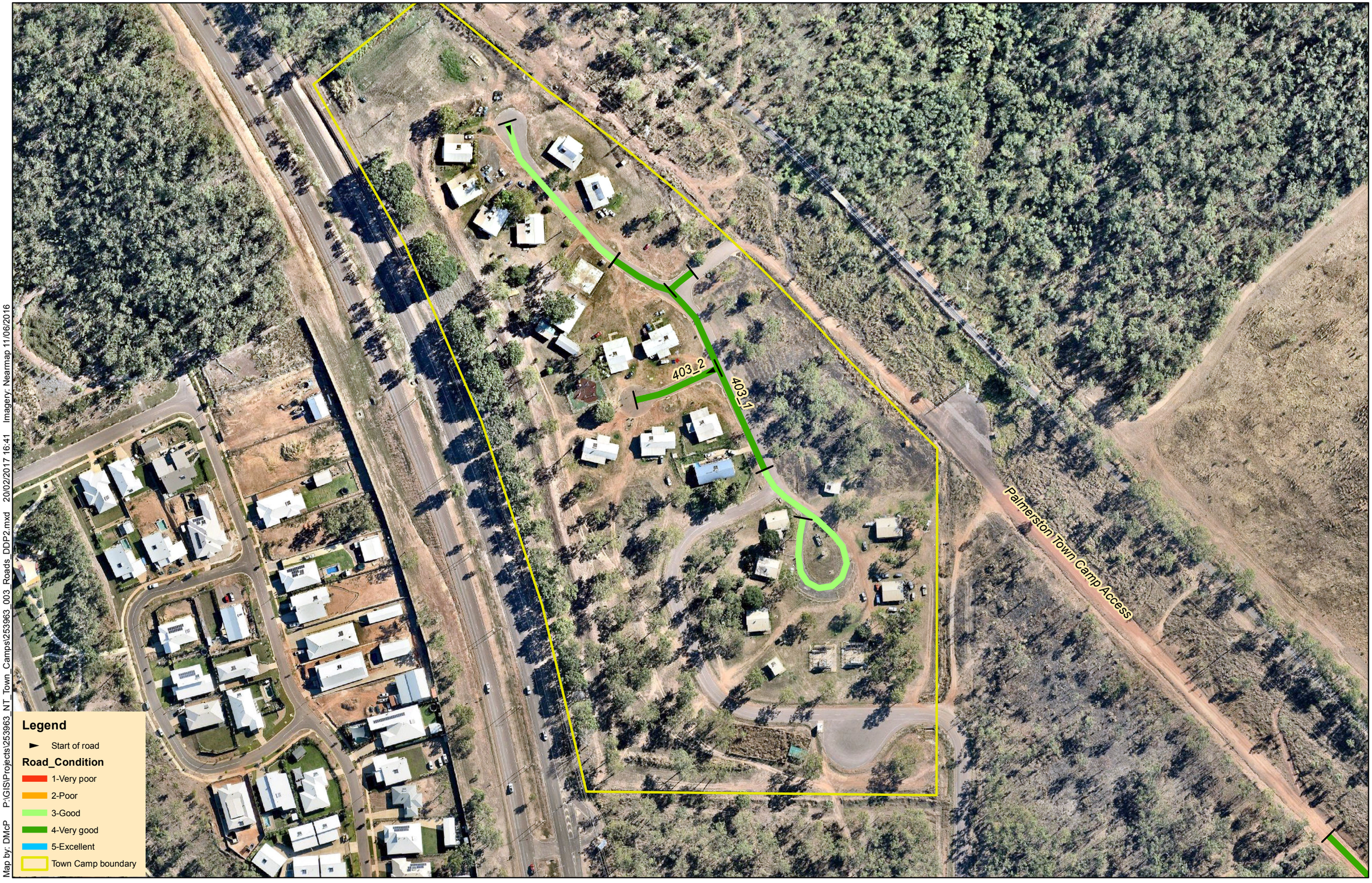


Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Roads_DDP2.mxd 20/02/2017 16:41 Imagery: Nearmap 11/06/2016

A3 scale: 1:2,000

0 20 40 60 80 100 m

Date: 20/02/2017 Version: 1

Coordinate system:MGA52

NT Town Camp Road Assessments

403 - Palmerston Indigenous Village (Palmerston)

Existing drawings

-12°29'00"
718 250 E
718 500 E
718 750 E
719 000 E
8 618 750 N
8 618 500 N

4234
4198
Sec. 4231
HOLTZE
4249
Sec. 5623
10974
4236
Sec. 273
Sec. 4894

Engineering Constraint Buffer
Reln Trenches
Rubbish Tip
Septic Tank
1m High Earth Berm
Flood and Traffic Mitigation
Septic Tank
Spoil Heap
Absorption Trench
Septic Tank
Ablution Block
Absorption Trench
Septic Tank
Fire Hydrant
1168
Fire Hydrant
Septic Tank
Absorption Trench

16 17 18 23 24 15 14 13 19 11 20 10 9 8 7 6 22 5 4 21 1 2 3

STUART HIGHWAY
TOWN OF PALMERSTON
JOHNSTON
TOWN BOUNDARY
TOWN BOUNDARY
HOWARD SPRINGS
HUNDRED OF BAGOT

LAND USE PLANNING:
APPROX. POSITION OF BUILDING constructed since date of photography

LAND EXCLUDED FROM DEVELOPMENT
GENERAL EXCLUSION BUFFERS
CULTURAL EXCLUSION AREAS:
Unauthorised entry, works on or use of land where there is a sacred site is an offence under the Northern Territory Aboriginal Sacred Sites Act. For conditions relating to works on or use of land within a Cultural Exclusion Area contact the Aboriginal Areas Protection Authority (AAPA): email enquiries.aapa@nt.gov.au or phone 8999 4332.
This advice does not negate the need for consent for entry, works, or use which may be required under the Aboriginal Land Rights(NT) Act (in the case of Aboriginal land), or another statute.

CADASTRE
Current 123
Proposed 123
Locality LOCALITY
UTILITY SERVICES
ELECTRICITY
LOW VOLTAGE LV
HIGH VOLTAGE HV
WATER RETICULATION
WATER MAIN W
WATER RISING MAIN W
SEWER
SEWER MAIN S
SEWER RISING MAIN S S

DIAL BEFORE YOU DIG
www.1100.com.au

LEGEND

TOPOGRAPHY
Road Sealed, Bridge
Road Unsealed, Track
Footpath, Drain, Culvert
Wall, Gate, Fence, Cattle Grid
Railway, Disused Railway
Aerodrome Tarmac, Landing Strip
Taxiway, Apron
Pipeline: Oil, Water, Undetermined Gas, Sewage
Building, Building-Shape unconfirmed
Shade Structure, Incomplete Building
Sewage Ponds, Tailings Pond
Oval, Arena, Swimming Pool
High Water Mark, Low Water Mark
Mine; Quarry, Surface Excavation
Contour; Index, Intermediate 75
Contour; Depression
Top of Bank, Bottom of Bank, Cliff
Watercourse; Perennial, Intermittent, Channel or Canal
WaterBodies; Perennial, Intermittent
WaterBodies; Reservoir, Water Hole
Swamp; Swamp Perennial, Swamp Intermittent
Flat; Mud Flat, Clay/Saltpan, STI
Pole; Power, General, Light
Tank; Water, Elevated, Non-Water, Silo
Manhole, Pylon, Communication Tower, Bore.

AVAILABLE FROM AND PRODUCED BY:
Northern Territory Government

NOTES:
POWER POLES, MANHOLES, SEPTIC TANKS, TOWERS/PYLONS and other similar shaped objects are captured from Aerial Photography and have their locations confirmed from ground surveys.
These features are suitable as LOCAL SURVEY CONTROL. Their ground location is expected to be within +/-0.3m of their mapped location.

DIAL BEFORE YOU DIG phone 1100 (freecall) or 1800 time 1100.com.au
For water, sewer, and power information and connection requirements for developments contact Power and Water Corporation, Indigenous Community Development on 1800 245 092, and visit http://www.powerwater.com.au/business

General enquiries, corrections, updates, errors and omissions:
Indigenous Community Land Use Planning, NT Dept of Lands and Planning
TEL: (08) 8999 1300, FAX: (08) 8999 7189, Email: planning@nt.gov.au

Topographic Information:
Land Information Division
Dept of Lands and Planning
TEL: (08) 8995 5331, FAX: (08) 8995 5398
Email: landinfo.dlp@nt.gov.au

Aboriginal Areas Protection Authority:
Ground Floor
Aboriginal Areas Protection Authority
TEL: (08) 8999 4332
Email: enquiries.aapa@nt.gov.au

Cadastral Information:
Office of the Surveyor-General
Dept of Lands and Planning
TEL: (08) 8995 5393, FAX: (08) 8995 5396
Email: landinfo.dlp@nt.gov.au

Planning Information:
Indigenous Community Land Use Planning
Dept of Lands and Planning
TEL: (08) 8999 1300, FAX: (08) 8999 7189
Email: planning@nt.gov.au

Power, Water or Sewer Information:
Remote Operations Planning Branch
Power and Water Corporation
TEL: (08) 8924 6364, FAX: (08) 8924 5360

Housing Infrastructure Information:
Infrastructure Delivery Branch
Dept of Housing, Local Government, and Regional Services
TEL: (08) 8995 5013, FAX: (08) 8995 5110
Email: tex.dhlgrs@nt.gov.au

SOURCE INFORMATION

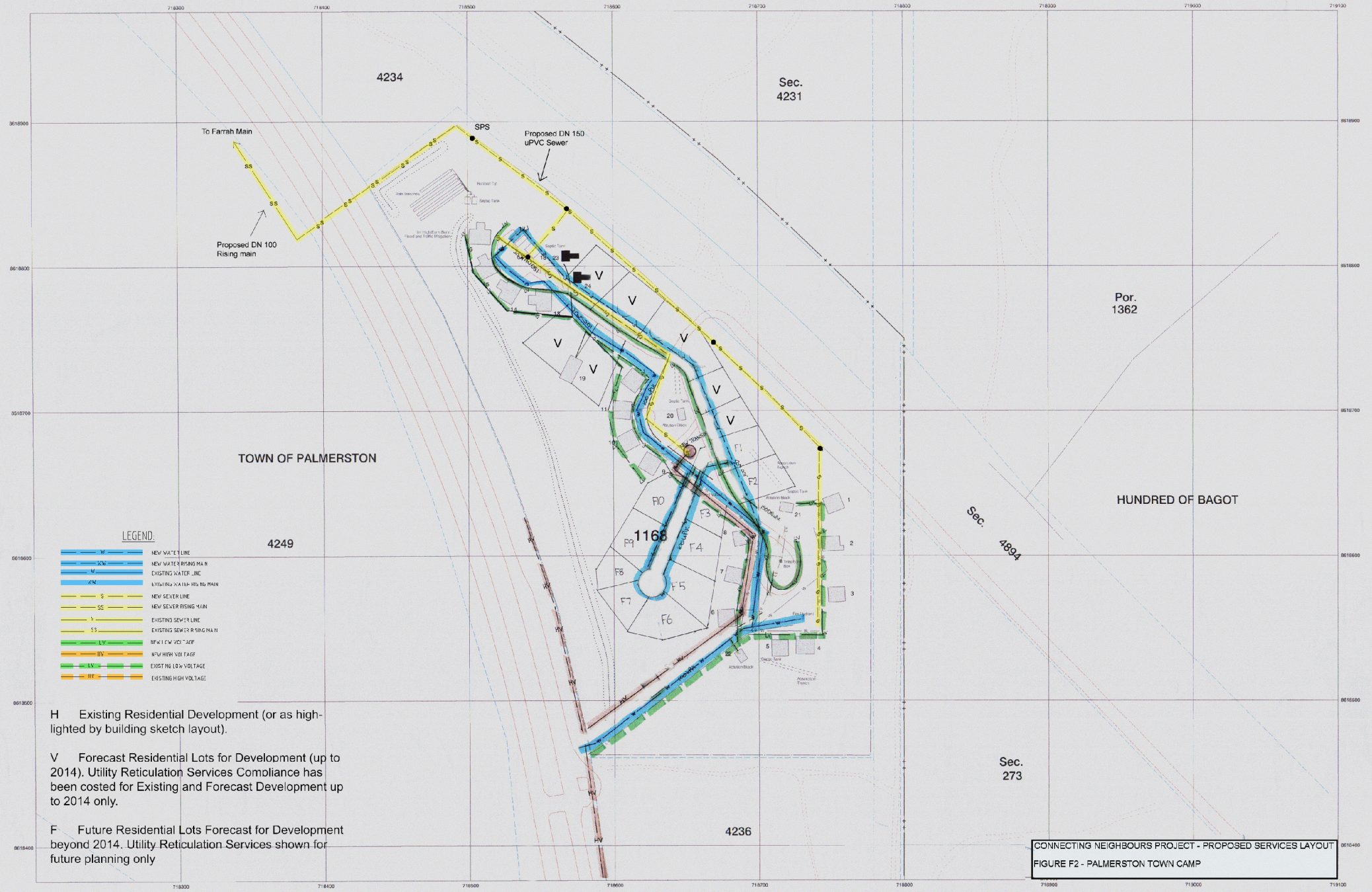
CONTOUR INTERVAL :		CURRENCY OF TOPOGRAPHY :	3 June 2011
HORIZONTAL DATUM :		SOURCE MAP SCALE :	2500
VERTICAL DATUM :		ZONE UTM :	52
PROJECTION :	Transverse Mercator	DATE GENERATED :	21 June 2012

N
GDA
0 20 40 60 80 100

Locality Diagram

SERVICED LAND AVAILABILITY PROGRAM
SLAP Map
Palmerston Indigenous Village (Palmerston Town Camp)
16 Mile
Palmerston City Council
Community ID: 403

7520



H Existing Residential Development (or as highlighted by building sketch layout).

V Forecast Residential Lots for Development (up to 2014). Utility Reticulation Services Compliance has been costed for Existing and Forecast Development up to 2014 only.

F Future Residential Lots Forecast for Development beyond 2014. Utility Reticulation Services shown for future planning only

CONNECTING NEIGHBOURS PROJECT - PROPOSED SERVICES LAYOUT

FIGURE F2 - PALMERSTON TOWN CAMP

Northern Territory Government
Department of Community Development, Sport & Cultural Affairs

PRODUCED BY
DEPARTMENT OF INFRASTRUCTURE, PLANNING AND ENVIRONMENT
DATE OF PHOTOGRAPHY 10/7/99

HORIZONTAL DATUM GDA94 (ZONE 53)
VERTICAL DATUM AUSTRALIAN HEIGHT DATUM (metres)
SCALE 1:1000

REFERENCE DRAWINGS

DEPARTMENT OF LANDS, PLANNING & ENVIRONMENT:
PHOTOGRAMMETRIC CONTOUR AND DETAIL PLAN

POWER AND WATER AUTHORITY:
WATER RETICULATION
SEWERAGE
ELECTRICAL

COUNCIL:
ROADS AND DRAINAGE

AMENDMENTS

No.	Date	Description	Authorized
1	06/6/00	PLAN UPDATED FROM SCANNED PHOTO	P. SIEBERT
2	15/11/01	PLAN UPDATED FROM NEW TOPO MAPPING	DLPE
3	19/06/2003	LOTS 23 & 24 NUMBERED, HOUSES ADDED TO LOTS 23 & 24	D. QUICKENDEN

PLAN LAST UPDATED BY SCJ ON 19/8/03

ABORIGINAL DEVELOPMENT FOUNDATION ASSOCIATION

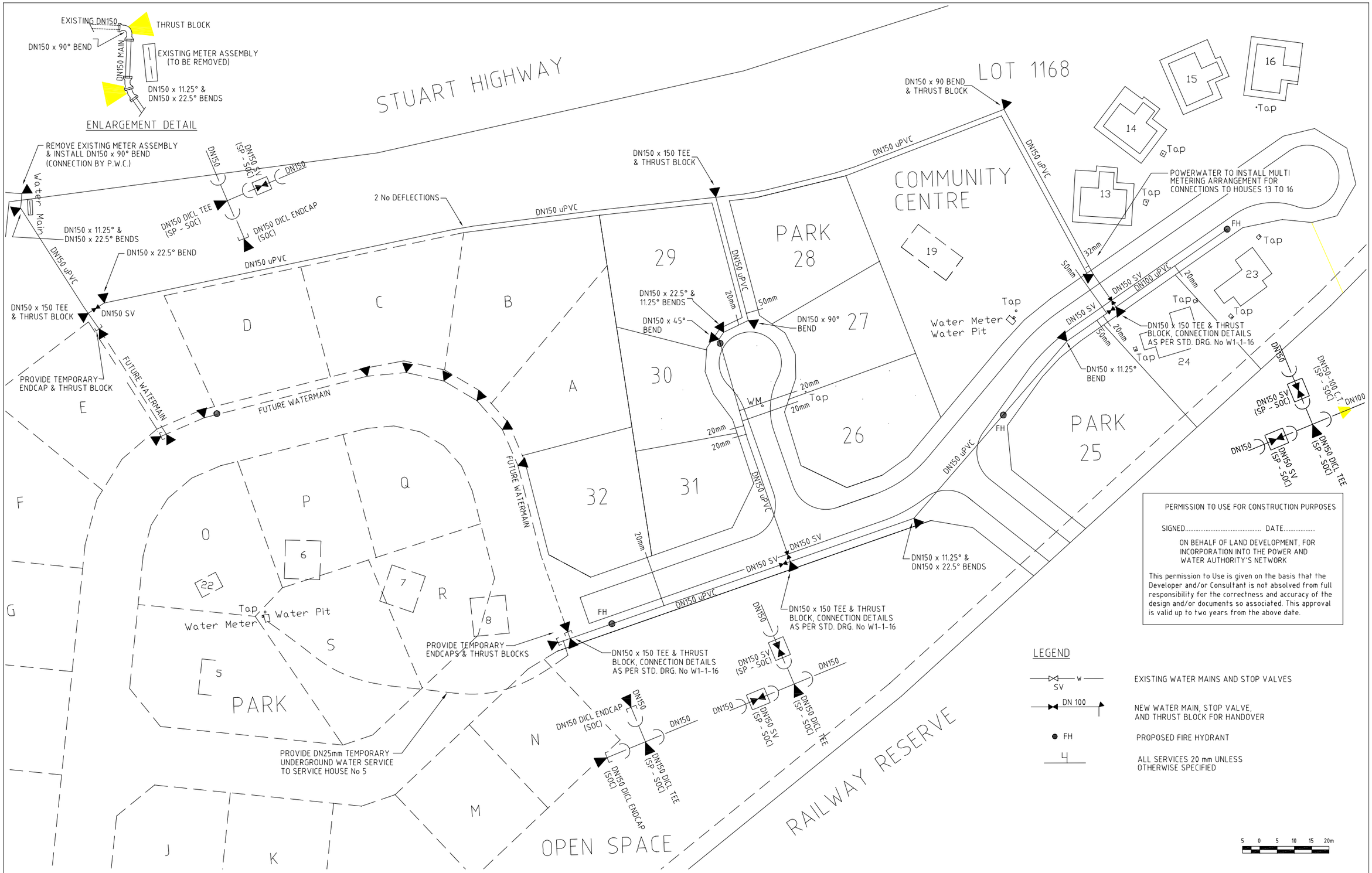
The Serviced Land Availability Program (SLAP) map system contains planning, engineering and topographical information. This map, called the SLAP map, contains information used for land use planning purposes.

COMMUNITY MAP

PALMERSTON TOWN CAMP

16 MILE
PALMERSTON
403

7521



PERMISSION TO USE FOR CONSTRUCTION PURPOSES

SIGNED..... DATE.....

ON BEHALF OF LAND DEVELOPMENT, FOR INCORPORATION INTO THE POWER AND WATER AUTHORITY'S NETWORK

This permission to Use is given on the basis that the Developer and/or Consultant is not absolved from full responsibility for the correctness and accuracy of the design and/or documents so associated. This approval is valid up to two years from the above date.

LEGEND

- EXISTING WATER MAINS AND STOP VALVES
- NEW WATER MAIN, STOP VALVE, AND THRUST BLOCK FOR HANDOVER
- PROPOSED FIRE HYDRANT
- ALL SERVICES 20 mm UNLESS OTHERWISE SPECIFIED

5 0 5 10 15 20m

No.	DESCRIPTION	DATE	INIT.
B	ISSUED FOR CONSTRUCTION	23-7-07	G.M.
A	ISSUED FOR FINAL REVIEW	29-6-07	G.M.

AMENDMENTS

\\Cardhont\admin\NT Stationary\Logos\JPEGS\Untitled-4.jpg

DRAWN G.M. DATE 26-4-07	CHECKED DATE		
DESIGNED G.M. DATE 26-4-07	CHECKED DATE		
DESIGN PROJECT LEADER DATE	PROJECT OFFICER DATE		

Northern Territory Government
Department of Planning and Infrastructure

DARWIN
PALMERSTON TOWN CAMP
SERVICE EXTENSIONS

WATER RETICULATION LAYOUT PLAN

FILE No.	ASSET No.	SHEET No.	DRAWING No.	AMEND.	SHEET SIZE
ALD07260	-	12 OF 15	R07-1505	B	A1

7522

STUART HIGHWAY

LOT 1168

COMMUNITY CENTRE

PARK 28

PARK 25

OPEN SPACE

PARK

FUTURE DEVELOPMENT

RAILWAY RESERVE

POWERLINE EASEMENT

SEPTIC

NEW SEPTIC TANK
REFER TO DRG. No
R07-1508 FOR DETAILS

1AA TEMPORARY PUMP WELL
1200 DIA. RCP MANHOLE
WITH H/D COVER

FUTURE SEWER

FUTURE
PUMP STATION

DN150 STUB
TYPE 1

LINE 1

LINE 2

Stn.2
37.285

Stn.3
37.035

Stn.4
37.895

Stn.5
37.805

4(35.300)
(150 DIA.)

2(35.780)

2(35.280)

4(37.200)

4(36.630)

7.00
1(36.300)

4(36.100)

4(36.400)

4(36.400)

SEWER LINE SET OUT SCHEDULE		
MANHOLE No	EASTING	NORTHING
1AA	1879.989	5101.770
1A	1879.707	5096.264
1B	1897.710	5098.101
1C	1964.896	5020.961
1D	2013.786	4993.096
1E	2049.614	4917.648
2A	1991.641	4945.030
END LINE 2	1966.677	4939.660

LEGEND

- EXISTING SEWERS AND MANHOLES
- PROPOSED SEWERS AND SEWER MANHOLES
- 1B — SEWER MANHOLE IDENTIFICATION NUMBER
- (12) — DISTANCE OF HOUSE CONNECTION FROM D/S S/MANHOLE
- 2(2.60) — HOUSE CONNECTION TYPE & INVERT LEVEL
- • I.O. — INSPECTION OPENING TO BE CONSTRUCTED
- HOUSE CONNECTION SERVICE TO BE COMPLETED AS PART OF THIS STAGE

PERMISSION TO USE FOR CONSTRUCTION PURPOSES

SIGNED..... DATE.....

ON BEHALF OF LAND DEVELOPMENT, FOR INCORPORATION INTO THE POWER AND WATER AUTHORITY'S NETWORK

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5 0 5 10 15 20m

No.	DESCRIPTION	DATE	INIT.
D	MANHOLE HOUSE CONNECTIONS ALTERED TO TYPE 4	20-9-07	G.M.
C	ISSUED FOR CONSTRUCTION	23-7-07	G.M.
B	REDUCED SCOPE OF WORK & REDESIGNED SEWER LAYOUT & LEVELS	13-7-07	G.M.
A	ISSUED FOR FINAL REVIEW	29-6-07	G.M.

AMENDMENTS

\\Cardnont\admin\NT Stationary\Logos\JPEGS\Untitled-4.jpg

DRAWN G.M. DATE 26-4-07	CHECKED DATE		
DESIGNED G.M. DATE 26-4-07	CHECKED DATE		
DESIGN PROJECT LEADER DATE	PROJECT OFFICER DATE		

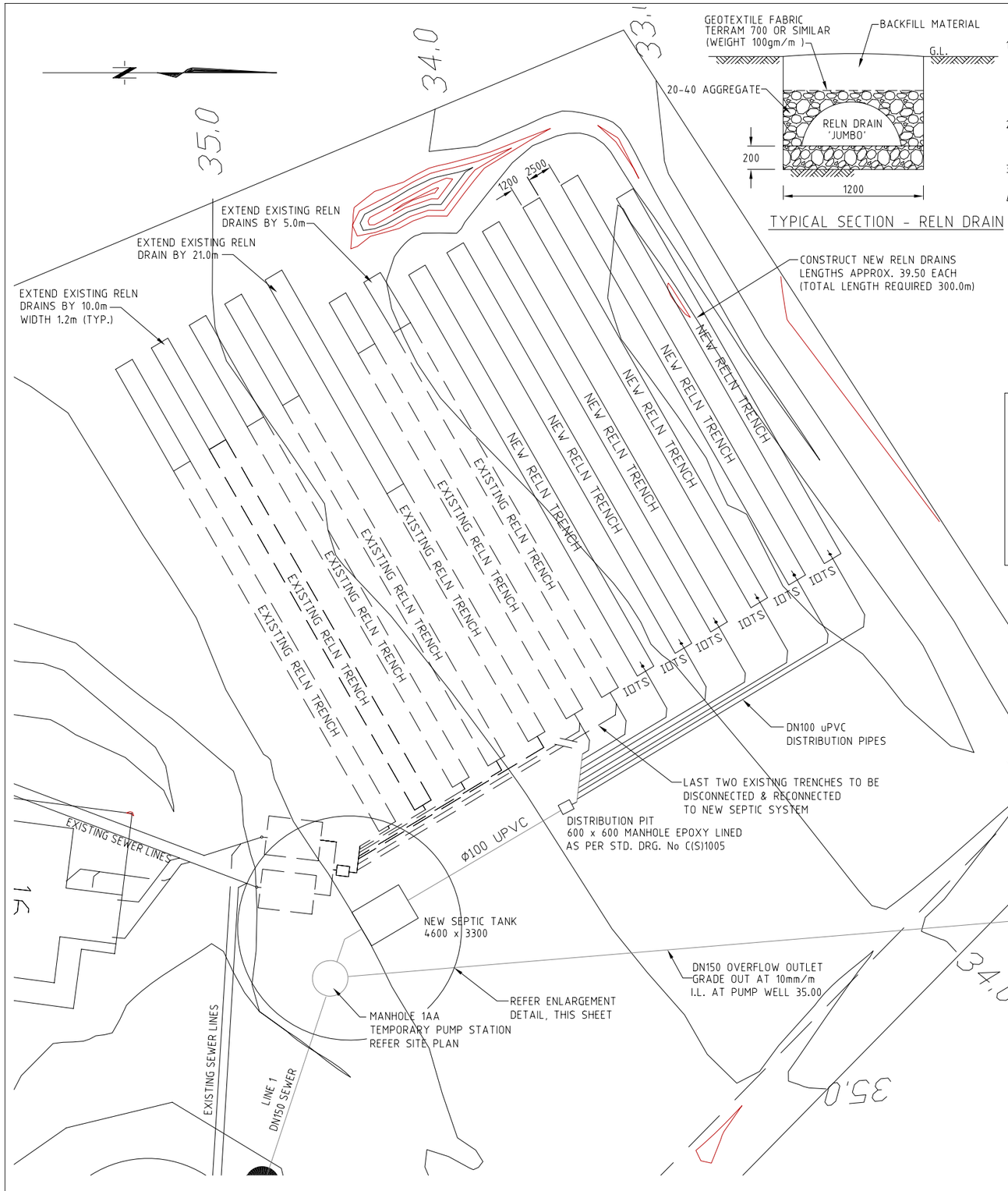
Northern Territory Government
Department of Planning and Infrastructure

DARWIN
PALMERSTON TOWN CAMP
SERVICE EXTENSIONS

SEWERAGE RETICULATION LAYOUT PLAN

FILE No.	ASSET No.	SHEET No.	DRAWING No.	AMEND.	SHEET SIZE
ALD07260	-	13 OF 15	R07-1506	D	A1

7523



TYPICAL SECTION - RELN DRAIN

NOTES:

1. TEMPORARY PUMP WELL TO BE 1200 DIA. R.C.P MANHOLE WITH H/D COVER, INSTALL GRUNDFOS 96249067 SV014CLU50B OR SIMILAR CONNECT TO EXISTING SEPTIC SYSTEM WITH 90 O.D. H.D.P.E. PRESSURE PIPE, COMPLETE WITH ELECTRICAL WORKS, REFER DETAILS
2. SUPPLY & INSTALL FLOAT SWITCHES FLOAT SWITCHES TO BE SET TO SUIT LEVEL OF DEVELOPMENT
3. ALL VALVES TO BE AS APPROVED FROM P.W.C. APPROVED PRODUCTS LIST.
4. PROVIDE ELECTRICAL CONNECTION AND ELECTRICAL CONTROL AND METERING CUBICLE.

LEVEL SCHEDULE

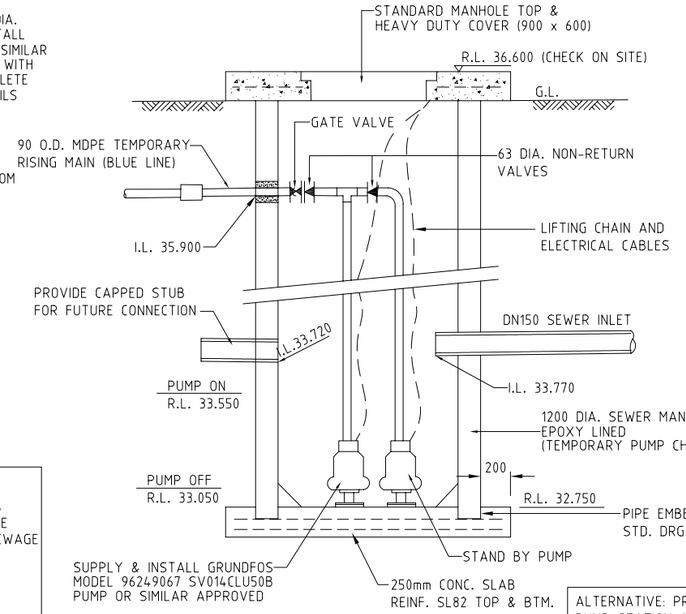
F.S.L. OF COVER	36.875
WELL FLOOR	32.750
ALARM LEVEL	33.750
STANDBY PUMP - ON	33.650
PUMP NO 1 - ON	33.550
PUMP NO 1 - OFF	33.050

SEPTIC NOTES

PROPOSED SEPTIC TANK AND RELN DRAINS TO BE INSTALLED IN ACCORDANCE WITH THE 'CODE OF PRACTICE FOR SMALL ON-SITE SEWAGE AND SULLAGE TREATMENT SYSTEMS'.

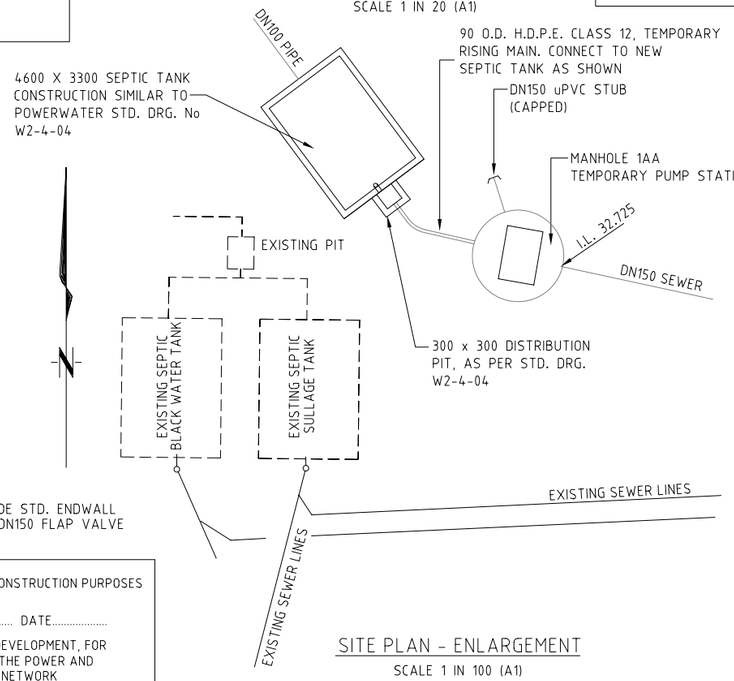
SEPTIC TANK TO BE INSTALLED 3m (MIN.) FROM ANY BUILDING LINE OR PROPERTY BOUNDARY.

ALL WORK TO BE INSTALLED BY SELF CERTIFYING PLUMBER OR DESIGNER



PUMP STATION - SECTION
SCALE 1 IN 20 (A1)

ALTERNATIVE: PROVIDE PACKAGE PUMP STATION AS PER MULLALY ENGINEERING OR SIMILAR.



SITE PLAN - ENLARGEMENT
SCALE 1 IN 100 (A1)

PERMISSION TO USE FOR CONSTRUCTION PURPOSES

SIGNED..... DATE.....

ON BEHALF OF LAND DEVELOPMENT, FOR INCORPORATION INTO THE POWER AND WATER AUTHORITY'S NETWORK

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5 0 5 10 15 20m

No.	DESCRIPTION	DATE	INIT.
C	ISSUED FOR CONSTRUCTION	23-7-07	G.M.
B	PUMP STATION LEVELS & DEPTH REVISED	13-7-07	G.M.
A	ISSUED FOR FINAL REVIEW	29-6-07	G.M.

AMENDMENTS

\\Cardnont\admin\NT Stationary\Logos\JPEGS\Untitled-4.jpg

DRAWN G.M. DATE 26-4-07	CHECKED DATE		
DESIGNED G.M. DATE 26-4-07	CHECKED DATE		
DESIGN PROJECT LEADER DATE	PROJECT OFFICER DATE		

Northern Territory Government
Department of Planning and Infrastructure

DARWIN
PALMERSTON TOWN CAMP
SERVICE EXTENSIONS

SEWERAGE PUMP STATION & RELN DRAIN DETAILS

FILE No.	ASSET No.	SHEET No.	DRAWING No.	AMEND.	SHEET SIZE
ALD07260	-	15 OF 15	R07-1508	C	A1

Transformer data

Group	Com Id	Location	Community Name	Dwellings No. (Funded Dwellings)	Dwellings No. (Bennett Design)	New Houses ** (Future Demand)	Primary Volatge Level (KV)	PWC Substation ID	PWC Test Number	Transformer size (KVA)	KVA Total dwellings @ 4.5KVA	KVA Total dwellings @ 7KVA	Comments
1	290	Darwin	Bagot	55	55		11	1924	1735	300	247.5	385	
	344	Darwin	Knuckey Lagoons	18	19	2	11	1771	2163	100	85.5	133	
	347	Darwin	Kulaluk	19	19		11	1092	10607	50	85.5	133	
	403	Darwin	Palmerston Town Camp	20	16		22	10196	10245	100	90	140	Two transformers for this Town Camp. Transformers are not in boundary of Town Camp [The nearest transformers data to Town Camp are highlighted in yellow].
							22	265	11645	25			
	412	Darwin	Railway Dam (One Mile Dam)	5	6	2	11	1041	4378	200	27	42	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	427	Adelaide River	Amangal	9	9		22	216	12187	100	40.5	63	Two transformers for this Town Camp.
							22	184	5646	63			
	687	Jabiru	Manabadurma	10	12		11	5050	11107	200	54	84	
	825	Darwin	Minmarama Park	24	24		11	2147	11372	100	108	168	
2	606	Katherine	Warlpiri Transient Camp	9	9		22	6416	4886	100	40.5	63	Two transformers for this Town Camp.
							22	6074	4695	25			
	621	Katherine	Miali Brumby (Kalano)	47	31		22	6133	12247	315	211.5	329	
	640	Pine Creek	Pine Creek Compound	4	4		22	6666	3147	25	18	28	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	971	Mataranka	Mulggan	12	9	4	22	6819	5296	16	54	84	
							22	6818	5297	16			
							22	6384	11028	25			
3	215	Tennant Creek	Blueberry Hill (Munji-Marla)	2	2		22	7079	1868	200	9	14	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	223	Tennant Creek	Dump Camp (Marla-Marla)	7	7		22	7181	11088	200	31.5	49	
	224	Elliott	Elliott South Camp	12	12		11	7504	4718	200	54	84	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	225	Elliott	Elliott North Camp	36	25		11	7505	4715	100	162	252	
	238	Tennant Creek	Kargaru (East Side Camp)	12	12	1	22	7572		200	54	84	
	246	Tennant Creek	Ngalpa Ngalpa	18	21		22	7179		200	94.5	147	Two transformers for this Town Camp.
							22	7033	10904	315			
	271	Tennant Creek	Village Camp	12	12	1	22	7183	11107	200	54	84	
	681	Tennant Creek	Tingkarli	12	12		22	7180		200	54	84	
	684	Tennant Creek	Wuppa	15	15	1	22	7141	11092	100	67.5	105	Two transformers for this Town Camp.
							22	7182	11095	200			
4	3	Alice Springs	Akngwertnarre (Morris Soak)	11	15		11	8596	11336	300	67.5	105	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	16	Alice Springs	Anthelk Ewlpaye (Charles Creek)	17	10		11	8569		315	76.5	119	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	17	Alice Springs	Anthepe	15	15		22	8598	5874	200	67.5	105	Data extracted from PWC asset information. There was not access to this Town Camp due to ceremony on inspection day.
							22	8597	11244	315			
	19	Alice Springs	Aper Alwerrknge (Palmers)	7	6		11	8405	2939	200	31.5	49	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	35	Alice Springs	Ewyenper Atwatye (Hidden Valley)	47	47		11	8622	11202	100	211.5	329	
							11	8623	11203	100			
							22	8625	11205	63			
							11	8626	11204	100			
	47	Alice Springs	Ilparpa	13	13		22	8611	11702	200	58.5	91	
	48	Alice Springs	Ilperle Tyathe (Walpiri)	10	9		11	8001	11209	315	45	70	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	50	Alice Springs	Ilyperenye (Old Timers)	10	10		22	8145	3323	100	45	70	
	64	Alice Springs	Bassos	2	2		11	8002	10946	50	9	14	
	69	Alice Springs	Karnte	19	19		22	8282	2345	100	85.5	133	
	87	Alice Springs	Yarrenty Altere (Larapinta Valley)	34	34		11	8617	11334	100	153	238	
							11	8618	11200	63			
							11	8619	11335	100			
							11	8620	11201	100			
	90	Alice Springs	Inarlenge (Little Sisters)	16	22		22	8137	2925	100	99	154	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	108	Alice Springs	Mpwetyerre (Abbotts)	6	6		11	8093	11703	315	27	42	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	113	Alice Springs	Mount Nancy (Nyewente)	11	12		11	8405	2939	200	54	84	
	129	Alice Springs	Nyewente (Trucking Yards)	26	26		11	8629	11312	300	117	182	
	675	Alice Springs	Hoppys	15	19						85.5	133	There is not any Transformer in boundary of Town Camp. Also it's not shown in PWC asset information.
	676	Alice Springs	Ilpiye Ilpiye (Golders Camp)	15	14		11	8314	369	50	67.5	105	
	1029	Alice Springs	Kunoth	4	4		11	8569		315	18	28	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
5	222	Borroloola	Mara	28	29	2	11	6187	12610	100	130.5	203	Two transformers for this Town Camp.
							11	6545	10203				
	229	Borroloola	Garawa 1	16	14		11	6546	10166	100	72	112	Two transformers for this Town Camp.
							11	6332	4890	100			
	278	Borroloola	Yanyula	29	29		11	6162	10496	200	130.5	203	Data extracted from PWC asset information. It's outside of Twon Camp, shown only Transformer to this Town Camp.
							11		10167				This transformer is not shown in PWC asset information. It's installed in Boat Ramp Road near to Town Camp and connected to Electrical reticulation of Town Camp.
	992	Borroloola	Garawa 2	11	11		11	6189	2669	25	49.5	77	

** For New house's demand calculation see section 13.4 "Future Demand".

Railway Dam

Railway Dam

1 Design

The infrastructure reviews have been undertaken against current relevant standards for typical sub-divisions. The following standards have been used in undertaking the reviews.

Sewerage and water supply

- Water Services Association of Australia – Sewerage Code – WSA 02 Part 1: Planning and Design
- Power and Water Corporation supplement to WSA 02
- Water Services Association of Australia – Sewerage Pumping Station Code – WSA 04 -2005 Part 1: Planning and Design
- Power and Water Corporation supplement to WSA 04
- Water Services Association of Australia – Water Supply Code – WSA 03 2002 Part 1: Planning and Design
- Power and Water Corporation supplement to WSA 03
- Power and Water Corporation Indigenous Community Engineering Guidelines (2008)
- Department of Housing and Community Development Indigenous Community Engineering Guidelines (ICEG 2014, updated September 2016)
- Power and Water Corporation Essential Services Infrastructure Assessment and Upgrade Guidelines (for Town Camps in Urban Communities, 2009)
- Power and Water Corporation Standard Drawings
- Australian Standards

Electrical services

Electrical infrastructure has been assessed against AS/NZS3000 Wiring Rules and against PWC Service, Installation and Metering Rules and Urban Residential Development (URD) Design Standards where possible.

With one exception, town camps are each a single lot and compliance with AS/NZS3000 is sufficient to address potential safety concerns.

As such application of PWC URD Design Standards will mainly apply to the incoming supply and bulk or initial multi-metering panels if provided.

URD Design Standards for internal reticulation and street lighting appear to have been applied in many cases for convenience rather than compliance.

For the purposes of this report, the demand per dwelling allowances of URD Design Standards have been used to estimate incoming supply and overall distribution capacity requirements.

The following standards apply:

- Australian Standards
- Power Networks Design and Construction Guidelines, Power and Water Corporation
    - NP001.1_Design and Construction of Network Assets – General Requirements
    - NP001.3_General Specification for Overhead Electrical Reticulation
    - NP001.6_General Specification for URD Subdivisions
    - NP003_Installation Rules_V3
    - NP007_Service Rules

- NP027_Capture of Newly Installed Street Lighting Information
- NP041_Guidelines for Electrical Design Consultants

Further referral to the guidelines in this report will be designated by the guidelines number, NP001.1.

Communications

- National Broadband Network Website viewed 21 January 2017 (http://www.nbnco.com.au/) – NBN rollout maps

Council Guidelines

In addition to the above standards, the following Council guidelines will be used where applicable.

- Darwin City Council – Subdivision and Development Guidelines, September 2005

General

It should be noted that if the town camps are proposed to be subdivided and services assets gifted to Power and Water Corporation (PWC) for operation and maintenance, all of these services will need to fully meet PWC standards. With the exception of a few town camps that have recently been upgraded, this will require the full replacement and/or realignment of most services.

2 Condition assessment

2.1 Rating assessment matrix

A condition rating matrix was developed and used to assess all municipal infrastructure. The same rating was used for all services to maintain consistency in assessments. Table 1 below shows the condition rating and operability.

Table 1 Condition rating

Condition rating		Operability
1	Very Poor	Not operational
2	Poor	Not fully operational or requires immediate maintenance to keep operational
3	Good	Fully operational, may require routine maintenance
4	Very Good	Fully operational, may require maintenance in the next six months
5	Excellent	New, fully operational

2.2 Civil assessment limitations

The civil infrastructure condition investigations were subject to a number of limitations. These include:

- Only accessible services have been investigated. This includes inspecting the top of sewer manholes, side entry pits, etc., however, does not include opening pits to inspect infrastructure below ground.
- No physical testing of the sewer, water or stormwater network was undertaken.
- No survey or service locating was undertaken.

As there was no survey, potholing or CCTV undertaken on the underground infrastructure there is insufficient information to make determinations on the asset condition. The condition assessments discussed in this report are only for the accessible services and do not necessarily represent the condition of the underground infrastructure. For the majority of the town camps, other than a few that have recently been upgraded it was found that the underground services are generally undersized and it is likely, due to their age, that the these services are in poor condition. Either factor would trigger the need for a complete replacement to meet current relevant standards.

2.3 Electrical assessment limitations

The electrical infrastructure condition investigations were subject to a number of limitations. These include:

- Inspections were carried out without the assistance of an electrical tradesman.
- Only accessible services were investigated. Assessments were of a visual nature and no pit covers were removed.
- Overhead equipment was assessed from ground level.
- Switchboards were not opened and no assessment of the internal connections or bus ratings was made.
- Electrical infrastructure was assessed down to the meter for multi-meter panels and down to the termination, overhead pole or distribution pillar, of the supply cable to a meter located at a dwelling.

3 Current infrastructure issues

Power and Water Corporation (PWC) have advised of the following concerns and issues in regard to the sewerage, water and electrical infrastructure at all town camps.

3.1 Ownership and maintenance

PWC stated there has always been confusion regarding the ownership and responsibilities of the internal sewer, water and electrical infrastructure. PWC have advised that they have no legal tenure on the majority of assets in any town camps and that the owner is essentially that of the land owner or leaseholder. This is further discussed for each type of infrastructure for each town camp.

The ownership and who is responsible for the maintenance of the sewage pump stations and street lighting is a major concern. In most town camps it was found that PWC have been maintaining the assets on an in-kind basis, although there are no maintenance or access agreements in place and the infrastructure is generally not compliant to PWC standards.

3.2 Access to infrastructure

PWC advised that due to the uncertainty surrounding ownership and responsibility of the sewerage, water and electrical infrastructure, each town camp is seen as a single lot with multiple houses on it. There are no formal road reserves or easements where the municipal infrastructure should be located. PWC therefore have no legal right to enter the town camps to work on the infrastructure, nor can PWC stop others from working on the infrastructure. There is a risk that the maintenance undertaken by others may be to a lower standard than PWC.

It should be noted that there are currently no legal services easements within the town camps, except for a few cases where a town service passes through the town camp. Therefore it is recommended that easements are created over any infrastructure owned by PWC and any future assets to be gifted to PWC, to allow the service providers access to the infrastructure.

3.3 Existing infrastructure

PWC have stated that although the existing sewerage and water infrastructure appears to comply with relevant standards in some locations, the capacity cannot be assumed to meet PWC requirements due to the potential for underground substandard condition and/or grading of pipework. It is likely that these assets will need to be fully replaced to PWC standards to ensure sufficient capacity.

The planning process currently allows construction within the town camps on Commonwealth land without requiring service authority (PWC) approvals. This means that there has been no opportunity for PWC to recover contributions towards required upgrades to headworks servicing the developments and these upgrades have been paid for by PWC in the past. This inconsistency needs to be addressed for future developments within the town camps to ensure PWC are able to continue to provide adequate services.

3.4 Safety concerns

PWC have expressed concerns with safety of PWC staff and contractors working within the camps. PWC have employed procedures such as multiple people / vehicles to attend the site, with police or housing safety officers as required. This

generally leads to a delayed response time and increased cost to respond to and remediate emergency situations.

PWC have also raised the concern that if others work on water infrastructure within the town camps and do not apply the correct sanitation procedures they not only risk contaminating the entire water supply network within the town camp, at some town camps with direct connections to the town supply, they risk contaminating the entire town's water supply.

4 Available information

As the site investigations were limited to accessible / visible services, information on below ground services (such as electrical cables, sewer pipes, water supply pipes, etc.) were determined from available information. This information included:

- Serviced Land Availability Program (SLAP) maps,
- Department of Family & Community Services - Connecting Neighbours Program – Essential Services Scoping Study Report Volume 1 April 2005,
- Connecting Neighbours Project – Infrastructure Assessment and Recommendation Report - Arup Pty Ltd, April 2005,
- Drawings supplied by NT Department of Infrastructure - Technical Records,
- Drawings supplied by Power Water Corporation,
- Bennett Design inspection reports and population data.

Aurecon undertook a site investigation of Railway Dam community to inspect roads, stormwater drainage, electrical services, sewerage and water supply, and community structures. The following sections detail the outcomes of this investigation and the assessments of the infrastructure.

The civil and electrical inspection reports can be found in the Appendices.

5 Sewerage

5.1 Ownership and boundaries

Railway Dam community is serviced by a DN450 RC/PVC trunk main that runs through the community. As it is a trunk main it is owned and maintained by PWC. All other sewerage assets within Railway Dam are believed to be owned by Aboriginal Development Foundation Incorporated, but are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain.

Drawings of the internal sewer network that connects to the trunk main were not available so the size and capacity could not be determined. However it is likely that the pipework was constructed to AS3500 and are DN100 PVC, which is not permitted within PWC guidelines.

5.1.1 Connection methods and billing

PWC advised that they currently charge a single sewerage bill based on a total number of houses or sanitary fixtures, which for Railway Dam is 2. The sewerage bill is charged to Aboriginal Development Foundation Inc (Yili Rreung Housing).

It is not known what contribution the residents make towards the sewerage bills.

5.2 Existing infrastructure condition assessment

The sewer infrastructure inspection was limited to inspecting the condition of manholes covers, as all other sewerage infrastructure is below ground. A total of three manholes were inspected, with condition ratings as follows:

Table 2 Sewer condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Manholes			1	2		3

Figure 1 Manhole, condition: *good*

Figure 2 Manhole, condition: *very good*

The manholes were rated as good and very good and do not require any maintenance works at this stage. It was noted that one of the manholes has some concrete damage (refer Figure 1), however this is not affecting the structural integrity of the manhole.

5.3 Current performance and risks

The current capacity of the sewer network could not be calculated as drawings or information detailing the number and size of connection points were not available. However, as the population of Railway Dam is low, it is expected that the capacity of the pipes between the ablution blocks and houses and the trunk main are sufficient.

5.4 Future demands

The future demand analysis showed that two additional houses are required to provide permanent accommodation for residents that are currently living in non-house dwellings. The type and location of house, number of bedrooms, etc. will need to be determined by the Department of Housing and Community Development when this work is undertaken.

An allowance of 9 EP has already been provided for each temporary house (caravans, structures, etc.) in the current demand calculations, so the future EP will not increase since the residents from the temporary housing will be living in the new accommodation and the number of tenants will not be increased.

The location of the new houses is assumed to be close to the existing houses such that significant extension of the existing sewerage infrastructure would not be required. This means that no additional sewerage infrastructure upgrades would be required to cater for the new houses, other than what has already been recommended for the current demand, and not including a new house drain and connections to the existing network. The cost estimates for these works have been allowed for the in the upgrades for current demand.

5.5 Recommended works

5.5.1 Works required to existing infrastructure for current demand

Based on the current use of Railway Dam and to comply with PWC guidelines, it is recommended that a reticulation main through the camp is constructed and connected to the DN450 RC/PVC trunk main.

The reticulation main would need to be minimum DN150 PVC and the alignment should follow the road alignment. For the purpose of cost estimates, 200 m of DN150 PVC, nine housing connections, three manholes, and a reconnection to the DN450 main were allowed for.

5.5.2 Works required to existing infrastructure for future demand

The upgrades required for the two new houses include a new house drain and new connections to the existing network.

6 Water supply

6.1 Ownership and boundaries

The existing water main servicing Railway Dam is understood to be a DN50 pipe.

The water supply assets within Railway Dam are believed to be owned by Aboriginal Development Foundation Incorporated, but are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain. Figure 3 shows the water services surrounding Railway Dam.

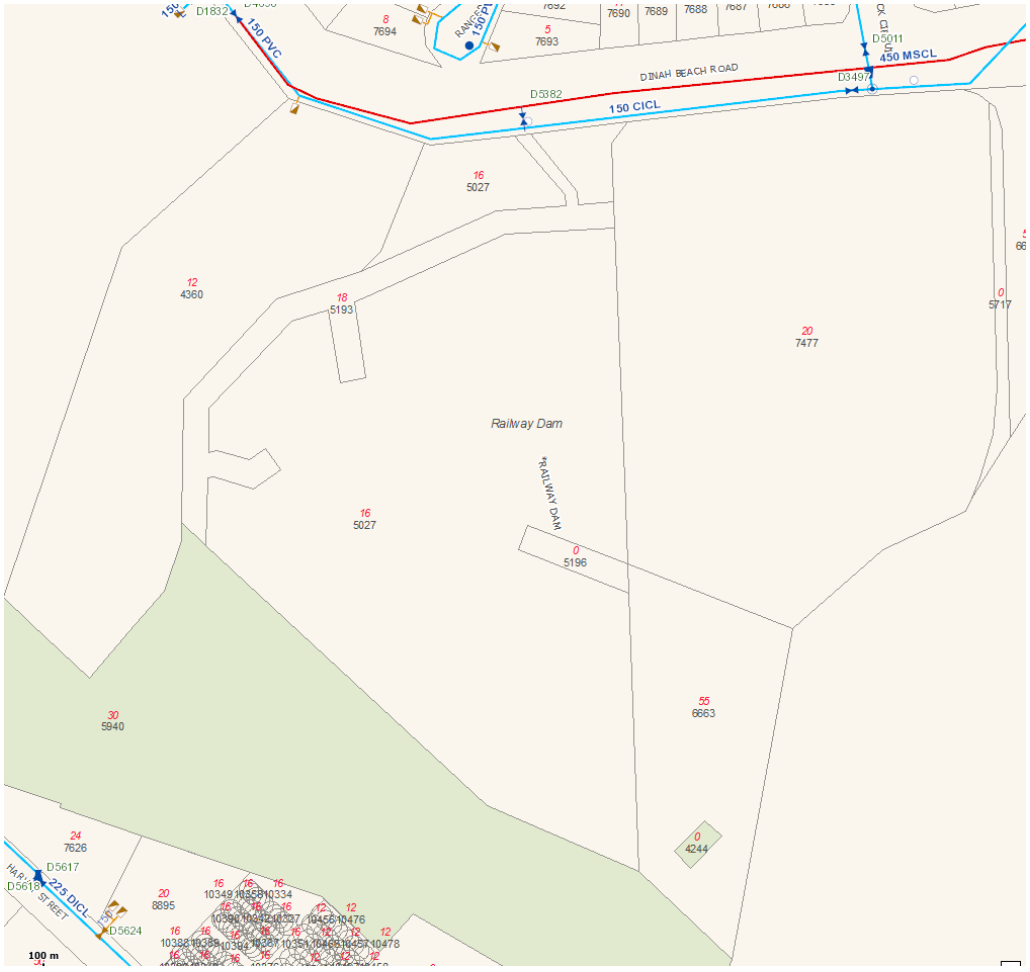


Figure 3 PWC water main network surrounding Railway Dam

6.1.1 Connection methods and billing

PWC advised that they currently charge a single water bill to the Aboriginal Development Foundation Inc (Yili Rreung Housing). It is not known what contribution the residents make towards the water bills. It is understood that the water usage is measured at the bulk water meter located on the community boundary.

A total of 7 residential lot water meters were assessed during the inspection and the community is believed to contain 9 dwellings. Therefore, up to two additional residential water meters are required to ensure each lot has a water meter.

It is proposed that PWC continues to measures the water supply to the entire community with a bulk meter at the community boundary, as opposed to individual

lots within the community. Under this scheme, the water bill for the entire community is the responsibility of the governing body, being Aboriginal Development Foundation Incorporated. It will be up to governing body to assign bills to residents accordingly.

It is also recommended that the installation of individual lot meters is included. This will assist the governing body with distributing bills to residents, the identification of any leaks in the network, and meeting PWC standards should the town camp be subdivided in the future.

6.2 Existing infrastructure condition assessment

The following table shows the results of the condition assessment of the existing water supply infrastructure at Railway Dam.

Table 3 Water supply condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Taps	2			1		3
Water meter (bulk)			1			1
Water meter (residential lot)			7			7

Figure 4 Tap, condition: *very good*

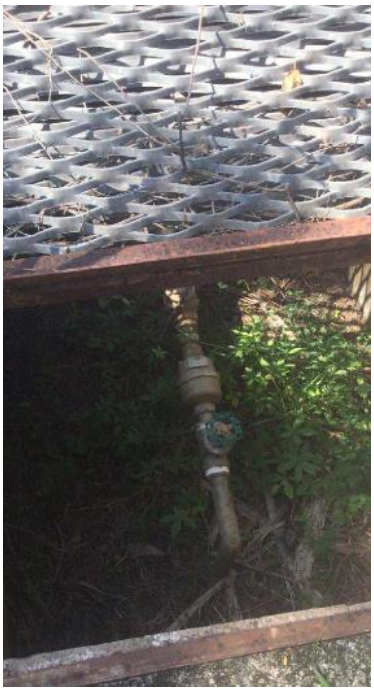


Figure 5 Water meter (bulk), condition: *good*

Figure 6 Water meter (lot), condition: *good*

Two taps were assessed as being in very poor condition. It is recommended these two taps are removed and replaced with new taps. Figure 6 shows a cage surrounding seven lot meters. Dense grass is clearly visible in the cage which should be cleared.

6.3 Current performance and risks

The current capacity of the water supply was calculated based on the following design assumptions:

- The nominal peak day flow is 1100 L/capita/day, based on PWC's supplement to WSA 03 2002. This value is for the northern region of NT. It was assumed that the nominal peak day flow of 1100 L/capita/day also applies to water usage within the community, although it is possible that this value could be higher in real life due to a lack of controls to reduce water usage.
- The Equivalent Population (EP) has been calculated assuming one household equates to 9 EP, based on discussions with Power and Water Corporation.
- The maximum flow velocity used for calculating the incoming flow capacity is 1.4 m/s. PWC supplement to WSA 03-2002 states that flow velocities should generally not exceed 1.4 m/s during peak hour demand.
- The peak hour factors are listed in PWC's Supplement to WSA 03-2002, and they depend on the population range of the community. The peak hour factor of 3.0 has been adopted, for populations less than 500.
- The water meter has PWC's minimum pressure guaranteed value of 15 m.
- Due to lack of contour information, no elevation differentials have been incorporated into the hydraulic calculations.

Table 5 shows the properties used to analyse Railway Dam's water supply. Note the fire flow demand was not assed as no firefighting infrastructure was found in Railway Dam

Table 4 Current water demand

Total dwellings	EP	Demand	Peak hour demand (l/s)	Pipe size and type	Total length (m)
9	81	1.03	3.09	DN50 PVC	250

Table 5 Current water demand analysis

Demand	Velocity (m/s)	Headloss (m)	Pressure (m)
Peak hour demand	1.58	13.92	1.08

The current water reticulation network is non-compliant with PWC standards as the velocity exceeds the maximum 1.4 m/s. Furthermore, the high head loss associated with the DN50 pipe causes low pressures at the end of the water main. Thus, the capacity of the existing network is insufficient.

The assessment of water supply for firefighting has been based on the size of the water mains and the condition of the accessible fire hydrants. Additional hydrants have been recommended where it appears the existing number of hydrants are insufficient. In the case of Railway Dam there is no indication of any firefighting services. It is recommended that fire hydrants are installed in accordance to AS2419.1 on the proposed DN150 water main. Two new fire hydrants have been incorporated into the cost estimates.

Ultimately, the existing network has insufficient capacity, does not comply with PWC standards and has no existing firefighting services connected.

6.4 Future demands

The future demand analysis showed that two additional house are required to provide permanent accommodation for residents that are currently living in non-house dwellings. The type and location of house, number of bedrooms, etc. will need to be determined by the Department of Housing and Community Development when this work is undertaken.

An allowance of 9 EP has already been provided for each temporary house (caravans, structures, etc) in the current demand calculations, so the future EP will not increase since the residents from the temporary housing will be living in the new accommodation and the number of tenants will not be increased.

The location of the new houses is assumed to be close to the existing houses such that significant extension of the existing water supply infrastructure would not be required. This means that no additional water supply infrastructure upgrades would be required to cater for the new houses, other than what has already been recommended for the current demand, and not including new residential water meters. The cost estimates for these works have been allowed for the in the upgrades for current demand.

6.5 Recommended works

6.5.1 Works required to existing infrastructure for current demand

The infrastructure that was assessed as very poor or poor is recommended to be upgraded to prevent failure in the future. The following maintenance works are recommended;

- Clear overgrown grass from existing water meter cage. (Maintenance for current water meters).
- Replace two taps.

It is recommended that the entire water network is replaced with a new DN150 looped water main with a bulk water meter measuring the entire water usage. The residential lot water meters should be relocated to the corner of the properties boundary. Therefore the existing water meter arrangement, shown in Figure 6 should be removed and lot meters placed at property boundaries. Note the properties within Railway Dam do not have fences no defined boundaries. The cost estimates for the upgrades at Railway Dam include:

- Install looped DN150 PVC water main, approximately 450 m.
- Install new bulk water meter DN150 at community boundary.
- Relocate seven water meters to property boundaries.
- Install up to three residential lot water meter.
- Install two fire hydrants

6.5.2 Works required to existing infrastructure for future demand

The upgrades required to supply and monitor water to the two new houses include new residential lot meter and connections to the networks.

7 Roadworks

7.1 Ownership and boundaries

It is the current understanding that the roadwork assets within Railway Dam are owned by Aboriginal Development Foundation Incorporated, but are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain.

7.2 Existing infrastructure condition assessment

The road network within Railway Dam consists of a single lane spray sealed road for the first approximately 100 m which turns into a 6.6 m wide asphalt sealed road through the community. The road also has speed bumps and two signs at the entrance. The following tables and figures show the condition of the existing infrastructure.

Table 6 Roadworks condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Sign		1		1		2

Aside from the two signs there was no other road furniture, such as footpaths or carparks at Railway Dam. As there are no kerbs along the road the driveways to the houses are informal.

Figure 7 Sign, condition: *poor*

Figure 8 Speed hump, condition: *poor*

Figure 9 Railway Dam road network

The following table shows the road condition and particular defects that were observed during the site inspection. Note that the defects given as a percentage refer to percentage of road for that particular segment. The associated condition of the defect is also displayed in the final column.

Table 7 Road network condition assessment

Road name	Chainage start (km)	Chainage end (km)	Road segment condition (1-5)	Defects and associated condition (1-5)
Railway Dam	0	0.1	3	-5% of the road has cracks (3) -5% of the road has edge breaks (3)
	0.1	0.21	3	-5% of the road has edge breaks (4) -5% of the roads has surfacing cracks (4) -5% of the road has potholes (3)

7.3 Current performance and risks

The main road into Railway Dam was rated as having good condition, although there were edge breaks and some potholes. The layout of the road network is sufficient for the current number of houses.

It was noted during the site inspections that a number of unsealed 'short-cuts' had been created and were regularly used. It is not recommended that these paths are formalised.

It is recommended that the road is upgraded to a two lane network with all associated stormwater drainage assets. It is also recommended that a road safety audit is undertaken to determine where signage, line marking, etc. are required.

7.4 Future demands

The addition of two new house will not require any upgrades to the road network. The additional house will require minor upgrades to the kerb to provide a layover kerb for a driveway.

7.5 Recommended works

7.5.1 Works required to existing infrastructure for current demand

The infrastructure that was assessed as very poor or poor is recommended to be upgraded to prevent failure in the future. The following works are recommended to upgrade the current infrastructure;

- Clean entrance sign
- Repair 5 potholes
- Repaint speed bump, as seen in Figure 8
- Repair 11 m of edge breaks
- Repair approximately 56 m2 of pavement cracks
- General tidy up of approximately 210m of road

In order to allow for a longer term sustainable road network a significant upgrade would be required. It is recommended that a long term design which incorporates a full two lane road network, with all appropriate road furniture, line-marking, kerbs and gutters is constructed. A cost estimate to reinstate the base and subbase material, reseal with a two coat spray seal surface, construct subsoil drainage, line marking and signage has been included. Note that these works will need to be fully

designed, the cost estimate is for budgetary purposes only and only indicates the construction phase. A footpath next to the road is also recommended to provide a safe trail for pedestrians.

As the maximum road width within the Railway Dam community is 6.6 m, this means that all 210 m of the road network will need to be upgraded to a 7.2 m wide road. The stormwater drainage infrastructure upgrades that are closely associated with the road upgrade i.e. kerb and gutters, side entry pits and underground drainage pipes are included in the stormwater section of this report.

7.5.2 Works required to existing infrastructure for future demand

Works required to provide for two additional house include upgrading the existing kerb to a layover kerb.

8 Stormwater drainage

8.1 Ownership and boundaries

The stormwater assets within Railway Dam are believed to be owned by Aboriginal Development Foundation Incorporated, but are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain.

8.2 Existing infrastructure condition assessment

The site investigation for the stormwater infrastructure included assessing the condition of swales, culverts and side entry pits (SEP). Only the above ground infrastructure was assessed. Consequently, the underground stormwater pipes were not investigated. As the inspection was undertaken outside of a storm event, flooding due to blockages or damages to the underground infrastructure could not be assessed. Table 8 below summarises the condition of the stormwater assets as assessed during the inspection.

Table 8 Stormwater drainage condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Swale	3	1				4
Culverts			2			2

Figure 10 Drain with ponding

Figure 11 Culverts and drain with ponding

Figure 12 Drain with ponding and debris at Railway Dam

Three swales were assessed as having very poor condition due to extensive ponding issues, debris and trees/branches affecting the flow of the water. It is recommended that these drains are cleaned out and the batters and invert level remediated to ensure the water flows away efficiently. Reshaping the swales to remove the stagnant water will also lead to a reduction in biting insects and mosquitoes.

The dam was not assessed during the site inspection due to the site being part of a sacred site.

8.3 Current demands

The current performance of the stormwater network cannot be fully analysed without significant hydraulic and hydrodynamic modelling, which is outside the scope of this project. It appears as though the current network is not working as effectively as it should, due to the blockages, shape and grade of the swales.

8.4 Future demands

The inclusion of two new houses at Railway Dam does not affect the stormwater drainage requirements. No further upgrades are required as a result of the new houses.

8.5 Recommended works

The following works are recommended to upgrade or improve the current infrastructure:

- Remove debris and dead vegetation from within swales and culverts
- Reshape batter and invert level to ensure stormwater can freely flow away
- Install kerbs and gutters, side entry pits, and underground stormwater drainage

9 Community structures

9.1 Ownership and boundaries

There were no community structures at Railway Dam.

9.2 Future demands

The population of Railway Dam is not expected to increase with the addition of one new house, as this house will provide permanent accommodation for residents that currently live in temporary housing. No additional community structures are required.

10 Electrical services

10.1 Ownership and boundaries

The following points, from Network Policy NP003 Installation Rules Section3, define the typical shared ownership of electrical infrastructure by Power and Water Corporation (PWC) and customers.

- The point of supply is defined as the point where PWC makes the electrical supply available. For domestic supply, this is normally one of the following:
- A point of attachment of an overhead service on to a building or pole on which a metering panel is fitted.
- A point of attachment of an overhead service on to a pole forming part of unmetered aerial consumer's mains.
- A nominated point on a distribution substation located on the customer's lot.
- A point of connection of an underground service in a metering panel, including underground services originating at an overhead line.
- A point of connection of an underground service in a pillar or junction box forming part of unmetered consumer's mains, located on the customer's lot.
- A point on a Power and Water pillar located on the customer's lot.

Typically, distribution infrastructure upstream of the point of supply is owned and maintained by PWC and infrastructure below the point of supply is owned and maintained by the customer.

In many cases PWC have defined a Point Of Supply to ensure that they retain responsibility for aerial high voltage infrastructure, and aerial low voltage infrastructure where installed with aerial high voltage infrastructure, to minimise the possibility of the community or it's contractors coming into contact, either deliberately or inadvertently, with aerial high voltage infrastructure.

In other cases isolation facilities are present or desired by PWC to define the Point of Supply at or near the boundary of the town camp.

The Railway Dam community electrical reticulation systems is supplied from the PWC network via Overhead LV cable to a low voltage switchboard. Unmetered consumer's mains run to a main metering board with outgoing LV feeders to LV distribution pillars and underground reticulation to dwellings.

The dwellings are supplied by individual analogue meters held in a main consumer switchboard.

PWC advise that the Point Of Supply is the LV switchboard on the start of community land and that they own and are responsible for upstream infrastructure.

PWC advise that street lighting is supplied from unmetered LV infrastructure and is the responsibility of the lot holder and not PWC.

All meters, whether pre- or post-paid are the property of PWC.

Railway Dam community are responsible for maintain all unmetered and metered LV infrastructure including the main switchboard, metering panel (excluding meter), underground distribution feeders, distribution pillars, consumers mains and consumer switchboards and street lighting.

10.2 Existing infrastructure assessment

Table 9 shows the condition rating given to the distribution switchboards and distribution pillars. The distribution panels have 75% operational rating and 25% of the pillars require immediate maintenance to remain operational while 75% had minor maintenance issues to address, clearing of vegetation labelling. Refer to Appendices.

Table 9 Distribution panel condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Distribution panels		1	3			4

Table 10 shows the condition rating given to the street lights. The street lights are supplied via underground LV reticulation and are generally six (6) metres high with Mercury lamp M80. One street light was fed from overhead LV reticulation.

The street lights have 80% operational rating based on daytime visual inspection and the "very poor" related to a solar powered light that was significantly damaged.

Table 10 Street light condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Street light	1		4			5

Table 11 shows the condition rating given to overhead power poles. The overhead poles where steel LV construction. The overhead poles were 100% operational rating.

Table 11 Overhead pole condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Overhead pole			1			1

Table 12 shows the condition ratings given to pits. The electrical pit were Class A pits with concrete lids. The pits were 100% operational rating.

Table 12 Pit condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Pit			3			3

Table 13 shows the condition rating given to the Metering panels. All assessed meters in this community are post-paid analogue meters.

Table 13 Meter panel condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Post-paid meter			9			9
Switchboard			1			1

Table 14 shows the condition rating given to the switchboards associated to dwellings.

Table 14 Switchboard condition assessment (housing footprint)

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Switchboard			1			1

The details of the individual inspections and photographs of each infrastructure item are included in Appendices.

10.3 Current performance and risks

The electrical infrastructure evaluation was conducted against the following criteria

- Number of dwellings on tenure, the higher value of the funded dwelling and as quoted in the population report was utilised.
- Urban area, NP001.1, 4. Definitions.
- General Specification for URD Subdivisions, NP001.6, 4.3 Substation Size.
- Normal ADMD (After Diversity Maximum Demand) of 4.5 kVA and high cost subdivisions at 7 kVA.
- Transformer ratings were assumed to be correct in Dekho (PWC asset information system) and compared against photographs of test or transformer numbers collected.
- Substation loads were compared against transformer sizes only. No load flow analysis was conducted.
- No load calculations were performed or assessment conducted on overhead or underground cable, visual inspection from the ground only.
- Streetlighting loads were ignored as they are not significant.

The calculated maximum demand of the Railway Dam (One Mile Dam) community transformer is 14% of rated capacity based on 4.5kVA/dwelling. The calculated maximum demand is within the total capacity of the substation on site.

Table 15 Railway Dam current demand load vs transformer ratings

Community name	Dwellings	Transformer (kVA)	kVA Total @ 4.5kVA	kVA Total @ 7kVA	Comments
Railway Dam (One Mile Dam)	6	200	27	42	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is utilised in the calculation].

A tabulated summary of all community transformers is included in Appendices.

There is a risk of equipment not being maintained associated with the non-standard division of responsibilities between the customer and PWC.

The following points from the PWC Metering Rules should be noted:

- The routine maintenance of metering installations and the replacement of any faulty meters is the responsibility of PWC.
- The property owners are responsible for the maintenance and upkeep of meter rooms, boxes and panels (including lids, doors and locking mechanisms).
- The installation of pre-paid metering is a cost to the customer, refer NP010 Meter Manual-Maintenance of Metering Installations, Power and Water Corporation.

10.4 Future demands

There are two new developments are currently planned for Railway Dam. Calculated future maximum demand of the Railway Dam community transformer is 18% of rated capacity based on 4.5kVA/dwelling. The calculated future maximum demand is within the total capacity of the substation on site.

Table 16 Railway Dam future demand load vs transformer ratings

Community name	Dwellings	Transformer (kVA)	kVA Total @ 4.5kVA	kVA Total @ 7kVA
Railway Dam (One Mile Dam)	8	200	36	56

10.5 Recommended works

The site maximum demand should be checked when any additional electrical loads are proposed.

The following should be carried out when the estimated site maximum demand reaches 85% of the substation capacity:

- Preparation of layout and schematic record drawings of the electrical reticulation system.
- Load monitoring to determine the detailed demand profile of each transformer.
- Modelling of the reticulation system to confirm load flow and voltage drop.
- Preparation of design documentation for modification of existing infrastructure to rectify issues found and incorporate provisions for two additional dwellings.

The following maintenance works and upgrades are recommended:

- Replace one 80W street light.
- Install new street lighting - approximately 11 poles

11 Communications

11.1 Ownership and boundaries

Details of Telstra pit and conduit infrastructure within the town camp boundaries were sought but were not forthcoming.

11.2 Existing infrastructure assessment

The telecommunications infrastructure assessed included pits and telephone booths.

Appendices contains the individual reports.

Table 17 Telecommunication pit condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Telecommunication pit		1				1

Table 18 Phone booth condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Phone booth						1 (status unknown)

11.3 Current performance and risks

No details of the performance of communications infrastructure were obtained.

11.4 Future demands

The current availability of broadband services at Railway Dam (One Mile Dam) is displayed in the Figure 13 below. NBN is available to residents via a fixed telecommunication line on application to an appropriate NBN access provider.

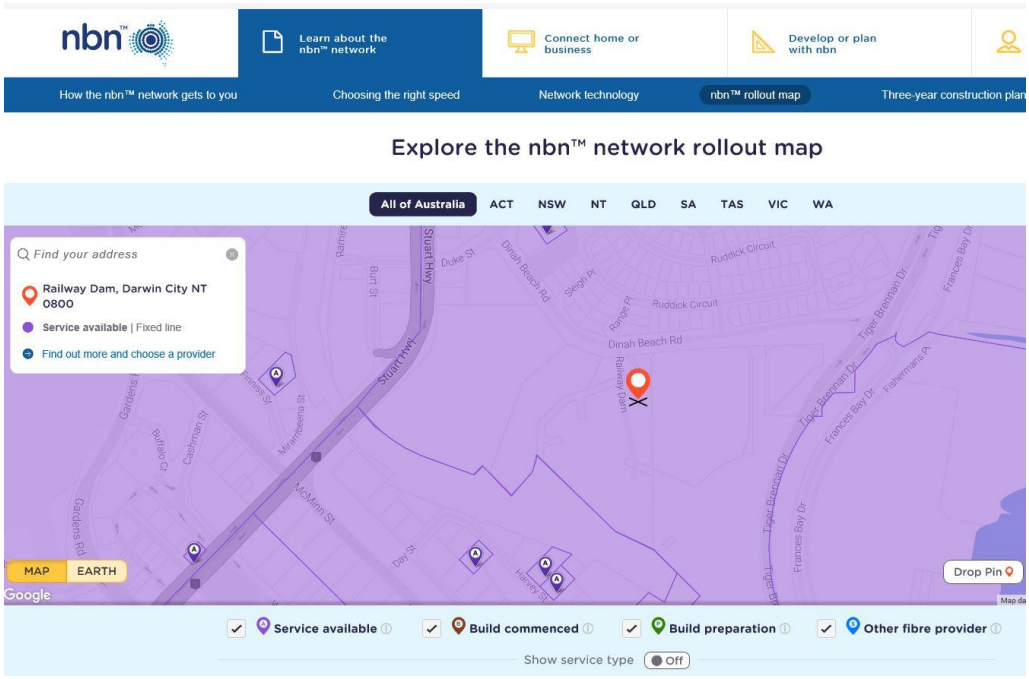


Figure 13 NBN network availability map

The NBN rollout map confirms that NBN is planned to be made available to residents via fixed telecommunications line on application to an appropriate NBN access provider.

11.5 Recommended works

Representatives from NBN's Land Access and Stake Holder management teams are currently engaged with Yilli Housing and NT Housing to look at how camps will be serviced. It is expected that any existing premises in these camps will have some type of NBN service via the NBN brownfields rollout in the future.

No works are required at Railway Dam (One Mile Dam) because NBN is available to residents via fixed telecommunications line on application to an appropriate NBN access provider.

12 Cost estimates

Table 19 below shows a summary of the cost estimates to undertake the maintenance required to fix the existing infrastructure, and to upgrade the existing network to meet current design standards. The estimates take into account a 30% contingency and are inclusive of GST.

Table 19 Cost estimates

Infrastructure	Maintenance of existing infrastructure	Upgrades to meet current design
Sewerage	$ 0	$ 180,000
Water supply	$ 1,000	$ 373,000
Roadworks	$ 13,000	$ 256,000
Stormwater drainage	$ 212,000	$ 243,000
Community structures	$ 0	$ 0
Electrical	$ 1,000	$ 157,000
Communications	$ 0	$ 0
Miscellaneous provisions	$ 37,000	$ 155,000
Total (including GST)	**$ 264,000**	**$ 1,364,000**
Grand total	**$ 1,628,000**	

The cost estimates are a preliminary estimate only. Since Aurecon has no control over the cost of labour, materials, equipment or services furnished by others, or over contractors' methods of determining prices, or over competitive bidding or market conditions, Aurecon cannot guarantee actual costs will not vary from these estimates.

13 Summary

A summary of the required upgrades at Railway Dam (One Mile Dam) community is as follows:

Sewerage

- New DN150 PVC reticulation main and associated works

Water supply

- Clear overgrown grass from existing water meter cage
- Replace two taps
- Install looped DN150 PVC water main, approximately 450 m
- Install new bulk water meters DN150 at community boundary
- Relocate seven water meters to property boundaries
- Install up to three residential lot water meter.
- Install fire hydrants, approximately two

Roadworks

- Clean entrance sign
- Repair five potholes
- Repaint speed bump, as seen in Figure 8
- Repair 20 m of edge breaks
- Repair approximately 60 m2 of pavement cracks
- General tidy up of approximately 200 m of road
- It is recommended that the road is upgraded to a two lane network with all appropriate road furniture, line marking, kerbs, footpaths, etc.

Stormwater drainage

- Remove debris and dead vegetation from within swales and culverts
- Reshape batter and invert level to ensure stormwater can freely flow away
- Install kerbs and gutters, side entry pits, and underground drainage

Community structures

- No upgrades required

Electrical services

- Replace one 80W street light.
- Install new street lighting - approximately 11 poles

Communications

- No works are required because NBN is available to residents via fixed telecommunications line on application to an appropriate NBN access provider.

Civil inspection reports

Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Civil_DDP.mxd 23/02/2017 08:41 Imagery: Nearmap 11/06/2016

A3 scale: 1:1,500

0 20 40 60 80 100 m

Note:
Label numbers refer to survey IDs

Date: 23/02/2017 Version: 1
Coordinate system: MGA94 Zone 52

NT Town Camp Infrastructure Assessments: Sewerage

412 - Railway Dam (Darwin)

7557

Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Civil_DDP.mxd 23/02/2017 08:41 Imagery: Nearmap 11/06/2016

A3 scale: 1:1,500

0 20 40 60 80 100 m

Note:
Label numbers refer to survey IDs

Date: 23/02/2017 Version: 1
Coordinate system: MGA94 Zone 52

NT Town Camp Infrastructure Assessments: Water

412 - Railway Dam (Darwin)

7558

Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Civil_DDP.mxd 23/02/2017 08:41 Imagery: Nearmap 11/06/2016

A3 scale: 1:1,500

0 20 40 60 80 100 m

Note:
Label numbers refer to survey IDs

Date: 23/02/2017 Version: 1
Coordinate system: MGA94 Zone 52

NT Town Camp Infrastructure Assessments
Road furniture, stormwater drainage & community structures
412 - Railway Dam (Darwin)

7559

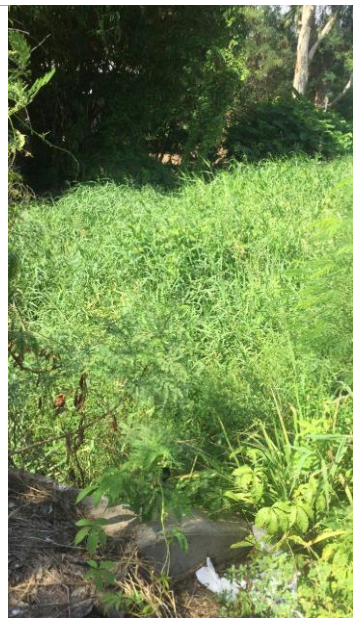
Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:53:30 AM

Insp ID: 168 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

Stormwater Infrastructure:	Culverts
Culvert Type:	RCBC
Diameter (mm):	
Width (mm):	900
Culvert Depth (mm):	900
Culvert Length (m):	9
Culvert Condition:	3 - Good
Culvert Blockage (%):	10
Culvert Comments:	
Culvert Head Wall:	Yes
Safety Grate:	No
Headwall Blockage:	
Headwall Condition:	3 - Good
Headwall Comment:	Dense vegetation
End Wall:	Yes
End Wall condition:	4 - Very Good
EW Comment:	Some scour around end wall



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:53:30 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:21:54 AM

Insp ID: 176 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

Stormwater Infrastructure:	Culverts
Culvert Type:	RCBC
Diameter (mm):	
Width (mm):	1200
Culvert Depth (mm):	450
Culvert Length (m):	9
Culvert Condition:	3 - Good
Culvert Blockage (%):	
Culvert Comments:	
Culvert Head Wall:	Yes
Safety Grate:	No
Headwall Blockage:	
Headwall Condition:	3 - Good
Headwall Comment:	Debris blocking culverts
End Wall:	Yes
End Wall condition:	3 - Good
EW Comment:	Debris and scour around endwall

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:21:54 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:16:15 AM

Insp ID: 173	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Sewerage Asset are you capturing:	Manholes
MH Cover Shape:	Rectangular
Manhole Cover Diam (mm):	
Manhole Length (mm):	1000
Manhole Width (mm):	700
Manhole Condition:	4 - Very Good
Notes on Lid:	
Comments:	Some concrete damage at edges

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:16:11 AM

Insp ID: 174 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Sewerage Asset are you capturing:	Manholes
MH Cover Shape:	Rectangular
Manhole Cover Diam (mm):	
Manhole Length (mm):	1000
Manhole Width (mm):	700
Manhole Condition:	3 - Good
Notes on Lid:	Class b
Comments:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 11/11/2016 11:12:07 AM

Insp ID: 222	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Sewerage Asset are you capturing:	Manholes
MH Cover Shape:	Round
Manhole Cover Diam (mm):	370
Manhole Length (mm):	
Manhole Width (mm):	
Manhole Condition:	4 - Very Good
Notes on Lid:	
Comments:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:43:34 AM

Insp ID: 165 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

Road Name:	Railway Dam
What are you inspecting:	Pavements
Ch From (km):	0
Ch To (km):	0.1
Road Type:	Sealed - spray seal
Section Width (m):	3.8
Road Condition:	3 - Good
General Comment:	Two speed bumps

Road Defects Section

Defect Type	Defect QTY	Defect Condition	Defect Comments
Surfacing Cracks	5	3 - Good	5% of road has cracks
Edge Breaks	5	3 - Good	5% of road has edge breaks

Kerbs Section

Kerb Type	Kerb Cond	Kerb Comments
Special	3 - Good	Gutters on both sides of road, some concrete dama debris

Shoulders Section

Linemarking Section

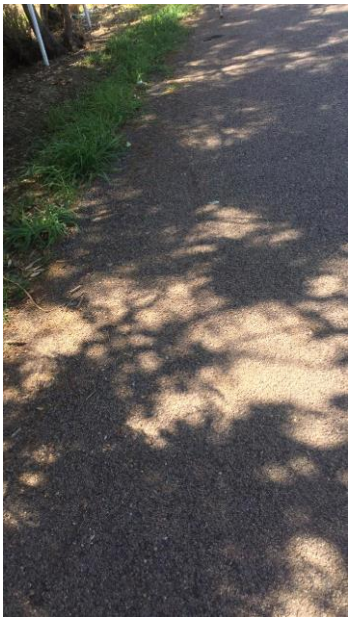
Obstruction Section

Road Obstruction	Other Road Obstruction
Trees	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:43:34 AM



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:43:34 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:22:07 AM

Insp ID: 178 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

Road Name:	Railway Dam
What are you inspecting:	Pavements
Ch From (km):	0.1
Ch To (km):	0.21
Road Type:	Sealed - asphalt
Section Width (m):	6.6
Road Condition:	3 - Good
General Comment:	

Road Defects Section

Defect Type	Defect QTY	Defect Condition	Defect Comments
Edge Breaks	5	4 - Very Good	5%
Surfacing Cracks	5	4 - Very Good	
Potholes	5	3 - Good	

Kerbs Section

Kerb Type	Kerb Cond	Kerb Comments
Special	3 - Good	Gutter kerb

Shoulders Section

Shoulder Type	Width	Dropoff(mm)	Erosion	Condition	Shoulder Comments
Unsealed					

Linemarking Section

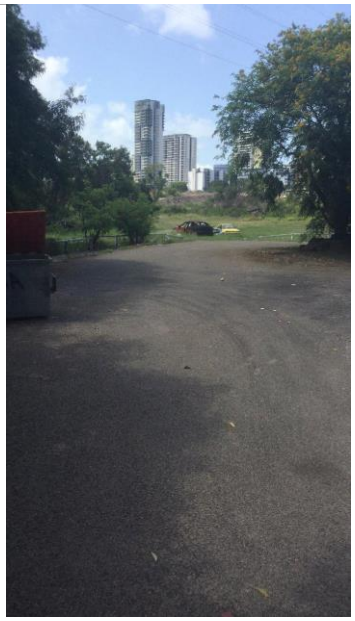
Obstruction Section

Road Obstruction	Other Road Obstruction
Trees	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:22:07 AM



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:22:07 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:45:44 AM

Insp ID: 163 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

Road Name:	Railway Dam
What are you inspecting:	Signs
Type of Sign:	Warning sign
Sign Condition:	4 - Very Good
Sign Comment:	
General Comment:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:49:09 AM

Insp ID: 164 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

Road Name:

What are you inspecting: Signs

Type of Sign: Welcome sign

Sign Condition: 2 - Poor

Sign Comment: Paint faded

General Comment:

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:59:07 AM

Insp ID: 167	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

Stormwater Infrastructure:	Swales
Type of lining:	
Are dimensions uniform along drain:	
Base Width (m):	
Overall Width (m):	
Swale Depth (m):	
Length of Batter 1 (m):	
Length of Batter 2 (m):	
Swale Condition:	1 - Very Poor
Swale Ponding:	Yes
Drain flooded at time of inspection:	Yes
Swale Comments:	Extensive ponding, unable to attain Swale dimensions

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:01:51 AM

Insp ID: 169	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

Stormwater Infrastructure:	Swales
Type of lining:	Grass
Are dimensions uniform along drain:	No Access
Base Width (m):	
Overall Width (m):	
Swale Depth (m):	
Length of Batter 1 (m):	
Length of Batter 2 (m):	
Swale Condition:	1 - Very Poor
Swale Ponding:	No Access
Drain flooded at time of inspection:	No Access
Swale Comments:	Heavily overgrown, characteristics not attainable

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:30:19 AM

Insp ID: 179	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

Stormwater Infrastructure:	Swales
Type of lining:	Tree roots
Are dimensions uniform along drain:	No Access
Base Width (m):	
Overall Width (m):	
Swale Depth (m):	
Length of Batter 1 (m):	
Length of Batter 2 (m):	
Swale Condition:	2 - Poor
Swale Ponding:	Yes
Drain flooded at time of inspection:	Yes
Swale Comments:	Not defined, debris, Ponding and stagnant water

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:30:19 AM

Insp ID: 180	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

Stormwater Infrastructure:	Swales
Type of lining:	Tree roots
Are dimensions uniform along drain:	No Access
Base Width (m):	
Overall Width (m):	
Swale Depth (m):	
Length of Batter 1 (m):	
Length of Batter 2 (m):	
Swale Condition:	2 - Poor
Swale Ponding:	Yes
Drain flooded at time of inspection:	Yes
Swale Comments:	Not defined, debris, Ponding and stagnant water

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:30:54 AM

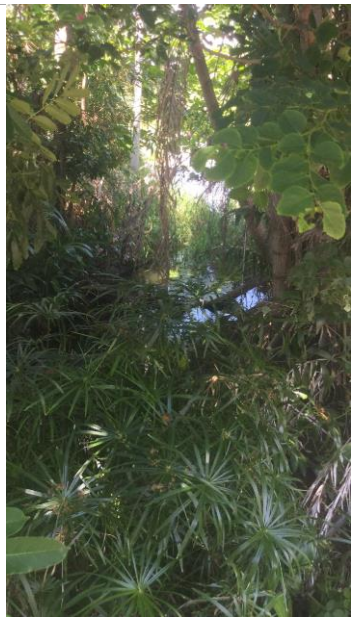
Insp ID: 181 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

Stormwater Infrastructure:	Swales
Type of lining:	No Lining
Are dimensions uniform along drain:	Yes
Base Width (m):	3
Overall Width (m):	6
Swale Depth (m):	0.5
Length of Batter 1 (m):	1.5
Length of Batter 2 (m):	1.5
Swale Condition:	1 - Very Poor
Swale Ponding:	Yes
Drain flooded at time of inspection:	Yes
Swale Comments:	Swale upstream of culvert, connected to dam

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:30:54 AM



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:02:46 AM

Insp ID: 170	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Water Asset Are you Capturing: Taps

Diameter(mm):	30
Tap Leakage:	No
Tap Condition:	4 - Very Good
Tap Comment:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:08:44 AM

Insp ID: 171	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Water Asset Are you Capturing: Taps

Diameter(mm):	30
Tap Leakage:	No
Tap Condition:	1 - Very Poor
Tap Comment:	No tap handle

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:32:50 AM

Insp ID: 182	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Water Asset Are you Capturing: Taps

Diameter(mm):	30
Tap Leakage:	No Access
Tap Condition:	1 - Very Poor
Tap Comment:	

Northern Territory Town Camps

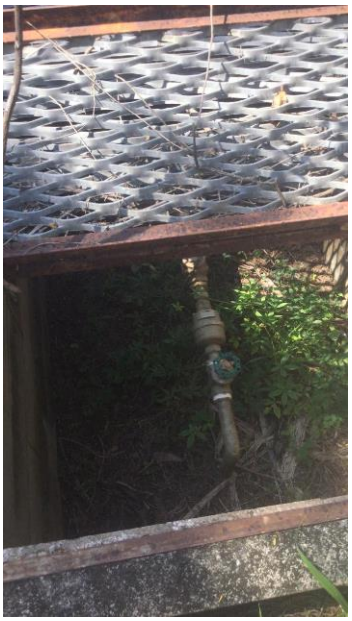
Civil Infrastructure

Inspection Date 9/11/2016 9:50:25 AM

Insp ID: 166 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Water Asset Are you Capturing: Water Meter

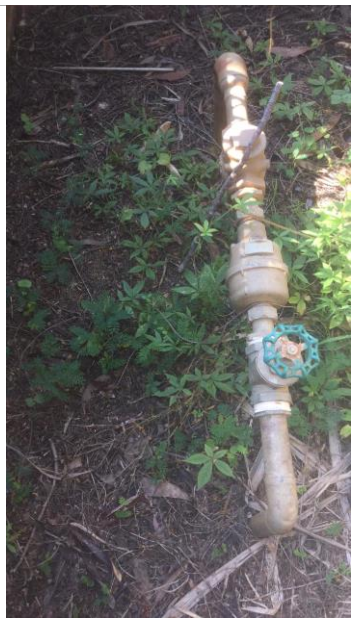
Water Meter Type:	Bulk
Bulk Water Meter Size (mm):	50
Bulk Water Meter Condition:	3 - Good
Bulk Water Meter Comment:	Flow meter located in pit
Lot Number:	
Lot Water Meter Size:	
Lot Water Meter Condition:	
Lot Water Meter Comment:	



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 9:50:25 AM



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:07:58 AM

Insp ID: 172 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Water Asset Are you Capturing: Water Meter

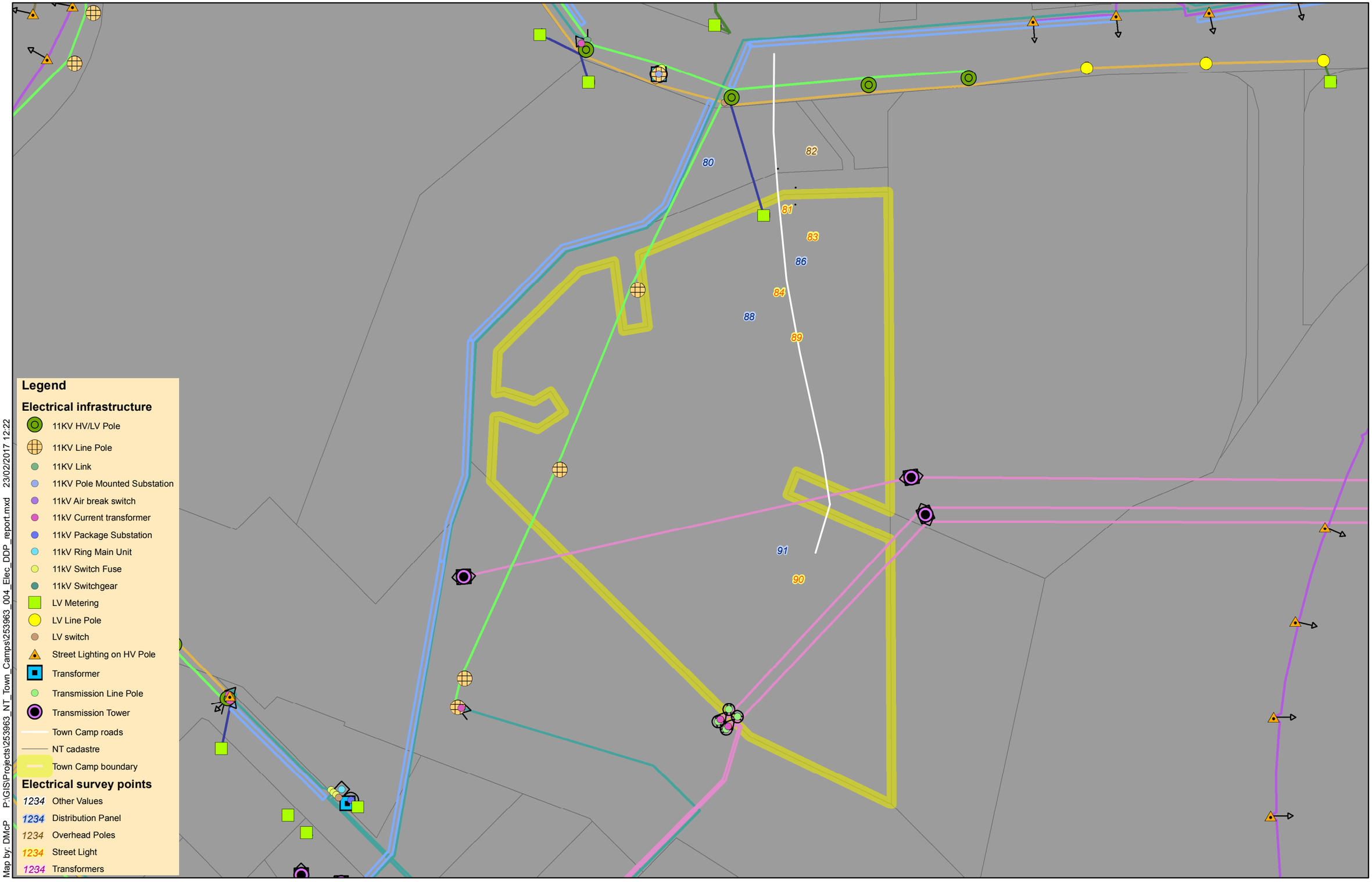
Water Meter Type:	Lot
Bulk Water Meter Size (mm):	
Bulk Water Meter Condition:	
Bulk Water Meter Comment:	
Lot Number:	
Lot Water Meter Size:	19
Lot Water Meter Condition:	3 - Good
Lot Water Meter Comment:	7 lot meters connected in arrangement

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/11/2016 10:07:58 AM

Electrical inspection report



A3 scale: 1:1,500

0 20 40 60 80 100 m

Date: 23/02/2017 Version: 3

Coordinate system: MGA94 Zone 52

NT Town Camp Infrastructure Assessments: Electrical

412 - Railway Dam (Darwin)

7589

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:21:48 AM

Insp ID: 80 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing:	Distribution Panel
What is Main Distribution Panel installation method:	Pole
Is the distribution panel labelled:	No
What is Distribution Panel main CB Rating:	100
What is the main incoming cable type/Size to Distribution Panel:	Black insulated single core per phase
What is the condition of switchboard:	3
Condition Comments:	
What is the condition of cables/glands into switchboard:	3
Cable/Gland Condition Comments:	
Distribution Panels name plate access:	NA

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:21:48 AM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:34:52 AM

Insp ID: 86 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing:	Distribution Panel
What is Main Distribution Panel installation method:	Outdoor
Is the distribution panel labelled:	No
What is Distribution Panel main CB Rating:	150A
What is the main incoming cable type/Size to Distribution Panel:	Unknown
What is the condition of switchboard:	3
Condition Comments:	
What is the condition of cables/glands into switchboard:	
Cable/Gland Condition Comments:	Unknown
Distribution Panels name plate access:	No

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:34:52 AM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:40:30 AM

Insp ID: 88 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing:	Distribution Panel
What is Main Distribution Panel installation method:	Outdoor
Is the distribution panel labelled:	No
What is Distribution Panel main CB Rating:	
What is the main incoming cable type/Size to Distribution Panel:	
What is the condition of switchboard:	3
Condition Comments:	Missing bolts
What is the condition of cables/glands into switchboard:	
Cable/Gland Condition Comments:	
Distribution Panels name plate access:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:48:45 AM

Insp ID: 91 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing:	Distribution Panel
What is Main Distribution Panel installation method:	Outdoor
Is the distribution panel labelled:	No
What is Distribution Panel main CB Rating:	Unknown
What is the main incoming cable type/Size to Distribution Panel:	Unknown
What is the condition of switchboard:	2
Condition Comments:	Needs cleaning around.
What is the condition of cables/glands into switchboard:	
Cable/Gland Condition Comments:	Unknown
Distribution Panels name plate access:	No

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:48:45 AM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 11:02:05 AM

Insp ID: 94	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Comms Category are you capturing:	Distribution
What is distribution method to households:	Underground
Is it Shared with PWC:	
Is there Anti-climb barrier provided for this pole:	
What is Pole construction type:	
Is street light fitted:	
Is there concrete collar around the base of pole:	
What is the condition of tap off to house:	
What is the condition of pole:	
How many Lots are connected to this pole:	
Is there access to Pits to take a photo:	No
What is Pit Condition:	2
Underground Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 11:02:05 AM

Northern Territory Town Camps

Communications Infrastructure

Inspection Date 9/11/2016 10:53:15 AM

Insp ID: 92	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Comms Category are you capturing:	General
Telstra Comms Drawing Available:	No
Facility upgrade not in drawings:	No Access
Which telecoms carriers are present in the town camp:	Telstra
How many Communications Pit(s) are allocated in this town camp:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 8:58:12 AM

Insp ID: 3375 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing: Electrical Meters

Meter Type: Post Paid

Meter Switchboard Cond: 3

Meter Condition: 3

Meter Comment: 9 Analogue Meters. Indoor SB, Cond 3

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:10:01 AM

Insp ID: 3376 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing: Electrical Meters

Meter Type: Post Paid

Meter Switchboard Cond:

Meter Condition: 3

Meter Comment: 9 Analogue Meters.

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:16:12 AM

Insp ID: 3377 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing: Electrical Meters

Meter Type: Post Paid

Meter Switchboard Cond:

Meter Condition: 3

Meter Comment: 9 Analogue Meters.

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:20:55 AM

Insp ID: 3378 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing: Electrical Meters

Meter Type: Post Paid

Meter Switchboard Cond:

Meter Condition: 3

Meter Comment: 9 Analogue Meters.

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:25:04 AM

Insp ID: 82 | Group 1 - Darwin, Jabiru, Adelaide River | Railway Dam (One Mile Dam)

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Steel
What is the condition of pole:	3
How is the pole planted:	Concrete
What is the Condition of plant:	3
Is street light fitted:	No
Street Light Power Supply:	
Street Light Type	
Street Light Watts	
Street Light Condition	
Street Light Height	
What is the type of service:	Three
What is the HV voltage level:	415
What is the arrangement of connected cables:	Twisted
Are there isolators on the pole:	No
What is the Condition:	
How many Lots are connected to this pole:	
Overhead Pole Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:25:04 AM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:34:48 AM

Insp ID: 85	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Category are you capturing: Pits and Conduits

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:35:50 AM

Insp ID: 87	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Category are you capturing: Pits and Conduits

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 11:06:01 AM

Insp ID: 95	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Category are you capturing: Pits and Conduits

Comments: Main supply to camp is prone to flooding and telecommunications conduit

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:23:23 AM

Insp ID: 81 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing:	Street Light
What is power supply method:	Underground
What is the lamp type:	Unknown
What Wattage is the lamp:	0
What is the condition of street lights:	1
What is Street Lighting pole installation height (approximate):	6

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:28:07 AM

Insp ID: 83 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing:	Street Light
What is power supply method:	Underground
What is the lamp type:	M80 D 05
What Wattage is the lamp:	80
What is the condition of street lights:	3
What is Street Lighting pole installation height (approximate):	6

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:33:03 AM

Insp ID: 84 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing:	Street Light
What is power supply method:	Solar
What is the lamp type:	Fluroscent single battern outdoor
What Wattage is the lamp:	18
What is the condition of street lights:	3
What is Street Lighting pole installation height (approximate):	6

Northern Territory Town Camps

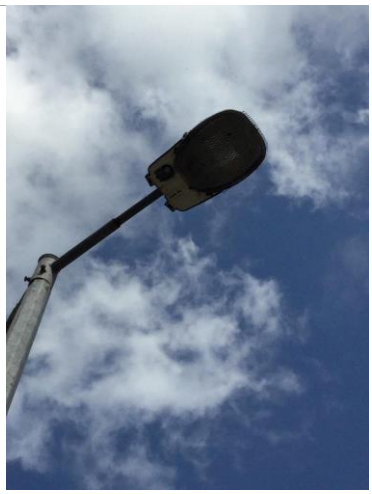
Electrical Infrastructure

Inspection Date 9/11/2016 10:43:21 AM

Insp ID: 89 Group 1 - Darwin, Jabiru, Adelaide River Railway Dam (One Mile Dam)

What Category are you capturing: Street Light

What is power supply method:	Underground
What is the lamp type:	M80D
What Wattage is the lamp:	80
What is the condition of street lights:	3
What is Street Lighting pole installation height (approximate):	



Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/11/2016 10:47:34 AM

Insp ID: 90	Group 1 - Darwin, Jabiru, Adelaide River	Railway Dam (One Mile Dam)

What Category are you capturing:	Street Light
What is power supply method:	Underground
What is the lamp type:	M80 D 05
What Wattage is the lamp:	80
What is the condition of street lights:	3
What is Street Lighting pole installation height (approximate):	6

Road map

Railway Dam

Legend

- Start of road

Road_Condition

- 1-Very poor
- 2-Poor
- 3-Good
- 4-Very good
- 5-Excellent
- Town Camp boundary

Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Roads_DDP2.mxd 20/02/2017 16:41 Imagery: Nearmap 11/06/2016

A3 scale: 1:1,500

0 20 40 60 80 100 m

Date: 20/02/2017 Version: 1

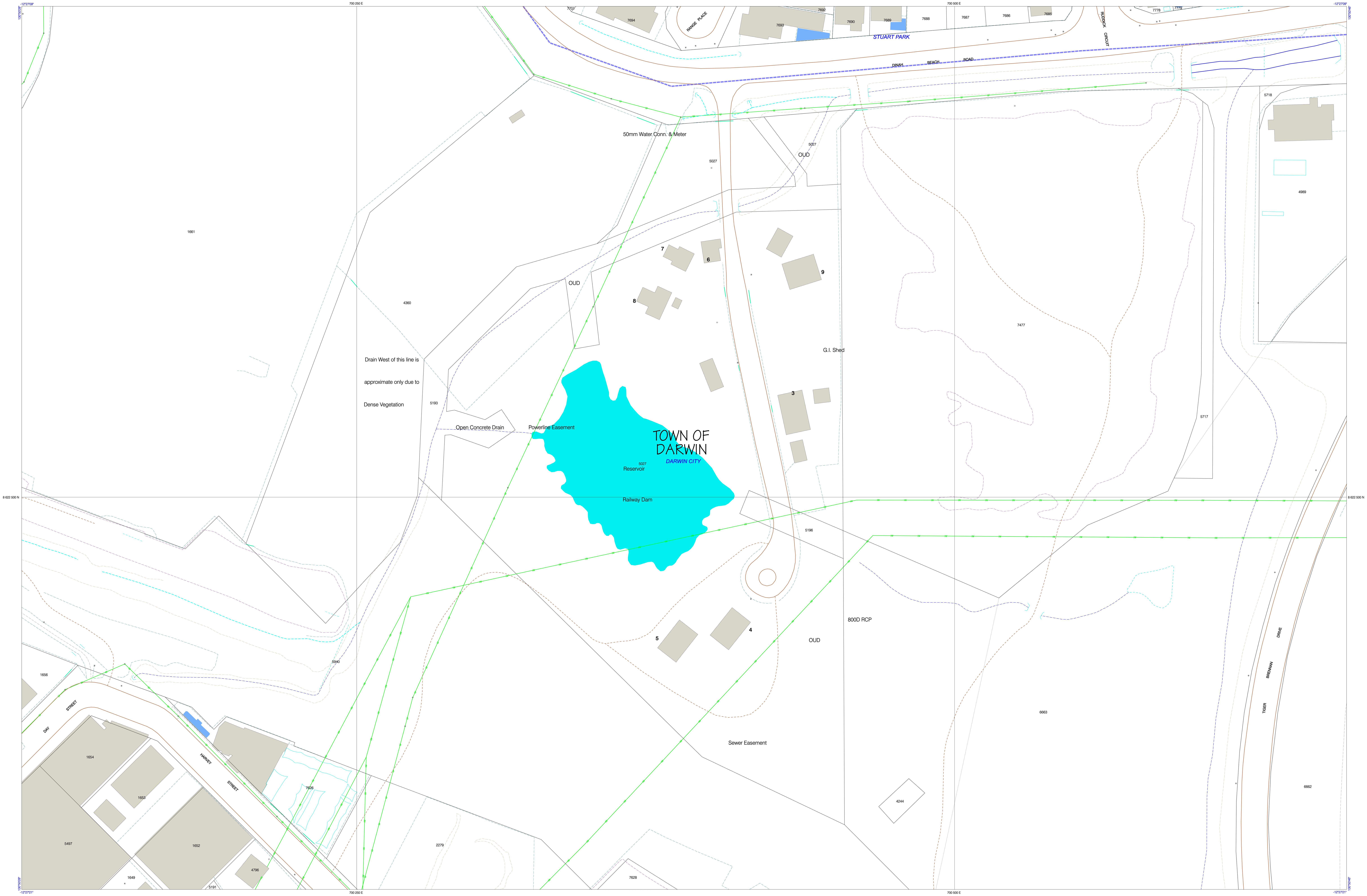
Coordinate system:MGA52

NT Town Camp Road Assessments

412 - Railway Dam (Darwin)

7615

Existing drawings



LEGEND

LAND USE PLANNING:

APPROX. POSITION OF BUILDING constructed since date of photography

LAND EXCLUDED FROM DEVELOPMENT

GENERAL EXCLUSION/BUFFERS

CULTURAL EXCLUSION AREAS:

Unauthorised entry, works on or use of land where there is a sacred site is an offence under the Northern Territory Aboriginal Sacred Sites Act. For conditions relating to works on or use of land within a Cultural Exclusion Area contact the Aboriginal Areas Protection Authority (AAPA): email enquiries.aapa@nt.gov.au or phone 8999 4332.

This advice does not negate the need for consent for entry, works, or use which may be required under the Aboriginal Land Rights(NT) Act (in the case of Aboriginal land), or another statute.

CADASTRE

- Current 123
- Proposed 123
- Locality LOCALITY

UTILITY SERVICES

- ELECTRICITY
  - LOW VOLTAGE LV
  - HIGH VOLTAGE HV
- WATER RETICULATION
  - WATER MAIN W
  - WATER RISING MAIN W W
- SEWER
  - SEWER MAIN S
  - SEWER RISING MAIN S S

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TOPOGRAPHY

- Road Sealed, Bridge
- Road Unsealed, Track
- Footpath, Drain, Culvert
- Wall, Gate, Fence, Cattle Grid
- Railway, Disused Railway
- Aerodrome Tarmac, Landing Strip
- Taxiway, Apron
- Pipeline: Oil, Water, Undetermined Gas, Sewage
- Building, Building-Shape unconfirmed
- Shade Structure, Incomplete Building
- Sewage Ponds, Tailings Pond
- Oval, Arena, Swimming Pool
- High Water Mark, Low Water Mark
- Mine; Quarry, Surface Excavation
- Contour; Index, Intermediate
- Contour; Depression
- Top of Bank, Bottom of Bank, Cliff
- Watercourse; Perennial, Intermittent, Channel or Canal
- WaterBodies; Perennial, Intermittent
- WaterBodies; Reservoir, Water Hole
- Swamp; Swamp Perennial, Swamp Intermittent
- Flat; Mud Flat, Clay/Saltpan, STI
- Pole; Power, General, Light
- Tank; Water, Elevated, Non-Water, Silo
- Manhole, Pylon, Communication Tower, Bore.

AVAILABLE FROM AND PRODUCED BY:

Northern Territory Government

NOTES:
POWER POLES, MANHOLES, SEPTIC TANKS, TOWERS/POSTS and other similar shaped objects are captured from Aerial Photography and have their locations confirmed from aerial survey techniques. These features are suitable as LOCAL SURVEY CONTROL. Their ground location is expected to be within +/-0.3m of their mapped location.

DIAL BEFORE YOU DIG phone 1100 (freecall) or visit www.1100.com.au
For water, sewer, and power information and connection requirements for developments contact Power and Water Corporation, Indigenous Community Development on 1800 245 092, and visit http://www.powerwater.com.au/business

General enquiries, corrections, updates, errors and omissions:
Indigenous Community Land Use Planning, NT Dept of Lands and Planning
TEL: (08) 8999 1300, FAX: (08) 8999 7189, Email: planning@nt.gov.au

This product is a compilation of data holdings from (but not restricted to) NT Dept of Lands and Planning, NT Dept of Housing, Local Government and Regional Services, Power and Water Corporation and Aboriginal Areas Protection Authority. Whilst every effort has been made to ensure the accuracy of this map, errors and omissions may occur. No Warranty is given concerning the accuracy of the information herein. Users should refer to the originating bodies or departments regarding the accuracy and currency of the data.

Topographic information:
Land Information Division
Dept of Lands and Planning
TEL: (08) 8995 5331, FAX: (08) 8995 5366
Email: landinfo.dpi@nt.gov.au

Cadastral information:
Office of the Surveyor-General
Dept of Lands and Planning
TEL: (08) 8995 5353, FAX: (08) 8995 5365
Email: landinfo.dpi@nt.gov.au

Power, Water or Sewer information:
Remote Operations Planning Branch
Power and Water Corporation
TEL: (08) 8924 5094, FAX: (08) 8924 5360

Aboriginal Areas Protection Authority:
The Registrar
Aboriginal Areas Protection Authority
TEL: (08) 8999 4332
Email: enquiries.aapa@nt.gov.au

Planning information:
Indigenous Community Land Use Planning
Dept of Lands and Planning
TEL: (08) 8999 1300, FAX: (08) 8999 7189
Email: planning@nt.gov.au

Housing Infrastructure Information:
Infrastructure Delivery Branch
Dept of Housing, Local Government, and Regional Services
TEL: (08) 8995 5013, FAX: (08) 8995 5110
Email: ies.dhlgrs@nt.gov.au

SOURCE INFORMATION

CONTOUR INTERVAL :		CURRENCY OF TOPOGRAPHY :	3 June 2011
HORIZONTAL DATUM :		SOURCE MAP SCALE :	2500
VERTICAL DATUM :		ZONE UTM :	52
PROJECTION :	Transverse Mercator	DATE GENERATED :	21 June 2012

N

GDA

0 10 20 30 40 50

Locality Diagram

SERVICED LAND AVAILABILITY PROGRAM

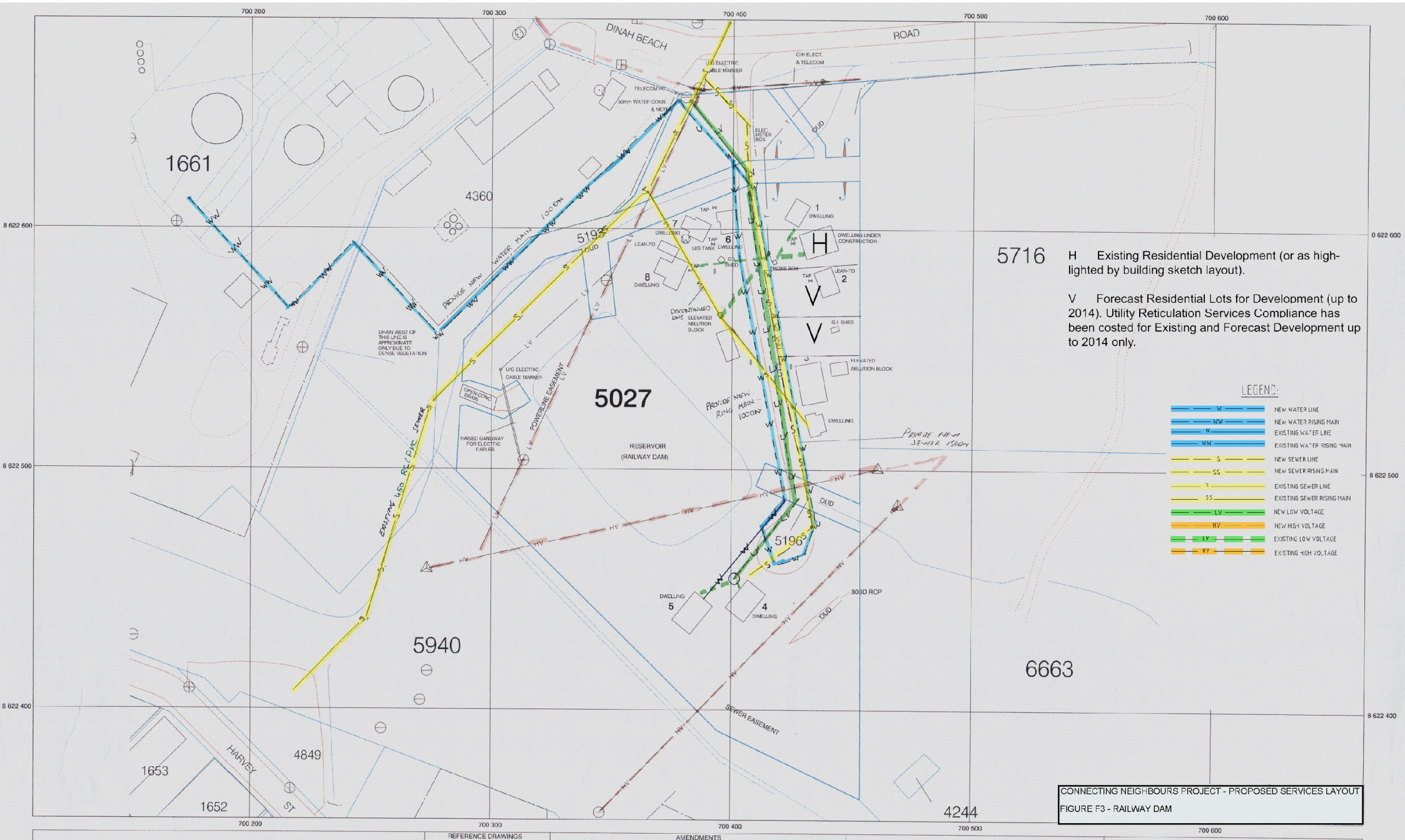
SLAP Map

Railway Dam (Darwin Town Camp)

One Mile Dam

Darwin City Council

Community ID: 412



CONNECTING NEIGHBOURS PROJECT - PROPOSED SERVICES LAYOUT
FIGURE F3 - RAILWAY DAM

HORIZONTAL DATUM : GDA94 (ZONE 53) (APPROX)
VERTICAL DATUM : AUSTRALIAN HEIGHT DATUM (metres)
SCALE 1:1000
metres 20 0 40 80 120

DEPARTMENT OF LANDS, PLANNING AND ENVIRONMENT
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DATE OF PHOTOGRAPHY 27/09/1999

REFERENCE DRAWINGS
DEPT OF LPE
1:2500 TOPO AQS 3027
PAWA:

AMENDMENTS

No.	Date		Authorized
1	Sept '00	PLAN UPDATED FROM SCANNED PHOTO	P. SIEBERT
2	Dec '01	LOTS 1 - 8 ADDED	I. REDMOND

Plan last updated by BA6 on the 27/12/01

ABORIGINAL DEVELOPMENT FOUNDATION

COMMUNITY MAP
RAILWAY DAM
412

76158

Transformer data

Group	Com Id	Location	Community Name	Dwellings No. (Funded Dwellings)	Dwellings No. (Bennett Design)	New Houses ** (Future Demand)	Primary Volatge Level (KV)	PWC Substation ID	PWC Test Number	Transformer size (KVA)	KVA Total dwellings @ 4.5KVA	KVA Total dwellings @ 7KVA	Comments
1	290	Darwin	Bagot	55	55		11	1924	1735	300	247.5	385	
	344	Darwin	Knuckey Lagoons	18	19	2	11	1771	2163	100	85.5	133	
	347	Darwin	Kulaluk	19	19		11	1092	10607	50	85.5	133	
	403	Darwin	Palmerston Town Camp	20	16		22	10196	10245	100	90	140	Two transformers for this Town Camp. Transformers are not in boundary of Town Camp [The nearest transformers data to Town Camp are highlighted in yellow].
							22	265	11645	25			
	412	Darwin	Railway Dam (One Mile Dam)	5	6	2	11	1041	4378	200	27	42	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	427	Adelaide River	Amangal	9	9		22	216	12187	100	40.5	63	Two transformers for this Town Camp.
							22	184	5646	63			
	687	Jabiru	Manabadurma	10	12		11	5050	11107	200	54	84	
	825	Darwin	Minmarama Park	24	24		11	2147	11372	100	108	168	
2	606	Katherine	Warlpiri Transient Camp	9	9		22	6416	4886	100	40.5	63	Two transformers for this Town Camp.
							22	6074	4695	25			
	621	Katherine	Miali Brumby (Kalano)	47	31		22	6133	12247	315	211.5	329	
	640	Pine Creek	Pine Creek Compound	4	4		22	6666	3147	25	18	28	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	971	Mataranka	Mulggan	12	9	4	22	6819	5296	16	54	84	
							22	6818	5297	16			
							22	6384	11028	25			
3	215	Tennant Creek	Blueberry Hill (Munji-Marla)	2	2		22	7079	1868	200	9	14	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	223	Tennant Creek	Dump Camp (Marla-Marla)	7	7		22	7181	11088	200	31.5	49	
	224	Elliott	Elliott South Camp	12	12		11	7504	4718	200	54	84	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	225	Elliott	Elliott North Camp	36	25		11	7505	4715	100	162	252	
	238	Tennant Creek	Kargaru (East Side Camp)	12	12	1	22	7572		200	54	84	
	246	Tennant Creek	Ngalpa Ngalpa	18	21		22	7179		200	94.5	147	Two transformers for this Town Camp.
							22	7033	10904	315			
	271	Tennant Creek	Village Camp	12	12	1	22	7183	11107	200	54	84	
	681	Tennant Creek	Tingkarli	12	12		22	7180		200	54	84	
	684	Tennant Creek	Wuppa	15	15	1	22	7141	11092	100	67.5	105	Two transformers for this Town Camp.
							22	7182	11095	200			
4	3	Alice Springs	Akngwertnarre (Morris Soak)	11	15		11	8596	11336	300	67.5	105	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	16	Alice Springs	Anthelk Ewlpaye (Charles Creek)	17	10		11	8569		315	76.5	119	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	17	Alice Springs	Anthepe	15	15		22	8598	5874	200	67.5	105	Data extracted from PWC asset information. There was not access to this Town Camp due to ceremony on inspection day.
							22	8597	11244	315			
	19	Alice Springs	Aper Alwerrknge (Palmers)	7	6		11	8405	2939	200	31.5	49	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	35	Alice Springs	Ewyenper Atwatye (Hidden Valley)	47	47		11	8622	11202	100	211.5	329	
							11	8623	11203	100			
							22	8625	11205	63			
							11	8626	11204	100			
	47	Alice Springs	Ilparpa	13	13		22	8611	11702	200	58.5	91	
	48	Alice Springs	Ilperle Tyathe (Walpiri)	10	9		11	8001	11209	315	45	70	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	50	Alice Springs	Ilyperenye (Old Timers)	10	10		22	8145	3323	100	45	70	
	64	Alice Springs	Bassos	2	2		11	8002	10946	50	9	14	
	69	Alice Springs	Karnte	19	19		22	8282	2345	100	85.5	133	
	87	Alice Springs	Yarrenty Altere (Larapinta Valley)	34	34		11	8617	11334	100	153	238	
							11	8618	11200	63			
							11	8619	11335	100			
							11	8620	11201	100			
	90	Alice Springs	Inarlenge (Little Sisters)	16	22		22	8137	2925	100	99	154	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	108	Alice Springs	Mpwetyerre (Abbotts)	6	6		11	8093	11703	315	27	42	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	113	Alice Springs	Mount Nancy (Nyewente)	11	12		11	8405	2939	200	54	84	
	129	Alice Springs	Nyewente (Trucking Yards)	26	26		11	8629	11312	300	117	182	
	675	Alice Springs	Hoppys	15	19						85.5	133	There is not any Transformer in boundary of Town Camp. Also it's not shown in PWC asset information.
	676	Alice Springs	Ilpiye Ilpiye (Golders Camp)	15	14		11	8314	369	50	67.5	105	
	1029	Alice Springs	Kunoth	4	4		11	8569		315	18	28	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
5	222	Borroloola	Mara	28	29	2	11	6187	12610	100	130.5	203	Two transformers for this Town Camp.
							11	6545	10203				
	229	Borroloola	Garawa 1	16	14		11	6546	10166	100	72	112	Two transformers for this Town Camp.
							11	6332	4890	100			
	278	Borroloola	Yanyula	29	29		11	6162	10496	200	130.5	203	Data extracted from PWC asset information. It's outside of Twon Camp, shown only Transformer to this Town Camp.
							11		10167				This transformer is not shown in PWC asset information. It's installed in Boat Ramp Road near to Town Camp and connected to Electrical reticulation of Town Camp.
	992	Borroloola	Garawa 2	11	11		11	6189	2669	25	49.5	77	

** For New house's demand calculation see section 13.4 "Future Demand".

Amangal

Amangal

1 Design

The infrastructure reviews have been undertaken against current relevant standards for typical sub-divisions. The following standards have been used in undertaking the reviews.

Sewerage and water supply

- Water Services Association of Australia – Sewerage Code – WSA 02 Part 1: Planning and Design
- Power and Water Corporation supplement to WSA 02
- Water Services Association of Australia – Sewerage Pumping Station Code – WSA 04 -2005 Part 1: Planning and Design
- Power and Water Corporation supplement to WSA 04
- Water Services Association of Australia – Water Supply Code – WSA 03 2002 Part 1: Planning and Design
- Power and Water Corporation supplement to WSA 03
- Power and Water Corporation Indigenous Community Engineering Guidelines (2008)
- Department of Housing and Community Development Indigenous Community Engineering Guidelines (ICEG 2014, updated September 2016)
- Power and Water Corporation Essential Services Infrastructure Assessment and Upgrade Guidelines (for Town Camps in Urban Communities, 2009)
- Power and Water Corporation Standard Drawings
- Australian Standards

Electrical services

Electrical infrastructure has been assessed against AS/NZS3000 Wiring Rules and against PWC Service, Installation and Metering Rules and Urban Residential Development (URD) Design Standards where possible.

With one exception, town camps are each a single lot and compliance with AS/NZS3000 is sufficient to address potential safety concerns.

As such application of PWC URD Design Standards will mainly apply to the incoming supply and bulk or initial multi-metering panels if provided.

URD Design Standards for internal reticulation and street lighting appear to have been applied in many cases for convenience rather than compliance.

For the purposes of this report, the demand per dwelling allowances of URD Design Standards have been used to estimate incoming supply and overall distribution capacity requirements.

The following standards apply:

- Australian Standards
- Power Networks Design and Construction Guidelines, Power and Water Corporation
    - NP001.1_Design and Construction of Network Assets – General Requirements
    - NP001.3_General Specification for Overhead Electrical Reticulation
    - NP001.6_General Specification for URD Subdivisions
    - NP003_Installation Rules_V3
    - NP007_Service Rules

- NP027_Capture of Newly Installed Street Lighting Information
- NP041_Guidelines for Electrical Design Consultants

Further referral to the guidelines in this report will be designated by the guidelines number, NP001.1.

Communications

- National Broadband Network Website viewed 21 January 2017 (http://www.nbnco.com.au/) – NBN rollout maps

General

It should be noted that if the town camps are proposed to be subdivided and services assets gifted to Power and Water Corporation (PWC) for operation and maintenance, all of these services will need to fully meet PWC standards. With the exception of a few town camps that have recently been upgraded, this will require the full replacement and/or realignment of most services.

2 Condition assessment

2.1 Rating assessment matrix

A condition rating matrix was developed and used to assess all municipal infrastructure. The same rating was used for all services to maintain consistency in assessments. **Error! Reference source not found.** below shows the condition rating and operability.

Table 1 Condition rating

Condition rating		Operability
1	Very Poor	Not operational
2	Poor	Not fully operational or requires immediate maintenance to keep operational
3	Good	Fully operational, may require routine maintenance
4	Very Good	Fully operational, may require maintenance in the next six months
5	Excellent	New, fully operational

2.2 Civil assessment limitations

The civil infrastructure condition investigations were subject to a number of limitations. These include:

- Only accessible services have been investigated. This includes inspecting the top of sewer manholes, side entry pits, etc., however, does not include opening pits to inspect infrastructure below ground.
- No physical testing of the sewer, water or stormwater network was undertaken.
- No survey or service locating was undertaken.

As there was no survey, potholing or CCTV undertaken on the underground infrastructure there is insufficient information to make determinations on the asset condition. The condition assessments discussed in this report are only for the accessible services and do not necessarily represent the condition of the underground infrastructure. For the majority of the town camps, other than a few that have recently been upgraded it was found that the underground services are generally undersized and it is likely, due to their age, that the these services are in poor condition. Either factor would trigger the need for a complete replacement to meet current relevant standards.

2.3 Electrical assessment limitations

The electrical infrastructure condition investigations were subject to a number of limitations. These include:

Inspections were carried out without the assistance of an electrical tradesman.

- Only accessible services were investigated. Assessments were of a visual nature and no pit covers were removed.
- Overhead equipment was assessed from ground level.
- Switchboards were not opened and no assessment of the internal connections or bus ratings was made.

- Electrical infrastructure was assessed down to the meter for multi-meter panels and down to the termination, overhead pole or distribution pillar, of the supply cable to a meter located at a dwelling.

3 Current infrastructure issues

Power and Water Corporation (PWC) have advised of the following concerns and issues in regard to the sewerage, water and electrical infrastructure at all town camps.

3.1 Ownership and maintenance

PWC stated there has always been confusion regarding the ownership and responsibilities of the internal sewer, water and electrical infrastructure. PWC have advised that they have no legal tenure on the majority of assets in any town camps and that the owner is essentially that of the land owner or leaseholder. This is further discussed for each type of infrastructure for each town camp.

The ownership and who is responsible for the maintenance of the sewage pump stations and street lighting is a major concern. In most town camps it was found that PWC have been maintaining the assets on an in-kind basis, although there are no maintenance or access agreements in place and the infrastructure is generally not compliant to PWC standards.

3.2 Access to infrastructure

PWC advised that due to the uncertainty surrounding ownership and responsibility of the sewerage, water and electrical infrastructure, each town camp is seen as a single lot with multiple houses on it. There are no formal road reserves or easements where the municipal infrastructure should be located. PWC therefore have no legal right to enter the town camps to work on the infrastructure, nor can PWC stop others from working on the infrastructure. There is a risk that the maintenance undertaken by others may be to a lower standard than PWC.

It should be noted that there are currently no legal services easements within the town camps, except for a few cases where a town service passes through the town camp. Therefore it is recommended that easements are created over any infrastructure owned by PWC and any future assets to be gifted to PWC, to allow the service providers access to the infrastructure.

3.3 Existing infrastructure

PWC have stated that although the existing sewerage and water infrastructure appears to comply with relevant standards in some locations, the capacity cannot be assumed to meet PWC requirements due to the potential for underground substandard condition and/or grading of pipework. It is likely that these assets will need to be fully replaced to PWC standards to ensure sufficient capacity.

The planning process currently allows construction within the town camps on Commonwealth land without requiring service authority (PWC) approvals. This means that there has been no opportunity for PWC to recover contributions towards required upgrades to headworks servicing the developments and these upgrades have been paid for by PWC in the past. This inconsistency needs to be addressed for future developments within the town camps to ensure PWC are able to continue to provide adequate services.

3.4 Safety concerns

PWC have expressed concerns with safety of PWC staff and contractors working within the camps. PWC have employed procedures such as multiple people / vehicles to attend the site, with police or housing safety officers as required. This

generally leads to a delayed response time and increased cost to respond to and remediate emergency situations.

PWC have also raised the concern that if others work on water infrastructure within the town camps and do not apply the correct sanitation procedures they not only risk contaminating the entire water supply network within the town camp, at some town camps with direct connections to the town supply, they risk contaminating the entire town's water supply.

4 Available information

As the site investigations were limited to accessible / visible services, information on below ground services (such as electrical cables, sewer pipes, water supply pipes, etc.) were determined from available information. This information included:

- Serviced Land Availability Program (SLAP) maps,
- Department of Family & Community Services - Connecting Neighbours Program – Essential Services Scoping Study Report Volume 1 April 2005,
- Connecting Neighbours Project – Infrastructure Assessment and Recommendation Report - Arup Pty Ltd, April 2005,
- Drawings supplied by NT Department of Infrastructure - Technical Records,
- Drawings supplied by Power Water Corporation,
- Bennett Design inspection reports and population data.

Aurecon undertook a site investigation of the Amangal community on 9 December 2016 to inspect roads, stormwater drainage, electrical services, sewerage and water supply, and community structures. The following sections detail the outcomes of this investigation and the assessments of the infrastructure.

The civil and electrical inspection reports can be found in the Appendices.

5 Sewerage

5.1 Ownership and boundaries

There was no sewerage infrastructure inspected at Amangal. There were no drawings available that showed the sewer network or sewer disposal system within Amangal. It is understood that the current sewer disposal is via septic tanks.

The septic tanks are assumed to be owned by the Aboriginal Development Foundation, and are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain.

It is understood that Adelaide River township has reticulated sewer which is the responsibility of Power and Water Corporation.

5.1.1 Connection methods and billing

It is understood that the Aboriginal Development Foundation would receive a bill from a contractor for emptying the septic tanks. It is not known what contribution the residents make towards this bill.

5.2 Current performance and risks

As there is currently no sewerage infrastructure at Amangal, it is recommended that a DN150 PVC gravity main, a pump station and a dedicated rising main are constructed so the sewage can be connected to the town sewer.

An assessment would need to be undertaken to determine whether the additional loads can be discharged into the existing sewer network, or if a dedicated main is required from Amangal all the way to the sewage ponds.

Preliminary estimates show that approximately 2500 m of sewer main would be required to dispose to the existing sewage ponds. One pump station has also been allowed for in the cost estimates.

5.3 Future demand

As no new developments are currently planned for Amangal, there are no additional upgrades required to cater for future demand.

5.4 Recommended works

It is recommended that the current capacity of the sewer network in Adelaide River, including the sewage ponds, is investigated to confirm whether the sewer loads from Amangal can be added to the existing network, or if a dedicated main would be required.

6 Water supply

6.1 Ownership and boundaries

The water main serving Amangal is a DN100 AC pipe with a single supply point and no network looping.

The water supply assets within Amangal are believed to be owned by Aboriginal Development Foundation Incorporated, but are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain. The water is supplied from PWC owned water mains outside of the community. Figure 1 below shows the DN100 AC reticulation main servicing Amangal community.

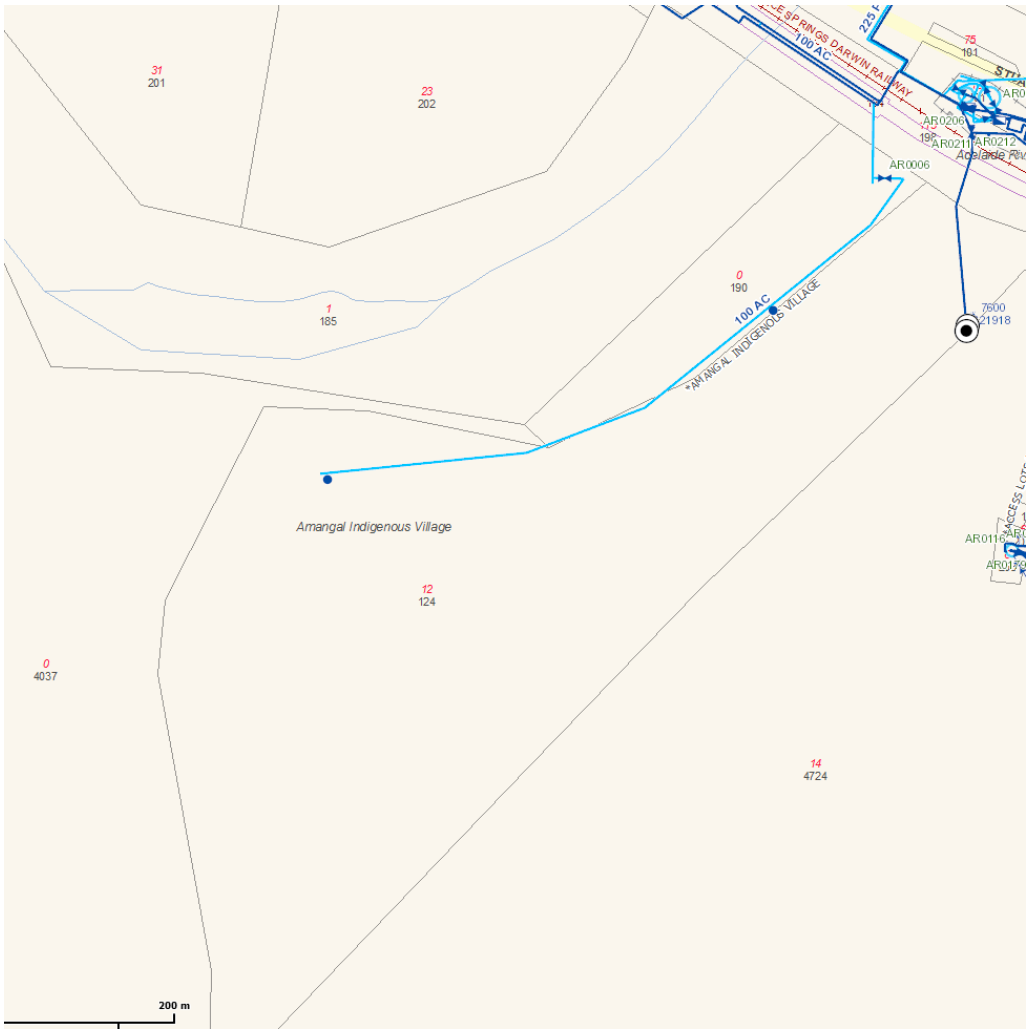


Figure 1 Amangal water main

6.1.1 Connection methods and billing

PWC advised that they currently charge a single water bill to the Aboriginal Development Foundation Inc (Yili Rreung Housing). It is not known what contribution the residents make towards the water bills. It is understood that the water usage is measured at the residential lot water meters.

It is proposed that PWC measures the water supply to the entire community with a bulk meter, as opposed to individual lots within the community. Under this scheme, a single water bill for the entire community is the responsibility of the governing

body, being Aboriginal Development Foundation Incorporated for Amangal. It will be up to governing body to assign bills to residents accordingly.

It is also recommended that individual lot meters are maintained. This will assist with the governing body distributing bills to residents, the identification of any leaks in the network, and meeting PWC standards should the town camp is subdivided in the future.

A total of nine residential lot water meters were assessed during the inspection and the community is believed to contain nine dwellings. Therefore, no additional residential water meters are required.

6.2 Existing infrastructure condition assessment

The site investigation for the water infrastructure included assessing the condition of any air valves, fire hydrants, tanks, taps, and water meters. The assessment was limited to services that could be assessed above ground; no below ground services were inspected.

The condition of each asset is as follows:

Table 2 Water supply condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Fire hydrant			2			2
Water meter (residential lots)		8			1	9

Figure 2 Residential lot water meters, condition: *poor*

Figure 3 Fire hydrant, condition: *good*

A total of eight lot meters in a single cage were inspected. Minor maintenance works are required for these lot meters including; clearing cage of weeds and rubbish, identifying and repairing leaks. No critical breaks were observed, however a small amount of water pooling below the water meters indicates leaks are present. The fire hydrants are in generally good condition however are in need of a repaint.

6.3 Current performance and risks

The current capacity of the water supply was calculated based on the following design assumptions:

- The nominal peak day flow is 1100 L/capita/day, based on PWC's supplement to WSA 03 2002. This value is for the northern region of NT. It was assumed that the nominal peak day flow of 1100 L/capita/day also applies to water usage within the community, although it is possible that this value could be higher in real life due to a lack of controls to reduce water usage.
- The Equivalent Population (EP) has been calculated assuming one household equates to 9 EP, based on discussions with Power and Water Corporation.
- The maximum flow velocity used for calculating the incoming flow capacity is 1.4 m/s. PWC supplement to WSA 03-2002 states that flow velocities should generally not exceed 1.4 m/s during peak hour demand.
- The peak hour factors are listed in PWC's Supplement to WSA 03-2002, and they depend on the population range of the community. The peak hour factor of 3.0 has been adopted, for populations less than 500.
- The water meter has PWC's minimum pressure guaranteed value of 15 m.

Table 3 shows the properties used to analyse Amangal water supply demand.

Table 3 Current water demand

Dwellings	EP	Demand (l/s)	Peak hour demand (l/s)	Fire flow demand (l/s)	Pipe size & type	Total length (m)
9	81	1.03	3.09	25	DN100 AC	900

Table 4 Current water demand analysis

Demand	Velocity (m/s)	Headloss (m)	Pressure (m)
Peak hour demand	0.39	1.5	13.5
Fire flow demand	3.18	98.12	-83.12

The existing network has capacity to supply adequate pressure under peak hour demands. However, it has insufficient capacity for fire flow demands.

The assessment of water supply for firefighting has been based on the size of the water mains and the condition of the accessible fire hydrants. Additional hydrants have been recommended where it appears the existing number of hydrants are insufficient. In the case of Amangal it is expected that an additional three fire hydrants are required to attain adequate coverage. As detailed above the existing network does not have the capacity for fire flow demands and is non-compliant with current PWC standards. Three additional fire hydrants have been incorporated into the cost estimates.

The DN100 AC water main is has a dead end which is not complaint with PWC standards. It is recommended that the main is updated to a DN150 to comply with PWC standards.

6.4 Future demands

As no new developments are currently planned for Amangal, there are no additional upgrades required to cater for future demand.

6.5 Recommended works

The infrastructure that was assessed as very poor or poor is recommended to be upgraded to prevent failure in the future. The following maintenance works are recommended;

- Clear cage of debris and repair minor leak on water meters
- Repaint three fire hydrants

It is proposed the current water reticulation network is upgraded to a DN150 PVC looped main with water usage measured using a bulk water meter. The cost estimates for upgrades at Amangal include;

- Install three additional fire hydrants
- Install new looped DN150 PVC looped main, approximately 1500 m
- Install new DN150 bulk water meter on new looped main
- Relocate eight water meters to property boundaries

7 Roadworks

7.1 Ownership and boundaries

It is the current understanding that the roadworks infrastructure within Amangal are owned by Aboriginal Development Foundation Incorporated, but are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain.

7.2 Existing infrastructure condition assessment

The road network within the Amangal community consists of spray sealed roads. These roads are either in very poor or poor condition, as shown in Figure 4. There are also numerous tracks which appear to be used frequently that are not included in the inspection and report. There was no road furniture, such as signs, carparks, footpaths etc. at Amangal.

A larger version of Figure 4 is found as the Appendices.

Figure 4 Road network condition assessment

Figure 5 Pavement, condition: *very poor*

Figure 6 Pavement, condition: *poor*

Figure 5 and Figure 6 show typical conditions of the internal road network at Amangal. As all roads within the community are at a condition poor or very poor, it is recommended that they are resealed to prevent future failure and to increase road safety within the community.

The following table shows the road condition and particular defects that were observed during the site inspection. Note that the defects given as a percentage refer to percentage of road for that particular segment.

Table 5 Road network condition assessment

Road name	Chainage start (km)	Chainage end (km)	Road segment condition (1-5)	Defects and associated condition (1-5)
427_2	0	0.09	1	-The roads surface is failing (1) -20% of the road section has edge breaks (2) -General appearance is very poor (1)
	0	0.27	1	-70% of the roads surface is failing (1)
Amangal Indigenous Village	0.2	0.25	2	-5% surfacing cracks (3)
	0.25	0.5	2	-5% surfacing cracks (2) -75% of the roads edge has breaks (2)

Road name	Chainage start (km)	Chainage end (km)	Road segment condition (1-5)	Defects and associated condition (1-5)
	0.5	0.75	2	-75% edge breaks (1) -5% Surfacing cracks (2)
	0.75	0.88	1	-10% of the road has potholes (1) -20% of the roads edge has breaks (1)

7.3 Current performance and risks

The main road into Amangal was rated as having poor condition as there were significant edge breaks, surface cracks, road failure and some potholes. The road network within Amangal is in poor condition or worse and requires significant maintenance and/or upgrades. As the road pavements are failing, there may be more significant issues to do with the subgrade or drainage issues that will require remediation before the road can be resealed.

The layout of the road network is sufficient for the current number of houses, although the condition of the road is poor.

It was noted during the site inspections that a number of unsealed 'short-cuts' had been created and were regularly used. It is not recommended that these paths are formalised.

It is also recommended that a road safety audit is undertaken to determine where signage, line marking, etc. are required.

7.4 Future demands

As no new developments are currently planned for Amangal, there are no additional upgrades required to cater for future demand.

7.5 Recommended works

The infrastructure that was assessed as very poor or poor is recommended to be upgraded to prevent failure in the future. The following works are recommended to upgrade the current infrastructure;

- A new custom entrance sign to the community
- Add eight new standard road signs (i.e. give way / speed restriction signs)
- Reseal 400 m of road, approximately 2850 m2 including reshaping the shoulders
- Repair 105 m^2 of pavement cracks
- Repair 375 m of edge breaks
- General tidy of 1 km of road, including removing graffiti from pavement
- Add line marking to the road for increased safety approximately 1 km

In order to allow for a longer term sustainable road network a significant upgrade would be required. It is recommended that a long term design which incorporates a full two lane road network, with all appropriate road furniture, line-marking, kerbs and gutters is constructed. A cost estimate to reinstate the base and subbase material, reseal with a two coat spray seal surface, construct subsoil drainage, line marking and signage has been included. Note that these works will need to be fully designed, the cost estimate is for budgetary purposes only and only indicates the

construction phase. A footpath next to the road is also recommended to provide a safe trail for pedestrians.

As the maximum road width within the Amangal community is 4 m, this means that all 950 m of the road network will need to be upgraded to a 7.2 m wide road. The stormwater drainage infrastructure upgrades that are closely associated with the road upgrade i.e. kerb and gutters, side entry pits and underground drainage pipes are included in the stormwater section of this report.

8 Stormwater drainage

8.1 Ownership and boundaries

The stormwater infrastructure within Amangal are believed to be owned by Aboriginal Development Foundation Incorporated, but are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain.

There are currently two swales and three culverts within the Amangal community. There are no side entry pits, kerb and gutters, or underground drainage network at Amangal.

8.2 Existing infrastructure condition assessment

The site investigation for the stormwater infrastructure included assessing the condition of swales, culverts, and headwalls. Only the above ground infrastructure was assessed. As the inspection was undertaken outside of a storm event and no CCTV of the pipes was undertaken, flooding due to blockages or damages to the underground infrastructure could not be assessed. The following table summarises the condition of the stormwater assets as assessed during the inspection.

Table 6 Stormwater drainage condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Culverts	2			1		3
Swales	1		1			2

Figure 7 Swale, condition: *very poor*

Figure 8 Headwall and culvert, condition: *very good*

8.3 Current performance and risks

The detailed performance of the stormwater network cannot be fully analysed without significant hydraulic and hydrodynamic modelling, which is outside the scope of this project.

However based on the condition of the stormwater infrastructure assessed it would appear that the current infrastructure requires upgrades and maintenance to be able to work effectively.

8.4 Future demands

As no new developments are currently planned for Amangal, there are no additional upgrades required to cater for future demand.

8.5 Recommended works

The following works are recommended to upgrade or improve the current infrastructure:

- Reshape and remediate batters and invert level of swales. This may include protection in the form of dumped rock or gabion rock baskets to reduce the velocity of water and the impacts of scour and erosion.
- Clear blockages from two RCPs. These works may also require reshaping and remediating the swales to avoid the culvert filling with sediment again.

9 Community structures

9.1 Ownership and boundaries

The community structures within Amangal are believed to be owned by Aboriginal Development Foundation Incorporated, but are the responsibility of Yilli Rreung Housing Aboriginal Corporation to maintain.

9.2 Existing infrastructure condition assessment

The site investigation for the community structures included assessing the condition and features of the one playground at Amangal. The following table shows the condition rating given to that community structure.

Table 7 Community structures condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Playground				1		1

Figure 9 Playground, condition: *very good*

9.3 Current performance and risks

At the time of the inspection, the playground was in very good condition, however there was no shade cloth. It appears as though the infrastructure is in place for a shade cloth. It is recommended that a shade cloth is installed to improve the functionality and amenity of the playground.

9.4 Future demands

As no new developments are currently planned for Amangal, there are no additional upgrades required to cater for future demand.

9.5 Recommended works

The following works are recommended to upgrade the community structures:

- Confirm existing infrastructure for shade cloth is sufficient and install new shade cloth

10 Electrical services

10.1 Ownership and boundaries

The following points, from Network Policy NP003 Installation Rules Section3, define the typical shared ownership of electrical infrastructure by Power and Water Corporation (PWC) and customers.

- The point of supply is defined as the point where PWC makes the electrical supply available. For domestic supply, this is normally one of the following:
- A point of attachment of an overhead service on to a building or pole on which a metering panel is fitted.
- A point of attachment of an overhead service on to a pole forming part of unmetered aerial consumer's mains.
- A nominated point on a distribution substation located on the customer's lot.
- A point of connection of an underground service in a metering panel, including underground services originating at an overhead line.
- A point of connection of an underground service in a pillar or junction box forming part of unmetered consumer's mains, located on the customer's lot.
- A point on a Power and Water pillar located on the customer's lot.

Typically, distribution infrastructure upstream of the point of supply is owned and maintained by PWC and infrastructure below the point of supply is owned and maintained by the customer.

In many cases PWC have defined a Point Of Supply to ensure that they retain responsibility for aerial high voltage infrastructure, and aerial low voltage infrastructure where installed with aerial high voltage infrastructure, to minimise the possibility of the community or it's contractors coming into contact, either deliberately or inadvertently, with aerial high voltage infrastructure.

In other cases isolation facilities are present or desired by PWC to define the Point of Supply at or near the boundary of the town camp.

The Amangal community electrical reticulation systems is supplied from the PWC network that has multiple points of supply to the community.1.via overhead service to a consumer metering panel fitted on building and 2. Via overhead HV cable to a pole mount transformer. Unmetered consumer's mains run to a main switchboard with outgoing LV feeders to underground reticulation to prepaid meters on dwellings.

All meters in this site are pre-paid digital meters.

PWC advise that the Point Of Supply is the LV terminals of the substation and that they own and are responsible for the pole mount substation and upstream infrastructure.

PWC advise that street lighting is supplied from unmetered LV infrastructure and is the responsibility of the lot holder and not PWC.

All meters, whether pre- or post-paid are the property of PWC.

Amangal community are responsible for maintain all unmetered and metered LV infrastructure including the main switchboard, metering panel (excluding meter), underground distribution feeders, distribution pillars, consumers mains and consumer switchboards.

10.2 Existing infrastructure condition assessment

Table 8 shows the condition rating given to the distribution switchboards and distribution pillars. The distribution pillars have 100% inoperable rating. Refer to Appendices for details.

The concrete structure is a potential hazard.

Table 8 Distribution panel condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Distribution panels		1				1

Table 9 shows the condition rating given to the street lights. The street lights are supplied via overhead LV reticulation and are generally eight (8) metres high with mercury lamp M80 and with lamp covers protected by cages. The street lights have 66.67% operational rating and 33.33% inoperable based on daytime visual inspection.

Table 9 Street light on O/H pole condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Street light on O/H pole		1	2			3

Table 10 shows the condition rating given to transformers. The transformer was of pole mount substation design. The transformer was visually accessed to be in good condition.

Table 10 Transformer condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Transformer			1			1

Table 11 shows the condition ratings given to overhead power poles. The overhead poles are of Weld Construction (Universal Pole construction). The overhead poles have 100% operational rating from the visual inspection.

Table 11 Overhead pole condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Overhead pole			8			8

Table 12 shows the condition rating given to the metering panels. All assessed meters in this community are prepaid digital meters.

Table 12 Meter panel condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Pre-paid meter			9			9
Switchboard		1	8			9

Table 13 shows the condition rating given to the switchboards associated to dwellings.

Table 13 Switchboard condition assessment (housing footprint)

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Switchboard			4			4

The details of the individual inspections and photographs of each infrastructure item are included in Appendices.

10.3 Current performance and risks

The electrical infrastructure evaluation was conducted against the following criteria

- Number of dwellings on tenure, the higher value of the funded dwelling and as quoted in the population report was utilised.
- Urban area, NP001.1, 4. Definitions.
- General Specification for URD Subdivisions, NP001.6, 4.3 Substation Size.
- Normal ADMD (After Diversity Maximum Demand) of 4.5 kVA and high cost subdivisions at 7 kVA.
- Transformer ratings were assumed to be correct in Dekho (PWC asset information system) and compared against photographs of test or transformer numbers collected.
- Substation loads were compared against transformer sizes only. No load flow analysis was conducted.
- No load calculations were performed or assessment conducted on overhead or underground cable, visual inspection from the ground only.
- Streetlighting loads were ignored as they are not significant.

The calculated maximum demand of the Amangal community transformer is 25% of rated capacity based on 4.5kVA/dwelling. The calculated maximum demand is within the total capacity of the substation on site. A recommended detail audit to be performed to ascertain the exact reticulation and load demand.

Table 14 Amangal current demand load vs transformer ratings

Community name	Dwellings	Transformer (kVA)	kVA Total @ 4.5kVA	kVA Total @ 7kVA	Comments
Amangal	9	100 63	40.5	63	Two transformers for this Town Camp.

A tabulated summary of all community transformers is included in Appendices.

There is a risk of equipment not being maintained associated with the non-standard division of responsibilities between the customer and PWC.

The following points from the PWC Metering Rules should be noted:

- The routine maintenance of metering installations and the replacement of any faulty meters is the responsibility of PWC.
- The property owners are responsible for the maintenance and upkeep of meter rooms, boxes and panels (including lids, doors and locking mechanisms).
- The installation of pre-paid metering is a cost to the customer, refer NP010 Meter Manual-Maintenance of Metering Installations, Power and Water Corporation.

10.4 Future demands

As no new developments are currently planned for Amangal, there are no additional upgrades required to cater for future demand.

10.5 Recommended works

The following maintenance works and upgrades are recommended:

- Replace one 80 W street light.
- Replace one multiple metering switchboard
- Replace one switchboard inside the metering panel
- Install new street lighting - approximately 48 poles

11 Communications

11.1 Ownership and boundaries

Details of Telstra pit and conduit infrastructure within the town camp boundaries were sought but were not forthcoming.

11.2 Existing infrastructure condition assessment

The telecommunications infrastructure assessed included pits and telephone booths. There were no telephone booths found at Amangal.

Appendices contain the individual reports.

Table 15 Telecommunication pit condition assessment

Asset	1 Very Poor	2 Poor	3 Good	4 Very Good	5 Excellent	Total
Telecommunication pit			2			2

11.3 Current performance and risks

No details of the performance of communications infrastructure were obtained.

11.4 Future demands

The current availability of broadband services at Amangal is displayed in the Figure 10 below. NBN is available to residents via satellite on application to an appropriate NBN access provider.

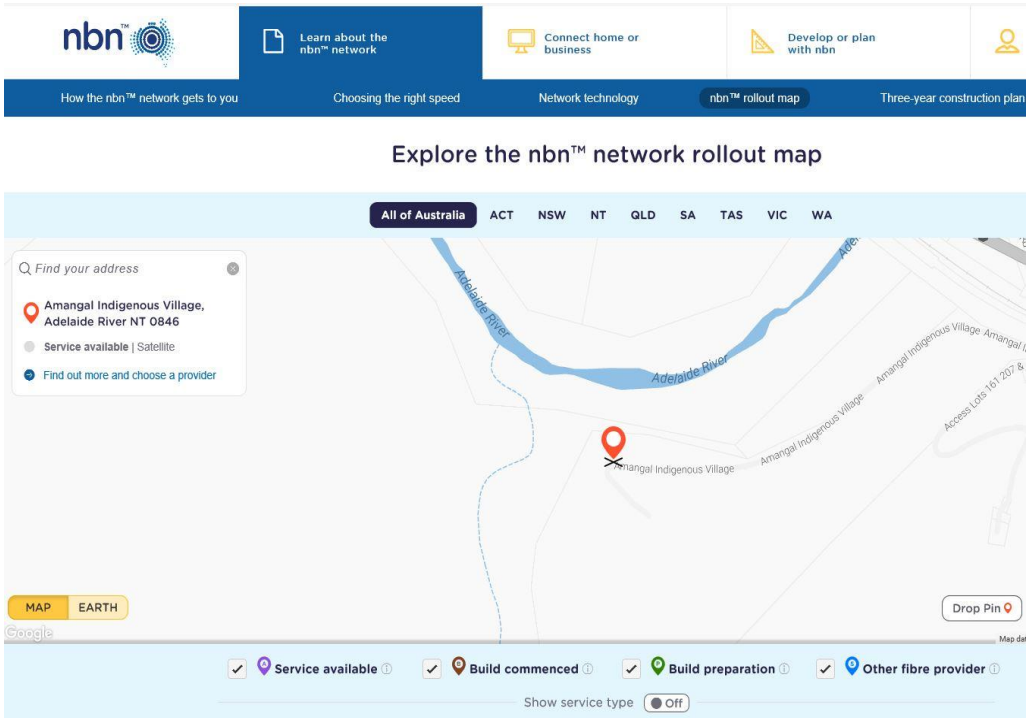


Figure 10 NBN network availability map

This map indicates that NBN is currently available via satellite on application.

11.5 Recommended works

Representatives from NBN's Land Access and Stake Holder management teams are currently engaged with Yilli Housing and NT Housing to look at how camps will be serviced. It is expected that any existing premises in these camps will have some type of NBN service via the NBN brownfields rollout in the future.

No works are required at Amangal because NBN is available to residents via satellite on application to an appropriate NBN access provider.

12 Cost estimates

Table 16 below shows a summary of the cost estimates to undertake the maintenance required to fix the existing infrastructure and to upgrade the existing network to meet current design standards. There are no upgrades required for the future design. The estimates take into account a 30% contingency, are inclusive of GST, and a location factor has been applied to town camps outside of Darwin.

Table 16 Cost estimates

Infrastructure	Maintenance of existing infrastructure	Upgrades to meet current design
Sewerage	$ 0	$ 2,107,000
Water supply	$ 5,000	$ 1,175,000
Roadworks	$ 564,000	$ 1,383,000
Stormwater drainage	$ 45,000	$ 0
Community structures	$ 9,000	$ 0
Electrical	$ 23,000	$ 824,000
Communications	$ 0	$ 0
Miscellaneous provisions	$ 89,000	$ 732,000
Total (including GST)	**$ 735,000**	**$ 6,221,000**
Grand total	**$ 6,956,000**	

The cost estimates are a preliminary estimate only. Since Aurecon has no control over the cost of labour, materials, equipment or services furnished by others, or over contractors' methods of determining prices, or over competitive bidding or market conditions, Aurecon cannot guarantee actual costs will not vary from these estimates.

13 Summary

The following works are recommended for Amangal:

Sewerage

- DN150 PVC reticulation main with sewage pump station and DN150 PVC rising main

Water supply

- Clear cage of debris and repair minor leak on water meters
- Install new looped DN150 PVC looped water main, approximately 1500 m
- Install new DN150 bulk water meter
- Relocate eight water meters to property boundaries
- Repaint two fire hydrants
- Install three new fire hydrants

Roadworks

- A new custom entrance sign to the community
- Add eight new standard road signs (i.e. give way / speed restriction signs)
- Reseal 400 m of road, approximately 2850 m2 including reshaping the shoulders
- Repair 100 m2 of pavement cracks
- Repair 375 m of edge breaks
- General tidy of 1 km of road, including removing graffiti from pavement
- Add line marking to the road for increased safety approximately 1 km
- It is recommended that the road is upgraded to a two lane network with all appropriate road furniture, line marking, kerbs, footpaths, etc.

Stormwater drainage

- Reshape and remediate batters and invert level of swales. This may include protection in the form of dumped rock or gabion rock baskets to reduce the velocity of water and the impacts of scour and erosion.
- Clear blockages from two RCPs. These works may also require reshaping and remediating the swales to avoid the culvert filling with sediment again.
- Install stormwater drainage network, consisting of side entry pits, kerb and gutter, underground pipes, etc.

Community structures

- Install new shade cloth

Electrical services

- Replace one 80 W street light.
- Replace one multiple metering switchboard
- Replace one switchboard inside the metering panel
- Install new street lighting - approximately 48 poles

Civil inspection reports

Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Civil_DDP.mxd 23/02/2017 12:02 Imagery: Digital Globe WV2 2013-2016

Legend

Town Camp boundary

A3 scale: 1:2,500

0 20 40 60 80 100 m

Note:
Label numbers refer to survey IDs

Date: 23/02/2017 Version: 2

Coordinate system: MGA94 Zone 52

NT Town Camp Infrastructure Assessments: Sewerage

427 - Amangal Indigenous Village (Adelaide River)

7651

Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Civil_DDP.mxd 23/02/2017 12:02 Imagery: Digital Globe WV2 2013-2016

A3 scale: 1:2,500

0 20 40 60 80 100 m

Note:
Label numbers refer to survey IDs

Date: 23/02/2017 Version: 2
Coordinate system: MGA94 Zone 52

NT Town Camp Infrastructure Assessments: Water

427 - Amangal Indigenous Village (Adelaide River)

7652

Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Civil_DDP.mxd 23/02/2017 12:02 Imagery: Digital Globe WV2 2013-2016

A3 scale: 1:2,500

0 20 40 60 80 100 m

Note:
Label numbers refer to survey IDs

Date: 23/02/2017 Version: 2
Coordinate system: MGA94 Zone 52

NT Town Camp Infrastructure Assessments
Road furniture, stormwater drainage & community structures
427 - Amangal Indigenous Village (Adelaide River)

7653

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:14:05 PM

Insp ID: 1844 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Stormwater Infrastructure:	Culverts
Culvert Type:	RCBC
Diameter (mm):	
Width (mm):	1200
Culvert Depth (mm):	60
Culvert Length (m):	10
Culvert Condition:	4 - Very Good
Culvert Blockage (%):	
Culvert Comments:	
Culvert Head Wall:	Yes
Safety Grate:	No
Headwall Blockage:	
Headwall Condition:	4 - Very Good
Headwall Comment:	
End Wall:	Yes
End Wall condition:	4 - Very Good
EW Comment:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:14:05 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:23:10 AM

Insp ID: 1861 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Stormwater Infrastructure:	Culverts
Culvert Type:	RCP
Diameter (mm):	350
Width (mm):	
Culvert Depth (mm):	
Culvert Length (m):	
Culvert Condition:	1 - Very Poor
Culvert Blockage (%):	90
Culvert Comments:	
Culvert Head Wall:	Yes
Safety Grate:	No
Headwall Blockage:	
Headwall Condition:	2 - Poor
Headwall Comment:	50
End Wall:	No
End Wall condition:	
EW Comment:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:23:10 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:32:17 PM

Insp ID: 1840 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Water Asset Are you Capturing: Fire Hydrants

Single or Double:	Single
Sluice Valve:	No
Above or Below ground:	Below ground
FH Leakage:	No Access
Bollards around hydrant:	Yes
FH Condition:	3 - Good
FH Comment:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:32:17 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:33:40 AM

Insp ID: 1851 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Water Asset Are you Capturing: Fire Hydrants

Single or Double:	Single
Sluice Valve:	No
Above or Below ground:	Below ground
FH Leakage:	No Access
Bollards around hydrant:	No
FH Condition:	3 - Good
FH Comment:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:42:17 PM

Insp ID: 1839 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Road Name:	Amangal Indigenous Village
What are you inspecting:	Pavements
Ch From (km):	0.2
Ch To (km):	0.25
Road Type:	Sealed - spray seal
Section Width (m):	4
Road Condition:	2 - Poor
General Comment:	

Road Defects Section

Defect Type	Defect QTY	Defect Condition	Defect Comments
Surfacing Cracks	5	3 - Good	Percent

Kerbs Section

Shoulders Section

Shoulder Type	Width	Dropoff(mm)	Erosion	Condition	Shoulder Comments
Unsealed		30			

Linemarking Section

Obstruction Section

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:42:17 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:42:17 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:27:22 PM

Insp ID: 1841 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Road Name:	Amangal Indigenous Village
What are you inspecting:	Pavements
Ch From (km):	0.25
Ch To (km):	0.5
Road Type:	Sealed - spray seal
Section Width (m):	3.8
Road Condition:	2 - Poor
General Comment:	

Road Defects Section

Defect Type	Defect QTY	Defect Condition	Defect Comments
Surfacing Cracks	5	2 - Poor	Percent
Edge Breaks	75	2 - Poor	

Kerbs Section

Shoulders Section

Shoulder Type	Width	Dropoff(mm)	Erosion	Condition	Shoulder Comments
Unsealed		40		3	

Linemarking Section

Obstruction Section

Northern Territory Town Camps

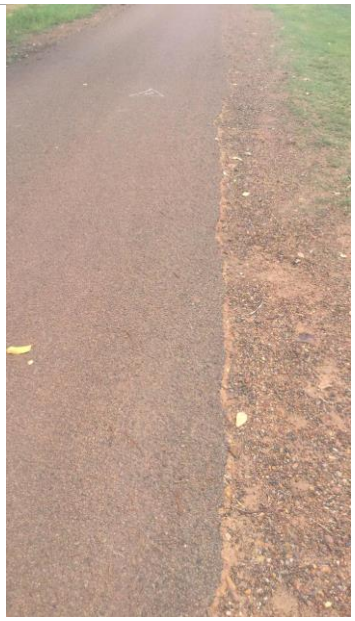
Civil Infrastructure

Inspection Date 9/12/2016 12:27:22 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:27:22 PM



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:10:19 PM

Insp ID: 1845 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Road Name:	Amangal Indigenous Village
What are you inspecting:	Pavements
Ch From (km):	0.5
Ch To (km):	0.75
Road Type:	Sealed - spray seal
Section Width (m):	3.8
Road Condition:	2 - Poor
General Comment:	

Road Defects Section

Defect Type	Defect QTY	Defect Condition	Defect Comments
Edge Breaks	75	1 - Very Poor	Percent
Surfacing Cracks	5	2 - Poor	Percent

Kerbs Section

Kerb Type	Kerb Cond	Kerb Comments
No kerb		

Shoulders Section

Shoulder Type	Width	Dropoff(mm)	Erosion	Condition	Shoulder Comments
Unsealed		80		2	

Linemarking Section

Obstruction Section

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:10:19 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:10:19 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:40:01 AM

Insp ID: 1848 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Road Name:	427_2
What are you inspecting:	Pavements
Ch From (km):	0
Ch To (km):	0.09
Road Type:	Sealed - asphalt
Section Width (m):	3.2
Road Condition:	1 - Very Poor
General Comment:	

Road Defects Section

Defect Type	Defect QTY	Defect Condition	Defect Comments
Surfacing Failure		1 - Very Poor	
Edge Breaks	20	2 - Poor	Percent
General Appearance		1 - Very Poor	

Kerbs Section

Kerb Type	Kerb Cond	Kerb Comments
No kerb		

Shoulders Section

Shoulder Type	Width	Dropoff(mm)	Erosion	Condition	Shoulder Comments
Unsealed		20			

Linemarking Section

Obstruction Section

Road Obstruction	Other Road Obstruction
other	Rubbish

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:40:01 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:40:01 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:13:10 AM

Insp ID: 1857 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Road Name:	427_2
What are you inspecting:	Pavements
Ch From (km):	0
Ch To (km):	0.27
Road Type:	Sealed - spray seal
Section Width (m):	3.8
Road Condition:	1 - Very Poor
General Comment:	Road was previously sealed however almost entirely broken

Road Defects Section

Defect Type	Defect QTY	Defect Condition	Defect Comments
Surfacing Failure	70	1 - Very Poor	

Kerbs Section

Kerb Type	Kerb Cond	Kerb Comments
No kerb		

Shoulders Section

Shoulder Type	Width	Dropoff(mm)	Erosion	Condition	Shoulder Comments
Unsealed					

Linemarking Section

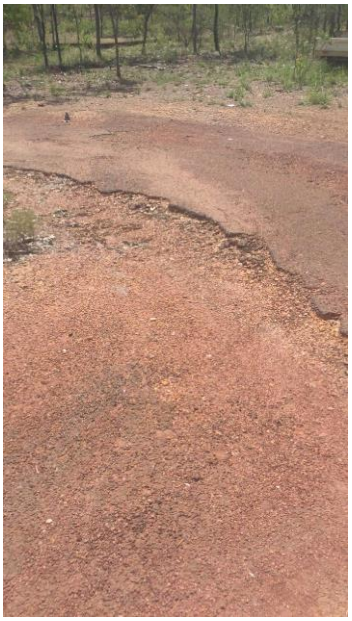
Obstruction Section

Road Obstruction	Other Road Obstruction
Trees	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:13:10 AM



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:13:10 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:28:37 AM

Insp ID: 1859 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Road Name:	Amangal Indigenous Village
What are you inspecting:	Pavements
Ch From (km):	0.75
Ch To (km):	0.88
Road Type:	Sealed - asphalt
Section Width (m):	3.8
Road Condition:	1 - Very Poor
General Comment:	

Road Defects Section

Defect Type	Defect QTY	Defect Condition	Defect Comments
Potholes	10	1 - Very Poor	Percent
Edge Breaks	20	1 - Very Poor	Percent

Kerbs Section

Kerb Type	Kerb Cond	Kerb Comments
No kerb		

Shoulders Section

Shoulder Type	Width	Dropoff(mm)	Erosion	Condition	Shoulder Comments
Unsealed		50		2	

Linemarking Section

Obstruction Section

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:28:37 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:28:37 AM

Northern Territory Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:08:20 PM

Insp ID: 1847 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Inspection Type:	Shade Structure
Shade Structure Type:	Play ground
Shade Floor Type:	Sand
Roof Type:	Not Covered
Width (mm):	12
Length (mm):	20
Appearance:	3
Appearance Comment:	
Condition:	4 - Very Good
Comment:	Shade cloth poles installed

Northern Territory Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:08:20 PM

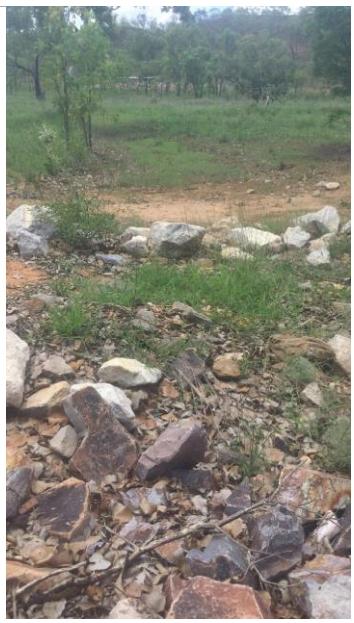
Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:19:46 PM

Insp ID: 1842 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Stormwater Infrastructure:	Swales
Type of lining:	Natural Grasses
Are dimensions uniform along drain:	Yes
Base Width (m):	3
Overall Width (m):	7
Swale Depth (m):	0.5
Length of Batter 1 (m):	2
Length of Batter 2 (m):	2
Swale Condition:	3 - Good
Swale Ponding:	No
Drain flooded at time of inspection:	No
Swale Comments:	Rock structure to dissipate energy



Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:19:46 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:20:03 PM

Insp ID: 1843 Group 1 - Darwin, Jabiru, Adelaide River Amangal

Stormwater Infrastructure:	Swales
Type of lining:	Natural Grasses
Are dimensions uniform along drain:	No
Base Width (m):	
Overall Width (m):	
Swale Depth (m):	2.5
Length of Batter 1 (m):	
Length of Batter 2 (m):	
Swale Condition:	1 - Very Poor
Swale Ponding:	No
Drain flooded at time of inspection:	No
Swale Comments:	Heavy erosion dimensions not indeterminable

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 12:20:03 PM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:27:07 AM

Insp ID: 1855 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Water Asset Are you Capturing: Taps

Diameter(mm):	25
Tap Leakage:	No
Tap Condition:	1 - Very Poor
Tap Comment:	No head, doesn't work

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:33:25 AM

Insp ID: 1850 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Water Asset Are you Capturing: Water Meter

Water Meter Type:	Lot
Bulk Water Meter Size (mm):	
Bulk Water Meter Condition:	
Bulk Water Meter Comment:	
Lot Number:	
Lot Water Meter Size:	25
Lot Water Meter Condition:	2 - Poor
Lot Water Meter Comment:	8 connected water meters inside box

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:33:25 AM

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:18:31 AM

Insp ID: 1858 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Water Asset Are you Capturing: Water Meter

Water Meter Type:	Lot
Bulk Water Meter Size (mm):	
Bulk Water Meter Condition:	
Bulk Water Meter Comment:	
Lot Number:	
Lot Water Meter Size:	25
Lot Water Meter Condition:	5 - Excellent
Lot Water Meter Comment:	

Northern Territory Town Camps

Civil Infrastructure

Inspection Date 9/12/2016 11:18:31 AM

Electrical inspection report

A3 scale: 1:2,500

0 20 40 60 80 100 m

Date: 23/02/2017 Version: 3

Coordinate system: MGA94 Zone 52

NT Town Camp Infrastructure Assessments: Electrical

427 - Amangal Indigenous Village (Adelaide River)

7691

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:37:30 PM

Insp ID: 1041 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Comms Category are you capturing:	Distribution
What is distribution method to households:	Underground
Is it Shared with PWC:	
Is there Anti-climb barrier provided for this pole:	
What is Pole construction type:	
Is street light fitted:	
Is there concrete collar around the base of pole:	
What is the condition of tap off to house:	
What is the condition of pole:	
How many Lots are connected to this pole:	
Is there access to Pits to take a photo:	No
What is Pit Condition:	3
Underground Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:07:03 PM

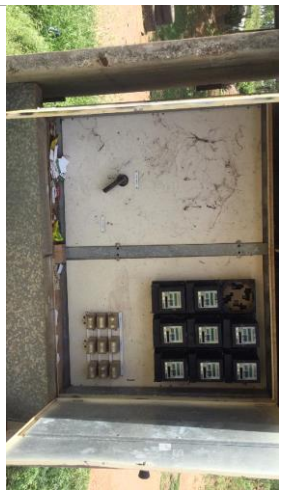
Insp ID: 1044 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Distribution Panel
What is Main Distribution Panel installation method:	Outdoor
Is the distribution panel labelled:	No
What is Distribution Panel main CB Rating:	
What is the main incoming cable type/Size to Distribution Panel:	
What is the condition of switchboard:	2
Condition Comments:	Concrete cover needs structural review
What is the condition of cables/glands into switchboard:	3
Cable/Gland Condition Comments:	
Distribution Panels name plate access:	No

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:07:03 PM



Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 11:54:26 AM

Insp ID: 1045 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Comms Category are you capturing:	Distribution
What is distribution method to households:	Underground
Is it Shared with PWC:	
Is there Anti-climb barrier provided for this pole:	
What is Pole construction type:	
Is street light fitted:	
Is there concrete collar around the base of pole:	
What is the condition of tap off to house:	
What is the condition of pole:	
How many Lots are connected to this pole:	
Is there access to Pits to take a photo:	No Access
What is Pit Condition:	3
Underground Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 17/11/2016 11:18:43 AM

Insp ID: 3306 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type:	Prepaid
Meter Switchboard Cond:	3
Meter Condition:	3
Meter Comment:	Needs Cleaning. 8 Digital Maters. Indoor SB, Cond 3
Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 17/11/2016 11:05:20 AM

Insp ID: 3307 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type: Prepaid

Meter Switchboard Cond: 3

Meter Condition: 3

Meter Comment: Needs Cleaning. 8 Digital Meters.

Comments:

Northern Territory Town Camps

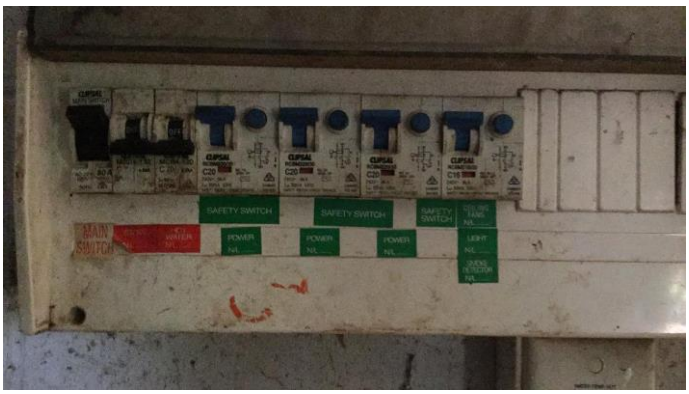
Electrical Infrastructure

Inspection Date 17/11/2016 11:45:17 AM

Insp ID: 3308 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type:	Prepaid
Meter Switchboard Cond:	2
Meter Condition:	3
Meter Comment:	Blank plates are missing on CB slot. Indoor SB, Cond 3
Comments:	



Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 17/11/2016 12:02:15 PM

Insp ID: 3309 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type: Prepaid

Meter Switchboard Cond: 3

Meter Condition: 3

Meter Comment: Needs Cleaning. 8 Digital Meters.

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 17/11/2016 12:16:04 PM

Insp ID: 3310 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type: Prepaid

Meter Switchboard Cond: 3

Meter Condition: 3

Meter Comment: Needs Cleaning. 8 Digital Maters.

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 17/11/2016 12:25:50 PM

Insp ID: 3311 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type:	Prepaid
Meter Switchboard Cond:	3
Meter Condition:	3
Meter Comment:	Needs Cleaning. 8 Digital Maters. Indoor SB, Cond 3
Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 17/11/2016 12:37:09 PM

Insp ID: 3312 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type: Prepaid

Meter Switchboard Cond: 3

Meter Condition: 3

Meter Comment: Needs Cleaning. 8 Digital Maters

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 17/11/2016 12:57:42 PM

Insp ID: 3313 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type:	Prepaid
Meter Switchboard Cond:	3
Meter Condition:	3
Meter Comment:	Indoor SB, Cond 3
Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 17/11/2016 1:17:04 PM

Insp ID: 3314 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing: Electrical Meters

Meter Type: Prepaid

Meter Switchboard Cond: 3

Meter Condition: 3

Meter Comment:

Comments:

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:11:47 PM

Insp ID: 1037 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Welded
What is the condition of pole:	3
How is the pole planted:	Concrete
What is the Condition of plant:	3
Is street light fitted:	No
Street Light Power Supply:	
Street Light Type	
Street Light Watts	
Street Light Condition	
Street Light Height	
What is the type of service:	Three
What is the HV voltage level:	
What is the arrangement of connected cables:	Twisted
Are there isolators on the pole:	No
What is the Condition:	
How many Lots are connected to this pole:	
Overhead Pole Comments:	No ID

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:11:47 PM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:09:04 PM

Insp ID: 1038 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Welded
What is the condition of pole:	3
How is the pole planted:	Concrete
What is the Condition of plant:	3
Is street light fitted:	Yes
Street Light Power Supply:	
Street Light Type	Unknown
Street Light Watts	
Street Light Condition	3
Street Light Height	
What is the type of service:	Three
What is the HV voltage level:	
What is the arrangement of connected cables:	Twisted
Are there isolators on the pole:	No
What is the Condition:	
How many Lots are connected to this pole:	
Overhead Pole Comments:	No ID

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:09:04 PM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:04:29 PM

Insp ID: 1039 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Welded
What is the condition of pole:	3
How is the pole planted:	Concrete
What is the Condition of plant:	3
Is street light fitted:	No
Street Light Power Supply:	
Street Light Type	
Street Light Watts	
Street Light Condition	
Street Light Height	
What is the type of service:	Three
What is the HV voltage level:	
What is the arrangement of connected cables:	Twisted
Are there isolators on the pole:	No
What is the Condition:	
How many Lots are connected to this pole:	2
Overhead Pole Comments:	No ID

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:04:29 PM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:01:40 PM

Insp ID: 1040 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Welded
What is the condition of pole:	3
How is the pole planted:	Concrete
What is the Condition of plant:	3
Is street light fitted:	No
Street Light Power Supply:	
Street Light Type	
Street Light Watts	
Street Light Condition	
Street Light Height	
What is the type of service:	Three
What is the HV voltage level:	
What is the arrangement of connected cables:	Twisted
Are there isolators on the pole:	No
What is the Condition:	
How many Lots are connected to this pole:	
Overhead Pole Comments:	No ID

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:01:40 PM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:20:46 PM

Insp ID: 1042 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Welded
What is the condition of pole:	3
How is the pole planted:	Concrete
What is the Condition of plant:	3
Is street light fitted:	Yes
Street Light Power Supply:	
Street Light Type	M80 D 04
Street Light Watts	
Street Light Condition	3
Street Light Height	
What is the type of service:	Three
What is the HV voltage level:	
What is the arrangement of connected cables:	Twisted
Are there isolators on the pole:	No
What is the Condition:	
How many Lots are connected to this pole:	
Overhead Pole Comments:	Vegetation needs clearing

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:20:46 PM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:17:05 PM

Insp ID: 1043 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Welded
What is the condition of pole:	3
How is the pole planted:	Concrete
What is the Condition of plant:	3
Is street light fitted:	Yes
Street Light Power Supply:	
Street Light Type	M80 D 04
Street Light Watts	
Street Light Condition	2
Street Light Height	
What is the type of service:	Three
What is the HV voltage level:	
What is the arrangement of connected cables:	Twisted
Are there isolators on the pole:	No
What is the Condition:	
How many Lots are connected to this pole:	
Overhead Pole Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:17:05 PM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 11:46:29 AM

Insp ID: 1046 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Welded
What is the condition of pole:	3
How is the pole planted:	Direct
What is the Condition of plant:	3
Is street light fitted:	
Street Light Power Supply:	
Street Light Type	
Street Light Watts	
Street Light Condition	
Street Light Height	
What is the type of service:	
What is the HV voltage level:	
What is the arrangement of connected cables:	
Are there isolators on the pole:	Yes
What is the Condition:	
How many Lots are connected to this pole:	
Overhead Pole Comments:	Disconnected no service required

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 11:46:29 AM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:28:44 PM

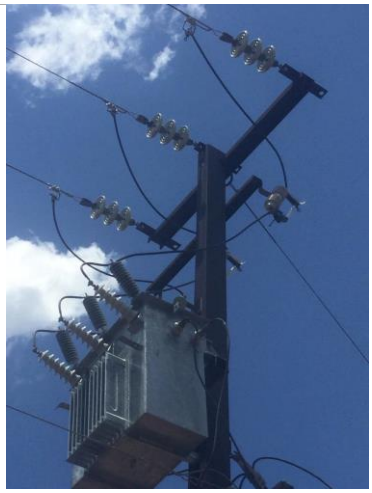
Insp ID: 1069 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
What is Pole Material type:	Welded
What is the condition of pole:	3
How is the pole planted:	Concrete
What is the Condition of plant:	3
Is street light fitted:	No
Street Light Power Supply:	
Street Light Type	
Street Light Watts	
Street Light Condition	
Street Light Height	
What is the type of service:	Combined
What is the HV voltage level:	
What is the arrangement of connected cables:	Parallel
Are there isolators on the pole:	Yes
What is the Condition:	3
How many Lots are connected to this pole:	
Overhead Pole Comments:	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:28:44 PM



Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 1:09:04 PM

Insp ID: 1038 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
Is street light fitted:	Yes
Street Light Power Supply:	
Street Light Type	Unknown
Street Light Watts	
Street Light Condition	3
Street Light Height	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:20:46 PM

Insp ID: 1042 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
Is street light fitted:	Yes
Street Light Power Supply:	
Street Light Type	M80 D 04
Street Light Watts	
Street Light Condition	3
Street Light Height	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:20:46 PM

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:17:05 PM

Insp ID: 1043 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Overhead Poles
Is street light fitted:	Yes
Street Light Power Supply:	
Street Light Type	M80 D 04
Street Light Watts	
Street Light Condition	2
Street Light Height	

Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:17:05 PM

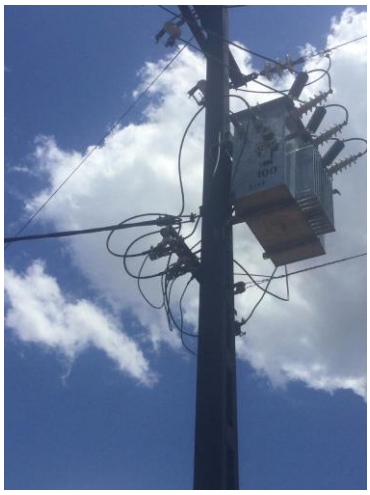
Northern Territory Town Camps

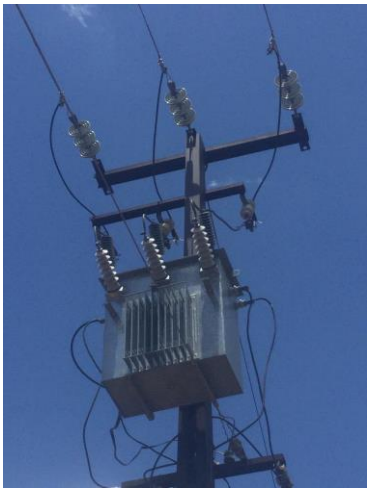
Electrical Infrastructure

Inspection Date 9/12/2016 12:33:25 PM

Insp ID: 1068 Group 1 - Darwin, Jabiru, Adelaide River Amangal

What Category are you capturing:	Transformers
What is Transformer installation method:	Pole
If method know:	11SS1P
What is the condition of the mounting:	3
What is Transformer Rating:	
Is there access to transformers name plate to take a photo:	No Access
What is the condition of transformer:	3
What is cable type to transformer:	
What is cable size to transformer:	
Is there switch gear or fusing associated with the transformer:	Drop out fuses
Transformer Comment:	

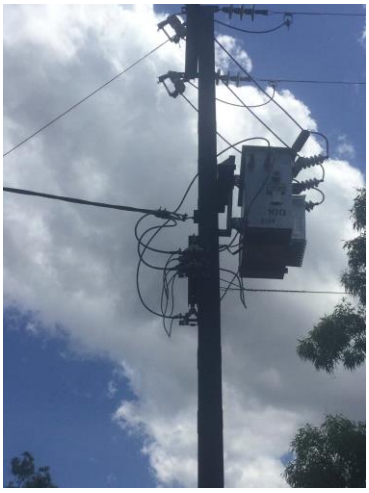




Northern Territory Town Camps

Electrical Infrastructure

Inspection Date 9/12/2016 12:33:25 PM



Road map

Map by: DMcP P:\GIS\Projects\253963_NT_Town_Camps\253963_003_Roads_DDP2.mxd 11/02/2017 17:17 Imagery: copyright DigitalGlobe WV 2

A3 scale: 1:2,500

0 20 40 60 80 100 m

Date: 11/02/2017 Version: 1

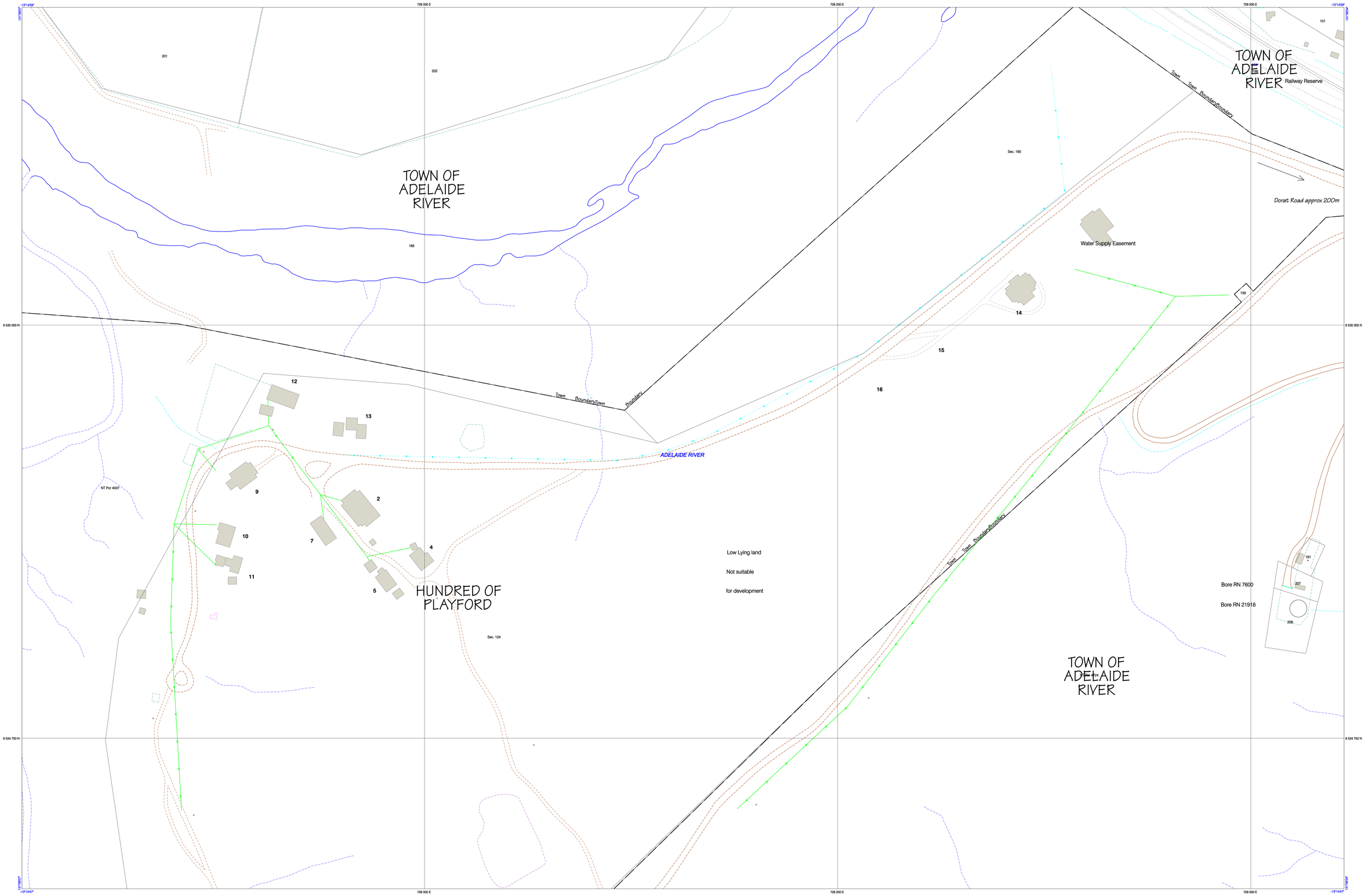
Coordinate system: GDA 1994

NT Town Camp Road Assessments

427 - Amangal Indigenous Village (Adelaide River)

7729

Existing drawings



LAND USE PLANNING:

APPROX. POSITION OF BUILDING constructed since date of photography

LAND EXCLUDED FROM DEVELOPMENT:

GENERAL EXCLUSION/BUFFERS

CULTURAL EXCLUSION AREAS:

Unauthorised entry, works on or use of land where there is a sacred site is an offence under the Northern Territory Aboriginal Sacred Sites Act. For conditions relating to works on or use of land within a Cultural Exclusion Area contact the Aboriginal Areas Protection Authority (AAPA) email enquiries.aapa@nt.gov.au or phone 8999 4332.

This advice does not negate the need for consent for entry, works, or use which may be required under the Aboriginal Land Rights(NT) Act (in the case of Aboriginal land), or another statute.

CADASTRE

Current 123

Proposed 123

Locality LOCALITY

UTILITY SERVICES

ELECTRICITY

LOW VOLTAGE LV

HIGH VOLTAGE HV

WATER RETICULATION

WATER MAIN W

WATER RISING MAIN W

SEWER S

SEWER MAIN S S

SEWER RISING MAIN

LEGEND

TOPOGRAPHY

Road Sealed, Bridge

Road Unsealed, Track

Footpath, Drain, Culvert

Wall, Gate, Fence, Cattle Grid

Railway, Disused Railway

Aerodrome Tarmac, Landing Strip

Taxiway, Apron

Pipeline: Oil, Water, Undetermined Gas, Sewage

Building, Building-Shape unconfirmed

Shade Structure, Incomplete Building

Sewage Ponds, Tailings Pond

Oval, Arena, Swimming Pool

High Water Mark, Low Water Mark

Mine, Quarry, Surface Excavation

Contour; Index, Intermediate 25

Contour; Depression

Top of Bank, Bottom of Bank, Cliff

Watercourse; Perennial, Intermittent, Channel or Canal

WaterBodies; Perennial, Intermittent

WaterBodies; Reservoir, Water Hole

Swamp; Swamp Perennial, Swamp Intermittent

Flat; Mud Flat, Clay/Saltpan, STI

Pole; Power, General, Light

Tank; Water, Elevated, Non-Water, Silo

Manhole, Pylon, Communication Tower, Bore.

AVAILABLE FROM AND PRODUCED BY:

Northern Territory Government

NOTES:

POWER POLES, MANHOLES, SEPTIC TANKS, TOWERS/PYLONS and other similar shaped objects are plotted from aerial photography and have their locations confirmed from aerial survey techniques.

These features are suitable as LOCAL SURVEY CONTROL. Their ground location is expected to be within +/-0.3m of their mapped location.

DIAL BEFORE YOU DIG phone 1100 (freecall) or visit www.1100.com.au

For water, sewer, and power information and connection requirements for Indigenous Community Land, Power and Water Corporation, Indigenous Community Development on 1800 245 092, and visit http://www.powerwater.com.au/business

General enquiries, corrections, updates, errors and omissions:

Indigenous Community Land Use Planning, NT Dept of Lands and Planning

TEL: (08) 8999 1300, FAX: (08) 8999 7189, Email: planning@nt.gov.au

Topographic Information:
Land Information Division
Dept of Lands and Planning
TEL: (08) 8995 5331, FAX: (08) 8995 5366
Email: landinfo.dpl@nt.gov.au

Cadastral Information:
Office of the Surveyor-General
Dept of Lands and Planning
TEL: (08) 8995 5353, FAX: (08) 8995 5395
Email: landinfo.dpl@nt.gov.au

Power, Water or Sewer Information:
Remote Operations Planning Branch
Power and Water Corporation
TEL: (08) 8924 5594, FAX: (08) 8924 5360

Aboriginal Areas Protection Authority:
The Registrar
Aboriginal Areas Protection Authority
TEL: (08) 8999 4332
Email: enquiries.aapa@nt.gov.au

Planning Information:
Indigenous Community Land Use Planning
Dept of Lands and Planning
TEL: (08) 8999 1300, FAX: (08) 8999 7189
Email: planning@nt.gov.au

Housing Infrastructure Information:
Infrastructure Delivery Branch
Dept of Housing, Local Government, and Regional Services
TEL: (08) 8995 5013, FAX: (08) 8995 5110
Email: tex.dhlgrs@nt.gov.au

SOURCE INFORMATION

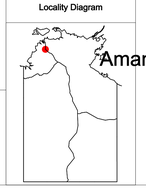
CONTOUR INTERVAL :		CURRENCY OF TOPOGRAPHY :	27 May 2009
HORIZONTAL DATUM :		SOURCE MAP SCALE :	2500
VERTICAL DATUM :		ZONE UTM :	52
PROJECTION :	Transverse Mercator	DATE GENERATED :	18 June 2012

N

GDA

0 20 40 60 80 100

Locality Diagram



SERVICED LAND AVAILABILITY PROGRAM

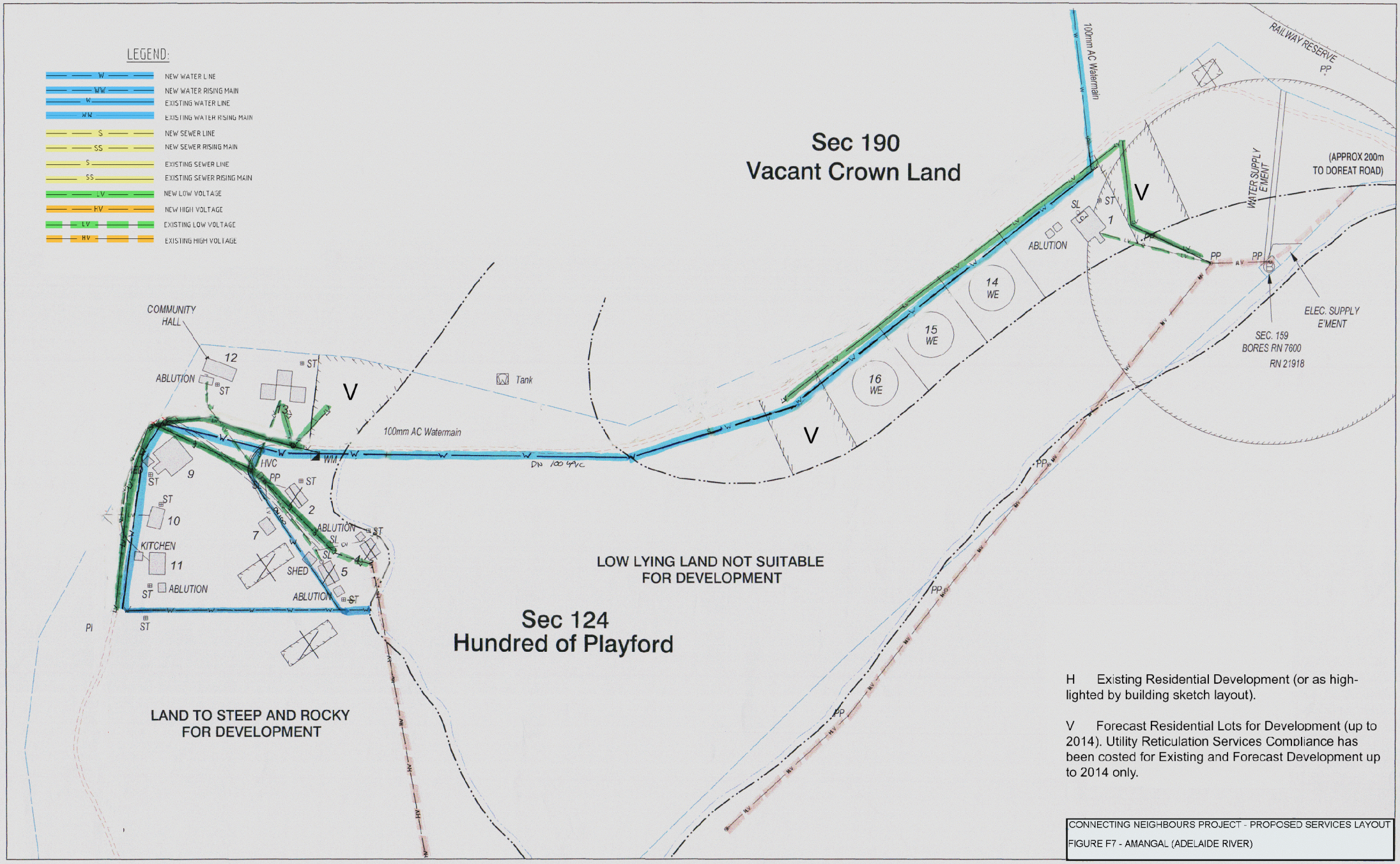
SLAP Map

Amangal Indigenous Village (Adelaide River Town Camp)

Adelaide River Town Camp

Coomalie Community Council

Community ID: 427



SCALE 1:2000

40 20 0 40 80

Metres

N

Northern Territory Government

Department of Community Development, Sport & Cultural Affairs

PREPARED BY DEPARTMENT OF INFRASTRUCTURE, PLANNING AND ENVIRONMENT

REFERENCE DRAWINGS

SURVEYED : WILLING & PARTNERS 11/7/00

AMENDMENTS

No.	Date	Description	Authorised
1	May 03	Proposed New Lots 14 to 16 Added	N. Thorpe
2	JUL 03	Lots 13,14,15 changed to one lot 13	N. Thorpe
3			
		Plan Last Updated by BQ5 on the 15/7/03	

ABORIGINAL DEVELOPMENT FOUNDATION

(LOCALITY)

COMMUNITY MAP

AMANGAL

(ADELAIDE RIVER TOWN CAMP)

427

POINT CO-ORDINATE TABLE		
POINT	EASTING	NORTHING
STATION 1	728397.983	8535100.976
STATION 2	728269.365	8534974.192
STATION 3	728129.412	8534916.523
B1 - DN 100 DIFBL 11 1/4 ° BEND - CH 5.74	728393.452	8535176.642
B2 - DN 100 DIFBL 45 ° BEND - CH.99.24	728382.799	8535083.738
FIRE HYDRANT CH 151.42	728342.309	8535050.828
B3 - DN 100 DIFBLE 45° BEND - CH 216.09	728292.124	8535010.039
B4 - DN 100 DIFBLE 45° BEND - CH. 234.47	728290.236	8534991.758
LOT MP 1	728368.531	8535050.999
LOT MP 2	728390.607	8535023.838
LOT MP 3	728367.327	8535004.917
LOT MP 4	728344.047	8534985.995
LOT MP 5	728320.766	8534967.073
LOT MP 6	728298.691	8534994.233
LOT MP 7	728321.971	8535013.155
LOT MP 8	728345.251	8535032.077

NEW DN100 uPVC WATER MAIN CONNECT TO EXISTING WATER ARRANGMENT. CH. 0.00 CONFIRM CONNECTION ARRANGEMENT ON SITE WITH SUPERINTEND PRIOR TO START OF WORKS

Existing Water Meter & Valves

DN 100 DIFBL 11¼° BEND WITH THRUST BLOCK AND CONCRETE FIELD MARKER REFER TO POWER AND WATER STANDARD DRAWINGS W1-2-03H/1 AND W1-2-05 CH. 5.74

CAP OFF AND ABANDON REDUNDANT WATER AC PIPELINE

1.5m CLEAR OF EXISTING MAIN

STATION NO. 1
728397.983 E
8535100.976 N
R.L. 52.155

DN 100 DIFBL 45° BEND WITH THRUST BLOCK AND CONCRETE FIELD MARKER. REFER TO POWER AND WATER STANDARD DRAWINGS W1-2-03H/1 AND W1-2-05. CH. 99.24

NEW DN100 uPVC WATER MAIN. WITH TYPE 1 EMBEDMENT. (REFER TO SPECIFCATION)

CH. 0.00 NEW BS 750 SCREW-DOWN HYDRANT WITH CONCRETE SURROUND REFER TO STANDARD DRAWING W1-2-03A/1 CH. 151.42

EXISTING EARTHWORKS CONTRACTOR TO CONFIRM FSL AND INSTALL LOT MARKER POST REFER TO STANDARD DRAWING W1-6-05

DN 100 DIFBL 45° BEND WITH THRUST BLOCK AND CONCRETE FIELD MARKER. REFER TO POWER AND WATER STANDARD DRAWINGS W1-2-03H/1 AND W1-2-05. CH. 216.09

REINSTATE EXISTING GRAVEL ROAD

DN 100 DIFBL 45° BEND WITH THRUST BLOCK AND CONCRETE FIELD MARKER. REFER TO POWER AND WATER STANDARD DRAWINGS W1-2-03H/1 AND W1-2-05. CONNECTION TO EXISTING MAIN. CH. 234.47

DESIGN F.S.L. 52.80

DN 32 PE DUAL WATER SERVICE REFER TO STANDARD DRAWING W1-1-05/3.

DN 25 PE WATER SERVICE REFER TO STANDARD DRAWING W1-1-05/3.

NEW LOT MARKER POSTS REFER TO STANDARD DRAWING W1-6-05 (TYPICAL) CONFIRM LOCATION ON SITE WITH SUPERINTENDENT

STATION NO. 2
728269.365 E
8534974.192 N
R.L. 52.510

Stn.1 52.155

Stn.2 52.510

F.H.

MP 1 2 3 4 5 6 7 8

14 15 16

TOP CAMP

Track

Gate Post

Septic Tank

Toilet

Building FFL 52.59

Shed FFL 52.36

Septic Tank Top 52.25

Steps

Unknown Pole

Water Marker Post

Centreline Unsealed Road

Swampy Ground

Scattered Trees

Bitumen

Bollard

Power Pole

Elec. Stay Wire

Water Supply Easement

Powerline Easement

Elec. Transformer

Fence

Lot 159

Water Bore (RN 21118)

Track

N

10m 0 10m 20m 30m 40m 50m

$DATES	$TIMES	$FILES

No.	DESCRIPTION	DATE	INIT.
0	ISSUED FOR CONSTRUCTION	10/9/04	D.A.
A	ISSUED FOR 90% DESIGN REVIEW	6/9/04	D.A.

AMENDMENTS

INDIGENOUS HOUSING AUTHORITY OF THE NORTHERN TERRITORY

DRAWN	CHECKED
D.A.	D.A.
DATE July 2004	DATE Sept. 2004
DESIGNED	CHECKED
D Annesley	B Meelky
DATE July 2004	DATE Sept. 2004
DESIGN PROJECT LEADER	PROJECT OFFICER
DATE	DATE

Northern Territory Government
Department of Infrastructure, Planning and Environment

AMANGAL - ADELAIDE RIVER
SERVICES TO LOTS 14, 15 AND 16 TOP CAMP AND UPGRADE DRAINAGE IN BOTTOM CAMP

WATER MAIN SETTING OUT PLAN

FILE No.	ASSET No.	SHEET No.	DRAWING No.	AMEND.	SHEET SIZE
ALD 38110		2 OF 5	B04-5750	0	A1

7733

E:\working\B045750.dgn 14/09/2004 1:16:04 PM

Transformer data

Group	Com Id	Location	Community Name	Dwellings No. (Funded Dwellings)	Dwellings No. (Bennett Design)	New Houses ** (Future Demand)	Primary Volatge Level (KV)	PWC Substation ID	PWC Test Number	Transformer size (KVA)	KVA Total dwellings @ 4.5KVA	KVA Total dwellings @ 7KVA	Comments
1	290	Darwin	Bagot	55	55		11	1924	1735	300	247.5	385	
	344	Darwin	Knuckey Lagoons	18	19	2	11	1771	2163	100	85.5	133	
	347	Darwin	Kulaluk	19	19		11	1092	10607	50	85.5	133	
	403	Darwin	Palmerston Town Camp	20	16		22	10196	10245	100	90	140	Two transformers for this Town Camp. Transformers are not in boundary of Town Camp [The nearest transformers data to Town Camp are highlighted in yellow].
							22	265	11645	25			
	412	Darwin	Railway Dam (One Mile Dam)	5	6	2	11	1041	4378	200	27	42	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	427	Adelaide River	Amangal	9	9		22	216	12187	100	40.5	63	Two transformers for this Town Camp.
							22	184	5646	63			
	687	Jabiru	Manabadurma	10	12		11	5050	11107	200	54	84	
	825	Darwin	Minmarama Park	24	24		11	2147	11372	100	108	168	
2	606	Katherine	Warlpiri Transient Camp	9	9		22	6416	4886	100	40.5	63	Two transformers for this Town Camp.
							22	6074	4695	25			
	621	Katherine	Miali Brumby (Kalano)	47	31		22	6133	12247	315	211.5	329	
	640	Pine Creek	Pine Creek Compound	4	4		22	6666	3147	25	18	28	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	971	Mataranka	Mulggan	12	9	4	22	6819	5296	16	54	84	
							22	6818	5297	16			
							22	6384	11028	25			
3	215	Tennant Creek	Blueberry Hill (Munji-Marla)	2	2		22	7079	1868	200	9	14	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	223	Tennant Creek	Dump Camp (Marla-Marla)	7	7		22	7181	11088	200	31.5	49	
	224	Elliott	Elliott South Camp	12	12		11	7504	4718	200	54	84	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	225	Elliott	Elliott North Camp	36	25		11	7505	4715	100	162	252	
	238	Tennant Creek	Kargaru (East Side Camp)	12	12	1	22	7572		200	54	84	
	246	Tennant Creek	Ngalpa Ngalpa	18	21		22	7179		200	94.5	147	Two transformers for this Town Camp.
							22	7033	10904	315			
	271	Tennant Creek	Village Camp	12	12	1	22	7183	11107	200	54	84	
	681	Tennant Creek	Tingkarli	12	12		22	7180		200	54	84	
	684	Tennant Creek	Wuppa	15	15	1	22	7141	11092	100	67.5	105	Two transformers for this Town Camp.
							22	7182	11095	200			
4	3	Alice Springs	Akngwertnarre (Morris Soak)	11	15		11	8596	11336	300	67.5	105	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	16	Alice Springs	Anthelk Ewlpaye (Charles Creek)	17	10		11	8569		315	76.5	119	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	17	Alice Springs	Anthepe	15	15		22	8598	5874	200	67.5	105	Data extracted from PWC asset information. There was not access to this Town Camp due to ceremony on inspection day.
							22	8597	11244	315			
	19	Alice Springs	Aper Alwerrknge (Palmers)	7	6		11	8405	2939	200	31.5	49	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	35	Alice Springs	Ewyenper Atwatye (Hidden Valley)	47	47		11	8622	11202	100	211.5	329	
							11	8623	11203	100			
							22	8625	11205	63			
							11	8626	11204	100			
	47	Alice Springs	Ilparpa	13	13		22	8611	11702	200	58.5	91	
	48	Alice Springs	Ilperle Tyathe (Walpiri)	10	9		11	8001	11209	315	45	70	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	50	Alice Springs	Ilyperenye (Old Timers)	10	10		22	8145	3323	100	45	70	
	64	Alice Springs	Bassos	2	2		11	8002	10946	50	9	14	
	69	Alice Springs	Karnte	19	19		22	8282	2345	100	85.5	133	
	87	Alice Springs	Yarrenty Altere (Larapinta Valley)	34	34		11	8617	11334	100	153	238	
							11	8618	11200	63			
							11	8619	11335	100			
							11	8620	11201	100			
	90	Alice Springs	Inarlenge (Little Sisters)	16	22		22	8137	2925	100	99	154	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	108	Alice Springs	Mpwetyerre (Abbotts)	6	6		11	8093	11703	315	27	42	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
	113	Alice Springs	Mount Nancy (Nyewente)	11	12		11	8405	2939	200	54	84	
	129	Alice Springs	Nyewente (Trucking Yards)	26	26		11	8629	11312	300	117	182	
	675	Alice Springs	Hoppys	15	19						85.5	133	There is not any Transformer in boundary of Town Camp. Also it's not shown in PWC asset information.
	676	Alice Springs	Ilpiye Ilpiye (Golders Camp)	15	14		11	8314	369	50	67.5	105	
	1029	Alice Springs	Kunoth	4	4		11	8569		315	18	28	Transformer is not in boundary of Town Camp [The nearest transformer data to Town Camp is highlighted in yellow].
5	222	Borroloola	Mara	28	29	2	11	6187	12610	100	130.5	203	Two transformers for this Town Camp.
							11	6545	10203				
	229	Borroloola	Garawa 1	16	14		11	6546	10166	100	72	112	Two transformers for this Town Camp.
							11	6332	4890	100			
	278	Borroloola	Yanyula	29	29		11	6162	10496	200	130.5	203	Data extracted from PWC asset information. It's outside of Twon Camp, shown only Transformer to this Town Camp.
							11		10167				This transformer is not shown in PWC asset information. It's installed in Boat Ramp Road near to Town Camp and connected to Electrical reticulation of Town Camp.
	992	Borroloola	Garawa 2	11	11		11	6189	2669	25	49.5	77	

** For New house's demand calculation see section 13.4 "Future Demand".