Date of Publication : 04 March 2004 - djt
Digital Photography : DOLA - January 2002

Hutchison Telecoms - Sites
Kallaroo Park - Mullaloo

Prepared by City of Joondalup : Planning and Community Development - Urban Design, Cartographic Section.

DRAWING SCHEDULE - L2 - 602707C

		DATE OF ISSUE
		05/08/03
ARCHITECTURAL DRAWINGS		
A01	SITE LOCALITY PLAN	A
A02	SITE SETOUT PLAN	A
A03	SITE ELEVATION	A
A04	NOMINAL EME ZONES	A
LEASE DRAWINGS		
STRUCTURAL DRAWINGS		
ELECTRICAL DRAWINGS		
OCCUPATIONAL HEALTH & SAFETY DRAWINGS		
DISTRIBUTION		
	HUTCHISON - WA SITE DESIGN MANAGER	1P 1P
	VENDOR	
	LEGAL	

Hutchison Telecoms

Site Name : MULLALOO
Site Number : 602707C
Site Address : GRADIENT PARK
KALLAROO PLACE
MULLALOO WA 6027

AMG66 Easting: 381 876
Northing: 6 482 999
Access Details : ACCESS TRACK OFF KALLAROO PLACE
Contact Name: T.B.C.
Contact Number : T.B.C.

Sign off

H3GA

	SIGNATURE	DATE
State P.M. Sign		
State D.M. Sign		
Site Ac. Sign		
R.F. Sign		
T.X. Sign		

SITE DESIGN

P.M. Sign		5/8/03
Site Eng. Sign		5/8/03

VENDOR LOGO

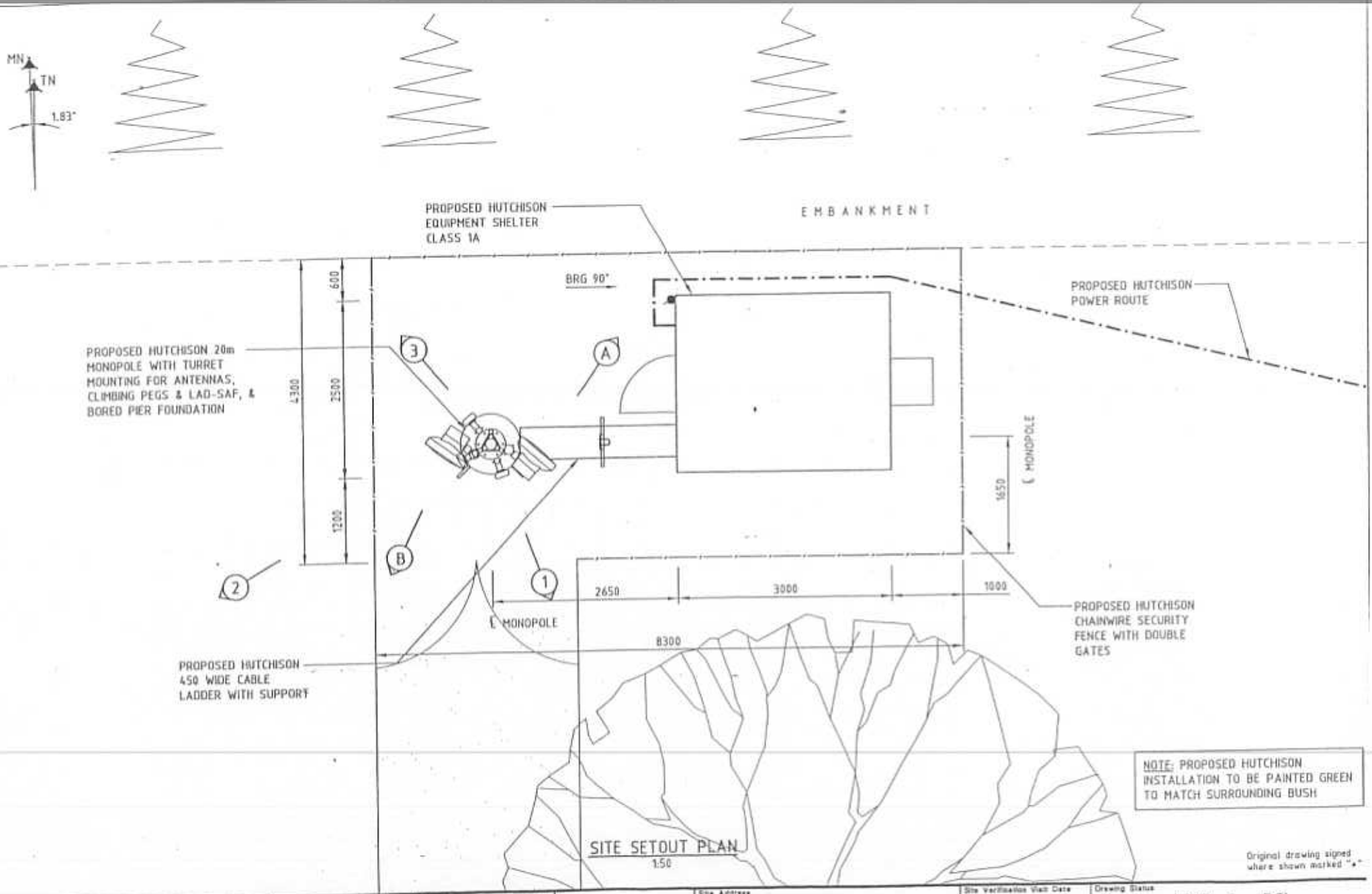
SINCLAIR KNIGHT MERZ

Issued By : _____

Received By : _____

ATTACHMENT : 2

PAGE No : 1



SITE SETOUT PLAN
1:50

NOTE: PROPOSED HUTCHISON INSTALLATION TO BE PAINTED GREEN TO MATCH SURROUNDING BUSH

Original drawing signed where shown marked "•"

rev.	date	app'd	amendment
A	5/12	AB	LEVEL 2 - DSL

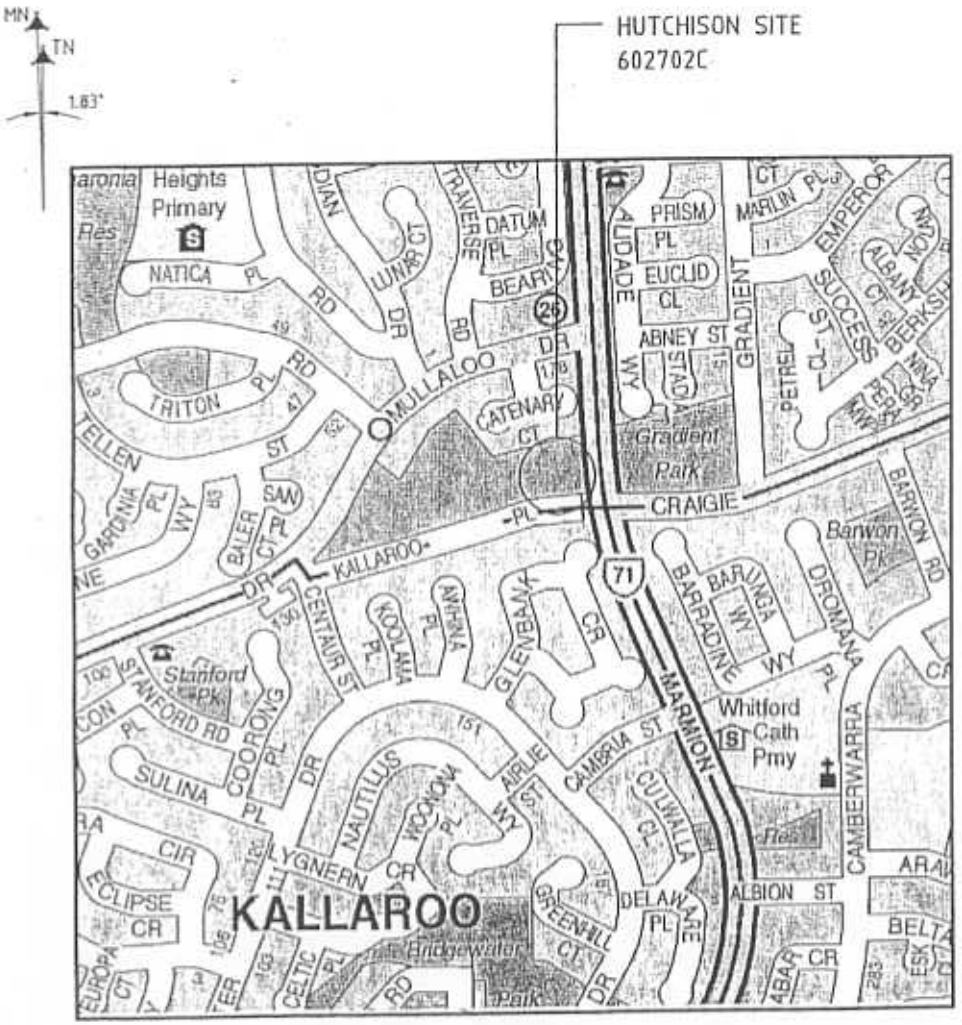
SINCLAIR KNIGHT MERZ
Sinclair Knight Merz Pty. Ltd.
ACN 001 024 096
7th Floor, Durack Centre
263 Adelaide Terrace Perth
WA 6001 Australia
Telephone (08) 9268 4400
Facsimile (08) 9268 4488

Hutchison Telecoms

Site Address
GRADIENT PARK
KALLAROO PLACE
HULLALOO WA 6027

Drawing Title
SITE SETOUT PLAN

Site Verification Visit Date	28/11/02
Search Ring Name	HULLALOO
Search Ring No.	602707C
Drg. No.	A02
Drawing Status	LEVEL 2 - DSL
Drawn	N FALCIONE
Drawing Check	AB
Engineering Check	AB
Approved	AB 5/12/02
Scale	AS SHOWN
Rev.	A

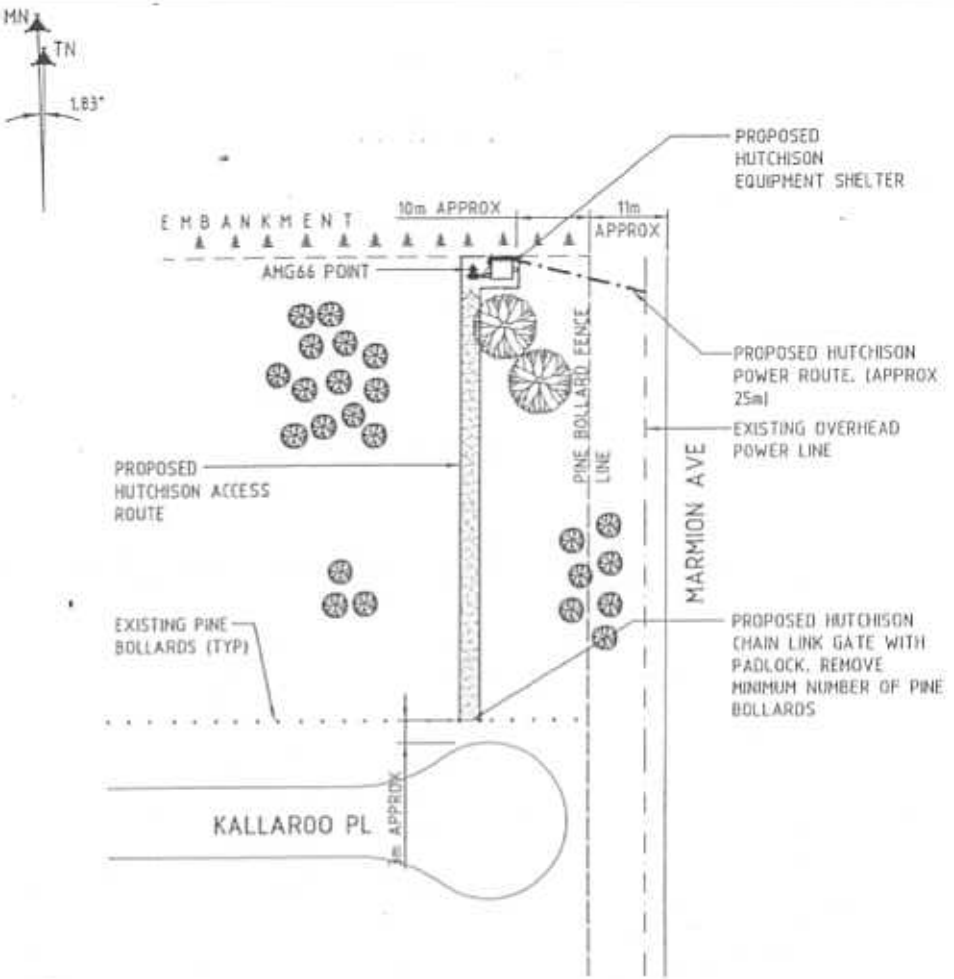


LOCALITY PLAN

UBD PERTH 2001

"REPRODUCED WITH PERMISSION OF UBD COPYRIGHT UNIVERSAL PRESS P/L 2001"

MAP: 185
GRID REFERENCE: N1
SCALE: N.T.S.



SITE LOCATION PLAN

1:750

Original drawing signed where shown marked "+"

rev.	date	app'd	amendment
A	5/12	AB	LEVEL 2 - DSL

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Hutchison Telecoms

Site Address
GRADIENT PARK
KALLAROO PLACE
MULLALOO WA 6027

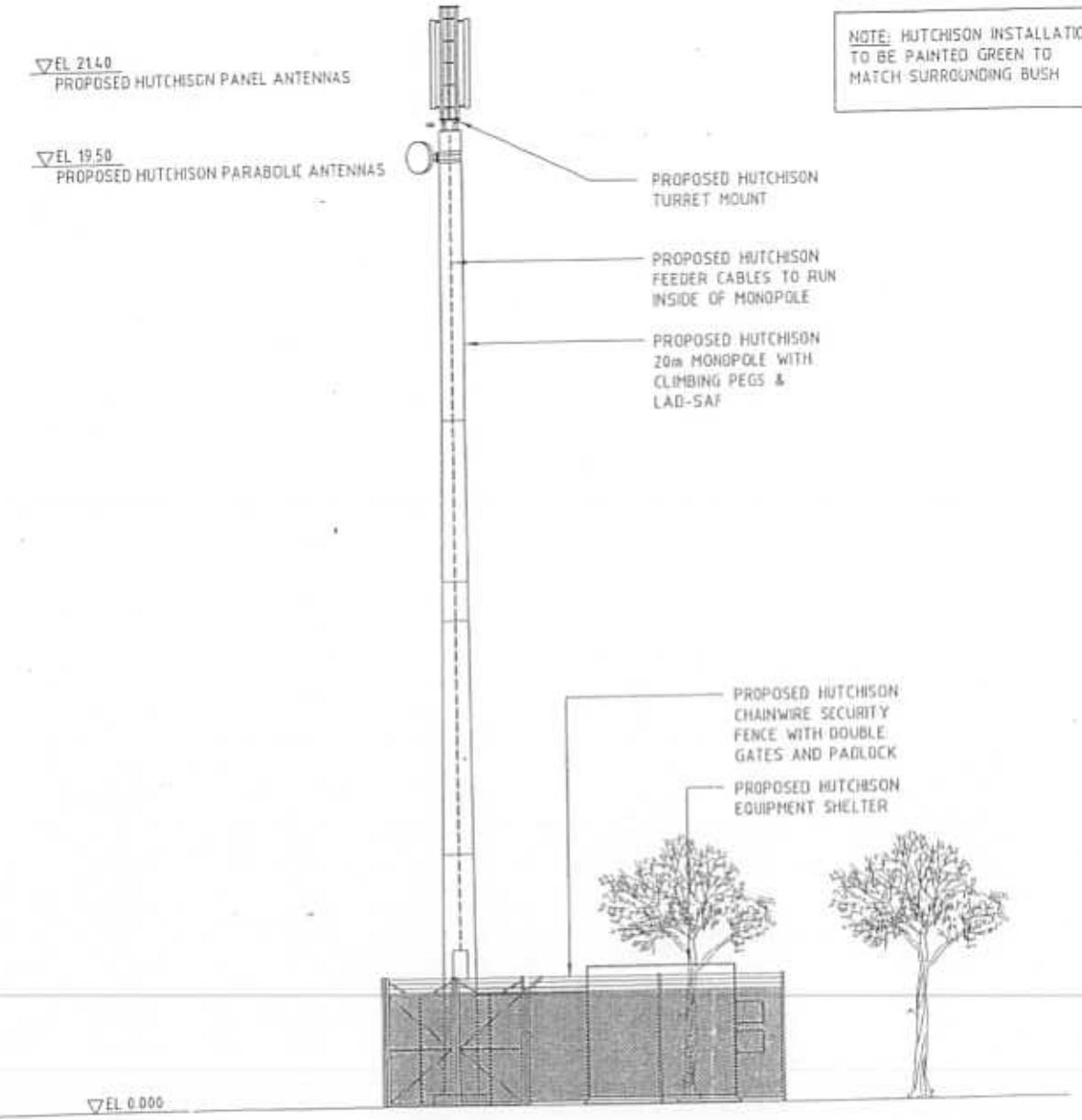
Drawing Title
SITE LOCALITY PLAN

Site Verification Visit Date	28/11/02
Search Ring Name	MULLALOO
Search Ring No.	602707C
Drg. No.	A01
Drawing Status	LEVEL 2 - DSL
Drawn	N FALCIONE
Drawing Check	
Engineering Check	
Approved	5/12/03
Scale	AS SHOWN
Rev.	A

PROPOSED HUTCHISON ANTENNA/PARABOLIC CONFIGURATION					
SECTOR	TYPE	ORIENTATION	ELEVATION HEIGHT (m)	FEEDER SIZE	FEEDER LENGTH (m)
SECTOR 1	1 x APXV18-206517L	160°	21.40	7/8"	20.5
SECTOR 2	1 x APXV18-206517L	240°	21.40	7/8"	20.5
SECTOR 3	1 x APXV18-206517L	320°	21.40	7/8"	20.5
PARABOLIC A	1 x Ø600 PARABOLIC	T.B.C.	19.5	5/8"	19.5
PARABOLIC B	1 x Ø600 PARABOLIC	T.B.C.	19.5	5/8"	19.5

*ELEVATION HEIGHTS AND CABLE FEEDER LENGTHS ARE APPROXIMATE ONLY.

NOTE: HUTCHISON INSTALLATION TO BE PAINTED GREEN TO MATCH SURROUNDING BUSH



SOUTH ELEVATION
1:100

Original drawing signed where shown marked "*"

rev.	date	app'd	amendment
A	5/12	RB	LEVEL 2 - DSL

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Hutchison Telecoms

Site Address	GRADIENT PARK KALLAROO PLACE MULLALOO WA 6027
Drawing Title	SITE ELEVATION
Site Verification Visit Date	28/11/02
Search Ring Name	MULLALOO
Search Ring No.	6027070
Drg. No.	A03
Drawing Status	LEVEL 2 - DSL
Drawn	N FALCIONE
Drawing Check	
Engineering Check	
Approved	5/12/03
Scale	AS SHOWN
Rev.	A

ATTACHMENT : 2 PAGE No : 4

VIEW FROM MARMION AVENUE LOOKING SOUTH

VIEW FROM MARMION AVENUE LOOKING NORTH

6.8 MATTERS TO BE CONSIDERED BY COUNCIL

6.8.1 The Council when considering an application for Planning Approval shall have due regard to the following:

(a) interests of orderly and proper planning and the preservation of the amenity of the relevant locality;

(b) any relevant submissions by the applicant;

(c) any Agreed Structure Plan prepared under the provisions of Part 9 of the Scheme;

(d) any planning policy of the Council adopted under the provisions of clause 8.11;

(e) any other matter which under the provisions of the Scheme the Council is required to have due regard;

(f) any policy of the Commission or its predecessors or successors or any planning policy adopted by the Government of the State of Western Australia;

(g) any relevant proposed new town planning scheme of the Council or amendment or proposed Metropolitan Region Scheme Amendment insofar as they can be regarded as seriously entertained planning proposals;

(h) the comments or wishes of any public or municipal authority received as part of the submission process;

(i) the comments or wishes of any objectors to or supporters of the application;

(j) any previous decision made by the Council in circumstances which are sufficiently similar for the previous decision to be relevant as a precedent, provided that the Council shall not be bound by such precedent; and

(k) any other matter which in the opinion of the Council is relevant.

POLICY 3.1.13 - TELECOMMUNICATION FACILITIES

STATEMENT

1 The City recognises that it is bound by the Federal legislation relating to telecommunication facilities and that it has no jurisdiction over the location or installation of "low impact" facilities as defined under the *Telecommunications (Low-Impact Facilities) Determination Act 1997*.

2 The City, as a general rule, does not support the installation or location of telecommunication facilities, particularly in the vicinity of schools, childcare establishments, hospitals and general residential areas.

3 The City recognises the right of land owners/applicants to make applications for planning approval for telecommunication facilities deemed to be other than low impact under the *Telecommunications Act,* and acknowledges its obligation to make a recommendation to the WAPC or determine the application in its own right.

4 Having received a Development Application for a telecommunication facility, the City will advertise the proposal for a 30-day period and consult with the local community surrounding the proposed site. Owners and occupiers of property within a radius of 500m will be advised in writing, at the cost of the applicant, and afforded an opportunity to make comment to the Council prior to the matter being considered at a Council meeting.

5 In making a recommendation to the WAPC or determining the application the Council will have regard to;

(a) the comments and concerns of the local community,
(b) the merits of the particular proposal
(c) compliance with the industry code of practice,
(d) compliance with matters required to be considered under the District Planning Scheme, and
(e) the general concerns of the Council regarding the potential effects of telecommunication facilities referred to in point 2 above.

Previous Policy No:
Amendments: C172-12/02
Issued: January 2003
Related Documentation:

RADHAZ
CONSULTING PTY LTD
ACN 082 613 161 ABN 72 082 613 161
Specialising in EME Analysis & Measurement

RF EME PREDICTIONS REPORT

HUTCHISON
SITE 602707C

MULLALOO

February 2003

Prepared by

Shane Peacock
Principal EME Consultant
Ass. Dip. Eng. (Electronics)

Melbourne: Suite 2, Sterling House, 1012 Doncaster Road, East Doncaster, Vic 3109 Phone: (03) 9841 0466 Fax: (03) 9841 0211

www.radhaz.com.au

Contents

1. Introduction

Hutchison 3G Australia Pty Ltd (Hutchison) proposes to install a Mobile Telecommunications Facility (MTF) on a 20m steel monopole located at Gradient Park, Kallaroo Place, Mullaloo, Western Australia.

Consequently, Hutchison requested RADHAZ Consulting Pty Ltd, as independent consultants, to undertake radio frequency (RF) electromagnetic energy (EME) prediction calculations and analysis for Hutchison Site 602707C, Mullaloo.

Calculations and analysis are for the proposed Hutchison 3G transmit antennae (Table 2) only and are based on:

i) design information from Hutchison,
ii) design information from SKM Drawing N^{o} 602707C A01 – A03 (Rev. A),
iii) data sheets supplied by the antenna manufacturer.

The term "power density" has been used throughout the report and relates to the rate of flow of radio frequency (RF) electromagnetic energy (EME) per unit surface area. Power density is typically expressed in units of microwatts per square centimetre ($\mu W/cm^2$).

2. Federal Government Legal Requirements

The Australian Communications Authority (ACA) will shortly (first quarter 2003) be introducing new conditions on the operation of radiocommunications transmitters. These conditions will regulate the exposure of the general public to RF EME levels produced by cellular telephone base stations (MTF).

Cellular telephone base station operators will be required to ensure that the general public is not exposed to RF EME levels from their service in excess of prescribed limits. The prescribed limits will be the reference field strength levels from the ARPANSA Radiation Protection Standard 2002 Maximum Exposure Levels to Radio Frequency Fields – 3 kHz to 300 GHz.

Further information can be gained from the ACA web site: http://www.aca.gov.au/standards/index.htm.

Table 1 – ARPANSA Radiation Protection Standard 2002 Maximum Exposure Levels to Radio Frequency Fields – 3 kHz to 300 GHz

Classification	Power Density at 2110 MHz		
	W/m^2	mW/cm^2	$\mu W/cm^2$
Occupational (RF Worker)	50	5	5000
Non-occupational (General Public)	10	1	1000

3. Calculations

The procedures for the calculation of the RF EME levels have been developed by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and are documented in the ARPANSA Technical Report: "Radiated EME Exposure Levels – Prediction Methodologies" and is available at http://www.arpansa.gov.au.

Maximum RF EME levels at 1.5m above ground level for distances of 5m, 50m, 100m, 200m, 300m, 400m, and 500m away from the proposed MTF (Table 3) and areas of interest as specified by Hutchison (Table 4) have also been calculated.

These calculations are based on corrected gain levels derived from the manufacture's data sheets for the proposed base station panel antennas (Table 2).

Table 2 Antenna and Transmitter Data – Hutchison (3G 2110 MHz)

Sector	1	2	3
Antenna Type	APXV18-206517LS	APXV18-206517LS	APXV18-206517LS
Gain (dBi)	18.5	18.5	18.5
Height (m – midpoint)	21.4	21.4	21.4
Bearing (° True North)	160	240	320
Downtilt (elect)	2	2	2
Downtilt (mech)	0	0	0
Tx Antennae per cell	1	1	1
Total pwr into antenna (dBm)	43	43	43
Measurement height (m)	1.5	1.5	1.5

All information for the above antennae is kept on file, together with specific antenna gain results.

4. Analysis

Power density emission patterns, relating to the limits (Table 1) referenced in ARPANSA Radiation Protection Standard 2002 have been shown for all known transmit antennae (Appendix A – RF Emission Drawings).

RF emissions exceeding the Occupational (RF worker) limit of 5000 μW/cm² in the areas analysed are shown on the RF Emission Drawings in red, and are "No Access" zones.

Areas analysed to have RF emissions below the Occupational (RF worker) limit of 5000 μW/cm², but exceed the Non-occupational (General Public) limit of 1000 μW/cm² are shown on the drawings in yellow, and are "RF Worker Access Only" zones.

Those areas not shown as either red or yellow will have RF emission levels lower than the Non-occupational (General Public) exposure limit and are not subject to access restrictions due to RF emissions.

5. Calculation Results

Table 3: Predicted RF Power Densities

Distance from base of radiating antennae 240° True North (m)	RF EME Level ($\mu W/cm^2$)	Times below the General Public Exposure Limit ($1000\mu W/cm^2$)
5	0.008428	118,652
50	0.0004594	2,176,752
100	0.008141	122,835
200	0.04658	21,468
300	0.08696	11,500
400	0.06564	15,235
500	0.04489	22,277
Highest level – ~284.24m @ 240.22° True North	0.09021	11,085

Table 4: Predicted RF Power Density Levels for Areas of Interest

Areas of Interest	RF EME Level ($\mu W/cm^2$)	Times below the General Public Exposure Limit ($1000\mu W/cm^2$)
Mullaloo Heights Primary School (~680m @ 305° from site)	0.02031	49,237
Whitford Catholic Primary (~505m @ 140° from site)	0.03405	29,369

Note:

1. These estimations are for the maximum level of RF EME at 1.5m above the ground from the proposed site.
2. Direct line of sight to the antennae has been assumed for the calculations.
3. This estimation does not include possible radio signal attenuation due to environmental factors (ie. buildings and topography).
4. Estimated levels have been calculated on the maximum mobile phone call capacity anticipated for this site.
5. The uncertainty in the predicted levels is ±3dB.

6. Summary

6.1 Calculations

i. The maximum level of exposure at 1.5m above ground level, from the proposed Hutchison transmit antennae only, is estimated to be 0.09021μW/cm^2 at a distance of ~284.24m away from the MTF. This level complies with the limits specified in the ARPANSA Radiation Protection Standard 2002 and is 11,085 times below the general public exposure limit of 1000 μW/cm^2.

ii. Quoted levels are at worst case and possible reductions in estimated levels due to environmental factors (ie. buildings and topography) have not been taken into account.

iii. The limits specified incorporate large safety factors (a factor of 50 times below the level where effects are observed) to ensure the general public is not exposed to exposure levels where effects have been observed.

iv. Based on current information provided by the worlds scientific community, including the World Health Organisation, exposure to levels below the general public exposure limits specified has not been proven to cause any adverse health effects.

6.2 Analysis

i. When operating at maximum power, the occupational (red) and non-occupational (yellow) boundaries (Appendix A – RF Emission Drawings) for the Hutchison transmit antennas will not extend into accessible areas of the pole.

ii. Emissions above the levels stated in Table 1 for the parabolic link antennae are contained within the antennae.

iii. For all areas outside of the red and yellow zones (Appendix A – RF Emission Drawings), power density levels from the above antennae will not exceed the Non-occupational limit of 1000μW/cm^2.

7. Recommendations

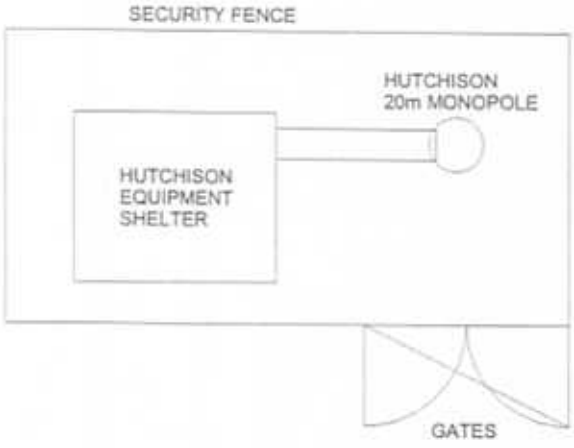
7.1 Before accessing antennas on the structure RF workers should study (if available) the Site Management Book (SMB) or equivalent to identify areas above the Occupational limit.

7.2 RF workers should wear personal RF monitors when working in restricted areas in close proximity to operational antennas.

Appendix A - RF Emission Drawings

Note:
1. Drawing Reference No.: 602707C-A02 & A03 (Rev. A).

TRUE NORTH



Plan 1 - Site Layout

File: 602707C_01.rhz Plan Alignment: 0 Deg Elevation Alignment: 0 Deg Scale: 1 cm = 1.0 m

Red Areas: NO ACCESS Yellow Areas: ACCESS FOR RF WORKERS ONLY (8 HOURS ONLY)

ORDER	DRAWN	CHKD	AMENDMENT	EXAM	APPD	DATE	ISS
	WJC	WJC		SP	SP	04/02/03	1

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HUTCHISON 602707C
RF EMISSION LIMITS
Gradient Park, Kallaroo Place
Mullaloo, W.A. 6027

Branch: RADHAZ Consulting Pty Ltd
File: 60195

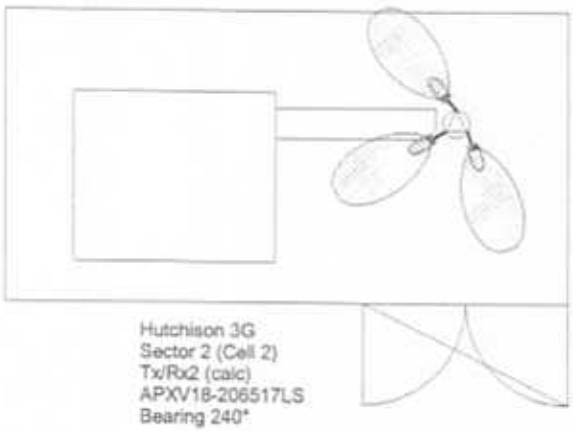
Note:
1. Drawing Reference No.: 602707C-A02 & A03 (Rev. A).

2. Antenna RF Emission Patterns have been either calculated (calc), range-tested (range) or sited (site) as indicated.

3. All RF Emission Patterns have been shown at worst case.

TRUE NORTH

Hutchison 3G
Sector 3 (Cell 3)
Tx/Rx3 (calc)
APXV18-206517LS
Bearing 320°



Hutchison 3G
Sector 1 (Cell 1)
Tx/Rx1 (calc)
APXV18-206517LS
Bearing 160°

Hutchison 3G
Sector 2 (Cell 2)
Tx/Rx2 (calc)
APXV18-206517LS
Bearing 240°

Occupational Exposure Limit (5mW/cm²)
No Access = 0.31m

Non-Occupational Exposure Limit (1mW/cm²)
RF Worker Access only = 1.57m

Plan 2 - 21.4m Level

File: 602707C_01.rhz Plan Alignment: 0 Deg Elevation Alignment: 0 Deg Scale: 1 cm = 1.0 m

Red Areas: NO ACCESS Yellow Areas: ACCESS FOR RF WORKERS ONLY (8 HOURS ONLY)

ORDER	DRAWN	CHKD	AMENDMENT	EXAM	APPD	DATE	ISS
	WJC	WJC		SP	SP	04/02/03	1

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RF EMISSION LIMITS
Gradient Park, Kallaroo Place
Mullaloo, W.A. 6027

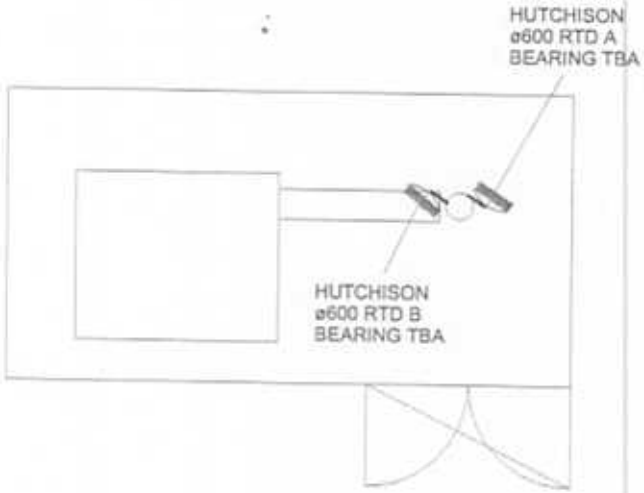
Branch: RADHAZ Consulting Pty Ltd
File: 60195

Note:
1. Drawing Reference No.: 602707C-A02 & A03 (Rev. A)

2. No RF hazard zones exist in front of the RTD's.

3. 'RTD' denotes Radio Transmission Dish.

TRUE NORTH



Plan 3 - 19.5m Level

File: 602707C_01.rhz Plan Alignment: 0 Deg Elevation Alignment: 0 Deg Scale: 1 cm = 1.0 m

Red Areas: NO ACCESS Yellow Areas: ACCESS FOR RF WORKERS ONLY (8 HOURS ONLY)

ORDER	DRAWN	CHKD	AMENDMENT	EXAM	APPD	DATE	ISS
	WJC	WJC		SP	SP	04/02/03	1

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RF EMISSION LIMITS
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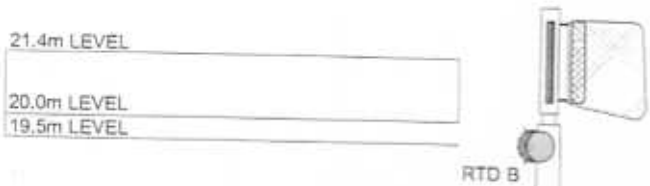
Mullaloo, W.A. 6027

Branch: RADHAZ Consulting Pty Ltd
File: 60195

Occupational Exposure Limit (5mW/cm²)
No Access = 0.31m

Non-Occupational Exposure Limit (1mW/cm²)
RF Worker Access only = 1.57m



Note:
1. Drawing Reference No.: 602707C-A02 & A03 (Rev. A).
2. Antenna RF Emission Patterns have been either calculated (calc), range-tested (range) or sited (site) as indicated.
3. All RF Emission Patterns have been shown at worst case.
4. No RF hazard zones exist in front of the RTD's.
5. 'RTD' denotes Radio Transmission Dish.

South West Elevation

File: 602707C_01.rhz Plan Alignment: 0 Deg Elevation Alignment: 70 Deg Scale: 1 cm = 1.5 m

Red Areas: NO ACCESS Yellow Areas: ACCESS FOR RF WORKERS ONLY (8 HOURS ONLY)

ORDER	DRAWN	CHKD	AMENDMENT	EXAM	APPD	DATE	ISS
	WJC	WJC		SP	SP	04/02/03	1

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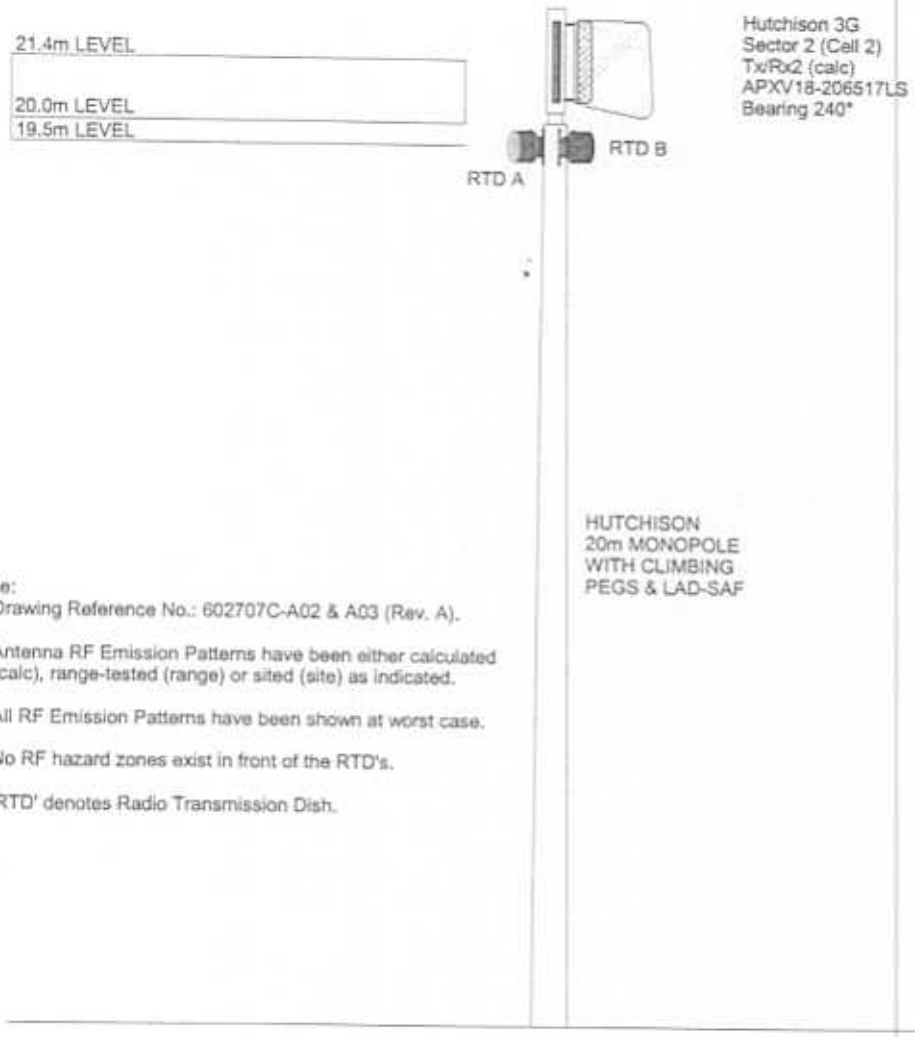
Gradient Park, Kallaroo Place
Mullaloo, W.A. 6027

Branch: RADHAZ Consulting Pty Ltd
File: 60195

Occupational Exposure Limit (5mW/cm²)
No Access = 0.31m

Non-Occupational Exposure Limit (1mW/cm²)
RF Worker Access only = 1.57m



Note:
1. Drawing Reference No.: 602707C-A02 & A03 (Rev. A).
2. Antenna RF Emission Patterns have been either calculated (calc), range-tested (range) or sited (site) as indicated.
3. All RF Emission Patterns have been shown at worst case.
4. No RF hazard zones exist in front of the RTD's.
5. 'RTD' denotes Radio Transmission Dish.

North West Elevation

File: 602707C_01.rhz Plan Alignment: 0 Deg Elevation Alignment: 150 Deg Scale: 1 cm = 1.5 m

Red Areas: NO ACCESS Yellow Areas: ACCESS FOR RF WORKERS ONLY (8 HOURS ONLY)

ORDER	DRAWN	CHKD	AMENDMENT	EXAM	APPD	DATE	ISS
	WJC	WJC		SP	SP	04/02/03	1

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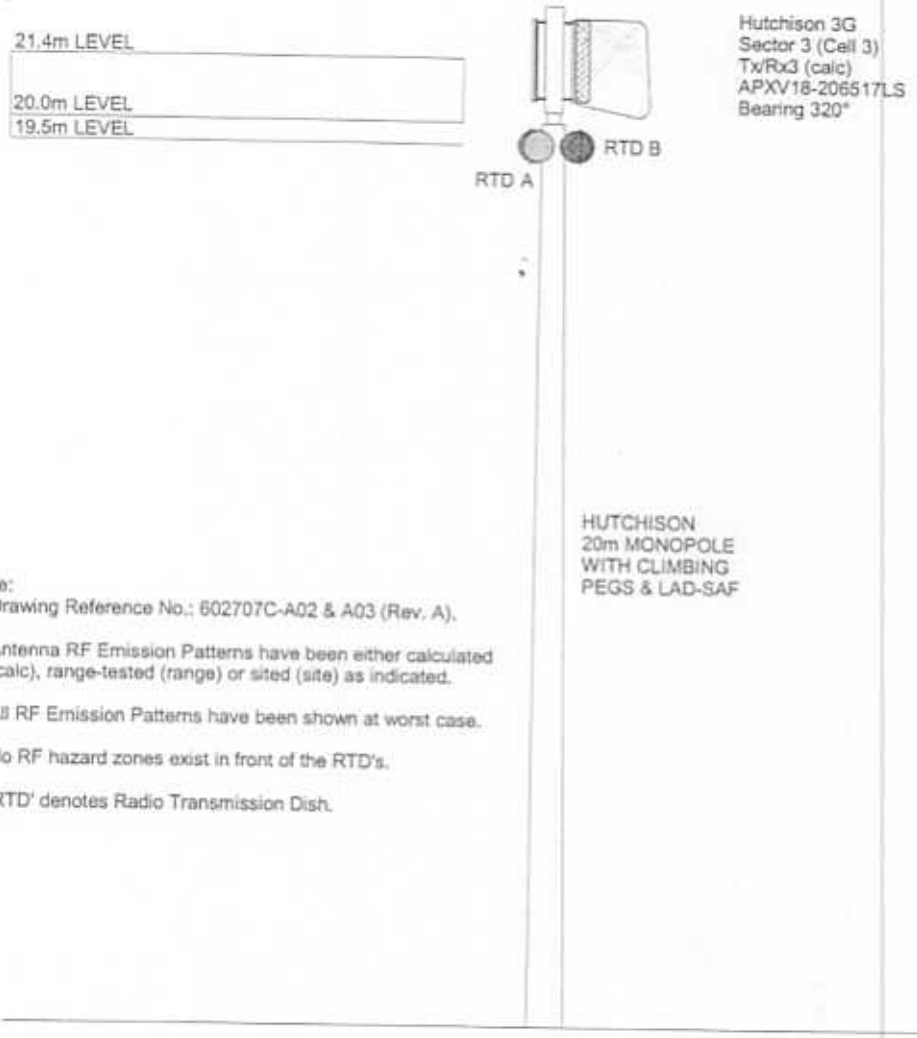
HUTCHISON 602707C
RF EMISSION LIMITS
Gradient Park, Kallaroo Place
Mullaloo, W.A. 6027

Branch: RADHAZ Consulting Pty Ltd
File: 60195

Occupational Exposure Limit (5mW/cm²)
No Access = 0.31m

Non-Occupational Exposure Limit (1mW/cm²)
RF Worker Access only = 1.57m



Note:
1. Drawing Reference No.: 602707C-A02 & A03 (Rev. A).
2. Antenna RF Emission Patterns have been either calculated (calc), range-tested (range) or sited (site) as indicated.
3. All RF Emission Patterns have been shown at worst case.
4. No RF hazard zones exist in front of the RTD's.
5. 'RTD' denotes Radio Transmission Dish.

North East Elevation

File: 602707C_01.rhz Plan Alignment: 0 Deg Elevation Alignment: 230 Deg Scale: 1 cm = 1.5 m

Red Areas: NO ACCESS Yellow Areas: ACCESS FOR RF WORKERS ONLY (8 HOURS ONLY)

ORDER	DRAWN	CHKD	AMENDMENT	EXAM	APPD	DATE	ISS
	WJC	WJC		SP	SP	04/02/03	1

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HUTCHISON 602707C
RF EMISSION LIMITS
Gradient Park, Kallaroo Place
Mullaloo, W.A. 6027

Branch: RADHAZ Consulting Pty Ltd
File: 60195

Appendix B - RF Emissions Contour Map

Site 602707C Mullaloo

Map = 185
Grid Reference = P1

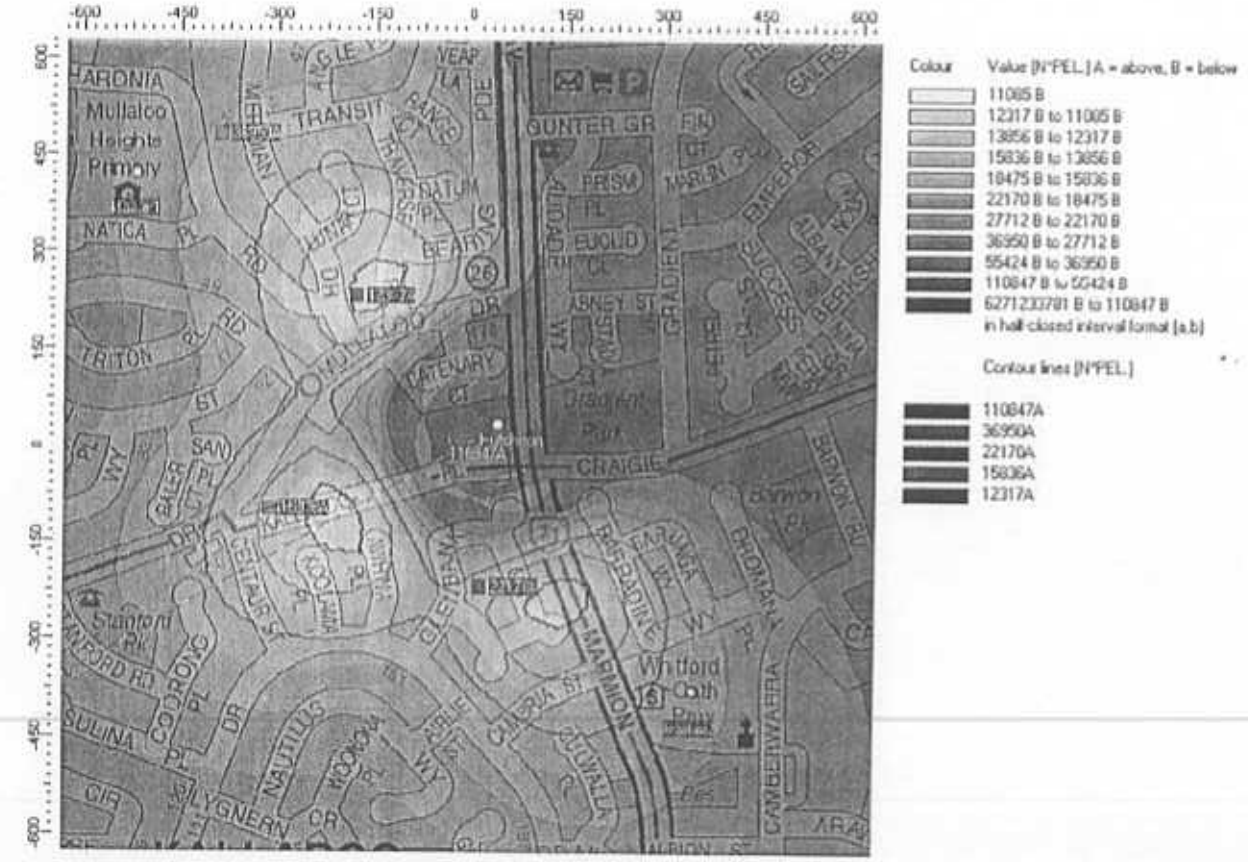
UBD Six Cities 2001
Street Directory on CD ROM

Note:

i. Contours and different colours are used to represent the number of times below the Non-occupational (General Public) exposure limit.

RF-MAP Information : Mullaloo - Power Density.tpf

RADHAZ



Colour — Value [N'PEL.] A = above, B = below

- 11085 B
- 12317 B to 11085 B
- 13856 B to 12317 B
- 15836 B to 13856 B
- 18475 B to 15836 B
- 22170 B to 18475 B
- 27712 B to 22170 B
- 36950 B to 27712 B
- 55424 B to 36950 B
- 110847 B to 55424 B
- 6271233781 B to 110847 B

in half-closed interval format [a,b)

Contour lines [N'PEL.]

- 110847A
- 36950A
- 22170A
- 15836A
- 12317A

RF-MAP 1.0 (Build 6.3)

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Specialising in EME Analysis & Measurement

SUPPLEMENTARY RF EME PREDICTIONS REPORT

HUTCHISON SITE 602707C

MULLALOO

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Contents

1. Introduction

Hutchison 3G Australia Pty Ltd (Hutchison) proposes to install a Mobile Telecommunications Facility (MTF) on a 20m steel monopole located at Gradient Park, Kallaroo Place, Mullaloo, Western Australia.

Consequently, Hutchison requested RADHAZ Consulting Pty Ltd, as independent consultants, to undertake radio frequency (RF) electromagnetic energy (EME) prediction calculations for Hutchison Site 602707C, Mullaloo.

This Supplementary Report has been prepared following a request from Hutchison to compare the RF EME levels at the above site to another candidate site at Mullaloo Squash Courts located at 25 Koorana Rd, Mullaloo.

Calculations and analysis are for the proposed Hutchison 3G transmit antennae (Table 2) only and are based on:

i) design information from Hutchison,
ii) design information from SKM Drawing N° 602707C A01 – A03 (Rev. A),
iii) design information from SKM Drawing N° 602707B A02 – A03 (Rev. 2),
iv) data sheets supplied by the antenna manufacturer.

The term "power density" has been used throughout the report and relates to the rate of flow of radio frequency (RF) electromagnetic energy (EME) per unit surface area. Power density is typically expressed in units of microwatts per square centimetre ($\mu W/cm^2$).

2. Federal Government Legal Requirements

The Australian Communications Authority (ACA) has established new conditions on the operation of radiocommunications transmitters. These conditions regulate the exposure of the general public to RF EME levels produced by cellular telephone base stations (MTF).

Cellular telephone base station operators are required to ensure that the general public is not exposed to RF EME levels from their service in excess of prescribed limits. The prescribed limits are the reference field strength levels from the ARPANSA Radiation Protection Standard 2002 Maximum Exposure Levels to Radio Frequency Fields – 3 kHz to 300 GHz.

Further information can be gained from the ACA web site: http://www.aca.gov.au/standards/index.htm.

Table 1 – ARPANSA Radiation Protection Standard 2002 Maximum Exposure Levels to Radio Frequency Fields – 3 kHz to 300 GHz

Classification	Power Density at 2110 MHz		
	W/m^2	mW/cm^2	$\mu W/cm^2$
Occupational (RF Worker)	50	5	5000
Non-occupational (General Public)	10	1	1000

The above levels are mandated through the Radiocommunications Licence Conditions (Apparatus Licence) Determination 2003 and form part of the licensing requirements under the Radiocommunications Act 1992.

3. Calculations

The procedures for the calculation of the RF EME levels have been developed by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and are documented in the ARPANSA Technical Report: "Radiated EME Exposure Levels – Prediction Methodologies" and is available at http://www.arpansa.gov.au.

Maximum RF EME levels at 1.5m above ground level for distances of 5m, 50m, 100m, 200m, 300m, 400m, and 500m away from the proposed sites (Tables 4 & 5) have been calculated.

Maximum RF EME levels at 21.4m (centre of antenna) above ground level for distances of 5m, 50m, 100m, 200m, 300m, 400m, and 500m away from the proposed Kallaroo Place site (Table 6) have been calculated.

These calculations are based on corrected gain levels derived from the manufacture's data sheets for the proposed base station panel antennas (Tables 2 & 3).

Table 2 Antenna and Transmitter Data – Hutchison (3G 2110 MHz) Kallaroo Place

Sector	1	2	3
Antenna Type	APXV18-206517LS	APXV18-206517LS	APXV18-206517LS
Gain (dBi)	18.5	18.5	18.5
Height (m – midpoint)	21.4	21.4	21.4
Bearing (° True North)	160	240	320
Downtilt (elect)	2	2	2
Downtilt (mech)	0	0	0
Tx Antennae per cell	1	1	1
Total pwr into antenna (dBm)	43	43	43
Measurement height (m)	1.5	1.5	1.5

Table 3 Antenna and Transmitter Data – Hutchison (3G 2110 MHz) Mullaloo Squash Courts

Sector	1	2	3
Antenna Type	APXV18-206517L	APXV18-206517L	APXV18-206517L
Gain (dBi)	19.1	19.1	19.1
Height (m – midpoint)	11.34	11.34	11.34
Bearing (° True North)	70	220	340
Downtilt (elect)	0	0	0
Downtilt (mech)	0	0	0
Antennas per cell	1	1	1
Total pwr into antenna (dBm)	43	43	43
Measurement height (m)	1.5	1.5	1.5

All information for the above antennae is kept on file, together with specific antenna gain results.

4. Calculation Results

Table 4: Predicted RF Power Densities – Kallaroo Place

Distance from base of radiating antennae 240° True North (m)	RF EME Level (μW/cm²)	Times below the General Public Exposure Limit (1000μW/cm²)
5	0.008428	118,652
50	0.0004594	2,176,752
100	0.008141	122,835
200	0.04658	21,468
300	0.08696	11,500
400	0.06564	15,235
500	0.04489	22,277
Highest level – ~284.24m @ 240.22° True North	0.09021	11,085

Table 5: Predicted RF Power Densities – Mullaloo Squash Courts

Distance from base of radiating antennas 340° True North (m)	RF EME Level (μW/cm²)	Times below General Public Exposure Limit (1000μW/cm²)
5	0.0022	454,545
50	0.0574	17,422
100	0.0353	28,329
200	0.0716	13,966
300	0.0772	12,953
400	0.0556	17,986
500	0.0413	24,213
Highest level – ~280.3m @ 342.0 ° True North	0.0826	12,107

Table 6: Predicted RF Power Densities – Kallaroo Place at 21.4m above ground

Distance from base of radiating antennas 240° True North (m)	RF EME Level (μW/cm²)	Times below General Public Exposure Limit (1000μW/cm²)
5	125.6	8
50	2.858	350
100	0.7494	1,334
200	0.1874	5,336
300	0.08327	12,009
400	0.04684	21,349
500	0.02998	33,356

Note:

1. The estimations in Tables 4 & 5 are at 1.5m above the ground from the proposed sites.
2. The estimations in Table 6 are at 21.4m (centre of antenna) above the ground from the proposed site.
3. Direct line of sight to the antennae has been assumed for the calculations.
4. This estimation does not include possible radio signal attenuation due to environmental factors (ie. buildings and topography).
5. Estimated levels have been calculated on the maximum mobile phone call capacity anticipated for these sites.
6. The uncertainty in the predicted levels is ±3dB.

5. Summary

i. The estimated RF EME levels differ between the Kallaroo Place site and the Mullaloo Squash Courts site (tables 4 & 5) due to the antenna height, type & electrical downtilt being different for each site. If the antenna type & electrical downtilt remained the same for both sites, then the geographic area covered by the Kallaroo site may increase due to the antennae being mounted higher than the Mullaloo Squash Courts site. However, each of these sites is designed to provide coverage to the Mullaloo area and therefore each site needs to be individually tailored to ensure particular coverage of a geographic area is achieved without causing interference to neighbouring cells.

ii. Quoted levels are at worst case and possible reductions in estimated levels due to environmental factors (ie. buildings and topography) have not been taken into account.

iii. An uncertainty in the predicted levels of ±3dB means that the actual levels, if measured, may be either half or double the predicted levels. For example, for a predicted level of 20,000 times below the General Public limit, the actual level may be somewhere between 40,000 and 10,000 times below the General Public limit. This is due to the effect of buildings & topography that have not been taken into account in the predictions.