Warren Smith & Partners Pty Ltd

Redfern-Waterloo Authority

HYDRAULIC SERVICES CONCEPT DESIGN REPORT

for

NORTH EVELEIGH CONCEPT PLAN

CLIENT

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C	Final Report	1st April 2008	L Panagopoulos	L Panagopoulos	Current

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ATTACHMENTS

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ABBREVIATIONS

Organisations

RWA	Redfern-Waterloo Authority
WSP	Warren Smith and Partners Pty Limited
BS	Bates Smart Architects
TDS	Turf Design Studio and Jeppe Aagaard Andersen
WI	Whelans Insites Pty Limited
DSP	Degotardi Smith and Partners Consultant Surveyors
SMEC	SMEC Australia Pty Ltd
ISF	Institute of Sustainable Futures, University of Technology, Sydney
UTS	University of Technology, Sydney
CABE	Commission of Architecture and the Built Environment
GBCA	Green Building Council of Australia

Authorities

DOP	Department of Planning
SCC	City of Sydney Council
MOA	NSW Ministry of the Arts
SWC	Sydney Water Corporation
SHFA	Sydney Harbour and Foreshore Authority
RTA	Roads &Traffic Authority
RCP	RailCorp
DECC	Department of Environment and Climate Change (NSW)
DWE	Department of Water and Energy (NSW)
BCA	Building Code of Australia
OHS	Occupational Health and Safety
AGL	Australian Gas Light Company

Units

GFA	Gross Floor Area
NLA	Nett Lettable Area
Ha	Hectare
Q	Discharge rate in m^3/sec
m^3/sec	Cubic metres per second
kL/m^2/a	Kilolitres per square meter per annum
kL/year	Kilolitres per year
TWL	Top Water Level
L	Litres
L/min	Litres per minute
L/m^2/day	Litres per square meter per day
L/person/day	Litres per person per day
L/person/year	Litres per person per year
ML	Megalitre
ML/yr	Megalitre per year
Dia	Diameter
OD	Outside Diameter
ID	Internal Diameter
pa	per annum
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids

Levels and Distances

AHD	Australian Height Datum
RL	Reduced Level
m	Height in metres to AHD
m	Length in metres
m^2	Square metre
m3/sec	Cubic metres per second
mm	Length in millimetres
IL	Invert Level
FFL	Finished Floor Level
FGL	Finished Ground Level
Ch	Chainage

Materials

RBC	Rectangular Box Culvert
RC	Reinforced Concrete (pipeline)
PE	Polyethylene (pipeline)
DICL	Ductile Iron Cement Lined (pipeline)
PVC	Polyvinyl Chloride (pipeline)
VC	Vitrified Clay (pipeline)
SPS	Sewerage Pumping Station

Design References

BASIX	Building Sustainability Index (NSW)
DRAINS	Two Dimensional Numerical Drainage Modelling Programme
DA	Development Application
OSD	On Site Stormwater Detention
PSD	Permissible Site Discharge
SSR	Site Storage Requirement
ARI	Average Recurrence Interval
ARQ	Australian Runoff Quality
PMF	Probable Maximum Flood
WSUD	Water Sensitive Urban Design
MWP	Metropolitan Water Plan
NABERS	National Australian Built Environment Rating System
NSESD	National Strategy for Ecologically Sustainable Development
NWI	National Water Initiative
WMP	Water Management Plan (North Eveleigh Redevelopment Project)
BEP	Built Environment Plan (Redfern–Waterloo – Stage One)
EMP	Environmental Management Plan (City of Sydney)
ESD	Ecologically Sustainable Development
LEED	Leadership in Energy and Environmental Design
NOR	Notice of Requirements under the Section 73 of the Sydney Water Act 1994, Part 6 Division 9
WSAA	Water Services Association Water Supply Code of Australia

1. INTRODUCTION AND CLIENT BRIEF

The purpose of this report is to provide supplementary information and advice in relation to the North Eveleigh Concept Plan.

This report undertakes a detailed review of the current servicing and proposed servicing of the redeveloped site taking into consideration the likely footprint of development, buildings, associated roads, setback areas and landscaping.

Accordingly, the scope of work addressed in this report includes the following items of work:-

- Undertake a site audit of the existing land;
- Liaison with RWA, BS and TDS;
- Liaison with Authorities including Utility Authorities consisting of SWC and SCC;
- Assessment of existing RC design and as built drawings to determine the location of existing stormwater drainage infrastructure within North Eveleigh and across the Great Western Railway corridor;
- Provision of a Survey Brief to receive additional topographic and services survey within North Eveleigh;
- Detailed numerical modelling of the existing RC drainage across the Great Western Railway corridor;
- Detailed numerical modelling of the proposed conceptual layout of stormwater drainage for North Eveleigh including proposed OSD for the majority of the proposed development and building precincts as presented on the BS Masterplan drawings;
- Preparation of a Stormwater Management Plan showing a conceptual layout of the stormwater drainage for North Eveleigh;
- Consultation with SWC in relation to the requirements for servicing North Eveleigh with water and the provision of appropriate sewer services to SWC standards;
- Preparation of a water reticulation concept plan to comply with SWC standards;
- Preparation of a sewer reticulation concept plan to comply with SWC standards;
- Preparation of this Services Infrastructure Masterplan Report.

2. DIRECTOR GENERAL'S REQUIREMENTS

Reference is made to the DGR requirements stipulated in correspondence 17th March 2008 received for the subject redevelopment of the North Eveleigh site with particular reference to Items 13 and 15 listed below:-

Item 13. Drainage and Flooding

- Address drainage/flooding issues associated with the development/site, including stormwater, drainage infrastructure and incorporation of WSUD measures;
- Address the issue of managing the downstream impacts of stormwater on SWC's stormwater network, including a stormwater management system and the capture and reuse of rainwater;
- Explore non-potable water supply sources, including onsite recycling of grey water;

Item 15. Utilities

- In consultation with relevant agencies, address the existing capacity and requirements of the development for the provision of utilities including staging of infrastructure works.

This report addresses these requirements under Section 7.

Architectural Concept Design

It is proposed that the existing CarriageWorks, Paint Shop Building, Blacksmiths' Workshop, Chief Mechanical Engineers Building, Scientific Services Building, Telecommunications Building, and the Clothing Store be retained. The Concept Plan proposes predominately residential multi-storey buildings with below ground basement carparks, internal roads and open space. The eastern end of the site is proposed to have residential, commercial, and retail buildings with below ground basement carparking and also community buildings.

The above layout of buildings has been adopted for presentation of *Figures SK STW 01, SK S 01 and SK W 01*.

Landscape Masterplan

Reference is made to the Landscape Strategy Report prepared by TDS which provides for landscape, hardscape, rail tracks and WSUD. Particular reference is made to the Landscape Plan DAL 01 which identifies locations of proposed garden beds, courtyards/grass, bio-swales, gravel, concrete, rail tracks and proposed trees.

Bio-retention swales are proposed along the main road corridor at the western end near the existing Wilson Street entrance, along the main rail corridor at the eastern portion of the site, and other strategic locations throughout the site.

3. DESCRIPTION OF THE EXISTING SITE AND SURVEY

Site Locality, Buildings and Topography

The existing site is located within North Eveleigh and bounded by Wilson Street to the north, Little Eveleigh Street to the north east, Iverys Lane to the west and the Great Western Railway corridor to the south. Access to the site is currently available at the extremities being the western end of Wilson Street and Little Eveleigh Street.

The site is legally described as Part Lot 4 and Part Lot 5 in DP 862514 and has a total site area of 10.7ha .

The North Eveleigh site contains numerous buildings and facilities including the following:-

- The CarriageWorks building;
- Traversers No. 1 and 2 adjoining the CarriageWorks building to the east and west respectively;
- The Blacksmiths' Workshop which is located immediately opposite CarriageWorks;
- The Paint Shop;
- The RWA Training Centre in the former Carpenters, Plumbers and Food Distribution building;
- The General Store/Clothing Store;
- The Chief Mechanical Engineer's building;
- Scientific Services building;
- The Fan of Tracks;

The main buildings that remain on the site include the CarriageWorks Building which was rehabilitated and converted and is currently occupied by MOA. The Blacksmiths' Workshop is currently unoccupied and is located directly north of CarriageWorks and is the subject of retention within the Concept Plan proposal for North Eveleigh. The Paint Shop which is located immediately east of CarriageWorks will also undergo substantial transformation into a residential and commercial/retail precinct and part of the fabric of this building will be retained.

In addition to buildings there is a significant number of railway tracks located such as in the Pedestrian link between the Blacksmiths' Workshop and the CarriageWorks building and east of the Paint Shop.

The other significant feature on the land is the existence of the two disused Traversers No. 1 and 2 which are located either side of the CarriageWorks building. Traverser No. 1 is the concrete lined traverser which is generally well intact and in good condition whilst the Traverser No. 2 has been disturbed and was recently resurfaced in gravel. Both Traversers have evidence of railway track which was used to maneuver carriages within and from the CarriageWorks building to adjacent buildings such as the Paint Shop.

The North Eveleigh site is generally at grade with the rail corridor and as a consequence has a significantly lower relative level than that of Wilson Street and is located on average 3 to 5 metres below Wilson Street. A retaining wall runs along the majority of the Wilson Street boundary and accommodates the difference in level between Wilson Street and the site.

The topography of the site is generally flat at approximate RL 25.00m AHD with a gentle fall from east to west. The original fall of this land was sloping from Wilson Street towards the Railway Corridor and the formation of the current site resulted in approximately 4m of cut in solid rock to achieve the desired platform. This is evident behind and adjacent to the Blacksmiths' Workshop.

Site History

The North Eveleigh railyard buildings were constructed in 1883 including the large stores at the McDonaldtown end of the site. Between 1884 and 1887 the Fan of Tracks were constructed and the Car and Wagon Workshops and the Paint Shop and Locomotive Engineers' Offices on Wilson Street were completed. During the 1900's various modifications to the North Eveleigh railyards were made including removal of internal traversers and the construction of the present two external traversers and the erection of the Blacksmiths Shop in 1907. Other construction included additional repair and painting shops and facilities for signaling, lighting, driver training, laboratories and staff amenities.

Survey by Whelans Insites (Reference Attachment 1)

As part of the assessment of the site stormwater drainage system, the Whelans Insites survey has bee used as the basis of all leveling and is headed 'Plan showing Levels and Features of Part Lots 4 and 5, DP 862514 combined Whelans Incite and RailCorp Data', Reference: Job File C641SC, Sheets 1 to 4 inclusive.

This survey incorporates previously issued survey which was used to undertake water supply and sewer design for the redevelopment of the Carriage Workshop and in addition incorporates survey outside the site within Wilson Street, Iverys Lane and Holdsworth Street. The survey also extends across to Railway Parade and Henderson Road which incorporates survey of existing Sydney Water sewers and topographic and level information adjacent to existing RailCorp buildings.

For the purposes of assessment of the Holdsworth Street drain, the level of this drainage line commencing at the southern end of Holdsworth Street is at IL 18.23m. The drainage line was also exposed and leveled within the basement of the RailCorp building, south of the rail corridor, between the rail corridor and Railway Parade and the IL at this point was 14.025m.

It is noted that this survey does not include any level information in relation to the existing 600mm and 1200mm drainage lines survey Traverser 1 and 2. Data in relation to these lines has been extracted from existing RailCorp design and as built drawings.

The survey does include level information and invert level information covering the stormwater drainage within the Pedestrian Link between the Carriage Workshop and the Blacksmiths' Workshop.

Survey by Degotardi Smith and Partners (Reference Attachment 2)

The DSP Survey consists of Drawings Reference No. 31129 A01.dwg, Sheets 1 to 6 inclusive, all Revision B and the purpose of the provision of this survey was to provide topographic, level and services information across the Great Western Railway Corridor at approximate Chainage location 1+ 730 to 1+ 870 as referenced from Central Station. This location is equivalent to Traverser No. 1 and was for the purpose of survey and design for the future pedestrian overpass linking North Eveleigh and South Eveleigh.

The survey provides relevant level information over the line of the 1200mm stormwater drainage line but does not reveal any invert level information over this line and at this stage is enclosed for information only.

4. EXISTING AUTHORITY AND AS BUILT INFRASTRUCTURE

RailCorp Searches and Drawings

Searches were undertaken to determine the location of existing infrastructure within North Eveleigh, within the Great Western Railway Corridor and south towards Railway Parade and Henderson Road. These searches are summarized with reference to the drawing heading and number and the asset found, as follows:-

Eveleigh Yard Services Infrastructure Stormwater, Reference 213/023/157/20, Sheet 1 of 4 dated December 1993

This plan indicates the existence of stormwater drainage in the following locations:-

- Existing 525mm Dia drainage west to east along Wilson Street;
- Existing 300mm Dia drainage outside and north of the Paint Shop;
- Existing 300mm Dia drainage between the Carriage Workshop and the Blacksmiths' Workshop;
- Existing 900mm Dia drainage along Traverser No. 1 between the Paint Shop and the Carriage Workshop (Note: The size of this line is not indicated on this drawing but indicated on one of the reference drawings below), this drainage line has been incorporated in the numerical modelling of the drainage system;
- Existing 450mm Dia drainage immediately south of the Carriage Workshop and draining towards Traverser No. 1 ;
- Existing 450mm Dia drainage south of the Fan of Tracks, draining west past the southern side of the Paint Shop, (Note: This drainage line has been included in the numerical modelling of the drainage system);
- A 1200mm Dia drainage line draining diagonally across the rail corridor from Traverser No. 1, (Note: This drainage line was not able to be identified by the WI and the DSP survey but is known anecdotally to exist);
- A series of smaller Dia drainage lines in Traverser No. 2 drained into a 600mm Dia drainage line across the rail corridor;
- A 300mm Dia drainage line draining east to west along the northern face of the Locomotive Workshop; (Note: The catchment to this drainage line has been incorporated in the drainage modelling to capture the sub-catchment area of the Locomotive Workshop);
- The 1200mm and 600mm Dia lines serving Traversers No. 1 and 2 merge into a single 1.25m wide x 1.125m high rectangular box culvert which runs across Henderson Road and south bound along Alexander Street.

Eveleigh Yard Drainage Plan, Reference 875-14833

This plan is undated and indicates the existence of the 900mm Dia drain within Traverser No. 1 and the 1200mm Dia and 600mm Dia drainage serving both Traversers 1 and 2 but there is lesser extent of detail on this plan. It appears to support the information on the plan above.

Eveleigh Proposed Improvements to Stormwater Drainage Drawing No. 83-113

This plan is dated 1948 and shows the existence of the 900mm Dia pipe in Traverser 1 and the existence of a line representing the 1200mm Dia line described above. It also indicates the existence of the 300mm Dia drainage line immediately north of the Locomotive Workshop.

In addition, it shows with more clarity the existence of a drainage system that serves the catchment north of approximately mid way along the Locomotive Workshop with a series of pipes commencing at 375mm Dia across the Great Western Railway line and increasing in size to a 900mm line beneath Henderson Road.

The catchment served by the above drainage is excluded from the numerical modelling of the North Eveleigh drainage system and in fact due to the relatively smaller pipe diameters above we have elected not to drain the eastern part of Eveleigh towards this corridor and it is likely to be well in excess of its capacity.

Eveleigh Plan Showing detail of Existing Drainage Sumps at site of Train Presentation Facility, Drawing No. 207/146

This plan on first inspection appears to contain level information in relation to drainage within the rail corridor generally opposite Traverser No. 1 within the Great Western Railway corridor, however there is no correlation with this minor drainage and the 1200mm drainage serving Traverser No. 1. This drawing is included for reference purposes only.

Eveleigh Carrriageworks Replacement of No. 1 Traverser Bed Reinforced Concrete and Drainage Drawing No. 184-161

The relevance of this drawing is that it shows in detail the configuration of Traverser No. 1 sumps and local drainage layout and more importantly the IL and location of the existing 900mm Dia pipeline serving Traverser No. 1 from north to south. The plan refers to this drainage line as being a 3 foot brick drain which is equivalent to 900mm Dia.

The details of this line have been inputed into the numerical modelling for the North Eveleigh drainage system.

Eveleigh Proposed Drainage for Addition to Paint Shop

This plan gives a general indication of a layout of drainage within the Paint Shop and depicts a series of 300mm Dia gullies serving as drainage pits, all draining to a 150mm longitudinal drainage line which ultimately connects to the 3 foot brick drain in Traverser No. 1. This plan is included for reference purposes only.

Sydney-Waterfall Electrification Diversion of Culvert under Steam Dives, Drawing No. L.8.26

This drawing shows the diversion of the existing 1200mm Dia to allow for the Sydney to Waterfall Electrification and the proposed Illawarra Steam Dives project in 1976.

The longitudinal section appears to show a minor chain in vertical grade which has been assessed and incorporated in the numerical modelling of this section of line.

Sydney Water Drainage Infrastructure

During consultation with Sydney Water and discussion as to the existing location of SWC infrastructure south of North Eveleigh, SWC provided an A3 colour aerial photo showing the existence of the Munni Creek drainage line draining south bound from the intersection of Henderson Road and Alexander Street.

Elsewhere, at the intersection of Railway Parade and Park Street there is the existence of another major drainage corridor and SWC interpreted that the Holdsworth Street drainage culvert which runs north to south under the Great Western railway appears to indirectly connect to this drainage system.'

A copy of this Plan is presented for reference purposes under *Attachment No. 4*.

As Built Site Stormwater Drainage for the Carriage Workshop, MOA Redevelopment

Reference is also made to WSP For Construction drawings adopted for the redevelopment of CarriageWorks for the NSW MOA. These drawings consist of the following:-

Proposed Services Sheet 1 and 2 (Reference Drawing No. 2536C-C11 and C-12, Revision 3)
Ground Floor Plan Sewer and Stormwater Drainage (Reference Drawing No. 5002 Revision F)
(Refer Attachment 5)

These drawings indicate the proposal for site stormwater drainage to split the drainage of the Carriage Workshop building by directing downpipes from Bay 16 to Bay 20 in an easterly direction with 375mm Dia up to 600mm Dia drainage and connection into the existing 900mm Dia brick stormwater drain in Traverser No. 1.

Downpipes from Bay 21 to Bay 25 were directed in a westerly direction and connected into an existing 600mm Dia drainage line outside the Carriage Workshop western building line and the proposed drainage commenced at 375mm Dia at the upstream end to 600mm Dia at the connection point in Traverser No. 2.

The direction of drainage for the Carriage Workshop has been taken into consideration in the numerical modelling of the proposed drainage system, Refer Section 7.

In addition, the open space (Pedestrian Link) between the Carriage Workshop and the Blacksmiths' Workshop is drained via a new 375mm Dia drainage with connection on to the existing 900mm brick stormwater drain in Traverser No. 1

5. AUTHORITY REQUIREMENTS

Sydney Water Corporation

As part of the previous negotiations and applications to Sydney Water for the MOA in relation to the Reuse of the Carriage Workshop and Blacksmiths' Workshop for use as a Contemporary Performing Arts Centre, a Notice of Requirements was obtained headed Notice of Requirements for Subdivider/Developer Compliance Certificate and dated 10th June 2005; Reference Sydney Water Case No. 79340.

In addition, a Notice of Requirements was obtained under Section 73 of the Sydney Water Act headed Notice Letter under Vesting Process Section 73 Subdivider/Developer Compliance Certificate and dated 2nd February 2005 and this Notice related to specific requirements in relation to provision of water supply and sewer service for the purpose of the Subdivision of the land. At the time a notional five lot subdivision had been proposed under the Vesting Process.

Copies of the above Notice letters are presented under *Attachment 6*.

The Notice letter in relation to the previous subdivision gave advice on the proposed sizing of the new internal watermain and provided comments on the connection requirements on the 375mm watermain in Wilson Street. These requirements still remain as part of the proposed North Eveleigh Concept Plan.

In relation to the proposed sewer service, the Notice Letter confirmed that an extension of a 225mm existing sewer main would be required to a point of connection 1 metre inside the boundary of each allotment in the proposed subdivision. Connection of the new sewer system was to occur from the southern end of Holdsworth Street.

As part of the North Eveleigh Concept Plan, RWA and WSP undertook further consultation with Sydney Water with an initial introductory meeting held early in 2007 and a follow up detailed discussion was held 8th November 2007 to provide the opportunity for RWA to brief SWC in relation to the current status of planning for the redevelopment of the North Eveleigh lands. SWC advised that the basis of the previous NOR's and approvals against figures and populations provided by RailCorp and that these would be subject to further review to ensure compliance.

WSP identified that the western part would be supplied with water via two new connections onto Wilson Street and this would occur in a similar manner to the eastern portion of the site. This was due to the completion of concrete roadworks between the Blacksmiths' Workshop and the Carriage Workshop which did not readily allow construction of a new watermain through this corridor.

As part of these discussions, WSP discussed the methodology for modelling the proposed stormwater drainage system which would be undertaken at concept level and identified the potential need for OSD which would be incorporated into the project with a variety of tank storage and surface storage over hardscape and landscape areas. SWC identified that its existing stormwater assets commenced further downstream in Alexander Street at the intersection with Henderson Road. SWC welcomed the initiative to provide OSD and advised that it would act as a referral agency in any future approval and as such would receive an application for review from the Minister. SWC indicated that its main objective would be to ensure that the future flow from the developed site did not exceed current stormwater discharge.

SWC has indicated that its normal requirement for OSD is the provision of 20m3 per 1,000m2 of developed site area and acknowledged that the provision for this site is well in excess of SWC's requirement. The main reason for this is to comply with the anticipated requirements of RailCorp being that a zero overflow results over the RailCorp corridor.

In principle, SWC has been contacted and consulted with and has provided comments in relation to the future provision of water supply and sewerage and stormwater drainage.

6. PREVIOUS STUDIES

Services and Infrastructure Final Concept Design Report

Reference is also made to a previous assessment undertaken by SMEC in December 2002 for a prior version of the proposed subdivision of the five allotments.

This study determined the capacity of the two pipes being the 600mm Dia and 1200mm Dia drainage lines across the Great Western Railway to have a peak flow capacity of 2.55m³/sec. The basis of this analysis was a water surface level of RL24.9m AHD which was the modelled TWL for the proposed OSD system.

This study also provided an analysis for the 1 in 100 year ARI event and found the critical storm duration for the site was 60 minutes and that peak discharge in the same event leaving the OSD was determined to be 2.5m³/sec. The report allowed for a total OSD volume of 4,000m³ as a minimum requirement for the redevelopment of North Eveleigh. The predominant means of proposed OSD was surface storage in Traverser No. 1 and the allowance of a 300 high dwarf wall constructed along the southern boundary of the site running from Iverys Lane on the western boundary to Traverser No. 2. The effect of this dwarf wall was to allow for damming of stormwater flow and runoff from the site catchment giving rise to ponding and thus creating the OSD system.

The overall basis of the proposed system of OSD storage was such that flows leaving the site in the proposed case were less than what the existing site generated to ensure that the downstream pipe system is not overloaded.

Section 7 of the report herein provides discussion with reference to the current Concept Plan (Architecture and Landscape) and the provision of OSD is predominantly 2m deep tank storage within each building basement footprint and surface storage of limited depth up to 300mm in Open Space areas.

7. PROPOSED UTILITY SERVICES AND DRAINAGE INFRASTRUCTURE

Water Reticulation

An application was made to SWC for a NOR under Section 73 Subdivider/Developer Compliance Certificate of the Sydney Water Act 1994, Part 6, Division 9. A copy of this reference document is provided in *Attachment 6*.

The requirements stipulated in this previous NOR letter will be similar for the proposed Concept Plan being addressed in this report. The follow up discussion held with SWC on 8th November 2007 recognised the previous NOR and it is understood that the following would be required for this current concept:-

- A 200mm Dia watermain extension from Wilson Street with dual connections onto the existing 375mm Dia watermain in Wilson Street;
- As the 200mm Dia link main in the Pedestrian Link between the CarriageWorks and the Blacksmiths' Workshop was not constructed as part of the CarriageWorks MOA Redevelopment project, it was agreed with SWC that separate looped mains were to be proposed for the western precinct and the eastern precinct;
- Other requirements included the provision of componentry to counter the effect of stray electrical currents from the Railway corridor;
- The provision of dead end mains was to be avoided and did not comply with WSAA, Sydney Water Edition;

Stage 1 of the project being the redevelopment of CarriageWorks for MOA allowed for provision of a water service and connection off the 375mm Dia Wilson Street main. The layout of this watermain service and connection is shown on WSP's Ground Floor Sewer and Drainage Plan (*Refer Attachment 5*). This will reconnect to the new water supply network when constructed to serve the proposed subdivision under the North Eveleigh Concept Plan.

The proposed design allows for hydrants at 80m nominal spacing and stop valves at the location of tees and junctions at a spacing not greater than approximately 300m.

The typical layout proposed for the Concept Plan is presented in the attached Water Reticulation Concept Plan, Reference SK W01 (*Refer Figures*).

Sewer Reticulation

Similarly, to the water supply scheme, an application was made to SWC for a NOR under Section 73 Subdivider/Developer Compliance Certificate of the Sydney Water Act 1994, Part 6, Division 9. A copy of this reference document is provided in *Attachment 6*.

A detailed design proposal was submitted previously to Sydney Water and approval was provided for Stage 1 construction comprising 225mm Dia sewer outside and for the full length of the Carriage Workshop between the Blacksmiths' Workshop and within the Pedestrian Link. Connection of the Carriage Workshop was made to this sewer system which drained from east to west along the Pedestrian Link to a temporary SPS. This SPS then discharged raw sewerage into an adjacent and in the future to be disused State Rail sewer which drains south west towards the SWC sewer system location in Iverys Lane.

Approval was also sought and gained and achieved for drainage of the North Eveleigh total site from east to west to the Holdsworth Street sewer system. This scheme required upgrade of a portion of the Iverys Lane sewer to bring its standard up to a 225mm Dia being the minimum pipe size for Commercial and Industrial projects. Maintenance holes (access points) are required to be constructed at 120 metres maximum spacings.

The proposed scheme herein for the North Eveleigh Concept Plan builds on the previous approval and provided by SWC and allows for extension of the Pedestrian Link SWC sewer system with a new 225mm sewer, west to Holdsworth Street. The depth of this sewer system varies from approximately 3.4m at the western end of the Carriage Workshop to 3.1m in Iverys Lane and 2.3m at the connection point in Holdsworth Street.

The remainder of the upstream section of SWC proposed sewer reticulation follows along the proposed road corridors from west to east towards Little Eveleigh Street. The sewer system varies in depth with a minimum depth of approximately 1m below the road surface at the very eastern end. There may be a requirement that the entry level of the buildings at this eastern end be raised to allow drainage to the proposed SWC reticulation system.

The typical layout proposed for the Concept Plan is presented in the attached Sewer Reticulation Concept Plan, Reference SK S01 (*Refer Figures*).

Site Infrastructure Drainage Works

The existing North Eveleigh site for the purposes of runoff analysis is considered to be a wholly self-contained catchment zone. The Wilson Street catchment immediately to the north is self-draining into the SWC trunk drainage system and is completely separated from the North Eveleigh site. For the purposes of flood assessment, the discussion below emphasises that the North Eveleigh site is completely self-contained and drains in the direction of existing drainage infrastructure below the rail corridor.

Reference is made to the existing stormwater drainage infrastructure previously discussed under Section 4 of this report. The purpose of this report with respect to existing drainage infrastructure and the proposed site drainage system was to liaise with SWC and obtain requirements with respect to drainage from the North Eveleigh redevelopment to the existing drainage system being the Munni Creek culvert.

To this end the previous study by SMEC was used as a guide to understand the nature of the required outcome and a detailed search was undertaken with RailCorp to determine the location and level of existing drainage assets linking the North Eveleigh site to the Munni Creek culvert.

An analysis has been undertaken incorporating the proposed building scheme and provision for roads, open space including hardscape and landscape.

The proposed site drainage scheme is planned to include the following:-

- A network of drainage pipelines and pits to comply with the requirements of SCC and relevant Australian Standards and Policies;
- A roof water system for each building complying with the relevant Australian Standards, the BCA and other relevant guideline documents;
- A below ground basement pump out system complying with the relevant Australian Standards, the BCA and other relevant guideline documents;
- An OSD system comprising below ground storage tanks of a minimum depth of two metres and varying cross-sectional area to comply with the relevant PSD for that precinct;
- A PSD exiting the North Eveleigh site not exceeding the capacity of the 600mm, 1200mm and 1.25m wide x 1.125m high Munni Creek culvert.

Modelling Structure and Subcatchments

The North Eveleigh Site and RailCorp Corridor Drainage Subcatchments

The basis of the site drainage system numerical modelling has been to use the footprint of the development precinct areas split up into the precincts, roads, open spaces and the catchment areas south and beyond the North Eveleigh redevelopment site and beyond within the Great Western railway corridor.

Figures SK STW 01 and SK STW 02 present the layout of the numerical model proposed site drainage system, drainage system across the railway corridor and across South Eveleigh to the intersection of Henderson Road and Alexander Street.

The subcatchments have been broken up as follows:-

- Subcatchments A to Q represent Building Precinct areas;
- Subcatchments RD1 to RD5 represent Road catchments;
- Subcatchments OS1 to OS7 represent Open Space precincts;
- Subcatchments R to W represent areas outside of the North Eveleigh redevelopment site consisting of the Great Western Railway and a part of the Locomotive Workshop.

A summary of the Subcatchment areas is presented on SK STW 01.

Table 1 below identifies each individual OSD Basin No with details of the surface area, depth, orifice Dia (mm) and the resulting volume.

This table identifies the elevation and surface area of each basin with the high value in the elevation column representing the TWL of each OSD storage. The model results which are presented under *Attachment 8* indicate a zero theoretical overflow from each of the storages in the 1 in 100 Year ARI event.

OSD BASIN DATA AND DETAILS				
Location/Name	Elevation (m) AHD	Surface Area m^2	Volume m^3	Orifice Dia (mm)
Basin A	24.3	225	450	40
	26.3			
Basin B	24.14	100	200	50
	26.14			
Basin C	23.79	400	800	50
	25.79			
Basin D	23.25	400	800	50
	25.25			
Basin BS	23.61	150	300	100
	25.61			
Basin G	23.37	50	100	200
	25.37			
Basin H	23.26	475	950	100
	25.26			
Basin F	23.26	75	150	100
	25.26			
Basin K	24.8	130	260	100
	26.8			
Basin L	24.42	130	260	100
	26.42			
Basin M	24.69	130	260	100
	26.69			
Basin P	24.69	90	180	100
	26.69			
Basin OS1	23.86	606.67	95	28
	26.18			
Basin OS2	23.5	461.67	74	28
	25.91			
Basin OS3	23	2486	248	70
	24.72			
Basin OS4	22.45	2232.50	226	100
	24.8			
Basin OS5	24.1	993.30	149	30
	25.21			
Basin OS6	23.86	835	126	60
	25.29			
Basin OS7	24.95	1146.70	172	40
	26.00			
Basin CW W	23.94	600	1200	40
	25.94			
Basin Rd1	24.57	560	493	100
	25.45			
Basin Rd 2	23.55	180	308	80
	24.43			

Table 1

King Street to Holdsworth Street Drainage Subcatchment and Holdsworth Street Drainage System

In addition to the assessment of the drainage system and catchment for the North Eveleigh site a supplementary analysis was undertaken to determine the capacity of the Holdsworth Street drainage system. The Holdsworth Street drainage system is a 600mm drain exiting southward below the Great Western Railway Corridor.

The Holdsworth Street drainage catchment is presented on Figure SK STW 03 and comprises a corridor of runoff between King Street, Wilson Street, Iverys Lane and the Great Western Railway Corridor. The total catchment area is 7.71 Ha and the analysis of the catchment allows for a further two sub-catchments being north and south of Wilson Street.

The results of the analysis indicate that a total volumetric flow of 4.43m^3/sec discharges to the intersection of Holdsworth Street and Iverys Lane resulting in a significant ponding of runoff against the railway corridor boundary wall. The TWL in the 1 in 100 year event is 26.34 against the ground surface of RL 20.2. The resulting discharge in the 1 in 100 year ARI event through the existing 600mm drain is 1.56m^3/sec and accordingly the existing 600mm drainage line is at capacity.

Details of the modelling calculations are appended in *Attachment 8*.

Results of Numerical Modelling Analysis

The proposed site drainage scheme which is presented on Figure SK STW 01 and SK STW 02 has been simplified and takes into consideration a lag time for each subcatchment, the percent imperviousness of each subcatchment which is defined as 100% impervious surface for a roof or a road and a portion of that for a landscaped area. The system that has been analysed only includes major drainage along road corridors.

The analysis has been run for the 1 in 20 Year and 1 in 100 Year ARI storm events for two different scenarios being with and without OSD and the performance of the existing 600mm Dia and 1200mm Dia outlet pipelines has been assessed to determine what is pipe flow and what is overflow.

The results of the analysis indicate general compliance with Railcorp anticipated requirements for zero or negligible overflow over the Great Western Railway Corridor. This has been provided by further extending the requirement for on-site detention into parts of the redevelopment area within roadways inclusive of Road 1 and Road 2 on the western portion of the North Eveleigh site.

SUMMARY OF PIPE AND OVERLAND FLOWS				
	(m3/sec)		(m3/sec)	
	1 in 20 Year		1 in 100 Year	
600mm diameter without OSD	Pipe	0.548	Pipe	0.568
	Overland	1.82	Overland	2.41
	Total	2.368	Total	2.978
600mm diameter with OSD	Pipe	0.059	Pipe	0.921
	Overland	0	Overland	0.98
	Total	0.059	Total	1.901
1200mm diameter without OSD	Pipe	2	Pipe	2
	Overland	6.32	Overland	8.54
	Total	8.32	Total	10.53
1200mm diameter with OSD	Pipe	1.05	Pipe	1.1
	Overland	0	Overland	0
	Total	1.05	Total	1.1

Table 2

Stormwater Quality Control Works

Reference is made to the Report presented by ISF headed North Eveleigh Redevelopment Water Management Plan of January 2008. To supplement the comments contained in this study, it is envisaged that the following stormwater treatment train will be required to meet the objectives and requirements of the SCC and other referral Agencies.

- OSD above ground or below ground systems complete with trash screens and sedimentation traps to control coarse litter and coarse sediment within each of the individual allotments as presented in the Concept Plan;
- Road flows will enter into a series of drainage structures located along kerb lines; Enviropods which are an outsource control screening system can be fitted to each of the drainage structures to control coarse debris and coarse sediment emanating from these road flows;
- The remaining residual flow will be treated within a series of bio-retention swales and shallow water bodies which together will aim to trap and treat coarse and fine sediment, nutrient and provide nutrient phosphorus removal.

AGL Gas Supply

It is envisaged that the proposed gas service will reticulate via the road corridors within the North Eveleigh redevelopment and a loop connection will be provided to the existing gas service in Wilson Street. This gas service consists of an existing 210kPa natural gas line on the northern side of Wilson Street and an existing 100mm Dia gas line on the southern side of Wilson Street.

Initial consultation with Alinta which is the service provider for the North Eveleigh area indicates that whilst the gas service is available at present, Alinta will provide a firm proposal to service the North Eveleigh site at the Project Application stage of the project, noting that it is unlikely that there should be adverse requirements for servicing the site.

Further to the above we enclose herewith under *Attachment 8*, a copy of correspondence undertaken with AGL in relation to an offer for the establishment of natural gas supply for the purposes of serving the redevelopment of the CarriageWorks for the MOA. A copy of the completed offer is also enclosed under *Attachment 8* and this information generally demonstrates the willingness of the AGL and in the future Alinta to assist North Eveleigh with the provision of a suitable gas supply.

8. REFERENCES

Redfern-Waterloo Authority (2006) Redfern-Waterloo Built Environment Plan (Stage One), August 2006, Sydney, Australia;

North Eveleigh Concept Plan, Part 3A Major Project Application Preliminary Environmental Assessment submitted to the Department of Planning, prepared by Redfern-Waterloo Authority, December 2007;

Services and Infrastructure Final Concept Design Report by SMEC Australia Pty Ltd of December 2002 for Project No. 31237.004 for State Rail – Rail Estate, Eveleigh CarriageWorks Redevelopment;

North Eveleigh Redevelopment Water Management Plan, Final Draft prepared by Institute of Sustainable Futures for Redfern-Waterloo Authority, UTS March 2008;

NSW Government Department of Planning letter 17th March 2008 enclosing Director General's requirements, Reference: Application No. MP 08_0015.

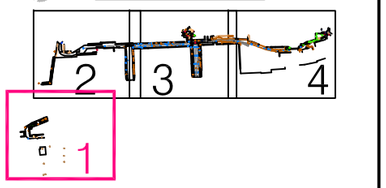
ATTACHMENT 1

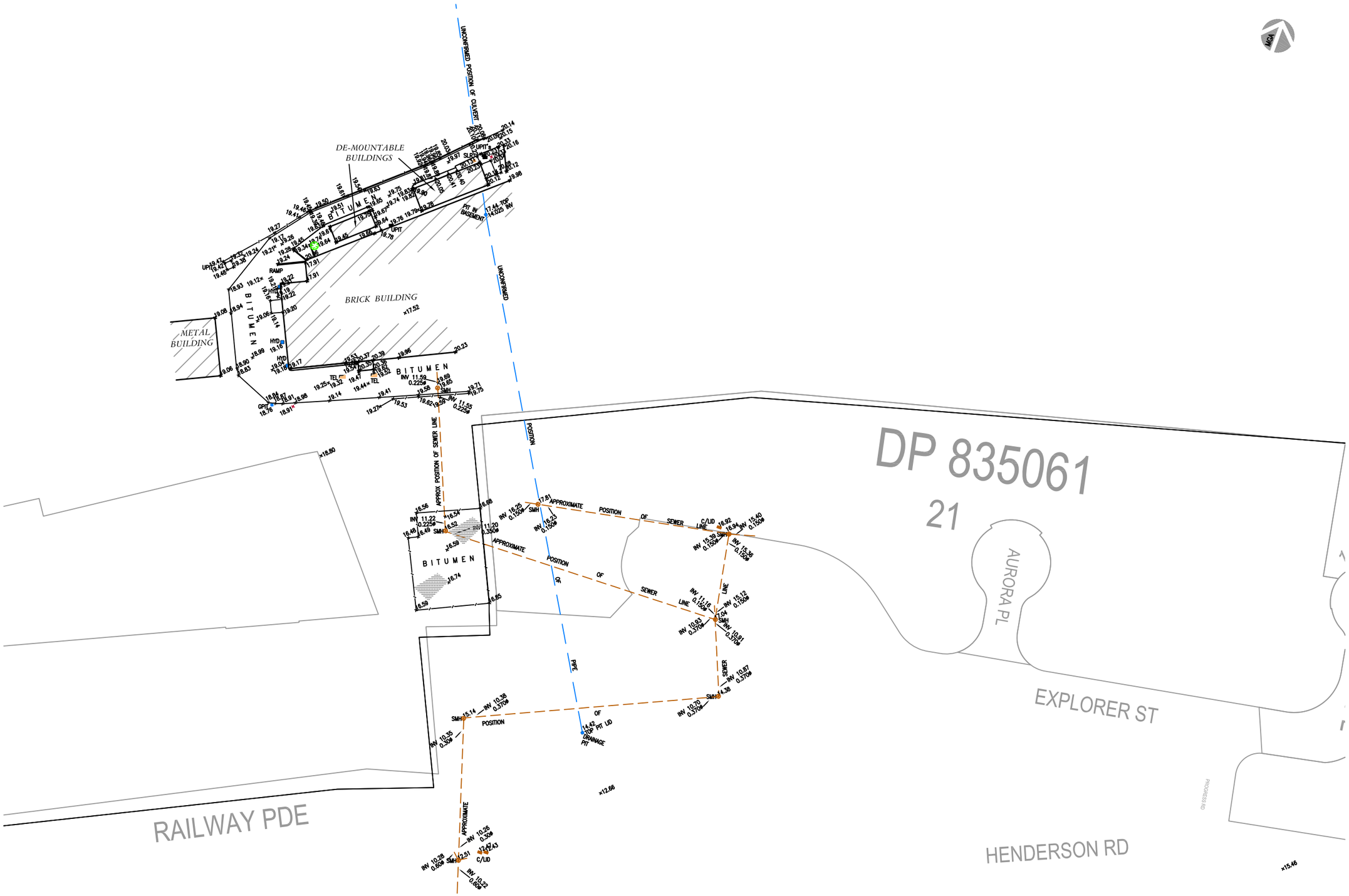
PLAN SHOWING LEVELS AND FEATURES OVER PART LOTS 4 AND 5 DP 86251

COMBINED WHELANS INSITES AND RAILCORP DATA, REFERENCE C641, SHEETS 1 TO 4

ADJOINS SHEET 2

KEY DIAGRAM





Notes:

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TPPET DENOTES LEVEL ON TOP OF PARAPET

TBW DENOTES TOP BRICK WALL

CRW DENOTES CONC RET WALL

LEGEND

TEL	TELSTRA PIT
GPIT	GRATED PIT
HYD	HYDRANT
SV	STOP VALVE
PP	ELECTRICITY POLE
ELP	ELEC LIGHT POLE
UPIT	UNCLASSIFIED PIT
USERV	UNCLASSIFIED SERVICE
0.34 25	TREE 0.3 DIA 5m SPREAD
SMH	SEWER MANHOLE
SLH	SEWER LAMPHOLE
GAS	GAS

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0 1 5 10 20 metres

No.	DATE	REVISION DETAILS
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Whelans Insites Pty Ltd
ACN: 088 148 743
Level 12, 80 Clarence Street
Sydney, NSW 2000
DX 288 Sydney
t: 02 8234 8300
f: 02 9262 6511
insites.com.au

PREPARED FOR:
RWA
(Redfern Waterloo Authority)

Plan Showing Levels & Features over Part Lots 4 & 5 DP 862514 Combined Whelans Insites & RailCorp Data

ORIGINAL SIZE: A1

SCALE HOR:	1:500	VERT:	-
CO-ORDS:	MGA	DATUM:	AHD
DATE OF SURVEY	08.07/01.08	DATE OF PLAN:	25.01.2008
SURVEY	ARK/JNP	DRAWN	JRF
CHECKED:	ARK	DATE	
APPROVED:		DATE	
JOB REF:	C641SC		
CAD REF:	C641–024.dwg	SHEET 1 OF 4 SHEETS	

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LEGEND

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- GPIT GRATED PIT
- HYD HYDRANT
- SV STOP VALVE
- PP ELECTRICITY POLE
- ELP ELEC LIGHT POLE
- UPIT UNCLASSIFIED PIT
- USERV UNCLASSIFIED SERVICE
- TREE 0.3 DIA 5m SPREAD
- SMH SEWER MANHOLE
- SLH SEWER LAMPHOLE
- GAS GAS

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APPROVED:		DATE	
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CAD REF:	C641–025.dwg	SHEET	2 OF 4 SHEETS

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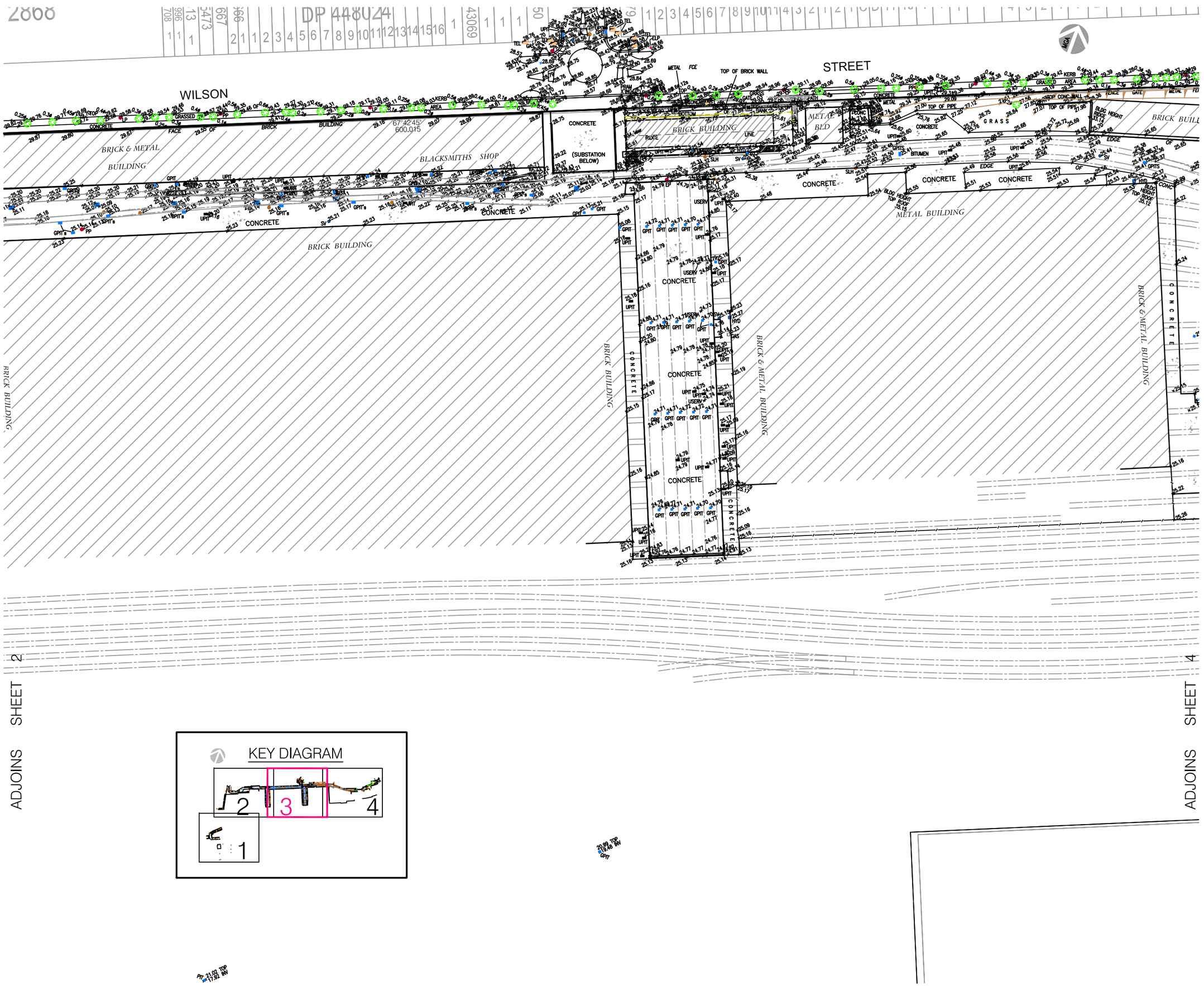

KEY DIAGRAM

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SURVEY	ARK/JNP	DRAWN	JRF
CHECKED:	ARK	DATE	
APPROVED:		DATE	
JOB REF:	C641SC		
CAD REF:	C641–026.dwg	SHEET	3 OF 4 SHEETS

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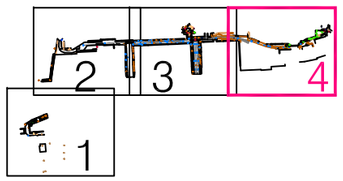
KEY DIAGRAM



WILSON STREET

ADJOINS SHEET 3

SP 39044

RESIDENTIAL APARTMENTS

2 STOREY BK BUILDING

BK BUILDING

BRICK BUILDING

METAL BUILDING

Fire Station

BK & GI/IRON SHED

GI BK BUILDING

LITTLE EVELEIGH

DP 649980 DP 653761 DP 101983 DP 101982 DP 904188 DP 98 DP 837778 DP 975109 DP 432824 DP 449634 DP 509419

CORNWALLIS

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0 1 5 10 20 metres

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ORIGINAL SIZE: A1

SCALE HOR:	1:500	VERT:	-
CO-ORDS:	MGA	DATUM:	AHD
DATE OF SURVEY	08.07/01.08	DATE OF PLAN:	25.01.2008
SURVEY	ARK/JNP	DRAWN	JRF
CHECKED:	ARK	DATE	
APPROVED:		DATE	
JOB REF:	C641SC		
CAD REF:	C641–027.dwg	SHEET 4 OF 4 SHEETS	

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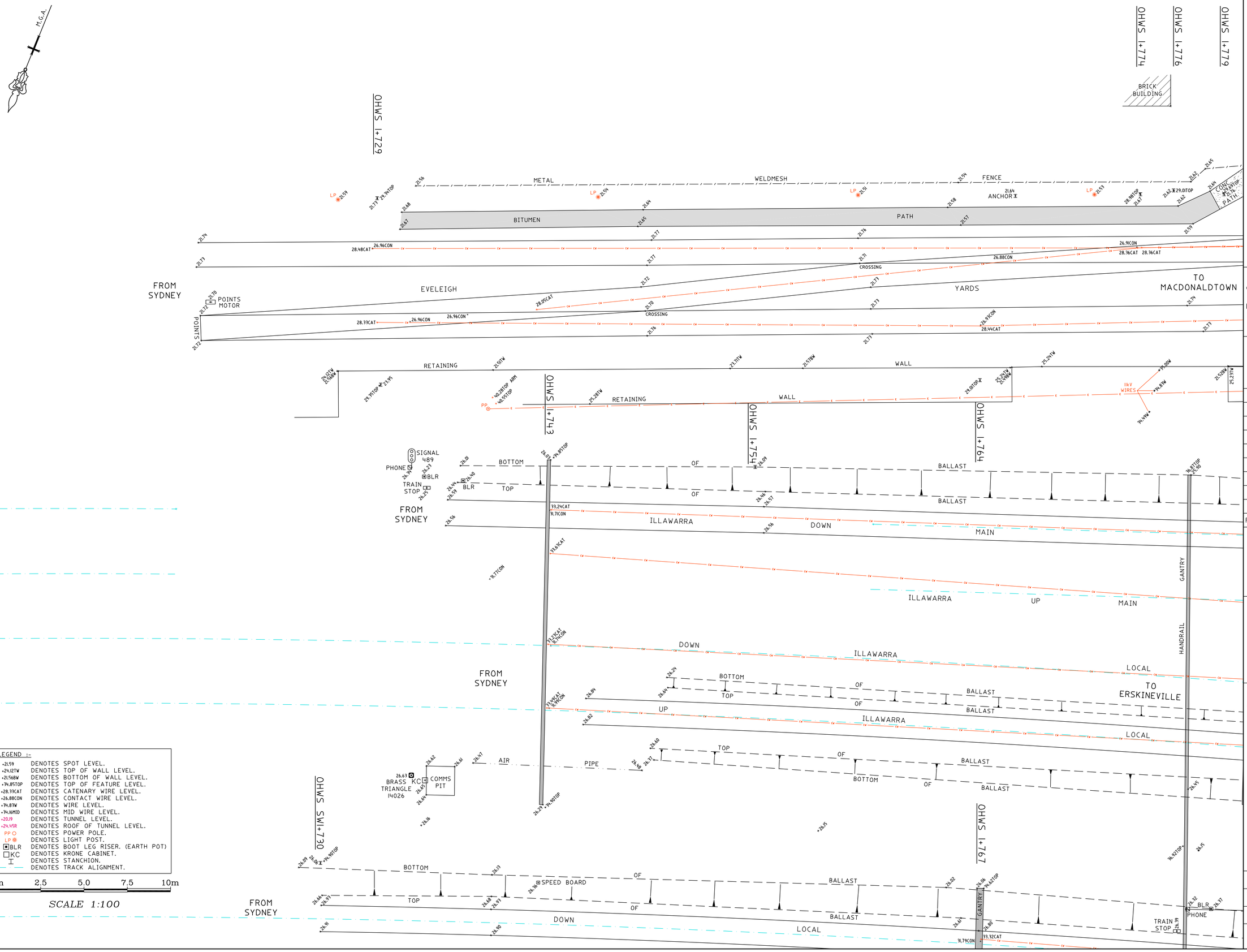
ATTACHMENT 2

PLAN SHOWING DETAILS AND LEVELS FROM 1+730 TO 1+870 EVELEIGH,

REFERENCE 31129, SHEETS 1 TO 6 INCLUSIVE BY DEGOTARDI SMITH AND PARTNERS

A1



LEGEND :-

+21.59	DENOTES SPOT LEVEL.
+24.12TW	DENOTES TOP OF WALL LEVEL.
+21.56BW	DENOTES BOTTOM OF WALL LEVEL.
+34.85TOP	DENOTES TOP OF FEATURE LEVEL.
+28.93CAT	DENOTES CATENARY WIRE LEVEL.
+26.88CON	DENOTES CONTACT WIRE LEVEL.
+34.83W	DENOTES WIRE LEVEL.
+34.16MID	DENOTES MID WIRE LEVEL.
+20.19	DENOTES TUNNEL LEVEL.
+24.45R	DENOTES ROOF OF TUNNEL LEVEL.
PP ○	DENOTES POWER POLE.
LP ✳	DENOTES LIGHT POST.
BLR	DENOTES BOOT LEG RISER. (EARTH POT)
KC	DENOTES KRONE CABINET.
I	DENOTES STANCHION.
	DENOTES TRACK ALIGNMENT.

0m 2.5 5.0 7.5 10m

SCALE 1:100

NOTES

- ONLY VISIBLE SERVICES HAVE BEEN LOCATED IN THIS SURVEY.
- AS PART OF YOUR DUTY OF CARE PLEASE CONTACT RAILCORP FOR SERVICE INFORMATION.
- THIS PLAN HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF REDFERN–WATERLOO AUTHORITY.
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- ANY CONSTRUCTION ON OR NEAR BOUNDARIES WILL REQUIRE FURTHER SURVEY IN ORDER THAT MARKS DEFINING BOUNDARIES CAN BE PLACED.
-

THIS NOTICE MUST NOT BE ERASED.

HORIZONTAL DATUM:

CO-ORDINATE SYSTEM: M.G.A.

MARKS ADOPTED:

BT 14027	BT 1629
332919.077	332801.561
6248066.203	6248047.510

VERTICAL DATUM:

DATUM:	A.H.D.
B.M. ADOPTED:	BT 14027
R.L.	26.176
SOURCE:	RAILCORP

REV.	AMENDMENTS	DATE
B	FINAL ISSUE	15/02/07
A	PRELIMINARY ISSUE	14/02/07

CLIENT:

REDFERN–WATERLOO AUTHORITY
LEVEL 11, TOWER 2
1 LAWSON SQUARE
REDFERN NSW 2016

PLAN

SHOWING DETAIL AND LEVELS FROM 1+730 TO 1+870 EVELEIGH

Degotardi, Smith & Partners
Consulting Surveyors
Established 1957
Incorporating Morrow & Young

11/19–23 Bridge Street
Pymble NSW 2073
Telephone: (02) 9440 1100
Facsimile: (02) 9440 1055
E–mail: surveys@degotardi.com.au
Website: www.degotardi.com.au

benchmark IN QUALITY AS/NZS 150 9001

Winner : "Sir Thomas Mitchell Excellence in Surveying & Mapping Award 2004"

L.G.A. SYDNEY		SHEET 1 OF 6	
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SURVEY REFERENCE 31129		SCALE 1:100	DATE 15/02/07
DRAWING NUMBER 31129A01.DWG			REV. B

A1

LEGEND :-

+21.59	DENOTES SPOT LEVEL.
+24.12TW	DENOTES TOP OF WALL LEVEL.
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	DENOTES STANCHION.
	DENOTES TRACK ALIGNMENT.

0m 2.5 5.0 7.5 10m

SCALE 1:100

M.G.A.

OHWS 1+774 OHWS 1+776 OHWS 1+779 OHWS 1+783 OHWS 1+786 OHWS 1+806 OHWS 1+823 OHWS 1+826 OHWS 1+836

BRICK BUILDING

CONC PATH

POINTS CONTROLLER

COMMS PIT

TUNING UNIT

PHONE

POINTS LEVER

POINTS MOTOR 659B

SIGNAL

EVELEIGH

YARDS

TRAIN BUFFER

GANTRY

CROSSING

TO MACDONALDTOWN

FROM SYDNEY

IIkV WIRES

RETAINING WALL

GALVANISED STEEL TROUGHING

ELECT. PIT

PP No.52 IIkV

36.0TOP ARM

HANDRAIL

ILLAWARRA DOWN MAIN

ILLAWARRA UP MAIN

BOTTOM OF BALLAST

TOP OF BALLAST

GROUND LEVEL AIR PIPE TROUGHING

LOCAL

TRAIN STOP

SIGNAL SY486

SIG LOC DB 6.8

SIG LOC DB 7/2

AIR MANIFOLD

BT 14027

TO ERSKINEVILLE

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CO-ORDINATE SYSTEM: M.G.A.

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332919.077	332801.561
6248066.203	6248047.510

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LEVEL 11, TOWER 2
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REDFERN NSW 2016

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L.G.A. SYDNEY			SHEET 2 OF 6
SURVEYED G.S./G.G.	DRAWN P.R.G.	CHECKED G.S.	APPROVED
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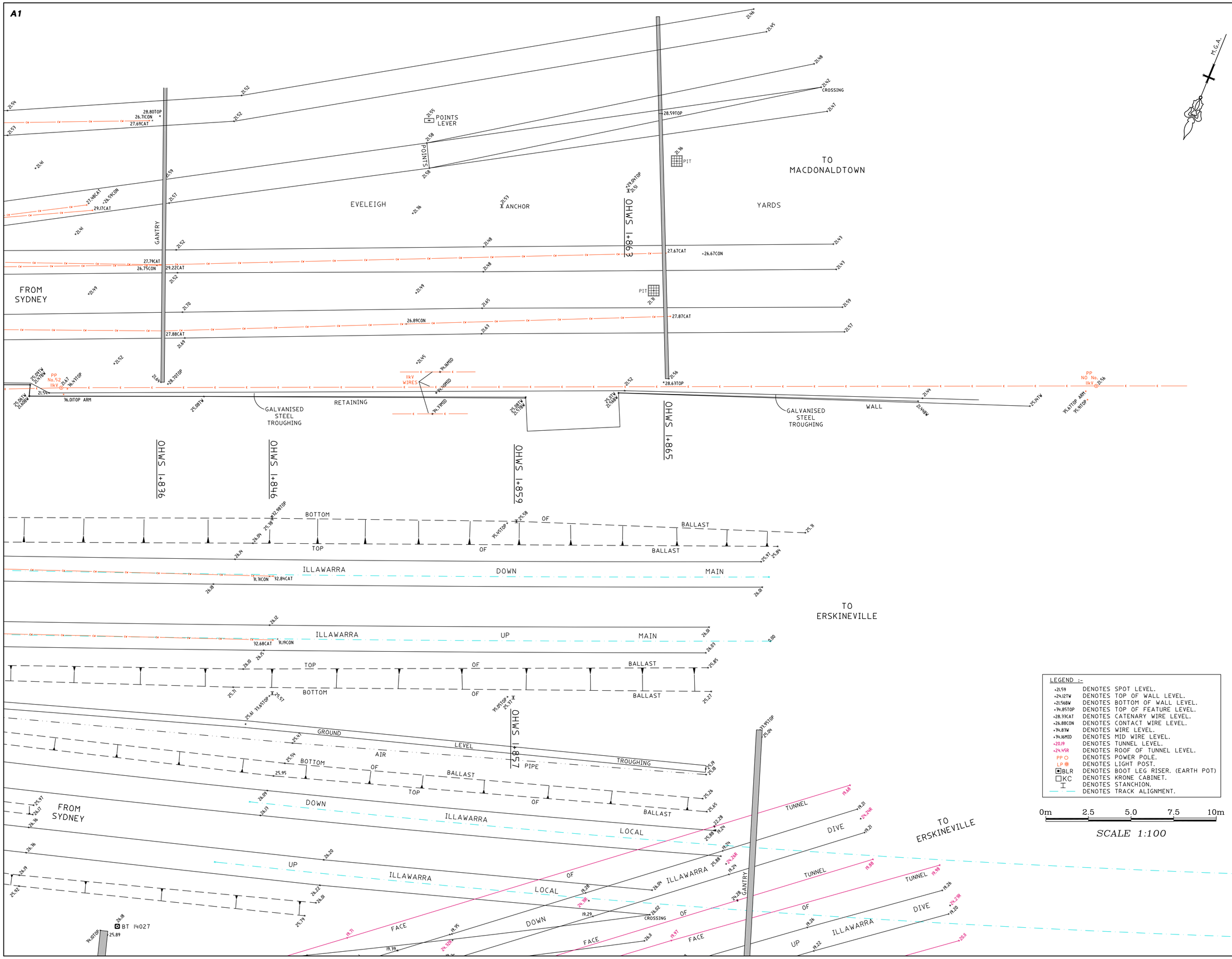

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HORIZONTAL DATUM:

CO-ORDINATE SYSTEM: M.G.A.

MARKS ADOPTED:

BT 14027	BT 1629
332919.077	332801.561
6248066.203	6248047.510

VERTICAL DATUM:

DATUM: A.H.D.
B.M. ADOPTED: BT 14027
R.L. 26.176
SOURCE: RAILCORP

LEGEND :-

+21.59	DENOTES SPOT LEVEL.
+24.12TW	DENOTES TOP OF WALL LEVEL.
+21.56BW	DENOTES BOTTOM OF WALL LEVEL.
+34.85TOP	DENOTES TOP OF FEATURE LEVEL.
+28.33CAT	DENOTES CATENARY WIRE LEVEL.
+26.88CON	DENOTES CONTACT WIRE LEVEL.
+34.83W	DENOTES WIRE LEVEL.
+34.16MID	DENOTES MID WIRE LEVEL.
+20.19	DENOTES TUNNEL LEVEL.
+24.45R	DENOTES ROOF OF TUNNEL LEVEL.
PP ○	DENOTES POWER POLE.
LP ☼	DENOTES LIGHT POST.
▣BLR	DENOTES BOOT LEG RISER. (EARTH POT)
□KC	DENOTES KRONE CABINET.
I	DENOTES STANCHION.
	DENOTES TRACK ALIGNMENT.

0m 2.5 5.0 7.5 10m

SCALE 1:100

REV.	AMENDMENTS	DATE
B	FINAL ISSUE	15/02/07
A	PRELIMINARY ISSUE	14/02/07

CLIENT:

REDFERN–WATERLOO AUTHORITY
LEVEL 11, TOWER 2
1 LAWSON SQUARE
REDFERN NSW 2016

PLAN

SHOWING DETAIL AND LEVELS FROM 1+730 TO 1+870 EVELEIGH

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Consulting Surveyors
Established 1957
Incorporating Morrow & Young

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Pymble NSW 2073
Telephone: (02) 9440 1100
Facsimile: (02) 9440 1055
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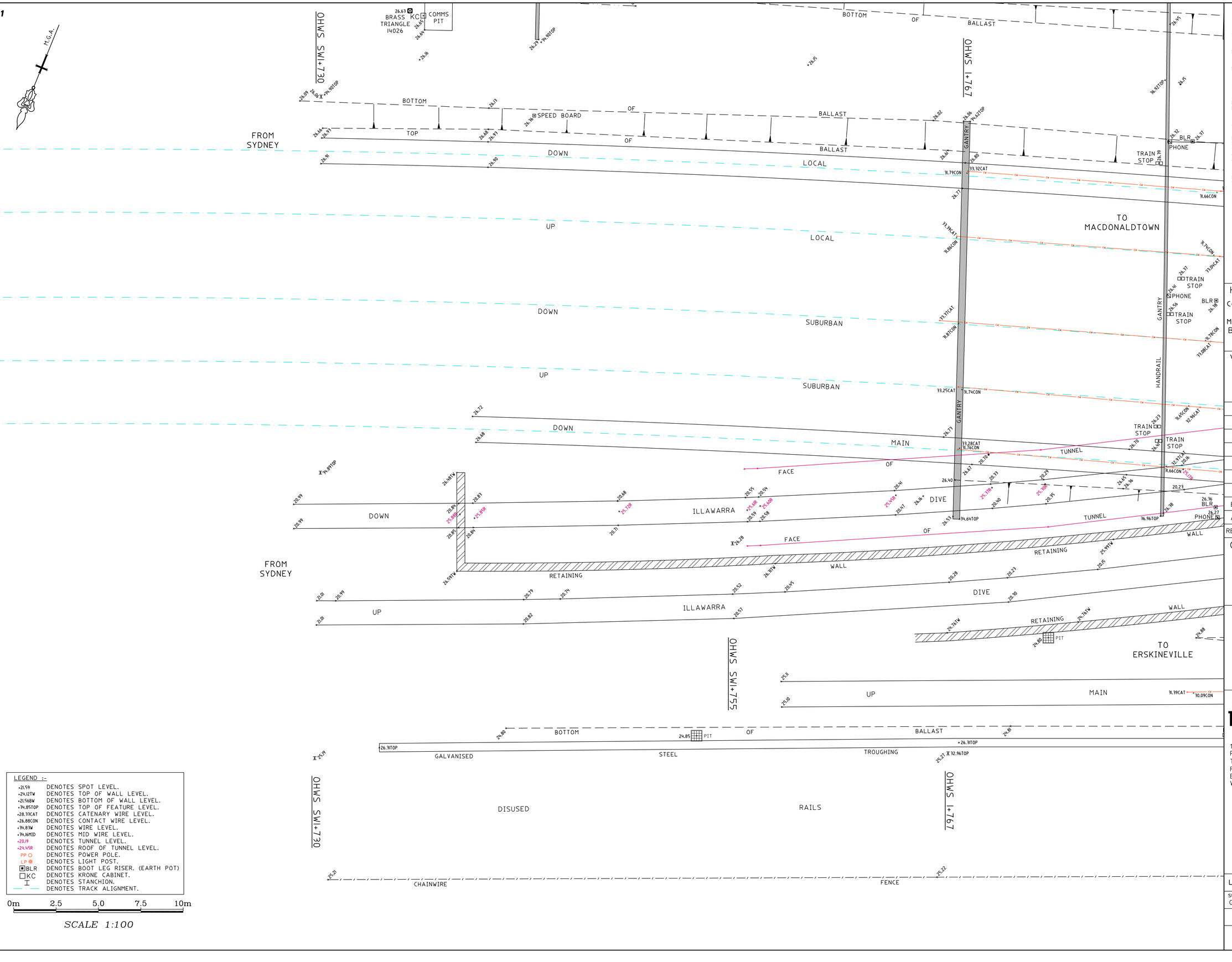
L.G.A. SYDNEY		SHEET 3 OF 6	
SURVEYED G.S./G.G.	DRAWN P.R.G.	CHECKED G.S.	APPROVED
SURVEY REFERENCE 31129		SCALE 1:100	DATE 15/02/07
DRAWING NUMBER 31129A01.DWG			REV. B

A1



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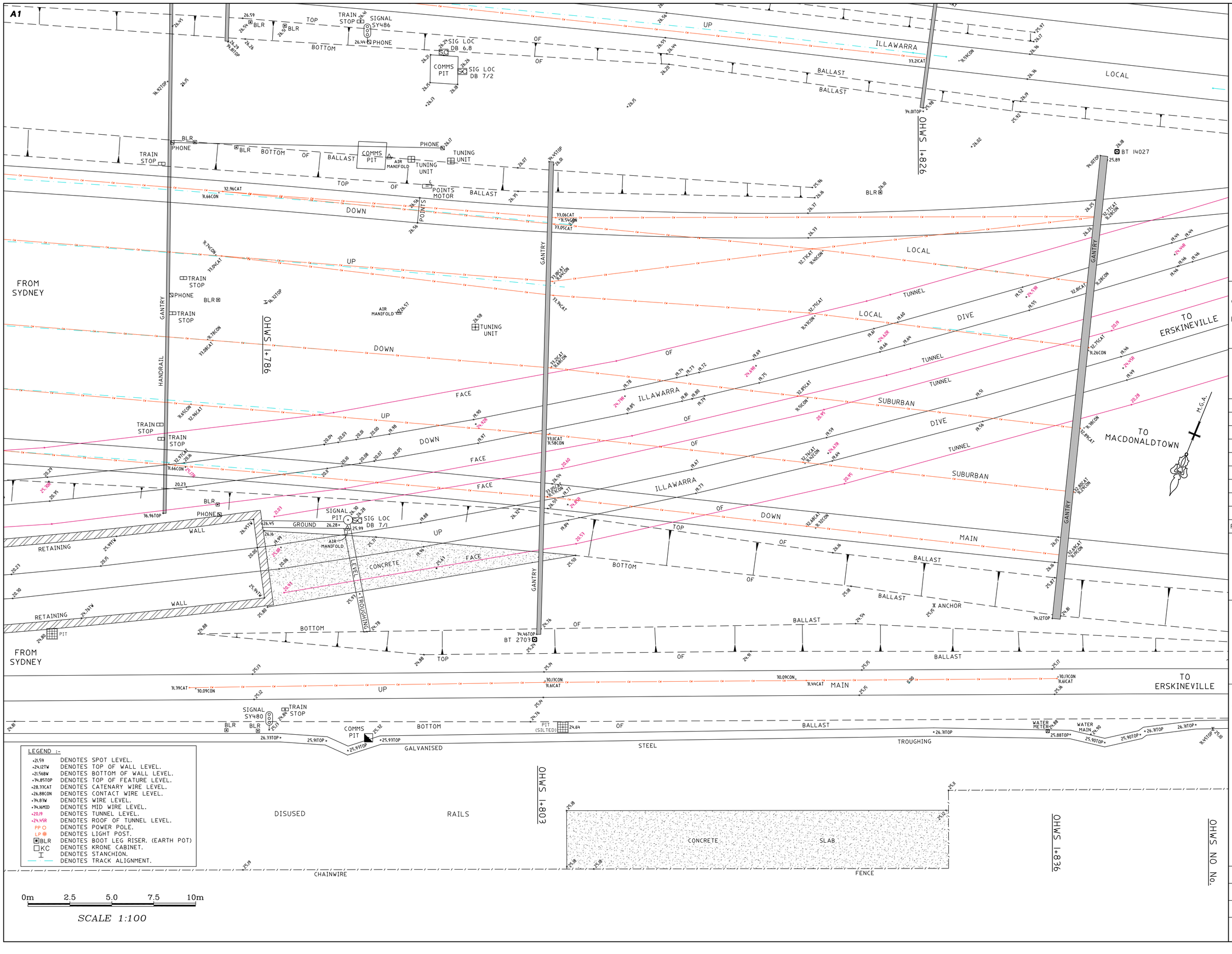
L.G.A. SYDNEY — SHEET 4 OF 6

SURVEYED	DRAWN	CHECKED	APPROVED
G.S./G.G.	P.R.G.	G.S.	

SURVEY REFERENCE	SCALE	DATE
31129	1:100	15/02/07

DRAWING NUMBER: 31129A01.DWG — REV.: B

A1



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DRAWING NUMBER 31129A01.DWG			REV. B

A1

TOP OF BALLAST

BT 14027

GANTRY

FROM SYDNEY

TO ERSKINEVILLE

DOWN ILLAWARRA LOCAL

UP ILLAWARRA LOCAL

DOWN LOCAL

UP LOCAL

DOWN SUBURBAN

UP SUBURBAN

TO MACDONALDTOWN

DOWN MAIN

UP MAIN

TO MACDONALDTOWN

CROSSING

M.G.A.

WATER METER

WATER MAIN

BOTTOM OF BALLAST

GALVANISED STEEL TROUGHING

ANCHOR

CHAINWIRE

CONCRETE SLAB

FENCE

BRICK BUILDING

OHWS 1+836

OHWS NO No.

OHWS SMI+873

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