PARSONS BRINCKERHOFF

Attachment C

Title search documentation

Database : SWC Property (Created 9/8/1999)

User : GEORGE JACKSON
Date/Time : 29/08/2001 9:42:18

LAND PARCEL SUMMARY

LAND PARCEL DETAILS

Holding Status: Current Property Holding **Property Ranking:** MKT

Land Parcel ID: 000913 **Land Parcel Name:** ASHFIELD RESERVOIR R3 (PT)

Street: HOLDEN STREET **Suburb:** HURLSTONE PARK **LGA :** Canterbury

Location Comments: OFF HOLDEN STREET

File No.: 10/103
System Service: Water
Main Property Use: Reservoir

FMIS Asset Number: 00005649
History Packet: 518/17
Deed Packet: 26/1
Asset/Book/Folio: A13-19

Potential Surplus Land Comments:

General Zoning: Special Uses 5 (A)
Comments:

General Comments: 30,36 . I.E.W. ADVISED 03/05/84 SITE REQUIRED FOR FUT. SURFACE & ELEV. RES'S. SYSTEM PLANNING ADVISE NO FUTURE PLANS FOR PROPD R4 RESERVOIR (15.4.94) * MARKET VALUE INCLUDED WITH LAND IN CTV.962 F.140(L900062701) RATEABLE LV INCLUDED IN PRO INCLUDED WITH ID 898

LOT DETAILS

Total Number of Lots: 1

Lot ID	Lot No.	DP	Portion	Section	Parish	Access Prop Number	Area(M2)
000758	1	115504	n/a		n/a	3797091	2,814.00

Total Area (M2): 2,814.00

RELATED INFORMATION

Master Site ID: 0015 **Master Site Name:** ASHFIELD RESERVOIR

Related Land Parcel(s):

ID	Name	Holding Status	Rank	Total Area
000898	ASHFIELD RESERVOIR R3 (PT) LGA: Canterbury	CPH	MKT	3,830.00
000899	ASHFIELD RESERVOIR R3 (PT) LGA: Canterbury	CPH	SYS	1,571.00
004555	ASHFIELD RESERVOIR R3 (PT) LGA: Canterbury	CPH	SYS	0.00

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 1/115504

SEARCH DATE	TIME	EDITION NO	DATE
29/8/2001	9:33AM	-	-

VOL 1942 FOL 152 IS THE CURRENT CERTIFICATE OF TITLE

LAND

LOT 1 IN DEPOSITED PLAN 115504
LOCAL GOVERNMENT AREA: CANTERBURY
PARISH OF PETERSHAM COUNTY OF CUMBERLAND
TITLE DIAGRAM: DP115504

FIRST SCHEDULE

BOARD OF WATER SUPPLY AND SEWERAGE

SECOND SCHEDULE (1 NOTIFICATION)

1. RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

SWC-GJ- PRINTED ON 29/8/2001

CERTIFICATE OF TITLE

(C.)

New South Wales.

[Appn No. 4523]
[Reference to last Certificate]
[Vol. 111 Folio 19.]

REGISTER BOOK,
Vol. 1942 Folio 152

Board of Water Supply and Sewerage Limited

of Transfer from The Australian Mutual Provident Society No. 15041 is —— now the proprietor of an Estate in Fee Simp subject nevertheless to the reservations and conditions, if any, contained in the Grant hereinafter referred to, and also subject to su encumbrances, liens, and interests as are notified hereon, in that piece of land situated ——
in the Municipality of Canterbury, Parish of Petersham, and County of Cumberland
containing two roods thirty one and one quarter perches ——, or thereabou as shown on the Plan hereon, and therein edged red, being part of Ten hundred acres delineated on the parish map of the said parish deposited in the Department of Lands originally granted to John Hepburn by Crown grant dated the eleventh day of November one thousand seven hundred and ninety four ——

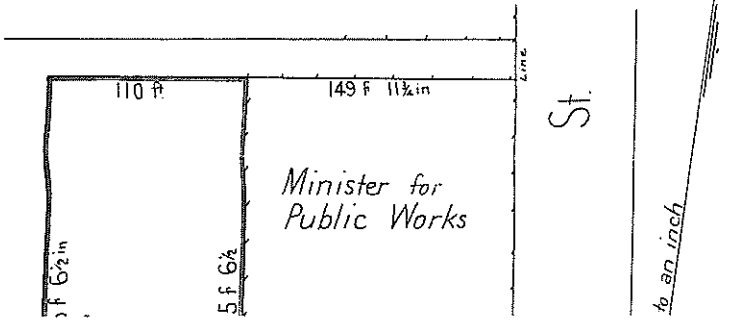
In witness whereof, I have hereunto signed my name and affixed my Seal, this Twentieth day of January one thousand nine hundred and ——

Signed the 20th day of January 190 ,

In the presence of

Deputy Registrar General.

NOTIFICATION REFERRED TO.



RG 2/18

PLAN OF LAND IN TSFR. No. 515011.

D. P. 115504

Mun./~~Shire~~ City : CANTERBURY

Locality: ASHFIELD

Parish: PETERSHAM

County: CUMBERLAND

Reduction Ratio 1: 800

Lengths are in metres

Registered: gc 28-7-83

C.A.: _____

Title System: TORRENS

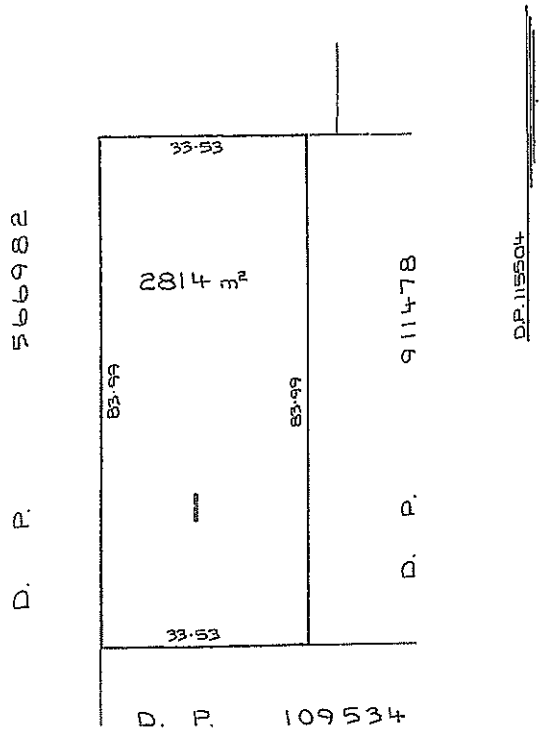
Purpose: DEPARTMENTAL

Ref. Map: U0945 - 444

Last Plan: D.P. 54533

Prepared in Registrar General's Office B.GRAY 28-7-83

Exmd.: gc 28-7-83



10 | 50 | 100 | Table of mm | 140 | 180 | 220

S.O. 2478 D. West, Government Printer

I, Bruce Richard Davies, Under Secretary for Lands and Registrar General for New South Wales, certify that this negative is a photograph made as a permanent record of a document in my custody this day.

1st August, 1983

20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 Table of mm

Last Certificate
Folio 189.

Vol. 1942 Folio 152

1/115504

d of Water Supply and Sewerage Transferee under Trust

om The Australian Mutual Provident Society of No. 515011 is ——— now the proprietor of an Estate in Fee S

ess to the reservations and conditions, if any, contained in the Grant hereinafter referred to, and also subject to

ns, and interests as are notified hereon, in that piece of land situated ———

ipality of Canterbury, Parish of Petersham, and County of Cumberland

roods thirty one and one quarter perches ———, or theres

Plan hereon, and therein edged red, being part of One hundred acres delineated in the public

Parish deposited in the Department of Lands originally granted to John Elphaum by Crow

the eleventh day of November one thousand seven hundred and ninety four ———

ess whereof, I have hereunto signed my name and affixed my Seal, this Twentieth

January one thousand nine hundred and nine ———

20th day of January 1909,

sence of J.R.Riley

Deputy Registrar General.

NOTIFICATION REFERRED TO.

In witness whereof, I have hereunto signed my name and affixed my Seal, this Twenty

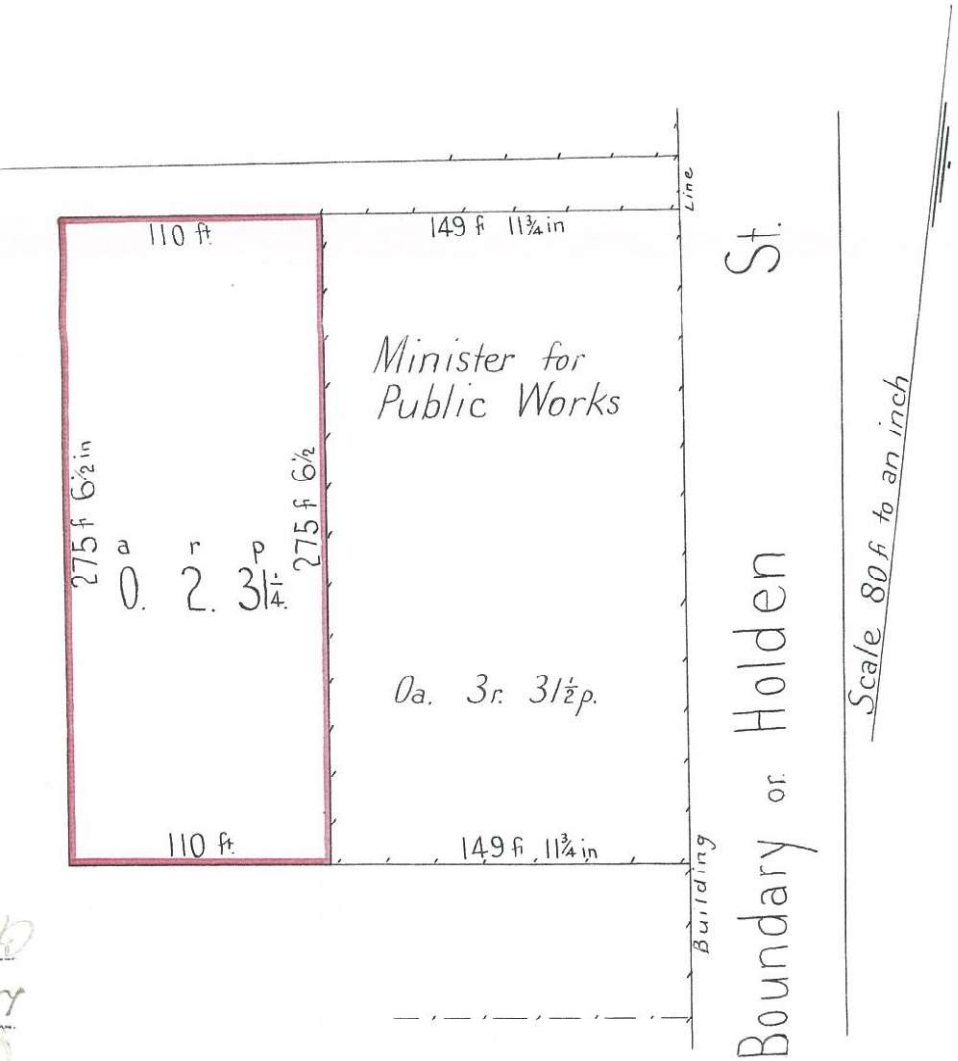
January one thousand nine hundred and nine

Signed the 20th day of January 190 ,

in the presence of

Deputy Registrar General.

NOTIFICATION REFERR



Database : SWC Property (Created 9/8/1999)

User : GEORGE JACKSON
Date/Time : 29/08/2001 9:46:51

LAND PARCEL SUMMARY

LAND PARCEL DETAILS

Holding Status: Current Property Holding **Property Ranking:** SYS

Land Parcel ID: 000899 **Land Parcel Name:** ASHFIELD RESERVOIR R3 (PT)

Street: HOLDEN STREET **Suburb:** HURLSTONE PARK **LGA :** Canterbury

Location Comments:

File No.: 123/2696
System Service: Water
Main Property Use: Reservoir

FMIS Asset Number: 00048918
History Packet: 3467/17
Deed Packet: 26/1
Asset/Book/Folio: A13-19

Potential Surplus Land N
Comments:

General Zoning: No record
Comments:

General Comments: 2,20 . SYSTEM PLANNING ADVISE NO FUTURE PLANS FOR PROPD R4 RESERVOIR (15.4.94) LOT 2 DP 711077 WAS SOLD TO S.ELAZZI FOR $1000 ON 6/7/88. PROP.VALUE ADJUSTED ACCORDINGLY. * MARKET VALUE INCLUDED WITH LAND IN V.962 F.140 (L900062701). LAND CO INCLUDED WITH ID 898

LOT DETAILS

Total Number of Lots: 1

Lot ID	Lot No.	DP	Portion	Section	Parish	Access Prop Number	Area(M2)
000746	1	711077	n/a		n/a	3797092	1,571.00

Total Area (M2): 1,571.00

RELATED INFORMATION

Master Site ID: 0015 **Master Site Name:** ASHFIELD RESERVOIR

Related Land Parcel(s):

ID	Name	Holding Status	Rank	Total Area
000898	ASHFIELD RESERVOIR R3 (PT) LGA: Canterbury	CPH	MKT	3,830.00
000913	ASHFIELD RESERVOIR R3 (PT) LGA: Canterbury	CPH	MKT	2,815.00
004555	ASHFIELD RESERVOIR R3 (PT) LGA: Canterbury	CPH	SYS	0.00

(DP711077)

New South Wales

CERTIFICATE OF TITLE

REAL PROPERTY ACT, 1900

TORRENS TITLE	
REFERENCE TO FOLIO OF THE REGISTER	
IDENTIFIER	1/711077
EDITION	DATE OF ISSUE
1	19. 2.1985

I certify that the person described in the First Schedule is the registered proprietor of an estate in fee simple (or such other estate or interest as is set forth in that Schedule) in the land within described subject to such exceptions, encumbrances, interests and entries as appear in the Second Schedule and to any additional entries in the Folio of the Register.

Registrar General

REGISTRAR GENERAL NEW SOUTH WALES

LAND

LOT 1 IN DEPOSITED PLAN 711077
AT ASHBURY
MUNICIPALITY OF CANTERBURY
PARISH OF PETERSHAM COUNTY OF CUMBERLAND
TITLE DIAGRAM: DP711077

FIRST SCHEDULE

THE METROPOLITAN WATER SEWERAGE AND DRAINAGE BOARD

SECOND SCHEDULE

1. RESERVATIONS AND CONDITIONS IN THE CROWN GRANT
2. D301630 EASEMENT APPURTENANT TO THE LAND ABOVE DESCRIBED AFFECTING THE LAND SHOWN SO BURDENED IN DP109534
3. D301630 COVENANT

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: BEFORE DEALING WITH THIS LAND SEARCH THE CURRENT FOLIO OF THE REGISTER

PLAN FORM 2

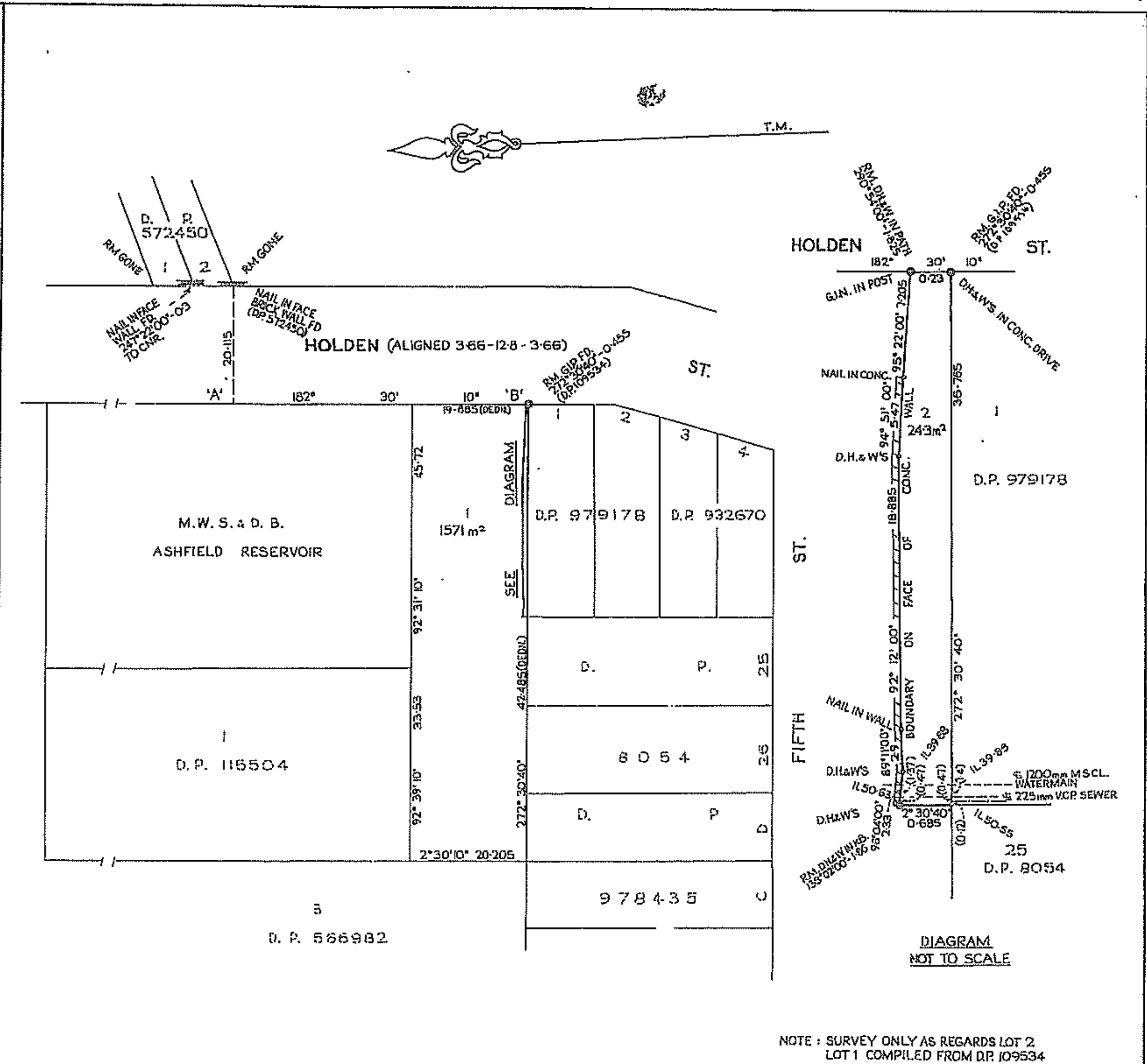
Plan Drawing only to appear in this space

Signatures and seals only.

THE METROPOLITAN WATER, SEWERAGE AND DRAINAGE BOARD BY ITS ATTORNEY WHO HEREBY STATES THAT AT THE TIME OF HIS EXECUTING THIS INSTRUMENT HE HAS NO NOTICE OF THE REVOCATION OF THE POWER OF ATTORNEY REGISTERED Nº 123 BOOK 3465 UNDER THE AUTHORITY OF WHICH HE HAS EXECUTED THIS INSTRUMENT.

SOLICITOR FOR THE BOARD.

SIGNED FOR AND ON BEHALF OF THE METROPOLITAN WATER, SEWERAGE AND DRAINAGE BOARD BY ROBERT DAVID JAMES GUTHRIE ITS DULY CONSTITUTED ATTORNEY WHO IS PERSONALLY KNOWN TO ME.



NOTE : SURVEY ONLY AS REGARDS LOT 2
LOT 1 COMPILED FROM D.P. 109534

*OFFICE USE ONLY

D.P. 711077.

Registered: 18-2-1985

C.A.:

Title System: TORRENS

Purpose: SUBDIVISION

Ref. Map: U0945 - 444

Last Plan: D.P. 109534.

PLAN OF SUBDIVISION OF LOT A, D.P. 109534

Reduction Ratio 1: 500
Lengths are in metres.

Mun./City: CANTERBURY

Locality: ASHBURY

Parish: PETERSHAM

County: CUMBERLAND

(Delete if inapplicable).

I, GREGORY PHILLIP SMITH of M.W.S.&D. BOARD, SYDNEY a surveyor registered under the Surveyors Act, 1929, as amended, hereby certify that the survey represented in this plan is accurate and has been made *(1) by me (2) ... in accordance with the Survey Practice Regulations, 1933, and was completed on † 6-12-1984.

Signature

Surveyor registered under Surveyors Act, 1929, as amended. Datum Line of Azimuth 'A'-'B'
*Strike out either (1) or (2). †Insert date of survey.

Panel for use only for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements or restrictions as to user.

Council Clerk's Certificate

I hereby certify that—
(a) the requirements of the Local Government Act, 1919 (other than the requirements for the registration of plans), and
*(b) the requirements of section 31B of the Metropolitan Water, Sewerage and Drainage Act, 1924, as amended, (Hunter District Water, Sewerage, and Drainage Act, 1938, as amended
have been complied with by the applicant in relation to the proposed
(Insert "new road", "subdivision" or "consolidated lot") set out herein
Subdivision No. ....
Date ....
(Signature) ....
Council Clerk
*This part of certificate to be deleted where the application is only for a consolidated lot or the opening of a new road or where the land to be subdivided is wholly outside the area of operations of the Metropolitan Water Sewerage and Drainage Board and the Hunter District Water Board.
†Delete if inapplicable.

M.P.D.   R.V. - R.5

Table of mm

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

SURVEYOR'S REFERENCE 346723 84/1035

FB. 6590 RE.

123/2696 Pt.2

D.P. 711077

This negative is a photograph made as a permanent record of a document in the custody of the Registrar General this day.

BOX 354L
(DP1141436)

TORRENS TITLE REFERENCE	
1/711077	
EDITION	DATE OF ISSUE
2	11/11/2010
CERTIFICATE AUTHENTICATION CODE	
FMHQ-QV-7K65	

NEW SOUTH WALES

CERTIFICATE OF TITLE

REAL PROPERTY ACT, 1900

I certify that the person described in the First Schedule is the registered proprietor of an estate in fee simple (or such other estate or interest as is set forth in that Schedule) in the land within described subject to such exceptions, encumbrances, interests and entries as appear in the Second Schedule and to any additional entries in the Folio of the Register.

REGISTRAR GENERAL

LAND

LOT 1 IN DEPOSITED PLAN 711077
AT ASHBURY.
LOCAL GOVERNMENT AREA: CANTERBURY.
PARISH OF PETERSHAM COUNTY OF CUMBERLAND
TITLE DIAGRAM: DP711077

FIRST SCHEDULE

THE METROPOLITAN WATER SEWERAGE AND DRAINAGE BOARD

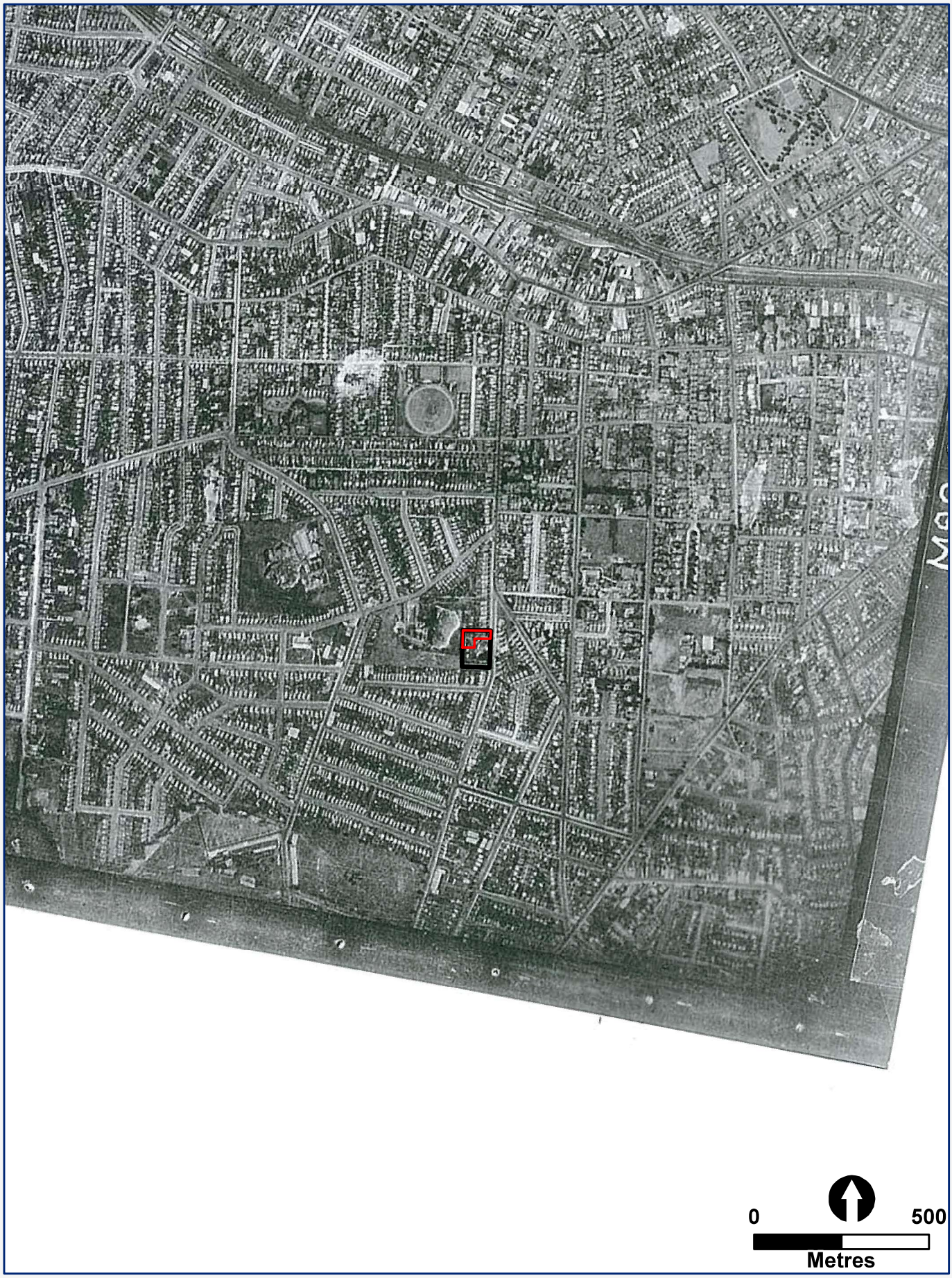
SECOND SCHEDULE
---
1. RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2. D801930 EASEMENT APPURTENANT TO THE LAND ABOVE DESCRIBED AFFECTING THE LAND SHOWN SO BURDENED IN DP109534
3. D801930 COVENANT
4. DP1141436 EASEMENT FOR ELECTRICITY AND OTHER PURPOSES 5.3 METRE(S) WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN DP1141436

**** END OF CERTIFICATE ****

PARSONS BRINCKERHOFF

Attachment D

Historical aerial photographs

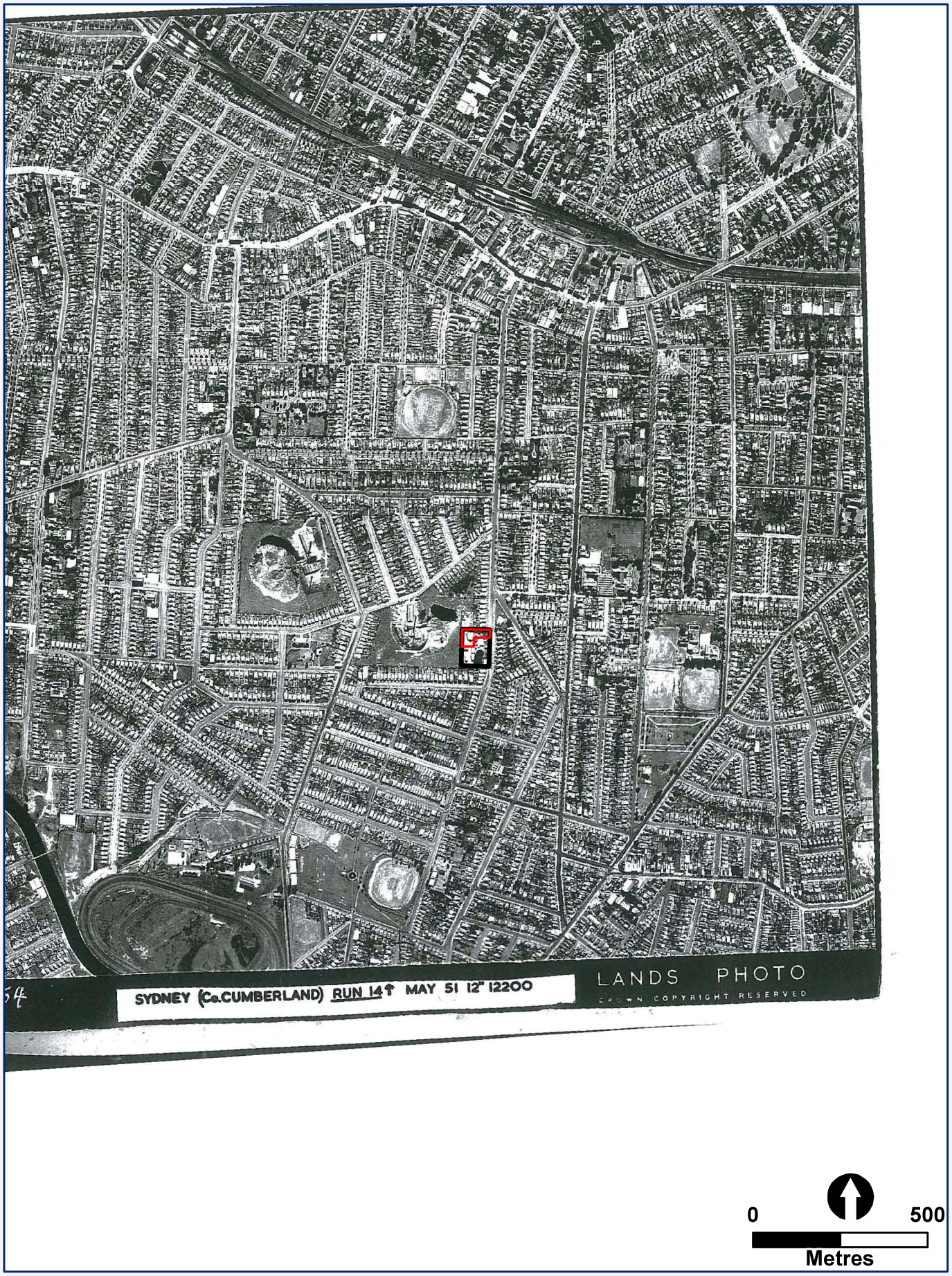


Aerial source: ©SKM2010 (GoogleEarth)

\\APSYDFIL03\proj\SISYD_WAT_COR_GRO\2201679ACLM_NSW_SW_DSI_PROGRAM_A_2015\10_GIS\Projects\Maps\Historical_Aerials\Ashfield\Ashfield_1930.mxd // PT / PottsR // 12/05/2015

Historic Aerial Photographs - 1930
Sydney Water Ashfield Reservoir
Holden St, Ashbury, NSW

Site extent
Sydney Water property

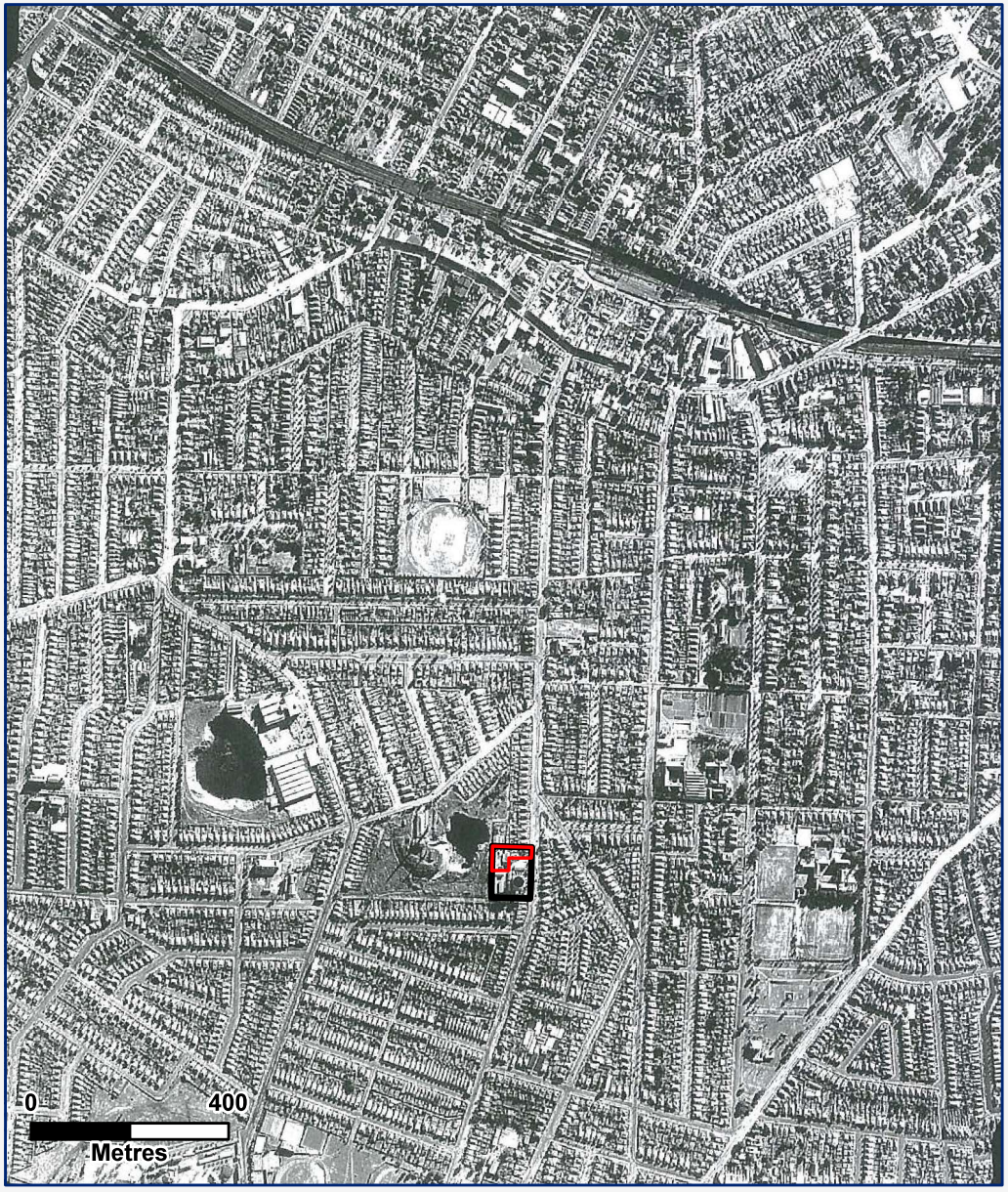


Aerial source: ©SKM2010 (GoogleEarth)

\\APSYDFIL03\proj\SISYD_WAT_COR_GRO\220167\9ACLM_NSW_SW_DSI_PROGRAM_A_2015\10_GIS\Projects\Maps\Historical_Aerials\AshfieldAshfield_1951.mxd // PT / PottsR // 12/05/2015

Historic Aerial Photographs - 1951
Sydney Water Ashfield Reservoir
Holden St, Ashbury, NSW

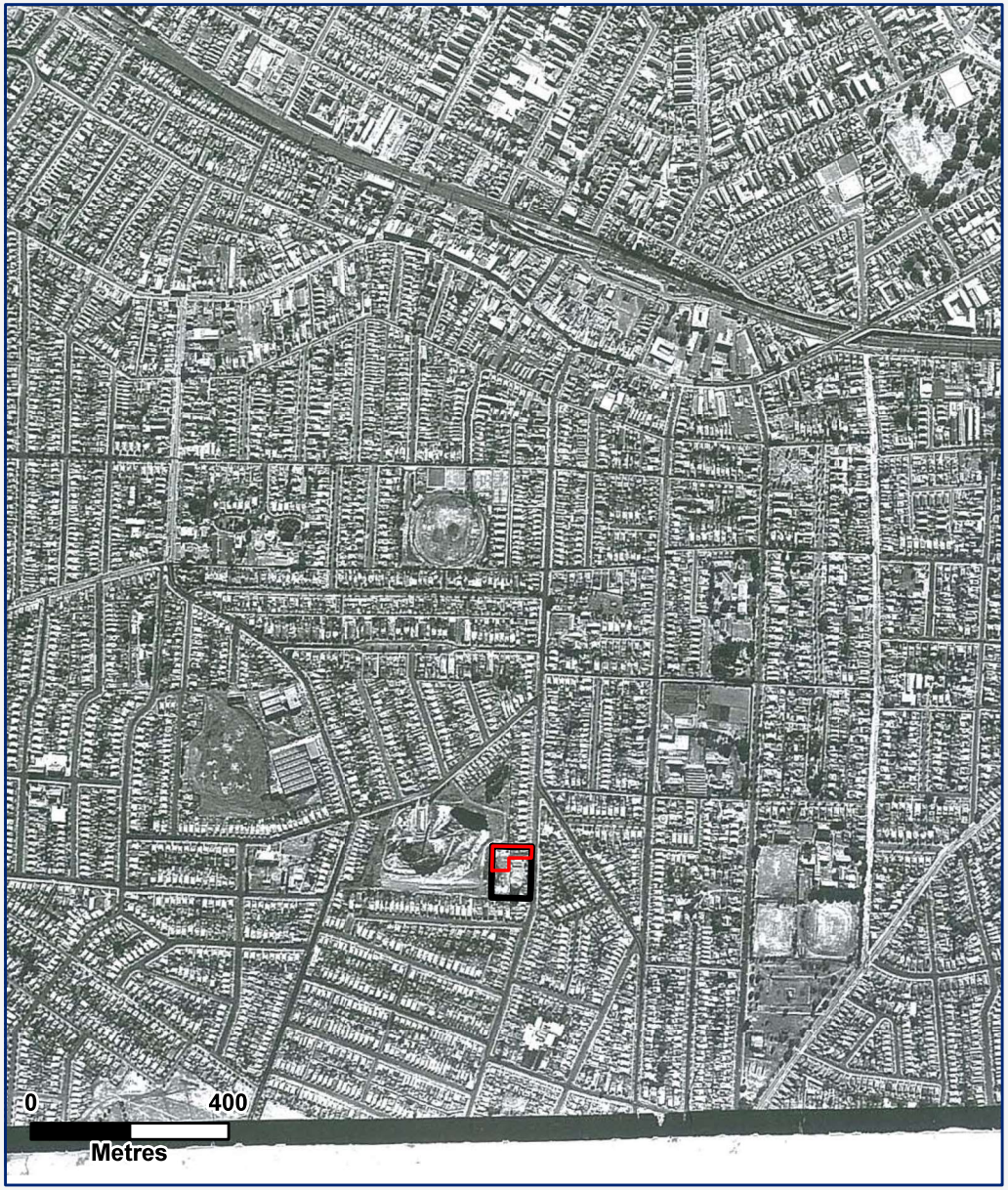
Site extent
Sydney Water property



Site extent

Sydney Water property

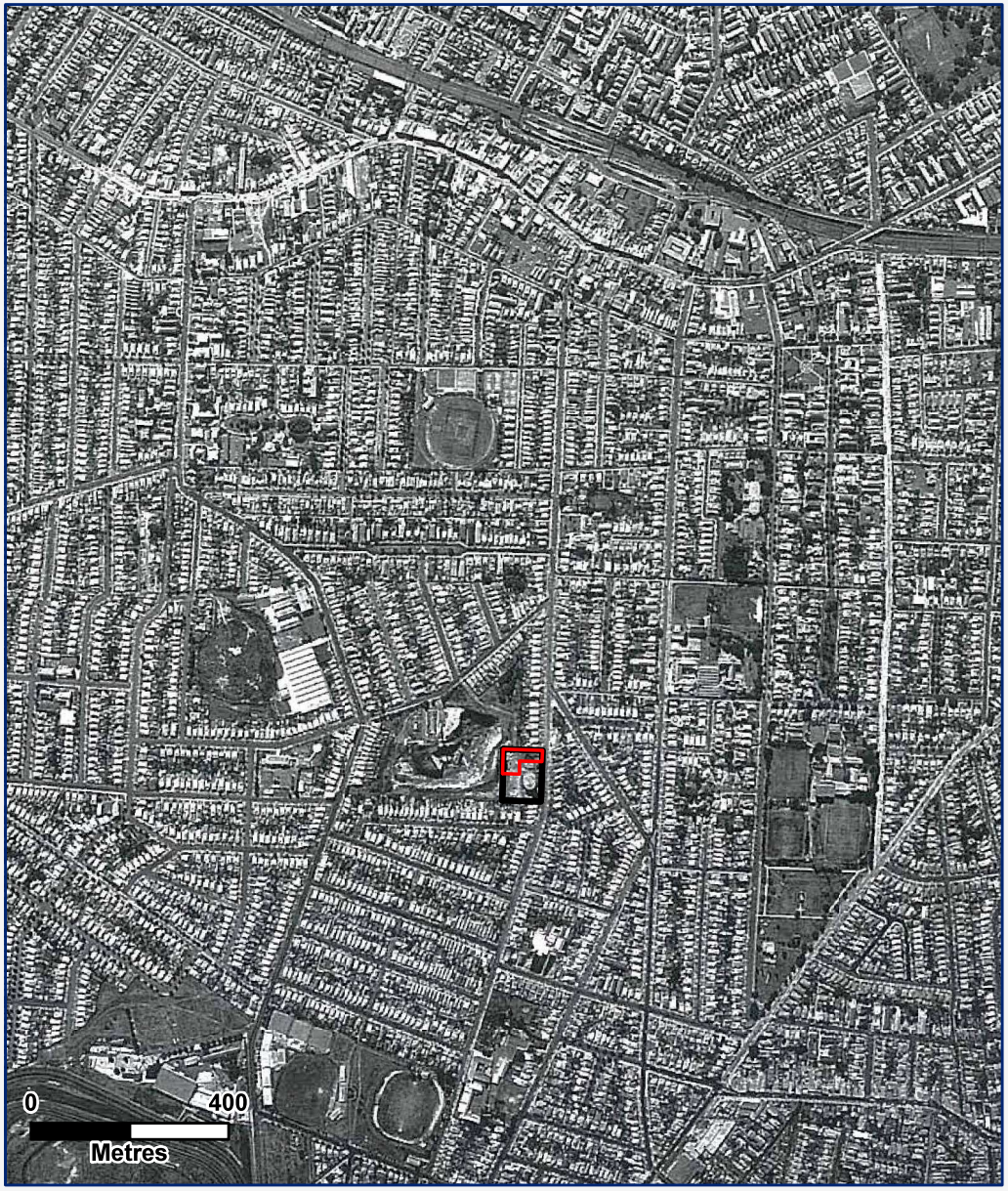
Historical Aerial Photographs - 1961
Sydney Water Ashfield Reservoir
Holden St, Ashbury, NSW



Site extent

Sydney Water property

Historical Aerial Photographs - 1970
Sydney Water Ashfield Reservoir
Holden St, Ashbury, NSW



Site extent

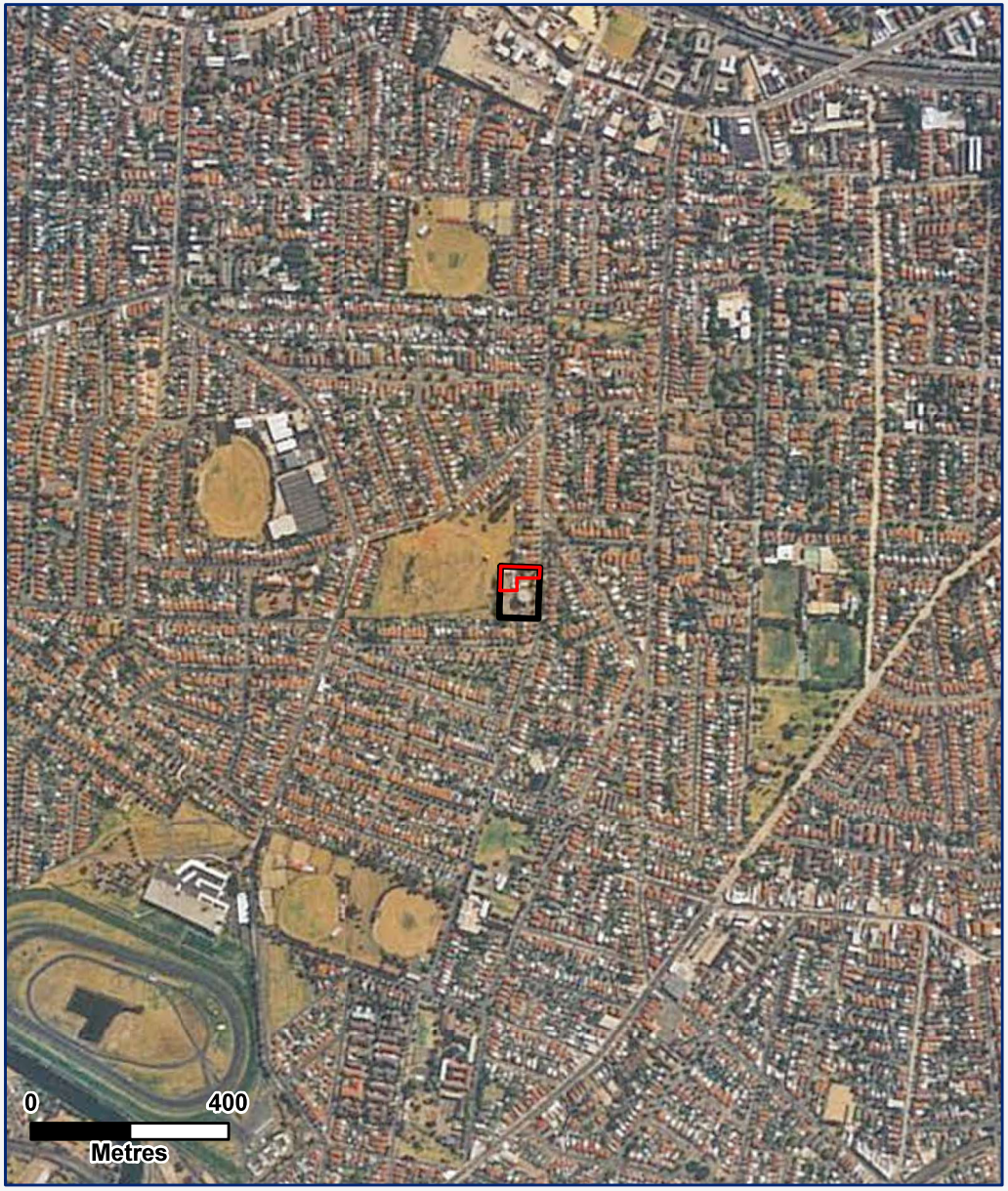
Sydney Water property

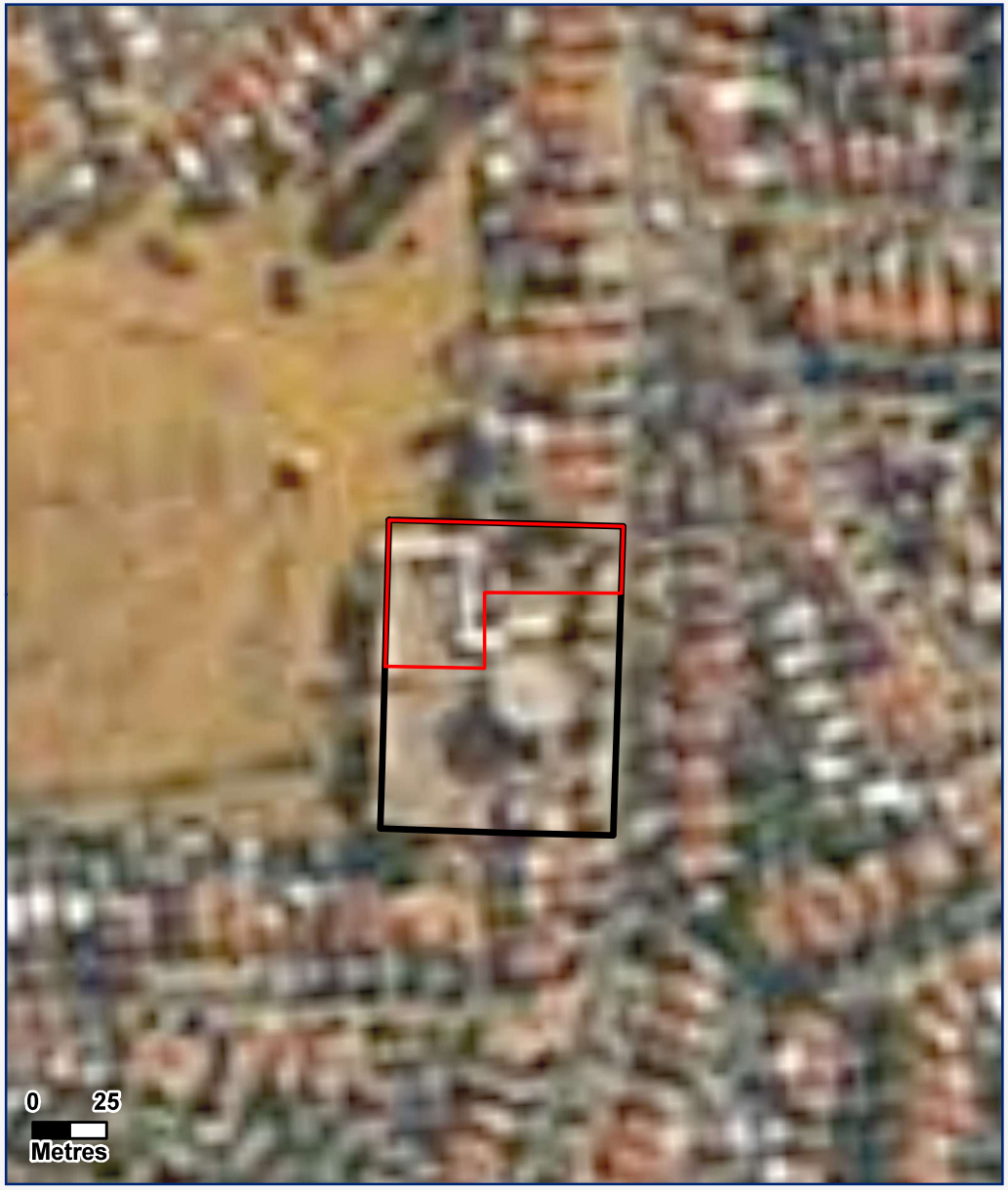
Historical Aerial Photographs - 1978
Sydney Water Ashfield Reservoir
Holden St, Ashbury, NSW

Site extent

Sydney Water property

Historical Aerial Photographs - 1986
Sydney Water Ashfield Reservoir
Holden St, Ashbury, NSW





Site extent

Sydney Water property

Historical Aerial Photographs - 1994
Sydney Water Ashfield Reservoir
Holden St, Ashbury, NSW

PARSONS BRINCKERHOFF

Attachment E

NSW WorkCover Dangerous Goods search results

NSW GOVERNMENT
WorkCover

WorkCover NSW
92–100 Donnison Street, Gosford, NSW 2250
Locked Bag 2906, Lisarow, NSW 2252
T 02 4321 5000 F 02 4325 4145
Customer Service Centre 13 10 50
DX 731 Sydney workcover.nsw.gov.au

Our Ref: D15/057745
Your Ref: Kellie Lynch

24th April 2015

Attention Kellie Lynch
Parsons Brinckerhoff Australia Pty Ltd
GPO Box 5394
SYDNEY NSW 2001

Dear Ms Lynch,

RE SITE: 165 Holden Street, Ashfield NSW

I refer to your site search request received by WorkCover NSW on 16 April 2015 requesting information on licences to keep dangerous goods for the above site.

Enclosed are copies of the documents that WorkCover NSW holds on Dangerous Goods Licence 35/028815 relating to the storage of dangerous goods at the above-mentioned premises, as listed on the Stored Chemical Information Database (SCID). If you have any further queries please contact the Dangerous Goods Licensing Team on (02) 4321 5500.

Yours Sincerely

Diana Hayes
Customer Service Officer - Operations
Dangerous Goods Notification Team

Reference

WORKCOVER AUTHORITY

APPLICATION FOR RENEWAL
OF LICENCE TO KEEP DANGEROUS GOODS

ISSUED UNDER AND SUBJECT TO THE PROVISIONS OF THE DANGEROUS GOODS ACT, 1975 AND REGULATION THEREUNDER

DECLARATION: *Please renew licence number 35/028815 to 1996. I confirm that all the licence details shown below are correct (amend if necessary).*

John Patterson — John Patterson — 12-7-95

(Signature) *(Please print name)* *(Date signed)*

for: SYDNEY WATER CORP LTD

*THIS **SIGNED** DECLARATION SHOULD BE RETURNED TO:*

WorkCover Authority
Dangerous Goods Licensing Section (Level 3)
Locked Bag 10
P O CLARENCE STREET 2000

Details of licence on 29 June 1995

Licence Number 35/028815 **Expiry Date** 31/08/95

Licensee SYDNEY WATER CORP LTD ACN 063 279 649

Postal Address ~~86 BELLINGARA RD, MIRANDA 2228~~ P.O. Box 555, Rockdale 2216
Licensee Contact ~~Susan~~ Wright ~~Ph. 522 1471 Fax. 522 7962~~ ph 6618247 fax 661 9084
Premises Licensed to Keep Dangerous Goods
HOLDEN ST
ASHFIELD 2131

Nature of Site Water Supply **Major Supplier of Dangerous Goods** UNKNOWN OR OTHER

Emergency Contact for this Site Wayne Stewart AH 551 4600 ph. 797 0765

Site staffing 8 Hrs 5 Days

Details of Depots

Depot No.	Depot Type	Goods Stored in Depot	Qty
01	FLAMMABLE LIQUID CABINET	Class 3 UN 1203 MOTOR SPIRIT	160 L 160 L

WorkCover New South Wales, 400 Kent Street, Sydney 2000, Telephone (02) 370 5000 ALL MAIL TO LOCKED BAG 10, CLARENCE STREET SYDNEY 2000

Reference

WORKCOVER
NEW SOUTH WALES

APPLICATION FOR RENEWAL
OF LICENCE TO KEEP DANGEROUS GOODS

ISSUED UNDER AND SUBJECT TO THE PROVISIONS OF THE DANGEROUS GOODS ACT, 1975 AND REGULATION THEREUNDER

DECLARATION: *Please renew licence number 35/028815 to 1997. I confirm that all the licence details shown below are correct (amend if necessary).*

..... G. Berriman ..... 16/8/96.....

(Signature) *(Please print name)* *(Date signed)*

for: SYDNEY WATER CORP LTD

*THIS **SIGNED** DECLARATION SHOULD BE **RETURNED TO:***

WorkCover New South Wales
Dangerous Goods Licensing Section (Level 3)
Locked Bag 10
P O CLARENCE STREET 2000

Details of licence on 13 August 1996

Licence Number 35/028815 **Expiry Date** 31/08/96

Licensee SYDNEY WATER CORP LTD ACN 063 279 649

Postal Address BOX 555 P O, ROCKDALE 2216
Licensee Contact Susan Wright Ph. 661 8247 Fax. 661 9084
Premises Licensed to Keep Dangerous Goods
HOLDEN ST
ASHFIELD 2131

Nature of Site Water Supply **Major Supplier of Dangerous Goods** UNKNOWN OR OTHER

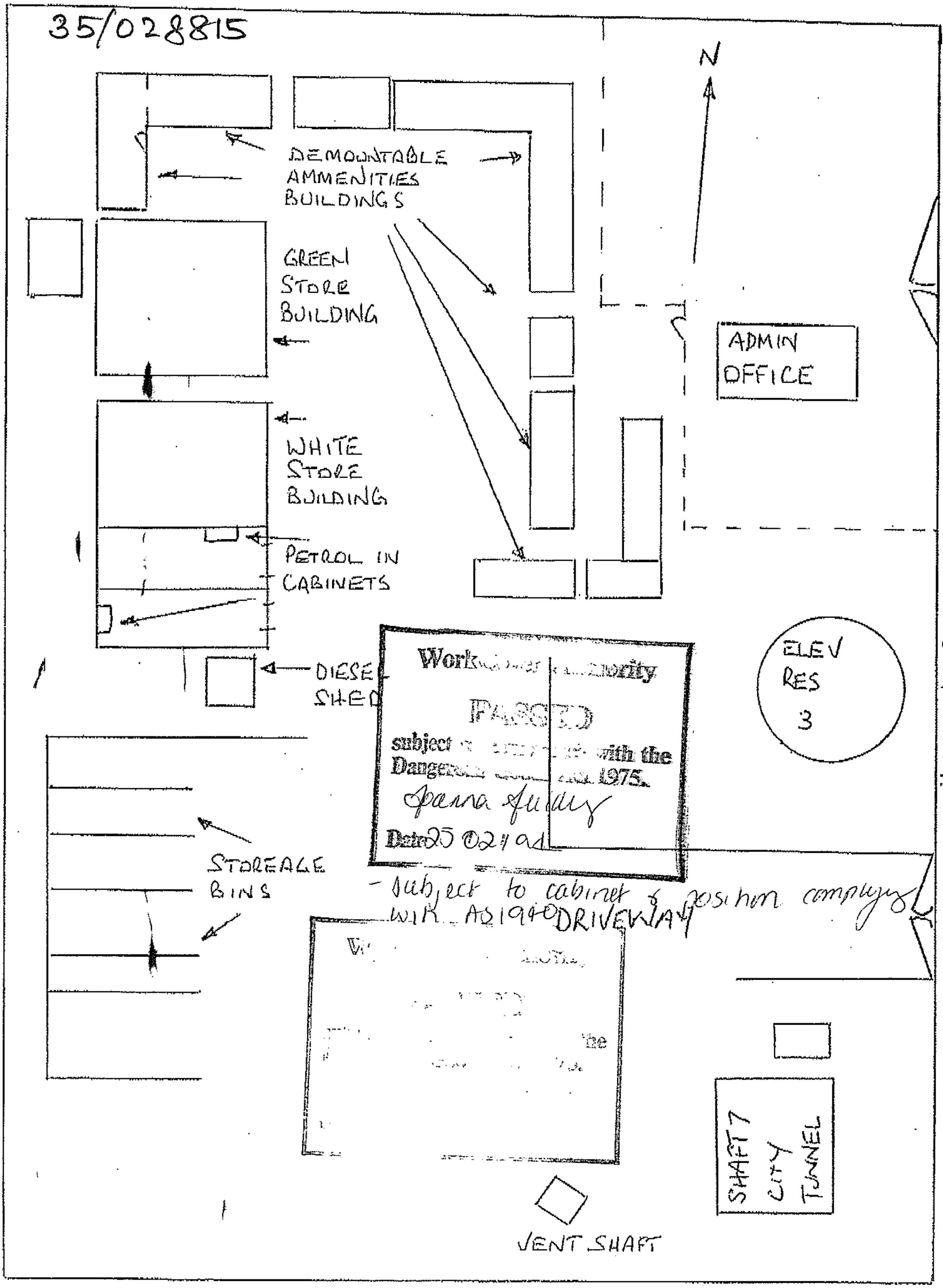
Emergency Contact for this Site Wayne Stewart AH 551 4600 ph. 797 0765

Site staffing 8 Hrs 5 Days

Details of Depots

Depot No.	Depot Type	Goods Stored in Depot	Qty
01	FLAMMABLE LIQUID CABINET	Class 3	160 L
		UN 1203 MOTOR SPIRIT	160 L

LAYOUT OF ASHFIELD DEPOT 165-183 HOLDEN ST NOT TO SCALE



DANGEROUS GOODS – CENTRAL REGION

Applications for 'Licences to Keep Dangerous Goods' have been submitted to Workcover for the following sites:

NAME/ADDRESS	CONTACT NAME	PHONE NO	FAX NO	CLASS	TYPE	QUANTITY	LICENCE	RENEW
Dover Heights Reservoir (no 1 & 2) Portland Road, Dover Heights	Ian Nisbet	6616130	3113500	2.3	Chlorine	only 420 kg approx 840 Kg	Unlicensed	Submitted 6.8.93
Maroubra Reservoir Johnson Parade off Byrne Ave, Maroubra	Ian Nisbet	6616130	3113500	2.3	Chlorine	* 574 Kg	35–0272–67	Submitted 6.8.93
Enfield Water Maintenance Depot Hill Street, Enfield	Geoff Vickers Shane Tindall	7425399	7425152	3PG11 2.3	Fuel Chlorine	120 Ltrs 219 Kg	~~35–0272–65~~	Re–Submitted 8.9.93
Penshurst Reservoir 12c Laycock Street, Penshurst	Rod Meres Colin Ryan	5795688	5808716	3PG11 2.3	Fuel Chlorine	160 Ltrs 102 Kg	35–0272–68	Re–Submitted 26.8.93
Petersham C12 Dosing Plant Cnr Chester & Albert Sts, Petersham	Wayne Stewart	7970765	7998892	2.3	Chlorine	200 Kg	35–0272–69	Submitted 6.8.93
City Water Depot Holden St, Ashfield	Wayne Stewart	7970765	7998892	3PG11	Fuel	200 Ltrs	Unlicensed	Submitted 26.8.93

Plan

RECEIVED FROM 02 5227962 14.1 09:38

PARSONS BRINCKERHOFF

Attachment F

QA/QC discussion

F1 QA/QC

F1.1 Field QA/QC

F1.1.1 Sample collection, handling and preservation

Field sampling procedures conforming to regulatory guidelines and Parsons Brinckerhoff QA/QC procedures are to be used to minimise potential for cross-contamination and preserve sample integrity. The non-disposable sampling equipment is to be decontaminated by triple washing between each sample location. The triple washing technique comprises washing equipment with water, scrubbing with phosphate free detergent (Decon 90) and water, followed by a final rinse with demineralised water. Disposable nitrile gloves are to be worn and replaced before collecting each sample.

All samples collected are to be placed into laboratory supplied containers. All samples are to be placed on ice in coolers for transport to the NATA accredited laboratories. Standard chain of custody documentation is to accompany the samples to the laboratories.

F1.1.2 Field duplicates

Field intra-laboratory duplicate samples are to be collected at a rate of 1 per 20 samples and inter-laboratory duplicate samples are to be collected at a rate of 1 per 20.

F1.1.3 Trip blanks

Trip blank samples comprise de-ionised water supplied by the laboratory placed within the cooler containing all the other sample containers. Trip blank samples remain within the cooler for the extent of the 'trip'. The purpose of the trip blank samples is to assess if any volatile contaminants have entered the sample containers during their journey from either an outside source or from the sample container itself.

One trip blank sample will be included with each sample shipment submitted to the laboratory and will be analysed for TRH C_6-C_{10} and BTEX.

F1.1.4 Field blanks

Field blank samples comprise de-ionised water supplied by the laboratory. Field blank sample containers are left open during the period of sampling of a single sample, then sealed and placed with other samples. The purpose of the field blank samples is to assess if any contaminants have entered the sample containers during the sampling event from either outside sources.

A field blank is undertaken for each day of sampling and will be analysed for the full suite of primary analytes with the exception of asbestos.

F1.1.5 Trip spike

Trip spike samples comprise a water sample spiked with a volatile compounds supplied by the laboratory placed within the cooler containing all the other sample containers. Trip spike samples remain within the

cooler for the extent of the 'trip'. The purpose of the trip spike sample is to assess for the potential loss of volatile constituents during the journey from the site to the laboratory.

One trip spike sample will be collected for each sample shipment submitted to the laboratory and analysed for BTEX compounds.

F1.1.6 Calibration

The PID will be calibrated daily using a known concentration of isobutylene gas. Calibration will be recorded on field sheets.

F1.2 Assessment of data quality

Data quality is typically discussed in terms of precision, accuracy, representativeness, comparability and completeness. These are referred to as the PARCC parameters. The PARCC and additional quality assurance (QA) parameters are discussed in what follows as indicators of data quality. The QA criteria to be examined include:

- relative percent difference (RPD) evaluation of laboratory matrix duplicates
- RPD evaluation of field duplicates
- matrix spike results
- surrogate spike results
- sample method blank results
- laboratory blank results
- laboratory control sample results
- holding times
- sample handling and analysis protocols (e.g. correct sample preservation, correct sample containers and chilling of the samples).

F1.2.1 Precision

Precision is a measure of the ability to reproduce results, and is assessed on the basis of agreement between a set of replicate results obtained from duplicate analyses. The precision of a set of duplicates is measured as RPD, and is calculated from the following equation:

$$\mathrm{RPD} = \left[\frac{\mathrm{X1 - X2}}{\left(\frac{X1 + X2}{2} \right)} \right] \times 100$$

where: X1 is the first duplicate value

X2 is the second duplicate value

Laboratory personnel calculate the RPDs of laboratory duplicates (also referred to as matrix duplicates) as a measure of precision. Laboratory duplicates are a sample which has been split by the laboratory and both portions are subject to the same analytical processes as if they were individual samples. Laboratory duplicates are generally analysed at a rate of 1 duplicate per 20 samples. The target RPD values range depending on the sample matrix and analyte as shown in Table F1.

Table F1 Acceptable laboratory duplicate RPD values

Analyte	Matrix	(>10 x PQL) %RPD	(4-10 PQL) %RPD	(<4 X PQL)
TRH, BTEX, PAHs	Soil	±30	±70	±2 X PQL
Total metals	Soil	±30	±50	±2 X PQL

If the RPD for a sample does not fall within the control limits, laboratory based corrective action is taken; however, the sample is not necessarily re-analysed.

It should be noted that a laboratory batch may contain samples from other sources; therefore, laboratory duplicates may be analysed on other samples from the batch. However, the laboratory's QA/QC procedures require all batch laboratory duplicates to conform to prescribed criteria.

Field duplicates

An assessment of the precision of the laboratory's results is also undertaken by Parsons Brinckerhoff following a similar method. A sample is split into three representative samples termed the primary, intra-laboratory duplicate and inter-laboratory duplicate samples. Primary samples and intra-laboratory duplicates are analysed by the nominated primary laboratory, while the inter-laboratory duplicate sample is submitted to a secondary laboratory. RPD values are calculated between the primary sample and the intra-laboratory duplicate sample, and the primary sample and the inter-laboratory duplicate sample.

The Australian standard for non-volatile and semi-volatile compounds in soil (AS 4482.1-2005) states that typical RPDs for non- and semi-volatile analytes in soil are 30% to 50%, and that results can be expected to be higher for organic analytes than inorganic and for low concentrations. The NEPM (2013) Schedule B(3) states the soil RPDs should in general be less than 30%.

With regards to asbestos quantification, no field duplicate analysis has been proposed to be undertaken. The purpose of collecting duplicate samples is to measure the potential for inaccuracy in sample results due to field or laboratory procedures. Analysis of anonymised duplicate samples by the primary and secondary laboratories serves to determine the degree to which sample analyses which should provide identical results do, in fact, provide them. The way this is measured is through the calculation of the RPD between the results, as detailed in the previous section.

For contaminants which are discrete within the matrix being sampled, such as asbestos in bonded or fibre form in soil, the duplication of a particular sample does not logically support the objective of duplicate sampling. Chemical contaminants tend, through a variety of processes, to diffuse towards homogeneous concentrations. However, as asbestos contamination represents foreign bodies present in the soil which do not diffuse except through mechanical mixing there is no logical expectation of similar quantities in any two discrete samples, even two samples split from one larger one. Therefore, the results of the analyses of two such samples should not be expected to adhere to the same RPD criteria by which chemical contaminants are measured.

F1.2.2 Accuracy

Accuracy is a measure of the agreement between an experimental determination and the true value of the parameter being measured.

Matrix spikes

The determination of accuracy can be achieved through the analysis of known reference materials or assessed by the analysis of matrix spikes. Matrix spikes are analysed by splitting a field sample. Each portion is spiked with known quantities of the target compound in order to ascertain the effects of the specific sample matrix on the recovery of analytes. Accuracy is measured in terms of percentage recovery as defined by the following equation:

$$\%R = \frac{SSR - SR}{SA} X\ 100$$

where: %R = percentage recovery of the spike
SSR = spiked sample result
SR = sample result (native)
SA = spike added

Laboratory personnel calculate percentage recoveries of spiked compounds, which are evaluated against control or acceptance limits taken from the appropriate method or the Laboratory Program Statement of Work. If the spike recovery for a sample does not fall within the prescribed control limits, laboratory based corrective action is taken, although the sample is not necessarily re analysed. Matrix spikes are analysed at a rate of 1 matrix spike per 20 samples. Acceptance criteria for matrix spikes are shown in Table F2.

Table F2 Acceptance criteria for matrix spikes

Analyte	Matrix	Acceptance criteria (% recovery)
TRH, BTEX, PAHs	Soil	70–130
Total metals	Soil	70–130

Typically, results are qualified when percentage recovery is below QA acceptance criteria, indicating that sample results may be biased low. However, results are also qualified when percentage recovery is above QA acceptance criteria, indicating that sample results may be biased high.

The sample batch may contain samples from other sources. Therefore, matrix spikes may be analysed on other samples from the batch. However, the laboratory's QA/QC procedures require all batch matrix spikes to conform to the prescribed criteria. The laboratory may report this analysis as laboratory control samples, which may be used to assess the laboratory's methods and procedures.

Laboratory control samples

A laboratory control sample comprises de-ionised water and is spiked with a known quantity of a target analyte. The laboratory control sample is extracted and analysed with the other samples. The aim of the laboratory control sample is to evaluate the efficiency of the extraction and analysis. The target recovery is 100%, although the range of acceptable results can vary depending on the type of analysis. The laboratory control sample also confirms the accuracy of the calibration, as the target analytes are obtained from an alternate source to the calibration standards.

Surrogate spikes

A surrogate spike is a sample which has been spiked with a pure substance that has similar chemical properties to the target analyte, and is unlikely to be found in the environment. The spiked compounds are expected to behave during analysis in the same way as the target compounds. Every sample is spiked prior to extraction or analysis with known concentrations of surrogate compounds that are representative of the analysis. If surrogate spike recovery does not meet the prescribed control limits, samples are generally re-analysed. The target criteria for surrogate spikes are the same for matrix spikes, presented in Table F1. It should be noted that for inorganic analyses no surrogate spikes are conducted.

Laboratory method blanks

Laboratory method blanks monitor externally introduced contaminants that potentially derive from glassware, cleaning reagents and digestion reagents during the analysis process. The method blank consists of de-ionised water or clean sand only and is prepared in the laboratory. The method blank is treated as a sample in the laboratory, going through the same sample preparation and analysis procedures as the corresponding batch.

To meet the acceptance criteria, the laboratory blanks should have no detectable concentrations of the target compounds. The laboratory blank results are presented in the laboratory analytical reports. Laboratory blanks are analysed at a rate of 1 laboratory blank per 20 samples.

G1.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition.

Representativeness is primarily dependent on the design and implementation of the sampling program and is partially ensured by the avoidance of cross-contamination, adherence to sample handling and analysis protocols, and use of proper chain of custody and documentation procedures. Sample blanks, holding times and field duplicates are QA parameters that can assist in the analysis of representativeness.

Holding times

Holding times from field sampling to laboratory analysis must be minimised to ensure the representativeness of the result obtained. Delays between sampling and analysis can lead to analytes changing due to such processes such as volatilisation, mineralisation and biological modification.

Where standard holding times are exceeded, professional judgement as to the integrity of the data will be required, taking into account such factors as field storage, laboratory storage and even sample-bottle characteristics.

G1.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. This will be achieved through maintaining a level of consistency in techniques used to collect samples and ensuring analytical laboratories used consistent analysis techniques and reporting methods. Comparability is also achieved by ensuring that precision and accuracy objectives were met.

G1.2.5 Completeness

The following information is required to check for completeness of data sets:

- chain of custody forms
- sample receipt notification or sample receipt advice
- certificates of analysis
- quality control report
- all sample results reported
- all blank data reported
- all laboratory duplicates reported and RPDs calculated
- NATA stamp on reports.

G1.2.6 Sensitivity

Sensitivity criteria are used to monitor achievement of quantification using method detection limits. Method detection limits depend on the method of analysis, the instrument's ability to measure analytes, and the sample matrix, in particular, background interferences.

When interferences are present in the sample, a loss of sensitivity can occur resulting in an increase in the method detection limit. In some instances (e.g. where one or more compounds have particularly high concentrations) the sample must be diluted for analysis. This increases the method detection limit by the dilution factor.

Method detection limits for soil/sediments are based on ‘wet weight’. Actual detection limits are calculated on a ‘dry weight’ basis and are higher. The detection limits achieved by the laboratory should be below the adopted criteria for all analytes.