# Saltwater – Lot 36 Subdivision
## DA Modification

## Engineering Issues Statement

## Revision 1

February 2017

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# 1 INTRODUCTION

de Groot & Benson has been engaged by S W R Developments Pty Ltd to prepare a Engineering Issues Statement for the proposed development of a site at 48 Belle O'Connor St, South West Rocks, NSW. The study site has the cadastral description of Lot 36 DP 1214499, and is located in the local government area of Kempsey Shire Council in NSW, being approximately 2km east of the town centre.

The site has current development consent being part of the site under Major Project 08-167. This DA modification does not change the development footprint, just the lot layout with the purpose that Lot 36 can be developed separately from the adjoining land to the east.

## 1.1 Existing Site

Lot 36 is approximately 3.58 ha in area and is bounded by an E2 zoned environmental protection habitat to the north which forms part of future developable land (Lot 35 DP 1214499). The site is also bounded by a sealed access track and the South West Rocks Golf Club to the west, an existing residential lot (Lot 51 DP 831284) to the south-west, future developable land (Lot 1 DP 1220275) to the east and a road reserve to the south providing a link via an unsealed access track to Belle O'Connor Street. The site is essentially cleared and has been zoned as R1 – General Residential. It is proposed to develop the entire site as a residential subdivision.

The catchment is assumed to be completely pervious as there are currently no developments on the site. The site currently does not contain any water quality improvement measures, with the site draining generally north-eastwards into Saltwater Lagoon.

# 2 PROPOSED DEVELOPMENT

The proposed development contains 43 low density lots, roads, associated infrastructure and a 15m wide easement into Lot 35 (DP 1214499) running parallel along the northern boundary of the development. The proposed easement is to incorporate a 3.5m wide access track, two bio-retention basins and an infiltration gallery to control water quality leaving the site.

The proposed development modification is to facilitate the subdivision of Lot 36 individually from the adjoining land to the east. Consideration has been made for future development to the adjoining land through the provision of capped water services and road networks terminating at the site boundary to facilitate future connection.

The proposed development is shown on Drawing 13056-L36-MOD02-DA1.

# 3 EXISTING INFRASTRUCTURE

## 3.1 ACCESS

Access to the site is off Belle O'Connor Street.

## 3.2 POTABLE WATER

Reticulated water is available to the site from mains located along Belle O'Connor Street.

### 3.3 RECYCLED WATER

Recycled water is available to the site from mains located adjacent to the existing potable water main in Belle O'Connor Street.

### 3.4 SEWERAGE

Sewerage services are available to the site, via council mains which run north from existing development in Belle O'Connor Street along the west boundary of the site.

### 3.5 POWER and TELSTRA

Power and communications facilities are also available to the site.

## 4 ENGINEERING ISSUES AFFECTING THE DEVELOPMENT

### 4.1 WATER QUALITY

#### 4.1.1 Water Quality During Construction

A sediment and erosion control plan for the site has been prepared. It is shown on Drawings 13056–L36-MOD03-DA1.

#### 4.1.2 Post Construction Water Quality

Water collected within the developed site is to be drained to bio-retention basins for treatment. The proposed bio-retention basins are to be lined with filter media and selected plantings. The bases of the basins are proposed to be impermeable and sub-soil drainage to be used to drain to the infiltration gallery to avoid waterlogging. The proposed infiltration gallery is to recharge the groundwater table. The bio-retention basins have been sized to suit the deemed to comply WSUD solutions.

Concept plans and typical details for the stormwater treatment measures are provided on Drawing 13056-L36-MOD04-DA1 and Drawing 13056-L36-MOD07-DA1 respectively.

### 4.2 TRAFFIC ISSUES RELATING TO THE DEVELOPMENT

Access to the site is from the existing roundabout in Belle O'Conner Street. This road has been designed as the main access to the Saltwater development area. A proposed Road 14 runs along the southern boundary of the property. It is proposed to connect Lot 36 to this road.

The section of road 14 will be built to Collector road standard. This road will be capable of use by public transport.

The remaining roads in the development are considered Local Access Streets.

Footpaths will be provided to all roadways in accordance with Council standards.

## 4.3 WATER SUPPLY

Concept plans for water supply are shown on Drawing 13056-L36-MOD05-DA1.

The development will be connected to the existing ø100mm capped water main located on the north side of Belle O'Conner Street. The internal mains for the development are proposed as ø100mm. Future connection to Stage 9 of Malbec Properties approved subdivision (MP08-0167) will likely occur at two points, both located along the development's eastern boundary running parallel to the Road 2 and Road 14.

## 4.4 RECYCLED WATER

Concept plans for recycled water are shown on Drawing 13056-L36-MOD05-DA1.

The DCP for the area calls for recycled water mains to be provided at subdivision stage. It is proposed to run ø100mm recycled water mains in the same trench as the standard water mains at construction stage. The mains will be differentiated by different coloured pipe material. Typically the recycled water will be in a purple coloured pipe and the potable water in a blue / grey or black pipe.

## 4.5 SEWERAGE

Concept plans for sewerage are shown on Drawing 13056-L36-MOD05-DA1.

The site will drained by gravity to the existing main running along the western boundary of Lot 36. It is proposed that the sewer network for the development will be connected to existing trunk main at four locations, namely at manholes T/6, T/7, T10 and T/11. House connections to the sewer trunk main are also proposed for lots 26-28, 31, 32, 34 and 35 to minimise fill volumes in required by gravity sewer.

## 4.6 DRAINAGE

The site will be drained by a conventional pit and pipe system and directed to the various water quality control devices to the north of the site, to be infiltrated to the groundwater table for groundwater recharge. Kerb inlet pits are proposed to drain the lots falling towards the road reserve. Interallotment drainage pits will be used to capture overland flow from lots that do not fall towards the road reserve as well as capture the runoff from Lot 51 (DP 831284) to the south-west of the site. During large design storm events excess stormwater is to be collected by an outlet control pit located in the proposed infiltration gallery and discharged to a natural gully to the north-east of the site. During severe flooding events stormwater is proposed to be discharged via overland flow from the most eastern bio-retention basin towards the Saltwater Lagoon.

A schematic of the drainage system is shown on Drawing 13056-L36-MOD04-DA1.

## 4.7 FLOODING

### 4.7.1 Design Flood Level

The Saltwater Development Control Plan sets the Flood Planning Level for the site at RL 3.5m AHD. The minimum floor level of any dwelling will need to be 0.5m above this level (RL 4.0m AHD).

A portion of the site along the northern boundary is below the RL 3.5m contour. Filling of lots 13-19, lot 40 and part of the proposed Road 2 will be required to raise the development out of the 1 in 100 year design flood. Localised filling of affected lots will also be required to ensure building floor levels are higher than RL 4.0m. Maximum batters of 1 in 4 to existing surface have been proposed.

## 4.8 BULK EARTHWORKS

Bulk earthworks are proposed to ensure that:

- The development is above the Flood Planning Level and building pads are at the minimum floor level
- the proposed lots drain appropriately to the street
- to prevent local drainage issues
- to provide sufficient fall and cover for stormwater pipes to reach the bio-retention basins
- to ensure that appropriate cover requirements and depth for house connections are maintained for the gravity sewerage system
- to provide sufficient depth for storage within the bio-retention basins and the infiltration gallery

## 4.9 SLOPE

The whole site has is considered flat, with site gradients generally at less than 0.5%. The average slope across the site is approximately 0.3%. This proposes a problem for road drainage, where a slope of 0.5% is often considered a practical minimum road slope. Filling of lots to provide sufficient cover for the gravity sewerage system and drainage networks has greatly alleviated the extent of the problem, however, issues with minimum road grade still exist.

The proposed road design is to have a series of crests and sags with the peak level of the crests falling towards the northern site boundary. This is to ensure that the overland flow path of runoff during a major storm event drains to the bio-retention and infiltration gallery through the 4m wide access easements.

## 4.10 ACID SULFATE SOILS

The potential for acid sulfate soils on the site was examined previously in the approved development application under Major Project 08-167. As the development footprint has not changed within the DA modification, the potential for acid sulfate soil has also not changed in the current study and therefore doesn't affect the site.

# 5 REFERENCES

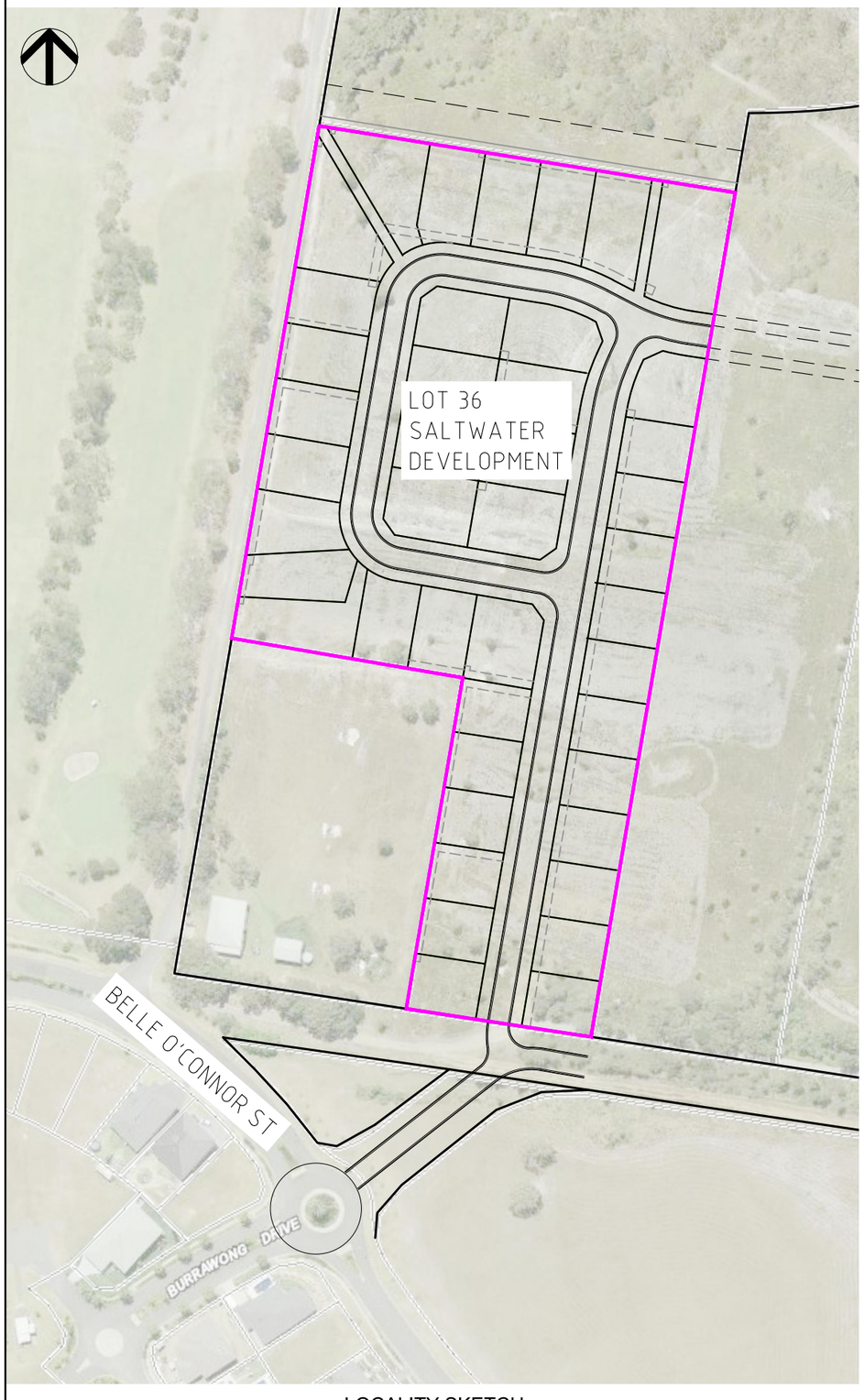
1. South West Rocks Sewerage Reticulation and Treatment Works - Augmentation Strategy and Conceptual Design – RDM 1998.

2. Saltwater Developments Area – Phillip Drive & Belle O'Connor Street – South West Rocks – local Environment Study" by Connell Wagner Pty Ltd, February 2018

3. "Saltwater precinct, South West Rocks – Traffic Impact Assessment" – September 2012

4. "Saltwater, South West Rocks – Development Control Plan – 2010" Kempsey Shire Council.

# 6 APPENDIX A – ENGINEERING DRAWINGS




LOCALITY SKETCH

# SALTWATER DEVELOPMENT

## 48 BELLE O'CONNOR ST

## SOUTH WEST ROCKS

DRAWING INDEX

| DRAWING No. | DESCRIPTION |
|---|---|
| 13056 - DA00 | COVER SHEET |
| 13056 - DA01 | LAYOUT PLAN WITH AERIAL |
| 13056 - DA02 | GENERAL ARRANGEMENT AND LOT LAYOUT PLAN |
| 13056 - DA03 | BULK EARTHWORKS & SEDIMENT EROSION CONTROL PLAN |
| 13056 - DA04 | ROAD & DRAINAGE PLAN |
| 13056 - DA05 | SEWER & WATER SERVICES PLAN |
| 13056 - DA06 | SEDIMENT & EROSION CONTROL DETAILS |
| 13056 - DA07 | BIO-RETENTION BASIN & INFILTRATION GALLERY DETAILS |

| REV. | DATE | REVISION | DR.BY | AP.BY |
|---|---|---|---|---|
| DA1 | 08/02/17 | FOR DA APPROVAL | KWW | RDG |

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| Scale: AS SHOWN | Cad File No.: 13056_Civil - LOT 36.dwg | | |
| Surveyed: MR | Datum: AHD | | |
| Drawn: KWW | Designed: KWW | Approved: RDG | |
| Checked: RDG | Date: JAN 2017 | No. of dwgs: -- | |

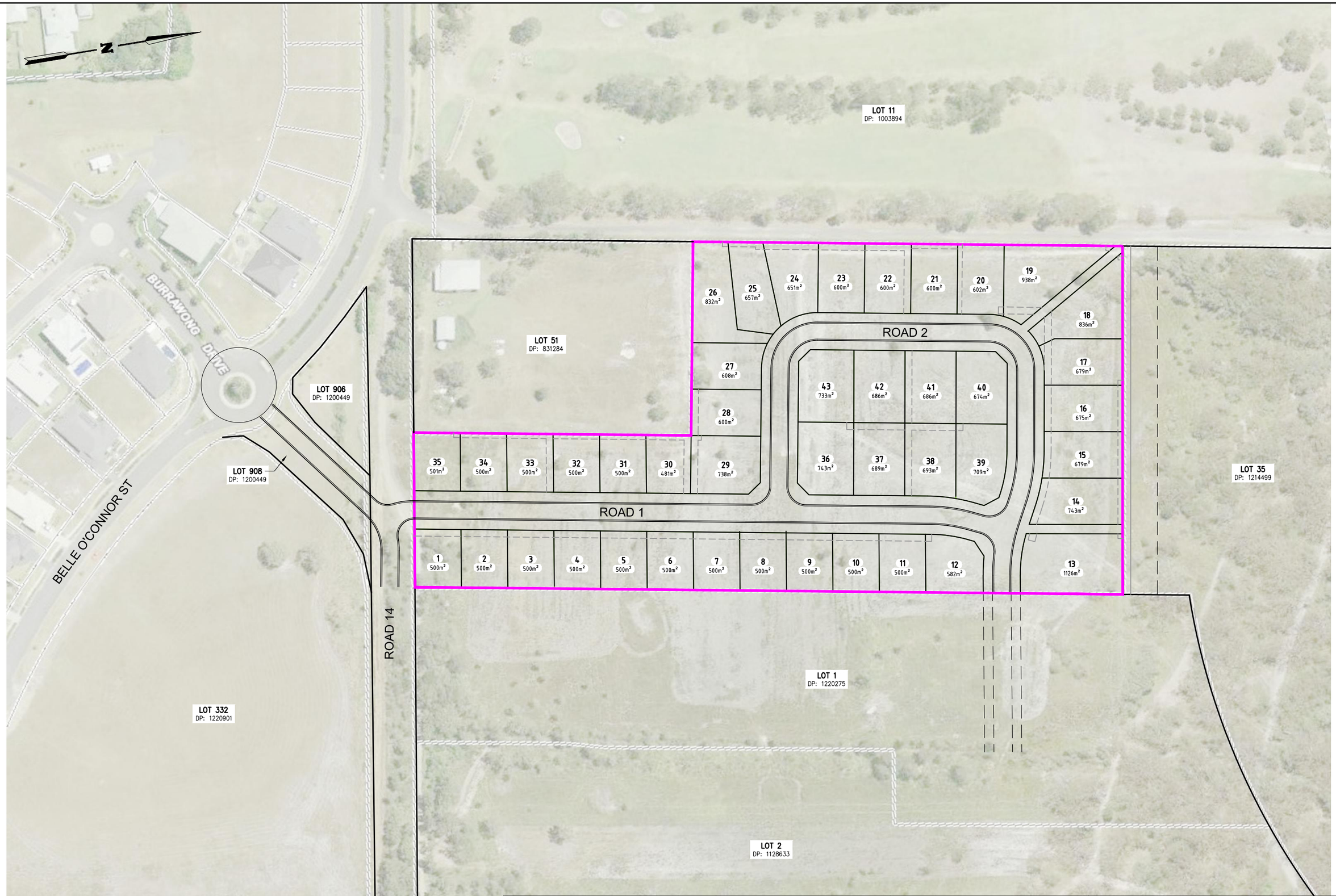
Project: SALTWATER DEVELOPMENT
SOUTH WEST ROCKS, NSW

Client: S W R Developments Pty Ltd

Title: COVER SHEET



Project No. 13056
Drawing No. L36-MOD00
Amendment No. DA1

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SCALE OF METRES 1:750

| REV. | DATE | REVISION | DR.BY | AP.BY |
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| Checked: RDG | Date: JAN 2017 | No. of dwgs: -- | |

Project: SALTWATER DEVELOPMENT SOUTH WEST ROCKS, NSW

Client: S W R Developments Pty Ltd

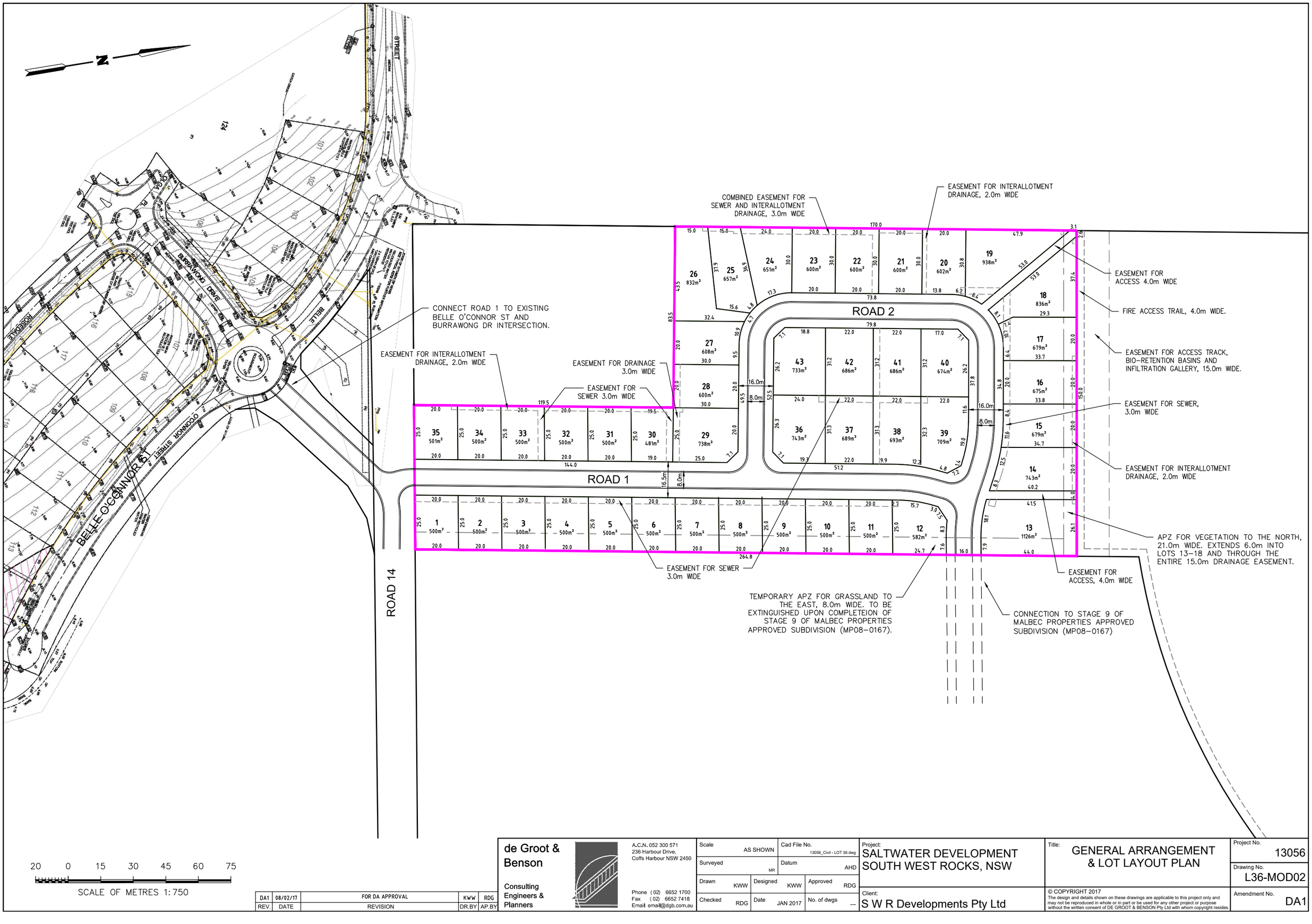
Title: LAYOUT PLAN WITH AERIAL



Project No.: 13056

Drawing No.: L36-MOD01

Amendment No.: DA1

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| Surveyed: MR | Datum: AHD | | |
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| Checked: RDG | Date: JAN 2017 | No. of dwgs: --- | |

Project: SALTWATER DEVELOPMENT SOUTH WEST ROCKS, NSW

Client: S W R Developments Pty Ltd

Title: GENERAL ARRANGEMENT & LOT LAYOUT PLAN



Project No. 13056

Drawing No. L36-MOD02

Amendment No. DA1

PROVIDE LOCALISED CUT AND FILL TO ACHIEVE 1% FALL ACROSS ALLOTMENTS. PROVIDE LOCALISED FILL TO RL 4.0 FOR BUILD PADS ONLY. MAX BATTER TO EXISTING SURFACE IS 1V : 4H.

APPROXIMATE EXTENT OF PROPOSED FILLING TO ACHIEVE MINIMUM LOT LEVEL OF RL 3.6 AHD – FINAL LEVEL WILL VARY TO ACHIEVE 1% FALL ACROSS ALLOTMENTS. MAX BATTER TO EXISTING SURFACE IS 1V : 4H.

FILL ROAD RESERVE TO ACHIEVE SUFFICIENT GRADE FOR DRAINAGE.

POTENTIAL TOPSOIL STOCKPILE AREA

CUT TO FORM BIO-RETENTION BASINS AND INFILTRATION GALLERY.

SEDIMENT FENCE

PROVIDE SHAKE DOWN AREA AT CONSTRUCTION ACCESS

SEDIMENT FENCE

FILL LOTS TO ACCOMMODATE GRAVITY SEWER RETICULATION

ROAD 1

ROAD 2

ROAD 14

BELLE OCEANVIEW

O'CONNOR STREET

BURRAWONG DRIVE

ROSEDALE

## LEGEND

- APPROXIMATE CUTTING
- APPROXIMATE FILLING
- SHAKE DOWN AREA
- SEDIMENT FENCE
- EXISTING SURFACE CONTOUR
- MATCH EXISTING + M.E.
- DESIGN SPOT HEIGHTS + 5.00

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SCALE OF METRES 1:750

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| Drawn | KWW | Designed | KWW |
| Approved | RDG | | |
| Checked | RDG | Date | JAN 2017 |
| No. of dwgs | -- | | |

Project: SALTWATER DEVELOPMENT SOUTH WEST ROCKS, NSW

Client: S W R Developments Pty Ltd

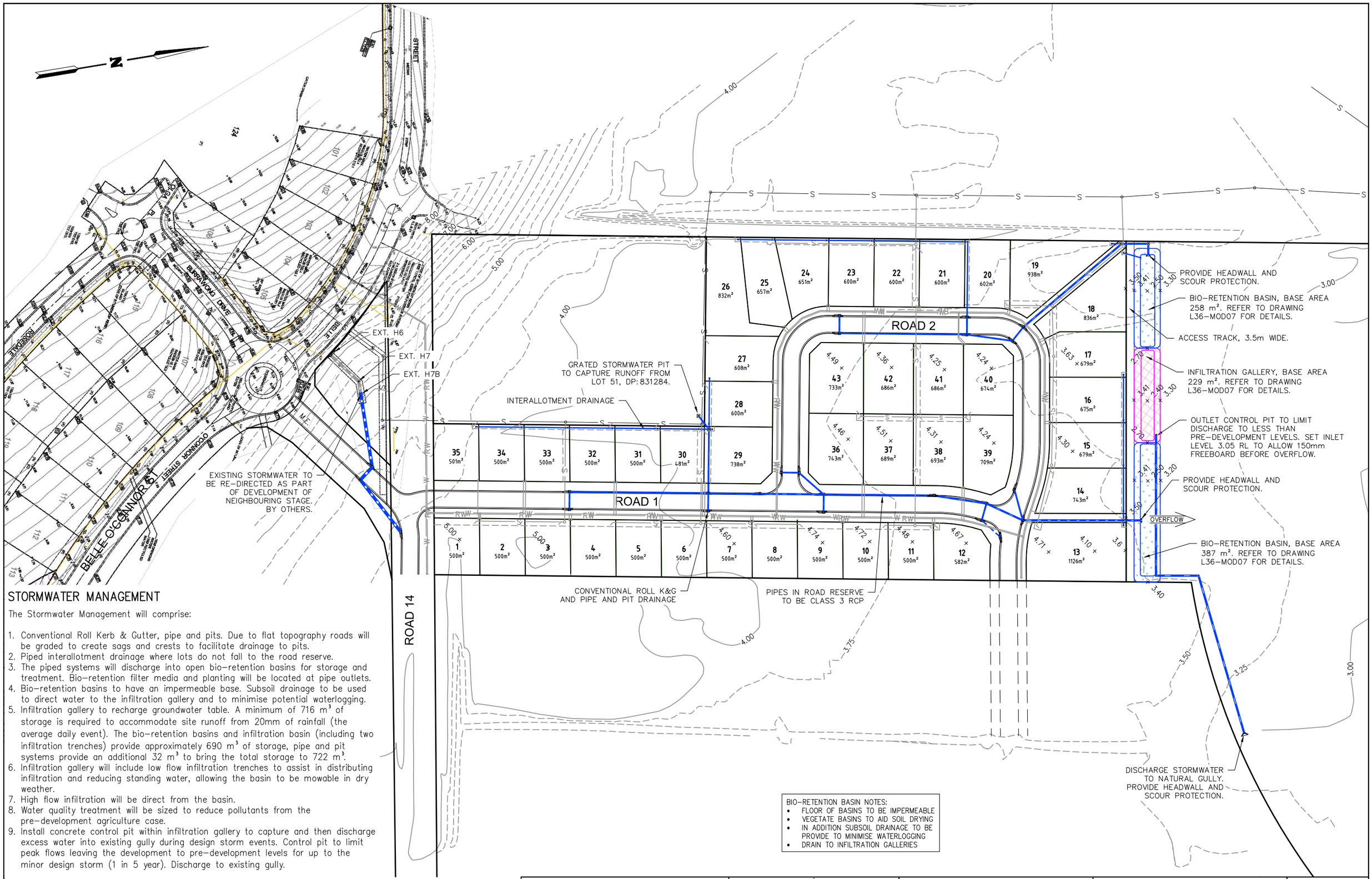
Title: BULK EARTHWORKS AND SEDIMENT & EROSION CONTROL PLAN



Project No. 13056

Drawing No. L36-MOD03

Amendment No. DA1




## STORMWATER MANAGEMENT

The Stormwater Management will comprise:

1. Conventional Roll Kerb & Gutter, pipe and pits. Due to flat topography roads will be graded to create sags and crests to facilitate drainage to pits.
2. Piped interallotment drainage where lots do not fall to the road reserve.
3. The piped systems will discharge into open bio-retention basins for storage and treatment. Bio-retention filter media and planting will be located at pipe outlets.
4. Bio-retention basins to have an impermeable base. Subsoil drainage to be used to direct water to the infiltration gallery and to minimise potential waterlogging.
5. Infiltration gallery to recharge groundwater table. A minimum of 716 $m^3$ of storage is required to accommodate site runoff from 20mm of rainfall (the average daily event). The bio-retention basins and infiltration basin (including two infiltration trenches) provide approximately 690 $m^3$ of storage, pipe and pit systems provide an additional 32 $m^3$ to bring the total storage to 722 $m^3$.
6. Infiltration gallery will include low flow infiltration trenches to assist in distributing infiltration and reducing standing water, allowing the basin to be mowable in dry weather.
7. High flow infiltration will be direct from the basin.
8. Water quality treatment will be sized to reduce pollutants from the pre-development agriculture case.
9. Install concrete control pit within infiltration gallery to capture and then discharge excess water into existing gully during design storm events. Control pit to limit peak flows leaving the development to pre-development levels for up to the minor design storm (1 in 5 year). Discharge to existing gully.

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| Drawn: KWW | Designed: KWW | Approved: RDG | |
| Checked: RDG | Date: JAN 2017 | No. of dwgs: -- | |

Project: SALTWATER DEVELOPMENT SOUTH WEST ROCKS, NSW

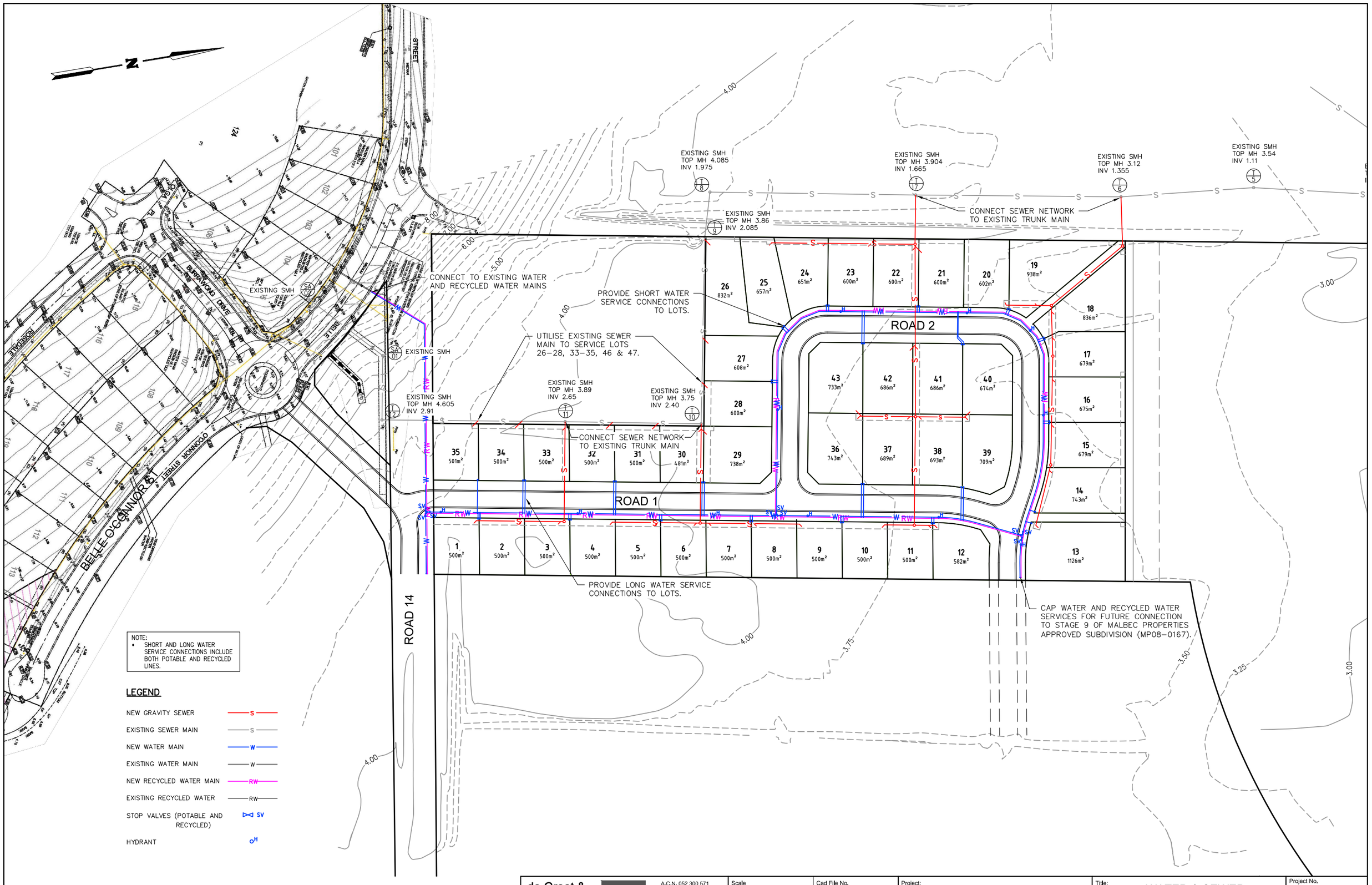
Client: S W R Developments Pty Ltd

Title: ROAD & DRAINAGE PLAN

Project No.: 13056

Drawing No.: L36-MOD04

Amendment No.: DA1




NOTE:
- SHORT AND LONG WATER SERVICE CONNECTIONS INCLUDE BOTH POTABLE AND RECYCLED LINES.

**LEGEND**

| | |
|---|---|
| NEW GRAVITY SEWER | S |
| EXISTING SEWER MAIN | S |
| NEW WATER MAIN | W |
| EXISTING WATER MAIN | W |
| NEW RECYCLED WATER MAIN | RW |
| EXISTING RECYCLED WATER | RW |
| STOP VALVES (POTABLE AND RECYCLED) | SV |
| HYDRANT | H |

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SCALE OF METRES 1:750

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| Checked | RDG | Date | JAN 2017 | No. of dwgs | -- |

Project: SALTWATER DEVELOPMENT SOUTH WEST ROCKS, NSW

Client: S W R Developments Pty Ltd

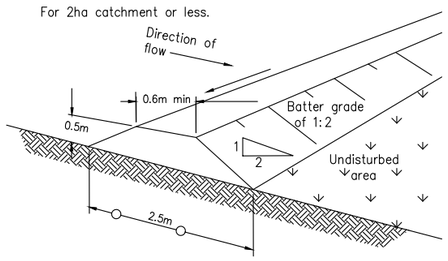
Title: WATER & SEWER SERVICES PLAN



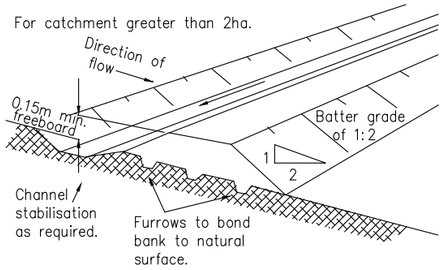
Project No. 13056

Drawing No. L36-MOD05

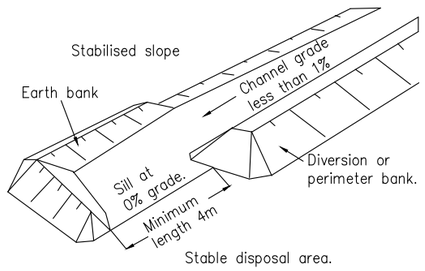
Amendment No. DA1



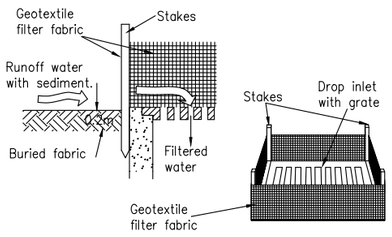

Perimeter Bank (without channel)



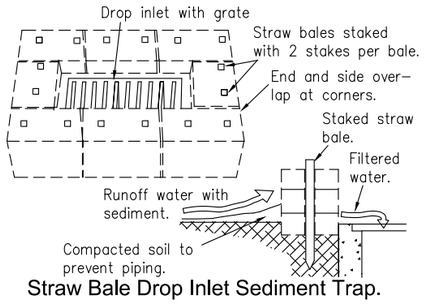

Perimeter Bank (with channel)



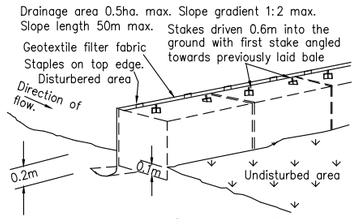

Level Spreader (or Sill)



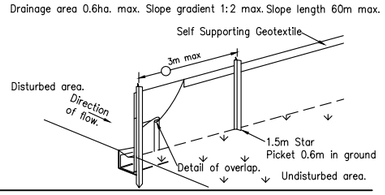

Geotextile Filter Fabric Drop Inlet Sediment Trap.

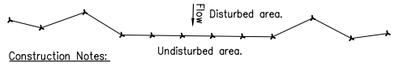



Straw Bale Drop Inlet Sediment Trap.




Hay Bale Sediment Fence.

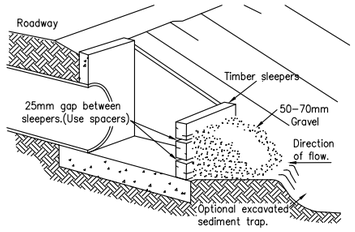


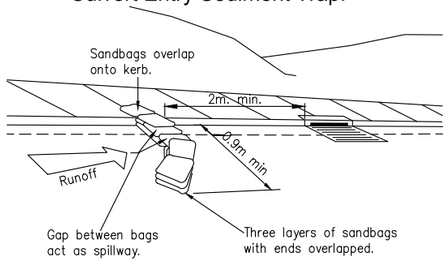

Construction Notes:

1. Construct sediment fence as close as possible to parallel to site contours.
2. Drive 1.5m star pickets into ground 3m apart.
3. Dig 150mm deep trench along upslope line of fence for the bottom of the fabric to be entrenched.
4. Backfill trench over base of fabric.
5. Fix self supporting Geotextile to upslope side of posts with wire ties or as recommended by Geotextile manufacturer.
6. Join sections of fabric at a support post with a 150mm overlap.

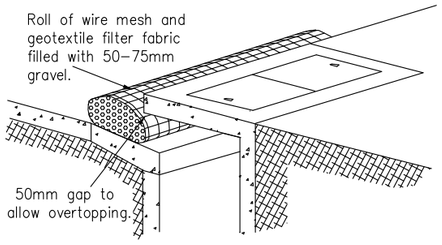
Sediment Fence.



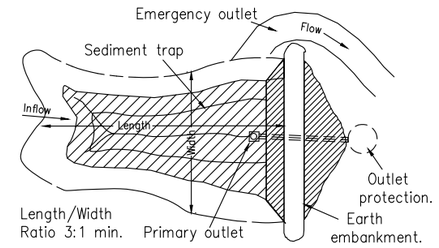

Culvert Entry Sediment Trap.



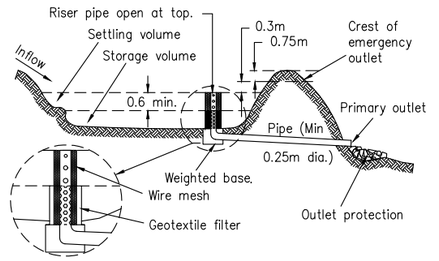

Sandbag Kerb Inlet Sediment Trap.



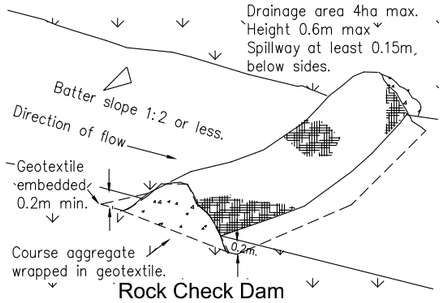

Portable Gravel Kerb Inlet Sediment Trap



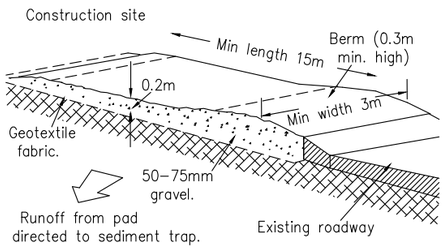

Plan View of Typical Sediment Basin



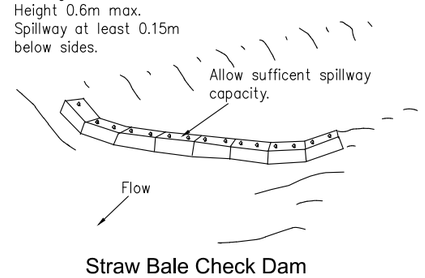

Cross Section of Typical Sediment Basin.




Rock Check Dam




Temporary Construction Exit




Straw Bale Check Dam

# SEDIMENT AND EROSION CONTROL NOTES

## GENERAL

1. ALL WORK IS TO BE IN ACCORDANCE WITH THE PLAN AND CONSISTENT WITH NSW LANDCOM PUBLICATION "MANAGING STORMWATER; SOILS & CONSTRUCTION" (THE "BLUE BOOK" 4th EDITION 2004)
2. THE NOMINATED PROJECT MANAGER (OR EARTHWORKS CONTRACTOR) SHALL BE RESPONSIBLE FOR THE IMPLEMENTATION OF THE EROSION AND SEDIMENT CONTROL PLAN
3. THE PROJECT MANAGER SHALL INFORM ALL CONTRACTORS AND SUB CONTRACTORS OF THEIR OBLIGATIONS UNDER THE ESCP
4. THE PROJECT MANAGER SHALL PROVIDE APPROPRIATE ENVIRONMENTAL INDUCTION TO ALL STAFF
5. THE PROJECT MANAGER SHALL PROVIDE APPROPRIATE ENVIRONMENTAL TRAINING TO ALL STAFF
6. THE PLAN SHALL INCLUDE A WORKS PROGRAM (E.G GANTT CHART) INCLUDING ACCOUNTABILITY FOR EACH ACTION (I.E RESPONSIBILITY / SIGN OFF)
7. CONTROL MEASURES SHALL BE IN PLACE PRIOR TO EACH SITE DISTURBANCE
8. SITE DISTURBANCE SHALL BE STAGED WHERE POSSIBLE
9. WORK SHALL BE RESTRICTED TO THE WELL DEFINED WORKS ZONES
10. ALL WORKS ARE TO BE INSPECTED, AND MAINTAINED WHERE NECESSARY, ON A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT
11. FAILURE TO IMPLEMENT ANY PART OF THE PLAN WILL CONSTITUTE A HOLD POINT (THIS WOULD ALSO CONSTITUTE A BREACH OF THE PROTECTION OF THE ENVIRONMENT OPERATIONS ACT).

## SITE INFRASTRUCTURE

12. THE SITE SUPERVISOR SHALL ENSURE ALL MATERIALS REQUIRED FOR EROSION AND SEDIMENT CONTROL, INCLUDING REHABILITATION WORKS, SHALL BE ON-SITE PRIOR TO IMPLEMENTATION DATES
13. ALL PROJECT MATERIALS SHALL BE CORRECTLY LOCATED AND PROTECTED TO AVOID ANY ADVERSE ENVIRONMENTAL IMPACT
14. ALL WEATHER AND SAFE SITE ACCESS SHALL BE IDENTIFIED
15. A SOIL RETENTION SYSTEM (E.G.. GRAVEL SHAKEDOWN ZONE) SHALL BE PROVIDED AT ALL SITE ACCESSES
16. ANY SOIL MATERIAL TRACKED OFF-SITE ONTO ROADWAYS SHALL BE IMMEDIATELY REMOVED
17. ALL CHEMICAL STORAGE SHALL BE MANAGED (E.G BUNDED) IN ACCORDANCE WITH WORKCOVER OR EPA GUIDELINES

## CLEARING

18. NO-GO AREAS SHALL BE CLEARLY MARKED BY MEANS OF APPROPRIATE MARKINGS.
19. VEGETATION TO BE CLEARED SHALL BE CLEARLY MARKED USING APPROPRIATE MARKINGS
20. MACHINERY CUTTING EDGES SHALL NOT CONTACT THE SOIL (GRASS, SMALLER SHRUBS, AND ROOTS ETC. WILL BE INCORPORATED INTO THE TOPSOIL WHEN STRIPPED)
21. MINIMUM FORWARD CLEARING SHALL BE ADOPTED. CLEARING OF WATERCOURSES WILL NOT BE CARRIED OUT UNTIL THE ASSOCIATED WORK COMMENCES
22. LOGS SHALL BE SALVAGED OR REPLACED AS HABITAT. REMAINING VEGETATION SHALL BE USED AS MULCH, REMOVED TO AN AUTHORISED WASTE STATION OR BURNED IN PITS UNDER A LICENCE FROM THE EPA
23. VEGETATION WINDROWS SHALL BE LOCATED OUT OF FLOW LINES AND AWAY FROM UNDISTURBED VEGETATION
24. TEMPORARY OR PERMANENT STABILISATION (E.G.. SOWING OF COVERCROP) SHALL BE IMPLEMENTED WITHIN 1 WEEK ON SECTIONS OF CLEARED ZONES NOT FURTHER SUBJECT TO WORKS.

## TOPSOIL STRIPPING

25. TOPSOIL SHALL INCLUDE A MINIMUM OF THE FIRST 100-150 MM OF THE SOIL SURFACE.
26. ALL TOPSOIL SHALL BE STRIPPED FROM ALL AREAS THAT ARE TO BE CUT OR FILLED AND STOCKPILED IN AREAS INDICATED ON THE PLAN, AWAY FROM DRAINAGE FLOWPATHS OR STORMWATER INLETS
27. TOPSOIL STOCKPILES SHALL BE LIMITED TO 1.5M IN HEIGHT, TRACK ROLLED AND WHERE STOCKPILED FOR PERIODS GREATER THAN 6 WEEKS FURTHER STABILISED (E.G.. EROSION PROTECTION BLANKET, VEGETATIVE COVER CROP (SEE BELOW) OR MULCHED).

## EROSION CONTROL

28. THE EXTENT OF CUT AND FILLS SHALL BE MINIMISED
29. CUT AND FILL BATTER GRADES SHALL IDEALLY BE AT 1:3
30. OVER FILLING OF BATTERS SHALL BE AVOIDED
31. BARRIER OR SIMILAR FENCING SHALL BE USED TO PROTECT NO-GO AREAS
32. DISTURBED SOIL AREAS SHALL BE EFFECTIVELY MANAGED BY STAGING, MINIMISING AREA EXPOSED AT ANY ONE TIME AND MINIMISING THE EXPOSURE TIMEFRAME OF EACH
33. CATCHMENTS SHALL BE BROKEN INTO SMALLER SUB-CATCHMENTS THEREBY REDUCING RUNOFF VOLUMES E.G.:
    - DIVERTING CLEAN 'RUN-ON' WATER SAFELY AROUND THE SITE USING CATCH DRAINS OR BANKS (GRADES GENERALLY 1-2%, TO STABLE OUTLET AREAS), OR THROUGH THE DISTURBED WORK SITE TEMPORARILY LINING DESIGNATED FLOW PATHS
    - REDUCING SLOPE LENGTHS USING DIVERSION DRAINS (GRADES GENERALLY 3-4%) AT REGULAR INTERVALS ACROSS THE SLOPE ) GENERALLY LOCATED AT EVERY LM FALL IN LONG GROUNDSLOPE ) TO SUITABLE SEDIMENT TRAPS / ENERGY DISSIPATERS
    - MINIMISING THE STEEPNESS OF DISTURBED SLOPES
34. SOIL MATERIAL STOCKPILES (EXCAVATED AND IMPORTED) SHALL BE LOCATED OUT OF FLOW LINES
35. TEMPORARY OR PERMANENT SOIL COVERING SHALL BE PROVIDED WHERE APPROPRIATE TO REDUCE EROSION
36. ALL CONTROL MEASURES SHALL BE APPROPRIATELY DESIGNED, SIZED, LOCATED AND INSTALLED
37. ALL PERMANENT EROSION CONTROL MEASURES SHALL BE INSTALLED AS EARLY AND AS SOON AS THEIR EARTHWORKS ARE COMPLETED.

## SEDIMENT CONTROL

38. THE NEED FOR SEDIMENT CONTROL MEANS THAT EROSION CONTROL HAS NOT BEEN ACHIEVED.
39. SEDIMENT FILTERS (E.G.. SEDIMENT FENCE) SHALL BE USED TO FILTER ALL 'SHEET FLOW' RUNOFF FROM DISTURBED AREAS. SEDIMENT FENCING SHALL BE INSTALLED TO THE MANUFACTURERS SPECIFICATIONS AND:
    - BE SPACED SUCCESSIVELY SPACED DOWNSLOPE NO GREATER THAN 50 M APART AND APPROXIMATELY AT EVERY 1 M FALL IN GROUNDSLOPE
    - BE INSTALLED TO THE CONTOUR
    - HAVE THE ENDS TURNED UPSLOPE 500 MM WHERE APPROPRIATE TO CREATE STORAGE
    - WHERE SEDIMENT FENCING CANNOT BE PLACED ON THE CONTOUR, SMALL CHECK DAMS OR FENCE RETURNS SHALL BE INCORPORATED AT REGULAR INTERVALS ALONG THE FENCE LINE TO SLOW RUNOFF

## SEDIMENT CONTROL (Cont)

40. SEDIMENT TRAPS (E.G EXCAVATIONS, BARRIERS) SHALL BE USED TO POND 'CONCENTRATED' RUNOFF THEREBY ALLOWING SETTLEMENT AND RETENTION OF SEDIMENT. SEDIMENT TRAPS SHALL BE INSTALLED IN ACCORDANCE WITH PLAN DETAILS OR NOTE 1. THEY WILL:
    - BE AS LARGE AS PRACTICAL
    - BE CONSTRUCTED TO SUIT EXPECTED FLOW CONDITIONS
    - BE LOCATED APPROXIMATELY EVERY 1 M FALL IN GROUNDSLOPE
    - PROVIDE FOR SAFE OVERFLOW
41. SEDIMENT CONTROLS SHALL BE LOCATED AS CLOSE TO DISTURBED AREAS AS PRACTICAL
42. TRAPPED SEDIMENT SHALL BE REMOVED TO AN APPROPRIATE NOMINATED LOCATION
43. TEMPORARY CONTROL MEASURES SHALL REMAIN IN PLACE UNTIL THE CATCHMENT THEY ARE SERVICING IS STABILISED (FOR GRASS THIS WILL MEAN 70% GROUNDCOVER).

## DUST CONTROL

44. ALL SOIL LOADED TRUCKS LEAVING OR ENTERING THE SITE SHALL BE TARPED
45. A WATER CART SHALL BE CONTINUALLY PROVIDED TO AVOID DUST GENERATION
46. WATERING, WIND FENCING, MANUFACTURED COVERINGS AND/OR MULCH SHALL BE PROVIDED WHERE COVERCROP STRIKE IS INHIBITED

## TOPSOIL REPLACEMENT

47. TOPSOIL SHALL BE RE-SPREAD OVER ALL EXPOSED SOIL SURFACES WHERE VEGETATION IS REQUIRED. A MAXIMUM DEPTH OF 50 MM SHALL BE PLACED ON SLOPES STEEPER THAN 1:3 AND A MINIMUM DEPTH OF 100 MM SHALL BE PLACED ON SLOPES LESS THAN 1:3
48. WHERE CUT BATTERS ARE TO BE SEEDED, SLOPES EXCEEDING 1:2.5 (H:V) SHALL BE ROUGHENED HORIZONTALLY TO ENHANCE THE RETENTION OF TOPSOIL
49. SOIL AMELIORANTS SHALL BE PROVIDED WHERE REQUIRED AS DETERMINED BY THE PROJECT MANAGER.
50. SEEDBED PREPARATION SHALL BE PROVIDED WHERE TOPSOIL HAS BEEN OVERLY COMPACTED.

## REVEGETATION

51. REVEGETATION SHALL BE ON-GOING AND PROGRESSIVE
52. WHERE ANY BREAK IN OPERATIONS, OR WHERE WORK IS CEASED IN AN AREA FOR LONGER THAN 4 WEEKS, THE EXPOSED AREAS SHALL BE STABILISED (E.G.. TEMPORARY TOPSOILING AND SEEDING WITH AN APPROPRIATE COVERCROP, MULCHES, BLANKETS / MATTINGS)
53. TOPSOILED AREAS SHALL BE SEEDED WITH THE FOLLOWING COVERCROP SPECIES:
    - SEPTEMBER TO FEBRUARY JAPANESE MILLET (15 KG/HA)
    - MARCH TO AUGUST ANNUAL RYEGRASS OR CEREAL RYE OR OATS (15 KG/HA)
54. FROM LATE FEBRUARY TO EARLY MARCH AND LATE AUGUST TO EARLY SEPTEMBER A COMBINATION OF SPECIES CAN BE USED
55. PERMANENT GRASS SPECIES SHALL COMPRISE:
    - PRE CONSTRUCTION OR NOMINATED SPECIES.
56. PERMANENT SHRUB AND TREE SPECIES SHALL COMPRISE:
    - AS PER LANDSCAPE PLAN;
    - IN ABSENCE OF LANDSCAPE PLAN, LOCAL NATIVE SPECIES. NOMINATE PLANT SPECIES, ITS FORM (SEED OR SEEDLING), PLANTING RATES, REGIMES, MATRICES,
57. AN NPK 11-34-11 FERTILISER OR SIMILAR AS APPROPRIATE SHALL BE APPLIED AT A RATE OF 200-400 KG/HA. CARE IS TO BE TAKEN TO AVOID ANY FERTILISER DIRECTLY ENTERING WATERCOURSES.
58. SCARIFYING OR DIRECT DRILLING SHOULD BE USED TO IMPROVE SEED STRIKE RATES
59. REVEGETATION WORKS SHALL BE MAINTAINED / ENHANCE (E.G.. RESEEDING, FERTILISING, WATERING) UNTIL A MINIMUM OF 70% GROUND COVER IS ESTABLISHED.
60. ADDITIONAL PROTECTION MEASURES (E.G ORGANIC MATTING / BLANKETS) SHALL BE PROVIDED (NOMINATE)
61. A STRIP OF TURF SHALL BE PROVIDED AND MAINTAINED IMMEDIATELY BEHIND KERB WHERE FOOTPATH AND SITE DISTURBANCE HAS OCCURRED AND COMPLIMENTED BY ADDITIONAL STRIPS ACROSS THE FOOTPATH AT REGULAR INTERVALS WHERE RUNOFF IS EXPECTED TO FLOW ALONG THE SAID FOOTPATH.
62. STOCKPILE SITES, BORROW PITS ETC. SHALL BE REVEGETATED IMMEDIATELY UPON DECOMMISSION.

## MONITORING

63. THE WORKS SUPERVISOR SHALL BE RESPONSIBLE FOR:
    AUDIT OF THE ESCP
    - MONITORING OF ESCs
    - MAINTENANCE OF ESCs
    - MANAGEMENT OF ANY NON-CONFORMANCES

## MAINTENANCE

64. THE WORKS SUPERVISOR SHALL BE RESPONSIBLE FOR ENSURING CONTROL MEASURES ARE CHECKED WEEKLY AND AFTER EACH RAINFALL EVENT INSPECTION AND MAINTENANCE PROVIDED WHERE REQUIRED.
65. TEMPORARY CONTROL MEASURES SHALL BE MAINTAINED UNTIL A MINIMUM OF 70% GROUND COVER IS ACHIEVED
66. WATER QUALITY ASSESSMENT SHALL BE PROVIDED PRIOR TO DISCHARGE OF ANY CONTAMINATED SITE STORMWATER INTO EITHER SURFACE OR GROUND WATERS
67. REHABILITATED AREAS SHALL BE MONITORED PERIODICALLY TO CHECK FOR THE POSSIBLE ONSET OF SOIL EROSION AND/OR WEED PROBLEMS.

## AT COMPLETION

68. THE WORKS SUPERVISOR SHALL ENSURE THAT:
    - ALL PERMANENT ESC WORKS ARE CORRECTLY INSTALLED
    - ALL TEMPORARY CONTROL MEASURES ARE REMOVED, BUT ONLY WHEN AT LEAST 70% GROUND COVER HAS BEEN ACHIEVED

## EVALUATION

69. THE WORKS SUPERVISOR SHALL ENSURE THE PLAN IS CONTINUALLY EVALUATED AND AMENDMED WHERE REQUIRED.

| REV. | DATE | REVISION | DR.BY | AP.BY |
|---|---|---|---|---|
| DA1 | 08/02/17 | FOR DA APPROVAL | KWW | RDG |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| Scale: AS SHOWN | Cad File No.: 13056_Civil - LOT 36.dwg | | |
| Surveyed: MR | Datum: AHD | | |
| Drawn: KWW | Designed: KWW | Approved: RDG | |
| Checked: RDG | Date: JAN 2017 | No. of dwgs: -- | |

Project: SALTWATER DEVELOPMENT SOUTH WEST ROCKS, NSW

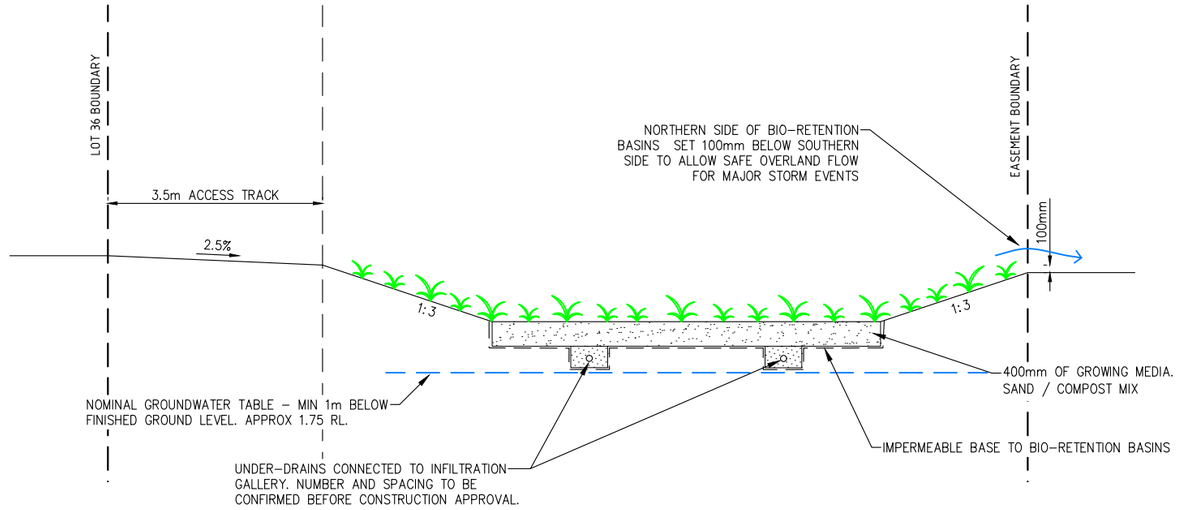
Client: S W R Developments Pty Ltd

Title: SEDIMENT AND EROSION CONTROL DETAILS

Project No.: 13056

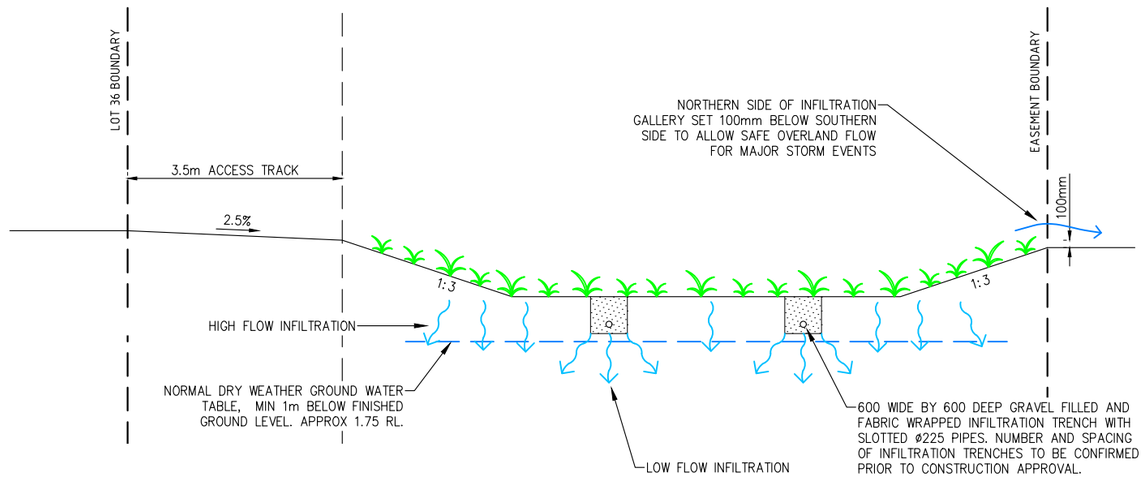
Drawing No.: L36-MOD06

Amendment No.: DA1




## BIO–RETENTION BASIN DETAIL

NTS




## INFILTRATION GALLERY DETAIL

NTS

| REV. | DATE | REVISION | DR.BY | AP.BY |
|---|---|---|---|---|
| DA1 | 08/02/17 | FOR DA APPROVAL | KWW | RDG |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Project: SALTWATER DEVELOPMENT SOUTH WEST ROCKS, NSW

Client: S W R Developments Pty Ltd

Title: BIO-RETENTION BASIN AND INFILTRATION GALLERY DETAIL



Project No. 13056

Drawing No. L36-MOD07

Amendment No. DA1