# BLAKEBROOK PUBLIC SCHOOL
# 417 ROSEHILL ROAD BLAKEBROOK NSW 2480
# CIVIL ENGINEERING WORKS

## GENERAL NOTES:

1. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH LISMORE CITY COUNCIL'S SPECIFICATION. CONTRACTOR TO OBTAIN AND RETAIN A COPY ON SITE DURING THE COURSE OF THE WORKS.
2. ALL NEW WORKS ARE TO MAKE A SMOOTH JUNCTION WITH EXISTING CONDITIONS AND MARRY IN A 'WORKMANLIKE' MANNER.
3. THE CONTRACTOR IS TO VERIFY THE LOCATION OF ALL SERVICES WITH EACH RELEVANT AUTHORITY. ANY DAMAGE TO SERVICES SHALL BE RECTIFIED BY THE CONTRACTOR OR THE RELEVANT AUTHORITY AT THE CONTRACTOR'S EXPENSE. SERVICES SHOWN ON THESE PLANS ARE ONLY THOSE EVIDENT AT THE TIME OF SURVEY OR AS DETERMINED FROM SERVICE DIAGRAMS. H & H CONSULTING ENGINEERS PTY. LTD CANNOT GUARANTEE THE INFORMATION SHOWN NOR ACCEPT ANY RESPONSIBILITY FOR INACCURACIES OR INCOMPLETE DATA.
4. SERVICES & ACCESSES TO THE EXISTING PROPERTIES ARE TO BE MAINTAINED IN WORKING ORDER AT ALL TIMES DURING CONSTRUCTION.
5. ADJUST EXISTING SERVICE COVERS TO SUIT NEW FINISHED LEVELS TO RELEVANT AUTHORITY REQUIREMENTS WHERE NECESSARY.
6. REINSTATE AND STABILISE ALL DISTURBED LANDSCAPED AREAS.
7. MINIMUM GRADE OF SUBSOIL SHALL BE 0.5% (1:200) FALL TO OUTLETS.
8. ALL TEMPORARY SEDIMENT AND EROSION CONTROL DEVICES ARE TO BE CONSTRUCTED, PLACED AND MAINTAINED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS, EROSION AND SEDIMENTATION CONTROL PLAN AND LISMORE CITY COUNCIL'S REQUIREMENTS WHERE APPLICABLE.
9. CONTRACTOR TO CHECK AND CONFIRM SITE DRAINAGE CONNECTIONS ACROSS THE VERGE PRIOR TO COMMENCEMENT OF SITE DRAINAGE WORKS.
10. PROPERTIES AFFECTED BY THE WORKS ARE TO BE NOTIFIED IN ADVANCE WHERE DISRUPTION TO EXISTING ACCESS IS LIKELY.

## SURVEY NOTES

THE EXISTING SITE CONDITIONS SHOWN ON THE FOLLOWING DRAWINGS HAVE BEEN INVESTIGATED BY THE SURVEYOR SPECIFIED IN THE TITLE BLOCK.
THE INFORMATION IS SHOWN TO PROVIDE A BASIS FOR DESIGN. HENRY AND HYMAS PTY. LTD. DOES NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF THE SURVEY BASE OR ITS SUITABILITY AS A BASIS FOR CONSTRUCTION DRAWINGS.
SHOULD DISCREPANCIES BE ENCOUNTERED DURING CONSTRUCTION BETWEEN THE SURVEY DATA AND ACTUAL FIELD DATA, CONTACT HENRY AND HYMAS PTY. LTD. THE FOLLOWING NOTES HAVE BEEN TAKEN DIRECTLY FROM ORIGINAL SURVEY DOCUMENTS.

| | |
|---|---|
| ORIGIN OF LEVELS | PM79619 RL10.984 |
| DATUM | A.H.D. |
| CONTOUR INTERVAL | 0.2m |


## LOCALITY SKETCH

SCALE: N.T.S.

## DRAWING SCHEDULE

| | |
|---|---|
| BLA-CIV-PP-DWG-0000 | COVER SHEET, DRAWING SCHEDULE, NOTES & LOCALITY SKETCH |
| BLA-CIV-PP-DWG-0050 | DEMOLITION PLAN |
| BLA-CIV-PP-DWG-0100 | DETAIL PLAN |
| BLA-CIV-PP-DWG-0200 | STORMWATER MISCELLANEOUS DETAILS & PIT LID SCHEDULE |
| BLA-CIV-PP-DWG-0201 | STORMWATER MISCELANEOUS DETAILS |
| BLA-CIV-PP-DWG-0250 | PRE-DEVELOPMENT CATCHMENT PLAN |
| BLA-CIV-PP-DWG-0251 | POST-DEVELOPMENT CATCHMENT PLAN |
| BLA-CIV-PP-DWG-0901 | SEDIMENT & EROSION CONTROL PLAN - STAGE 1 (DEMOLITION) |
| BLA-CIV-PP-DWG-0902 | SEDIMENT & EROSION CONTROL PLAN - STAGE 2 (MAIN WORKS) |
| BLA-CIV-PP-DWG-0910 | SEDIMENT & EROSION CONTROL TYPICAL SECTIONS & DETAILS |

## SITEWORKS NOTES

- DATUM : A.H.D.
- ORIGIN OF LEVELS : REFER TO BENCH OR STATE SURVEY MARKS WHERE SHOWN ON PLAN.
- CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO THE COMMENCEMENT OF WORK.
- ALL WORKS TO BE UNDERTAKEN IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS & THE DIRECTIONS OF THE SUPERINTENDENT.
- EXISTING SERVICES UNLESS SHOWN ON THE SURVEY PLAN HAVE BEEN PLOTTED FROM SERVICES SEARCH PLANS AND AS SUCH THEIR ACCURACY CANNOT BE GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY.
- WHERE NEW WORKS ABUT EXISTING THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS ACHIEVED.
- THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR.
- CARE IS TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATION IS TO BE UNDERTAKEN OVER TELSTRA OR ELECTRICAL SERVICES. HAND EXCAVATE IN THESE AREAS.
- CONTRACTOR TO OBTAIN AUTHORITY APPROVALS WHERE APPLICABLE.
- MAKE SMOOTH TRANSITION TO EXISTING SURFACES AND MAKE GOOD.
- THESE PLANS SHALL BE READ IN CONJUNCTION WITH APPROVED LANDSCAPE, ARCHITECTURAL, STRUCTURAL, HYDRAULIC AND MECHANICAL DRAWINGS AND SPECIFICATIONS OR WRITTEN INSTRUCTIONS THAT MAY BE ISSUED RELATING TO DEVELOPMENT AT THE SITE.
- TRENCHES THROUGH EXISTING ROAD AND CONCRETE PAVEMENTS SHALL BE SAWCUT TO FULL DEPTH OF CONCRETE AND A MINIMUM OF 50mm IN BITUMINOUS PAVING.
- ALL BRANCH GAS AND WATER SERVICES UNDER DRIVEWAYS AND BRICK PAVING SHALL BE LOCATED IN Ø80 uPVC SEWER GRADE CONDUITS EXTENDING A MINIMUM OF 500mm BEYOND EDGE OF PAVING.
- GRADES TO PAVEMENTS TO BE AS IMPLIED BY RL'S ON PLAN . GRADE EVENLY BETWEEN NOMINATED RL'S. AREAS EXHIBITING PONDING GREATER THAN 5mm DEPTH WILL NOT BE ACCEPTED UNLESS IN A DESIGNATED SAG POINT.
- ALL COVERS AND GRATES ETC TO EXISTING SERVICE UTILITIES ARE TO BE ADJUSTED TO SUIT NEW FINISHED SURFACE LEVELS WHERE APPLICABLE.

## EXISTING SERVICES & FEATURES

- THE CONTRACTOR SHALL ALLOW FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF ALL EXISTING SERVICES IN AREAS AFFECTED BY WORKS WITHIN THE CONTRACT AREA OR AS SHOWN ON THE DRAWINGS UNLESS DIRECTED OTHERWISE BY THE SUPERINTENDENT.
- THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES SERVICES TO ALL BUILDINGS NOT AFFECTED BY THE WORKS ARE NOT DISRUPTED.
- PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL GAIN APPROVAL OF HIS PROGRAM FOR THE RELOCATION/ CONSTRUCTION OF TEMPORARY SERVICES.
- CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN SUPPLY TO EXISTING BUILDING REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED, THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.
- INTERRUPTION TO SUPPLY OF EXISTING SERVICES SHALL BE DONE SO AS NOT TO CAUSE ANY INCONVENIENCE TO THE PRINCIPAL. CONTRACTOR TO GAIN APPROVAL FROM THE SUPERINTENDENT FOR TIME OF INTERRUPTION.
- EXISTING SERVICES, BUILDINGS, EXTERNAL STRUCTURES AND TREES SHOWN ON THESE DRAWINGS ARE EXISTING FEATURES PRIOR TO ANY DEMOLITION WORKS.
- EXISTING SERVICES UNLESS SHOWN ON SURVEY PLAN HAVE BEEN PLOTTED FROM SERVICES SEARCH PLANS AND AS SUCH THEIR ACCURACY CANNOT BE GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLETE A 'DIAL BEFORE YOU DIG' SEARCH AND TO ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY.
- ALL BRANCH GAS AND WATER SERVICES UNDER DRIVEWAYS AND BRICK PAVING SHALL BE LOCATED IN Ø80 uPVC SEWER GRADE CONDUITS EXTENDING A MINIMUM OF 500mm BEYOND EDGE OF PAVING.

**FOR DA ONLY**

SURVEY INFORMATION
SURVEYED BY
BEVERIDGE WILLIAMS
DATUM: A.H.D.
ORIGIN OF LEVELS: PM 79619 RL 10.984

| REVISION | AMENDMENT | DRAWN | DESIGNED | DATE |
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| 02 | ISSUED FOR DA1 ONLY | MB | NW | 26.09.2023 |
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Client
SCHOOL INFRASTRUCTURE

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henry&hymas

Project
BLAKEBROOK PUBLIC SCHOOL
417 ROSEHILL ROAD BLAKEBROOK NSW 2480

Title
COVER SHEET, DRAWING SCHEDULE, NOTES & LOCALITY SKETCH

| Drawn | Designed | Original issue date |
|---|---|---|
| M.Pereira | B.Seizov | AUGUST |
| Checked | Approved | Scale @A1 |
| B.Seizov | A.Francis | NTS |

Drawing number: BLA-CIV-PP-DWG-0000

Revision: 03

## LEGEND

PROPERTY BOUNDARY

DEMOLITION AREAS

RETAIN EXISTING SHED

EXISTING POLY WATER TANK TO BE MADE REDUNDANT

EXISTING STORMWATER PITS AND PIPES TO BE MADE REDUNDANT

EXISTING GREEN HOUSE TO BE DEMOLISHED

EXISTING PLAY EQUIPMENT TO BE DEMOLISHED

EXISTING WATER TANKS TO BE MADE REDUNDANT

EXISTING CONTAINER TO BE RELOCATED

EXISTING STORMWATER PITS AND PIPES TO BE MADE REDUNDANT

TREE RETENTION TO BE CONFIRMED BY PROJECT ARBORIST TYPICAL

EXISTING STORMWATER PITS AND PIPES TO BE MADE REDUNDANT

EXISTING SEPTIC TANK TO BE MADE REDUNDANT

EXISTING WATER TANKS TO BE MADE REDUNDANT

TEMPORARY SCHOOL TO BE RELOCATED

EXISTING WATER TANKS TO BE MADE REDUNDANT

BM 2 GI NAIL IN BITUMEN RL 14.38 (AHD)

BM T O-NAIL IN BITUMEN RL 14.20 (AHD)

EXISTING BUS SHELTER TO BE RELOCATED

EXISTING STORMWATER TO BE RETAINED. CONTRACTOR TO INVESTIGATE IF EXISTING PIPE CAN BE REUSED

2 DP859866

ROSEHILL ROAD

# DEMOLITION PLAN

SCALE: 1:250

0 5 10 15 20 25m

SCALE 1:250

**NOTE:**

- TREE RETENTION TO BE CONFIRMED BY PROJECT ARBORIST.
- BUILDING AND STRUCTURE RETENTION TO BE CONFIRMED BY PROJECT ARCHITECTURAL.

**FOR DA ONLY**

SURVEY INFORMATION

SURVEYED BY BEVERIDGE WILLIAMS

DATUM: A.H.D.

ORIGIN OF LEVELS: PM 79619 RL 10.984

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Client: SCHOOL INFRASTRUCTURE

Architect: PEDAVOLI ARCHITECTS PTY LTD



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H&H Job No: 230050

DRAWING TO BE PRINTED IN COLOUR

henry&hymas

Project: BLAKEBROOK PUBLIC SCHOOL
417 ROSEHILL ROAD BLAKEBROOK NSW 2480

Title: DEMOLITION PLAN

| Drawn | Designed | Original issue date |
|---|---|---|
| M.Pereira | B.Seizov | AUGUST |
| Checked | Approved | Scale @A1 |
| B.Seizov | A.Francis | 1:250 |

Drawing number: BLA-CIV-PP-DWG-0050

Revision: 03

CONNECT WHOLE ROOF CATCHMENT TO THE PROPOSED 68 KL RWT AND PROVIDE OVERFLOW PIPE TO THE NEAREST PIT.
REFER HYDRAULIC DRAWING FOR DETAIL AND ROOF CONNECTION AND INTEGRATION WITH TOILETS AND

PROPOSED RIP RAP SCOUR PROTECTION

INSTALL EARTH BUND ALONG NORTHERN BOUNDARY TO DIVERT OVERLAND FLOW AWAY FROM DEVELOPMENT BUILDING AREA

OVERFLOW Ø225 PIPE

EXISTING METAL SHED TO RETAIN

PROPOSED NEW SWALE AND EARTH BUND TO CONNECT TO EXISTING SWALE, STABILISE WITH ROCK

EXISTING SWALE TO REMAIN

BUILDING EXTENT OVER, PROPOSED RL 19.3

SEPTIC TANKS BY OTHERS

PROPOSED FIRE TANKS BY OTHERS

EXISTING PIT TO REMAIN

FLOOD WARNING NOTICE SIGNAGE IS RECOMMENDED BE INSTALLED WITHIN THE SCHOOL GROUNDS AT A PROMINENT LOCATION NEAR THE MAIN SCHOOL ENTRY POINT FOR THE INFORMATION OF THE SCHOOL COMMUNITY. FINAL LOCATION TO BE DETERMINED IN LATER STAGE BY THE ARCHITECT.

FILL THIS AREA TO AVOID SAG POINT

EXISTING BUS SHELTER TO BE RELOCATED

LISMORE COUNCIL TO BE CONTACTED TO INVESTIGATE NUISANCE PONDING AND STORMWATER GRATE LEVELS WITHIN THE VERGE CARPARK AREA OF ROSEHILL ROAD. THE STORMWATER PIT AT THIS LOCATION NEAR THE SCHOOL ENTRANCE AT ROSEHILL ROAD IS SILTED AND SHOULD BE DE-SILTED BY COUNCIL. THE COUNCIL STORMWATER PIPE MAY ALSO NEED DE-SILTING (JET-BLASTING). THE AREA FROM THE SCHOOL ENTRANCE TO THE EXISTING PIT TO BE REGRADED TO PROVIDE FALL.

TEMPORARY SCHOOL

CONTRACTOR TO INVESTIGATE IF EXISTING PIPE CAN BE REUSED

ROSEHILL ROAD

LISMORE COUNCIL TO BE CONTACTED TO DE-SILT AND RE-GRADE THE EXISTING SWALE DRAIN WITHIN THE VERGE OF ROSEHILL ROAD NEAR THE SOUTH-EAST CORNER OF THE SITE

FILL THIS AREA TO AVOID SAG POINT

2 DP 859866

BM 2 GI NAIL IN BITUMEN

BM 1 GI NAIL IN BITUMEN RL 14.20 (AHD)

**FLOOD WARNING NOTICE**

THESE SCHOOL GROUNDS ARE SUBJECT TO INUNDATION BY FLOOD WATER DURING:
- FLOODING OF GOOLMANGAR CREEK
- COMBINED FLOODING OF GOOLMANGAR CREEK, TERANIA CREEK, LEYCESTER CREEK AND WILSONS RIVER.

THE SCHOOL ADMINISTRATION WILL PROVIDE INFORMATION TO PARENTS AND CITIZENS IN ACCORDANCE WITH THE FLOOD EMERGENCY RESPONSE PLAN.
FLOOD WATCHES/WARNINGS/ALERTS AND ADVICE FROM THE STATE EMERGENCY SERVICE AND OTHER AUTHORITIES.

LOCAL ROADS ARE SUBJECT TO FLOODING.

DO NOT DRIVE THROUGH FLOODWATER.

THE SCHOOL MAY BE CLOSED (DO NOT ATTEND) OR EVACUATED UPON ISSUE OF A 'SEVERE WEATHER WARNING' OR 'FLOOD WATCH' NOTIFICATION BY THE BUREAU OF METEOROLOGY.

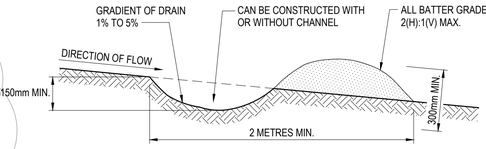
THIS NOTICE IS NOT TO BE REMOVED OR RELOCATED.

## DETAIL PLAN
SCALE: 1:250

0 5 10 15 20 25m
5 4 3 2 1
SCALE 1:250

## LEGEND

- PROPERTY LEASE LINE
- BUILDING EXTENT OVER LINES
- ROOF LINES
- PROPOSED SUBSOIL LINE
- PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIPE
- PROPOSED SURFACE INLET PITS
- A-1 LINE LETTER / PIT NUMBER — PROPOSED PIT TAG
- RL14.80 — PROPOSED SPOT LEVEL
- EX13.60 — EXISTING SPOT LEVEL
- EXISTING PIT
- SW EXISTING STORMWATER LINE
- T EXISTING TELECOM LINE
- E EXISTING ELECTRICITY LINE
- O/F OVERLAND FLOW PATH
- IK PROPOSED INTEGRAL KERB
- 15.40 EXISTING CONTOURS




NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

## EARTH BANK CONSTRUCTION NOTES:

1. BUILD WITH GRADIENTS BETWEEN 1% AND 5%.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS-SECTIONS, NOT "V" SHAPED.
5. ENSURE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

## SECTION A
SCALE N.T.S.

## NOTE:

- CONTRACTOR TO INVESTIGATE PRESENCE OF UTILITIES, SIZE AND DEPTH OF ALL IN-GROUND UTILITIES, PRIOR TO CONSTRUCTION. SERVICES SHOWN ON THIS DRAWING DEPICTED FROM SERVICES SEARCH PLANS AND CANNOT BE GUARANTEED.
- ALL STORMWATER PITS TO HAVE Ø100 uPVC SLOTTED SUBSOIL PIPES CONNECTED TO THEM. THESE SUBSOILS TO EXTEND 3m UPSTREAM OF THE PIT AT A MINIMUM GRADE.
- INVERT LEVEL TO EXISTING STORMWATER DRAINAGE LINES TO BE CHECKED AND CONFIRMED PRIOR TO COMMENCEMENT OF WORK.
- SERVICES SHOWN ON THIS DRAWING ARE DEPICTED FROM SERVICES SEARCH PLANS AND CAN NOT BE GUARANTEED. THE EXACT DEPTH AND LOCATION OF ALL IN-GROUND UTILITIES TO BE DETERMINED BY POT HOLING OR CABLE SEARCH.
- DOWNPIPE LOCATION AND CONNECTION TO HYDRAULIC ENGINEER'S DETAILS.
- CONTRACTOR TO ALLOW FOR SUBSOIL LINES BEHIND EVERY RETAINING WALL AND KERB EVEN IF NOT SHOWN IN PLAN.
- FLOOR OF EVERY STORMWATER PIT TO BE BENCHED WITH GROUT FILL TO FACILITATE FLOW TOWARDS OUTLET PIPE.

## NOTE:

**STORMWATER DESIGN SUMMARY**

IN ACCORDANCE WITH COUNCIL DCP AND HANDBOOK OF STORMWATER DRAINAGE DESIGN, PERMISSIBLE SITE DISCHARGE (PSD) IS THE MAXIMUM DISCHARGE FROM THE POST-DEVELOPMENT SITE AND SHALL NOT EXCEED THE PRE-DEVELOPED FLOWS FOR ALL STORM EVENTS UP TO THE 1 IN 100 YEARS ARI PROPOSED DEVELOPMENT IS ADDITION TO EXISTING DEVELOPMENT, PROPOSED IS APPROX 1295m$^2$ NEW BUILDING AND DEMOLITION OF THE EXISTING SCHOOL BUILDING.IMPERVIOUS AREA IS REDUCED FROM 2240m$^2$ TO 2048m$^2$. REFER CATCHMENT PLAN ON C250 & C251. IN ACCORDANCE WITH LISMORE DEVELOPMENT CONTROL PLAN AND HANDBOOK OF STORMWATER DRAINAGE DESIGN OSD IS NOT REQUIRED FOR THE PROPOSED DEVELOPMENT. PART OF THE PROPOSED ADDITION PROPOSED IS 68 KL RAINWATER TANK THAT WILL BE CONNECTED TO THE TOILETS FOR TOILET FLUSHING AND IRRIGATION.

**FOR DA ONLY**

SURVEY INFORMATION
SURVEYED BY BEVERIDGE WILLIAMS
DATUM: A.H.D.
ORIGIN OF LEVELS: PM 79619 RL 10.984

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Client: SCHOOL INFRASTRUCTURE
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DRAWING TO BE PRINTED IN COLOUR

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Project: BLAKEBROOK PUBLIC SCHOOL
417 ROSEHILL ROAD BLAKEBROOK NSW 2480

Title: DETAIL PLAN

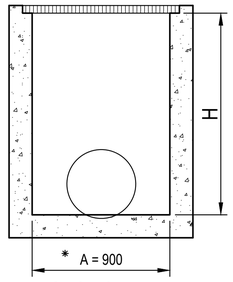
| Drawn | Designed | Original issue date |
|---|---|---|
| M.Pereira | B.Seizov | AUGUST |
| Checked | Approved | Scale @A1 |
| B.Seizov | A.Francis | 1:250 |

Drawing number: BLA-CIV-PP-DWG-0100
Revision: 04

# TYPICAL PIT CHAMBER SIZES

## IT IS THE CONTRACTORS RESPONSIBILITY TO SELECT PIT CHAMBER SIZE WITH REGARDS TO PIPE SIZE, DEPTH TO INVERT AND SKEW ANGLE. REFER SKETCHES BELOW.

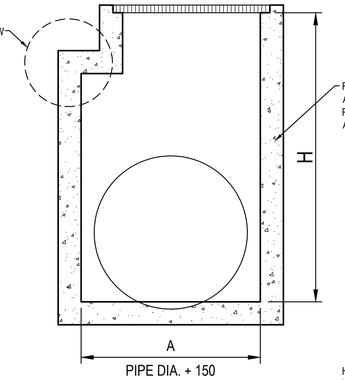
1. SELECT PIT CHAMBER USING THE STEPS BELOW:
2. SELECT PIT CHAMBER SIZE DEPENDING ON THE PIPE DIAMETERS.
3. CHECK PIT CHAMBER SIZE TO SATISFY DEPTH TO INVERT REQUIREMENTS.
   CHECK PIT CHAMBER DIMENSIONS TO SATISFY THE SKEW ANGLE IN THE TABLE.




SECTION
NTS

*A = 600 FOR PIPES UP TO 375 DIA.

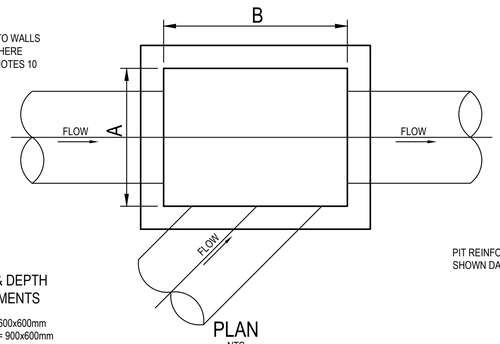
(1) PIT CHAMBER DIMENSIONS FOR PIPES UP TO 600 DIA.




SECTION
NTS

(1) PIT CHAMBER FOR PIPES GREATER THAN 600 DIA.

FOR B = 600mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 225mm
FOR B = 900mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 375mm
FOR B = 1200mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 600mm
FOR B = 1500mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 825mm
FOR B = 1900mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 1050mm

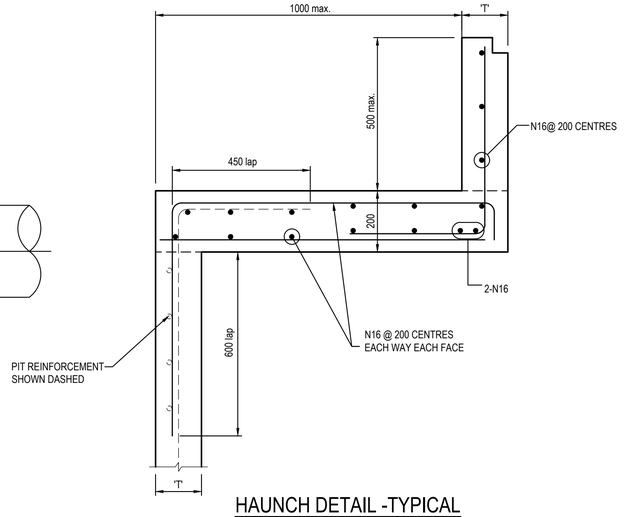



PLAN
NTS

(3) PIT CHAMBER FOR SIDE ENTRY ON SKEW

(2) PIT SIZE & DEPTH REQUIREMENTS

H = 0-900mm - AxB = 600x600mm
H = 900-1200mm - AxB = 900x600mm
H = >1200mm - AxB = 900x900mm




## HAUNCH DETAIL -TYPICAL

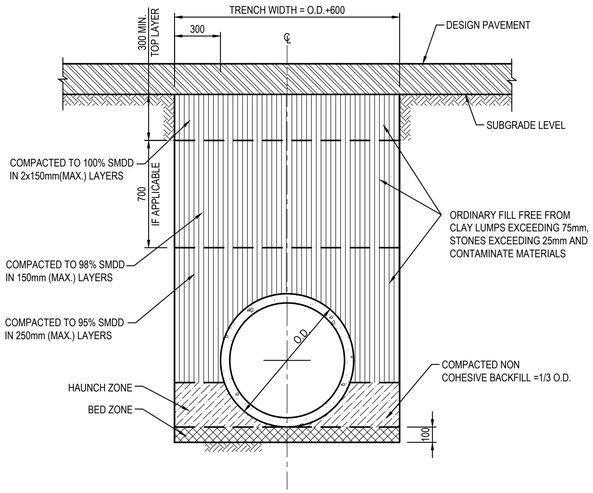
SCALE 1:10

## PIT LID SCHEDULE

| PIT/STRUCTURE NUMBER | DESCRIPTION |
|---|---|
| (A-1) (A-2) (A-3) | PROPOSED INLET PIT WITH 600x600 HINGED LIGHT DUTY GRATED LID CLASS "B" IN ACCORDANCE WITH LISMORE CITY COUNCIL'S REQUIREMENTS. |
| (A-0) | PROPOSED JUNCTION PIT 600x600 SEALED LID LIGHT DUTY CLASS "B" IN ACCORDANCE WITH LISMORE CITY COUNCIL'S REQUIREMENTS. |
| (SD-1) | 150mm GRATED DRAIN WITH LIGHT DUTY FRAME CLASS "B" AND LIGHT DUTY GRATE IN ACCORDANCE WITH LISMORE CITY COUNCIL'S REQUIREMENTS. |

## NOTE:

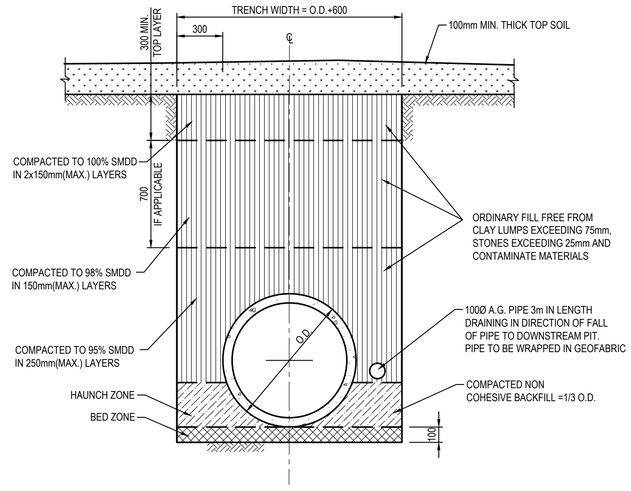
- ALL GRATED INLET PITS TO CONTAIN OCEAN PROTECT 200 MICRON PIT BASKETS OR APPROVED EQUIVALENT UNLESS NOTED ON PLAN. REFER DRAWING C201 FOR DETAILS.
- REFER C201 FOR DRAINAGE AND SUBSOIL NOTES.
- ALL PITS IN FOOTPATH, OR ADJACENT TO FOOTPATHS, TO BE FITTED WITH SLIP RESISTANT HEELGUARD LID.
- PIT SCHEDULE ABOVE DOES NOT INCLUDE PIT LIDS FOR WATER QUALITY DEVICES OR BELOW GROUND OSD TANKS
- ALL RAINWATER OUTLETS (RWO) TO BE MIN 200MM IN DIAMETER. ALL RAINWATER OUTLETS TO BE HEELPROOF FINISH AND TO ARCHITECTS SPECIFICATIONS UNLESS NOTED ON PLAN.




## PIPE TRENCH INSTALLATION BENEATH PAVEMENT

(H1 & H2 SUPPORT)

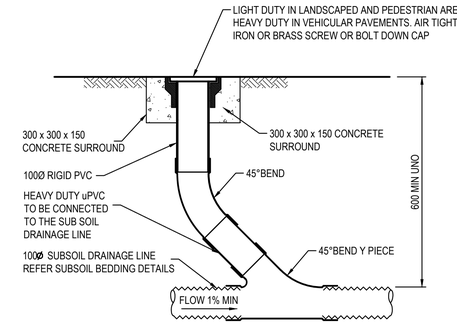
SCALE 1:20




## PIPE TRENCH INSTALLATION IN LANDSCAPE AREAS

(H1 & H2 SUPPORT)

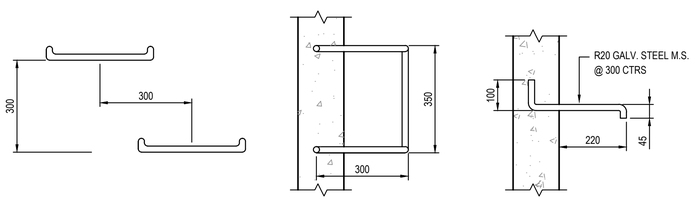
SCALE 1:20




## INTERMEDIATE RISER (IR)

SCALE 1:10

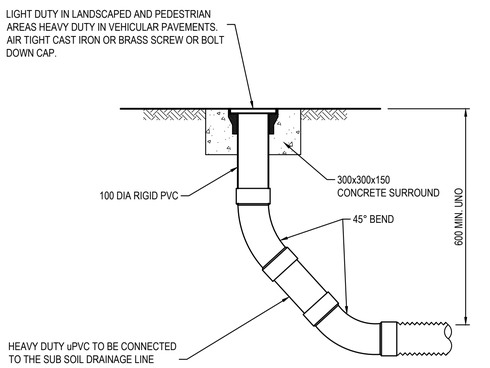
NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED




ELEVATION PLAN SECTION

## TYPICAL STEP IRON DETAIL

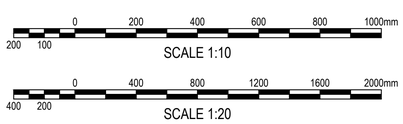
SCALE 1:10




## FLUSHING POINT (FP)

SCALE 1:10

NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED




SCALE 1:10




SCALE 1:20

## DRAINAGE NOTES:

1. ALL STORMWATER WORK TO COMPLY WITH AS 3500 PART 3.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE MINIMUM COVER OF 600mm ON ALL PIPES.

3. PROTECTION OF PIPES DUE TO LOADS EXCEEDING W7 WHEEL LOAD SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

4. BEDDING TYPE SHALL BE TYPE H2 FOR RCP. WHERE NECESSARY THE OVERLAY ZONE SHALL BE REDUCED TO ACCOMMODATE PAVEMENT REQUIREMENTS. REFER TO THIS DRAWING FOR DETAILS.

5. MINIMUM COVER OVER EXISTING PIPES FOR PROTECTION DURING CONSTRUCTION SHALL BE 800mm.

6. NO CONSTRUCTION LOADS SHALL BE APPLIED TO PLASTIC PIPES.

7. FINISHED SURFACE LEVELS SHOWN ON LAYOUT PLAN DRGS TAKE PRECEDENCE OVER DESIGN DRAINAGE SURFACE LEVELS.

8. ALL PIPES UP TO AND INCLUDING 300 DIA. SHALL BE SOLVENT OR RUBBER RING JOINTED PVC CLASS SH PIPE TO AS1260. ALL OTHER PIPES TO BE RCP USING CLASS 2 RUBBER RING JOINTED PIPE. HARDIES FRC PIPE MAY BE USED IN LIEU OF RCP IF DESIRED IN GROUND. ALL AERIAL PIPES TO BE PVC CLASS SH.

9. ALL PITS IN NON TRAFFICABLE AREAS TO BE PREFABRICATED POLYESTER CONCRETE "POLYCRETE" WITH "LIGHT DUTY" CLASS B GALV. MILD STEEL GRATING AND FRAME.
ALL PITS IN TRAFFICABLE AREAS (CLASS "D" LOADING MAX) TO HAVE 150mm THICK CONCRETE WALLS AND BASE CAST IN-SITU f'c=32 MPa, REINFORCED WITH N12-200 BOTH LOADING WAYS CENTRALLY PLACE .U.N.O. ON SEPARATE DESIGN DRAWINGS IN THIS SET. GALV.MILD STEEL GRATING AND FRAME TO SUIT DESIGN LOADING. PRECAST PITS, RECTANGULAR OR CIRCULAR IN SHAPE, MAY BE USED IN LIEU AND SHALL COMPLY WITH RELEVANT AUSTRALIAN STANDARDS.

10. ALL PITS, GRATINGS AND FRAMES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION AND TO BE IN ACCORDANCE WITH AS3500.3 AND AS3996.

11. PIT CHAMBER DIMENSIONS ARE TO BE SELECTED TO SATISFY THE FOLLOWING:
- PIPE SIZE
- DEPTH TO INVERT
- SKEW ANGLE
  REFER TYPICAL PIT CHAMBER DETAILS BELOW
IF PIT LID SIZE IS SMALLER THAN THE PIT CHAMBER SIZE THEN THE PIT LID IS TO BE CONSTRUCTED ON THE CORNER OF THE PIT CHAMBER WITH THE STEP IRONS DIRECTLY BELOW. ALTERNATIVELY THE PIT LID TO BE USED, IS TO BE THE SAME SIZE AS THE PIT CHAMBER.

12. FOR PIPE SIZES GREATER THAN Ø300mm, PIT FLOOR IS TO BE BENCHED TO FACILITATE FLOW.

13. GALVANISED STEP IRONS SHALL BE PROVIDED AT 300 CTS FOR PITS HAVING A DEPTH EXCEEDING 1200mm. SUBSOIL DRAINAGE PIPE SHALL BE PROVIDED IN PIPE TRENCHES ADJACENT TO INLET PIPES. (MINIMUM LENGTH 3m).

14. ALL SUBSOIL PIPES SHALL BE 100mm SLOTTED PVC IN A FILTER SOCK, UNO, WITH 3m INSTALLED UPSTREAM OF ALL PITS.

15. ALL PIPEWORK SHALL HAVE MINIMUM DIAMETER 100.

16. MINIMUM GRADE FOR ROOFWATER DRAINAGE LINES SHALL BE 1%.

17. ALL PIPE JUNCTIONS AND TAPER UP TO AND INCLUDING 300 DIA. SHALL BE VIA PURPOSE MADE FITTINGS.

18. ALL DRAINAGE TO BE INSTALLED IN ACCORDANCE WITH AS3500, PART 3. TESTING TO BE UNDERTAKEN AND REPORTS PROVIDED TO THE SUPERINTENDENT.

19. LOCATION OF THE DIRECT DOWN PIPE CONNECTIONS MAY VARY ON SITE TO SUIT SITE CONDITIONS, WHERE CONNECTION SHOWN ON LONG SECTIONS CHAINAGES ARE INDICATIVE ONLY.

20. PITS IN EXCESS OF 1.5 m DEEP TO HAVE WALL AND FLOOR THICKNESS INCREASED TO 200mm. REINFORCED WITH N12@200 CTS CENTRALLY PLACED BOTH WAYS THROUGHOUT U.N.O.ON SEPARATE DESIGN DRAWINGS IN THIS SET. IF DEPTH EXCEEDS 5m CONTACT ENGINEER.

21. SUBSOIL DRAINAGE LINES FOR LANDSCAPE AREA NOT SHOWN ON THESE DRAWINGS. REFER TO LANDSCAPING DRAWINGS FOR ANY ADDITIONAL SUBSOIL LINES IN LANDSCAPING AREAS THAT ARE NOT SHOWN ON THESE CIVIL DRAWINGS.

22. ALL STORMWATER PITS TO HAVE Ø100 uPVC SLOTTED SUBSOIL PIPES CONNECTED TO THEM. THESE SUBSOILS TO EXTEND 3m UPSTREAM OF THE PIT AT A MINIMUM GRADE.

**FOR DA ONLY**

SURVEY INFORMATION
SURVEYED BY
BEVERIDGE WILLIAMS
DATUM: A.H.D.
ORIGIN OF LEVELS: PM 79619 RL 10.984

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H&H Job No: 230050

DRAWING TO BE PRINTED IN COLOUR

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Project: BLAKEBROOK PUBLIC SCHOOL
417 ROSEHILL ROAD BLAKEBROOK NSW 2480

Title: STORMWATER MISCELLANEOUS DETAILS

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| M.Pereira | B.Seizov | AUGUST |
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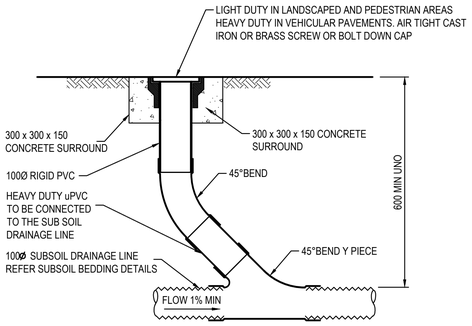
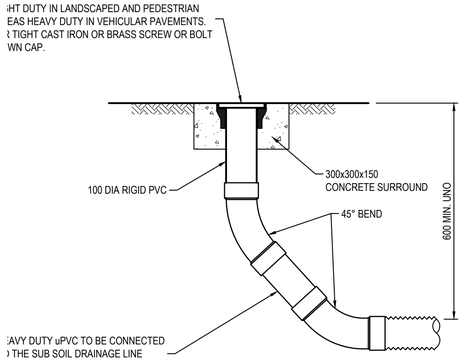



## INTERMEDIATE RISER (IR)

SCALE 1:10

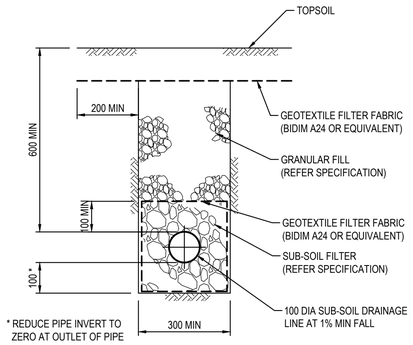
NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED




## FLUSHING POINT (FP)

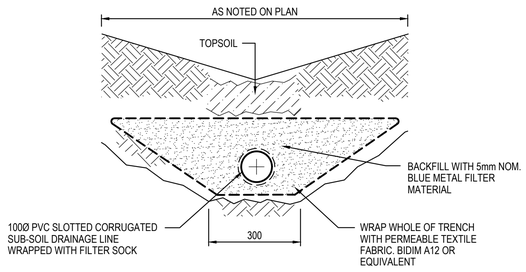
SCALE 1:10

NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED




## SUB-SOIL IN LANDSCAPED AREAS

SCALE 1:10




## SUBSOIL DRAIN DETAIL IN SWALES

SCALE 1:10

SWALE SUBSOIL NOT SHOWN ON PLAN FOR CLARITY.

## SUBSOIL DRAINAGE NOTES

1. GENERALY PROVIDE SUBSOIL DRAINS TO INTERCEPT GROUNDWATER SEEPAGE AND PREVENT WATER BUILD-UP BEHIND WALLS AND UNDER FLOORS AND PAVEMENTS. CONNECT SUBSOIL TO SURFACE DRAINS OR TO THE STORMWATER DRAINAGE SYSTEM AS APPLICABLE.

2. PIPE DEPTH:
PROVIDE THE FOLLOWING MINIMUM CLEAR DEPTH, MEASURED TO THE CROWN OF THE PIPE, WHERE THE PIPE PASSES BELOW THE FOLLOWING ELEMENTS:

- 100mm BELOW FORMATION LEVEL OF THE PAVEMENT, KERB OR CHANNEL.
- 100mm BELOW THE AVERAGE GRADIENT OF THE BOTTOM OF FOOTINGS.

3. JOINTING:
AT JUNCTIONS OF SUBSOIL PIPES PROVIDE TEES, COUPLINGS OR ADAPTORS TO AS2439.1.

4. TRENCH WIDTH MINIMUM 300mm.

5. PIPE UNDERLAY
GENERAL: GRADE THE TRENCH FLOOR EVENLY TO THE GRADIENT OF THE PIPELINE. IF THE TRENCH FLOOR IS ROCK, CORRECT ANY IRREGULARITIES WITH COMPACTED BEDDING MATERIAL. BED PIPING ON A CONTINUOUS UNDERLAY OF BEDDING MATERIAL, AT LEAST 75mm THICK AFTER COMPACTION. LAY THE PIPE WITH ONE LINE OF PERFORATIONS AT THE BOTTOM.

CHASES: IF NECESSARY TO PREVENT PROJECTIONS SUCH AS SOCKETS AND FLANGES FROM BEARING ON THE TRENCH BOTTOM OR UNDERLAY.

6. PIPE SURROUNDS:
GENERAL: PLACE THE MATERIAL IN THE PIPE SURROUND IN LAYERS SMALLER THAN OR EQUAL TO 200mm LOOSE THICKNESS, AND COMPACT WITHOUT DAMAGING OR DISPLACING PIPING.
DEPTH OF OVERLAY: TO THE UNDERSIDE OF THE BASE OF OVERLYING STRUCTURES SUCH AS PAVEMENTS, SLABS AND CHANNELS TO WITHIN 150mm OF THE FINISHED SURFACE OF UNPAVED OR LANDSCAPED AREAS.

7. FILTER SOCKS:
PROVIDE POLYESTER PERMEABLE SOCKS CAPABLE OF RETAINING PARTICLES OF 0.25mm SIZES. SECURELY FIT OR JOIN THE SOCK AT EACH JOINT.

| PLAN ID | MAXIMUM PIT PLAN DIMENSIONS |
|---|---|
| S | 450mm x 450mm |
| M | 600mm x 600mm |
| L | 900mm x 900mm |
| XL | 1200mm x 1200mm |

| DEPTH ID | BAG DEPTH | OVERALL DEPTH |
|---|---|---|
| 1 | 170 | 270 |
| 2 | 300 | 450 |
| 3 | 600 | 700 |

| | | DEPTH ID | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| PLAN ID | S | ■ | | |
| | M | ■ | ■ | |
| | L | ■ | ■ | ■ |
| | XL | ■ | ■ | ■ |


## GENERAL NOTES

1. THE MINIMUM CLEARANCE DEPENDS ON THE CONFIGURATION (SEE NOTE 2) AND THE LOCAL COUNCIL REQUIREMENTS.
2. CLEARANCE FOR ANY PIT WITHOUT AN INLET PIPE (ONLY USED FOR SURFACE FLOW) CAN BE AS LOW AS 50mm. FOR OTHER PITS, THE RECOMMENDED CLEARANCE SHOULD BE GREATER OR EQUAL TO THE PIPE OBVERT SO AS NOT TO INHIBIT HYDRAULIC CAPACITY.
3. OCEAN PROTECT PROVIDES TWO FILTRATION BAG TYPES:- 200 MICRON BAGS FOR HIGHER WATER QUALITY FILTERING AND A COARSE BAG FOR TARGETING GROSS POLLUTANTS.
4. DRAWINGS NOT TO SCALE.

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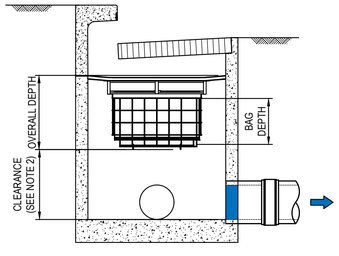
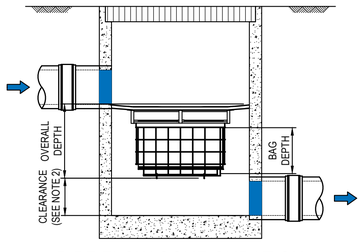
SPECIFICATION DRAWING




## SURFACE FLOW CONFIGURATION

SCALE: 1:20




## PIPE FLOW CONFIGURATION

SCALE: 1:20

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SURVEY INFORMATION
SURVEYED BY
BEVERIDGE WILLIAMS
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H&H Job No: 230050

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Project
BLAKEBROOK PUBLIC SCHOOL
417 ROSEHILL ROAD BLAKEBROOK NSW 2480

Title
STORMWATER MISCELANEOUS DETAILS

| Drawn | Designed | Original issue date |
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| M.Pereira | B.Seizov | AUGUST |
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| B.Seizov | A.Francis | AS NOTED |

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Revision
02


## PRE-DEVELOPMENT CATCHMENT PLAN

SCALE: 1:250

PRE-DEVELOPMENT - TOTAL SITE AREA = 12761.68m²

EXISTING IMPERVIOUS AREA
AREA = 2240.48m²

EXISTING PERVIOUS AREA
AREA = 10521.20m²

0 5 10 15 20 25m
5 4 3 2 1
SCALE 1:250

**FOR DA ONLY**

SURVEY INFORMATION
SURVEYED BY
BEVERIDGE WILLIAMS
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ORIGIN OF LEVELS: PM 79619 RL 10.984

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Project
BLAKEBROOK PUBLIC SCHOOL
417 ROSEHILL ROAD BLAKEBROOK NSW 2480

Title
PRE-DEVELOPMENT CATCHMENT PLAN

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| M.Pereira | B.Seizov | AUGUST |
| **Checked** | **Approved** | **Scale @A1** |
| B.Seizov | A.Francis | 1:250 |

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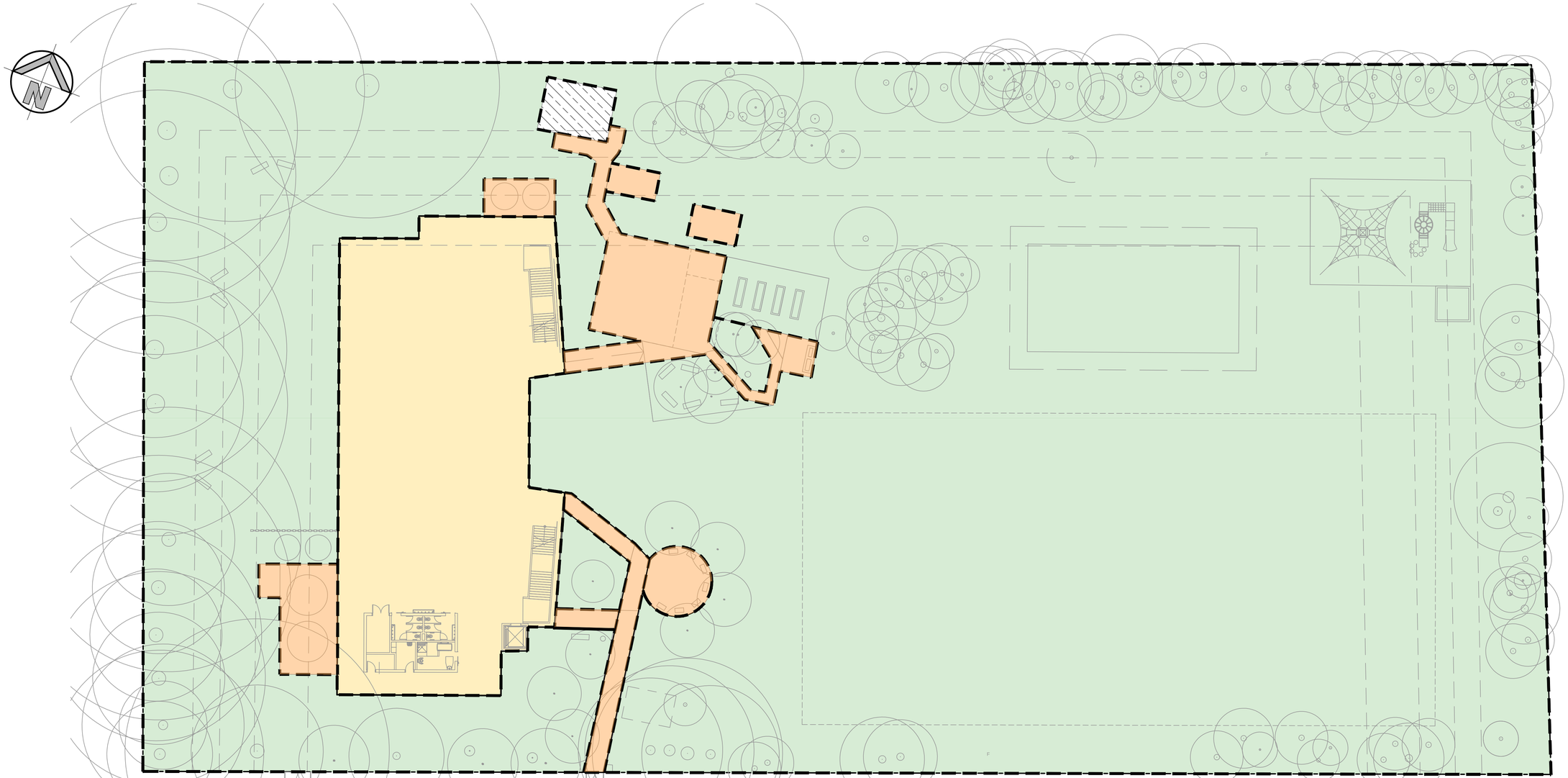


ROSEHILL ROAD

## POST-DEVELOPMENT CATCHMENT PLAN

SCALE: 1:250

## POST-DEVELOPMENT - TOTAL SITE AREA = 12761.68m²

PROPOSED ROOF AREA TO RWT/OSD
AREA = 1254m²

EXISTING HARDSTAND AREA
AREA = 48m²

PROPOSED HARDSTAND AREA
AREA = 563m²

PROPOSED LANDSCAPE AREA
AREA = 10896.68m²

0 5 10 15 20 25m
5 4 3 2 1
SCALE 1:250

**FOR DA ONLY**

SURVEY INFORMATION
SURVEYED BY
BEVERIDGE WILLIAMS
DATUM: A.H.D.
ORIGIN OF LEVELS: PM 79619 RL 10.984

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Project
BLAKEBROOK PUBLIC SCHOOL
417 ROSEHILL ROAD BLAKEBROOK NSW 2480

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POST-DEVELOPMENT CATCHMENT PLAN

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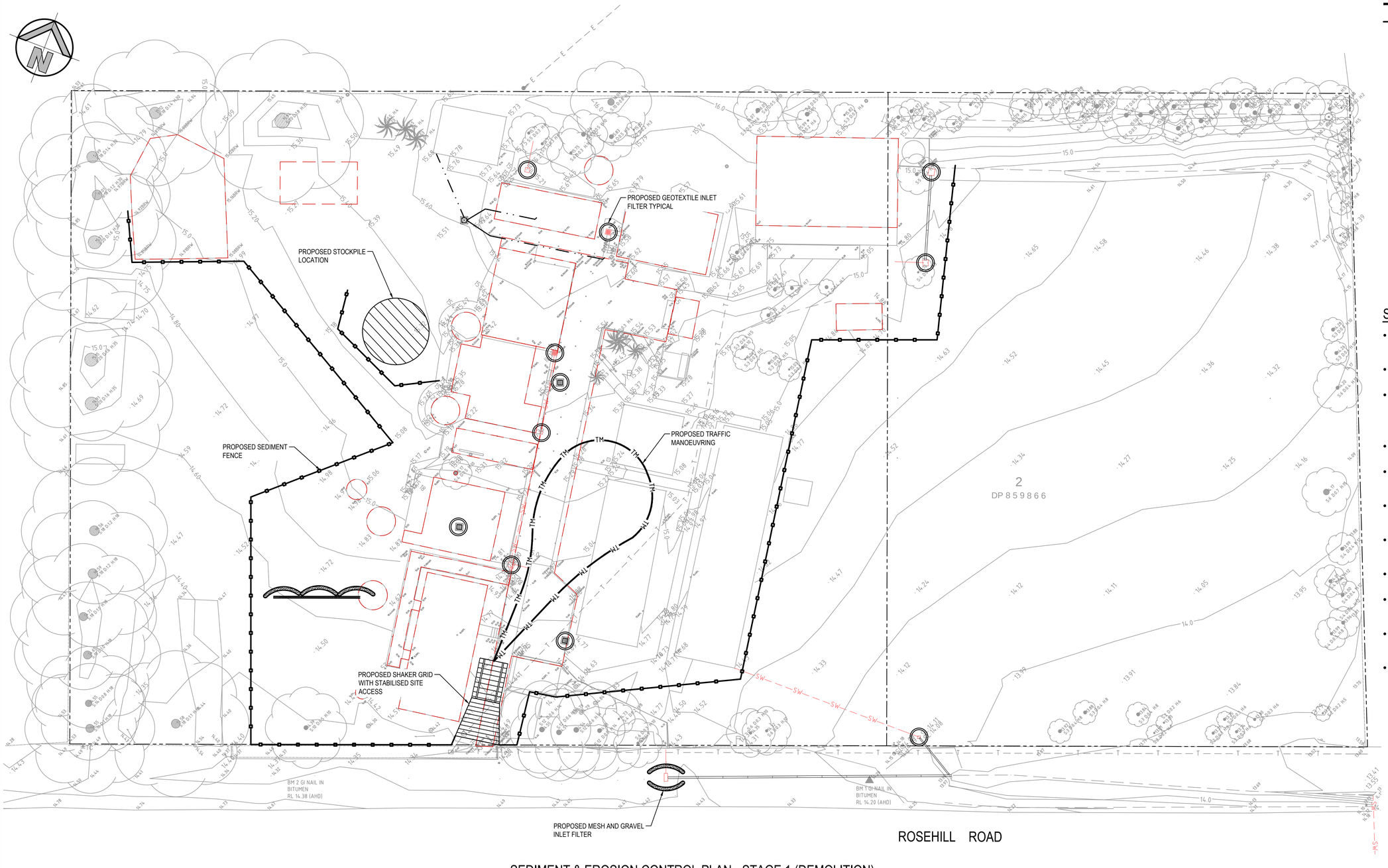


## LEGEND

- PROPOSED TRAFFIC MANOEUVRING
- PROPOSED SEDIMENTATION FENCE
- PROPOSED VEHICLE SHAKER GRID
- PROPOSED STABILISED SITE ACCESS
- PROPOSED STOCKPILE LOCATION
- PROPOSED GEOTEXTILE INLET FILTER
- PROPOSED MESH AND GRAVEL INLET FILTER

## SEDIMENT & EROSION CONTROL NOTES

- ALL SEDIMENT CONTROL DEVICES ARE TO BE CONSTRUCTED, PLACED AND MAINTAINED IN ACCORDANCE WITH LISMORE CITY COUNCIL'S SPECIFICATIONS AND LANDCOM'S "SOIL AND CONSTRUCTION" MANUAL.
- ALL PERIMETER & SILTATION CONTROL MEASURES ARE TO BE PLACED PRIOR TO, OR AS THE FIRST STEP IN EARTH WORKS AND/OR CLEARING.
- THE SEDIMENT & EROSION CONTROL PLAN MAY REQUIRE FUTURE ADJUSTMENT TO REFLECT CONSTRUCTION STAGING. IT IS ALSO THE CONTRACTORS RESPONSIBILTY TO PREPARE THEIR OWN SEDIMENT AND EROSION CONTROL PLAN WHICH SUITS THE DESIGNED CONSTRUCTION STAGING.
- FILTRATION BUFFER ZONES ARE TO BE FENCED OFF AND ACCESS PROHIBITED TO ALL PLANT AND MACHINERY.
- ALL TEMPORARY EARTH BERMS, DIVERSIONS & SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED & MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
- ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING. TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE LOCATION.
- ALL TOPSOIL IS TO BE STOCKPILED ON SITE FOR REUSE (AWAY FROM TREES AND DRAINAGE LINES). MEASURES SHALL BE APPLIED TO PREVENT EROSION OF THE STOCKPILES.
- ALL EARTHWORK AREAS SHALL BE ROLLED EACH EVENING TO SEAL THE EARTHWORKS.
- ALL FILLS ARE TO BE LEFT WITH A LIP AT THE TOP OF THE SLOPE AT THE END. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND STRAW MULCHED WITHIN 14 DAYS OF COMPLETION OF FORMATION U.N.O. BY LANDSCAPE ARCHITECTS.
- UPON COMPLETION OF ALL EARTHWORKS OR AS DIRECTED BY COUNCIL SOIL CONSERVATION TREATMENTS SHALL BE APPLIED SO AS TO RENDER AREAS THAT HAVE BEEN DISTURBED, EROSION PROOF WITHIN 14 DAYS.
- EROSION AND SILT PROTECTION MEASURES ARE TO BE MAINTAINED AT ALL TIMES.

# SEDIMENT & EROSION CONTROL PLAN - STAGE 1 (DEMOLITION)

SCALE: 1:250

0 5 10 15 20 25m

SCALE 1:250

**FOR DA ONLY**

SURVEY INFORMATION
SURVEYED BY
BEVERIDGE WILLIAMS
DATUM: A.H.D.
ORIGIN OF LEVELS: PM 79619 RL 10.984

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H&H Job No: 230050

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Project
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Title
SEDIMENT & EROSION CONTROL PLAN
STAGE 1 (DEMOLITION WORKS)

| Drawn | Designed | Original issue date |
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| M.Pereira | B.Seizov | AUGUST |
| Checked | Approved | Scale @A1 |
| B.Seizov | A.Francis | 1:250 |

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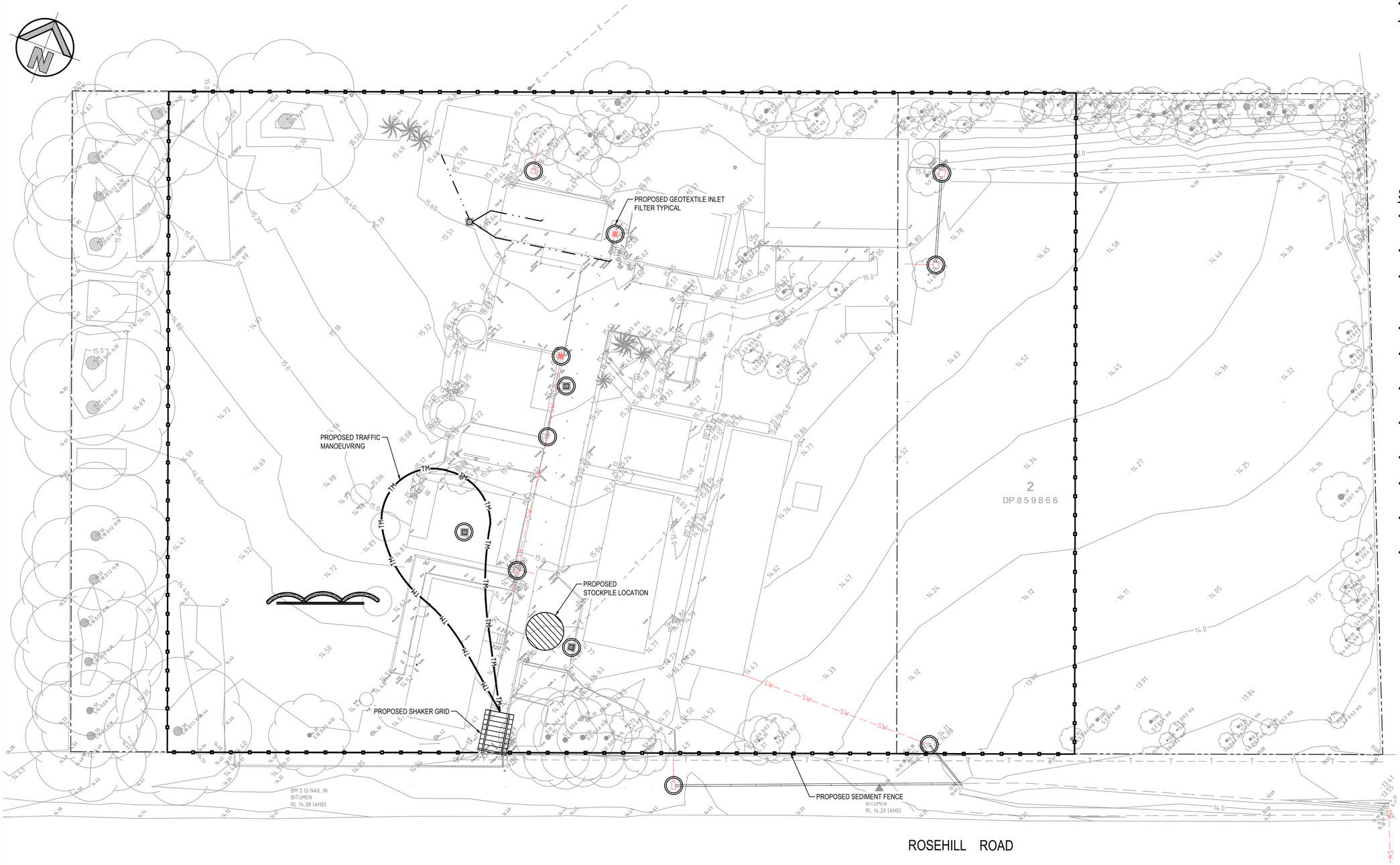


## LEGEND

- PROPOSED TRAFFIC MANOEUVRING
- PROPOSED SEDIMENTATION FENCE
- PROPOSED VEHICLE SHAKER GRID
- PROPOSED STOCKPILE LOCATION
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- PROPOSED MESH AND GRAVEL INLET FILTER

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- FILTRATION BUFFER ZONES ARE TO BE FENCED OFF AND ACCESS PROHIBITED TO ALL PLANT AND MACHINERY.
- ALL TEMPORARY EARTH BERMS, DIVERSIONS & SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED & MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
- ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING. TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE LOCATION.
- ALL TOPSOIL IS TO BE STOCKPILED ON SITE FOR REUSE (AWAY FROM TREES AND DRAINAGE LINES). MEASURES SHALL BE APPLIED TO PREVENT EROSION OF THE STOCKPILES.
- ALL EARTHWORK AREAS SHALL BE ROLLED EACH EVENING TO SEAL THE EARTHWORKS.
- ALL FILLS ARE TO BE LEFT WITH A LIP AT THE TOP OF THE SLOPE AT THE END. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND STRAW MULCHED WITHIN 14 DAYS OF COMPLETION OF FORMATION U.N.O. BY LANDSCAPE ARCHITECTS.
- UPON COMPLETION OF ALL EARTHWORKS OR AS DIRECTED BY COUNCIL SOIL CONSERVATION TREATMENTS SHALL BE APPLIED SO AS TO RENDER AREAS THAT HAVE BEEN DISTURBED, EROSION PROOF WITHIN 14 DAYS.
- EROSION AND SILT PROTECTION MEASURES ARE TO BE MAINTAINED AT ALL TIMES.

## SEDIMENT & EROSION CONTROL PLAN - STAGE 2 (MAIN WORKS)

SCALE: 1:250

0 5 10 15 20 25m

SCALE 1:250

**FOR DA ONLY**

SURVEY INFORMATION
SURVEYED BY
BEVERIDGE WILLIAMS
DATUM: A.H.D.
ORIGIN OF LEVELS: PM 79619 RL 10.984

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Client
SCHOOL INFRASTRUCTURE

Architect
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H&H Job No: 230050

DRAWING TO BE PRINTED IN COLOUR

henry&hymas

Project
BLAKEBROOK PUBLIC SCHOOL
417 ROSEHILL ROAD BLAKEBROOK NSW 2480

Title
SEDIMENT & EROSION CONTROL PLAN
STAGE 2 (MAIN WORKS)

| Drawn | Designed | Original issue date |
|---|---|---|
| M.Pereira | B.Seizov | AUGUST |
| Checked | Approved | Scale @A1 |
| B.Seizov | A.Francis | 1:250 |

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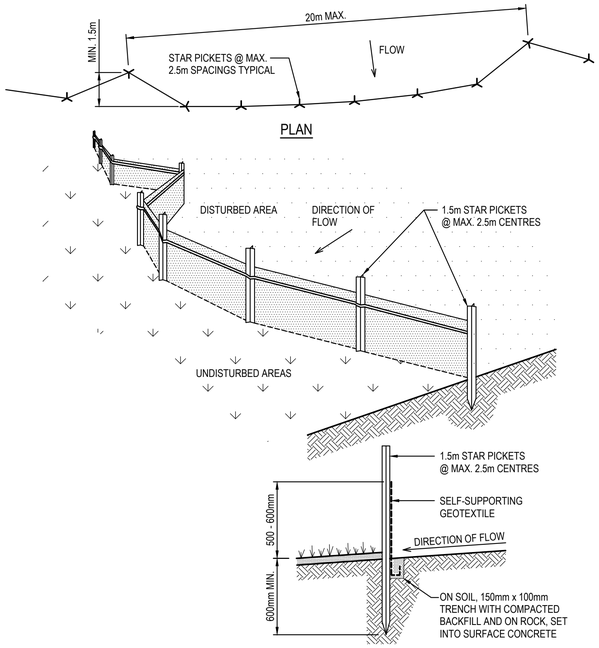


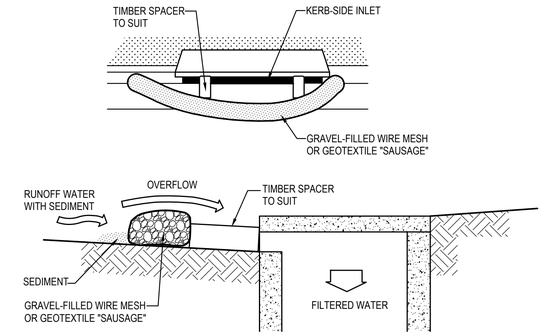

SECTION DETAIL

## SEDIMENT FENCE

N.T.S.

### SEDIMENT FENCE CONSTRUCTION NOTES:

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5m LONG STAR PICKETS INTO GROUND @ 2.5m INTERVALS (MAX.) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

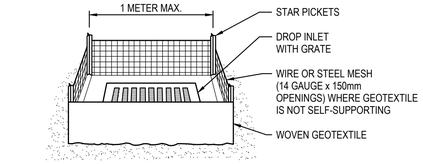


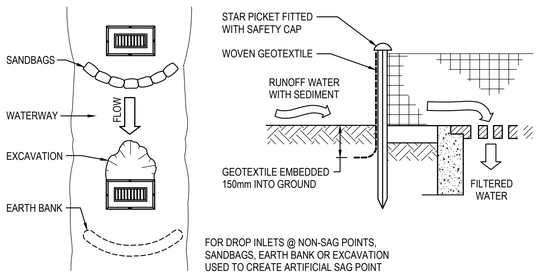

### MESH & GRAVEL INLET FILTER CONSTRUCTION NOTES:

1. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
2. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
3. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
4. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
5. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY CAN FIRMLY ABUT EACH OTHER AND SEDIMENT / LADEN WATERS CANNOT PASS BETWEEN.

## MESH & GRAVEL INLET FILTER

SCALE N.T.S.



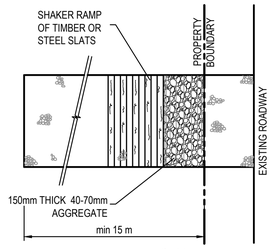

FOR DROP INLETS @ NON-SAG POINTS, SANDBAGS, EARTH BANK OR EXCAVATION USED TO CREATE ARTIFICIAL SAG POINT

### GEOTEXTILE INLET FILTER CONSTRUCTION NOTES:

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE.
2. PICKET SPACING TO BE MAXIMUM 1.0m.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILES UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

## GEOTEXTILE INLET FILTER

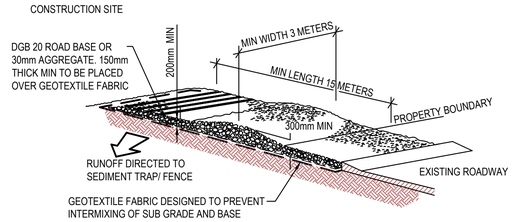
N.T.S.




PLAN

## STABILISED SITE ACCESS WITH SHAKER RAMP

N.T.S.



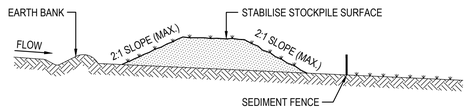

GEOTEXTILE MAY BE A WOVEN OR NEEDLE PUNCHED PRODUCT WITH A MINIMUM CBR BURST STRENGTH (AS3706.4-90) OF 2500 N

## STABILISED SITE ACCESS WITH SHAKER RAMP

N.T.S.

NOTES:

1. THIS DEVICE IS TO BE LOCATED AT ALL EXITS FROM CONSTRUCTION SITE.
2. THIS DEVICE IS TO BE REGULARLY CLEANED OF DEPOSITED MATERIAL SO AS TO MAINTAIN A 50mm DEEP SPACE BETWEEN PLANKS.
3. ANY UNSEALED ROAD BETWEEN THIS DEVICE AND NEAREST ROADWAY IS TO BE TOPPED WITH 100mm THICK 40-70mm SIZE AGGREGATE.
4. ALTERNATIVELY, THREE(3) PRECAST CONCRETE CATTLE GRIDS (AS MANUFACTURED BY "HUMES CONCRETE MAY BE USED. 1, 2 & 3 ABOVE ALSO APPLY.




### STOCKPILE CONSTRUCTION NOTES:

1. PLACE STOCKPILES MORE THAN 2 (PREFERABLY 5) METRES FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2 METRES IN HEIGHT.
4. WHERE THEY ARE TO BE PLACED FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED E.S.C.P. OR S.W.M.P. TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES 1 TO 2 METRES DOWNSLOPE.

## STOCKPILES

N.T.S.

**FOR DA ONLY**

SURVEY INFORMATION
SURVEYED BY
BEVERIDGE WILLIAMS
DATUM: A.H.D.
ORIGIN OF LEVELS: PM 79619 RL 10.984

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417 ROSEHILL ROAD BLAKEBROOK NSW 2480

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# CIVIL ENGINEERING REPORT

## BLAKEBROOK PUBLIC SCHOOL
### 417 ROSEHILL RD, BLAKEBROOK NSW 2480

**Revision 01**

**December 2023**

**Our Ref No. 230050**

henry&hymas

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**Project verification**

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| Client contact | Andrew Roman – ADCO Constructions NSW |

| | Name | |
|---|---|---|
| Prepared By | Matthew Mishevski | |
| Checked by | Boro Seizov | |
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Disclaimer:

This report has been prepared in accordance with the scope of services as detailed in the agreement between the client and H & H Consulting Engineers PTY LTD (trading as Henry & Hymas). The information presented by Henry & Hymas in the Report has been collated and summarised from reporting, data, surveys, measurements and results by a variety of different third-party sources. Henry & Hymas does not take responsibility for the information presented in this report unless its is directly produced by Henry & Hymas based off validated third party information. Validated third party information will be noted as such in the following report. Unless directly noted as such, Henry and Hymas have not verified the accuracy or completeness of any information provided by third-party sources. Due to the above, Henry & Hymas accepts no responsibility for the results of any actions taken on the basis of information or material provided, nor for its accuracy, completeness or appropriateness given current scenarios. Henry & Hymas does not offer any warranty or guarantee for the observations or finding expressed in this report.

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## Table of Contents

## Preface

Henry & Hymas has been engaged by ADCO Constructions NSW PTY LTD to prepare this Civil Engineering Report (The Report) to satisfy civil engineering matters in support of the Review of Environmental Factors (REF) for the proposed reconstruction of the Blakebrook Public School.

In February and March 2022 extreme flood events occurred in the local floodplain, with the lower Richmond River flooding. Floodwaters resulted in significant inundation of the school resulting in damage and rendering the school unfit for use.

This Report aims to provide a summary of key civil engineering design elements of the proposed reconstruction for the purpose of seeking development approval:

- General site locality, topography, and existing characteristics
- The proposed site works – earthworks and site access
- Stormwater management
- Flooding
- Sediment and Erosion

This Report has been prepared in conjunction with a set of Civil Engineering Drawings which show the general proposed civil and stormwater design for the development. The drawings are available for review in Appendix A of this Report.

The following principles have been adopted as part of the design process:

- Consideration of design intent in relation to functionality, expectations and requirements of the end user.
- Compliance with relevant Council and authority standards and policies.
- Compliance with the Education Facilities Standards and Guidelines (EFSG).
- Design coordination with the project team.
- A design philosophy sympathetic to the site constraints, environment, terrain, and landform.
- Retention of existing infrastructure where suitable.

The civil engineering component of the aforementioned project has been designed in accordance with the following council codes and policies:

- Lismore City Council Development and Design Manual, specifically:
    - Stormwater Drainage Design.
    - Handbook of Stormwater Drainage Design
    - Lismore City Council Lismore Floodplain Risk Management Plan - Land Use Planning and Development Control.
    - Lismore City Council Lismore Flood Prone Lands

This civil engineering report also draws on previous expert reporting discussing flooding specific to the proposed redevelopment as well as the greater floodplain in general. These will be periodically introduced and addressed throughout the report where necessary. The main reports relating to the flooding for the development and the wider catchment are listed below:

- Blakebrook Public School – Flood and Civil Engineering Assessment prepared for NSW Department of Education | School Infrastructure NSW by ACOR August 2023
- Engeny 2021 Lismore Floodplain Risk Management Study
- Engeny flood modelling for Blakebrook Public School
- Lismore City Local Flood Plan by the NSW State Emergency Service (SES).
- Flood Emergency Response Plan for Blakebrook Public School by ACOR
- NSW DPE (2022), Flood Risk Management Manual: The Management of Flood Liable Land. © State of New South Wales.

- NSW DPE (2022a), Support for Emergency Management Planning: Flood Risk Management Guide EM01. © State of New South Wales

## 1. Site overview

The site is located within Blakebrook in the municipality of Lismore City Council at 417 Rosehill Rd, Blakebrook, NSW 2480. It is surrounded by mostly undeveloped farmland, with Rosehill Rd to the South and Nimbin Rd to the East. Goolmangar Creek is approximately 220m Southwest of Richmond Street.

The subject site is legally identified as Lot 2 DP 859866 and is approximately 1.27 ha in area although a significant portion of the site is undeveloped. The proposed works are to be limited to less than 0.60 ha of the total site. The locality of the site and surroundings are shown below in Figure 1.


*Figure 1: Existing site locality sketch, annotations by H&H, Nearmaps images*

The existing site is located on a ridge line, with a two-way crossfall. The western portion of the site falls at approximately 2% to the southwest. The Eastern portion of the site also falls at approximately 2% to the southeast. The existing site generally varies in elevation from 16.05m AHD to 13.40m AHD.

The existing site features several small buildings as well as open play areas and smaller storage sheds/containers.

From a stormwater drainage perspective, the site has an existing drainage swale that collects all runoff from the existing development. The channel drains from the west to east along Rosehill Rd eventually discharging towards Terania Creek, which in turn discharges to Leycester Creek, Wilsons River and finally, Richmond River.

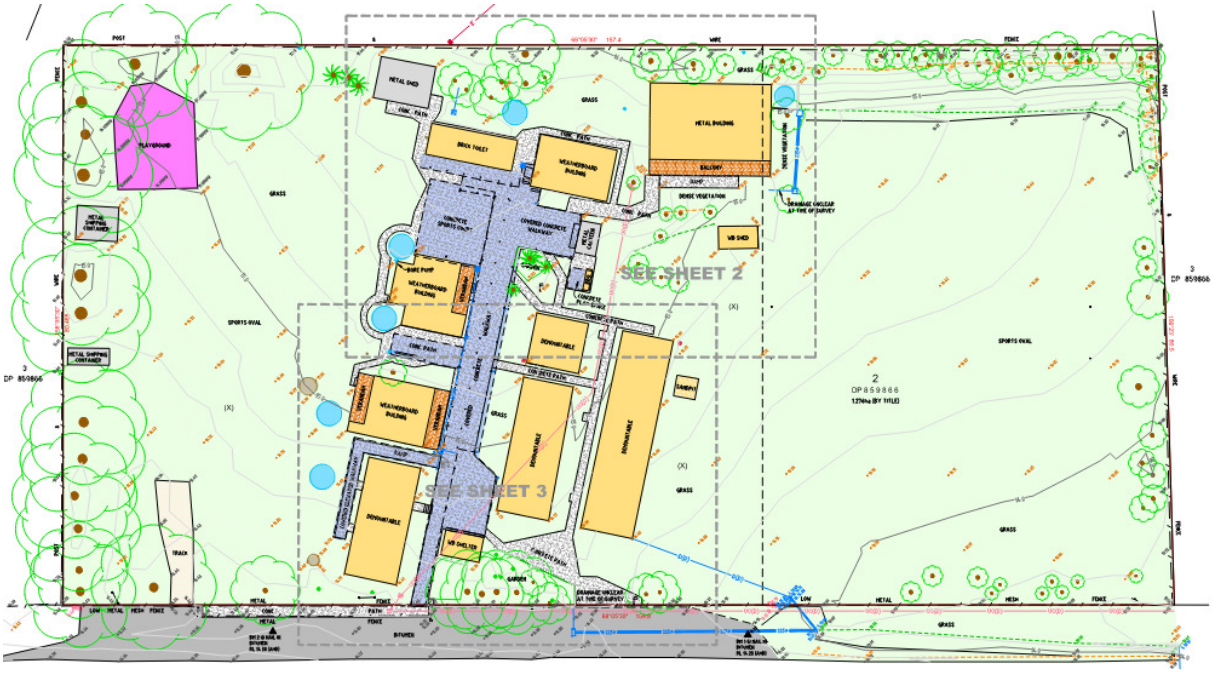



*Figure 2: Feature survey by Beveridge Williams*

## 2. Proposed Redevelopment

The proposed redevelopment of the school comprises the removal of several of the damaged buildings onsite and formalisation of the existing administration and teaching spaces in a single raised building. Lesser damaged buildings that can be renovated are proposed to be retained and some ancillary structures such as sheds, and storage containers are proposed to be retained and/relocated. A key feature of the proposed new main building is habitable areas such as administration and teaching spaces are located on a raised level to provide better flood immunity. The significance of the raised level and the developments interaction with the local flood plain is detailed in Chapter 6 - Flooding. The lower undercroft level is provided for storage and supporting building amenities. A section showing the raised level and undercroft is shown below in Figure 4.

Architectural concept plans can be found in Appendix C of this report, and excerpt of the site plan is shown below in Figure 3 and Figure 4.

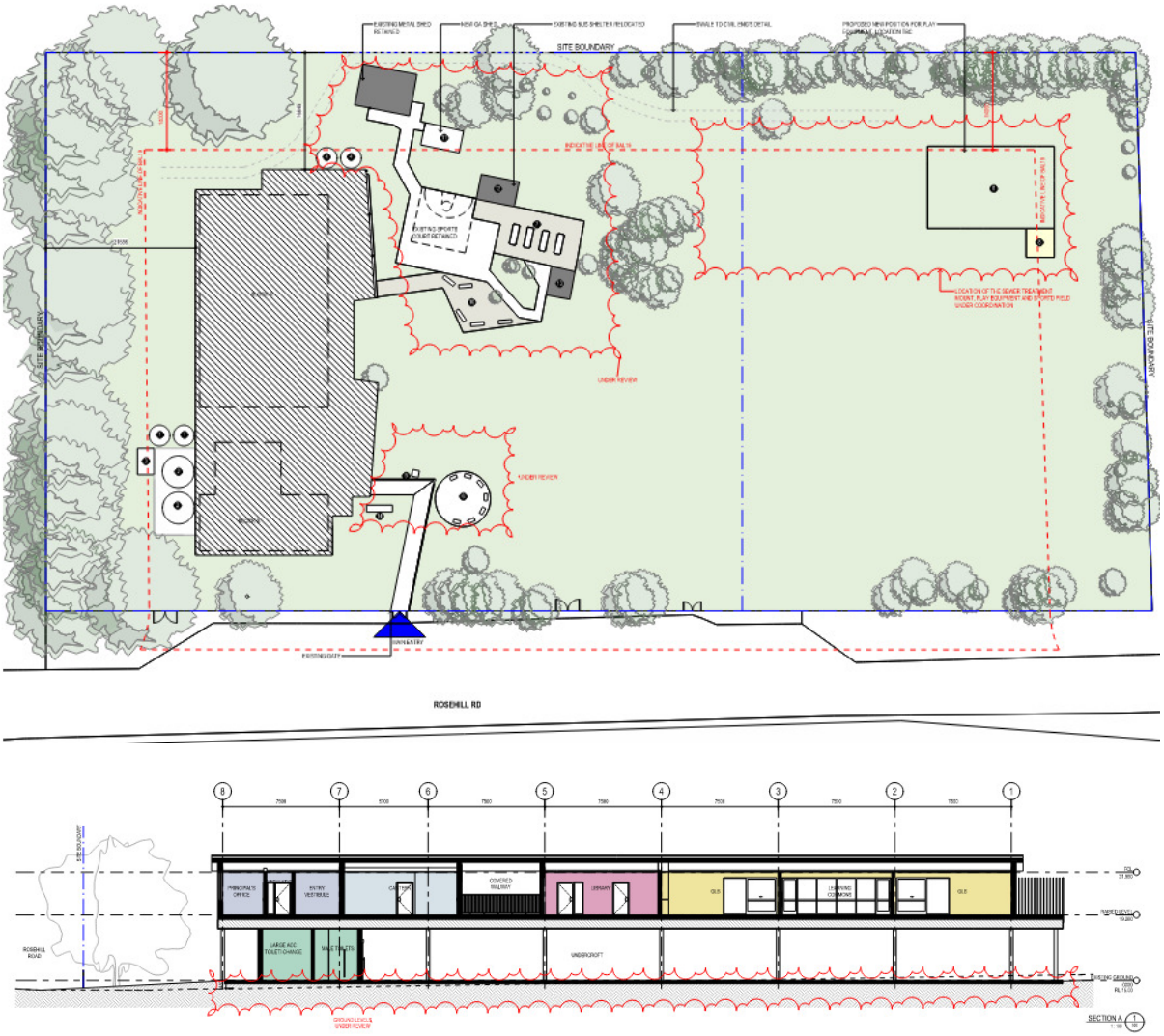



*Figure 3 (top) and 4 (bottom): Architectural site plan and section (respectively) of the proposed development. Pedavoli Architects 2023*

# 3. Site Works

## 3.1 Site grading

Proposed grading has been undertaken to generally match the existing sites topography. With only minor area of development proposed (beyond building lines) the proposed grading of external areas main feature is to create suitable and compliant transitions between existing hardstand structures and new hardstands structures.

Minor site grading has also been undertaken around the proposed building to improve drainage onsite and is such that overland flow will be directed away from buildings with no impact on proposed or surrounding habitable areas. Grading has been undertaken in accordance with the EFSG, however the retention of existing tree levels has meant we have had to work around these levels. Proposed grading for the development is shown on engineering drawing BLA-CIV-PP-DWG-0100 in Appendix A.

## 3.2 Retaining walls and site stability

No significant level changes from existing surface levels are proposed onsite. Proposed site grading has been undertaken in a manner to match the existing topography and no retaining walls are proposed for this development. No significant existing retaining walls are located onsite.

The high ground water table level does not support the use of permanent batters. With this considered, proposed site grading has been undertaken to minimise earthworks batters. Minor earthworks batters (less than 0.3m) are provided wherever required as part of the grading design for the site. Temporary earthworks batters will be provided at maximum slopes of 1(H) in 1.5(V) in accordance with the current geotechnical understanding for the development and where short-term construction batters are implemented, these will be protected from erosion by appropriately installed sediment and erosion control measures.

## 3.3 Bulk earthworks

As previously noted, proposed site levels have been generally designed to match the existing topography and marry existing hardstands and structures. As such, earthworks on a bulk scale are not proposed nor required to form suitable bulk earthworks levels and subgrade for building and hardstand construction.

# 4. Stormwater Management

## 4.1 Existing System

Stormwater generated by the existing school development is generally captured by roof drainage, stormwater pits or travels overland to an existing swale south of the existing developed area along Rosehill Rd. Smaller building roof areas and awnings drain to downpipes which discharge over stormwater pits or directly on ground. Run-off from most of the existing hardstand is directed to stormwater pits which is drained via an in-ground piped stormwater system to the northern easement or south to existing drainage pits within Rosehill Road.

The existing swale bounding the site on the North, drains a portion of the neighbouring development to the west and connect to existing swale on the east. The swale on the west drains to rip rap structure and disperses to the west.

## 4.2 Proposed Stormwater System

The proposed stormwater management system has been designed to reduce the overall impact of the development on the existing onsite and surrounding stormwater systems and flow regime. The proposed stormwater management system responds to the architectural layout and incorporates the natural topography and site constraints to produce a cost-effective layout that meets best industry practices and water quality and quantity objectives.

The stormwater management system for the proposed development has been designed to collect all concentrated flows from the proposed impervious areas as well as stormwater runoff generated by pervious areas such as landscaping and earthworks batters. In accordance with Council guidelines, the in-ground stormwater pipe network has been designed to cater for the 20-year ARI storm event. The system has also been designed in such a way that stormwater run-off generated by the 100-year ARI storm event will be conveyed via piped and overland flow paths with no impact on the subject development or surrounding developments/infrastructure. In the event of a total system blockage/failure, site grading is such that overland flow will be directed away from buildings with no impact on proposed or surrounding habitable areas.

The proposed stormwater system for the development will be designed in accordance and in consideration of the following:

- Institution of Engineers, Australia publication “Australian Rainfall and Runoff” (2019 Edition), Volumes 1 and 2 (AR&R).
- AS 3500.3: National Plumbing and Drainage Code Part 3 – Stormwater Drainage.
- Lismore Development Control Plan – Chapter 5B Commercial and Industrial Subdivision (2012).
- Lismore City Council Development and Design Manuel.

Catchment analysis has been undertaken to assess the change in predevelopment and post development catchments. Pre and post development catchments are shown on proposed grading for the development is shown on engineering drawing BLA-CIV-PP-DWG-0250 and 0251 in Appendix A. The predevelopment site has an impervious area of 2240m$^2$. The post development site has an impervious area of 2048m$^2$. The post development site has a decrease in impervious area of 192m$^2$.

The “Lismore Development Control Plan (2012)” was reviewed to determine if Onsite Stormwater Detention (OSD) is required for school redevelopment. Chapter 12.02 Permissible Site Discharge (PSD) is the maximum discharge from the post-development site and shall not exceed the pre-developed flows for all storm events up to the 1 in 100.

In accordance with Lismore development control plan and handbook of stormwater drainage design OSD is not required for the proposed development.

Where suitable given the existing site constraints, the proposed stormwater system design has been undertaken to be in accordance with the EFSG.

### 4.3. Water Sensitive Urban Design and Water Conservation

Pollution and contamination dislodged or inherent to and in stormwater and stormwater run-off from urban developments have the potential to damage the ecology and health of local creeks and waterways. As such stormwater quality improvement devices (SQIDs) that aim to minimise pollution during construction and operation of the development have been incorporated into the overall stormwater management design. Furter to the Council DCP Water Sensitive Design for developments which creates and additional impervious area of less than 300m2 the WSD performance criteria in Table 1 and the objectives of that Chapter does not apply.

Rainwater tanks are proposed to assist in water conservation and are sized in accordance with Council's policy. The proposed roof area for the new main building is 1290m$^2$. Rainwater tanks comprising of an approximate storage volume of 68kL is proposed in considerable excess of the minimum storage requirements.

As part of an effective treatment train for the site system, selected areas of the development or targeted removal zones (TRZs), will be pre-treated via passive screening pit baskets. To form a site-wide primary treatment system the TRZ for the development encompasses all external areas not beneath roofs and exposed to surface run-off. Target zones, mostly comprising of highly trafficked and hardstand areas that are subject to higher instances of pollution and litter and stand most to benefit from effective.

The pit basket proposed to be used is the "200-micron mesh Enviropod" pit basket filter by Enviropod. Pit baskets to be fitted with the "Enviropod" bit basket are noted on drawing BLA-CIV-PP-DWG-0201.

The maintenance of the pit baskets is important to ensure the effective removal of pollutants. As such, a maintenance schedule will be required to be detailed at the Construction Certificate stage. For this submission we have provided the generic maintenance schedule as prepared by Ocean Protect.

## 5. Sediment and Erosion Controls

During construction, appropriate sediment and erosion control measures need to be implemented to ensure that downstream receiving waters are not adversely impacted as a result of construction activities. The engineering drawings BLA-CIV-PP-DWG-0901 and 0910 by Henry & Hymas outline appropriately designed and detailed measures to mitigate against this risk. These measures have been designed in accordance with the requirements of the publication "Landcom – Managing Urban Stormwater - Soils and Construction, Volume 1, 4th Edition March 2004" and Lismore City Council requirements.

## 6. Flooding

As previously noted, in February and March 2022 extreme flood events occurred in the local floodplain, the lower Richmond River flooding. Floodwaters resulted in significant inundation of the school resulting in damage and rendering the school unfit for use.

### 6.1 Review of the existing Flood Assessment

On 4th August 2022, ACOR consultants undertook a site inspection to assess the severity of the local flooding and provide context on the flood levels in relation to the existing development and the frequency of the storm. The findings of the site inspection following the extreme flood event as well as review of other expert reporting and consultant consultation related to the flooding is documented in the Blakebrook Public School - Flood and Civil Engineering Assessment prepared for School Infrastructure NSW by ACOR Consultants (QLD) Revision 1 (ACOR, 2022). Major findings of the report (and subsequent updates following development of *Flood Emergency Response Plans – refer Chapter 6.2)* are listed below (ACOR, 2023):

- Flood likelihood and corresponding flood levels are listed below:

- Flood characteristics for the site obtained from Lismore City Council Council flood mapping is as follows:
  - 1% AEP flood velocity is up to 2.0 m/s.
  - 1% AEP Flood risk precinct is 'Medium' (ACOR, 2022).
- Following site inspection of the visible flood line left on the existing building following the aforementioned 2022 flood event the peak flood level of the 2022 flood was calculated to be approximately 17.4m AHD.
- The Flood Planning Level (FPL) has been adopted at RL 19.20m AHD.

Henry & Hymas has undertaken an independent review of the available literature and confirm the information presented above, based on the available literature, is accurate and suitable to undertake detailed design of the development. Available literature reviewed is listed below:

- Flood information from Lismore City Council
- Lismore City Council Lismore Floodplain Risk Management Plan - Land Use Planning and Development Control.
- Lismore City Council Local Environmental Plan (2012)
- Lismore City Council Development Control Plan (2012) Part A Chapter 8 Flood Prone Lands.
- Flood risk management manual, The policy and manual for the management of flood liable land by Department of Planning and Environment dated June 2023.

### 6.2 Review of Flood Emergency Response Plan

ACOR Consultants have also prepared a Flood Emergency Response Plan that details the arrangements that provide a framework for management of a flood emergency. The flood emergency response plan provides and adaptable framework that outlines the progression of emergency management functions and the parts that each party will play, including defined the roles and responsibilities of different agencies and outlining the strategies for the performance of key flood management capabilities (ACOR, 2023).

The main features of the Flood Emergency Response Plan are detailed below (ACOR, 2023):
It should be noted the above is simply a summary of the Flood Emergency Response Plan prepared by ACOR. It is strongly recommended the full Flood Emergency Response Plan is reviewed in conjunction with this summary.

*It was advised by the NSW State Emergency Service at a meeting on 11 April 2023 with the consultant project team that that an 'evacuation strategy' could be adopted by Blakebrook Public School such that the school is closed or evacuated (until the potential for flooding has passed) upon issue of a 'Severe Weather Warning' or 'Severe Thunderstorm Warning' for very heavy rain or intense rain in the region (catchment) by the Bureau of Meteorology (which may be relayed by the NSW SES).*

*It is possible that the Bureau of Meteorology may issue a 'Flood Watch' notification for Lismore City (noting the notification may be relayed by the NSW SES), as it is possible for flooding to occur in Lismore City due to rainfall in Coopers Creek catchment, Bangalow Area catchment, or Leycester Creek catchment, without significant rainfall in the Terania Creek catchment that the school is located within.*
*Closing (do not attend) or evacuating the school upon issue of a 'Severe Weather Warning' or 'Severe Thunderstorm Warning' alert notification provides longer effective warning times to allow evacuation to take place, as an alternative to waiting for a 'Flood Watch' or 'Flood Warning' notification for Lismore City.*

*- A 'Flood Watch' provides early advice of a developing situation that may lead to flooding, and is not a warning of imminent flooding,*
*- A 'Flood Warning' is advice that flooding is occurring or expected to occur in a geographical area,*
*- 'Severe Weather Warnings' can be issued for very heavy rain or intense rain that may lead to flash flooding.*

*The evacuation strategy for the school for the purposes of evacuation prior to flood inundation of local roads, the school and the wider area is as follows:*

*- School administration to have a database of names, phone numbers (mobile and landline) of parents and citizens/carers (emergency contacts)*

*- School administration to implement a messaging system to communicate to parents and citizens/carers (emergency contacts) that closure of the school (do not attend) or evacuation of the school may be or is required. Methods include (more than one can be used):*

*- Bulk 'SMS' messaging to all mobile phones on a list*
*- Messaging via social media channels*
*- Telephone*
*- Email*

*- School administration to be subscribed to Bureau of Meteorology (BOM Weather App) 'Severe Weather Warnings', 'Flood Watch' and 'Flood Warning' notification alert systems.*

*- School administration to be subscribed to Early Warning Network paid subscription service to send the BOM alerts to the school administration, in addition to BOM Weather App notification alert systems. EWN sends alerts by multiple channels (SMS, email and text-to-voice for landlines), providing confidence that the school will know an alert has been issued. This subscription service provides more channels for alerts than notifications/alerts sent via the BOM Weather App and reduces the potential for subscribers to 'turn off' notifications.*

- *Closure (do not attend) or evacuation of Blakebrook Public School should be undertaken by the school administration or Department of Education when a 'Severe Weather Warning' notification for very heavy rainfall or intense rainfall is issued by the Bureau of Meteorology (using Early Warning Network location services alerts for the catchment that Blakebrook Public School is within (Terania Creek catchment)).*
- *The decision to close or evacuate should be made early using information at hand.*
- *Timely relaying of Bureau of Meteorology 'Severe Weather Warnings', 'Flood Watch' and 'Flood Warning' notifications, or NSW SES 'Advice' or 'Watch and Act' or 'Emergency Warning' warnings to parents and citizens/carers.*
- *Evacuation is to be undertaken as early as possible, which is aided by monitoring of warnings and weather conditions in the upper catchment and upstream flood conditions.*

*- It is not advised that the decision to close or evacuate the school should wait until a:*

*- 'Flood Watch' or 'Flood Warning' notification for Lismore City (Leycester Creek or Wilsons River) is issued by the Bureau of Meteorology (or relayed by the NSW SES), or*

*- an 'Evacuate Now - Emergency Warning' notification for Lismore City is issued by the NSW SES.*

*- Students are largely unable to self-evacuate and require assistance from parents/carers and multiple methods of evacuation must be available for the FERP to be effective, such as:*

*- arrangement with a local bus service to be on-call and available for the evacuation of all students to a pre-determined evacuation location is required*

*- by parents and carers*

*- by teachers and school staff*

*- Distribution of the evacuation route map to higher ground and a pre-determined evacuation location*

*- Evacuation must not require people to drive or walk through flood water*

*- Parents and citizens/carers or responsible adults are to evacuate the students under local traffic arrangements from the school via managed evacuation routes*

*- Evacuees are to go to home with their parents, or to friends or relatives, or else be taken to the nearest accessible evacuation centre. The homes of students, friends or relatives may also be subject to flood inundation, therefore these destinations may not be safe to stay at for extended periods if a major flood event occurs.*

*- The NSW SES will advise when return to evacuated areas is safe after flood waters have receded and reliable access is available.*

*- The process for making decisions by the school in the event of a flood emergency should be consistent with the process in section 1.3 of the school's emergency management plan.*

*The evacuation process is illustrated in the following figure.*

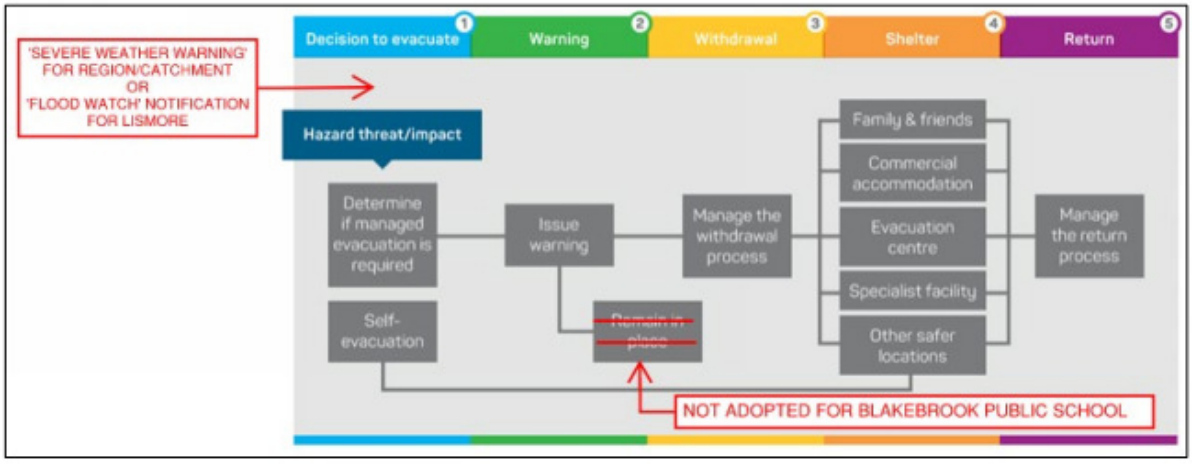



Figure 3-4 Evacuation process for Blakebrook Public School administration (Australian Institute for Disaster Resilience, 2017)

Henry & Hymas have undertaken an independent review of the available literature and generally support the actions detailed in the current flood emergency response plan. Available literature reviewed is listed below:

- Engeny 2023 flood modelling for Blakebrook Public School
- Engeny 2021 Lismore Floodplain Risk Management Study
- Lismore City Local Flood Plan by the NSW State Emergency Service (SES).
- Flood Emergency Response Plan for Blakebrook Public School by ACOR
- NSW DPE (2022), Flood Risk Management Manual: The Management of Flood Liable Land. © State of New South Wales.
- NSW DPE (2022a), Support for Emergency Management Planning: Flood Risk Management Guide EM01. © State of New South Wales

### 6.3. Further recommendations on current Flood Assessment and current Flood Emergency Response plan.

The Flood Assessment and Flood Emergency Response plan should be regularly, and consistency updated for the most recent and accurate flood data reviewed for consistency and accuracy of current flood information and updates to the Flood Assessment and Flood Emergency Response Plan are made if required.

### 6.4. Flood Impact Assessment

The flood impact assessment detailed below has been prepared in conjunction with the aforementioned Flood Assessment and Flood Emergency Response Plan by Acor. The Flood impact assessment detailed below provides a simple assessment in regards to the impacts of the development on flood behavior and the impacts flooding has on the design of the building in terms of built form, material selection and flood proofing etc. In regards to the developed impact on flood behavior, a simple assessment of flood impacts was determined appropriate due to the scale of the development in relation to the flood plain, the location of the development within the flood plain and the overall reduction in built area and insignificant changed to site levels. Where relating to these two items, the Flood Impact Assessment is in accordance with the framework of relevant regulatory guidelines such as the Department of Planning and Environment (DPE) recommendations as detailed in Flood impact and risk assessment - Flood risk management guideline LU01 (DPE1, 2023). The actions and recommendations below also comply with Lismore City Council requirement as outlined in New Lismore Flood DCP particularly in regard to setting of minimal habitable floor level and provision of flood compatible materials and methods.

To provide context on the flood levels and frequencies mentioned in this report the CSIRO provides estimation on the flood frequency of the 2022 event. The CSIRO states “The 2022 peak flow was estimated to be significantly higher than the 1% Annual Exceedance Probability event at seven gauging stations in the region and for the Lismore partial inflows (a partial estimate of streamflow at Lismore based on the sum of flows at two upstream stations). A high degree of uncertainty is associated with these frequency estimates which were found to vary between slightly less than a 1 in 100 year frequency (1% AEP) to 1 in several thousand years (up to 0.01% AEP for one station).” (CISRO, 2022).

<u>The developments interaction with flooding</u>

As detailed in Chapter 3, the proposed site works will only generate minor modifications to existing topography. The building form and location of structures generally match that of the developed portion of the site which are proposed to be removed. Blakebrook Public School can be impacted by three types of flooding, overland flow, creek flooding and riverine flooding. The school is not within the area covered by the Lismore Floodplain Risk Management Plan 2014
(Lismore City Council, 2014).

Replacement buildings have undercroft areas without enclosed sides to allow flood water to pass beneath the enclosed building. Stairwells, lifts and the enclosed building amenities undercroft area (toilets and store rooms) are proposed be located close, between or near existing building locations and have minimal footprints. The proposed superstructure for the raised floor is proposed to have a soffit height at (or above) the PMF level of 18.38 m AHD.

A comparison of buildings and significant structures was undertaken to assess the impact of the development on flood plain storage. Comparison confirmed no change in total building and significant structure building plan area from 1557 $m^2$ in the predevelopment scenario to 1313 $m^2$ post development scenario (16% change).

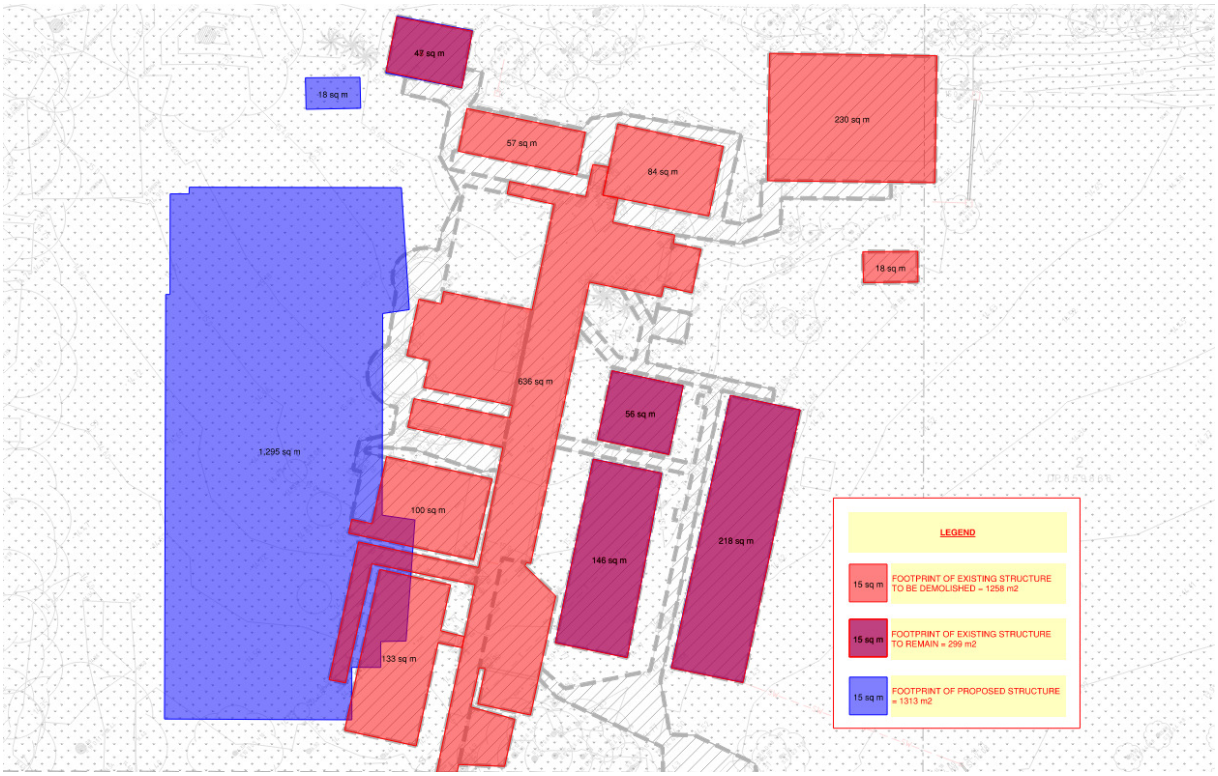



*Figure 5: Comparison between existing and proposed and structures (Henry & Hymas 2023).*

Given the context of the development in the floodplain, the minor changes in topography and built form will have a negligible impact on local flood conveyance and storage and will have negligible adverse impact on existing flood behavior. The following impact considerations under the DPE's Flood impact and risk assessment - Flood risk management guideline LU01 are made:

- The proposed development will not result in significant changes to the existing flood level.
- The proposed development will not result in significant changes to the existing the duration of flooding.
- The proposed development will not result in meaningful or significant changes to existing flood velocity or existing flow path.
- The proposed development does not decrease available warning time and time available for evacuation.
- The proposed development does not increase the frequency of inundation.

<u>Flood Resilience - structural design and flood compatible materials.</u>

It is understood that flood risk assessment and the decision on evacuation is detailed in the FERP completed by Acor Consultants. It is accepted that the risk and endangerment to life is a main priority and that this risk is addressed in the response strategy detailed in the FERP. The following portion of the Flood Impact Assessment addresses lesser risks, such as the risk to property, and provides measures to ensure the school will suffer minimal damage during a flood event and can quickly be repaired and cleaned for operation following a major flood event.

The proposed flood proofing methodology is adopted from the NCC and associated reference materials such as the (ABCB, 2012). The core of the methodology is different flood proofing methods are applied to different components of the building depending on where these building components sit relative the flood level and depending on how these actors need to perform

structurally. Building area and components can be designed for 'dry flood proofing'. For dry flood proofing, the building or relevant parts of the building envelope are made substantially impermeable to flood water. If this method is used, care must be taken to ensure the structural adequacy of the envelope of the dry food proofing part of the building to carry the differential hydrostatic pressure (in addition to the hydrodynamic action) created by the flood water. This pressure is quite severe and could cause major structural damage if not properly accounted for (ABCB, 2012). Given the depth of the water relative to the ground flood undercroft areas, the imposed loading by flood waters would be an unnecessary risk that could cause damage to the building.

For the undercroft area of the new building (including the undercroft storage areas and amenities) and existing buildings below the flood level a 'wet flood proofing' methodology has been adopted. With wet flood proofing, the water is allowed to enter the building to reduce the built-up of hydrostatic pressure between the flood water and the inside of the building. The structural materials used below the flood level must therefore be water resistant to minimize the resulting damage (ABCB, 2012).

Structural design will take into account all relevant provisions of the Australian Standards, the National Construction Code (NCC) and Building Code of Australia (BCA) relating to design of building subject to flooding.

Structural design and material selection incorporates relevant industry documentation relating to construction within flood plains such as "Flood risk management manual, The policy and manual for the management of flood liable land by Department of Planning and Environment" dated June 2023 and "Construction of Buildings in Flood Hazard Areas" by the Australian Building Codes Board dated 2012 (ABCB, 2012). All materials used in the construction of the building are proposed to conform to the appropriate requirements of the NCC, including its referenced documents. In addition, materials that are exposed to water inundation have been given further consideration of their properties when wet in deciding whether they are suitable for use (ABCB, 2012). These include:

- Likely duration of exposure to wetness.
- Changes to dimensions and strength when wet.
- Water absorption rate and required drying time.
- Cost and feasibility of replacement of components.

A detailed assessment of the materials and their arrangement in building systems is provided in the Chapter - Material Selection.

Another valuable source of guidance on flood compatible materials, design and construction techniques is the "Reducing vulnerability of buildings to flood damage - Guidance On Building In Flood Prone Areas by the Hawkesbury-Nepean Floodplain Management Steering Committee, 2006" (HNFMSC, 2006). Material selection, structural design and construction methodology has been undertaken in accordance with this guideline. Lastly, the structural design and material selection has been undertaken to be in accordance with the LGA requirements as detailed in the Lismore Flood DCP.

The structure proposed has been designed in consideration of all additional forces and loads imposed from flood waters including hydrostatic actions (e.g. buoyancy), hydrodynamic (e.g. drag forces), debris actions, wave actions, erosion and scour and combinations of these actions. In addition to standard design requirements for flooding for buildings of this nature (listed above), structural design considers relevant provisions of the Australian Standard for Bridge Design, Part

2: Design loads where related to the design of the superstructure and supporting columns, including and not limited to:

- Loading from impacts of debris in particular impacts from logs and floating debris.
- Additional drag forces from accumulating debris mat in superstructure (if relevant considering flood level).
- Additional drag forces from accumulating debris mat including entanglement around columns and other structures.

Based on the current design methodology, structural design of the building has been undertaken to incorporate the aforementioned additional forces and loading by floodwaters has been undertaken up to the sofit of the ground floor at 19.20m AHD (in excess of the FPL). For the Blakebrook School Site, this means structural design of the school has been undertaken to withstand floodwater up until the PMF flood level (as recorded in ACOR flood assessment).

Structural design of the building takes into account the flood information present in Acor's flood assessment (ACOR, 2022) as well as other key documentation surrounding the attributes of flooding, in particularly, flood velocity and level. The key attributes relevant from the current flood impact assessment and other key documentation is detailed below:

- 1% AEP flood velocity is up to 2.0 m/s.
- FPL of RL 19.20 m AHD.

Undercroft area - Design methodology

Following review of the aforementioned industry guidelines around flood resilient design the proposed undercroft area (toilets and storerooms) has been designed with the following 'wet proof' design methodology;

- Reinforced concrete ground floor slab designed for potential uplift forces due to receding flood waters. The ground flood slab is proposed to include a subsurface drainage system to mitigate uplift forces from receding floodwaters. The selection of the reinforced concrete ground floor slab is supported by (BSC, 2012) and a preferred flood resilient design option in both the (HNFMSC, 2006) and (ABCB, 2012).
- Reinforced core filled blockwork external and internal walls extending to the underside of the super structure (min RL 18.85m AHD). The selection of this method of construction is supported by the (BSC, 2012) and a preferred flood resilient design option in both the (HNFMSC, 2006) and (ABCB, 2012).

Modular design and flood resilience

A major challenge for providing a flood resilient design is to incorporate the EFSG design methodology to incorporate modular design. To provide a flood resilient modular undercroft solution, consultation between ADCO constructions, Henry & Hymas and the Modscape was undertaken to ensure any solutions are buildable, coordinated and appropriately flood resilient. Following extensive consultation it was determined better outcomes in terms of flood resilience could be achieved by reverting to a conventional construction methodology. The main feature of this design include:

- The wall structure is comprised of external and internal reinforced concrete blockwork walls.
- The external reinforced blockwork has been designed to resist the forces imposed by floodwaters and debris impact.
- The external reinforced blockwork wall has been designed to include regular removeable vent blocks or weep holes to equalise water pressures.
- The undercroft floor is proposed to be reinforced concrete slab construction which is poured following construction of the external and internal walls, columns and associated footings. The internal floor is proposed to be finished higher than the surrounding flood level to

provide a level difference across the external wall to promote water to drain water externally. The ground flood slab is proposed to include a subsurface drainage system to mitigate uplift forces from receding floodwaters.

- The internal wall systems have been designed using approved flood resilient material and strength suitable to withstand pressure differential forces that will occur between the internal and external water levels. Internal and external walls are proposed to include small weepholes to relieve pressure between external and internal areas minimising pressure differential between internal and external walls. Cavities and internal wall linings (excluding render) are not proposed due to the additional burden of maintenance following a flood event.
- As recommended in the NCC and reference documentation. The design has been undertaken to reduce moisture traps in design of the building. I.e., avoid non ventilated or non-free draining cavities etc.

Material Selection

Similar with the generally design methodology, the proposed building materials were reviewed against the aforementioned reference documentation to ensure base material selection is suitable. The *(ABCB, 2012)* notes in regards to material section, the Limited (or nil) use of Materials:

- That are weakened when wet.
- Materials that are stable but porous that will need drying out after the flood.
- Material prone to absorption
- Material prone to fouling, rusting, rotting when exposed to water.

(HNFMSC, 2006) is also an excellent source of information regarding materials section and and provides detailed information on the vulnerability, absorbency and suitably following prolonged immersion.

The results of the review for each key building material, and commentary on suitability, are provided below.

Floor: Concrete ground floor slab:

- Supported by Council Schedule for (BSC, 2012).
- **Low** vulnerability classification as defined in (HNFMSC, 2006).
- Materials 96-Hour Immersion classification as **suitable** *(these materials or products are relatively unaffected by submersion and flood exposure and are the best available for the particular application)* as defined in (HNFMSC, 2006).
- Material absorbency classification **A** *(minimal damage under most circumstances)* as defined in (HNFMSC, 2006).

Internal and External walls: Reinforced core filled blockwork

- Supported by Council Schedule for (BSC, 2012).
- **Lowest** vulnerability classification as defined in (HNFMSC, 2006).
- Materials 96-Hour Immersion classification as **suitable** as defined in (HNFMSC, 2006).
- Material absorbency classification **A** *(minimal damage under most circumstances)* as defined in (HNFMSC, 2006).
- Structural reasons, refer earlier chapter regarding structural design.
- Blockwork unaffected by immersion.
- Minimal clean-up and repair.
- No chance of decay, distortion or rusting of supporting frame.
- Normally no wall insulation required.
- Skirtings and architraves not required.
- Cement render finish is durable.

Non-Load Carrying Component Interior Lining of Walls: Cement Render

- Supported by Council Schedule for (BSC, 2012).
- **Lowest** vulnerability classification as defined in (HNFMSC, 2006).
- Materials 96-Hour Immersion classification as **suitable** as defined in (HNFMSC, 2006).
- Material absorbency classification **C** *(subject to damage after prolonged immersion, but will recover when effectively dried)* (HNFMSC, 2006).
- Unaffected by water immersion.
- Not prone to impact damage.
- Easy to clean or repaint.

Similarly, to structure and material design, consultation was held between Henry & Hymas and services engineers JHA to develop services solutions for the development which are flood resilient. Review of the services focuses on those located beneath the FPL or have the possibility of being either directly or indirectly impacted by a flood event. The following recommendations were provided for incorporation into the services design for the development. The recommendations focus on improving flood resilience, minimising damage during a flood event and reducing required replacement, maintenance and cleaning of key infrastructure following a flood event.

In addition to incorporation of the items mentioned below it is recommended the services designers undertake and assessment of the flood resilience of the respective services designs against current industry regulatory and guidelines relating to flood resilience. For guidance the relevant document reference is shown *(in brackets)* with the proposed recommendation.

Lighting and Electrical:

- The most effective flood-resistant option for electrical systems in new buildings in flood prone areas is elevation of electrical components to the highest practical or regulatory level. *(HNFMSC, 2006)*
- Where possible, wiring should be placed above the FPL. A practical option could be to place wiring in the roof space or the floor above and extend down the wall. The power points and switches in particular should be elevated above the FPL to gain extra protection. Conduits should be installed to ensure that water will be drained freely if subject to immersion. *(ABCB, 2012)*,
- Sensor lighting should be provided in the undercroft toilets and store rooms to prevent additional switches below the FPL.
- Fixed electrical equipment such as non submergible pumps, water filtration units, air conditioners and hot water systems should be mounted above the FPL to reduce the chance of inundation. *(ABCB, 2012)*,
- Where possible, electrical switches must be placed above the FPL. Electrical conduits and cables installed below the FPL must be waterproofed or placed in waterproofed enclosures. *(ABCB, 2012)*.
- In two-storey construction, lighting and power on each level on separate circuits, any electrical power outlets below the FPL should be provided on a separate circuit. Ground and first floor electrical services should be provided on a separate circuit. Note: This control relates to lift electrical. *(HNFMSC, 2006),*
- Where possible, all cable runs should be of one length. If junction boxes are unavoidable, they should be located in easily accessible, yet elevated, locations. *(HNFMSC, 2006),*
- Conduits should be installed in such a manner to ensure any water will drain freely as the floodwaters recede. Similarly, where the mains supply is located underground, it should be

installed to ensure that water can drain from the conduit. Sag points in any conduits should be avoided. (HNFMSC, 2006)

- All wiring, power outlets, switches, etc., should, to the maximum extent possible, be located above the relevant flood level. All electrical wiring installed below the relevant flood level should be suitable for continuous submergence in water and should contain no fibrous components. Earth core leakage systems (or safety switches) are to be installed. Only submersible-type splices should be used below the relevant flood level. All conduits located below the relevant designated flood level should be so installed that they will be self-draining if subjected to flooding. *(BSC, 2012)*
- All equipment installed below or partially below the relevant flood level should be capable of disconnection by a single plug and socket assembly. *(BSC, 2012)*
- Should any electrical device and/or part of the wiring be flooded it should be thoroughly cleaned or replaced and checked by an approved electrical contractor before reconnection. *(BSC, 2012)*
- Buried systems must be placed at a depth sufficient to prevent damage due to scour and erosion during the flood event. Exposed systems must be designed to withstand the flood related actions (buoyancy, flow, debris and wave) *(ABCB, 2012).*

Stormwater:

- Selection of water quality management system, refer Chapter 4.3
- Provision of Onsite Stormwater Detention (OSD), refer Chapter 4.2
- Consideration of flood levels for hydraulic modelling.

Hydraulic, Fire and other services:

- Water filtration and non-submergible pump equipment should be located above the FPL.
- Buried systems must be placed at a depth sufficient to prevent damage due to scour and erosion during the flood event. Exposed systems must be designed to withstand the flood related actions (buoyancy, flow, debris and wave) (ABCB, 2012).
- Both above and under ground tanks need to be designed for any likely buoyancy forces. All tanks need to be designed with appropriate hold down capability and to resist impact loads from debris. (HNFMSC, 2006)
- Any restraints should be of corrosion resistant material to reduce the chance of corrosion weakening the support. The number and capacity of these restraints required can be calculated after determining the net buoyancy force. (HNFMSC, 2006)
- Where feasible, above ground tanks should be elevated as much as possible to reduce the buoyancy forces but the support structures need to be designed to resist the forces. The supporting posts or columns should have deep concrete footings embedded below expected erosion and scour lines. (HNFMSC, 2006)
- If high velocities are expected in an area, flow deflector walls can be constructed around the tank to protect it from debris impact and the forces of velocity flow. The walls should be as high as practical but they do not have to be watertight. Should they fully circle the tank, there must be drainage holes at the base of the walls for rain and floodwater to drain. (HNFMSC, 2006).
- During a flood, settlement of a structures such as pits can occur, especially those placed on fill, can occur due to soil saturation. This can lead to breakage of pipework and or the connections. Accordingly, pipework connections should have some flexibility to reduce the chance of breakage. (HNFMSC, 2006)
- To reduce the possibility of the water in rainwater tanks becoming contaminated, the inlet should be located as high as possible so it does not become submerged. (HNFMSC, 2006)

- Exposed components or pipework at risk from flowing water and debris should be securely fastened or located in sheltered areas to reduce the chance of damage. (HNFMSC, 2006)
- Hot water heaters are likely to need replacing if immersed in water and should be mounted as high as practical. (HNFMSC, 2006)
- Rainwater tanks (both in ground and below ground) are design for all relevant flood forces e.g. buoyancy and dynamic forces from flood waters. (HNFMSC, 2006)
- The main issue with sewerage systems during flooding is the potential for the backflow of sewage into the building. Refer to plumbing regulations or separate State/Territory requirements to determine whether backflow protection devices should be fitted for this purpose. *(ABCB, 2012)*
- The main issue with storage tanks is the possibility that they may float or pop out of the ground due to buoyancy and therefore they should be designed to resist the uplift forces. Above ground tanks should be placed above the FHL if possible. *(ABCB, 2012)*

Other considerations

The design has been undertaken to reduce introducing additional debris into flood waters. Undercroft areas should not be used for storage of vulnerable equipment or assets in cages or otherwise. Floatable items such as tables and bench seating should be fixed securely (such that movement is not easily possible) to an undercroft ground slab or surrounding footpaths (ACOR, 2022).

## 7. Conclusion

In general, the engineering objectives of civil design and stormwater management elements mentioned above are to create a system that is based on the architectural layout and incorporates the natural topography and site constraints to produce a cost-effective and appropriate drainage system that meets best industry practices and governing water quality and quantity objectives.

We trust the information provided in this report satisfies matters relating to civil, stormwater design and flooding.

## 8. References

*(ACOR, 2022),* Blakebrook Public School - Flood Emergency Response Plan prepared for School Infrastructure NSW by ACOR Consultants (QLD) Revision 1 dated 31/08/2022.

*(HNFMSC, 2006),* Reducing vulnerability of buildings to flood damage - Guidance On Building In Flood Prone Areas by the Hawkesbury-Nepean Floodplain Management Steering Committee, 2006" (HNFMSC, 2006).

*(ABCB, 2012)*, Construction of Buildings in Flood Hazard Areas" Version 2012.3 by the Australian Building Codes Board (ABCB) dated 2012.

*Engeny 2023 flood modelling for Blakebrook Public School*

*Engeny 2021 Lismore Floodplain Risk Management Study*

*Lismore City Local Flood Plan by the NSW State Emergency Service (SES).*

*Flood Emergency Response Plan for Blakebrook Public School by ACOR*
NSW Office of Environment and Heritage (2017). NSW ocean and river entrance tidal levels annual summary 2016–2017. Report MHL2574. December 2017.

Coastal Risk Australia (2021). Predicted Coastal Flooding Resulting from Climate Change. IPCC Sixth Assessment Report Update 2021.

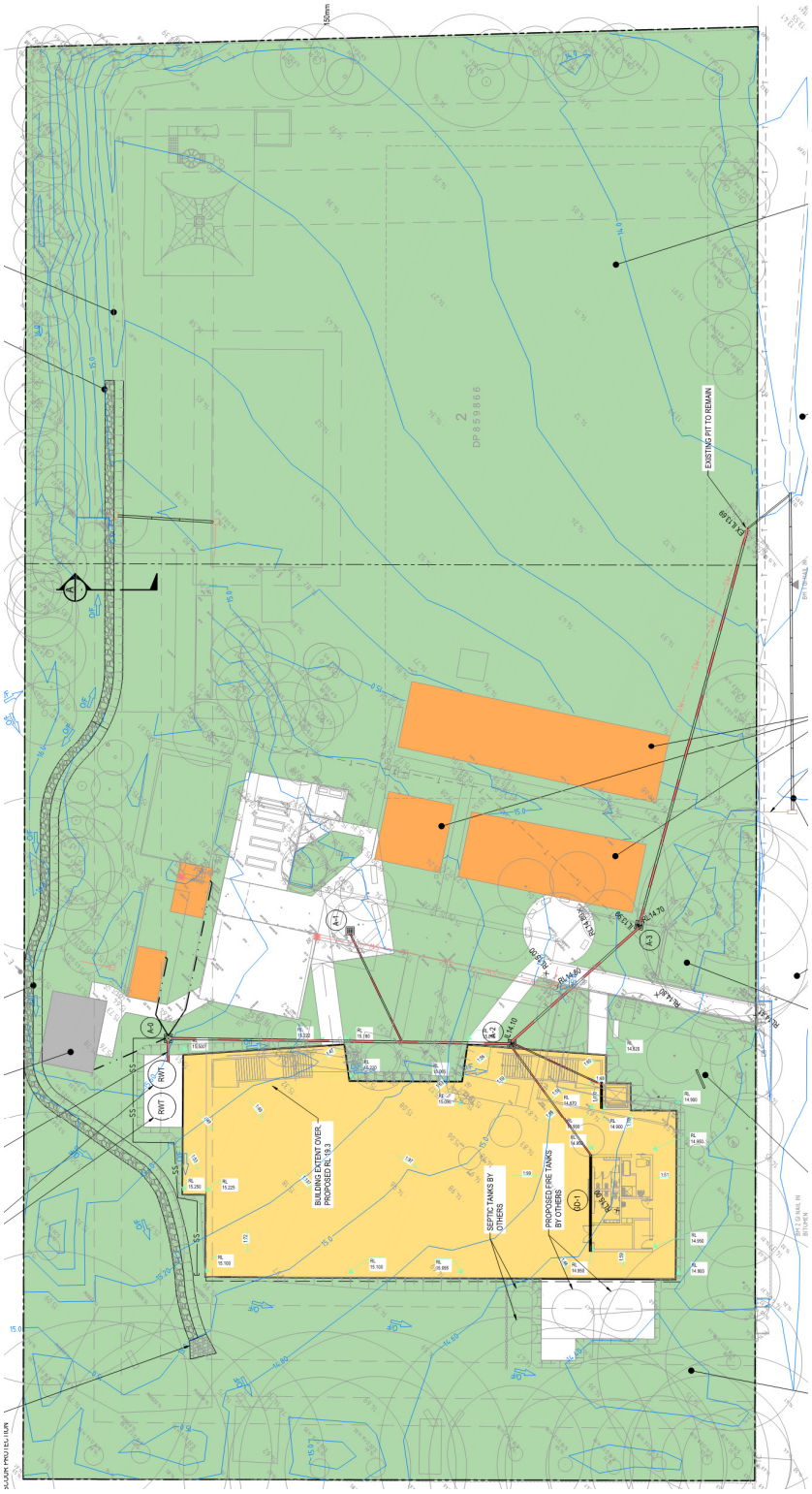
## 9. Appendices

Appendix A: Civil Engineering Drawings by Henry & Hymas Engineers

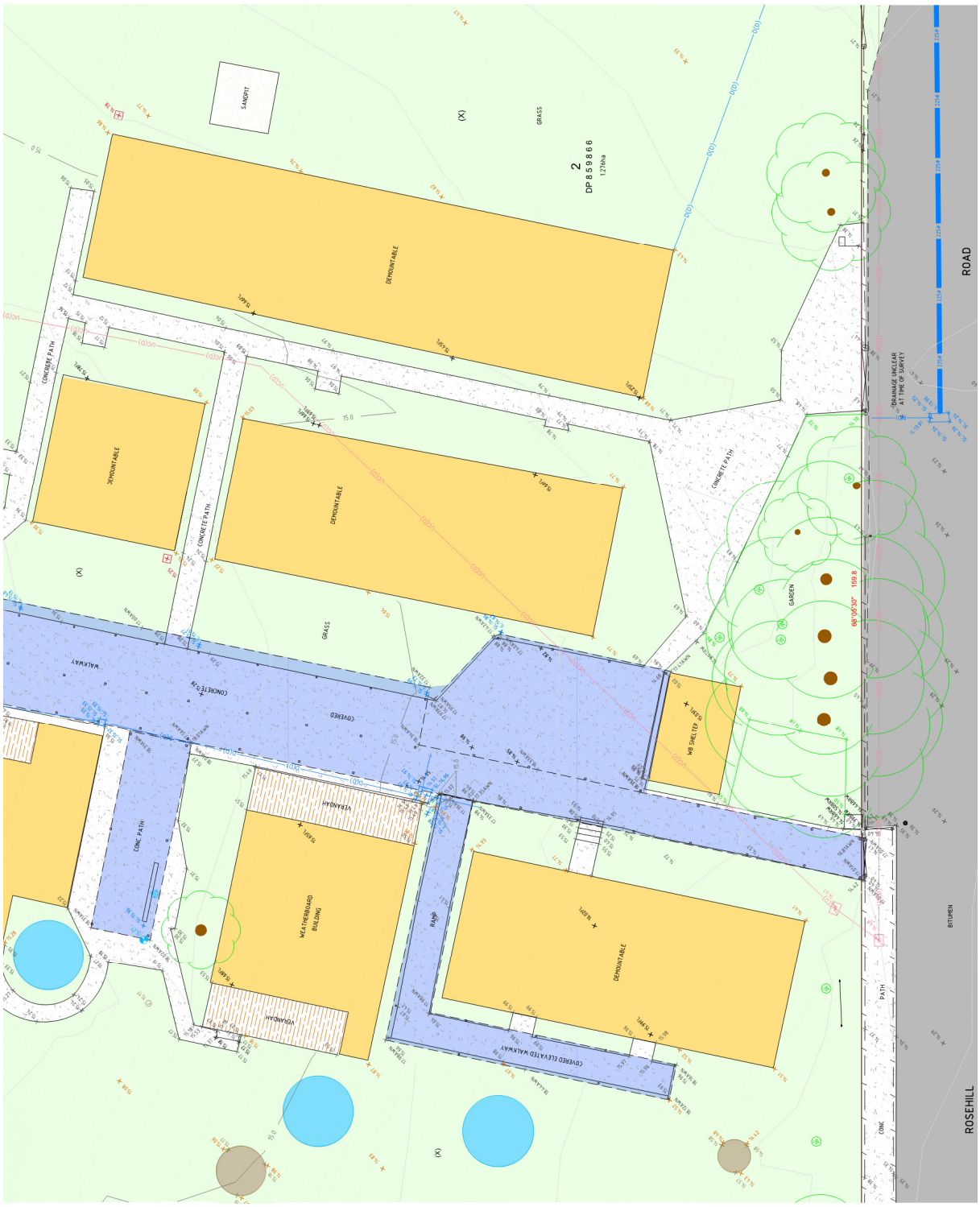
Appendix B: Site Survey

Appendix C: Architectural concept drawings – Site plan

## Appendix A: Civil Engineering Drawings by Henry & Hymas Engineers



## Appendix B: Site Survey



## Appendix C: Architectural concept drawings – Site plan