 2024 but was found not feasible.

Following a review of other possibilities for One Plant's future tailings deposition by Harmony, an option to utilise the space between the Free State North 1 (FSN) and Free State North 2 (FSN) TSFs and portion of the footprint of the FSN4 TSF as shown in the Google Earth image in Figure 1 below has been identified as possible deposition site.


*Figure 1: Google Earth image of the position of the proposed Valley TSF*

For premature closure, only relevant activities within a year from the first day of disturbance of the Valley TSF was considered. According to the schedule provided by EIMS (see Appendix A), the construction of the Valley TSF is planned to take 276 working days, starting on 28 April 2025 and ending on 18 May 2026, thus the earthworks, bottom liner system and supporting infrastructure are to be demolished during year one of the premature closure.

The following items were considered for the Year 1 premature closure quantum of the Valley TSF:

- Removal of bottom barrier system;
- Removal of underdrainage system;
- Demolition of all embankments;
- Rehabilitation of Valley area; and
- Decommissioning of Return water dam and supporting infrastructure.

The embankments and bottom liner system designs as designed and provided by Geotheta, Appendix A, was incorporated into the premature closure quantum.

No allowance was made for Post closure monitoring and aftercare as part of the premature closure quantum as no tailings material has been deposited during this first year period. Allowance for Year 2, which will include commissioning and deposition of tailings material, should form part of Harmony Gold's upcoming annual update.

# 2. MINE OVERVIEW

Harmony is a gold mine located approximately 8km north-west of Welkom in the Free State.

Table 1 presents the infrastructure and features associated with the Valley TSF.

*Table 1:Activities as per DMR Guidelines*

| Component | Description | Applicable |
|---|---|---|
| 1 | Dismantling of processing plant and related structures (incl. overland conveyors and Power lines) | N/A |
| 2 (A) | Demolition of steel buildings and structures | N/A |
| 2 (B) | Demolition of reinforced concrete buildings and structures | Silt Trap<br>Culvert<br>Solution outfall trench<br>Spillway<br>Decant manholes and pump chamber |
| 3 | Rehabilitation of access roads | N/A |
| 4 (A) | Demolition and rehabilitation of electrified railway lines | N/A |
| 4 (B) | Demolition and rehabilitation of non-electrified railway lines | N/A |
| 5 | Demolition of housing and/or administration facilities | N/A |
| 6 | Opencast rehabilitation including final voids and ramps | N/A |
| 7 | Sealing of shafts, adits and inclines | N/A |
| 8 (A) | Rehabilitation of overburden and spoils | N/A |
| 8 (B) | Rehabilitation of processing waste deposits and evaporation ponds (basic, salt producing waste) | N/A |
| 8 (C) | Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste) | N/A |
| 9 | Rehabilitation of subsided areas | N/A |
| 10 | General surface rehabilitation | Valley Tailings Storage Facility assumed to be empty at this stage and no deposition has taken place<br>Topsoil footprint 1<br>Topsoil footprint 2 |

| Component | Description | Applicable |
|---|---|---|
| | | RWD liner removal assumed allowed for in general surface rehabilitation rate |
| 11 | River diversions | N/A |
| 12 | Fencing | RWD Perimeter fence |
| 13 | Water management | N/A |
| 14 | 2 to 3 years of maintenance and aftercare | N/A |

# 3. CLOSURE COST ASSESSMENT

This section presents the basis of the calculation of the quantum for financial provisions for closure. The assessment and calculations are based on the 2005 DMR 'Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision' provided by a Mine (Department of Mineral Resources, 2005).

## 3.1 Input parameters for quantum provision

| No | Input data |
|---|---|
| 1 | Risk ranking for mine type and mineral by-product |
| 2 | Environmental sensitivity of the mining area |
| 3 | Level of information available |
| 4 | Type of mining operation |
| 5 | Geographical location of the mine |
| 6 | Closure components & Areas of disturbance (Components Map) |

## 3.2 Primary Risk Class for type of minerals mined

| Mineral | Ore | Size: Larger if > than (tpm) | Primary risk class | | | |
|---|---|---|---|---|---|---|
| | | | Large Mine | | Small Mine | |
| | | | Mine and mine waste | Mine, mine waste, plant and plant waste | Mine and mine waste | Mine, mine waste, plant and plant waste |
| **Gold** | | 10 000 | B | A | B | A |

## 3.3 Risk Class

| Determine risk class | |
|---|---|
| Class A | a high probability of the occurrence of the impact with a severe consequence, |
| Class B | a moderate probability of occurrence of the impact with a manageable consequence, |
| Class C | a low probability of occurrence of the impact with a negligible consequence. |

## 3.4 Area Sensitivity

| Area sensitivity | | | |
|---|---|---|---|
| Sensitivity | Sensitivity criteria | | |
| | Biophysical | Social | Economic |
| Low | • *Largely disturbed from natural state.*<br>• Limited natural fauna and flora remains.<br>• Exotic plant species evident.<br>• Unplanned development. | • *The local communities are not within sighting distance of the mining operation.*<br>• *Lightly inhabited area (rural).* | • *The area is insensitive to development.*<br>• *The area is not a major source of income to the local communities.* |

| | | | |
|---|---|---|---|
| | • Water resources disturbed and impaired. | | |
| Medium | • *Mix of natural and exotic fauna and flora.*<br>• *Development is a mix of disturbed and undisturbed areas, within an overall planned framework.*<br>• *Water resources are well controlled.* | • *The local communities are in the proximity of the mining operation (within sighting distance).*<br>• *Peri-urban area with density aligned with a development framework.*<br>• *Area developed with an established* | • *The area has a balanced economic development where a degree of income for the local communities is derived from the area.*<br>• *The economic activity could be influenced by indiscriminate development.* |
| High | • *Largely in natural state.*<br>• *Vibrant fauna and flora, with species diversity and abundance matching the nature of the area.*<br>• *Well planned development.*<br>• *Area forms part of an overall ecological regime of conservation value.*<br>• *Water resources emulate their original state.* | • *The local communities are in close proximity of the mining operation (on the boundary of the mine).*<br>• *Densely inhabited area (urban/dense settlements).*<br>• *Developed and well-established communities.* | • *The local communities derive the bulk of their income directly from the area.*<br>• *The area is sensitive to development that could compromise the existing economic activity.* |

## 3.5 Closure components

| Component No. | Main description | Applicable closure components for mine type | | |
|---|---|---|---|---|
| | | Open-cast | Under ground | Combination |
| 1 | Dismantling of processing plant and related structures (including overland conveyors and power lines) | No | No | No |
| 2(A) | Demolition of steel buildings and structures | No | No | No |
| 2(B) | Demolition of reinforced concrete buildings and structures | No | No | Yes |
| 3 | Rehabilitation of access roads | No | No | No |
| 4(A) | Demolition and rehabilitation of electrified railway lines | No | No | No |
| 4(B) | Demolition and rehabilitation of non-electrified | No | No | No |

| Component No. | Main description | Applicable closure components for mine type | | |
|---|---|---|---|---|
| | | Open-cast | Under ground | Combination |
| | railway lines | | | |
| 5 | Demolition of housing and facilities | No | No | No |
| 6 | Opencast rehabilitation including final voids and ramps | No | No | No |
| 7 | Sealing of shafts, adits and inclines | No | No | No |
| 8(A) | Rehabilitation of overburden and spoils | No | No | No |
| 8(B) | Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste) | No | No | No |
| 8(C) | Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste) | No | No | No |
| 9 | Rehabilitation of subsided areas | No | No | No |
| 10 | General surface rehabilitation, including grassing of all denuded areas | No | No | Yes |
| 11 | River diversions | No | No | No |
| 12 | Fencing | No | No | Yes |
| 13 | Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required) | No | No | No |
| 14 | 2 to 3 years of maintenance and aftercare | No | No | No |

## 3.6 Unit rates for closure components

The components in the DMR guideline that has multiplication factors different than 1 are listed below. It is, however, not necessarily applicable to the costing of this site.

Component 6 - Opencast Rehabilitation:

| COMPONENT 6 | OPENCAST REHABILITATION | | | |
|---|---|---|---|---|
| | UNIT | | | MASTER RATE |
| | *ha* | | | R 213 206.21 |
| | Multiplication factor | | | |
| Risk Class (A, B or C) | A | 0.04 | 0.52 | 1.00 |
| | B | 0.04 | 0.52 | 1.00 |
| | C | 0.04 | 0.52 | 1.00 |
| | | Low | Medium | High |
| | Environmental Sensitivity | | | |

Component 8 (c) - Processing water deposits & Evaporation ponds:

| COMPONENT 8 (C) | PROCESSING WATER DEPOSITS & EVAPORATION PONDS | | | |
|---|---|---|---|---|
| | UNIT | | | MASTER RATE |
| | *ha* | | | R 529 598.05 |
| | Multiplication factor | | | |
| Risk Class (A, B or C) | A | 0.59 | 0.80 | 1.00 |
| | B | 0.55 | 0.76 | 0.90 |
| | C | 0.51 | 0.66 | 0.81 |
| | | Low | Medium | High |
| | Environmental Sensitivity | | | |

Component 13 – Water Management:

| COMPONENT 13 | WATER MANAGEMENT | | | |
|---|---|---|---|---|
| | UNIT | | | MASTER RATE |
| | *ha* | | | R 44 096.42 |
| | Multiplication factor | | | |
| Risk Class (A, B or C) | A | 0.60 | 0.67 | 1.00 |
| | B | 0.41 | 0.60 | 0.67 |
| | C | 0.17 | 0.25 | 0.33 |
| | | Low | Medium | High |
| | Environmental Sensitivity | | | |

## 3.7 Weighting Factor 1 and 2

Weighting factor 1 is applied to all closure components:

| Nature of the Terrain/Accessibility | Flat | Undulating | Rugged |
|---|---|---|---|
| Weighting Factor 1 | 1.00 | 1.10 | 1.20 |

Weighting factor 2 is applied to preliminary and general item only:

| Proximity to urban area where goods and services are supplied | Urban | Peri-urban | Remote |
|---|---|---|---|
| Weighting Factor 2 | 1.00 | 1.05 | 1.10 |

## 3.8 Escalation

In South Africa, the Consumer Price Index or CPI measures changes in the prices paid by consumers for a basket of goods and services and is published Stats SA (Consumer Price Index, Statistical Release P0141).

The master rates were updated (escalated) by multiplying the master rate of the previous year with the new (average) CPI value. The average CPI was published end of January 2024.

*Table 2: Consumer price indices headline year-on-year rates*

| Year | Jan | Feb | March | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2023 | 6.9 | 7 | 7.1 | 6.8 | 6.3 | 5.4 | 4.7 | 4.8 | 5.4 | 5.9 | 5.5 | 5.1 | 5.91 |
| 2024 | 5.3 | - | - | - | - | - | - | - | - | - | - | - | 5.30 |

## 3.9 Closure methods and assumptions

The DMR Guideline presents generally accepted closure methods, based on experience in the field, which have been used as the basis for determining the Master Rates for the various closure components in the "rules-based" approach. Where relevant, specific reference is made to the site conditions and requirements applicable to the closure of the Valley TSF. In addition, the relevant mine structures and components requiring closure are listed.

### 3.9.1 Components 2 (B): Steel and reinforced concrete structures and housing, facilities and services

According to the DMR Guideline, the generally accepted closure methods applicable to this component include:

- All structures should be demolished to 1m below ground level.
- The rubble is to be buried adjacent to the sites, provided this adheres to the National Waste Management Strategy.
- Silos should be imploded and buried.
- The areas should be shaped, top soiled with 300mm of topsoil and vegetated or as stated in the relevant EMP document.
- Monitoring and maintenance are costed in the relevant areas.
- The concrete hardstand is the area between buildings such as workshops, offices, etc.

### 3.9.2 Component 10: General surface rehabilitation

Final surface rehabilitation of areas disturbed by mining and related activities should be aligned to the selected final land use. The generally accepted closure methods applicable to general surface rehabilitation includes:

- Surface topography that emulates the surrounding areas and aligned to the general landscape character. Steep slopes more than 6 percent should also be avoided if possible.
- Landscaping that would facilitate surface runoff and result in free draining areas. If possible, the drainage lines should be reinstated.

- An area without unnecessary remnants of structures and surface infrastructure to give the rehabilitated area a “neat” appearance. Special attention must be given to shape and/or removal of heaps of excess material being the legacy of prolonged mining and related activity.
- An area suitable for revegetation.

The unit cost for general rehabilitation allows for shaping and landscaping of disturbed areas. The Master Rate for the shaping of material to a depth/thickness of about 500mm. An extra over allowance in the unit cost of 50% has been made to cover the removal and/or destruction of surface infrastructure remnants and/or other undesirable objects such as trees, foundations, concrete slabs, etc.

In this study area it is assumed to include the removal of the liner systems for TSF and RWD.

### 3.9.3 Component 12: Fencing

This item includes the removal of all fencing structures. The fencing included for the RCM project includes all fences on the mine.

### 3.9.4 Costs

The quantum for financial provisions for un-scheduled closure was estimated using the rule-based approach defined in the DMR Guideline. Refer to Table 3 for a summarised breakdown of the closure cost assessment estimate as of January 2024.

*Table 3: Summary of the unscheduled closure cost for RCM*

| | CALCULATION OF THE QUANTUM | | | | | | |
|---|---|---|---|---|---|---|---|
| | MINE: HARMONY GOLD MINING COMPANY LIMITED | | | | LOCATION: FREE STATE | | |
| | EVAULUATORS: MINELOCK ENVIRONMENTAL ENGINEERS (PTY) LTD | | | | DATE: 2024/03/20 | | |
| NO | DESCRIPTION | UNIT | A QUANTITY | B MASTER RATE DEC 2023 | C MULTIPLICATION FACTOR | D WEIGHTING FACTOR | AMOUNT RAND JAN 2024 |
| 1 | Dismantling of processing plant and related structures (Including overland conveyors and power lines) | $m^3$ | - | R 19.45 | 1.00 | 1.00 | R 0.00 |
| 2(A) | Demolition of steel buildings and structures | $m^2$ | - | R 270.95 | 1.00 | 1.00 | R 0.00 |
| 2(b) | Demolition of reinforced concrete buildings and structures | $m^2$ | 10 025.06 | R 399.29 | 1.00 | 1.00 | R 4 002 922.13 |
| 3 | Rehabilitation of access roads Including all haul roads | $m^2$ | - | R 48.49 | 1.00 | 1.00 | R 0.00 |
| 4(A) | Demolition and rehabilitation of electrified railway lines | m | - | R 470.60 | 1.00 | 1.00 | R 0.00 |
| 4(B) | Demolition and rehabilitation of non-electrified railway lines | $m^2$ | - | R 256.69 | 1.00 | 1.00 | R 0.00 |
| 5 | Demolition of housing and/or administration facilities | $m^2$ | - | R 541.91 | 1.00 | 1.00 | R 0.00 |
| 6 | Opencast rehabilitation including final voids and ramps | ha | - | R 275 798.43 | 0.52 | 1.00 | R 0.00 |
| 7 | Sealing of shafts, adits and inclines | $m^3$ | - | R 145.46 | 1.00 | 1.00 | R 0.00 |
| 8(A) | Rehabilitation of overburden and spoils | ha | | R 189 379.68 | 1.00 | 1.00 | R 0.00 |

| | CALCULATION OF THE QUANTUM | | | | | | |
|---|---|---|---|---|---|---|---|
| | **MINE: HARMONY GOLD MINING COMPANY LIMITED** | | | | | | **LOCATION: FREE STATE** |
| | **EVAULUATORS: MINELOCK ENVIRONMENTAL ENGINEERS (PTY) LTD** | | | | | | **DATE: 2024/03/19** |
| **NO** | **DESCRIPTION** | **UNIT** | **A QUANTITY** | **B MASTER RATE DEC 2023** | **C MULTIPLICATION FACTOR** | **D WEIGHTING FACTOR** | **AMOUNT RAND JAN 2024** |
| 8(B) | Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste) | ha | - | R 235 868.97 | 1.00 | 1.00 | R 0.00 |
| 8(C) | Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste) | ha | - | R 685 075.31 | 0.80 | 1.00 | R 0.00 |
| 9 | Rehabilitation of subsided areas | ha | - | R 158 576.97 | 1.00 | 1.00 | R 0.00 |
| 10 | General surface rehabilitation | ha | 136.05 | R 150 020.65 | 1.00 | 1.00 | R 20 410 999.66 |
| 11 | River diversions | ha | - | R 150 020.65 | 1.00 | 1.00 | R 0.00 |
| 12 | Fencing | m | 1 500.00 | R 171.13 | 1.00 | 1.00 | R 256 694.56 |
| 13 | Water management | ha | - | R 57 042.07 | 0.67 | 1.00 | R 0.00 |
| 14 | Maintenance and aftercare | ha | - | R 19 964.73 | 1.00 | 1.00 | R 0.00 |
| 15(A) | Specialist study | Sum | - | R 0.00 | 1.00 | 1.00 | R 0.00 |
| 15(B) | Specialist study | Sum | - | R 0.00 | 1.00 | 1.00 | R 0.00 |
| | | | | | | **Sub Total 1** | **R 24 670 616.35** |
| | | | | | | **Weighting factor 2 (1)** | **R 24 670 616.35** |
| 1 | **Preliminary and general** | | | **12 % of Sub Total 1** | | | R2 960 473.96 |
| | | | | | | **Sub Total 2** | **R 27 631 090.31** |
| 7 | **Contingencies** | | | **10 % of Sub Total 1** | | | R 2 467 061.63 |
| | | | | | | **Grand Total 3** | **R 30 098 151.94** |

# 4. CONCLUSION

The financial provision for premature rehabilitation and closure for Valley TSF for Harmony is documented in this Report. All information was provided by EIMS and Harmony. No site visits were conducted and in those cases where information was not available, estimates / assumptions were made based on experience.

The Master Rates was escalated with an average CPI published until end January 2024.

Notwithstanding the above, the premature closure quantum documented in this Report reflects the costs for premature closure costs provision in January 2024 aligned with the Harmony current approved EMPR.

# 5. RECOMMENDATIONS

Aspects that that require further attention have been identified. These aspects may improve the accuracy of futures closure cost estimates.

- To ensure that the financial provision is up-to-date and in accordance to the NEMA requirements, annual revision of closure costing is recommended. This will also assist in accommodating changes in the closure costing due to any facilities that was constructed or demolished as well as any changes in the closure approach;

# 6. REFERENCES

Department of Mineral Resources, 2005. *Guideline Document for The Evaluatuon of The Quantum of Closure-Related Financial Provision Provided by a Mine,* s.l.: s.n.

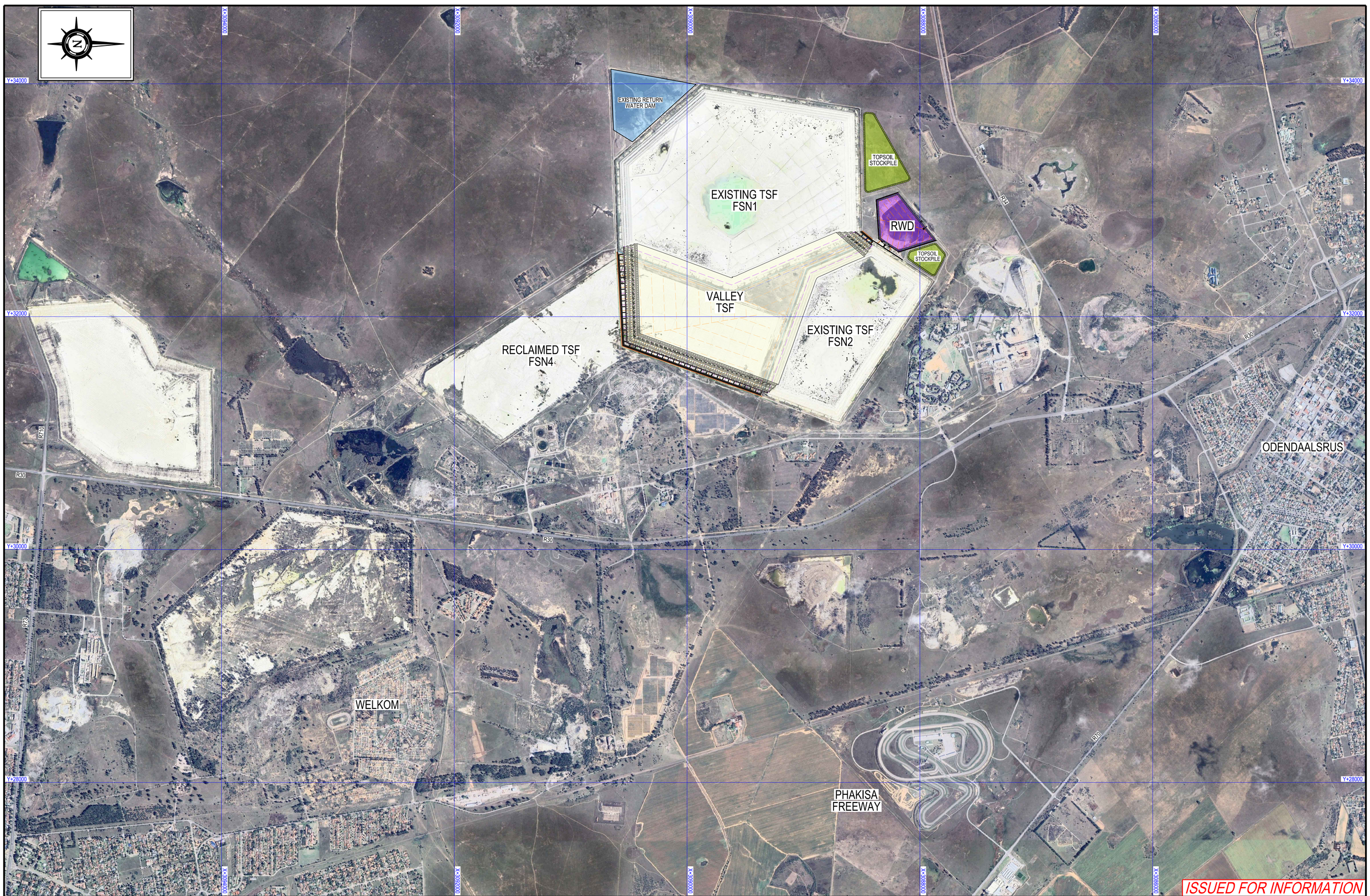
Department: Statistics South Africa, 2024. Statistical Release P0141. *Consumer Price Index January 2024*, January.

Environmental Impact Management Services, 2023. *Environmental Management Programme. Proposed Harmony Valley Tailings Storage Facility Project,* s.l.: s.n.

**Douglas Richards**
**Director**

**Is-Mari Kretschmer**
**Civil Engineer**

# APPENDIX A
# Geotheta drawings and schedule

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| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | . | . |
| | | | 503 | FINAL HEIGHT GENERAL ARRANGEMENT | | |



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| NAME | QUALIFICATION & REG. No. | SIGNATURE | DATE |
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| | |
|---|---|
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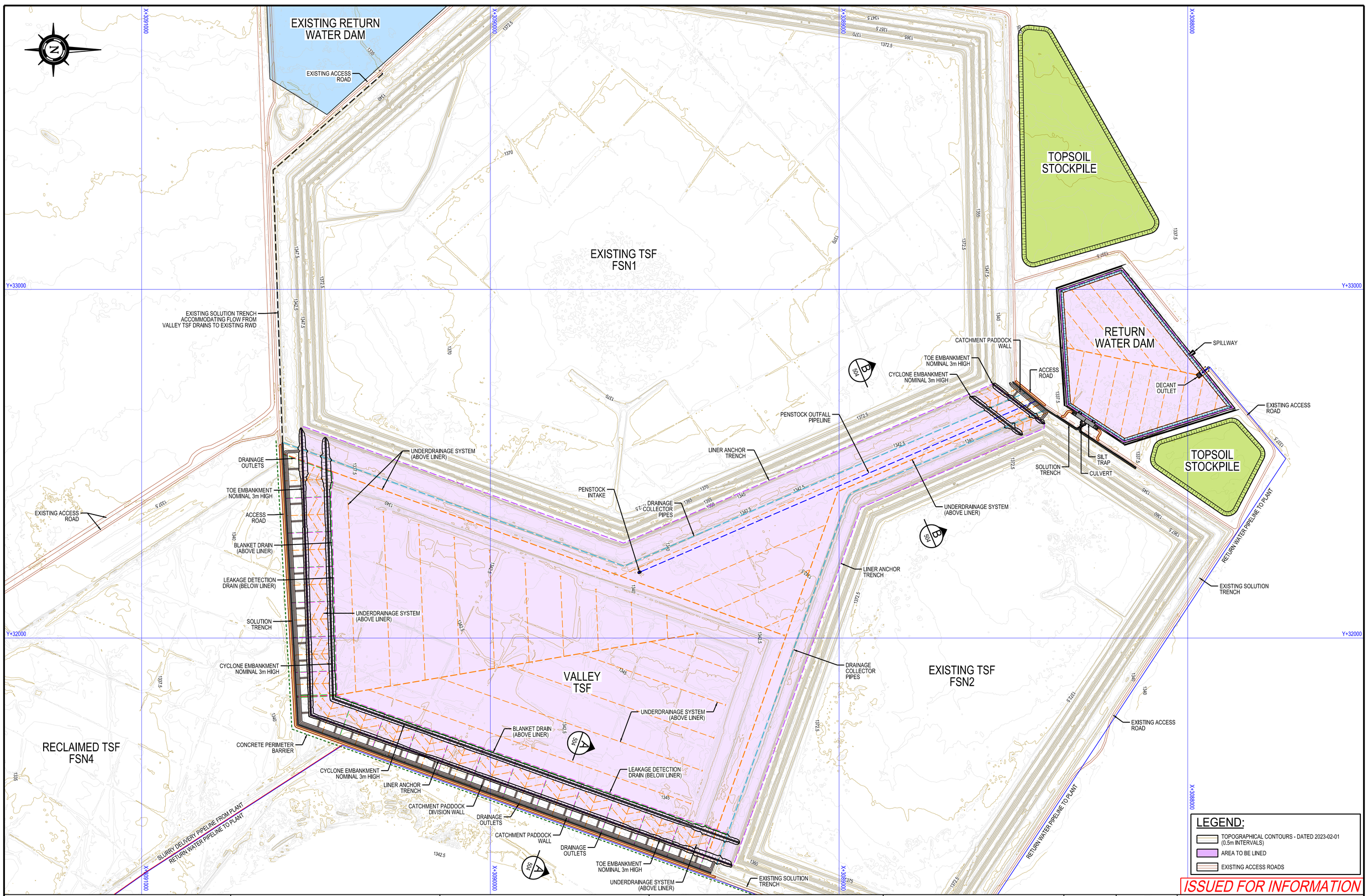
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| WGS 84 LO27 | A1 1:15000 |
| | A3 1:30000 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED) OVERALL SITE LAYOUT

DRG No. 2210513-501

REV. A

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| A | 2023-08-25 | ISSUED FOR INFORMATION | 503 | FINAL HEIGHT GENERAL ARRANGEMENT | 511 | SOLUTION OUTFALL TRENCH PLAN, SECTIONS & DTLS |
| | | | 504 | EARTHWORKS SECTIONS | 601 | RWD SILT TRAP PLAN, SECTIONS & DETAILS |
| | | | 505 | EARTHWORKS SECTIONS & DETAILS | 604 | RETURN WATER DAM GENERAL ARRANGEMENT |
| | | | 506 | DRAINAGE SECTIONS & DETAILS | | |
| | | | 507 | DRAINAGE COLLECTOR PIPES SECTIONS & DETAILS | | |
| | | | 508 | SOLUTION TRENCH SECTIONS & DETAILS | | |
| | | | 509 | PENSTOCK INTAKE SECTIONS & DETAILS | | |
| | | | 510 | PENSTOCK CATWALK TYPICAL DETAILS | | |



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|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
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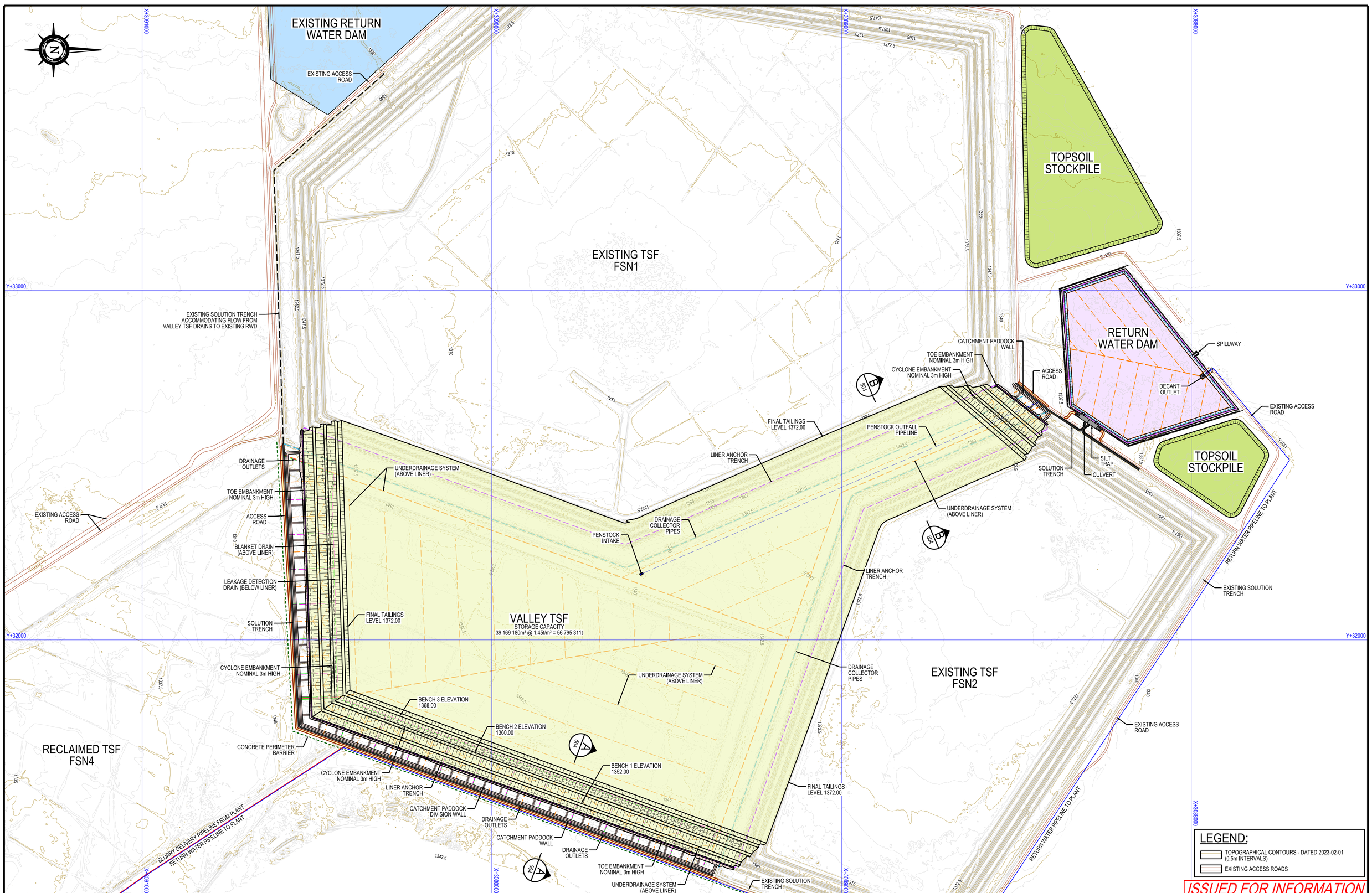
CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED) PRE-DEPOSITION WORKS GENERAL ARRANGEMENT

DRG No. 2210513-502 | REV. A




LEGEND:

- TOPOGRAPHICAL CONTOURS - DATED 2023-02-01 (0.5m INTERVALS)
- EXISTING ACCESS ROADS

**ISSUED FOR INFORMATION**

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|---|---|---|
| REV | DATE | DESCRIPTION |
| A | 2023-08-25 | ISSUED FOR INFORMATION |

| REFERENCE DRAWINGS | |
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| DRG.No. | DRAWING TITLE |
| 503 | FINAL HEIGHT GENERAL ARRANGEMENT |
| 504 | EARTHWORKS SECTIONS |
| 505 | EARTHWORKS SECTIONS & DETAILS |
| 506 | DRAINAGE SECTIONS & DETAILS |
| 507 | DRAINAGE COLLECTOR PIPES SECTIONS & DETAILS |
| 508 | SOLUTION TRENCH SECTIONS & DETAILS |
| 509 | PENSTOCK INTAKE SECTIONS & DETAILS |
| 510 | PENSTOCK CATWALK TYPICAL DETAILS |

| REFERENCE DRAWINGS | |
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| DRG.No. | DRAWING TITLE |
| 511 | SOLUTION OUTFALL TRENCH PLAN, SECTIONS & DTLS |
| 601 | RWD SILT TRAP PLAN, SECTIONS & DETAILS |
| 604 | RETURN WATER DAM GENERAL ARRANGEMENT |



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| | |
|---|---|
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| CHECKED | S.M. |
| DATE | 2023-08-31 |
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| DATE | 2023-08-18 |
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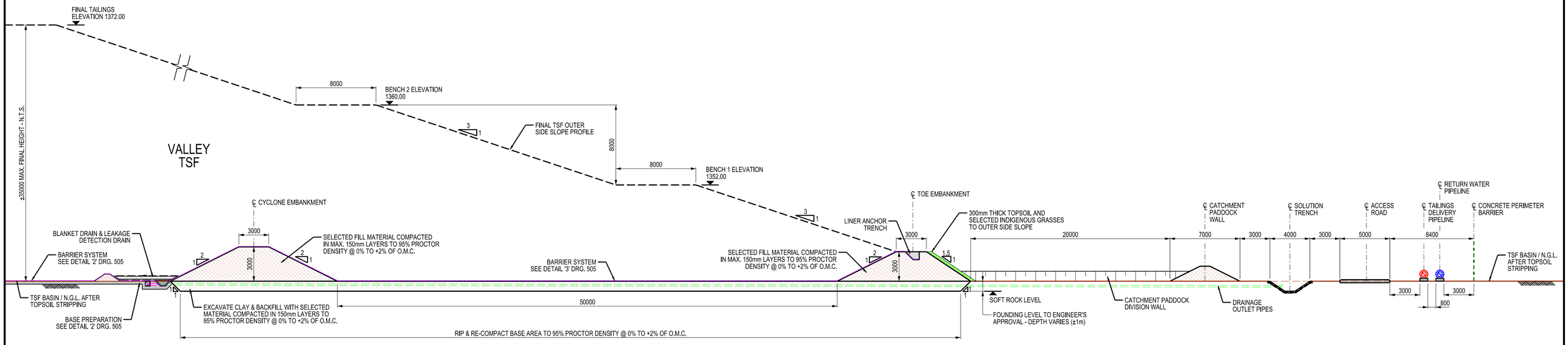
CLIENT: HARMONY

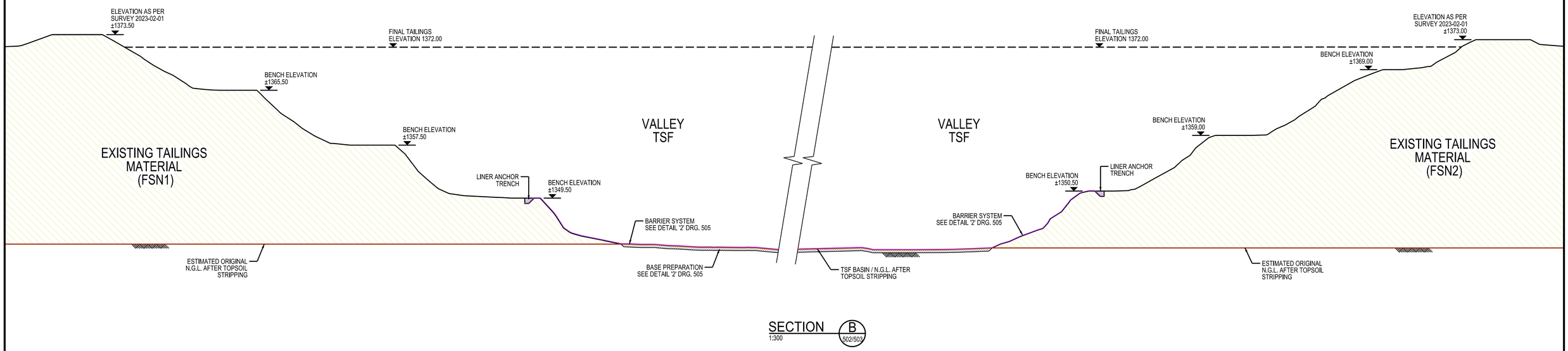
TITLE: HARMONY - VALLEY TSF (CYCLONED) FINAL HEIGHT GENERAL ARRANGEMENT

DRG No. 2210513-503

REV. A




## SECTION A
1:200 — 502/503




## SECTION B
1:300 — 502/503

ISSUED FOR INFORMATION

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | | |
| | | | 503 | FINAL HEIGHT GENERAL ARRANGEMENT | | |
| | | | 504 | EARTHWORKS SECTIONS | | |
| | | | 505 | EARTHWORKS SECTIONS & DETAILS | | |
| | | | 506 | DRAINAGE SECTIONS & DETAILS | | |
| | | | 507 | DRAINAGE COLLECTOR PIPES SECTIONS & DETAILS | | |
| | | | 508 | SOLUTION TRENCH SECTIONS & DETAILS | | |



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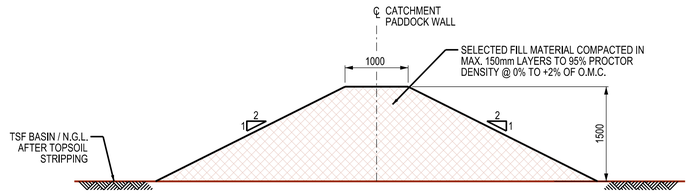
| | |
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| · | A1 AS SHOWN |
| | A3 AS SHOWN X2 |

CLIENT: HARMONY

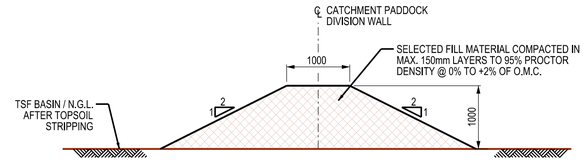
TITLE: HARMONY - VALLEY TSF (CYCLONED) EARTHWORKS SECTIONS

DRG No. 2210513-504 — REV. A



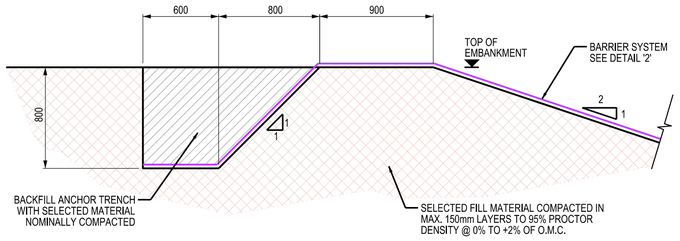

## TYPICAL SECTION - CATCHMENT PADDOCK WALL

SCALE 1:50



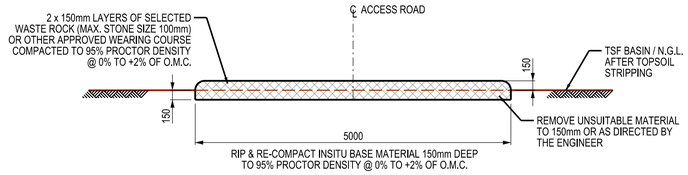

## TYPICAL SECTION - CATCHMENT PADDOCK DIVISION WALL

SCALE 1:50



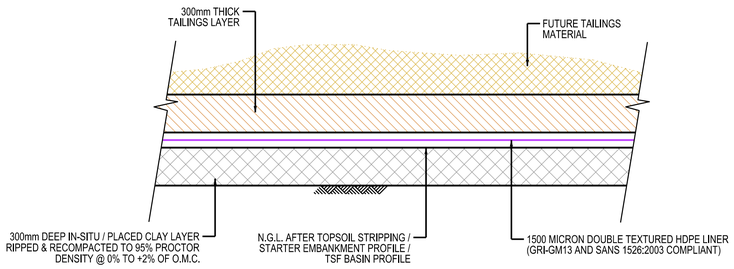

## DETAIL '1' - SECTION SHOWING LINER ANCHOR TRENCH

SCALE 1:25



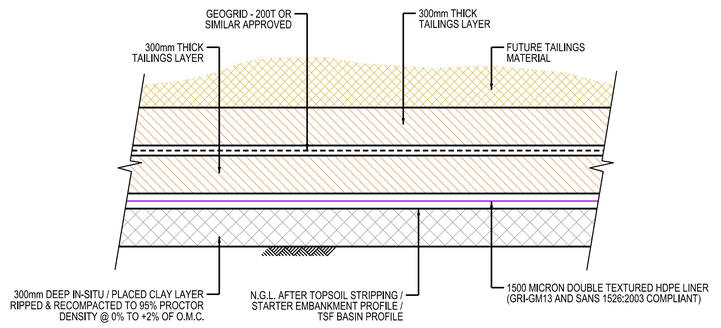

## TYPICAL SECTION - ACCESS ROAD

SCALE 1:50




## DETAIL '2' - TYPICAL SECTION BARRIER SYSTEM (CENTRAL BASIN AREA)

SCALE 1:25




## DETAIL '3' - TYPICAL SECTION BARRIER SYSTEM (BASIN AREA BETWEEN OUTER EMBANKMENTS)

SCALE 1:25

ISSUED FOR INFORMATION

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | . | . |
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|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| . | A1 AS SHOWN |
| | A3 AS SHOWN X2 |

CLIENT: HARMONY

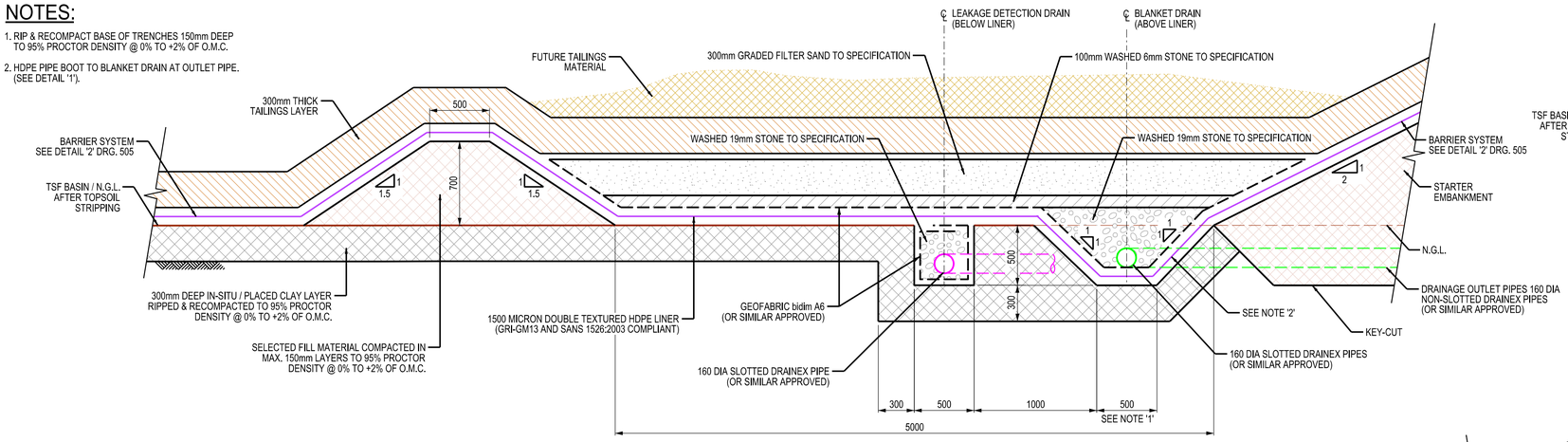
TITLE: HARMONY - VALLEY TSF (CYCLONED) EARTHWORKS SECTIONS & DETAILS

DRG No. 2210513-505

REV. A

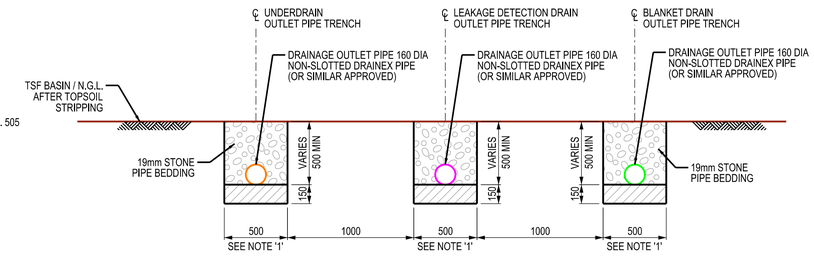
## NOTES:

1. RIP & RECOMPACT BASE OF TRENCHES 150mm DEEP TO 95% PROCTOR DENSITY @ 0% TO +2% OF O.M.C.
2. HDPE PIPE BOOT TO BLANKET DRAIN AT OUTLET PIPE. (SEE DETAIL '1').



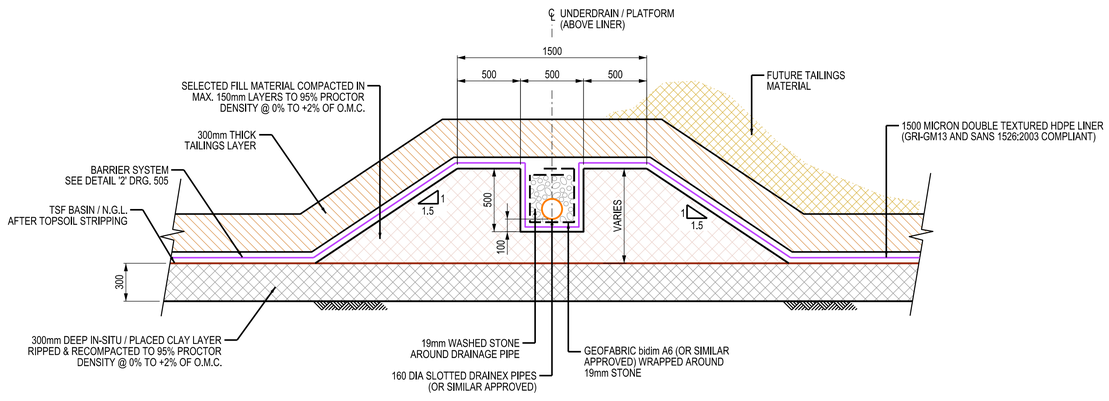

## TYPICAL SECTION - BLANKET DRAIN & LEAKAGE DETECTION DRAIN

SCALE 1:25



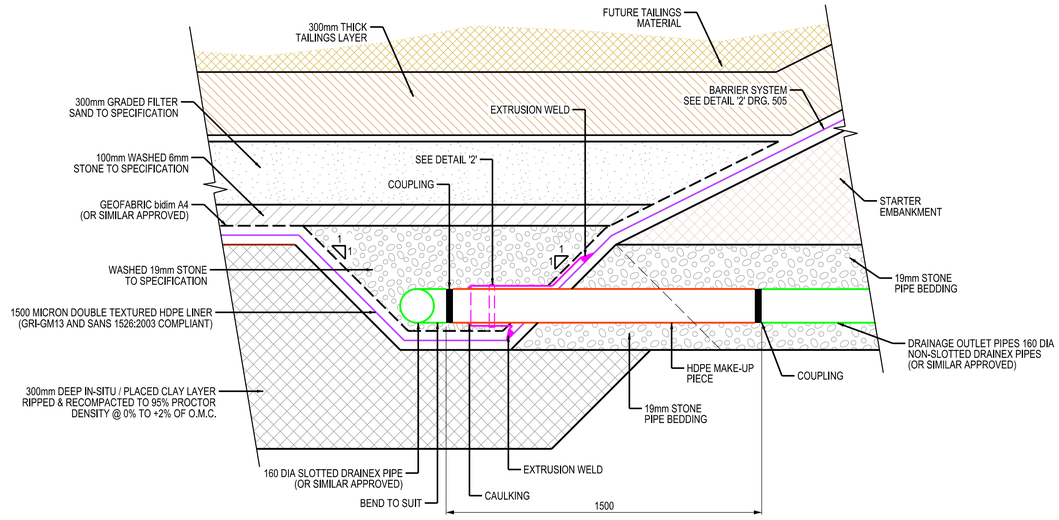

## TYPICAL SECTION - DRAINAGE OUTLET PIPES

SCALE 1:25



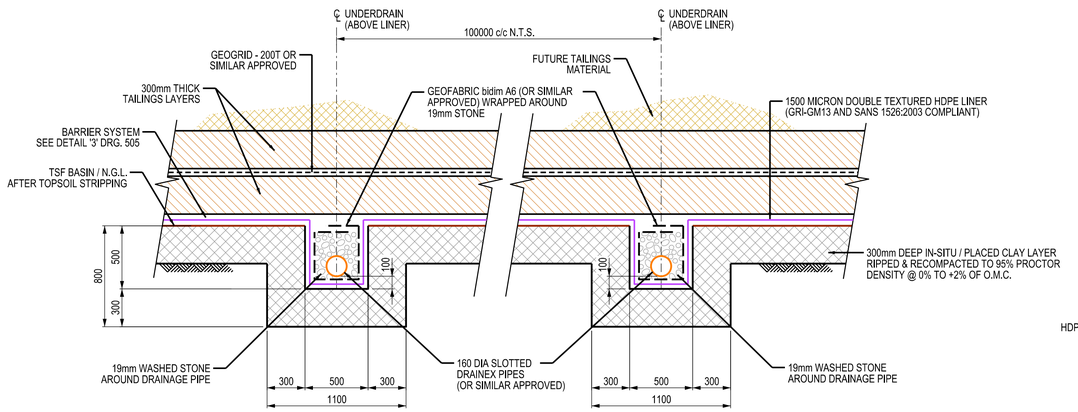

## TYPICAL SECTION - UNDERDRAINAGE SYSTEM ON PLATFORM (ABOVE LINER) (CENTRAL BASIN AREA)

SCALE 1:25



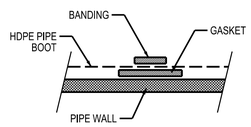

## DETAIL '1' - TYPICAL SECTION HDPE PIPE BOOT

SCALE 1:15



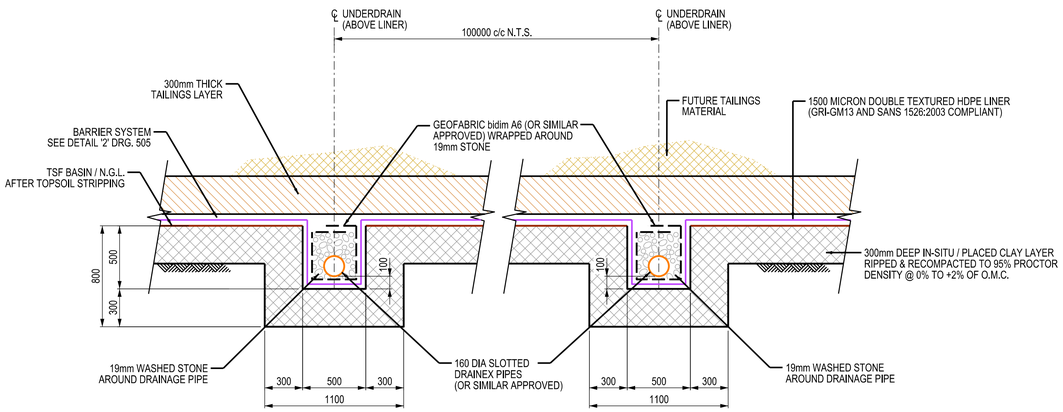

## TYPICAL SECTION - UNDERDRAINAGE SYSTEM (ABOVE LINER) (BASIN AREA BETWEEN OUTER EMBANKMENTS)

SCALE 1:25




## DETAIL '2'

N.T.S.




## TYPICAL SECTION - UNDERDRAINAGE SYSTEM (ABOVE LINER) (CENTRAL BASIN AREA)

SCALE 1:25

**ISSUED FOR INFORMATION**

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| | | | 508 | DRAINAGE COLLECTOR PIPES SECTIONS & DETAILS | | |



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| IAN HAMMOND | PR.ENG 20110169 | | 2023-08 | . |

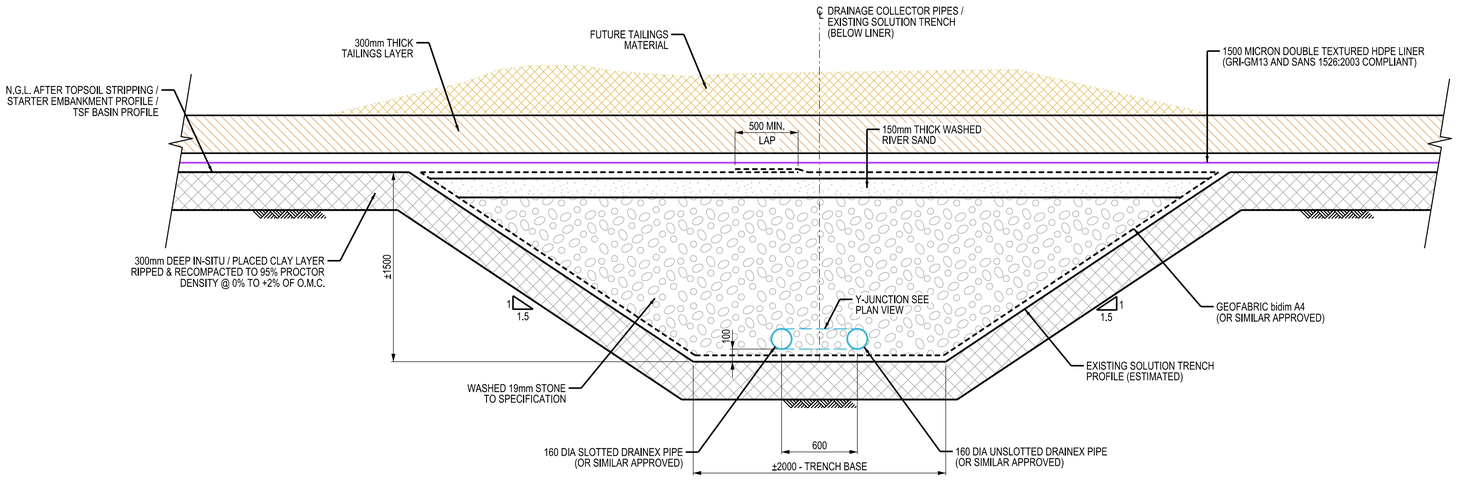
| | |
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| SCALE | |
| A1 | AS SHOWN |
| A3 | AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED) DRAINAGE SECTIONS & DETAILS

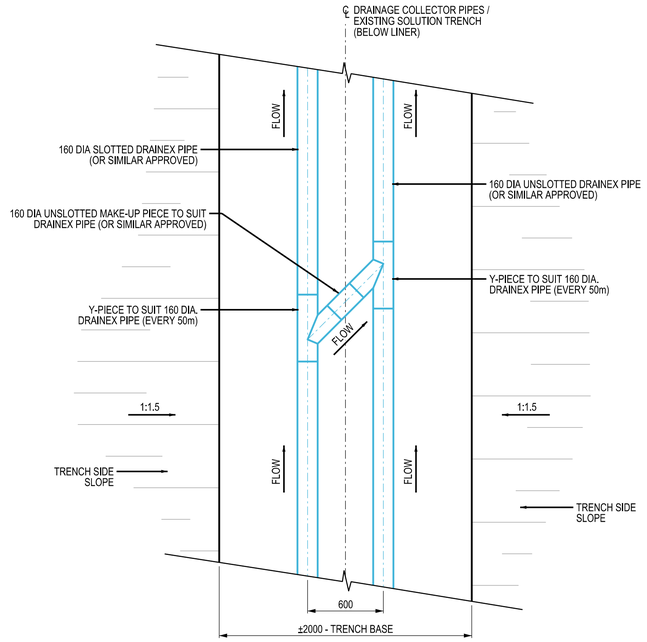
DRG No. 2210513-506

REV. A




## TYPICAL SECTION - DRAINAGE COLLECTOR PIPES (CENTRAL BASIN AREA)

SCALE 1:25




## PLAN - DRAINAGE COLLECTOR PIPES (PRIOR TO STONE PLACEMENT)

SCALE 1:25

ISSUED FOR INFORMATION

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
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| | | | 506 | DRAINAGE SECTIONS & DETAILS | | |



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|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| . | A1 AS SHOWN |
| | A3 AS SHOWN X2 |

CLIENT: HARMONY

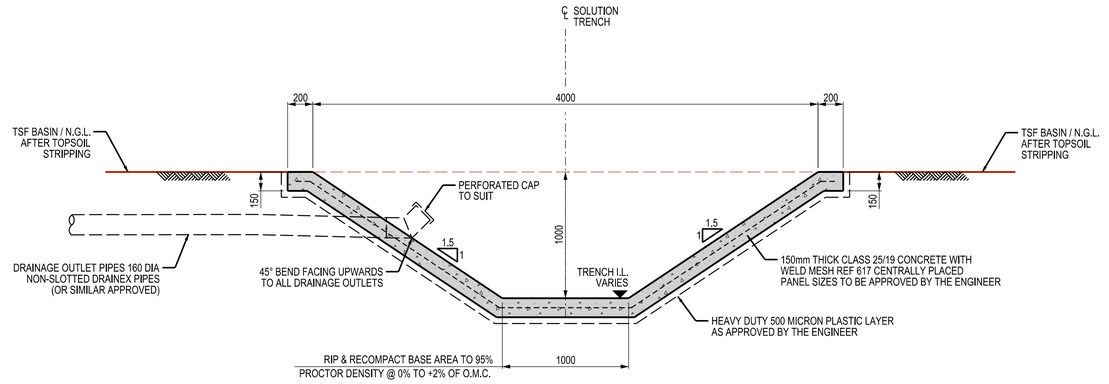
TITLE: HARMONY - VALLEY TSF (CYCLONED) DRAINAGE COLLECTOR PIPES SECTIONS & DETAILS

DRG No. 2210513-507

REV. A

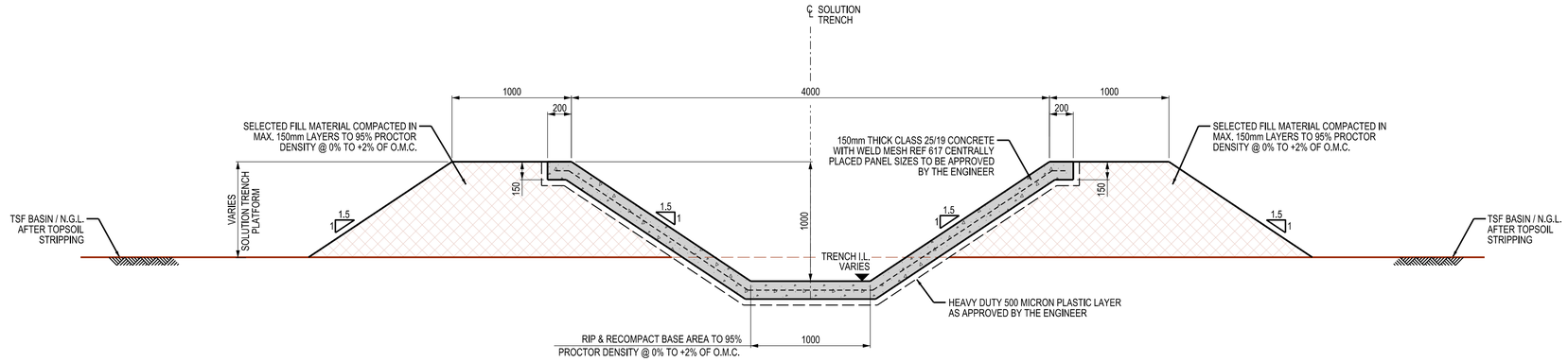
## NOTES:

1. WELD MESH TO BE REF 617 CENTRALLY PLACED.
2. MINIMUM REINFORCING LAP LENGTH TO BE 600mm.
3. EARTH ADJACENT TO CONCRETE TO BE COMPACTED.
4. ALL CONCRETE TO HAVE A SMOOTH FINISH.
5. ALL CONCRETE CORNERS IN CONTACT WITH THE LINING TO BE CHAMFERED MIN. 25mm.
6. ALL CONSTRUCTION JOINTS TO BE AS PER DETAIL '1'. PANEL SIZES TO BE APPROVED BY THE ENGINEER. JOINTS TO BE WELL CLEANED & SCRABBLED TO EXPOSE FRESH AGGREGATE & THOROUGHLY WETTED BEFORE NEXT POUR.



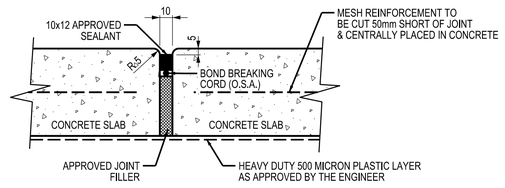

## TYPICAL SECTION - SOLUTION TRENCH

SCALE 1:25




## TYPICAL SECTION - SOLUTION TRENCH ON PLATFORM

SCALE 1:25




## DETAIL '1' - SECTION CONSTRUCTION JOINT

N.T.S.

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| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
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| DRAWN | 3D |
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| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| - | A1 AS SHOWN |
| | A3 AS SHOWN X2 |

CLIENT: HARMONY

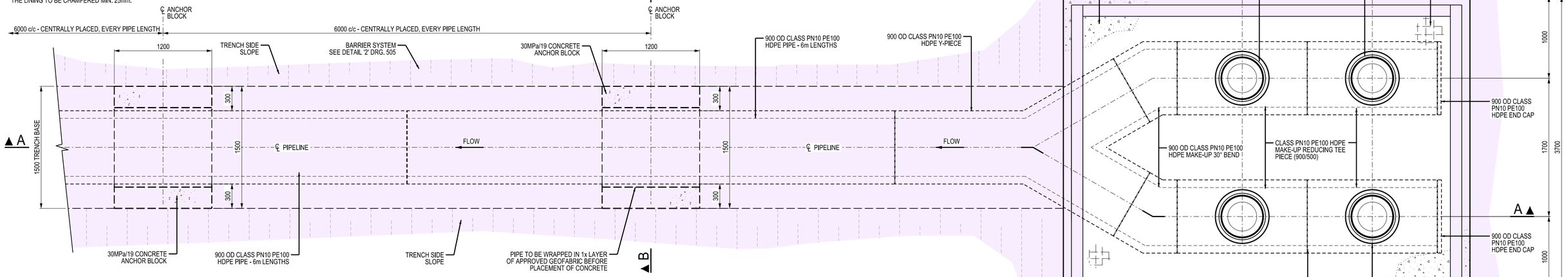
TITLE: HARMONY - VALLEY TSF (CYCLONED)
SOLUTION TRENCH
SECTIONS & DETAILS

DRG No. 2210513-508

REV. A

## NOTES:

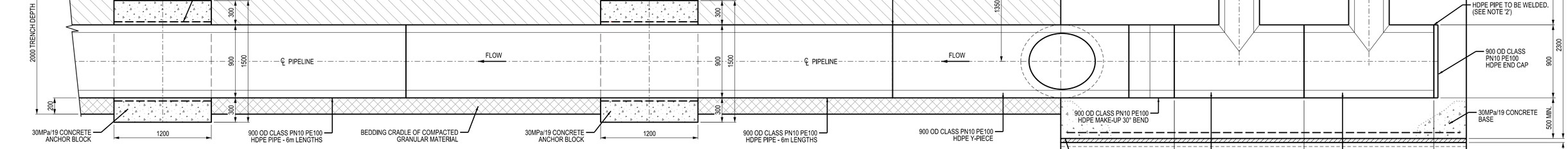
1. UNLESS OTHERWISE INDICATED, ALL PIPES & FITTINGS TO BE CLASS PN10 PE 100 HDPE PLAIN ENDED SECTIONS.
2. UNLESS OTHERWISE INDICATED, ALL HDPE PIPES AND FITTINGS TO BE JOINED BY ELECTRO FUSION WELDING.
3. ALL CONCRETE CORNERS IN CONTACT WITH THE LINING TO BE CHAMFERED MIN. 25mm.




## PLAN - PENSTOCK INTAKE

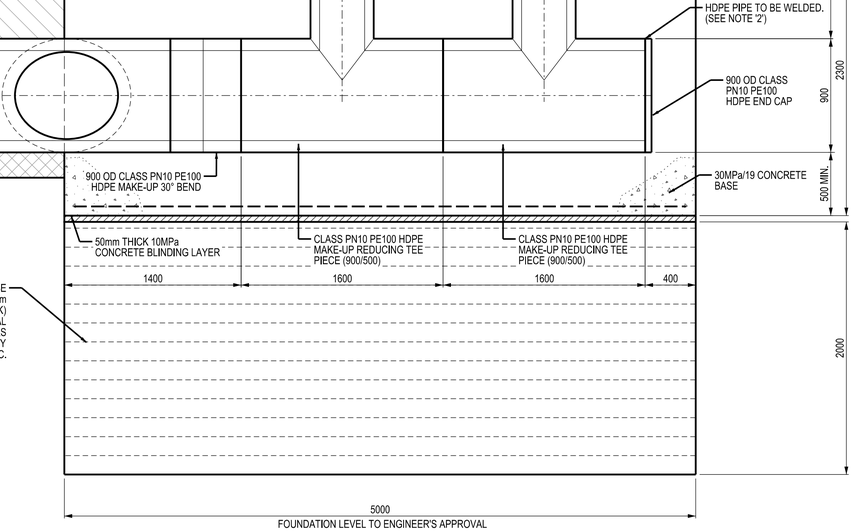
SCALE 1:25

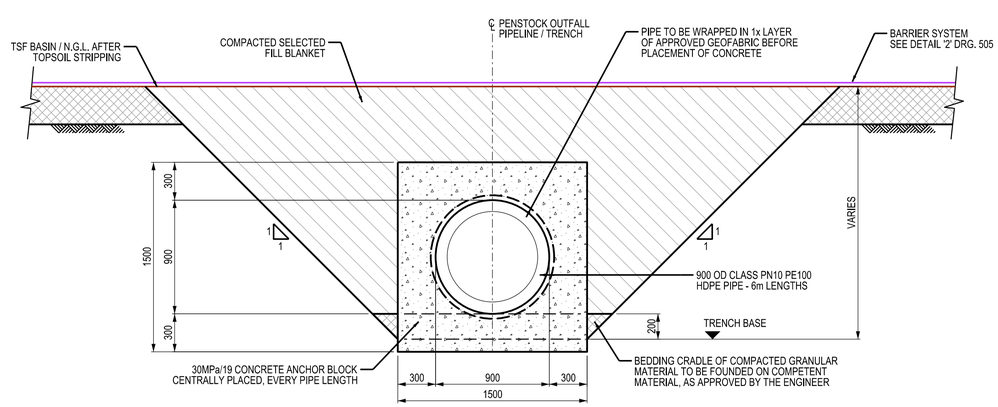



## SECTION A - A

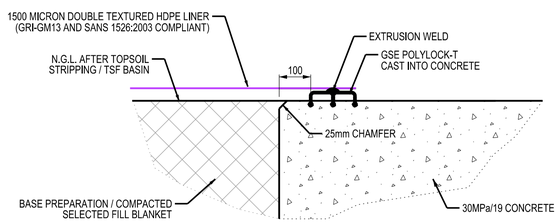
SCALE 1:25




## SECTION B - B

SCALE 1:25




## DETAIL '1' - TYPICAL SECTION LINER ATTACHMENT TO CONCRETE

SCALE 1:10

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| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
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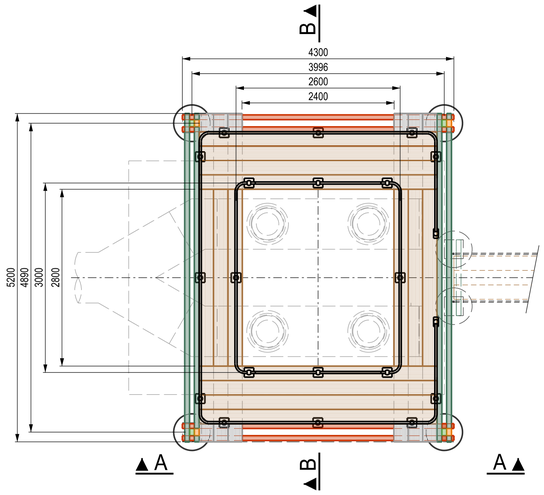
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | . |
| SCALE | |
| A1 | AS SHOWN |
| A3 | AS SHOWN X2 |

CLIENT: HARMONY

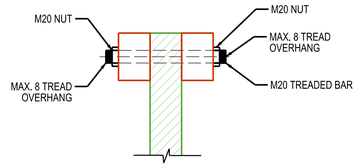
TITLE: HARMONY - VALLEY TSF (CYCLONED) PENSTOCK INTAKE SECTIONS & DETAILS

DRG No. 2210513-509

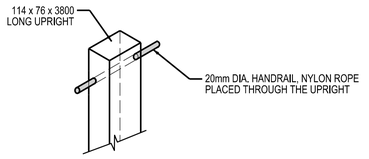
REV. A



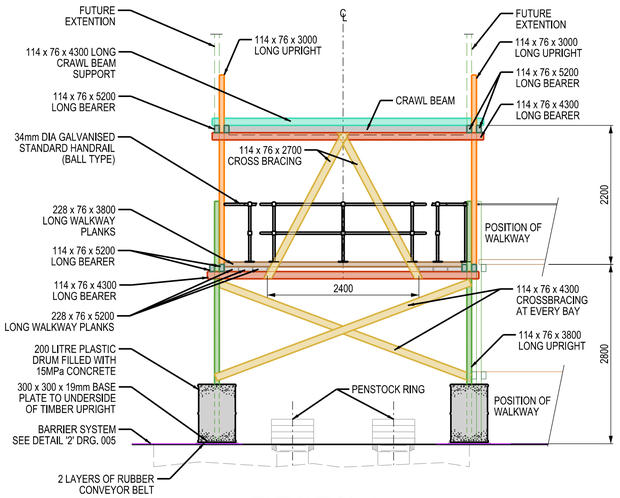

PLAN - PLATFORM
AT PENSTOCK INTAKE
SCALE 1:50



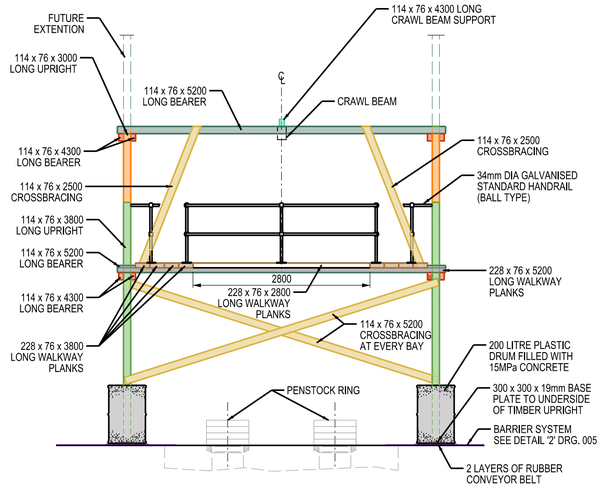

DETAIL 1
SHOWING TYPICAL CONNECTION DETAIL
N.T.S.



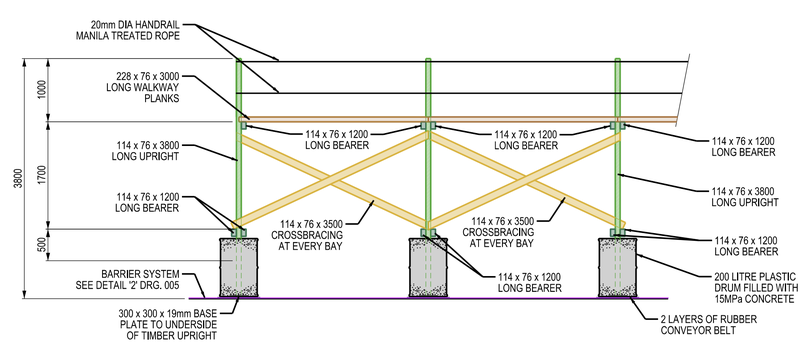

DETAIL 2
SHOWING ROPE HANDRAIL AT UPRIGHT
N.T.S.



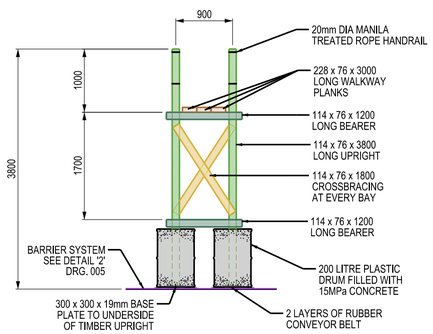

ELEVATION A - A
PLATFORM AT PENSTOCK INTAKE
SCALE 1:50



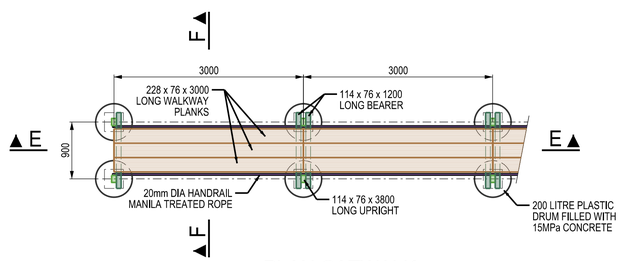

SECTION B - B
PLATFORM AT PENSTOCK INTAKE
SCALE 1:50




SECTION E - E
CATWALK
SCALE 1:50




SECTION F - F
CATWALK
SCALE 1:50




PLAN CATWALK
SCALE 1:50

ISSUED FOR INFORMATION

| REVISIONS | | |
|---|---|---|
| REV | DATE | DESCRIPTION |
| A | 2023-08-25 | ISSUED FOR INFORMATION |
| | | |
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| REFERENCE DRAWINGS | |
|---|---|
| DRG.No. | DRAWING TITLE |
| 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT |
| 503 | FINAL HEIGHT GENERAL ARRANGEMENT |
| 505 | EARTHWORKS SECTIONS & DETAILS |
| 509 | PENSTOCK INTAKE SECTIONS & DETAILS |
| | |
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| | |

| REFERENCE DRAWINGS | |
|---|---|
| DRG.No. | DRAWING TITLE |
| . | . |
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| APPROVED BY | | | |
|---|---|---|---|
| NAME | QUALIFICATION & REG. No. | SIGNATURE | DATE |
| IAN HAMMOND | PR.ENG 20110169 | | 2023-08 |

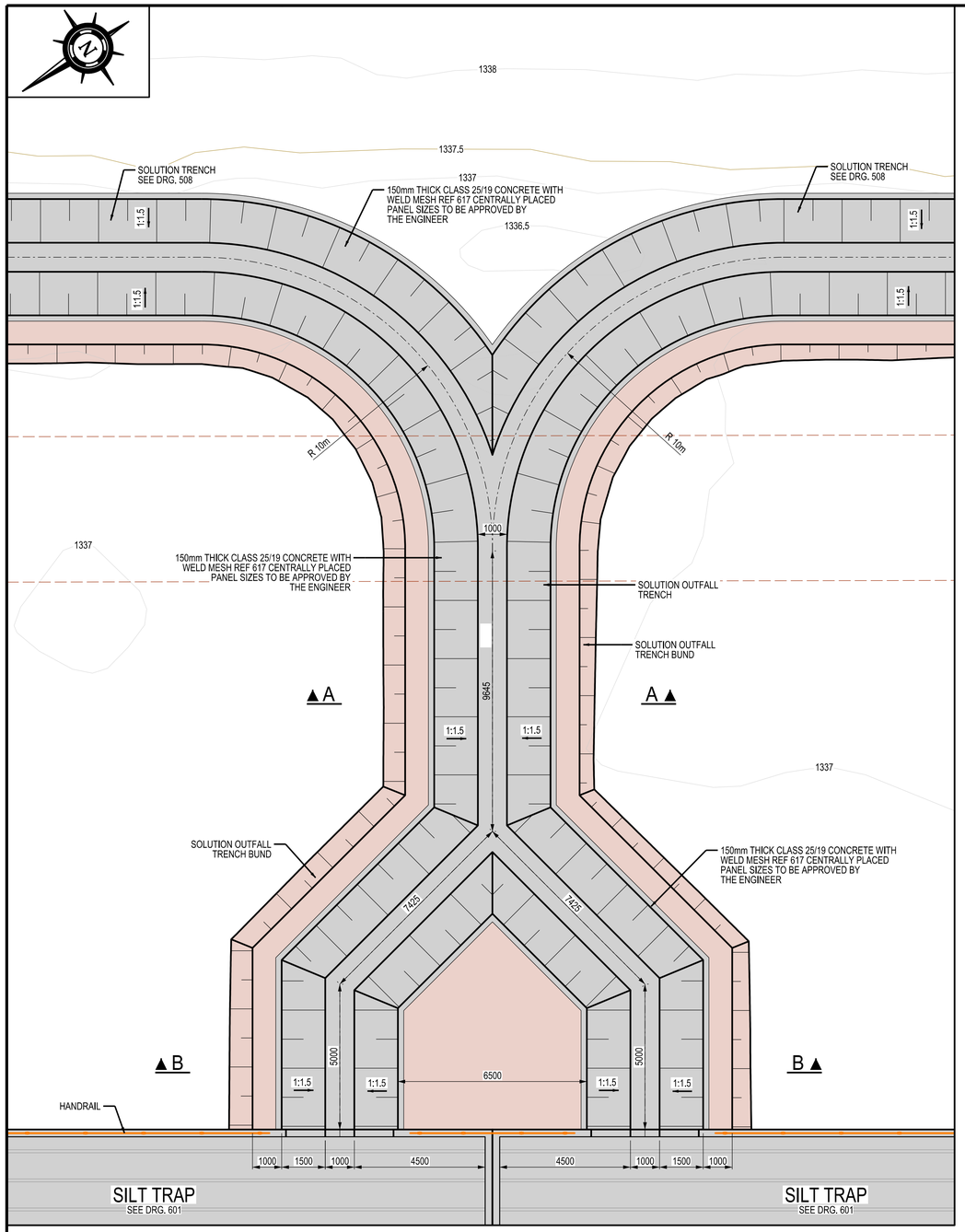
| | |
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| . | A1 AS SHOWN |
| | A3 AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED)
PENSTOCK CATWALK
TYPICAL DETAILS

DRG No. 2210513-510

REV. A

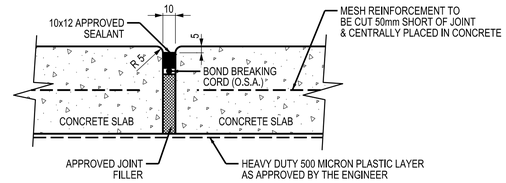



## PLAN - SOLUTION OUTFALL TRENCH

SCALE 1:100

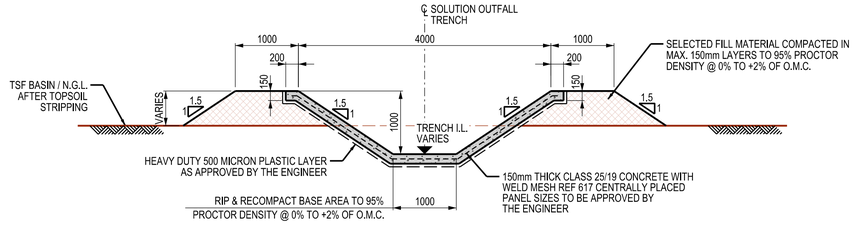
## NOTES:

1. WELD MESH TO BE REF 617 CENTRALLY PLACED.
2. MINIMUM REINFORCING LAP LENGTH TO BE 600mm.
3. EARTH ADJACENT TO CONCRETE TO BE COMPACTED.
4. ALL CONCRETE TO HAVE A SMOOTH FINISH.
5. ALL CONCRETE CORNERS IN CONTACT WITH THE LINING TO BE CHAMFERED MIN. 25mm.
6. ALL CONSTRUCTION JOINTS TO BE AS PER DETAIL '1'. PANEL SIZES TO BE APPROVED BY THE ENGINEER. JOINTS TO BE WELL CLEANED & SCRABBLED TO EXPOSE FRESH AGGREGATE & THOROUGHLY WETTED BEFORE NEXT POUR.



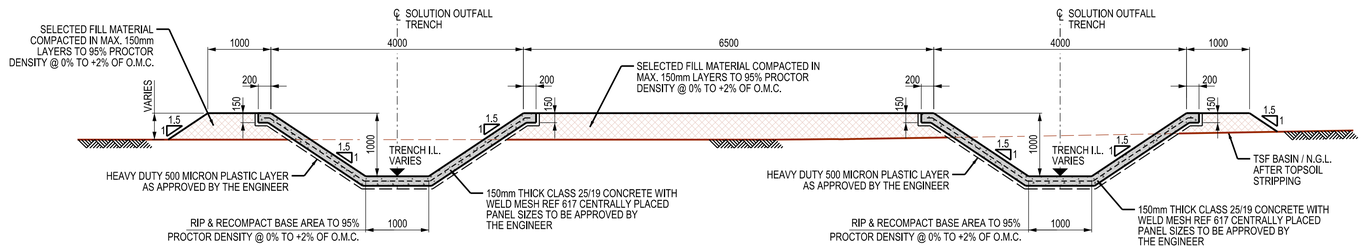

## DETAIL '1' - SECTION CONSTRUCTION JOINT

N.T.S.




## SECTION A - A

SCALE 1:50




## SECTION B - B

SCALE 1:50

ISSUED FOR INFORMATION

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | . | . |
| | | | 508 | SOLUTION TRENCH SECTIONS & DETAILS | | |
| | | | 601 | SILT TRAP PLAN, SECTIONS & DETAILS | | |



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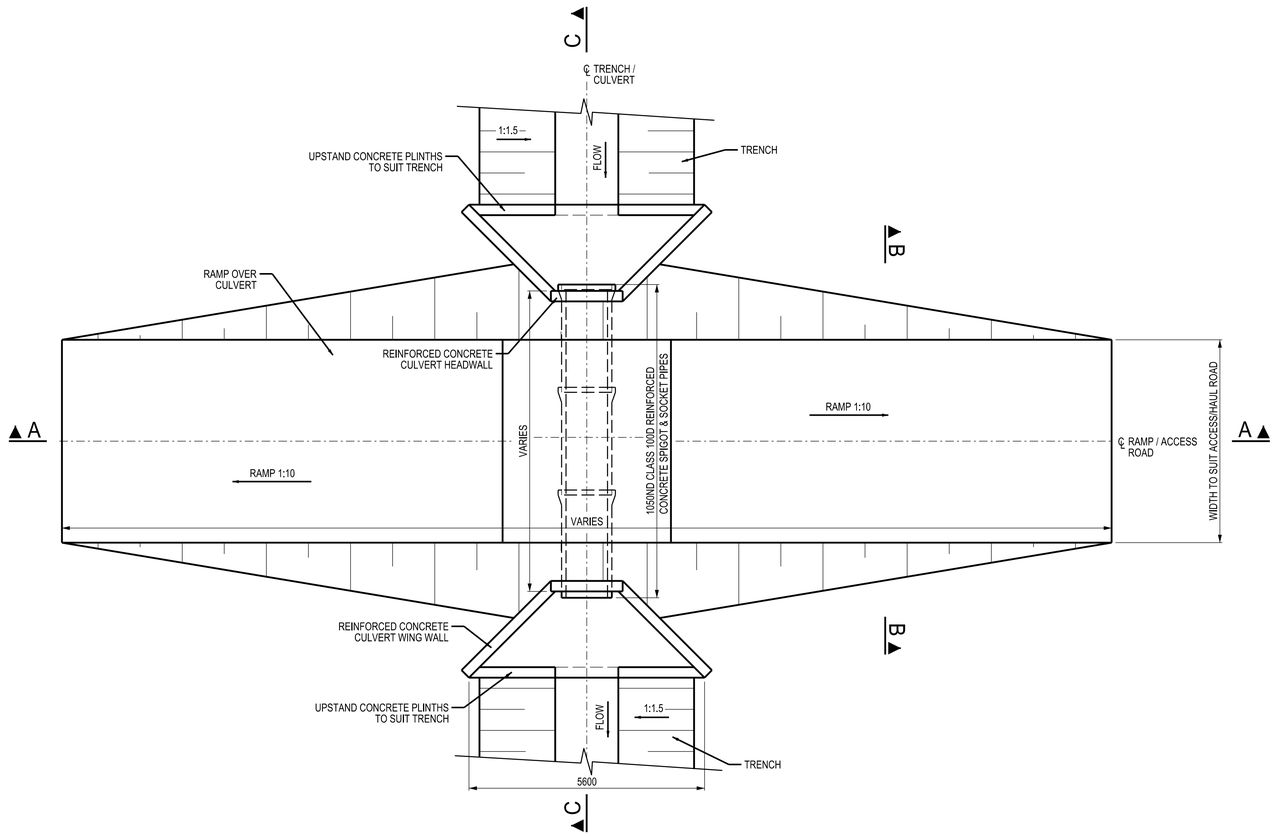
| | |
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| WGS 84 LO27 | A1 AS SHOWN / A3 AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED) SOLUTION OUTFALL TRENCH PLAN, SECTIONS & DETAILS

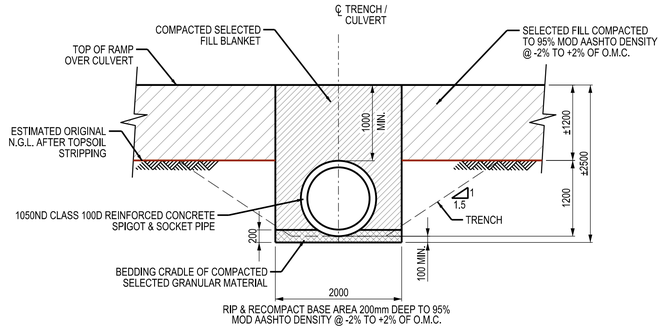
DRG No. 2210513-511

REV. A




## PLAN - TYPICAL ACCESS ROAD CULVERT FOR TRENCH

SCALE 1:75




## SECTION D - D
## 1050ND CLASS 100D SPIGOT & SOCKET REINFORCED CONCRETE PIPE ON CLASS C BEDDING

SCALE 1:50

## GENERAL NOTES

1) THESE NOTES SERVE AS AN ADDENDUM TO THE SPECIFICATION IN THE BILL OF QUANTITIES FOR THIS PROJECT. IN CASES WHERE THE SPECIFICATIONS IN THE BILL OF QUANTITIES DIFFER FROM THESE NOTES, THESE NOTES SHALL TAKE PREFERENCE.
2) THE CONTRACTOR SHALL COMPLY WITH ALL STANDARDS/ SPECIFICATIONS WHICH ARE REFERRED TO IN THESE NOTES.
3) DRAWINGS SHALL BE CHECKED BY THE CONTRACTOR AND ANY DISCREPANCIES IN DIMENSIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE WORK IS COMMENCED.
4) DRAWINGS MAY NOT BE SCALED.

CONCRETE

EXCEPT WHERE MENTIONED OTHERWISE, THE CONCRETE WORK SHALL COMPLY WITH SANS 1200 G LATEST REVISION.

CONCRETE STRENGTHS

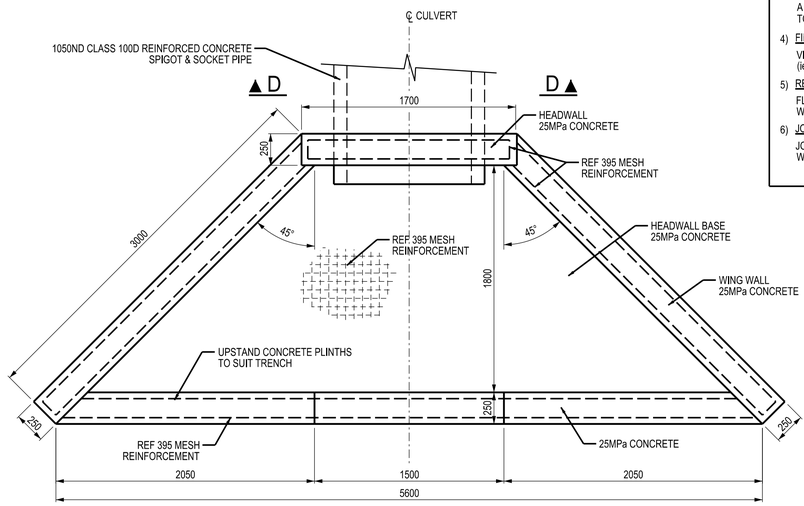
| STRUCTURAL ELEMENT | CHARACTERISTIC 28 DAY STRENGTH (MPa) |
|---|---|

FOUNDATIONS

1) BACKFILLING:
ALL BACKFILLING TO FOUNDATIONS TO BE COMPACTED TO 95% Mod. AASHTO DENSITY (min).
2) BLINDING:
ALL BASES TO BE PROVIDED WITH 75mm BLINDING.
3) ALL SPECIFIED FOUNDING LEVELS ARE PROVISIONAL AND NEED TO BE CONFIRMED BY THE ENGINEER ON SITE

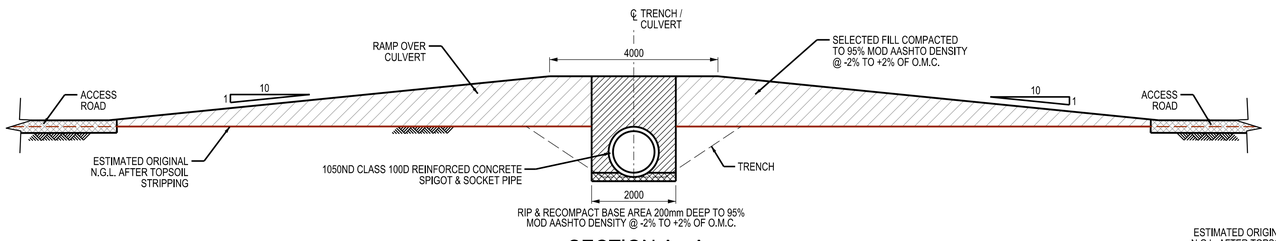
NOTES

1) CULVERT TYPES
1050ND CLASS 100D SPIGOT & SOCKET REINFORCED CONCRETE PIPES ON CLASS C BEDDING
2) CONSTRUCTION AND INSTALLATION CODES
PER SANS 1200 OR PROJECT SPECIFICATION.
3) FOUNDATIONS
A BEARING CAPACITY OF 200 kpa IS ASSUMED TO BE AVAILABLE.
4) FINISHING
VISIBLE SURFACES - WOOD FLOAT (ie TOP OF SLAB FOR FOUNDATIONS).
5) REINFORCING
FLOOR SLABS - MESH REF No 395
WING WALLS - MESH REF No 395
} ALL HIGH YIELD
6) JOINTS
JOINTS BETWEEN PRECAST UNITS TO BE SEALED WITH GEOTEXTILE - 3.1mm THICK & 340g/m² OR SIMILAR.



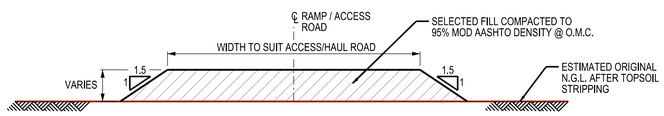

## PLAN - CULVERT HEADWALL

SCALE 1:25



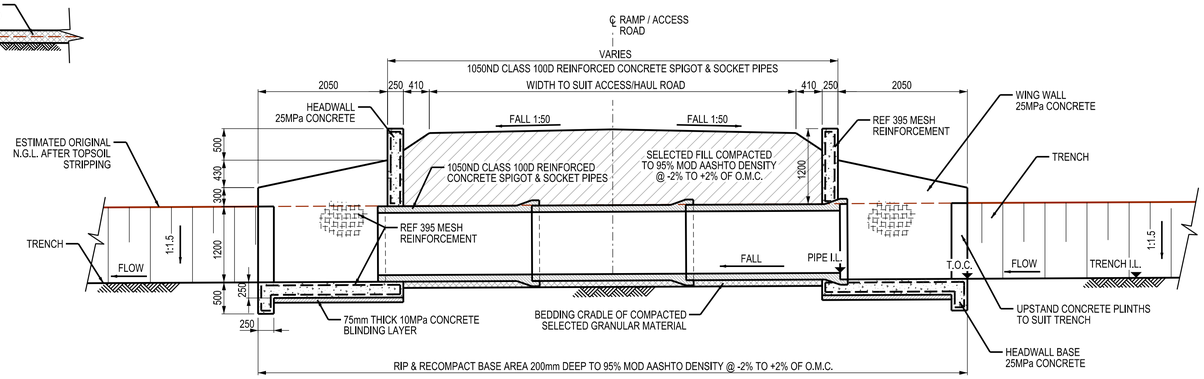

## SECTION A - A

SCALE 1:75




## SECTION B - B

SCALE 1:75




## SECTION C - C

SCALE 1:50

ISSUED FOR INFORMATION

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | . | . |
| | | | 503 | FINAL HEIGHT GENERAL ARRANGEMENT | | |
| | | | 504 | EARTHWORKS SECTIONS | | |



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|---|---|---|---|
| NAME | QUALIFICATION & REG. No. | SIGNATURE | DATE |
| IAN HAMMOND | PR.ENG 20110169 | | 2023-08 |

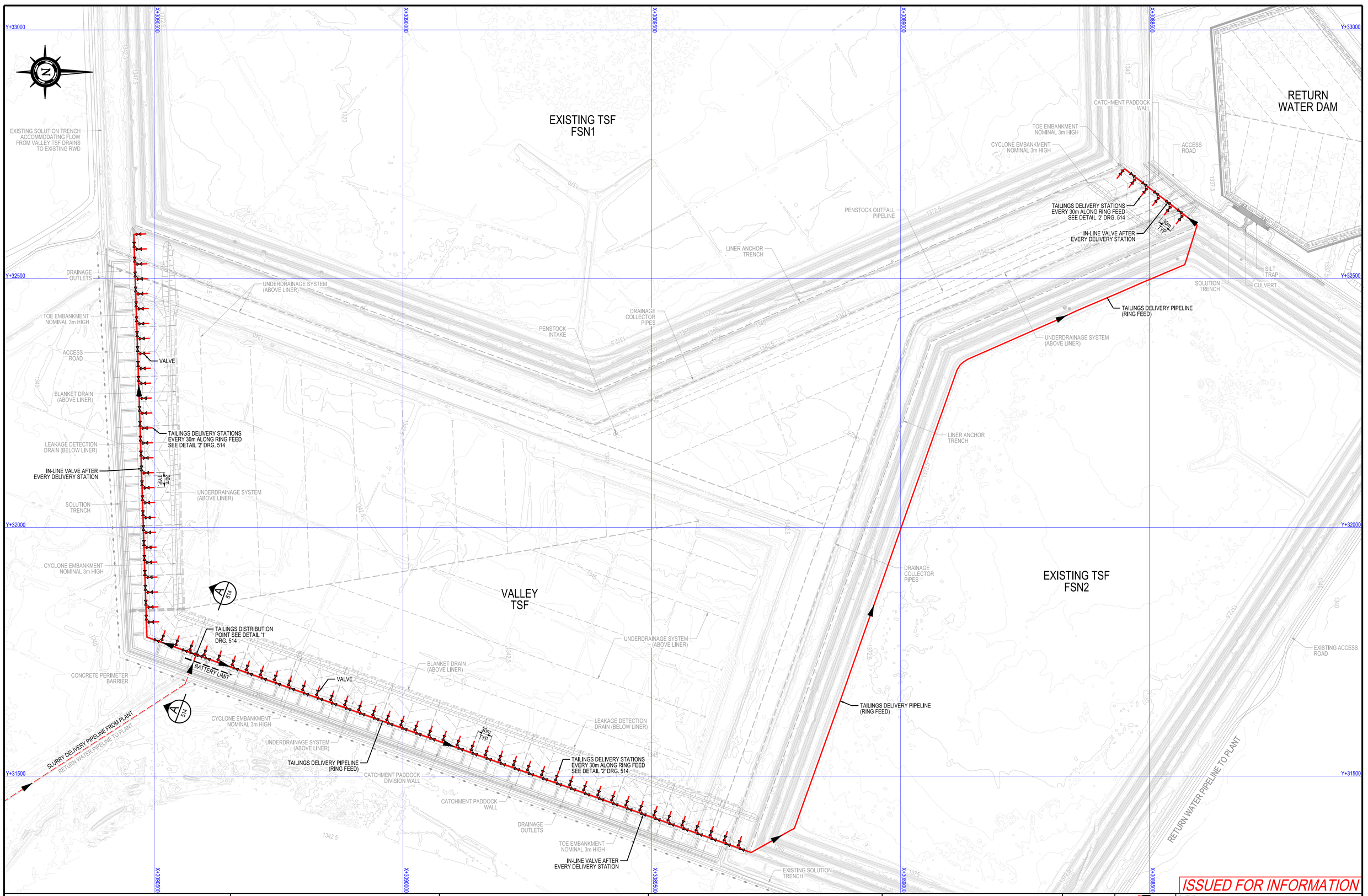
| | |
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| . | A1 AS SHOWN / A3 AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED) TYPICAL CULVERT DETAILS

DRG No. 2210513-512

REV. A




ISSUED FOR INFORMATION

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | . | . |
| | | | 514 | TAILINGS DELIVERY PIPELINE DETAILS | | |



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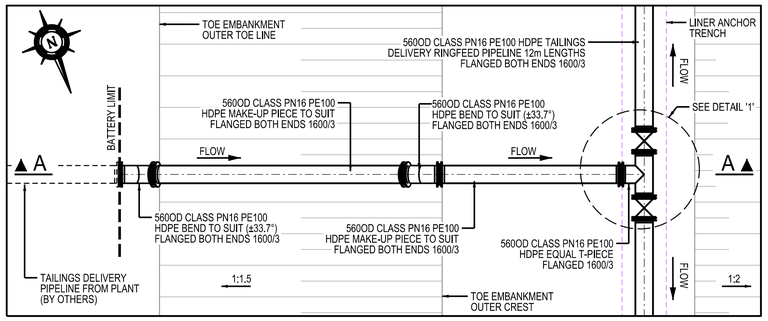
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| WGS 84 LO27 | A1 1:5000 |
| | A3 1:10000 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED) TAILINGS DELIVERY PIPELINE LAYOUT

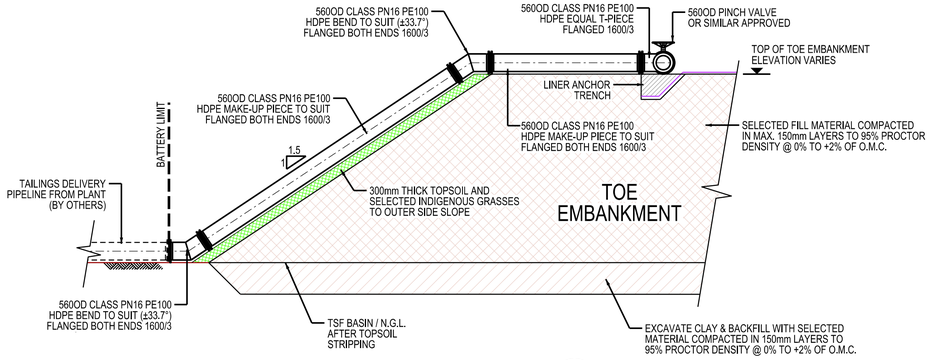
DRG No. 2210513-513

REV. A



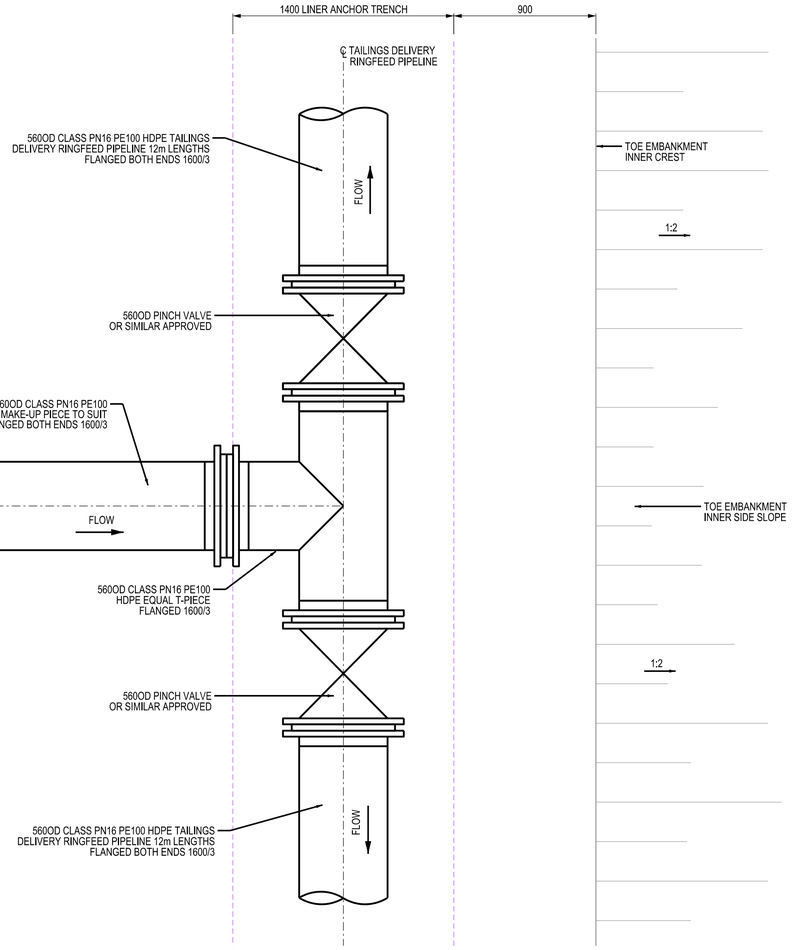

## PLAN - TAILINGS DISTRIBUTION POINT FROM PLANT (1 No. REQUIRED)

SCALE 1:100



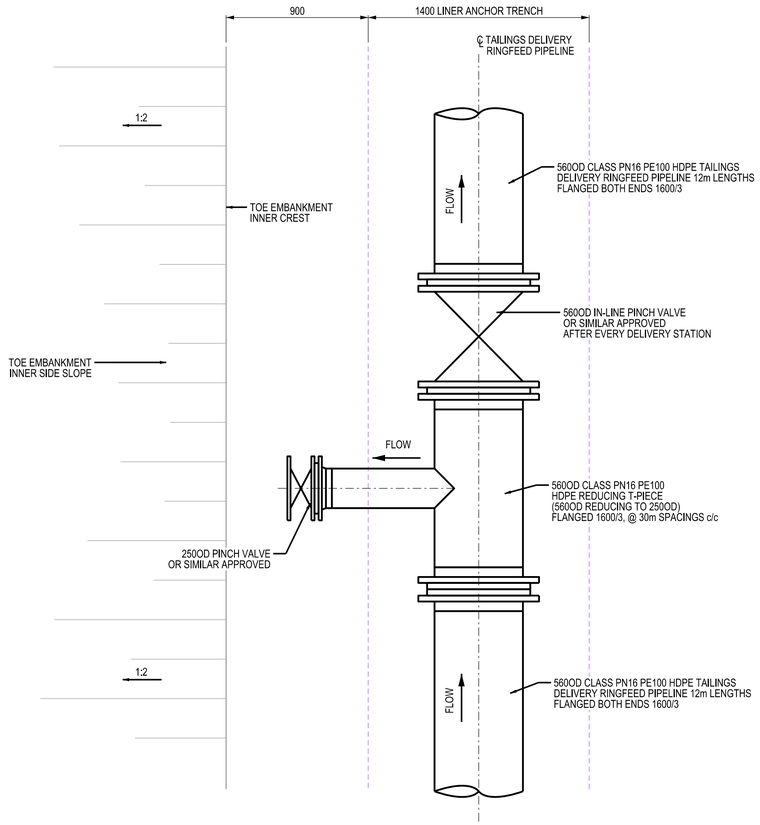

## SECTION A

1:100 — 513




## DETAIL '1' - ENLARGED PLAN ON TAILINGS DISTRIBUTION POINT FROM PLANT (1 No. REQUIRED)

SCALE 1:20




## DETAIL '2' - PLAN ON TYPICAL TAILINGS DELIVERY STATION (75 No. REQUIRED)

SCALE 1:20

*ISSUED FOR INFORMATION*

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 513 | TAILINGS DELIVERY PIPELINE LAYOUT | . | . |



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| NAME | QUALIFICATION & REG. No. | SIGNATURE | DATE |
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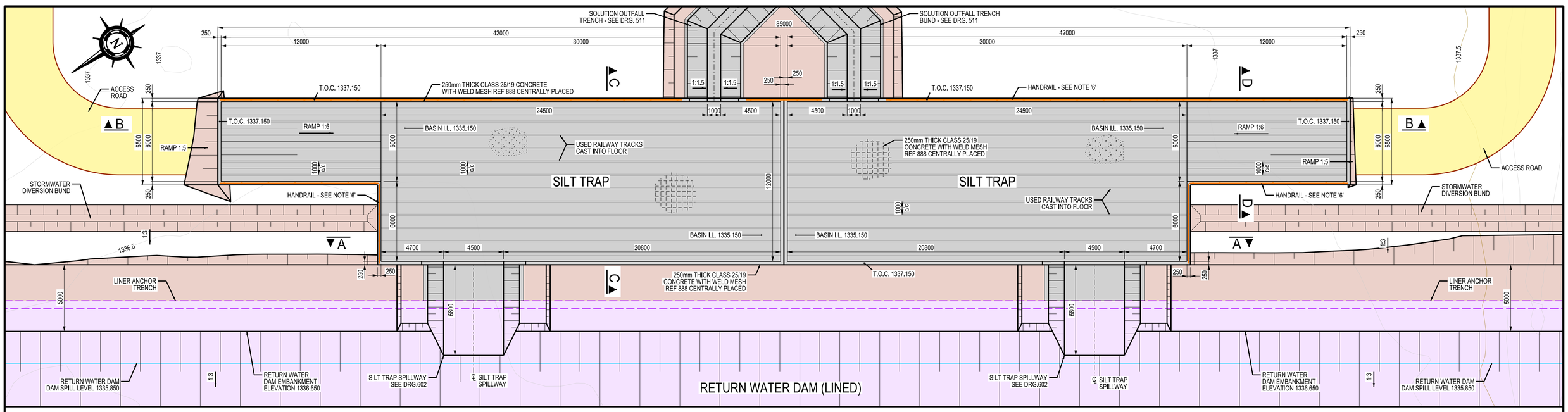
| | |
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| WGS 84 LO27 | A1 AS SHOWN / A3 AS SHOWN X2 |

CLIENT: HARMONY

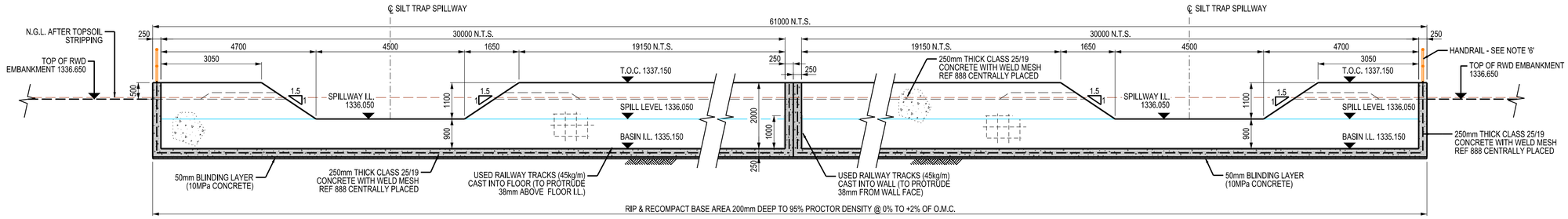
TITLE: HARMONY - VALLEY TSF (CYCLONED) TAILINGS DELIVERY PIPELINE DETAILS

DRG No. 2210513-514 — REV. A




## PLAN - SILT TRAP

SCALE 1:150

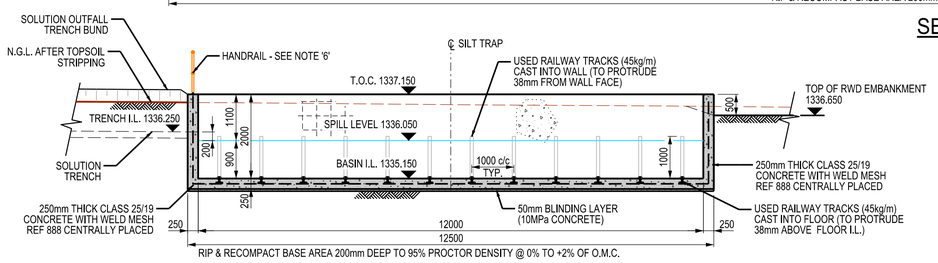



## NOTES:

1. WELD MESH TO BE REF 888 (Y12 @ 200) CENTRALLY PLACED.
2. MINIMUM REINFORCING LAP LENGTH TO BE 600mm.
3. EARTH ADJACENT TO CONCRETE TO BE COMPACTED.
4. ALL CONCRETE TO HAVE A SMOOTH FINISH.
5. ALL CONSTRUCTION JOINTS TO BE AS PER DETAIL '1'. PANEL SIZES TO BE APPROVED BY THE ENGINEER. JOINTS TO BE WELL CLEANED & SCRABBLED TO EXPOSE FRESH AGGREGATE & THOROUGHLY WETTED BEFORE NEXT POUR.
6. ALL HANDRAILS TO BE STANDARD MS90 BALL TYPE TOP MOUNT HANDRAIL WITH STANCHIONS @ 2m c/c TYP. SECURED TO CONCRETE WITH M16 x 100mm LONG CINCH ANCHOR BOLTS C/W NUT & WASHER.
7. SILT TRAP INCLUDES INFRASTRUCTURE TO ENABLE CLEANING.

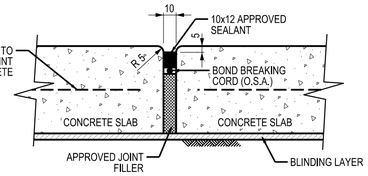
## SECTION A - A

SCALE 1:75



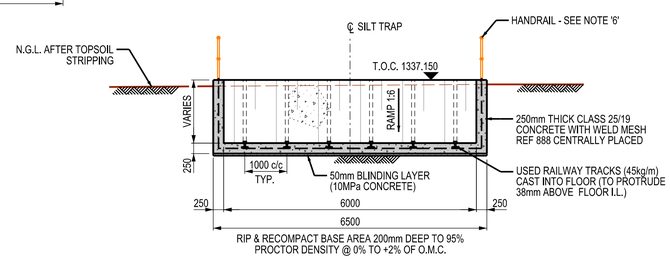

## DETAIL '1' - SECTION CONSTRUCTION JOINT

N.T.S.



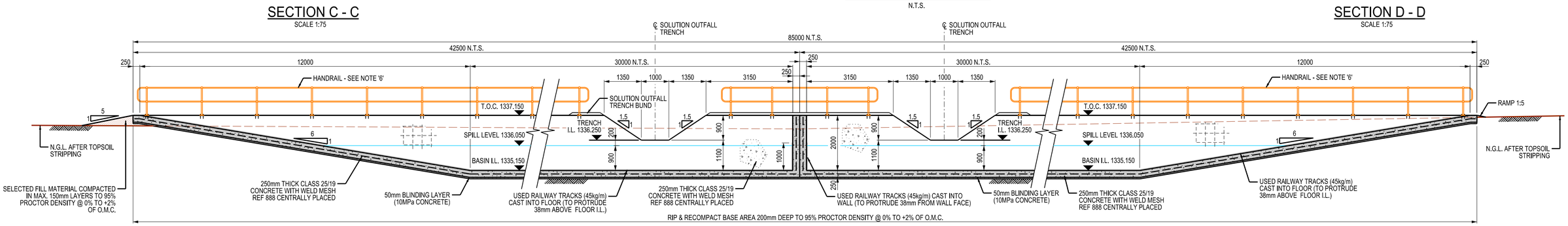

## SECTION D - D

SCALE 1:75




## SECTION C - C

SCALE 1:75




## SECTION B - B

SCALE 1:75

**ISSUED FOR INFORMATION**

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | . | . |
| | | | 511 | SOLUTION OUTFALL TRENCH PLAN, SECTIONS & DTLS | | |
| | | | 602 | SILT TRAP SPILLWAY DETAILS | | |
| | | | 603 | RETURN WATER DAM GENERAL ARRANGEMENT | | |
| | | | 604 | RETURN WATER DAM SECTIONS & DETAILS | | |



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|---|---|---|---|
| NAME | QUALIFICATION & REG. No. | SIGNATURE | DATE |
| IAN HAMMOND | PR.ENG 20110169 | | 2023-08 |

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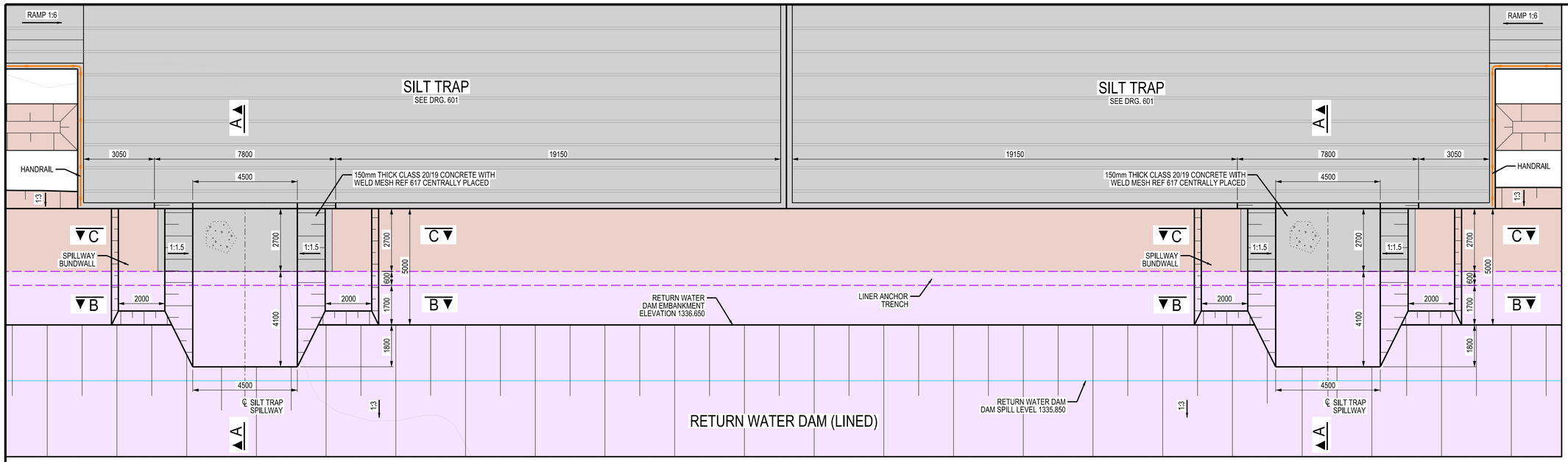
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| WGS 84 LO27 | A1 AS SHOWN / A3 AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED) RETURN WATER DAM SILT TRAP PLAN, SECTIONS & DETAILS

DRG No. 2210513-601 | REV. A

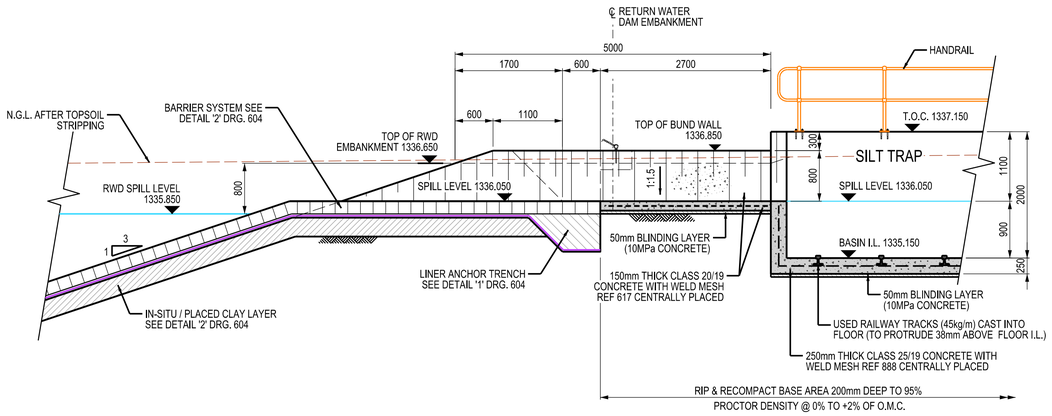



## PLAN - SILT TRAP SPILLWAYS

SCALE 1:100

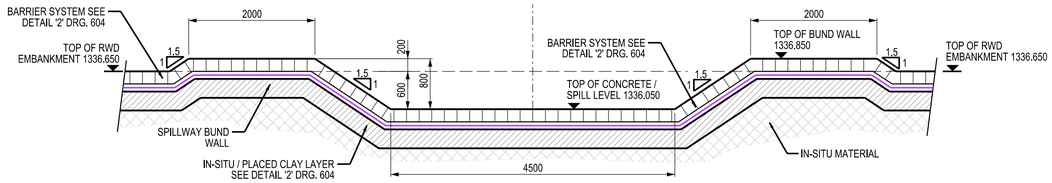
## NOTES:

1. WELD MESH TO BE REF 617 CENTRALLY PLACED.
2. MINIMUM REINFORCING LAP LENGTH TO BE 600mm.
3. EARTH ADJACENT TO CONCRETE TO BE COMPACTED.
4. ALL CONCRETE TO HAVE A SMOOTH FINISH.
5. ALL CONCRETE CORNERS IN CONTACT WITH THE LINING TO BE CHAMFERED MIN. 25mm.
6. ALL CONSTRUCTION JOINTS TO BE AS PER DETAIL '1'. PANEL SIZES TO BE APPROVED BY THE ENGINEER. JOINTS TO BE WELL CLEANED & SCRABBLED TO EXPOSE FRESH AGGREGATE & THOROUGHLY WETTED BEFORE NEXT POUR.



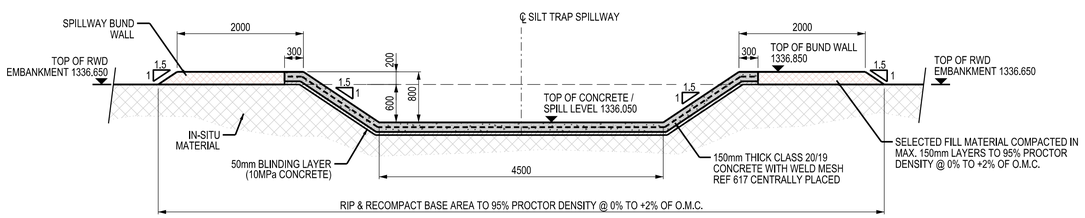

## SECTION A - A
## 2 No. REQUIRED

SCALE 1:50



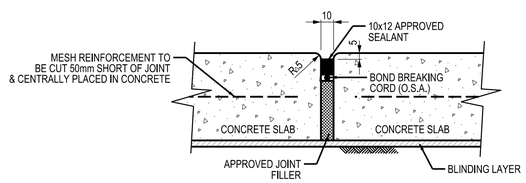

## SECTION B - B
## SILT TRAP SPILLWAY HDPE PORTION - 2 No. REQUIRED

SCALE 1:50




## SECTION C - C
## SILT TRAP SPILLWAY CONCRETE PORTION - 2 No. REQUIRED

SCALE 1:50




## DETAIL '1' - SECTION
## CONSTRUCTION JOINT

N.T.S.

ISSUED FOR INFORMATION

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | . | . |
| | | | 601 | SILT TRAP PLAN, SECTIONS & DETAILS | | |
| | | | 603 | RETURN WATER DAM GENERAL ARRANGEMENT | | |
| | | | 604 | RETURN WATER DAM SECTIONS & DETAILS | | |



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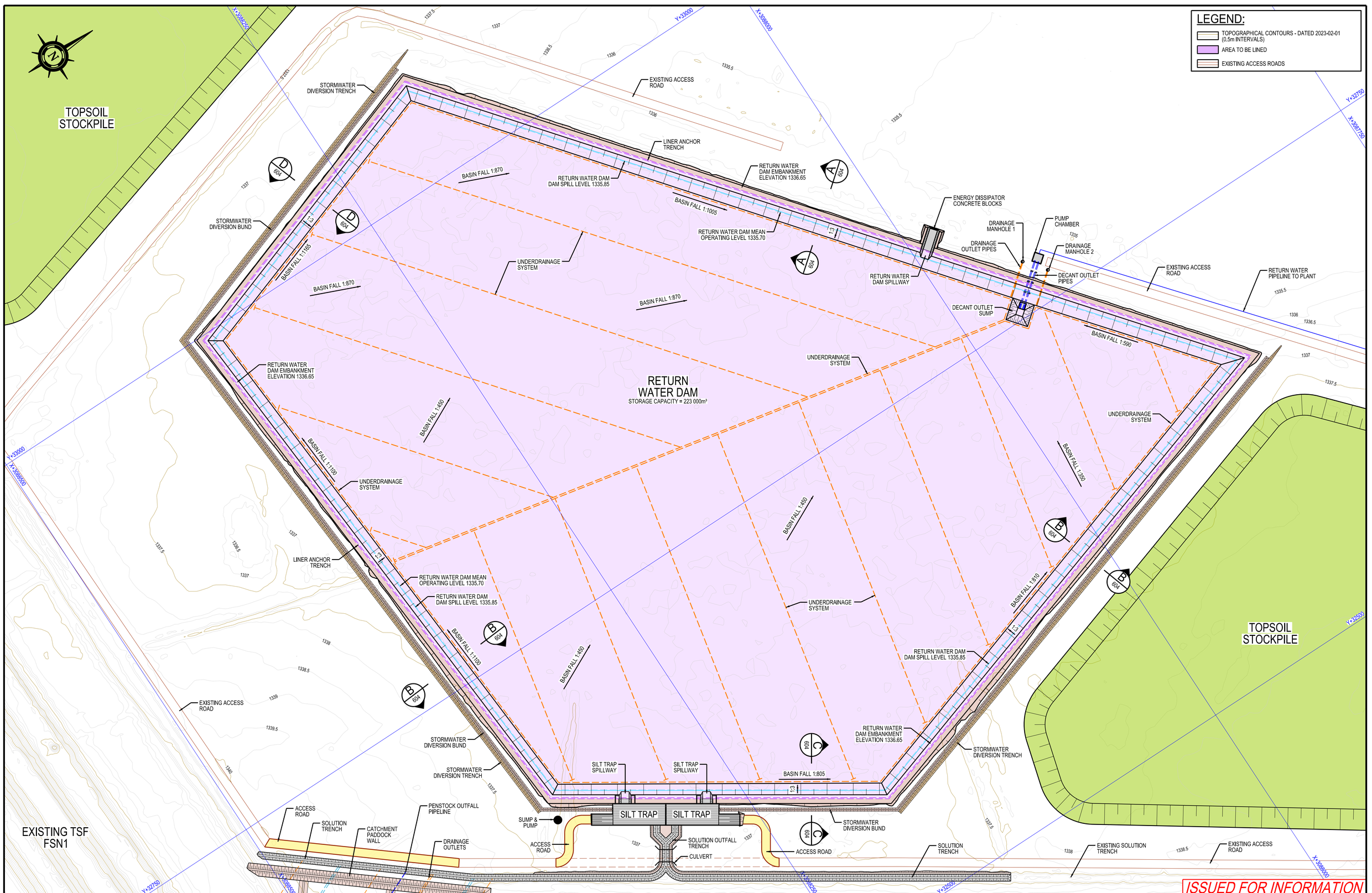
|---|---|---|---|
| NAME | QUALIFICATION & REG. No. | SIGNATURE | DATE |
| IAN HAMMOND | PR.ENG 20110169 | | 2023-08 |

| | |
|---|---|
| DRAWN | 3D |
| DATE | 2023-08-25 |
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| WGS 84 LO27 | A1 AS SHOWN / A3 AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED)
RETURN WATER DAM
SILT TRAP
PLAN, SECTIONS & DETAILS

DRG No. 2210513-602 REV. A




ISSUED FOR INFORMATION

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| | | | 602 | SILT TRAP SPILLWAY DETAILS | | |
| | | | 604 | RETURN WATER DAM SECTIONS & DETAILS | | |
| | | | 605 | RETURN WATER DAM SPILLWAY DETAILS | | |
| | | | 606 | RETURN WATER DAM UNDERDRAINAGE DETAILS | | |
| | | | 607 | RETURN WATER DAM DECANT STRUCTURE DETAILS | | |



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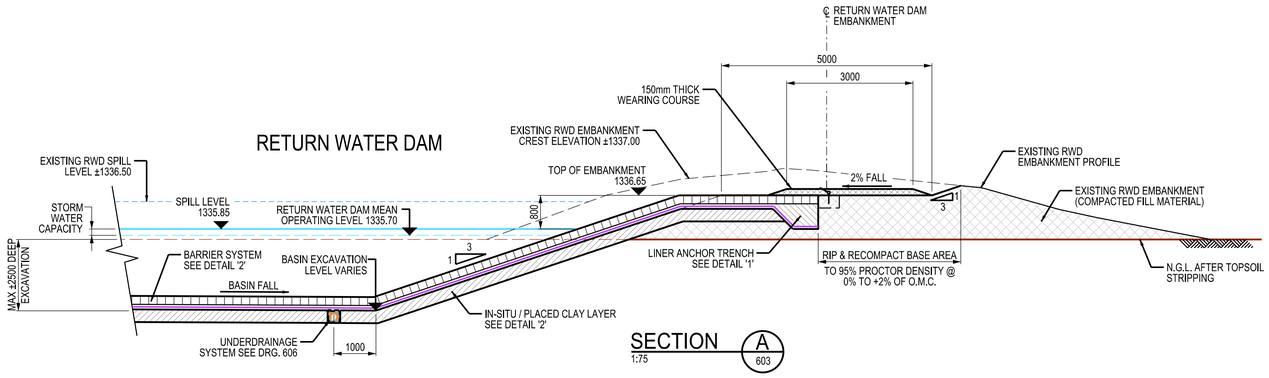
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| WGS 84 LO27 | A1 1:1000 / A3 1:2000 |

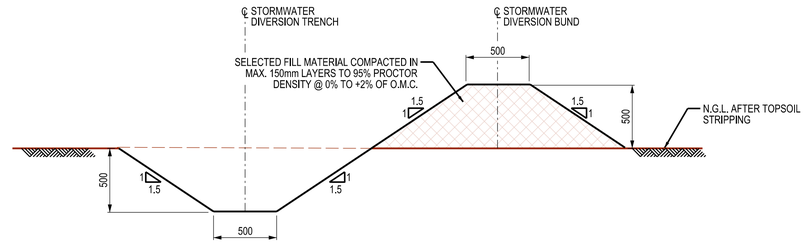
CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED)
RETURN WATER DAM
GENERAL ARRANGEMENT

DRG No. 2210513-603

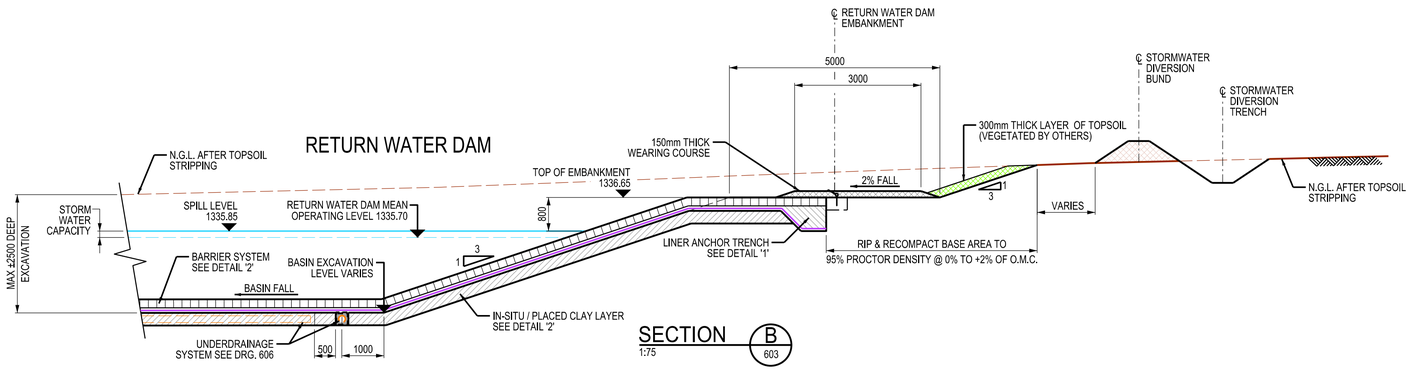
REV. A

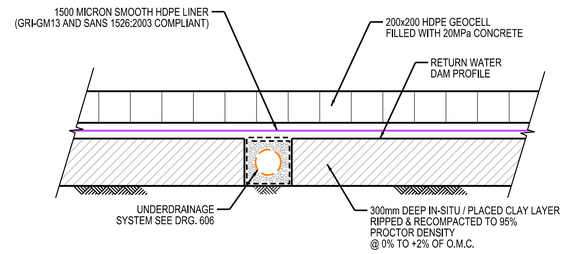



## TYPICAL SECTION - STORMWATER DIVERSION BUND / TRENCH

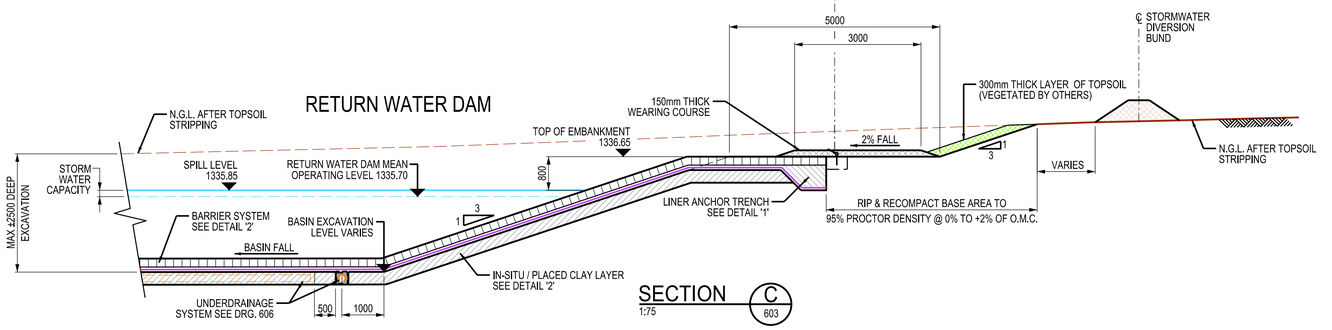
SCALE 1:25

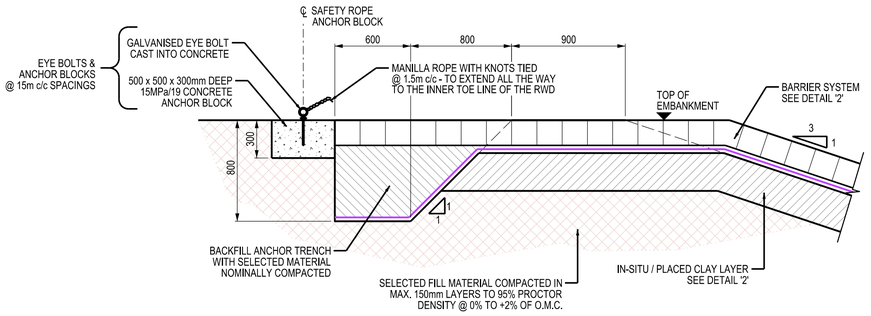



## DETAIL '2' - BARRIER SYSTEM

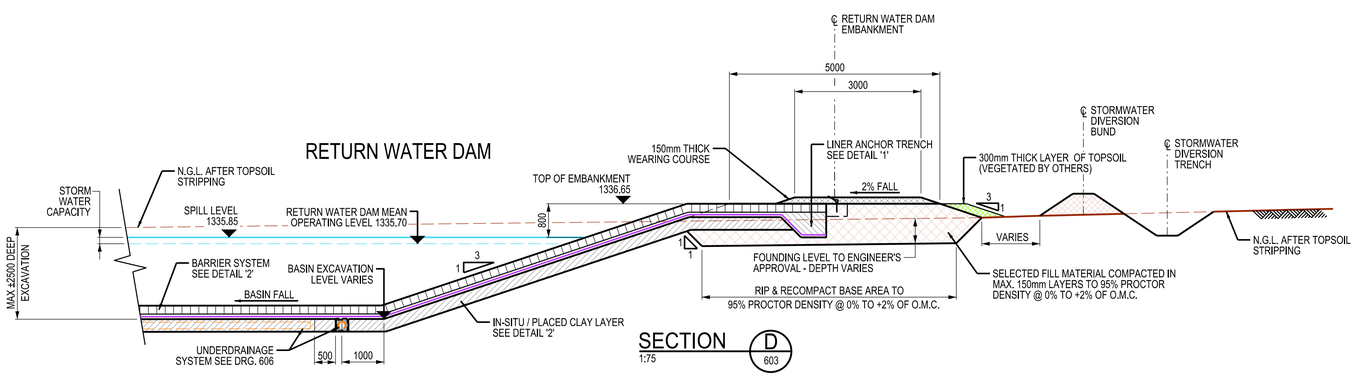
SCALE 1:20

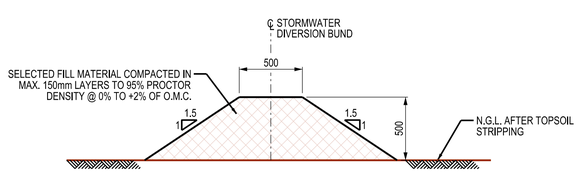



## DETAIL '1' - SECTION SHOWING LINER ANCHOR TRENCH AND ANCHOR BLOCK FOR SAFETY ROPE

SCALE 1:25




## TYPICAL SECTION - STORMWATER DIVERSION BUND

SCALE 1:25

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|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
| A | 2023-08-25 | ISSUED FOR INFORMATION | 502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | . | . |
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| | | | 606 | RETURN WATER DAM UNDERDRAINAGE DETAILS | | |



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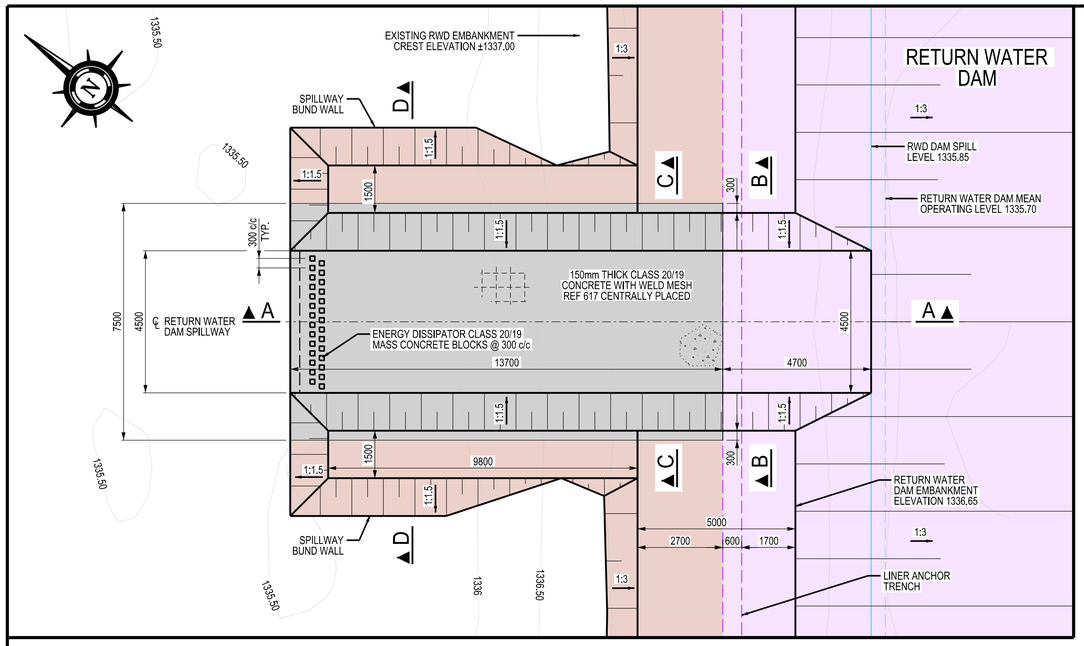
| CHECKED | S.M. |
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | . |
| SCALE | A1 AS SHOWN / A3 AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED)
RETURN WATER DAM
SECTIONS & DETAILS

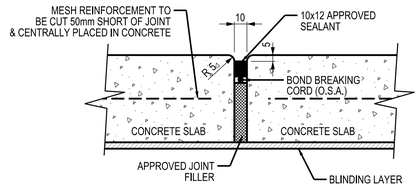
DRG No. 2210513-604

REV. A




## PLAN - RETURN WATER DAM SPILLWAY

SCALE 1:100

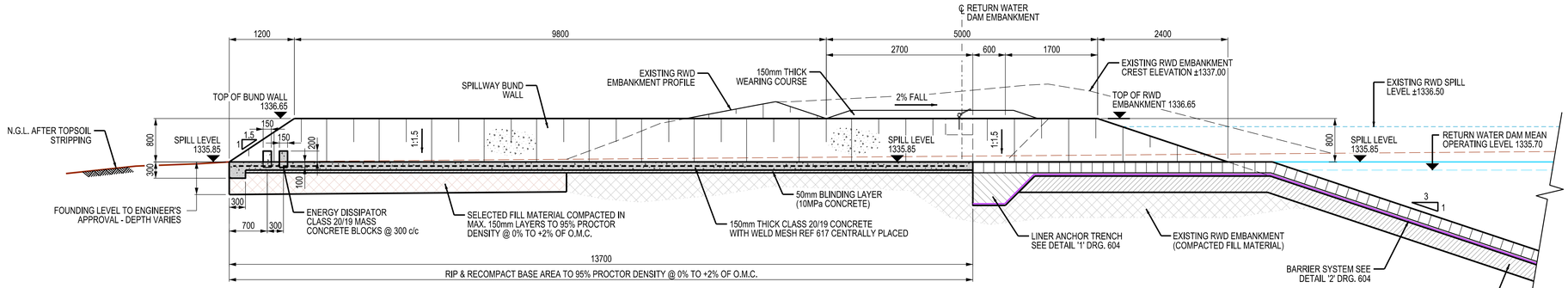



## DETAIL '1' - SECTION CONSTRUCTION JOINT

N.T.S.

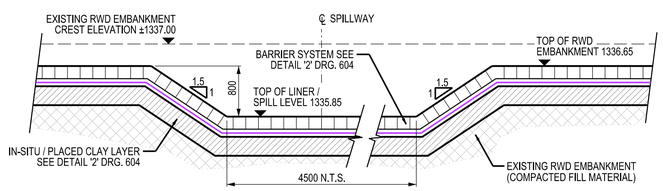
## NOTES:

1. WELD MESH TO BE REF 617 CENTRALLY PLACED.
2. MINIMUM REINFORCING LAP LENGTH TO BE 600mm.
3. EARTH ADJACENT TO CONCRETE TO BE COMPACTED.
4. ALL CONCRETE TO HAVE A SMOOTH FINISH.
5. ALL CONCRETE CORNERS IN CONTACT WITH THE LINING TO BE CHAMFERED MIN. 25mm.
6. ALL CONSTRUCTION JOINTS TO BE AS PER DETAIL '1'. PANEL SIZES TO BE APPROVED BY THE ENGINEER. JOINTS TO BE WELL CLEANED & SCRABBLED TO EXPOSE FRESH AGGREGATE & THOROUGHLY WETTED BEFORE NEXT POUR.



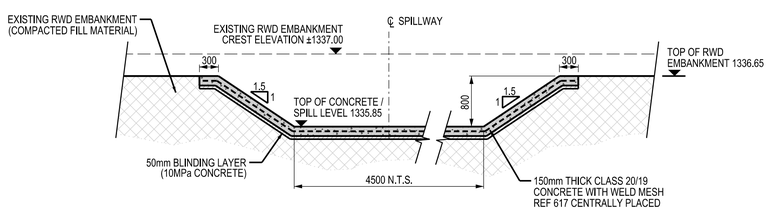

## SECTION A - A

SCALE 1:50



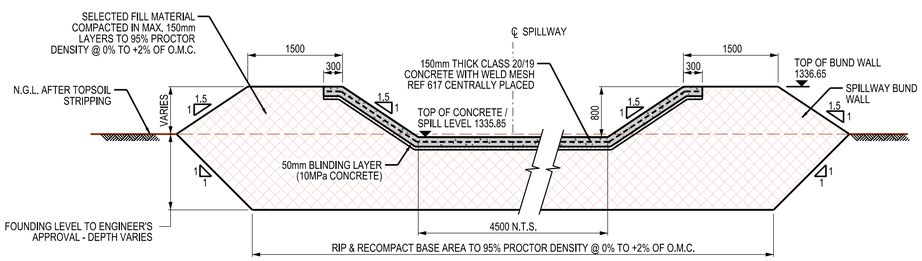

## SECTION B - B
## SPILLWAY HDPE PORTION

SCALE 1:50




## SECTION C - C
## SPILLWAY CONCRETE PORTION

SCALE 1:50




## SECTION D - D
## SPILLWAY CONCRETE PORTION

SCALE 1:50

**ISSUED FOR INFORMATION**

| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
| REV | DATE | DESCRIPTION | DRG.No. | DRAWING TITLE | DRG.No. | DRAWING TITLE |
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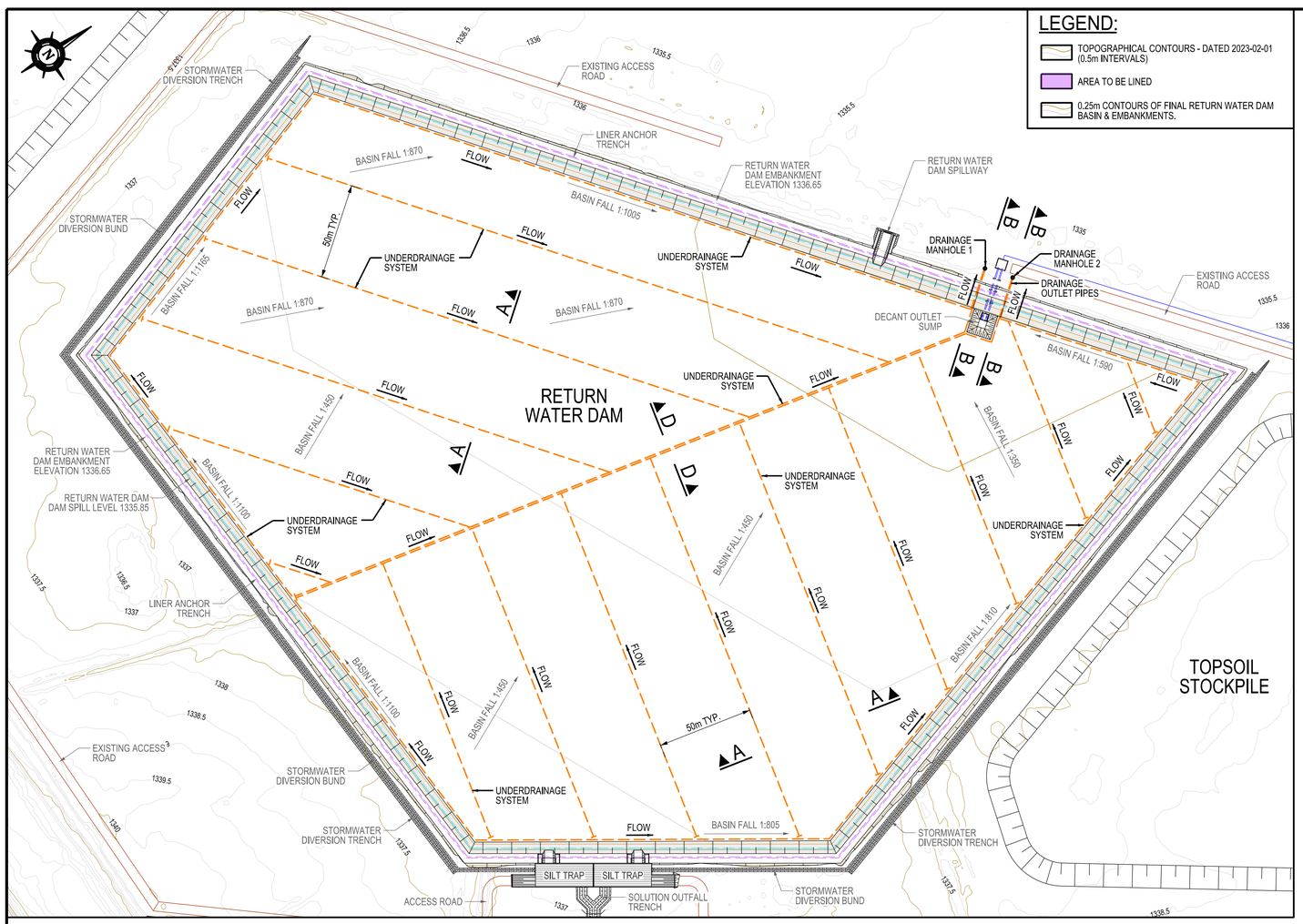
| DATE | 2023-08-31 |
| DESIGNED | S.M./I.H. |
| DATE | 2023-08-18 |
| CO-ORD SYSTEM | SCALE |
| WGS 84 LO27 | A1 AS SHOWN / A3 AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED)
RETURN WATER DAM
SPILLWAY DETAILS

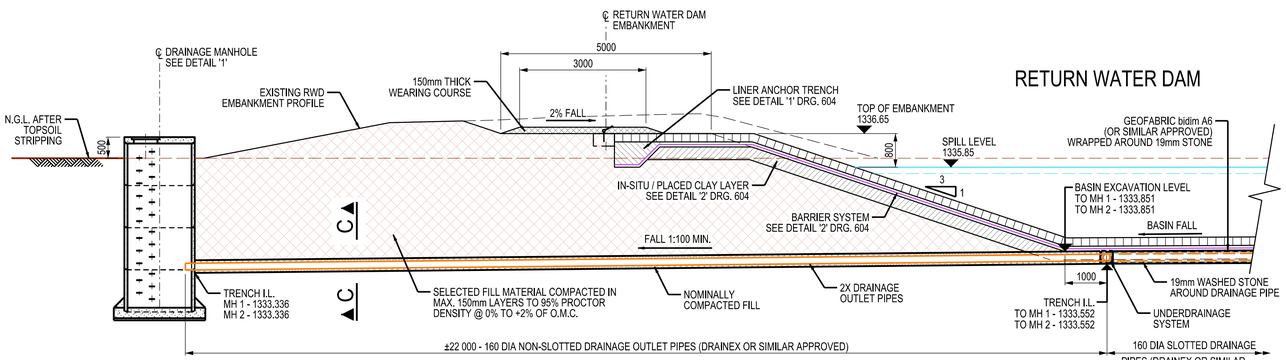
DRG No. 2210513-605

REV. A



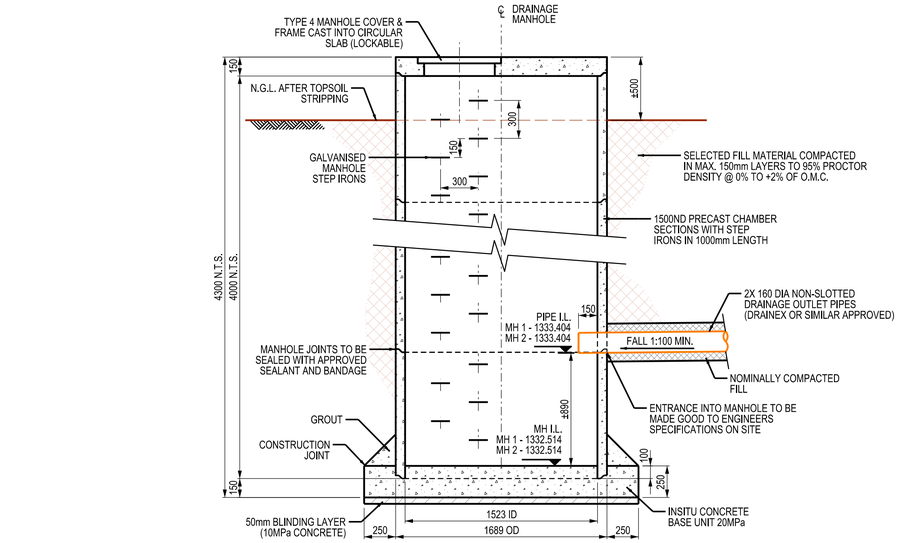

## PLAN - RETURN WATER DAM UNDERDRAINAGE SYSTEM

SCALE 1:1500



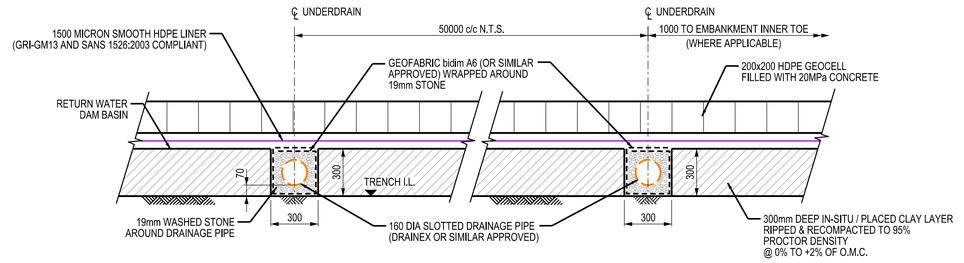

## SECTION B - B
## DRAINAGE OUTLET PIPES TO MANHOLES

SCALE 1:75



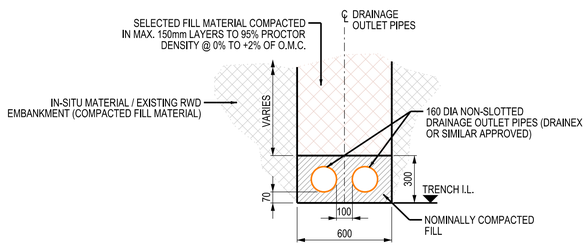

## DETAIL '1' - SECTION DRAINAGE MANHOLE

SCALE 1:25



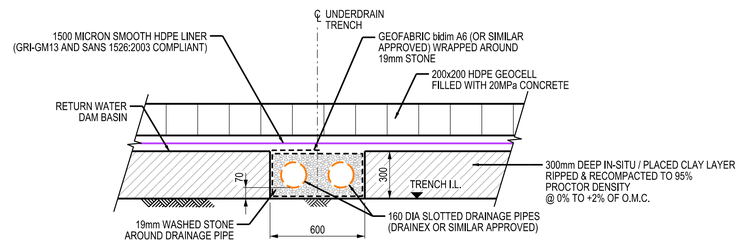

## SECTION A - A
## SLOTTED UNDERDRAINAGE SYSTEM IN BASIN

SCALE 1:20




## SECTION C - C
## NON-PERFORATED DRAINAGE OUTLET PIPES

SCALE 1:20




## SECTION D - D
## SLOTTED UNDERDRAINAGE SYSTEM IN BASIN

SCALE 1:20

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| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
|---|---|---|---|---|---|---|
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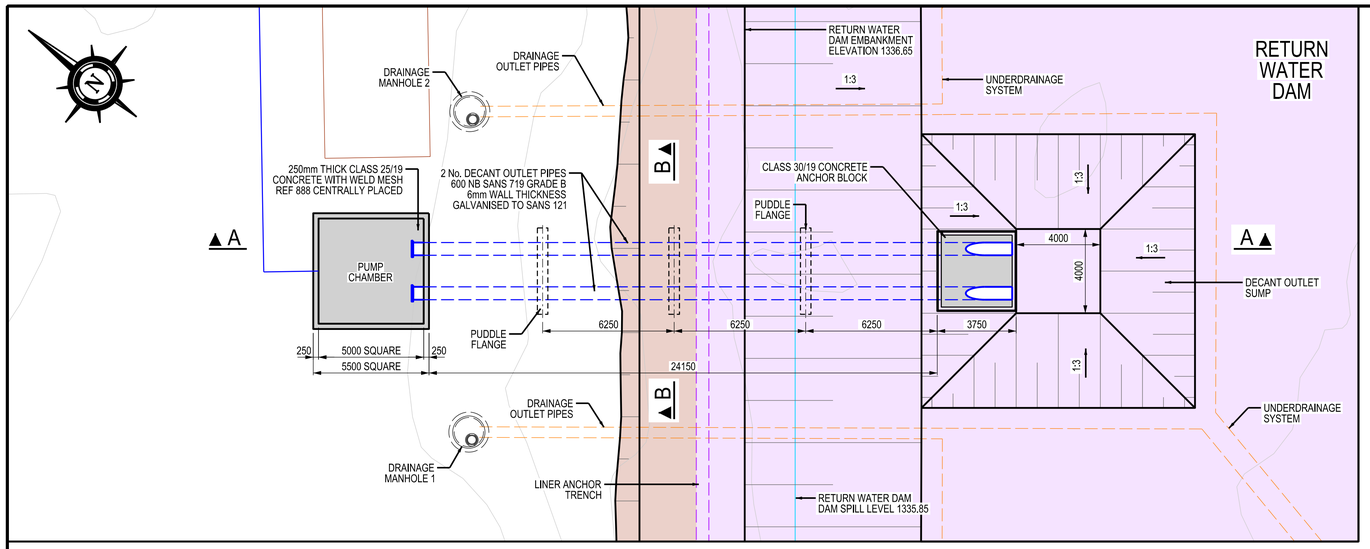
| WGS 84 LO27 | A1 AS SHOWN / A3 AS SHOWN X2 |

CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED) RETURN WATER DAM UNDERDRAINAGE DETAILS

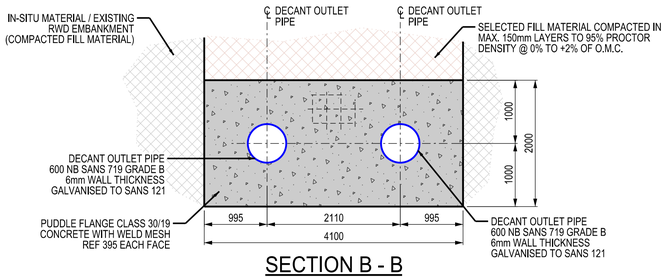
DRG No. 2210513-606

REV. A



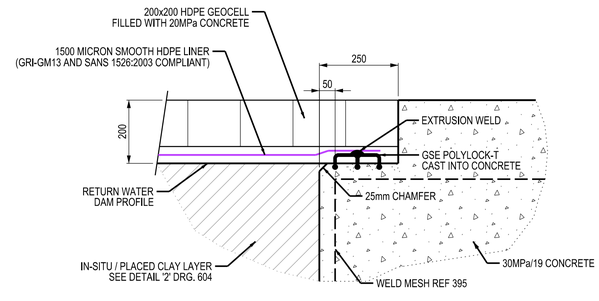

## PLAN - RETURN WATER DAM DECANT STRUCTURE

SCALE 1:150



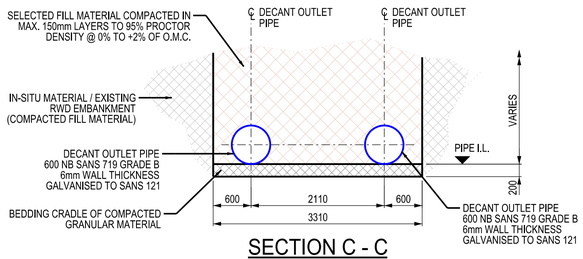

## SECTION B - B
## PUDDLE FLANGES

SCALE 1:50



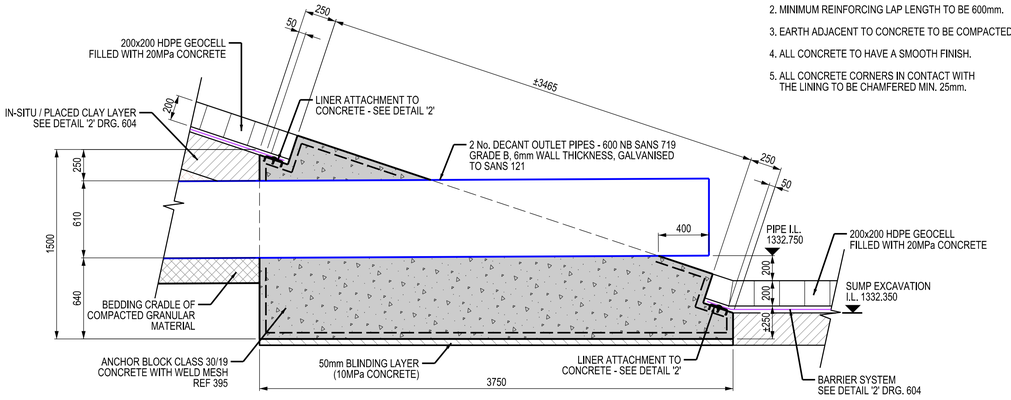

## DETAIL '2' - TYPICAL SECTION
## LINER ATTACHMENT TO CONCRETE

SCALE 1:10



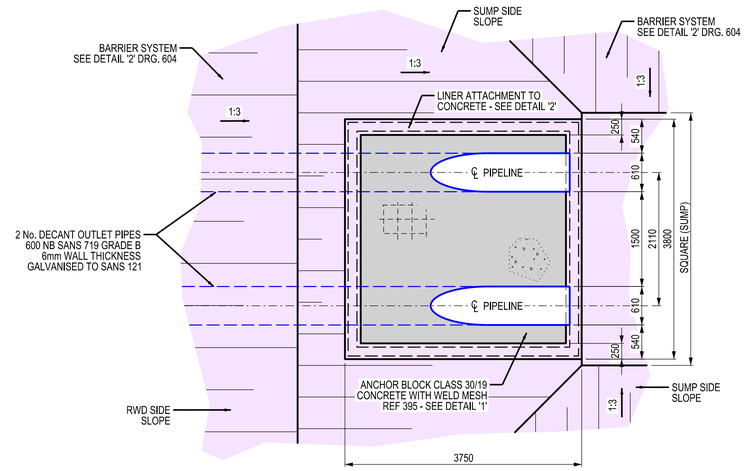

## SECTION C - C
## DECANT OUTLET PIPES

SCALE 1:50



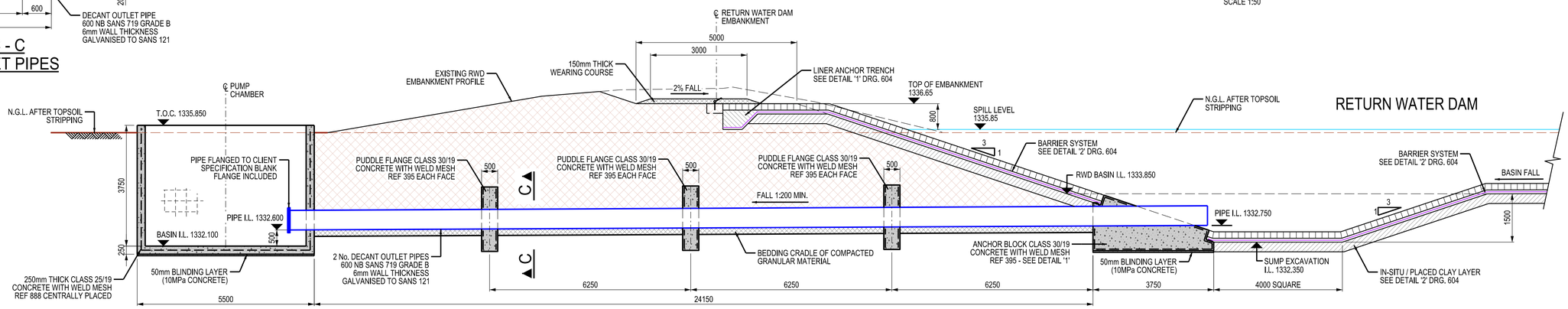

## DETAIL '1' - SECTION - DECANT OUTLET PIPE ANCHOR BLOCK

SCALE 1:25




## PLAN - DECANT OUTLET PIPE ANCHOR BLOCK

SCALE 1:50




## SECTION A - A
## DECANT OUTLET PIPES TO PUMP CHAMBER

SCALE 1:75

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| REVISIONS | | | REFERENCE DRAWINGS | | REFERENCE DRAWINGS | |
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CLIENT: HARMONY

TITLE: HARMONY - VALLEY TSF (CYCLONED)
RETURN WATER DAM
DECANT STRUCTURE
DETAILS

DRG No. 2210513-607 REV. A

**DESIGN DETAIL DRAFTING CC**
P O Box 1432, Noordheuwel. 1756
Tel : 084 581 4179
Email : niel@3ddd.co.za / sonja@3ddd.co.za

# DRAWING REGISTER

***Client/Company:*** ***HARMONY***

***Project name:*** ***HARMONY VALLEY TAILINGS STORAGE FACILITY***

***Project no:*** ***2210513***

***Revision:*** ***A*** ***Date:*** ***2023/08/25***

| Drawing number | Description | Revision | Date |
|---|---|---|---|
| | HARMONY VALLEY TSF (CYCLONED) | | |
| | | | |
| 2210513-501 | OVERALL SITE LAYOUT | A | Aug-23 |
| 2210513-502 | PRE-DEPOSITION WORKS GENERAL ARRANGEMENT | A | Aug-23 |
| 2210513-503 | FINAL HEIGHT GENERAL ARRANGEMENT | A | Aug-23 |
| 2210513-504 | EARTHWORKS SECTIONS | A | Aug-23 |
| 2210513-505 | EARTHWORKS SECTIONS & DETAILS | A | Aug-23 |
| 2210513-506 | DRAINAGE SECTIONS & DETAILS | A | Aug-23 |
| 2210513-507 | DRAINAGE COLLECTOR PIPES SECTIONS & DETAILS | A | Aug-23 |
| 2210513-508 | SOLUTION TRENCH SECTIONS & DETAILS | A | Aug-23 |
| 2210513-509 | PENSTOCK INTAKE SECTIONS & DETAILS | A | Aug-23 |
| 2210513-510 | PENSTOCK CATWALK TYPICAL DETAILS | A | Aug-23 |
| 2210513-511 | SOLUTION OUTFALL TRENCH PLAN, SECTIONS & DETAILS | A | Aug-23 |
| 2210513-512 | TYPICAL CULVERT DETAILS | A | Aug-23 |
| 2210513-513 | TAILINGS DELIVERY PIPELINE LAYOUT | A | Aug-23 |
| 2210513-514 | TAILINGS DELIVERY PIPELINE DETAILS | A | Aug-23 |
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| | RETURN WATER DAM | | |
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| 2210513-601 | SILT TRAP PLAN, SECTIONS & DETAILS | A | Aug-23 |
| 2210513-602 | SILT TRAP SPILLWAY DETAILS | A | Aug-23 |
| 2210513-603 | RETURN WATER DAM GENERAL ARRANGEMENT | A | Aug-23 |
| 2210513-604 | RETURN WATER DAM SECTIONS & DETAILS | A | Aug-23 |
| 2210513-605 | RETURN WATER DAM SPILLWAY DETAILS | A | Aug-23 |
| 2210513-606 | RETURN WATER DAM UNDERDRAINAGE DETAILS | A | Aug-23 |
| 2210513-607 | RETURN WATER DAM DECANT STRUCTURE DETAILS | A | Aug-23 |
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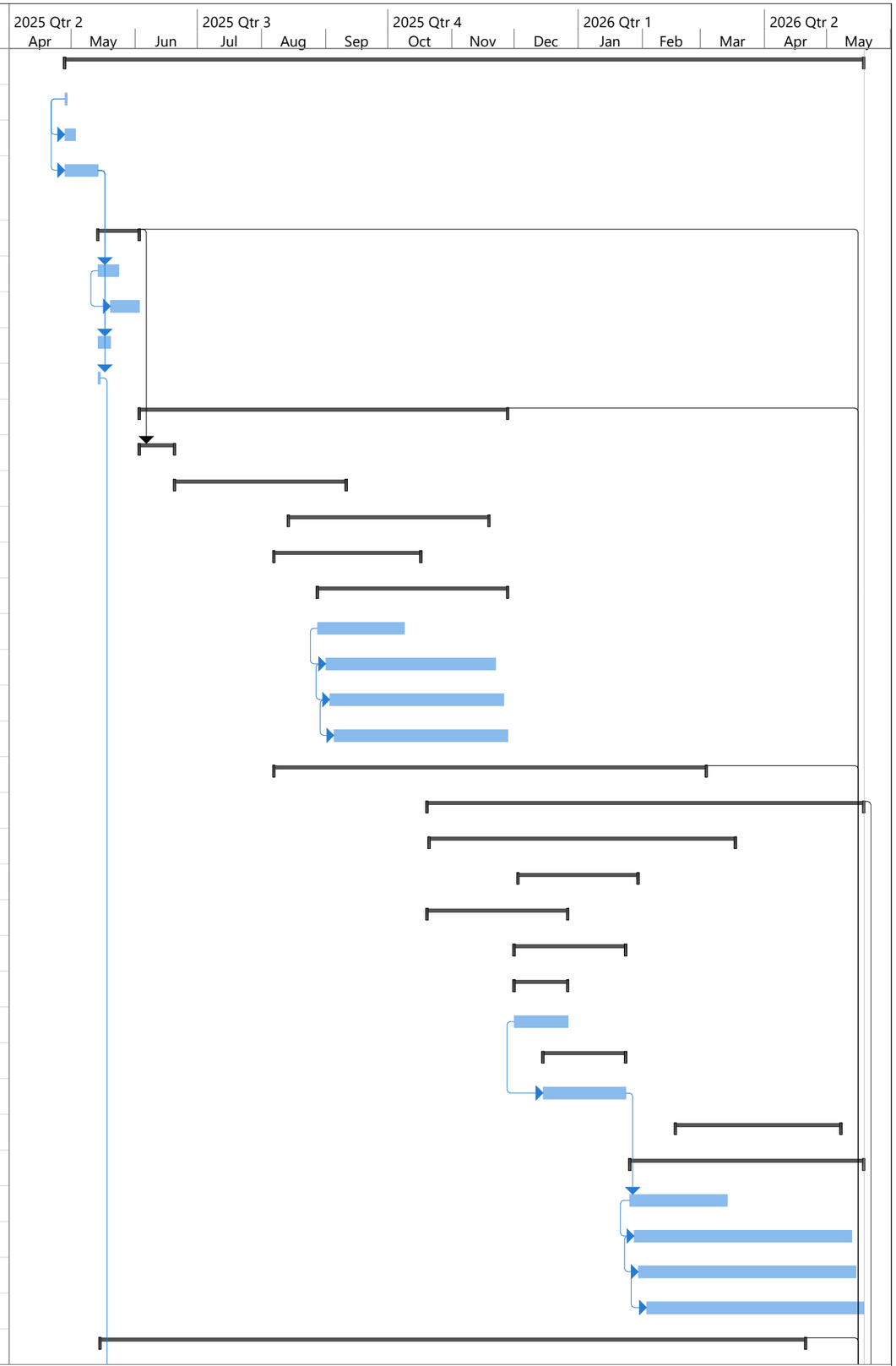
| ID | Task Mode | Task Name | Duration | Start | Finish | Predecessors |
|---|---|---|---|---|---|---|
| 1 | | **Valley TSF Construction Schedule** | **276 days** | **Mon 25/04/28** | **Mon 26/05/18** | |
| 2 | | Contract Start date | 1 day | Mon 25/04/28 | Mon 25/04/28 | |
| 3 | | Safety file approval | 5 days | Mon 25/04/28 | Fri 25/05/02 | 2SS |
| 4 | | Onboarding Process, Medical, Training & Inductions | 12 days | Mon 25/04/28 | Tue 25/05/13 | 2SS |
| 5 | | **Site Establishment** | **14 days** | **Wed 25/05/14** | **Mon 25/06/02** | |
| 6 | | Laydown area | 8 days | Wed 25/05/14 | Fri 25/05/23 | 4 |
| 7 | | Offices | 10 days | Tue 25/05/20 | Mon 25/06/02 | 6SS+4 days |
| 8 | | Plant establishment | 4 days | Wed 25/05/14 | Mon 25/05/19 | 4 |
| 9 | | Initial setting out | 1 day | Wed 25/05/14 | Wed 25/05/14 | 4 |
| 10 | | **South east wall section** | **128 days** | **Tue 25/06/03** | **Thu 25/11/27** | |
| 11 | | **Site Clearance** | **13 days** | **Tue 25/06/03** | **Thu 25/06/19** | **5** |
| 15 | | **TSF bulk earthworks** | **59 days** | **Fri 25/06/20** | **Wed 25/09/10** | |
| 28 | | **Drains** | **69 days** | **Thu 25/08/14** | **Tue 25/11/18** | |
| 33 | | **Solution trench** | **51 days** | **Thu 25/08/07** | **Thu 25/10/16** | |
| 37 | | **Liner installation** | **66 days** | **Thu 25/08/28** | **Thu 25/11/27** | |
| 38 | | Surface preparation | 30 days | Thu 25/08/28 | Wed 25/10/08 | 30SS+10 days |
| 39 | | Panel placement | 60 days | Mon 25/09/01 | Fri 25/11/21 | 38SS+2 days |
| 40 | | Seam welding | 60 days | Wed 25/09/03 | Tue 25/11/25 | 39SS+2 days |
| 41 | | Non-destructive testing | 60 days | Fri 25/09/05 | Thu 25/11/27 | 40SS+2 days |
| 42 | | **North West wall section** | **149 days** | **Thu 25/08/07** | **Tue 26/03/03** | |
| 73 | | **Basin section** | **151 days** | **Mon 25/10/20** | **Mon 26/05/18** | |
| 74 | | **Penstock** | **106 days** | **Tue 25/10/21** | **Tue 26/03/17** | |
| 78 | | **Catwalk** | **42 days** | **Wed 25/12/03** | **Thu 26/01/29** | |
| 81 | | **Site Clearance** | **50 days** | **Mon 25/10/20** | **Fri 25/12/26** | |
| 84 | | **TSF bulk earthworks** | **40 days** | **Mon 25/12/01** | **Fri 26/01/23** | |
| 85 | | **Preparation of approved in-situ material** | **20 days** | **Mon 25/12/01** | **Fri 25/12/26** | |
| 86 | | TSF basin and wall area | 20 days | Mon 25/12/01 | Fri 25/12/26 | 83SS+20 days |
| 87 | | **Supply and place tailings material over liner** | **30 days** | **Mon 25/12/15** | **Fri 26/01/23** | |
| 88 | | TSF basin and wall area | 30 days | Mon 25/12/15 | Fri 26/01/23 | 86SS+10 days |
| 89 | | **Drains** | **58 days** | **Tue 26/02/17** | **Thu 26/05/07** | |
| 92 | | **Liner installation** | **81 days** | **Mon 26/01/26** | **Mon 26/05/18** | |
| 93 | | Surface preparation | 35 days | **Mon 26/01/26** | Fri 26/03/13 | 88 |
| 94 | | Panel placement | 75 days | Wed 26/01/28 | Tue 26/05/12 | 93SS+2 days |
| 95 | | Seam welding | 75 days | Fri 26/01/30 | Thu 26/05/14 | 94SS+2 days |
| 96 | | Non-destructive testing | 75 days | Tue 26/02/03 | Mon 26/05/18 | 95SS+2 days |
| 97 | | **Return Water Dam** | **243 days** | **Thu 25/05/15** | **Mon 26/04/20** | |



| ID | Task Mode | Task Name | Duration | Start | Finish | Predecessors |
|---|---|---|---|---|---|---|
| 98 | | **Site clearance** | **75 days** | **Thu 25/05/15** | **Wed 25/08/27** | |
| 99 | | Drain existing RWD | 60 days | Thu 25/05/15 | Wed 25/08/06 | 9 |
| 100 | | Clear and grub | 10 days | Thu 25/08/07 | Wed 25/08/20 | 99 |
| 101 | | Topsoil stripping and stockpiling | 10 days | Thu 25/08/14 | Wed 25/08/27 | 100SS+5 days |
| 102 | | **RWD bulk earthworks** | **135 days** | **Thu 25/08/21** | **Wed 26/02/25** | |
| 103 | | **Excavation** | **66 days** | **Thu 25/08/21** | **Thu 25/11/20** | |
| 104 | | RWD basin | 25 days | Thu 25/08/21 | Wed 25/09/24 | 25;100 |
| 105 | | RWD embankment key-cut | 10 days | Thu 25/09/18 | Wed 25/10/01 | 104SS+20 days |
| 106 | | Silt trap | 2 days | Thu 25/10/02 | Fri 25/10/03 | 105 |
| 107 | | Spillway | 1 day | Thu 25/11/20 | Thu 25/11/20 | 113SS+15 days |
| 108 | | **Preparation of approved in-situ material** | **120 days** | **Thu 25/09/11** | **Wed 26/02/25** | |
| 109 | | RWD basin | 120 days | Thu 25/09/11 | Wed 26/02/25 | 104SS+15 days |
| 110 | | RWD embankment | 10 days | Thu 25/10/09 | Wed 25/10/22 | 105SS+15 days |
| 111 | | Silt trap | 2 days | Fri 25/11/21 | Mon 25/11/24 | 107 |
| 112 | | **Construct embankment walls** | **65 days** | **Thu 25/09/11** | **Wed 25/12/10** | |
| 113 | | RWD embankments | 30 days | Thu 25/10/30 | Wed 25/12/10 | 110SS+15 days |
| 114 | | Stormwater diversion bund wall | 10 days | Thu 25/09/11 | Wed 25/09/24 | 104SS+15 days |
| 115 | | **Underdrainage** | **50 days** | **Thu 25/09/25** | **Wed 25/12/03** | |
| 116 | | Excavate trench | 30 days | Thu 25/09/25 | Wed 25/11/05 | 109SS+10 days |
| 117 | | Place drainage material | 30 days | Thu 25/10/16 | Wed 25/11/26 | 116SS+15 days |
| 118 | | Cover with bidim and backfill | 20 days | Thu 25/11/06 | Wed 25/12/03 | 117SS+15 days |
| 119 | | **Concrete works** | **105 days** | **Tue 25/11/25** | **Mon 26/04/20** | |
| 120 | | Geocells | 45 days | Thu 26/01/15 | Wed 26/03/18 | 128SS+20 days |
| 121 | | Spillway | 20 days | Thu 26/02/12 | Wed 26/03/11 | 120SS+20 days;11 |
| 122 | | Silt trap | 30 days | Tue 25/11/25 | Mon 26/01/05 | 111 |
| 123 | | Concrete curing time | 28 days | Thu 26/03/12 | Mon 26/04/20 | 120SS+1 day;121; |
| 124 | | **RWD Liner** | **60 days** | **Thu 25/11/27** | **Wed 26/02/18** | |
| 125 | | Surface preparation | 20 days | Thu 25/11/27 | Wed 25/12/24 | 118SS+15 days |
| 126 | | Panel placement | 45 days | Thu 25/12/04 | Wed 26/02/04 | 125SS+5 days |
| 127 | | Seam welding | 45 days | Thu 25/12/11 | Wed 26/02/11 | 126SS+5 days |
| 128 | | Non-destructive testing | 45 days | Thu 25/12/18 | Wed 26/02/18 | 127SS+5 days |
| 129 | | **Tailings delivery pipeline** | **90 days** | **Tue 25/10/21** | **Mon 26/02/23** | |
| 130 | | Final delivery pipeline | 90 days | Tue 25/10/21 | Mon 26/02/23 | 53 |
| 131 | | De-establishment | 44 days | Tue 25/12/30 | Fri 26/02/27 | 130SS+50 days |
| 132 | | Completion | 0 days | Mon 26/05/18 | Mon 26/05/18 | 131;5;10;42;73;9 |