NSW Independent Planning Commission

ipcn@ipcn.nsw.gov.au 10th August, 2020

Objection to Narrabri Gas Project

I am a retired NSW government veterinarian with 38 years service, and I am also qualified as an environmental lawyer.

I have been following the Narrabri Gas Project since the EIS was released in 2017. I also listened to some of the recent hearings on the project held by the IPC, and have read the transcripts of many of the technical presentations on Hearing Day 4 with great interest. I object to the project, but wished to clarify an important planning issue frequently raised in the submissions and Commissioners' questions, namely ESD principles and particularly the precautionary principle.

The issue of the precautionary principle was raised in Day 4 of IPC Proceedings in discussions between Senior Counsel (Mr Beasley) assisting IPC and Mr White, appearing on behalf of the North West Alliance[1].

Unfortunately, an error has crept into the transcript with respect to the precautionary principle, which is described on at least one occasion by both Mr Beasley and Mr White as:

"…a lack of scientific uncertainty…"

This terminology is incorrect. The correct terminology is set out in Section 6(2) of the Protection of the Environment Administration Act 1991 (NSW), which defines the precautionary principle as:

"…if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation".

On Day 1 of the transcript of the IPC Hearing on the Narrabri Gas Project, there is a long debate[2] between Mr Beasley SC, and David Kitto on the precautionary principle. Mr Kitto was representing the NSW Department of Planning and is one of the signatories to the Department's Final Assessment on the Narrabri Gas Project.

On page 22, Mr Kitto is quoted as saying that:

"we don't think the precautionary principle is triggered in this instance" [3]

[1] Day 4 Transcript (23/7/20), pages 3-5
[2] Day 1 Transcriot (20/7/20), pages 18-22
[3] Day 1 Transcript, p 22 @ 30

I profoundly disagree with this view, and will make the point in more detail below. Firstly, I wish to point out that Mr Kitto is representing the NSW Government in this matter, and is advocating the approval of the Narrabri Gas Project.

The Commissioners may or may not be aware that the pure principles of our democracy depend at least in theory on the independence of the three arms of democratic government:

- The legislature, or parliament, which makes the laws
- The executive (which Mr Kitto is representing) which implements the laws
- The judiciary, which interprets the laws. In NSW, the relevant judiciary for matters under the NSW Environmental Planning and Assessment Act is the NSW Land and Environment Court, and, on appeal, the NSW Court of Appeal.

While the separation of powers is not present in two arms of government in NSW, the independence of the judiciary is an important element of our democracy, and is clearly illustrated in the structure of the Australian Constitution. Any lawyer will tell you that for an independent opinion on a question of law in planning or other legal matters, the place to go is the NSW judiciary, not the NSW executive.

The NSW Land and Environment Court sets out on its website a list of cases which are considered as planning principles, designed to provide a list of appropriate matters to be considered in making a planning decision. There happens to be a case which illustrates the planning principles of ESD and the precautionary principle, the Telstra Corporation case [4]. The judgement is by Chief Justice Preston, and his clear exposition of the precautionary principle is definitive. I have taken the liberty of attaching the case to may email to the IPC for the Commissioners to examine for themselves.

Chief Justice Preston notes in the Telstra case that the threat of environmental damage must be adequately sustained by scientific evidence.

In my opinion, the precautionary principle is triggered by at least three areas of impact associated with the Narrabri Gas Project, and all three can be sustained by scientific evidence provided by a number of experts engaged by the North West Alliance. The IPC heard from these experts on Day 4 of the hearings.

They are listed below:

[4] Telstra Corporation v Hornsby Shire Council [2006] NSW LEC 133 @ 107-183

Impact Area: Biodiversity Impacts

Scientific evidence:

- **David Milledge, Day 4, transcript pp 30-34**
- **David Paull, Day 4, pp 35-39**

Waste Disposal from Produced Water

Scientific evidence:

- **Prof Stuart Khan, Day 4, transcript pp 24-30**

Groundwater

Scientific evidence:

- **Dr Kevin Hayley, Day 4, transcript pp 8-13**
- **A/Prof M. Currell, Day 4, pp 14-23**
- **Ms Georgina Woods (Lock the Gate), Day 1, transcript pp 51-56**
  [Ms Woods provides useful evidence of the scientific criticism of the Narrabri EIS water models by the NSW Government's own agency, DPIE Water]

I am confident that, armed with the scientific evidence from the transcripts above, an application of Chief Justice Preston's explanation of the precautionary principle will allow the IPC to conclude that there is a risk of serious or irreversible environmental damage with respect to these three areas (I believe there are others, but the application of the precautionary principle may not be as clear).

Once the precautionary principle is activated, Chief Justice Preston describes the next stage of the process:

"…At this point, there is a shifting of an evidentiary burden of proof. A decision-maker must assume that the threat of serious or irreversible environmental damage is no longer uncertain but is a reality. The burden of showing that this threat does not in fact exist or is negligible effectively reverts to the proponent of …the project.

…The benefit of the doubt is given to environmental protection when there is scientific uncertainty".

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- NSW
- NT
- QLD
- SA
- TAS
- VIC
- WA
- New Zealand
- **Specific Year**

  Any 2015
- Any
- Any

Telstra Corporation Limited v Hornsby Shire Council [2006] NSWLEC 133 (24 March 2006)

Last Updated: 27 March 2006

NEW SOUTH WALES LAND AND ENVIRONMENT COURT

CITATION: Telstra Corporation Limited v Hornsby Shire Council [2006] NSWLEC 133

PARTIES:

APPLICANT

Telstra Corporation Limited

RESPONDENT

Hornsby Shire Council

CASE NUMBER: 11097 of 2005

CATCH WORDS: Appeal

LEGISLATION CITED:

Environmental Planning and Assessment Act 1979 (NSW) s 4(1), s 5(a)(vii), s 5C, s 79C(1), s 79C(1)(d), s 79C(1)(e), s 82A, s 97(1)

Land and Environment Court Act 1979 (NSW) s 17, s 39(2), s 39(3), s 39(4)

Protection of the Environment Administration Act 1991 (NSW) s 6(2), s 6(2)(a), s 6 (2)(b), s 6(2)(c), s 6(2)(d)

Telecommunications Act 1997 (Cth) Sch 3, Pt 1, Div 3 cl 6(1)(b), Sch 3, Pt 1, Div 3 cl 6(3)

CORAM: Preston CJBrown C

DATES OF HEARING: 06/03/2006, 07/03/2006

DECISION DATE: 24/03/2006

LEGAL REPRESENTATIVES

APPLICANT

M S Henry (barrister)

SOLICITORS

Mallesons Stephen Jaques

RESPONDENT

A E Galasso (barrister)

SOLICITORS

Storey & Gough

JUDGMENT:

THE LAND AND

ENVIRONMENT COURT

OF NEW SOUTH WALES

PRESTON CJ

24 MARCH 2006

11097 of 2005

TELSTRA CORPORATION LIMITED V HORNSBY SHIRE COUNCIL

JUDGMENT

1 **HIS HONOUR**: To the northwest of Sydney lies the suburb of Cheltenham. It is a suburb with heritage charm, with a number of late 19th and early 20th century homes and gardens. Remarkably for these days, the suburb is solely residential, with no commercial or retail activities within the boundaries of the suburb.

2 At the heart of the suburb is the Cheltenham Recreation Club ("the Club"). The Club's site is large, about 1.7ha, and contains recreational and sporting facilities including bowling greens, croquet courts and tennis courts. The park-like grounds are of local heritage significance. The Club has been and still is a meeting point for members of the community of Cheltenham.

3 However, the suburb of Cheltenham is not isolated from the modern world. Residents of, visitors to and travellers through the suburb wish to engage with each other and others outside the suburb through the marvel of modern telecommunications. Here the problem arises. Cheltenham suffers from inadequate mobile telephone coverage. There are holes in the extent of the coverage or areas where the coverage is of inferior quality. The inadequacies are particularly experienced along the railway line, affecting commuters.

4 The largest of the telecommunications carriers in Australia, Telstra, wishes to address the inadequate mobile telephone coverage. It identified the Club site as a suitable location for a mobile telephone base station which could provide mobile telephone coverage in the suburb of Cheltenham and particularly along the railway line.

5 Telstra and the Club reached agreement whereby Telstra could, after obtaining necessary approvals, erect on the roof of the clubhouse two panel antennas surrounded by a glass plastic shroud (simulating the appearance of chimneys) and an equipment cabin to the rear of the clubhouse. Telstra would also construct a small pergola for the benefit and use of the Club at the rear of the clubhouse and pay the Club an annual lease rental.

6 This proposal, however, has caused a section of the community of Cheltenham and Hornsby Shire Council ("the Council") much concern. Perhaps their greatest concern is the fear that the proposed facility will emit electromagnetic energy that will harm the health and safety of the residents of Cheltenham.

7 This fear has fuelled opposition to the proposal, both in a section of the community and by the elected councillors of the Council. The Council refused the development application for the proposal.

8 Telstra has appealed to this Court seeking consent for the proposal. The Club supports Telstra's application. The Council and certain residents contest the appeal, still maintaining their opposition.

9 The case raises questions about fear, rationality and the law. How should a responsible decision-maker respond to public fear? Responsiveness to public fear entails a commitment to rational deliberation, in the form of reflection and reason-giving. An approach with some currency at the moment is the precautionary principle. What is the precautionary principle and how is it to be applied when thinking about public health and safety and the environment? How can it be invoked to respond to public fear?

10 The case provides some guidance in relation to these questions.

11 In the hearing and determination of the appeal I have been assisted by Commissioner Brown.

Nature of the appeal

12 The appeal is against the refusal of the Council of the applicant's development application No. 1514/04 for the installation of telecommunications equipment and alterations and additions to an existing building at 60-74 The Crescent, Cheltenham ("the site").

13 The appeal is brought pursuant to s 97(1) of the *Environmental Planning and Assessment Act* 1979 (NSW) ("EPA Act"). The appeal is within Class 1 of the Land and Environment Court's jurisdiction: s 17 of the *Land and Environment Court Act* 1979 (NSW) ("LEC Act"). The Court has all of the functions and discretions which the Council, as the consent authority under the EPA Act, had in respect of the development application the subject of the appeal: s 39(2) of the LEC Act.

14 The appeal is by way of rehearing and fresh evidence or evidence in addition to, or in substitution for, the evidence given on the making of the decision by the Council, may be given on the appeal: s 39(3) of the LEC Act. The Court is to have regard to the EPA Act and any other relevant Act, any instrument made under any such Act, the circumstances of the case and the public interest: s 39(4) of the LEC Act.

The site

15 The site consists of Lots 1, 2, 3, 4 and 5 in DP 5440, Lot C in DP 306966, Lot C in DP 328704, Lot 1 in DP 335423, Lot G in DP360935, Lot J in DP 374758 and Lot A in DP 303812. It has a total area of 1.7 hectares with frontages to The Crescent, The Boulevard and Lyne Road, Cheltenham.

16 The site accommodates the Cheltenham Recreational Club. The facilities located on the site include a clubhouse, tennis courts, croquet lawns, bowling greens and car parking.

17 The surrounding development is predominantly residential with the Cheltenham railway station located approximately 200 metres to the north. The railway line linking Strathfield and Hornsby is located on the opposite side of The Crescent.

The proposed development

18 The proposal seeks development consent to construct a mobile telephone base station as a rooftop facility on the existing clubhouse. The proposal also seeks to construct a pergola off the rear of the existing clubhouse although this is not associated with the telecommunications base station.

19 The base station equipment comprises:

· 2 tri-band panel antennas located at either end of the clubhouse,

· an equipment cabin located at the rear of a clubhouse, and

· a 450 mm wide cable tray, located between the equipment cabin and the to a communications pole.

20 The antennas would be enclosed in a shrouding which is moulded and painted to represent brickwork chimneys of the clubhouse.

The history of the development application

21 The application was lodged with the Council on 23 August 2004. It was considered by the Council at its meeting on 17 November 2004 and was recommended for approval by council officers. The report of the council officers indicated that 26 submissions were received when the application was advertised, 23 opposing the application and 3 submissions in support. The Council refused the application on 17 November 2004.

22 A review of the Council's determination of 17 November 2004, pursuant to s 82A of the EPA Act, was considered by the Council on 17 August 2005. The review proposed no changes to the application previously considered by the Council and was again recommended for approval by council officers. The report of the council officers indicated that 76 submissions were received when the application was advertised. The submissions consisted of 60 submissions (including 52 proforma letters) in support of the proposal and 16 submissions objecting to the proposal. The submissions in support of the proposal included a petition with 61 signatories. The Council refused the application on 17 August 2005.

Relevant planning controls

23 The *Telecommunications Act* 1997 (Cth) exempts carriers from the requirements of State environmental planning legislation in certain circumstances, including where a proposed facility is defined as a low impact facility (Sch 3, Pt 1, Div 3, cl 6(1)(b)). The Minister, pursuant to Sch 3, Pt 1, Div 3, cl 6(3) may determine what is a low impact facility. The Minister's determination is contained in the *Telecommunications (Low-impact Facilities) Determination* 1997. It relevantly states:

Part 2 Areas

2.5 Area of environmental significance

(7) An area is an area of environmental significance if, under a law of the Commonwealth, a State or a Territory, it consists of a place, building or thing that is entered in a register relating to heritage conservation.

Part 3 Low - impact facilities

3.1 Facilities

(2) However, the facility is not a low-impact facility if the area is also an area of environmental significance.

24 In this case, the telecommunications facility is not defined as a low impact facility, as it is located within a heritage conservation area and is thus an area of environmental significance. The proposal is therefore subject to the provisions of the EPA Act and local planning controls.

25 Under *Hornsby Local Environmental Plan 1994* (the LEP), the site is zoned Open Space C (Private Recreation). The proposed use is permissible with consent within this zone. The grounds of the Club are listed as a heritage item of local significance under Schedule D (Heritage Items) of the LEP. A number of dwellings near the site are identified as items of local significance under Schedule D. The site is also located within the Beecroft/Cheltenham Heritage Conservation Area under Schedule E (Heritage Conservation Areas) of the LEP. Clause 18 provides requirements for development in conservation areas and in the vicinity of heritage items.

The issues

The Council filed a Statement of Issues containing the following issues:

"1. Whether approval should be granted as inadequate assessment has been made of alternate sites in the vicinity and the potential for co-location on existing structures.

2. Whether approval should be granted as inadequate information has been provided in terms of the existing network in the locality and the need for an additional facility.

3. Whether approval should be granted as the Applicant has not adequately demonstrated that the development will not cause a level of electromagnetic radiation that will impact on the health of persons in the locality.

4. Public Interest:-

a) Whether consent should be granted in the public interest;

b) Issues raised by objectors, which include:-

§ Public health impacts;

§ Visual impacts;

§ Heritage impacts; and

§ Co-location."

26 The Council clarified that the aspects of the public interest in issue 4(a) relied upon are the matters raised in the other issues 1 to 3 and 4(b).

27 It is logical to address these issues in the following order: the effect of radiofrequency ("RF") electromagnetic energy ("EME") including on public health and safety, the need for the development, alternative sites for the development and the matters raised by objectors of visual impacts, heritage impacts and co-location.

The evidence

Expert evidence

28 The parties agreed to the appointment of Dr David Black as the Court appointed expert on the effects of RF EME. Dr Black is eminently qualified to give such evidence.

29 Dr Black is a medically qualified specialist in occupational and environmental medicine and is currently employed as a senior lecturer in Occupational Medicine in the Department of Medicine, Faculty of Medical and Health Sciences, at the University of Auckland. He holds the medical degree of MBChB from the University of Auckland.

30 Dr Black has had a strong academic interest in the area of radio frequency safety for over fifteen years. He has worked on committees producing several national and international standards and has published papers on health and biological effects of radio frequency energy in the international peer reviewed scientific literature. He was a named contributor to the current Australian Standard, namely the Australian Radiation Protection Standard "Maximum Exposure Levels to Radiofrequency Fields 3kHz to 300 GHz: Radiation Protection Series No. 3" ("Australian Standard RPS3"), having been employed by the Australian Radiation Protection and Nuclear Safety Authority ("ARPANSA") as a consultant to the committee.

31 Dr Black is a Fellow of the Australasian Faculty of Occupational Medicine, of the Royal Australian College of Physicians (FAFOM), a Member of the Australasian Radiation Protection Society (MARPS) and a Member of the Royal Society of New Zealand (NRSNZ). He is also an active member of the Bioelectromagnetics Society of the USA (BEMS) and the European Bioelectromagnetics Association (EBA). He is a consultant member of the International Commission for Non-Ionising Radiation Protection (ICNIRP).

32 Dr Black was an author and co-author of two papers to a special edition of the authoritative journal *Bioelectromagnetics* on the topics of the interaction of RF EME with living tissue and the potential for adverse effects of RF EME on humans. This special edition was published in preparation for the release of the 2005 American International Committee on Electromagnetic Safety (ICES) Standard administered by the Institute of Electrical and Electronic Engineers (IEEE).

33 Dr Black also considered for the purpose of giving his evidence the most recent authorative review of epidemiological and population studies by the Epidemiology Standing Committee of the International Commission for Non-Ionising Radiation Protection (ICNIRP) published in December 2004.

34 The applicant provided further evidence from Mr Michael Bangay, a consultant with experience in radio frequency propagation and measurement, and Mr Bill Papadatos, a radio frequency design engineer.

35 Mr Bangay has worked for 38 years in the field of radiofrequency propagation and measurement. For 25 years, he was employed by ARPANSA, an agency of the Commonwealth Department of Health. He represented ARPANSA on the Standards Association of Australia technical committee (TE/7) for setting safe limits of human exposure to RF fields and was a member of the RF Working Group that produced the Australian Standard RPS3. He currently chairs the Standards Australia TE7/2 committee which has the responsibility of producing the RF measurement standard. He has authored and co-authored numerous scientific papers published in peer-reviewed scientific journals. Mr Bangay's current position is as principal consultant with Radhaz Consulting Pty Ltd, a consultancy company specialising in RF EME management and compliance to relevant exposure standards.

36 Mr Papadatos is a radio frequency design engineer who has worked in the industry for many years and is currently subcontracted to Telstra to design mobile telephone base stations and other aspects of the telecommunications network.

37 I will outline their respective evidence later in the judgment. The respondent called no expert evidence. The respondent did not challenge the expertise of Dr Black, Mr Bangay or Mr Papadatos or, notwithstanding some cross-examination, their expert testimony.

Non-expert evidence in support of development

38 Evidence in support of the proposed development was provided on site by:

· Mr Robert Cole, President of the Club;

· Mr Brian Sipple of 22A Hull Road, Beecroft; and

· Mr Spencer Bough of 82 Baronia Place, Cheltenham.

39 Mr Robert Cole is the Chairman of the Cheltenham Recreation Club. Mr Cole submitted a letter dated 24 January 2006 on behalf of the Club. The letter stated:

(a) The Club has given approval for the proposed base station.

(b) The Club, in its negotiations with the applicant, ensured that the proposed base station in terms of its size and location would not impact on the heritage listed grounds of the Club or the exterior of the clubhouse.

(c) The Club is reassured by the report of the court appointed expert Dr Black that the proposed base station poses no health risk. The Club would not permit the proposal if there were to be any adverse impacts to the clubhouse, grounds or users.

(d) The Club has secured the construction of a new pergola as part of the lease agreement with the applicant, demonstrating also the Club's commitment to maintaining the site and its amenity.

40 Mr Cole also stated orally that:

(a) The residents' description of the antennas as "towers" is inaccurate; they will look more like chimneys.

(b) The Club acted responsibly, only supporting the proposed base station after obtaining information from the applicant on:

(i) heritage: a heritage report established there would be no impact on the Club or grounds; and

(ii) health: the report by Dr Black established a "clean bill of health".

(c) The annual rental income and the construction of a pergola will preserve the Club for the future.

(d) No other carrier has approached the Club to co-locate a mobile phone base station at the Club site.

41 Mr Spencer Bough supported the proposal for the following reasons:

(a) The proposal has been recommended for approval by council officers on each occasion.

(b) There have been public meetings to discuss the proposal.

(c) The Parents Association of Cheltenham Girls High School has withdrawn its objection to the proposal.

(d) Mobile phone base stations and antennas have been approved and installed at other school sites in the area included Arden School.

42 Mr Brian Sipple is a member of Cheltenham Recreation Club. He recently joined the Club to support it. He has been concerned at the decline in bowling clubs in Sydney, because they serve an important community function and provide pleasant public open spaces. He believes that the proposal, by providing much needed annual rental revenue to the Club, will improve the Club's long-term viability.

Non-expert evidence objecting to the development

43 Evidence was provided on site and in Court from the following local residents:

· Mr Daniel Brunelli – Brondex of 23 Cheltenham Road, Cheltenham;

· Mr Jack Ray of 25 Cheltenham Road, Cheltenham;

· Ms Jolien Deller of 6 Cheltenham Road, Cheltenham;

· Mr John Nichols of 1 Lyne Road, Cheltenham;

· Dr Austin Mack of 78 The Crescent, Cheltenham; and

· Ms Jillian Brunelli – Brondex of 23 Cheltenham Road, Cheltenham.

44 Mr Daniel Brunelli-Brondex objected to the proposed base station for the following reasons:

(a) The proposed installation will impact on the visual amenity of the area which is a heritage conservation area.

(b) The applicant has provided inadequate information to the community about the development, the hazards of RF EME from the development and proposed management practices to restrict access to RF EME hazard areas.

(c) Co-location by other carriers at the Club site might occur in the future. The proposal would become more comprehensive and critical than it appears now. The Court should prevent co-location in the future.

(d) The cumulative effect of EME on the neighbouring community, especially around schools, kindergartens and residential areas, should be considered.

(e) The precautionary principle should be applied.

(f) The applicant has not complied with the ACIF Code for the Deployment of Radiocommunications Infrastructure in making available to the public RF EME health and safety information.

45 Mr Jack Ray, who lives 200 metres from the proposed base station, objected for the following reasons:

(a) While there exists such a large degree of uncertainty concerning the health risks associated with mobile phone antennas, these installations should be limited.

(b) Residents who do not choose to be subjected to RF EME from the proposed base station, should not be subjected to it.

(c) Good mobile phone reception is not a basic human right. The adverse health effects outweigh any benefit from improved mobile phone reception.

(d) There is no need for further mobile phone base stations and antennas.

(e) Co-location by other carriers might occur in the future.

46 Ms Jolien Deller objected to the proposal for the following reasons:

(a) There is no established need for the proposal. There are already telecommunications facilities in the broader area. The extension in the mobile phone coverage area will be limited. A Councillor of Hornsby Council and the Council's solicitor were able to make mobile telephone calls driving and riding on the train respectively in the area.

(b) There is a potential for co-location by other carriers once the applicant establishes its "towers" at the Club site. This could lead to a "forest of towers" such as has occurred at Beecroft.

(c) The applicant has not looked at other sites in Cheltenham except the railway station.

(d) The antennas will be ugly and attract graffiti.

(e) There were 57 letters of objections of residents from Cheltenham. In contrast, there were 53 letters in support, but only 7 were from Cheltenham.

(f) The financial benefit to the Club from annual rental payments by the applicant is not significant.

(g) The suburb of Cheltenham is a heritage area. There are covenants on the original subdivision precluding noxious and commercial activity. The proposal would infringe these covenants.

(h) The Cheltenham community has received a lack of information on the proposal.

(i) Although the RF EME emitted from the proposed base station may "meet all industry standards regarding emissions", there are vulnerable groups such as children and the elderly who live in the suburb who absorb much more electromagnetic radiation ("EMR").

(j) Other substances such as asbestos in years gone by met "industry standards" but today health effects are being experienced by persons who worked in those industries. The same might occur with RF EME from mobile phone base stations.

(k) The technology is so new we will not know until much later if there is harm.

47 Mr John Nichols lived across the road from the Club's land at 1 Lyme Road, Cheltenham. Mr Nichols opposed the proposed base station for seven reasons:

(a) The proposal (but principally the antennas which he described as “towers”) would be intrusive visually in an area that is a heritage area.

(b) The health effects of the RF EME give cause for “great apprehension”. He believes there is no definitive and proven long term report on their effects. Assurances by the applicant to the contrary were speculation.

(c) There is no established need for the proposal. Mr Nichols and a Councillor of Hornsby Council were able to make calls on their mobile phone. Mr Nichol’s wife is able to make mobile telephone calls to him on the train between Eastwood and Cheltenham.

(d) Co-location at the Club site may occur with other carriers joining Telstra.

(e) The information provided by the application and its consultant to Mr Nichols has been inadequate and there have been no discussions.

(f) The information provided with the development application and application for s 82A review is misleading and deceptive.

(g) The engineering prospects of the proposal are second rate.

48 Dr Austin Mack lives within 100 metres of the proposed base station. He objects on a number of grounds, but his primary concern is the RF EME that will be emitted. Dr Mack says he has undertaken research in the area of electromagnetic radiation. However, he was not called by the Council as an expert in the field and Dr Mack’s qualifications and expertise were not revealed. He stated he was not a medical doctor. Dr Mack provided no references or scientific literature to corroborate his statements. Dr Mack’s concerns included the following:

(a) The Australian Standard RPS3 is in line with international standards but is less stringent than those in many countries. It is less stringent than the previous Australian Standard.

(b) The Australian Standard RPS3 protects human tissue against damage caused by heating from RF EME but does not protect against damage caused by other reasons. There may be more health risks at lower powers than at higher powers.

(c) Although proof of adverse health risks from RF EME is not yet conclusive, there is nevertheless a considerable body of knowledge which suggests the need for a precautionary approach to be taken.

(d) The applicant has stated to the Council and residents that there is no evidence that mobile phone base stations cause any adverse health effects, yet the applicant has also stated in its 2004 Annual Report that insurers were less prepared to give insurance cover against adverse health risks.

(e) The effects of exposure to "radiation" (Dr Mack did not distinguish between ionising radiation and non-ionising radiation such as RF EME) are cumulative.

(f) Exposure to RF EME from mobile phone stations is involuntary.

(g) The ACIF Code for the Deployment of Radiocommunications Infrastructure requires carriers to demonstrate they have applied a precautionary approach. The applicant has not done this. The applicant has not had regard to the physical characteristics of the locality including the elevation and terrain or the location of sensitive community facilities such as schools in siting the proposed base station.

(h) Children will be more at risk of exposure to RF EME.

(i) The proposal is not essential for the activities of the Club.

(j) The applicant has not considered alternative sites. There are more suitable sites in the area.

(k) There is no need for the proposed base station. There are already base stations in neighbouring areas. Coverage is adequate. There is no birth right to blanket coverage by mobile phone.

(l) The application has provided the Council and the residents with little, or outdated, or misleading information.

(m) The Council has rejected the application on three occasions.

49 Mrs Jillian Brunelli-Brondex objected to the proposal on the following grounds:

(a) The Council has refused the application on three occasions.

(b) The applicant has not produced evidence "guaranteeing" the safety of the antennas.

(c) It is "not prudent" to install "irradiating infrastructure" in a residential area, especially Cheltenham where 28% of the population are children.

(d) From reading newspapers and watching news broadcasts whilst living in Europe and North America, Mr Brunelli-Brondex has become conscious of the "growing problems" that this type of infrastructure causes.

(e) Antennas should not be at the same elevation as residences. Mrs Brunelli-Brondex's childrens' bedrooms are at the same elevation as the proposed antennas at the Club site.

(f) The precautionary principle should be applied. It is cited in reports in various countries and in the ACIF Code.

(g) Communities are not convinced by the latest scientific evidence being supplied by people who wish to install mobile phone base stations.

(h) The antennas will give the Club's clubhouse building an industrial appearance, which is inappropriate in a heritage conversation area.

(i) There is a high probability of co-location by other carriers. This could lead to multiplication of antennas and a resultant ugliness.

(j) The health and safety of the local community outweighs the financial gain to the Club and the applicant.

(k) 56 letters of objection have been written by local residents, but of the responses supporting the proposal, only 8 were individual letters and the majority of supporters did not live nearby.

(l) By reason of a covenant on the original subdivision of Cheltenham, no noxious or commercial activity is permitted in Cheltenham. The proposal would infringe this covenant. Establishing a noxious, commercial activity in Cheltenham such as the proposal will set a dangerous precedent.

50 The Court also had the benefit of a bundle of documents containing the submissions received when the development application and review of the Council's determination under s 82A were advertised. These have been considered.

Mobile telephone technology and RF EME

51 Before discussing the effect of RF EME on the health and safety of humans and the environment, it is instructive to explain three fundamental matters: first, the history and development of mobile telephone technology, secondly, the nature of electromagnetic energy generally and, thirdly, the nature of radiofrequency electromagnetic energy in particular, being the form emitted from mobile phone base stations.

52 Some of the concerns raised by residents stem from a misunderstanding of these fundamental concepts.

53 In his expert report to the Court, Dr Black provided a helpful and clear overview of these fundamental concepts. I will set out his overview on these concepts in its entirety.

Overview of Mobile Telephone Technology

54 Dr Black's overview of mobile telephone technology is as follows:

"16. The use of radio based systems for communications dates back to the late 19th century, beginning after the demonstrations of wireless communication by Marconi, which he announced in 1896. In the years which followed, intelligence communication using radio signals was initially achieved by interrupting the signal and sending pulsed codes using the method which had been invented a century earlier for wireless telegraphy by Samuel Morse.

17. This proved highly effective on wire based systems throughout the preceding century and was adapted to radio simply by interrupting the transmitted signal, which coded characters by using either an on or off state.

18. However, the discovery of electronic methods of signal amplification, particularly the thermionic valve by de Forrest enabled the development of systems to modulate speech and other sound intelligence onto the radio signal in an analogue fashion, heralding the beginning of wireless technology.

19. By the 1920's, this was used widely for both broadcasting and communications, although morse code systems remained important for a further eighty years. By the time of the second world war the use of radio telephone systems was widespread for both military and civil communications and the direct descendents of these systems remain today, for example in the facilities used in Australia by taxis and emergency services.

20. An important characteristic of a radio transmitting and receiving system is the relationship of stations to

each other, whether they are in a one to one or one to many system. In broadcasting, one transmitter may serve literally millions of receivers whereas in a radio telephone system generally one transmitter and receiver set is communicating with another single transmitter and receiver set thus creating one circuit of radio telephony communication.

21. However, in the earlier systems of radio telephones, and some of these or their modern equivalents are still in use, one central base station would serve many transceivers on the same frequency and usage of the system depended on the users having to wait their turn, which is a primitive system of time division multiple access (TDMA).

22. It is also possible to create a number of different channels at different radio frequencies, that is effectively a number of different base transmitter stations, which is a system of frequency division multiple access (FDMA).

23. In practice, the two were mixed and so a 1950's radio telephone system as operated in Australia by the Post Office, would have, say 10 transmitters on different frequencies operating from a high point in a city, each of which might serve, say 100 mobile stations, so 1000 users could benefit from a service providing they waited their turn for an empty time slot. In general, these systems used relatively high powers, of the order of hundreds of watts at the base stations and tens of watts at the mobile stations. They generally relied on rather bulky equipment with power derived from an external source, such as a motor vehicle battery.

24. Whilst the essential technology of radio transmission and reception did not change markedly in the last quarter of the 20th century, the manner of using the available spectrum space was radically altered by the development of cellular telephone technology, the modern derivative of which is used in today's mobile telephone systems.

25. There are a number of important concepts in this, all of which evolve from the earlier ideas of time and frequency division.

26. Firstly, the utility of particular frequencies can be greatly altered, if the frequencies are able to be reused in different geographic locations. At ultra high frequencies, this can be achieved by utilising the line of sight properties of high frequency radio signals so that, if these are effectively obstructed by geographical features, the same channel can be reused in another location.

27. If a mobile transmitter can be arranged so that it can be identified wherever it is, and the base system can be designed so that it keeps track of each mobile transceiver, then a system of greatly expanded utility can be arranged by containing each transmission area into "cells", which are the basis of modern mobile telephone technology.

28. Modern systems have gone further than this and divided the area around a base station into sectors, usually three, which interface with the sectors of the next adjacent sites forming a honeycomb pattern of cells. That system provides greatly increased utility of frequency division multiple access.

29. The most basic use of time division multiple access is achieved by simply having users queue up and wait for an empty time slot. However, digital technology has afforded a further refinement of this by transmitting signals in bursts after momentarily storing and preparing the signal in electronic memory and then rapidly switching between a number users.

30. The second generation mobile telephone system used by Telstra and their competitors, Global System Mobile (GSM) has used this technique since the early 1980's and is able to manage eight simultaneous conversations using switched time slots on a single carrier, thus, there is an added increase in capacity of the system by combining time division multiple access (TDMA) with the existing frequency division multiple access (FDMA) afforded by the use of multiple channels and geographically separated cells.

31. Such systems are at the current state of the art and because the cells can be relatively small, and the base stations are all linked by microwave or fibre optic circuits to central exchanges, a high level of performance and coverage can be relatively easily achieved using small amounts of transmitted power and relatively small bands of radio frequency spectrum.

32. Thus, the first generation of mobile telephone systems in cellular techniques used only FDMA and cellular techniques for channel reuse. The second generation has used FDMA and TDMA but now there is a third generation which is presently being introduced throughout the world.

33. Third generation mobile telephone technology has evolved to a more sophisticated system of using signals, which contain special codes so that the receiving station at the base or mobile end is able to decipher only the part transmitted signal relevant to the circuit, which has been established for the particular users, who have established contact with the call. However, the base station transmits a broadband signal at low level, which on initial inspection would appear to be little more than noise, but by the use of the codes and mathematical methods imbedded in the electronics of the base station and phone to decipher these, the intelligent signal can be extracted.

34. These systems have proven to be by far the most efficient yet at achieving useful levels of communication, using small amounts of power and efficient use of spectrum. FDMA is no longer necessary, for that matter neither is TDMA, because all of the codes are effectively coexisting in parallel on the one signal.

35. This system is known as code division multiple access (CDMA) and this forms the basis for third generation systems. Telstra in Australia and Telecom in New Zealand used the CDMAOne system, which is strictly second generation with some third generation characteristics. Both second and third generation systems also incorporate power minimising technology, known as adaptive power control (APC) in GSM, or in other technologies by analogous similar names.

36. APC has the ability at the time of negotiating the original circuit to establish transmitter power levels at both the base station and mobile, which are no more powerful than necessary to achieve reliable

communications, thus minimising the likelihood of interference, as well as increasing the battery life of the mobile phone. This incidentally has the effect of minimising the exposure of radio frequency energy to the user of the mobile phone or to other electronic equipment or people in the vicinity of the base transmitter, although by the standard of other RF based equipment, the levels are already very low in any event. Studies have shown that this exposure minimising effect is as effective as a strategy with this as its primary goal."

Electromagnetic Energy (EME)

55 Dr Black also provided the Court with an overview of electromagnetic energy or EME:

"37. Energy is defined in physics as something which is capable of doing work. Work may consist of moving, heating, or otherwise altering the physical characteristics of the environment, or something in the environment. Energy and work are for practical purposes the same thing and they are expressed as a total amount accrued over time.

38. A common example is the use of electrical energy purchased from a supply company, measured with units of kilowatt hours. Energy at a point in time is expressed as power (kilowatts), crude work over time is energy (kilowatt hours), although the correct SI unit for total energy is the joule. Systeme Internationale (SI) is the agreed international system of units used in science and industry based on the metre, kilogram and second. The joule is one watt for one second. Energy involving mechanical force or movement may involve moving objects against gravity, or imparting heat by conduction, though intermediates (for example boiling food in water) or conducting heat through gases in the atmosphere.

39. However, energy can also transmit though space on its own account, without any intermediate as, for example, the energy from the sun does in transiting through space to the earth. This happens by means of electromagnetic waves of which there is a wide spectrum with varying properties.

40. The behaviour of electromagnetic energy (EME) has caused it to be characterised as waves and it remains most useful to think of the spectrum in these terms, although it is self evident, since EME is capable of passing through nothing, it cannot be waves in nothing, and therefore EME also has the characteristics of particles, which are known as photons.

41. The electromagnetic spectrum extends from extremely low frequencies of a few cycles per second to extremely high frequencies of billons of cycles per second. Electromagnetic energy travels at more or less a constant speed depending on the medium in which it is moving. In a vacuum that is approximately 300 million metres per second (300Mms-1) and the frequency and wavelength are inversely proportional.

42. The speed of light and radio waves is generally known as C and is measured in metres per second (m/s) or ms-1). The frequency of vibration is expressed as cycles per second which are termed Hertz (Hz) (or multiples of Hertz). The wavelength is measured in metres or fraction of a metre and is signified by the

Greek letter λ. There is a direct and constant relationship between the speed, the frequency and the wavelength in which, as the frequency goes up the wavelength goes down, or conversely, as the wavelength goes up the frequency goes down. The contract in this relationship is the speed (C). Thus the formula is C (speed) = Hz (frequency) x λ (wavelength).

43. Another characteristic of electromagnetic waves is the energy contained within them and this is carried in two importantly different forms. Firstly, the wave itself has an amplitude and power, which can deliver energy directly to a receiving object, where the wave lands and stops, or in physical terms is absorbed. A classical example of this is an object in the path of sunlight which absorbs the heat of the sun and is warmed up.

44. However, there is also another form of energy in the wave, which is the energy bundled up in the nature of the wave itself, or, if the wave is thought of as a stream of particles, in the photons. This becomes significant at frequencies much higher than that of light and enormously higher than the frequency of radio waves. This is known as “photon energy”. At low frequencies this is insignificant, but at extremely high frequencies, for example, those well above light, photon energy becomes much more significant than the power of the wave, so much so that it dominates the characteristics of the wave (or stream of photons, whichever way you look at it) and is capable of causing chemical changes in structures, because the photon energy exceeds the electrical strength of the bonds, which hold atoms together in molecules.

45. Thus photon energy is measured in electron volts or thousands of electron volts (kiloelectron volts, keV) and this property of knocking atoms off molecules is known as “ionisation”. It is called ionisation, because when it breaks up a substance, which has become electrically neutral, it renders it charged thus creating an ion. The ionising properties of electromagnetic waves do not begin until well above the frequency of visible light, in the upper ultra-violet spectrum, although the lower ultra violet, which is capable of travelling through the earth’s atmosphere, is not ionising.

46. The human and most animals’ eyes have evolved to react to the narrow band of frequencies centred around 500 nanometres (that is 500 thousand millionths of a metre), because this region is a “window” in the earth’s atmosphere, where electromagnetic energy from the sun is able to transmit relatively freely.

47. The frequencies immediately below the lower end of the visible spectrum, which is red, are known as infrared and are capable of transmitting both heat energy and can be used for intelligent information, the most commonly encountered application of which are infrared remote controls, such as are widely used in television sets and the like. Frequencies below this, in practice well below, are those used for radio frequency communications.”

Radio Frequency Electromagnetic Energy (RF EME)

56 In his report, Dr Black then briefly discusses radiofrequency electromagnetic energy (“RF EME”):

“48. In general, RF is regarded as the spectrum from 30 kHz to 300 GHz and that is because these

frequencies can be reasonably readily transmitted around the earth, through the atmosphere and in different regions possess important characteristics, which can be utilised. For example, lower frequencies in the short wave band (3 to 30 MHz) can be bounced from the ionosphere and thus circumnavigate the globe enabling a radio listener in Australia to hear a broadcast from England.

49. However, at higher frequencies, the point to point characteristics and lack of further propagation can be utilised, as it is in mobile telephone technology and these characteristics are typically found in frequencies of the order of 1 GHz (1 thousand million hertz).

50. It is around these frequencies that mobile telephone systems operate. Those currently in use in Australian are confined to the region from 800 MHz to 2.2 GHz. The characteristics of these frequencies are that they are of relatively short wavelength (between 5 and 15 centimetres), are more or less confined to point to point transmission, in that they do not bend around solid screening or absorbing objects very much, although they will bounce off reflecting surfaces readily, which turns out to be useful in achieving local coverage in the cells of a mobile telephone system.

51. Broadcast systems such as television and radio use the bands immediately below these because, as one of many systems using only frequency division for multiple users of the spectrum, isolation of signals is not so important, but the ability for them to bend around to a greater or lesser extent is useful. So frequencies such as broadcasting band 1 (about 50 MHz), used in Australia for television channels 0 to 3, can achieve good coverage even to areas which cannot see the transmitter. This would be an impediment in the design of a mobile telephone system, but is an advantage in a television system."

Predicted RF EME levels

57 Telstra estimated the maximum cumulative RF EME levels from all carriers at distances between 5 and 500 metres on one of the radiofrequency beams transmitted by the proposed base station (at a direction of 131.73o). This was done in accordance with and as required by the relevant industry code (Australian Communications Industry Forum, "Industry Code – Deployment of Mobile Phone Network Infrastructure", 2004). The maximum level, which occurs at an intermediate distance of 83.89 metres, was estimated as equivalent to 2.39% of the Australian Communications Authority (ACA) mandated exposure limits when these estimates are made at 1.5m above ground level. The document referenced in the summary of estimated RF EME levels from Telstra, is the ACA Mandatory Standard "Radiocommunications (electromagnetic radiation – human exposure) standard 2003". The ACA Standard fixed as the mandatory EMR exposure limits from mobile telephone base stations, the exposure limits in the standard set by ARPANSA, namely the Australian Standard RPS3.

58 The approach taken in Australia to estimating levels for such compliance is the use of modelling software which is well accepted and reliable. This uses complex mathematical models to combine the effects of signals at various frequencies. However, the figure finally arrived at should be considered as a percentage of the frequency in use which has the most restrictive standard. The variation in reference levels at various frequencies results from differences in absorption. The lowest frequency in use, rounded down to the nearest 100 MHz, is 800 MHz which, using the method in the Australian Standard RPS3, results in a power density limit of 4 watts per square metre.

59 Accordingly, in this case, the maximum level is 2.39% of 4 watts per square metre which is less than 10 milliwatts per square metre or less than 1/40th of the Australia Standard RPS3.

60 Mr Bangay gave corroborative evidence of the predicted RF EME levels from the proposed base station.

61 Mr Bangay measured the existing RF EME levels (from AM and FM radio, VHF and UHF television, and mobile phone base signals) at community sensitive locations in Cheltenham in the vicinity of the proposed base station. These measurements were expressed as a cumulative RF EME level as a fraction of the RPS3 General Public Exposure Limit. The results are summarised in Table 1 below.

Measurement Location	**Measured Cumulative Environmental RF EME Level as a Fraction of RPS3 GP Limit**	
Girls High School	0.0068%	
Cnr The Crescent & The Promenade	0.0068%	
Pre School – The Promenade	0.0030%	
Church car park The Promenade		0.0023%
School Crossing Beecroft Rd		0.0023%
Beecroft Rd opposite The Promenade	0.0023%	
Recreational Club	0.0071%	
No. 2 The Boulevarde		0.0071%
Railway Station Car park		0.0071%
Cnr The Crescent & Lyne Rd	0.0017%	

Table 1. Measurements of existing RF EME at specific locations

62 Of the cumulative RF EME level, mobile phone base signals are an extremely minor component. For example, at the Cheltenham Girls High School, of the cumulative RF EME total of 0.0068% of the RPS3 General Public Exposure Limit, mobile phone base signals comprise a mere 0.000002%. The largest contributor of RF EME to the cumulative total is radio, both FM (0.005%) and AM (0.00135%). Television is the next largest contributor, both UHF TV (0.0003%) and VHF TV (0.0002%).

63 Next, Mr Bangay used well-accepted and reliable computer modelling to predict the RF EME levels from the proposed base station at each of the locations at which Mr Bangay had measured the existing cumulative EME levels. These predicted levels were again expressed as a fraction of the RPS3 General Public Exposure Limit. Table 2 below summarises Mr Bangay's predictions.

Prediction Location	**Predicted level of RF EME from proposed Base Station as a Fraction of RPS3 GP Limited**	
Girls High School	0.0406%	
Cnr The Crescent & The Promenade	0.0763%	
Pre School – The Promenade	0.0156%	
Church car park The Promenade		0.0134%
School Crossing Beecroft Rd		0.0071%
Beecroft Rd opposite The Promenade	0.0095%	
Recreational Club	0.0839%	
No. 2 The Boulevarde		1.692%
Railway Station Car park		0.3300%
Cnr The Crescent & Lyne Rd	0.6890%	

Table 2. Predicted level of base station RF EME

64 Mr Bangay stated that the predicted levels are a worst-case assessment. Actual levels will be far less. Mr Bangay gave four main reasons for predicted levels being in excess of actual levels.

65 First, predictions are made on the basis of all transmitters operating at full rated power. This seldom, if ever, occurs. Adaptive power control and phone traffic of less than 100% causes lower transmitting powers. Adaptive power control minimises transmitted power to prevent interference with other base station signals and conserve battery life in the mobile phone: see also *Telstra Corporation Ltd v Moreland City Council* [2002] VCAT 1294 (23 October 2002) at [31].

66 Secondly, for prediction purposes, antennas are significantly tilted downwards in the vertical plane. Although a number of sites, such as tall buildings and towers, require the downward tilting of antennas, sites on low buildings and at the bottom of hills do not. The antennas for the proposed base station will be on a

low building and in a topographically lower location and will not be required to be tilted downwards.

67 Thirdly, transmission losses between transmitters and antennas are not fully taken into account.

68 Fourthly, radio signals are absorbed and reflected by buildings and trees that are in the signal path. Mr Bangay noted that the majority of the community sensitive locations in the Cheltenham area do not have direct line of sight transmission paths to the proposed base station. This will cause a significant reduction in the reported predicted levels.

69 Mr Papadatos, a Radio Frequency Design Engineer sub-contracted to Telstra, also gave evidence that actual emission levels from the proposed base station will be lower than the estimated levels. He gave two reasons: first, the estimation makes no allowance for signal attenuation resulting from buildings, trees and the general environment and, secondly, cellular networks rarely operate at maximum power.

70 For these reasons given by Mr Bangay and Mr Papadatos, the actual RF EME levels radiated from the proposed base station will be significantly reduced from the predicted RF EME levels.

71 Mr Bangay corroborated this evidence by reference to an audit ARPANSA initiated in 2003 of the actual measured RF EME levels of 60 mobile phone base stations in Australia. Mr Bangay was one of the auditors. The work has been published: G I Henderson and M J Bangay (2005), "Survey of RF exposure levels from mobile telephone base stations in Australia", 27(1) *Bioelectromagnetics* 73-76.

72 One of the objectives of the audit was to compare predicted levels, using the well accepted modelling, with the actual measured levels. The audit showed that, on average, the measured levels for CDMA signals at the distance from the base station where the maximum level was predicted to occur was 43,000 times less than the ARPANSA/ACA General Public Exposure Limit. The audit also showed that the GSM signals were, on average, 4,500 times less than the ARPANSA/ACA General Public Exposure Limit.

73 Furthermore, the audit demonstrated that predictions, based on the well accepted modelling, were conservative. Estimated levels were, on average, 28 times greater than the measured levels for cumulative signals radiated from co-located sites.

74 As a final step, Mr Bangay aggregated the existing cumulative environmental RF EME levels that he had measured at the community sensitive locations in Cheltenham, with his predicted levels of RF EME from the proposed base station. Table 3 below summarises the results of this aggregation.

Location	**Cumulative RF EME Level (proposed base station & existing environmental) as a Fraction of RPS3 GP Limit**

Girls High School	0.0474%		
Cnr The Crescent & The Promenade	0.0831%		
Pre School – The Promenade	0.0186%		
Church car park The Promenade		0.0164%	
School Crossing Beecroft Rd		0.0200%	
Beecroft Rd opposite The Promenade	0.0125%		
Recreational Club	0.0910%		
No. 2 The Boulevarde		1.6991%	
Railway Station Car park		0.3371%	
Cnr The Crescent & Lyne Rd	0.6961%		

Table 3. Cumulative level of existing environmental and base station RF EME

75 These cumulative totals of RF EME at each location will also represent worst-case assessments for the reasons given above. The actual levels from the proposed base station will be significantly less than the predicted levels. Hence, the cumulative totals shown in Table 3 will in actuality be significantly less.

76 Mr Bangay stated that the RF EME levels in Tables 1 to 3 are "well below the ARPANSA General Public Exposure Limit and are not known to have any adverse health effects".

77 Mr Bangay also noted that the greatest contributors of RF EME to the totals for the cumulative RF EME environmental levels in Table 3 at the locations of the pre-school and Cheltenham Girls High School, after commissioning of the proposed base station, will continue to be broadcast services (TV and radio). This is a consequence of the proposed base station creating low level RF EME, the significantly higher elevations at the locations of the pre-school and Cheltenham Girls High School, and signal path attenuation. Dr Black corroborated this conclusion.

Health effects of exposure to RF EME

78 Dr Black was appointed as a court-appointed expert on the health effects of exposure to RF EME from the proposed base station.

79 Dr Black explained that the manner in which RF EME can interact with living tissue is well understood and documented. There have been extensive publications on this topic over the last 50 years and a large number of expert summaries published. The extensive publications were reviewed, summarised and referenced in the Australian Standard RPS3 (see Schedule 1 in particular).

80 Dr Black explained that the Australian Standard RPS3 sets limiting values to deal with both thermal and athermal effects of RF EME.

81 Thermal effects involve the heating of living tissue by the absorption of energy and the dissipation of heat from circulating electric currents in conductive tissue. This occurs because the external electromagnetic field in space results in an internal field within the space occupied by the body. However, the presence of electrical conductors results in this field resolving to electric currents in the manner of a radio receiving aerial.

82 For this reason, all of the current standards, including the Australian Standard RPS3, are based on the potential for biological consequences of this effect to be limited by the specific absorption rate (SAR). This is the rate at which energy is absorbed into tissue measured in watts per kilogram of tissue. This parameter forms a basic restriction in the standards.

83 For thermal effects, the basic restriction is whole body average SAR to prevent whole body heat stress. The mandatory limiting value of exposure expressed for whole body average SAR closely matches the known biophysical interaction mechanisms caused by heating. In the case of the Australian Standard RPS3, the whole body average SAR threshold for general public exposure to RF in the frequency range of 100 kHz - 6GHz is 0.08 watts for kilogram. (Table 2 on p. 7, Australian Standard RPS3).

84 However, direct measurement of this basic restriction is often impractical. Therefore, the Australian Standard RPS3 provides a set of indicative levels called reference levels as an alternative means for determining compliance. Compliance with the reference levels assumes that SAR thresholds will not be exceeded.

85 For the basic restriction of whole body average SAR (for frequencies in the range 100kHz - 6GHz) the corresponding reference levels are time averaged exposure to rms electrical (E) and magnetic (H) field strengths (Table 1 on p. 6, Australian Standard RPS3). These reference levels vary depending on the frequency range. The reference levels are lower for general public exposure than for occupational exposure (Table 7 on p. 12, Australian Standard RPS3).

86 Athermal effects are any effects not related to heating that results from the interaction of RF fields with a biological system. At frequencies between 10MHz, RF EME has athermal effects. Sensitive tissue such as nerves and muscles can be electrostimulated at levels below perceptible heating.

87 Accordingly, at these low frequencies, these athermal effects form the limiting basic restriction. The basic

restriction is the instantaneously special peak rms current density to prevent electrostimulation of excitable tissue. The corresponding reference levels to instantaneous spatial peak rms current density (for the frequency range of 3kHz - 10MHz) are the instantaneous rms electrical (E) and/or magnetic (H) (3kHz - 10MHz) field strengths and instantaneous contact current (3kHz - 10MHz) (Table 1 on p. 6, Australian Standard RPS3). Satisfaction of the reference levels for the electric and magnetic field strength instantaneous reference levels assumes compliance with the basis restriction on instantaneous spatial peak rms current density.

88 The RF EME generated by the proposed base station will comply by significant margins of safety with the basic restrictions and corresponding reference levels for general public exposure for thermal and athermal effects. Such compliance ensures that the general public will not experience thermal or athermal effects.

89 Dr Black concluded that the RF EME which would radiate from the proposed base station "could not conceivably cause any adverse biological or health effect". Dr Black provides reassurance "that a high standard of environmental and health protection would be maintained if this station is allowed to be constructed as specified in the proposal from Telstra".

90 I accept the evidence of Dr Black and Mr Bangay and find that RF EME emitted from the proposed base station will not cause any adverse biological or health effect to the general public.

Appropriateness of the Australian Standard RPS3

91 The Australian Standard RPS3 is an authoritative and scientifically credible standard to protect the health and safety of people and the environment from the harmful effects of radiofrequency fields in the frequency range of 3kHz to 300 GHz. The Standard is based on the 1998 ICNIRP Guidelines of the International Commission on Non-Ionising Radiation Protection ("ICNIRP Guidelines").

92 The Australian Standard RPS3 notes that ICNIRP is an international scientific body with affiliations to various international standards bodies and organisations. The ICNIRP rules establish scientific integrity and require all committee members to be independent experts who are not members of commercial or industrial organisations. All ICNIRP publications appear in the peer reviewed scientific journal *Health Physics*: p. 34 of the Australian Standard RPS3.

93 The Australian Standard RPS3 has reworked the ICNIRP specifications to improve technical specifications or complete specifications where incomplete in the ICNIRP Guidelines. The result is a sturdy and unambiguous technical framework: pp. 33-34 of Australian Standard RPS3.

94 The Australian Standard RPS3 notes that in the process of settling the Standard extensive, further research was also carried out:

"In establishing this Standard, the origins and evolution of relevant recommendations and publications of the ICNIRP and the American National Standards Institute (ANSI) were carefully reviewed. Additionally, the rationale for further development of these documents was examined and consideration given to whether any published evidence challenges the integrity of the approaches taken by the current ICNIRP (ICNIRP 1998) (formerly IRPA/INIRC) approach and the current ANSI/IEEE (IEEE 1999) approach. In addition to reviews conducted by expert groups or panels, there is a large body of literature published in peer reviewed journals which has been relied on. Recent epidemiological studies and laboratory research reports have been carefully examined for evidence that would establish a need to modify the basic restrictions or the associated reference levels. Moreover, relevant spatial and temporal measurement averaging parameters have been reviewed and where necessary revised, so as to provide an adequate and unambiguous specification of the limits": p. 35 of the Australian Standard RPS3.

95 The purpose of the Australian Standard RPS3 is stated to be "to specify limits of exposure to electromagnetic fields within radiofrequency range from 3kHz to 300 GHz such that any persons exposed below the limits will be fully protected against all established adverse health effects": p. 42 of Australian Standard RPS3.

96 The Australian Standard RPS3 concludes:

"The current scientific evidence clearly indicates that there are RF exposure thresholds for the adverse health effects of heating, electro-stimulation and auditory response. The basic restrictions of this Standard are derived from these thresholds and include safety margins.

There is some debate as to whether RF causes any effects below the threshold of exposure capable of causing heating and electro-stimulation, and in particular whether any effects occur at or below the exposure levels of the limits. If any low-level RF effects occur, they are unable to be reliably detected by modern scientific methods, but a degree of uncertainty remains. The data of long term exposure is limited. It was considered that the evidence for possible low-level effects is so weak and inconsistent, that it does not provide a reason to alter the level of the limits. The limits specific in this Standard are designed to protect against known health effects and may not prevent possible or unknown low-level effects, although the safety margin within the limit may provide some protection against such low-level effects.

Furthermore, the reference levels given in this Standard are based on specific 'worst case' assumptions regarding particular exposure conditions that will lead to exposure at the level of the basic restrictions. In the majority of exposure situations, such 'worst case' exposure conditions do not apply, and thus the application of the reference levels will provide additional safety margins": p. 42 of Australian Standard RPS3.

97 The Standard envisages and sets basic restrictions to take account of different groups within the general public, including children. The basic restrictions in the Standard account for different sizes and tissue properties of all individuals, including children: pp. 42-43 of Australian Standard RPS3.

Application of the Australian Standard RPS3

98 It is not appropriate for a court to set aside or disregard such an authoritative and scientifically credible standard as the Australian Standard RPS3: *Connell Wagner Pty Ltd v City of Port Phillip* [1998] VCAT 606 (15 January 1999) at pp. 18, 21 and *Heland Pty Ltd & Anor v Telstra*, unreported, VCAT Ref No P 3620/2004 (8 March 2005) at [7].

99 Nor is it appropriate for a court to pioneer standards of its own. The creation of new standards is the responsibility of other authorities with special expertise, such as ARPANSA: *Hyett v Corangamite Shire Council & Telstra* [1999] VCAT 794 (30 April 1999) at p. 5; *Telstra Corporation Ltd v Pine Rivers Shire Council* [2001] QPELR 350 (9 March 2001) at 364 [61] and 379 [117]; *Lucent Technologies v Maribyrnong City Council & Ors* [2001] VCAT 1955 (27 September 2001) at [52] and [57]; *Peasley & Ors v Frankston City Council* [2002] VCAT 642 (25 July 2002); *Telstra Corporation Ltd v Moreland City Council* [2002] VCAT 1294 (23 October 2002) at [32]; *Optus Mobile Ltd v Whittlesea City Council* [2003] VCAT 968 (16 June 2003) at [24]; *Optus Pty Ltd v Cardinia Shire Council* [2004] VCAT 581 (2 April 2004) at [17] and [19]; *Telstra Ltd v Mornington Peninsula Shire Council* [2005] VCAT 863 (9 May 2005) at [20]; *Hutchison 3G Australia Pty Ltd v Hobsons Bay City Council* [2005] VCAT 1470 (18 July 2005) at [28]-[29].

100 The Court should accept and apply the Australian Standard RPS3: *Sinclair v Loddon Shire Council* [1997] VCAT 241 (1 December 1999) at p. 3; *Telstra Corporation Ltd v Pine Rivers Shire Council* [2001] QPELR 250 at 364 [61]; *Optus Mobile Ltd v Whittlesea City Council* [2003] VCAT 968 (16 June 2003) at [26]; *Blake Dawson Waldron on behalf of Telstra Corporation v West Tamar Council* [2004] TASRMPAT 201 (20 August 2004) at [43]; *Hutchison Telecommunication (Australia) Limited v Ku-ring-gai Municipal Council* [2004] NSWLEC 665 (10 November 2004) at [15]; and see also *McIntyre v Christchurch City Council* [1996] NZRMA 289 (5 March 1996) New Zealand Environment Court, 295.

101 The Australian Standard RPS3 embraces a precautionary approach. The exposure limits set are conservative relative to the scientific evidence on biological effects of exposure to RF fields. There are margins for safety in the basic restrictions and associated reference levels. The reference levels are based on worst case assumptions: *Optus Communications Pty Ltd v Corporation of the City of Kensington and Norwood* [1998] SAERDC 480 (29 May 1998) at p. 6; *Shirley Primary School v Telecom Mobile Communications Limited* [1998] NZEnvC 394; [1999] NZRMA 66 (14 December 1998) New Zealand Environment Court, 143 [250]; *Lucent Technologies v Maribyrnong City Council & Ors* [2001] VCAT 1955 (27 September 2001) at [26]; and *Optus Mobile Ltd v Whittlesea City Council* [2003] VCAT 968 (16 June 2003) at [25].

102 Another precautionary approach advocated by the Australian Standard RPS3 is, in relation to the general public, to adopt the principle of:

"Minimising, as appropriate, RF exposure which is unnecessary or incidental to achievement of service objectives or process requirements, provided this can be readily achieved at reasonable expense. Any such precautionary measures should follow good engineering practice and relevant codes of practice. The incorporation of arbitrary additional safety factors beyond the exposure limits of this Standard is not supported": section 5.7(e) of Australian Standard RPS3 at p. 29.

103 This precautionary approach has been adopted by Telstra in its proposal. The nature and design of the antennas, their tilt and pan, the nature and quality of the radio equipment comprising the proposed base

station and the efficient use of the equipment including the use of adaptive power control, all operate to minimise RF EME exposure: see also *Connell Wagner Pty Ltd v City of Port Phillip* [1998] VCAT 606 (15 January 1999) at p. 13 and V*ertical Telecoms Pty Ltd v Hornsby Shire Council* [2000] NSWLEC 172 (10 August 2000) at [7].

104 No evidence was put forward to suggest that any RF EME exposure from the proposed base station was unnecessary or incidental to the achievement of service objectives or process requirements for the proposed base station. Dr Black stated there were no other precautionary measures that could be taken to further minimise RF EME exposure from the proposed base station and certainly none that could be readily achieved at reasonable expense.

105 Accordingly, the proposed base station meets the precautionary approach recommended by the Australian Standard RPS3.

106 Indeed, as was concluded in *Vertical Telecoms Pty Ltd v Hornsby Shire Council* [2000] NSWLEC 172 (10 August 2000) at [70], "the safeguards generally adopted, and applied to this proposal, are for more stringent than any research has shown to be necessary".

Ecologically sustainable development

107 The issue of the effect of RF EME emitted from the proposed base station raises the question of the ecological sustainability of the development, and in particular the applicability of the precautionary principle to the development. I will first outline the basic concept of ecologically sustainable development and then its applicability to the determination of development applications under the EPA Act. I will next focus on the precautionary principle and its applicability to the proposed development in this case.

108 Ecologically sustainable development, in its most basic formulation, is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs": World Commission on Environment and Development, *Our Common Future*, 1987 at p. 44 (also known as the Brundtland Report after the Chairperson of the Commission, Gro Harlem Brundtland). More particularly, ecologically sustainable development involves a cluster of elements or principles. Six are worth highlighting.

109 First, from the very name itself comes the principle of sustainable use - the aim of exploiting natural resources in a manner which is "sustainable" or "prudent" or "rational" or "wise" or "appropriate": P Sands, *Principles of International Environmental Law*, 2nd ed, Cambridge University Press, 2003 at p. 253. The concept of sustainability applies not merely to development but to the environment. The *Australian National Strategy for Ecologically Sustainable Development* makes this explicit in defining ecologically sustainable development as "development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends": *National Strategy for Ecologically Sustainable Development*, Australian Government Publishing Service, 1992 at p. 8.

110 Secondly, ecologically sustainable development requires the effective integration of economic and

environmental considerations in the decision-making process: see the chapeau to the definition of ecologically sustainable development in s 6(2) of the *Protection of the Environment Administration Act* 1991 (NSW) adopted by s 4(1) of the EPA Act and Principle 4 of the *Rio Declaration on Environment and Development*. This is the principle of integration it was the philosophical underpinning of the report *Our Common Future*. That report recognised that the ecologically harmful cycle caused by economic development without regard to and at the cost of the environment could only be broken by integrating environmental concerns with economic goals.

111 The principle of integration ensures mutual respect and reciprocity between economic and environmental considerations. The principle recognises the need to ensure not only that environmental considerations are integrated into economic and other development plans, programmes and projects but also that development needs are taken into account in applying environmental objectives: see P Sands, *Principles of International Environmental Law*, 2nd ed, Cambridge University Press, 2003 at p. 253.

112 The principle has been refined in recent times to add social development to economic development and environmental protection. The Plan of Implementation of the World Summit on Sustainable Development held in Johannesburg, 2002, notes that efforts need to be taken to:

"promote the integration of the three components of sustainable development – economic development, social development and environmental protection – as interdependent and mutually reinforcing pillars. Poverty eradication, changing unsustainable patterns of production and consumption and protecting and managing the natural resource base of economic and social development are overarching objectives of, and essential requirements for, sustainable development": at paragraph 2.

113 Thirdly, there is the precautionary principle. There are numerous formulations of the precautionary principle but the most widely employed formulation adopted in Australia is that stated in s 6(2)(a) of the *Protection of the Environment Administration Act* 1991 (NSW). This provides:

"...If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequence of various options".

See also s 3.5.1 of the *Intergovernmental Agreement on the Environment*, 1992.

114 Principle 15 of the *Rio Declaration on Environment and Development* is expressed in similar terms.

115 This is the particular principle of ecologically sustainable development invoked by the Council and the residents in this case in aid of their opposition to the proposed base station. I will return to it shortly.

116 Fourthly, there are principles of equity. There is a need for inter-generational equity - the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations: see s 6(2)(b) of the *Protection of the Environment Administration Act* 1991; s 3.5.2 of the *Intergovernmental Agreement on the Environment*; and Principle 3 of the *Rio Declaration on Environment and Development*.

117 There is also a need for intra-generational equity. This involves considerations of equity within the present generation, such as use of natural resources by one nation-state (or sector or class within a nation-state) needing to take account of the needs of other nation-states (or sectors or classes within a nation-state): P Sands, *Principles of International Environmental Law*, 2nd ed, Cambridge University Press, 2003 at p. 253 and E Brown Weiss, "Intergenerational Equity: a legal framework for global environmental change" in E Brown Weiss (ed), *Environmental Change and International Law: New Challenges and Dimensions*, UN University Press, 1992, p. 385 at pp. 397-398. It involves people within the present generation having equal rights to benefit from the exploitation of resources and from the enjoyment of a clean and healthy environment: B Boer, "Institutionalising Ecologically Sustainable Development: The Role of National, State and Local Governments in Translating Grand Strategy into Action" (1995) 31 *Willamette Law Review* 307 at 320.

118 Fifthly, there is the principle that conservation of biological diversity and ecologically integrity should be a fundamental consideration: s 6(2)(c) of the *Protection of the Environment Administration Act* 1991; s 3.5.3 of the Intergovernmental Agreement on the Environment; and *Bentley v BGP Properties Pty Ltd* [2006] NSWLEC 34 (6 February 2006) at [58]-[63].

119 Sixthly, ecologically sustainable development involves the internalisation of environmental costs into decision-making for economic and other development plans, programmes and projects likely to affect the environment. This is the principle of the internalisation of environmental costs. The principle requires accounting for both the short-term and the long-term external environmental costs. This can be undertaken in a number of ways including:

(a) environmental factors being included in the valuation of assets and services;

(b) adopting the polluter pays (or user pays) principle, that is to say, those who generate pollution and waste should bear the costs of containment, avoidance or abatement;

(c) the users of goods and services paying prices based on the full life cycle of the costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and

(d) environmental goals, having been established, being pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems: see s 6(2)(d) of the *Protection of the Environment Administration Act* 1991 and s 3.5.4 of the *Intergovernmental Agreement on the Environment* 1992.

120 These principles do not exhaustively describe the full ambit of the concept of ecologically sustainable development, but they do afford guidance in most situations. These principles, if adequately implemented, may ultimately realise a paradigm shift from a world in which the development of the environment takes place without regard to environmental consequences, to one where a culture of sustainability extends to institutions, private development interests, communities and individuals: B Boer, "The Globalisation of Environmental Law" [1995] MelbULawRw 8; (1995) 20 *Melbourne University Law Review* 101 at 111.

121 The principles of ecologically sustainable development are to be applied when decisions are being made under any legislative enactment or instrument which adopts the principles: *Murrumbidgee Ground-Water Preservation Association v Minister for Natural Resources* [2004] NSWLEC 122 (7 April 2004) at [178]; and *Bentley v BGP Properties Pty Ltd* [2006] NSWLEC 34 (6 February 2006) at [57].

122 The EPA Act is one such legislative enactment. It expressly states that one of the objects of the EPA Act is to encourage ecologically sustainable development: s 5(a)(vii). The Act defines ecologically sustainable development as having the same meaning as it has in s 6(2) of the *Protection of the Environment Administration Act* 1991.

123 Section 79C(1) of the EPA Act, which sets out the relevant matters which a consent authority must take into consideration, does not expressly refer to ecologically sustainable development. Nevertheless, it does require a consent authority to take into account "the public interest" in s 79C(1)(e). The consideration of the public interest is ample enough, having regard to the subject matter, scope and purpose of the EPA Act, to embrace ecologically sustainable development.

124 Accordingly, by requiring a consent authority (or on a merits review appeal the Court) to have regard to the public interest, s 79C(1)(e) of the EPA Act obliges the consent authority to have regard to the principles of ecologically sustainable development in cases where issues relevant to those principles arise: *Carstens v Pittwater Council* [1999] NSWLEC 249; (1999) 111 LGERA 1 at 25; *BGP Properties Pty Ltd v Lake Macquarie City Council* [2004] NSWLEC 399; (2004) 138 LGERA 237 at 262 [113]; and *Port Stephens Pearls Pty Ltd v Minister for Infrastructure and Planning* [2005] NSWLEC 426 (15 August 2005) at [54].

The precautionary principle

The precautionary principle explored

125 I have set out in the preceding section on ecologically sustainable development, the formulation of the precautionary principle in s 6(2) of the *Protection of the Environment Administration Act* 1991 which is adopted by s 4(1) of the EPA Act: see paragraph 112 above.

126 A number of decisions in this Court have established that the precautionary principle is to be considered in making determinations of development applications under the EPA Act: *Carstens v Pittwater Council* [1999] NSWLEC 249; (1999) 111 LGERA 1 at 25; *Hutchison Telecommunications (Australia) Pty Ltd v Baulkham Hills Shire Council* [2004] NSWLEC 104 (26 March 2004), [26]; *BGP Properties Pty Ltd v Lake Macquarie City Council* [2004] NSWLEC 399; (2004) 138 LGERA 237 at 262 [113]- [114]; *B T Goldsmith Planning Services Pty Ltd v Blacktown City Council* [2005] NSWLEC 210 (1 July 2005) at [73]; *Port Stephens Pearls Pty Ltd v Minister for Infrastructure and Planning* [2005] NSWLEC 426 (15 August 2005) at [54]; *Providence Projects Pty Ltd v Gosford City Council* [2006] NSWLEC 52 (17 February 2006) at [68], [76] and [108]; and *Gales Holdings Pty Ltd v Tweed Shire Council* [2006] NSWLEC 85 (27 February 2006) at [56]-[61].

127 However, there has not yet been, in the decisions of this Court, a detailed explanation of the precautionary principle or the procedure for application of it. Hence, it is necessary to refer to other sources of information on the precautionary principle, including judicial decisions of other jurisdictions and the academic literature on the precautionary principle. Drawing on these sources, the following guidance can be offered on the concept of the precautionary principle and its application.

Conditions precedent or thresholds to application of the precautionary principle

128 The application of the precautionary principle and the concomitant need to take precautionary measures is triggered by the satisfaction of two conditions precedent or thresholds: a threat of serious or irreversible environmental damage and scientific uncertainty as to the environmental damage. These conditions or thresholds are cumulative. Once both of these conditions or thresholds are satisfied, a precautionary measure may be taken to avert the anticipated threat of environmental damage, but it should be proportionate: N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at p. 155.

Threat of serious or irreversible damage

129 Two points need to be noted about the first condition precedent that there be a threat of serious or irreversible environmental damage. First, it is not necessary that serious or irreversible environmental damage has actually occurred – it is the *threat* of such damage that is required. Secondly, the environmental damage threatened must attain the threshold of being *serious or irreversible*.

130 Threats to the environment that should be addressed include direct and indirect threats, secondary and long-term threats and the incremental or cumulative impacts of multiple or repeated actions or decisions. Where threats may interact or be interrelated (for example where action against one threat may exacerbate another threat) they should not be addressed in isolation: see "Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management", R Cooney and B Dickson (eds)

Biodiversity and the Precautionary Principle, Risk and Uncertainty in Conservation and Sustainable Use, Earthscan, 2005 at p. 302, Guideline 6.

131 Assessing the seriousness or irreversibility of environmental damage involves consideration of many factors: see, for example, the suggested process of analysis in A Deville and R Harding, *Applying the Precautionary Principle*, Federation Press, 1997 at pp. 25-31; and the discussion in N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at pp. 163-165. The factors might include:

(a) the spatial scale of the threat (eg local, regional, statewide, national, international);

(b) the magnitude of possible impacts, on both natural and human systems;

(c) the perceived value of the threatened environment;

(d) the temporal scale of possible impacts, in terms of both the timing and the longevity (or persistence) of the impacts;

(e) the complexity and connectivity of the possible impacts;

(f) the manageability of possible impacts, having regard to the availability of means and the acceptability of means;

(g) the level of public concern, and the rationality of and scientific or other evidentiary basis for the public concern; and

(h) the reversibility of the possible impacts and, if reversible, the time frame for reversing the impacts, and the difficulty and expense of reversing the impacts.

132 The assessment of whether the threats are serious or irreversible will be enhanced by broadening the range of professional expertise consulted and seeking and taking into account the views of relevant stakeholders and rightholders. The former is important because of the inter-disciplinary nature of the questions involved. The latter is important because different judgments, values and cultural perceptions of risk, threat and required action play a role in the assessment process: see “Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management” in Appendix A to R Cooney and B Dickson (eds) *Biodiversity and the Precautionary Principle, Risk and Uncertainty in Conservation and Sustainable Use*, Earthscan, 2005 at p. 301, Guideline 4; and A Deville and R Harding, *Applying the precautionary principle*, Federation Press, 1997 at p. 26.

133 The assessment involves ascertaining whether scientifically reasonable (that is, based on scientifically plausible reasoning) scenarios or models of possible harm that may result have been formulated: World Commission on the Ethics of Scientific Knowledge and Technology, *The Precautionary Principle*, UNESCO, Paris, 2005 at p. 31.

134 The threat of environmental damage must be adequately sustained by scientific evidence. As was held in *Monsanto Agricoltura Italia v Presidenza del Consiglio dei Ministri*, European Court of Justice, Case C-236/0 (13 March 2003) at [138]:

"not every claim or scientifically unfounded presumption of potential risk to human health or the environment can justify the adoption of national protective measures. Rather, the risk must be adequately substantiated by scientific evidence".

135 In *Daubert v Merrell Dow Pharmaceuticals* [1993] USSC 99; 509 US 579 (1993) at 589-590; [1993] USSC 99; 125 L Ed 2d 469 (1993) at 481, the United States Supreme Court held that in a case involving scientific evidence, the evidence must pertain to scientific knowledge. The adjective "scientific" implies a grounding in the methods and procedures of science and the word "knowledge" connotes more that subjective belief or unsupported speculation. The requirement that expert evidence pertain to scientific knowledge establishes a standard of evidentiary reliability.

136 In *Gabcikovo-Nagymaros (Hungary v Slovakia)* [1997] ICJ Rep 7, the International Court of Justice held that Hungary had not established that there existed a state of necessity justifying the suspension of its treaty obligations with the former Czechoslovakia. A state of necessity has to be occasioned by an essential interest of the State and the interest must have been threatened by a grave and imminent peril (a concept equivalent to a threat). The International Court of Justice did not accept that Hungary had established the objective existence of a grave and imminent peril and hence a component element of a state of necessity was absent. The Court noted:

"The word 'peril' certainly evokes the idea of 'risk'; that is precisely what distinguishes 'peril' from material damage. But a state of necessity could not exist without a 'peril' duly established at the relevant point in time; the mere apprehension of a possible 'peril' could not suffice in that respect": at [54].

137 Determining the existence of a threat of serious or irreversible environmental damage does not involve, at the stage of assessing the first condition precedent, any evaluation of the scientific uncertainty of the threat. That evaluation comes in the following steps of analysis.

138 If there is not a threat of serious or irreversible environmental damage, there is no basis upon which the precautionary principle can operate. The precautionary principle does not apply, and precautionary measures cannot be taken, to regulate a threat of negligible environmental damage: N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at p. 163.

139 This was the conclusion in *Alumino (Aust) Pty Ltd v Minister administering the Environmental Planning and Assessment Act 1979 (NSW)* [1996] NSWLEC 102 (29 March 1996) where the evidence established that the development could be operated in a way which would not have any significant environmental consequence: at pp. 15-16. So too in *Hutchison Telecommunications (Australia) Pty Limited v Baulkham Hills Shire Council* [2004] NSWLEC 104 (26 March 2004), where compliance of a development with the relevant standard for the protection of public health and safety by a significant margin meant that there was no threat of serious or irreversible damage to public health and safety from the development, and hence no basis on which to apply the precautionary principle: at [27].

Scientific uncertainty

140 The second condition precedent required to trigger the application of the precautionary principle and the necessity to take precautionary measures is that there be "a lack of full scientific certainty". The uncertainty is as to the nature and scope of the threat of environmental damage: *Leatch v National Parks and Wildlife Services* (1993) 81 LGERA 270 at 282.

141 Assessing the degree of scientific uncertainty also involves a process of analysis of many factors: see A Deville and R Harding, *Applying the Precautionary Principle*, Federation Press, 1997 at pp. 31-37. The assessment of the degree of uncertainty might include consideration of the following factors:

(a) the sufficiency of the evidence that there might be serious or irreversible environmental harm caused by the development plan, programme or project;

(b) the level of uncertainty, including the kind of uncertainty (such as technical, methodological or epistemological uncertainty); and

(c) the potential to reduce uncertainty having regard to what is possible in principle, economically and within a reasonable time frame.

142 One issue that the formulation of the precautionary principle raises is how much scientific uncertainty must exist. On a literal reading, the threshold is crossed whenever there is a lack of "full" scientific certainty. Yet, such a literal interpretation of the principle would render this condition meaningless.

143 Certainly, "full" scientific certainty as to the threat of environmental damage would be an unattainable goal: *Nicholls v Director-General of National Parks and Wildlife* (1994) 84 LGERA 397 at 419. It is impossible to be completely certain about the threats of environmental damage: C Barton, "The status of the precautionary principle in Australia: Its emergence in legislation and as a common law doctrine" (1998) 22 *Harvard Environmental Law Review* 509 at 518.

144 It cannot be unequivocally stated that a particular phenomenon will never cause adverse effects. This is because a null hypothesis can never be proven through processes of inductive logic. Indeed, this point is made in the Australian Standard RPS3 at p. 41. Karl Popper, the eminent scientific philosopher, has also explained why it is impossible to prove, with certainty and finality, a scientific theory. No matter how many positive instances of a generalisation are observed, it is still possible that the next instance will falsify it. However, a sound and reliable scientific theory will be one which, while being capable of being falsified, has been put to the test and has resisted falsification whenever it is put to the test: see K Popper, *Conjectures and Reputations*, 5th ed, Routledge, London, 1989, p 37 and *Daubert v Merrell Dow Pharmaceuticals* [1993] USSC 99; 509 US 579 (1993) at 593; [1993] USSC 99; 125 L Ed 2d 469 (1993) at 482-483. See also B J Preston, "Science and the Law: Evaluating evidentiary reliability" (2003) 23 *Australian Bar Review* 263 at 271, 280-282 and 287.

145 Once it is accepted that the threshold is something less than full scientific certainty, the question becomes how much less? Or turning the question around, how much scientific uncertainty need there be as to the threat of environmental damage before the second condition precedent to trigger application of the precautionary principle is fulfilled?

146 Cordonier Segger and Khalfan suggest that the magnitude of environmental damage is usually inversely proportionate to the likelihood of risk in order for precaution to be triggered. That is to say, where the relevant degree or magnitude of potential environmental damage is greater, the degree of certainty about the threat is lower. They suggest that for a formulation of the precautionary principle which uses the threshold of "serious or irreversible" environmental damage, the correlative degree of certainty about the threat is "highly uncertain of threat". This would contrast with a formulation of the precautionary principle which sets a lower degree of potential harm such as "potential adverse effects", where the correlative degree of certainty about the threat would be higher, namely "highly certain of threat": M-C Cordonier Segger and A Khalfan, *Sustainable Development Law: Principles, Practices and Prospects*, Oxford University Press, 2004 at pp. 145-146.

147 The World Commission on the Ethics of Scientific Knowledge and Technology, in its 2005 report on the precautionary principle, postulated that one of the conditions that must be present for the precautionary principle to apply is that "considerable scientific uncertainty must exist": World Commission on the Ethics of Scientific Knowledge and Technology, *The Precautionary Principle*, UNESCO, Paris, 2005 at p. 31.

148 de Sadeleer posits a threshold test of "reasonable scientific plausibility," or where a threat or risk of environmental damage is considered scientifically likely. de Sadeleer explains his test of reasonable scientific plausibility as follows:

"That condition would be fulfilled when empirical scientific data (as opposed to simple hypothesis, speculation, or intuition) make it reasonable to envisage a scenario, even it if does not enjoy unanimous scientific support.

When is there 'reasonable scientific plausibility'? When risk begins to represent a minimum degree of certainty, supported by repeated experience. But a purely theoretical risk may also satisfy this condition, as soon as it becomes scientifically credible: that is, it arises from a hypothesis formulated with methodological rigour and wins the support of part of the scientific community, albeit a minority.

The principle may consequently apply to all post-industrial risks for which a cause-and-effect relationship is not clearly established but where there is a 'reasonable scientific plausibility' that this relationship exists. This would be particularly appropriate for delayed pollution, which does not become apparent for some time and for which full scientific proof is difficult to assemble": N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at p. 160.

See also A Deville and R Harding, *Applying the Precautionary Principle*, Federation Press, 1997 at p. 33.

149 If there is no, or not considerable, scientific uncertainty (the second condition precedent is not satisfied), but there is a threat of serious or irreversible environmental damage (the first condition precedent is satisfied), the precautionary principle will not apply. The threat of serious irreversible environmental damage can be classified as relatively certain because it is possible to establish a causal link between an action or event and environmental damage, to calculate the probability of their occurrence, and to insure against them. Measures will still need to be taken but these will be *preventative* measures to control or regulate the relatively certain threat of serious or irreversible environmental damage, rather than precautionary measures which are appropriate in relation to uncertain threats: A Deville and R Harding, *Applying the Precautionary Principle*, Federation Press, 1997 at p. 31 and 34; J Cameron, "The precautionary principle: Core meaning, constitutional framework and procedures for implementation" in R Harding and E Fisher (eds), *Perspectives on the Precautionary Principle*, Federation Press, 1999, p. 29 at p. 37; and N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at pp. 74-75 and 158.

Shifting of the burden of proof

150 If each of the two conditions precedent or thresholds are satisfied – that is, there is a threat of serious or irreversible environmental damage and there is the requisite degree of scientific uncertainty – the precautionary principle will be activated. At this point, there is a shifting of an evidentiary burden of proof. A decision-maker must assume that the threat of serious or irreversible environmental damage is no longer uncertain but is a reality. The burden of showing that this threat does not in fact exist or is negligible effectively reverts to the proponent of the economic or other development plan, programme or project.

151 The rationale for requiring this shift of the burden of proof is to ensure preventative anticipation; to act before scientific certainty of cause and effect is established. It may be too late, or too difficult and costly, to change a course of action once it is proven to be harmful. The preference is to prevent environmental damage, rather than remediate it. The benefit of the doubt is given to environmental protection when there is scientific uncertainty. To avoid environmental harm, it is better to err on the side of caution.

152 The function of the precautionary principle is, therefore, to require the decision-maker to assume that there is, or will be, a serious or irreversible threat of environmental damage and to take this into account, notwithstanding that there is a degree of scientific uncertainty about whether the threat really exists: see J Cameron and J Aboucher, "The Precautionary Principle: A Fundamental Principle of Law and Policy for the Protection of the Global Environment" (1991) 14 *Boston College International and Comparative Law Review* 1 at 22; B Boer, "Implementing Sustainability" (1992) 14 *Delhi Law Review* 1 at 17; B A Weintraub, "Science, International Environmental Regulation, and the Precautionary Principle: Setting Standards and

Defining Terms" (1992) 1 *NYU Environmental Law Journal* 173 at 204-207; W Gullett, "Environmental Protection and the 'Precautionary Principle': A Response to Scientific Uncertainty in Environmental Management" (1997) 14 *Environmental Planning Law Journal* 52 at 59-60; C Barton, "The status of the precautionary principle in Australia: Its emergence in legislation and as a common law doctrine" (1998) 22 *Harvard Environmental Law Review* 509 at 519 and 549-551; D Farrier, "Factoring biodiversity conservation into decision-making processes: The role of the precautionary principle" in R Harding and E Fisher (eds), *Perspectives on the Precautionary Principle*, Federation Press, 1999, p. 99 at pp. 107-110; *Conservation Council of South Australia v Development Assessment Committee and Tuna Boat Owners Association (No. 2)* [1999] SAERDC 86 (16 December 1999) at [24]-[25]; M Parnell, "Southern Bluefin Tuna Feedlotting: ESD, the Precautionary Principle and Burden of Proof" (1999) 9 *Journal of International Wildlife Law and Policy* 334; *Tuna Boat Owners Association of SA Inc v Development Assessment Commission* [2000] SASC 238; (2000) 110 LGERA 1 at 6[27]-7[30]; *Vellore Citizens Welfare Forum v Union of India* AIR 1996 SC 2715 at 2720 [11] – 2721; *AP Pollution Control Board v Prof. M V Bayadu* AIR 1999 SC 812 at 821 [27]-[39]; *Narmada Bachao Andolan v Union of India* AIR 2000 SC 3751 at 3803[15]-3804; and M-C Cordonier Segger and A Khalfan, *Sustainable Development Law: Principles, Practices and Prospects*, Oxford University Press, 2004 at pp. 144 and 150.

153 An illustration of this function of the precautionary principle can be found in *Providence Projects Pty Ltd v Gosford City Council* [2006] NSWLEC 52 (17 February 2006) in which there was scientific uncertainty as to whether a proposed development would cause serious or irreversible environmental damage to a threatened ecological community, the Umina Coastal Sandplain Woodland (UCSW). This scientific uncertainty stemmed from uncertainty as to whether the threatened ecological community was widely distributed over the site. The function of the precautionary principle was to shift the burden of proof in relation to this question. Bignold J held:

"The application of the precautionary principle in the present case justifies an approach which avoids the risk of serious or irreversible environmental damage by assuming the existence of the wide distribution of UCSW over the development site": at [77].

154 It should be recognised that the shifting of the evidentiary burden of proof operates in relation to only one input of the decision-making process – the question of environmental damage. If a proponent of a plan, programme or project fails to discharge the burden to prove that there is no threat of serious or irreversible environmental damage, this does not necessarily mean that the plan, programme or project must be refused. It simply means that, in making the final decision, the decision-maker must assume that there will be serious or irreversible environmental damage. This assumed factor must be taken into account in the calculus which decision-makers are instructed to apply under environmental legislation (such as s 79C(1) of the EPA Act). There is nothing in the formulation of the precautionary principle which requires decision-makers to give the assumed factor (the serious or irreversible environmental damage) overriding weight compared to the other factors required to be considered, such as social and economic factors, when deciding how to proceed: D Farrier, "Factoring biodiversity conservation into decision-making processes: The role of the precautionary principle" in R Harding and E Fisher, *Perspectives on the Precautionary Principle*, Federation Press, 1999 at p. 108.

155 This was the conclusion in *Greenpeace Australia Ltd v Redbank Power Company Pty Ltd and Singleton Council* (1994) 86 LGERA 143 where Pearlman J held at 154 that:

"The application of the precautionary principle dictates that a cautious approach should be adopted in evaluating the various relevant factors in determining whether or not to grant consent; it does not require that

the greenhouse issue should outweigh all other issues".

Precautionary principle invokes preventative anticipation

156 The precautionary principle permits the taking of preventative measures without having to wait until the reality and seriousness of the threats become fully known: *Pfizer Animal Health SA v Council of the European Union* [2002] ECR II–3305 (11 September 2002), European Court of First Instance (11 September 2002) at [139]; 15 *Journal of Environmental Law* 372 at 378; *Monsanto Agricoltura Italia v Presidenza dei Consiglio dei Ministri*, European Court of Justice, Case C-236/01 (13 March 2003) at [111]. This is the concept of preventative anticipation: T O'Riordan and J Cameron, "The History and Contemporary Significance of the Precautionary Principle" in T O'Riordan and J Cameron (eds), *Interpreting the Precautionary Principle*, Earthscan Publications, 1994, p. 12 at p. 17; and P Sands, *Principles of International Environmental Law*, 2nd ed, Cambridge University Press, 2003 at p. 269.

Zero risk precautionary standard inappropriate

157 The precautionary principle should not be used to try to avoid all risks. As the United States Supreme Court said in *Industrial Union Department, AFL-C10 v American Petroleum Institute* [1980] USSC 152; 448 US 607 (1980) at 656 [1980] USSC 152; (1980); 65 L Ed 2d 1010 (1980) at 1064:

"Some risks are plainly acceptable and others are plainly unacceptable".

158 A zero risk precautionary standard is inappropriate: see Analysis on *Pfizer Animal Health SA v Council of the European Union* by W Th Douma (2003) 15 *Journal of Environmental Law* 394 at 401. The Advocate General, in his opinion in *National Farmers' Union v Secretary Central of the French Government*, European Court of Justice, Case C-241/01 (2 July 2002) at [76] stated:

"the precautionary principle has a future only to the extent that, far from opening the door wide to irrationality, it establishes itself as an aspect of the rational management of risks, designed not to achieve a zero risk, which everything suggests does not exist, but to limit the risks to which citizens are exposed to the lowest level reasonably imaginable".

See also *EFTA Surveillance Authority v Norway,* European Free Trade Association (EFTA) Court, Case E-3/00 (5 April 2001) at [32].

159 Rationality dictates that the precautionary principle and any preventative measure cannot be based on a purely hypothetical approach to the risk, founded on mere conjecture which has not been scientifically verified: *Pfizer Animal Health SA v Council of the European Union* [2002] ECR II–3305 European Court of

First Instance (11 September 2002) at [145]; (2003) 15 *Journal of Environmental Law* 372 at 378 and *EFTA Surveillance Authority v Norway*, European Free Trade Association (EFTA) Court, Case E-3/00 (5 April 2001) at [29]. Rather, a preventative measure may be taken only if the risk, although the reality and extent of the risk have not been "fully" demonstrated by conclusive scientific evidence, appears nevertheless to be adequately backed up by the scientific data available at the time when the measure was taken: *Pfizer Animal Health SA v Council of the European Union* [2002] ECR II–3305, European Court of First Instance (11 September 2002) at [145]; (2003) 15 *Journal of Environmental Law* 372 at 379; and *Monsanto Agricoltura Italia v Presidenza de Consiglio dei Ministri*, European Court of Justice, Case C236/01 (9 September 2003) at [113].

160 de Sadeleer expresses this approach in the following passage:

"Adherence to the adage 'when in doubt, do nothing' should not overshadow the complementary wisdom that 'there's such a thing as being too careful'. To avoid having the best become the enemy of the good, the [precautionary] principle's field of application must exclude those risks characterised as residual, that is, hypothetical risks resting on purely speculative considerations without any scientific foundation. Speculation, conjecture, intuition, warnings, denunciations, or implications should not suffice in and of themselves to justify an attitude of precaution": N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at p. 158.

Degree of precaution required

161 The type and level of precautionary measures that will be appropriate will depend on the combined effect of the degree of seriousness and irreversibility of the threat and the degree of uncertainty. This involves assessment of risk in its usual formulation, namely the probability of the event occurring and the seriousness of the consequences should it occur. The more significant and the more uncertain the threat, the greater the degree of precaution required: A Deville and R Harding, *Applying the Precautionary Principle,* Federation Press, 1997 at p. 37; and J Cameron, "The precautionary principle: Core meaning, constitutional framework and procedures for implementation" in R Harding and E Fisher, *Perspectives on the Precautionary Principle*, Federation Press, 1999, p. 29 at pp. 37-38; and Commission on Environmental Law of IUCN (the World Conservation Union), *Draft International Covenant on Environment and Development*, 3rd ed., Environmental Policy & Law Paper No. 31, Rev. 2, 2004 at p. 45.

162 Prudence would also suggest that some margin for error should be retained until all the consequences of the decision to proceed with the development plan, programme or project are known. This allows for potential errors in risk assessment and cost-benefit analysis. Potential errors are weighted in favour of environmental protection. Weighting the risk of error in favour of the environment is to safeguard ecological space or environmental room for manoeuvre: T O'Riordan and J Cameron, "The History and Contemporary Significance of the Precautionary Principle" in T O'Riordan and J Cameron (eds), *Interpreting the Precautionary Principle*, Earthscan Publications, 1994, p. 12 at p. 17; and C Barton, "The status of the precautionary principle in Australia: Its emergence in legislation and as a common law doctrine" (1998) 22 *Harvard Environmental Law Review* 509 at 520.

163 One means of retaining a margin for error is to implement a step-wise or adaptive management approach, whereby uncertainties are acknowledged and the area affected by the development plan, programme or project is expanded as the extent of uncertainty is reduced: M D Young, "The precautionary

principle as a key element of ecologically sustainable development" in R Harding and E Fisher, *Perspectives on the Precautionary Principle*, Federation Press, 1999, 127 at 140.

164 An adaptive management approach might involve the following core elements:

" monitoring of impacts of management or decisions based on agreed indicators;

promoting research, to reduce key uncertainties;

ensuring periodic evaluation of the outcomes of implementation, drawing of lessons, and review of adjustment, as necessary of the measures or decisions adopted; and

establishing an efficient and effective compliance system": see "Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management" in Appendix A to R Cooney and B Dickson (eds), *Biodiversity and the Precautionary Principle, Risk and Uncertainty in Conservation and Sustainable Use*, Earthscan, 2005 p. 304, Guideline 12.

165 An adaptive management approach was required in *Port Stephens Pearls Pty Ltd v Minister for Infrastructure and Planning* [2005] NSWLEC 426 (15 August 2005). Talbot J held that application of the precautionary principle required that consent should only be granted if there was a monitoring regime that would detect emerging adverse impacts and enable the appropriate regulatory authority to require them to be addressed if and when they emerged: at [58]. See also *Tuna Boat Owners Association of SA Inc v Development Assessment Commission* [2000] SASC 238; (2000) 110 LGERA 1 at 8[35].

Proportionality of response

166 The precautionary principle embraces the concept of proportionality. The concept of proportionality is that measures should not go beyond what is appropriate and necessary in order to achieve the objectives in question. Where there is a choice between several appropriate measures, recourse should be had to the least onerous measure and the disadvantages caused should not be disproportionate to the aims pursued.

167 In applying the precautionary principle, measures should be adopted that are proportionate to the potential threats. A reasonable balance must be struck between the stringency of the precautionary measures, which may have associated costs, such as financial, livelihood and opportunity costs, and the seriousness and irreversibility of the potential threat: see "Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management" in Appendix A to R Cooney and B Dickson (eds), *Biodiversity and the Precautionary Principle, Risk and Uncertainty in Conservation and Sustainable Use*, Earthscan, 2005 at p. 304, Guideline 10.

168 The European Commission states in its *Communication on the Precautionary Principle*:

"Measures based on the precautionary principle must not be disproportionate to the desired level of protection and must not aim at zero risk, something which rarely exists": European Commission, *Communication from the Commission on the Precautionary Principle*, 2000, part 6.3.1.

169 Considerations of practicability need to be taken into account: see the definition of the precautionary principle which requires "careful evaluation to avoid, *wherever practicable*, serious or irreversible damage to the environment" in s 6(2)(a)(i) of the *Protection of the Environment Administration Act* 1991. One consideration of practicability is the cost of precautionary measures.

170 There must be proportionality of response or cost effectiveness of margins of error to show that the selected precautionary measure is not unduly costly: T O'Riordan and J Cameron, "The History and Contemporary Significance of the Precautionary Principle" in T O'Riordan and J Cameron, *Interpreting the Precautionary Principal,* Earthscan Publications, 1994, p. 12 at p. 17; and *National Farmers Union v Secretary General of the French Government,* European Court of Justice, Case C-241/01, (Opinion of the Advocate General) at [78].

171 The cost consequences of increasing levels of precaution must be evaluated. As O'Riordan notes:

"There are some dangers with getting too carried away with the application of precaution at any cost. In the absence of comparative risk assessment, the consequences of curtailing potentially beneficial activity and creating another set of unforeseeable risks for an unprepared society could be greater than proceeding step by step with prudent precaution": T O'Riordan "The Precaution Principle in Environmental Management" in R Ayres and U E Simonis (eds), *Industrial Metabolism: restructuring for sustainable development,* UN University Press, 1994.

See also A Deville and R Harding, *Applying the Precautionary Principle*, Federation Press, 1997 at pp. 43-44; and J Cameron "The precautionary principle: Core meaning, constitutional framework and procedures for implementation" in R Harding and E Fisher (eds), *Perspectives on the Precautionary Principle*, Federation Press, 1999, p. 29 at p. 42.

172 The selection of the appropriate precautionary measures to regulate the identified threat of serious or irreversible environmental damage with its identified uncertainty, requires assessment of the risk-weighted consequences of various options: see the definition of the precautionary principle in s 6(2)(a)(ii) of the *Protection of the Environment Administration Act* 1991. The available options to address the threat should be identified and the likely consequences of these options and of inaction should be assessed: see "Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management" in Appendix A to R Cooney and B Dickson (eds), *Biodiversity and the Precautionary Principle: Risk and Uncertainty in Conservation and Sustainable Use*, Earthscan, 2005 at p. 303.

173 The process of assessment of the risk-weighted consequences of options for precautionary measures has been suggested to involve a form of cost-benefit analysis with risk aversion assumed: see generally, R Posner, *Catastrophe: Risk and Response*, Oxford University Press, 2004; C Gollier, B Jullien, N Treich, "Scientific progress and irreversibility: an economic interpretation of the 'Precautionary Principle'"(2000) 75 *Journal of Public Economics* 229; and *R v Secretary of State for Trade and Industry; Ex Parte Duddridge,* UK Queens Bench Division, Farquharson LJ and Smith J (4 October 1994); (1995) 7 *Journal of Environmental Law* 224 at 230; [1995] Env LR 151.

174 However, there are difficulties in the application of the traditional form of cost-benefit analysis used in economics. First, traditional cost-benefit analysis tends to squeeze out qualitative soft values in favour of quantifiable hard values: see L Tribe, "Ways not to think about Plastic Trees: New Foundations for Environmental Law" (1974) 83 *Yale Law Journal* 1315; and N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at p. 199. This is what occurred in *Leatch v National Parks and Wildlife Service* (1993) 81 LGERA 270 at 286, where environmental factors were not included in the cost-benefit analysis.

175 Secondly, traditional cost-benefit analysis has difficulty in correctly internalising all externalities in the context of uncertainty. There are no simple or comprehensive rules in economic analysis for integrating risk and uncertainty into decision-making: see D Pearce, "The Precautionay Principle and Economic Analysis" in T O'Riordan and J Cameron (eds), *Interpreting the Precautionary Principle*, Earthscan Publications, 1994 at p. 140; and N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at p. 170. There is a difficulty in translating risks into monetary equivalents: C R Sunstein, "Cost-Benefit Analysis and the Environment" (2005) 115 *Ethics* 351 at 369 and 384; and C R Sunstein, *Laws of Fear: Beyond the Precautionary Principle,* Cambridge University Press, 2005, pp.7 and 131.

176 One solution suggested is to combine economic and non-economic measures by way of multi-criteria analysis. Multi-criteria analysis is a tool for integrating different types of monetary and non-monetary decision criteria. It deals with situations where decisions must be made taking into account multiple objectives, which cannot be reduced to a single dimension. Usually, multi-criteria analysis is clustered into three dimensions: the ecological, the economic and the social. Within each of these dimensions certain criteria are set so that decision-makers can weigh the importance of one element in association with other elements. Monetary values and cost-benefit analysis measures can be incorporated as one of the criteria to be considered, and weighted against the other criteria in decision-making: L Emerton, M Greig-Gran, M Kallesoe and J MacGregor, "Economics, the Precautionary Principles and Natural Resource Management: Key Issues, Tools and Practices" in R Cooney and B Dickson (eds), *Biodiversity and the Precautionary Principle: Risk and Uncertainty in Conservation and Sustainable Use*, Earthscan, 2005, p. 253 at p. 265.

177 The selection of the appropriate precautionary measures must involve examining both sides of the ledger: the costs associated with the project, process or product (which tends to increase the degree of precaution) as well as the benefits of the project, process or product (which tends to decrease the degree of precaution commensurate with realising the benefit). As Sunstein notes:

"Advocates of precaution often emphasise the costs associated with a product or process, without seeing that it may have benefits as well; and sometimes those benefits involve the environment itself. Why should regulators examine only one side of the ledger?" C R Sunstein, "Cost - Benefit Analysis and the Environment", (2005) 115 *Ethics* 351 at 366.

See generally C R Sunstein, *Laws of Fear: Beyond the Precautionary Principle*, Cambridge University Press, 2005.

178 In assessing the proportionality of a precautionary measure, consideration needs to be given to non-targeted risks that might arise. Efforts to eliminate all of the targeted risks might cause other adverse consequences. One adverse consequence may be that in addressing ever smaller target risks, the importance of countervailing risks relative to the target risks is likely to grow: F B Cross, "Paradoxical Perils of the Precautionary Principle" (1996) 53 *Washington and Lee Law Review* 851 at 860, 898, 906, and 924; and N de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, Oxford University Press, 2005 at pp. 171-172.

Precautionary principle does not necessarily prohibit development

179 The precautionary principle, where triggered, does not necessarily prohibit the carrying out of a development plan, programme or project until full scientific certainty is attained: P Stein, "A cautious application of the precautionary principle" (2002) 2 *Environmental Law Review* 1 at 10; *Vertical Telecoms Pty Ltd v Hornsby Shire Council* [2002] NSWLEC 172 (10 August 2000) at [68]; *Telstra Corporation Limited v Pine Rivers Shire Council & Ors* [2001] QPELR 350 at 380-381 [119]; *BGP Properties Pty Ltd v Lake Macquarie City Council* [2004] NSWLEC 399; (2004) 138 LGERA 237 at 262 [114]; A Deville and R Harding, *Applying the Precautionary Principle*, Federation Press, 1997 at 44; and M D Young "The precautionary principle as a key element of ecologically sustainable development" in R Harding and E Fisher, *Perspectives on the Precautionary Principle*, Federation Press, 1999, p. 127 at p. 138. See also *Greenpeace Australia Ltd v Redbank Power Company Pty Ltd and Singleton Council* (1994) 86 LGERA 143 at 154-155; and *Port Stephens Pearls Pty Ltd v Minister for Infrastructure and Planning* [2005] NSWLEC 426 (15 August 2005) at [56].

180 If the precautionary principle were to be interpreted in this way, it would result in a paralysing bias in favour of the status quo and against taking precautions against risk. The precautionary principle so construed would ban "the very steps that it requires": C R Sunstein, *Laws of Fear: Beyond the Precautionary Principle*, Cambridge University Press, 2005 at pp. 4, 14 and 26. It must be recognised that "precautions against some risks almost always create other risks": C R Sunstein, s*upra* at p. 53.

181 The solution is to assess the risk-weighted consequences of various options and select the option that affords the appropriate degree of precaution for the set of risks associated with the option.

Precautionary principle in context of other ESD principles

182 The precautionary principle is but one of the set of principles of ecologically sustainable development (highlighted earlier in the judgment). It should not be viewed in isolation, but rather as part of the package. This means that the precautionary measures that should be selected must not only be appropriate having regard to the precautionary principle itself, but also in the context of the other principles of ecologically sustainable development including inter-generational and intra-generational equity and the conservation of

biological diversity and ecological integrity: see A Deville and R Harding, *Applying the Precautionary Principle*, Federation Press, 1997 at p. 43. In some circumstances these other principles may strengthen the case for precautionary action, while in others the precautionary principle may need to be weighed against the other principles as well as other human rights such as food, water, health and shelter: see "Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management" in Appendix A to R Cooney and B Dickson (eds), *Biodiversity and the Precautionary Principle: Risk and Uncertainty in Conservation and Sustainable Use*, Earthscan, 2005 at p. 301, Guideline 2.

183 In *Northcompass Inc v Hornsby Shire Council* [1996] NSWLEC 213; (1996) 130 LGERA 248, the proposed development was a bioremediation plant which took green wastes away from diminishing landfill and provided value added end products. This was consistent with the principle of sustainable use of resources and the principle of intergenerational equity. However, the proposed development infringed the precautionary principle. The Court emphasised the need to consider all of the principles of ecologically sustainable development: at 246-247.

Application of precautionary principle to this case

184 In this case, the first condition precedent for the application of precautionary principle, that there be threats of serious or irreversible environmental damage, is not satisfied. The levels of RF EME emitted from the proposed base station will easily comply with the Australian Standard RPS3. Any harm to the health and safety of people or the environment caused by exposure to such extremely low levels of RF EME is negligible.

185 Accordingly, there is no basis on which the precautionary principle can be applied to this development. This is the same conclusion reached by other courts and tribunals dealing with other proposed mobile phone base stations and antennas which emitted RF EME that complied with the relevant regulatory standards: in New South Wales, see *Vertical Telecoms Pty Ltd v Hornsby Shire Council* [2000] NSWLEC 172 (10 August 2000) at [68]; *NTL Australia Ltd v Willoughby Council* [2000] NSWLEC 244 (27 November 2000) at [87]; *Hutchison Telecommunications (Australia) Pty Ltd v Baulkham Hills Shire Council* [2004] NSWLEC 104 (26 March 2004) at [27]; and in other states, see: *Connell Wagner Pty Ltd v City of Port Phillip* [1998] VCAT 606 (15 January 1999); and *Telstra Corporation Ltd v Pine Rivers Shire Council* [2001] QPELR 350 at 381[121].

186 This conclusion does not mean that there has been an avoidance of a precautionary approach. To the contrary, the conclusion is a direct consequence of the fact that a precautionary approach has already been adopted in the standard setting process, the terms of the Australian Standard RPS3, the design and location of the proposed base station, the equipment to be provided, the operation of the equipment including adaptive power control, the application of the Standard to the RF EME generated from the base station, and the likelihood of actual RF EME being significantly less than predicted RF EME. The cumulative effect of these precautionary approaches is to prevent any threat of serious or irreversible environmental damage. Hence, there is no basis to invoke the precautionary principle so as to take any further measures to prevent environmental degradation.

187 The circumstances in this case stand in contrast to the situation that faced the Supreme Court of Pakistan in *Zia v WAPDA* PLD 1994 SC 693. There, the government agency WAPDA and the relevant government department undertook the process of planning and deciding to construct an electricity grid station in a routine

manner without taking into consideration the latest research and planning in the field and without giving any thought to the potential hazards that the electromagnetic fields that radiated from the grid station might cause to human health. The Supreme Court of Pakistan held such an approach offended the precautionary principle: at [8]. Instead, a method needed to be devised to strike a balance between economic progress and prosperity and minimising possible hazards. The Court held that a policy of sustainable development should be adopted: at [10]. The appropriate precautionary measure adopted by the Supreme Court was, before passing any final order, to appoint an expert commissioner to examine and study the scheme, planning, device and technique employed by WAPDA and report whether there was any likelihood of any hazard or adverse effects on the health of the residents of the locality. The commissioner was also to suggest variation in the plan for minimising the alleged danger: at [10] and [16].

188 In the present case, such a precautionary approach has already been undertaken, first, in the standard-setting process which involved a comprehensive review of all relevant scientific literature on the potential biological effects of exposure to RF EME, secondly, in the adoption of the Australian Standard RPS3 with margins of safety, thirdly, in the requirements of the relevant industry code to comply with the adopted standard, fourthly, in the measurement of existing and the estimation of predicted RF EME levels from the proposed base station, in accordance with the accepted methodology, fifthly, in the selection of equipment and antennas to be used in the proposed base station and, finally, in the efficient operation of the equipment and antennas to minimise RF EME levels generated from the proposed base station. The carrying out of these precautionary measures implements, and indeed is likely to go further than, the precautionary approach required by the Supreme Court of Pakistan in *Zia v WAPDA*. The present case is, therefore, consistent with that decision.

Perceptions of effects on amenity and health

189 In the determination of a development application the consent authority (and this Court on a merits review appeal) must consider the effect of the proposed development on the amenity of the locality.

190 The concept of the amenity of the locality is wide and flexible. Some aspects of amenity are practical and tangible. Examples are traffic generation, noise, nuisance, appearance and way of life in the neighbourhood. Other aspects of amenity are intangible and subjective. They include the standard or class of the neighbourhood and the reasonable expectations of a neighbourhood: *Broad v Brisbane City Council* (1986) 59 LGRA 296 at 299. Amenity may embrace the effect of a place on the senses and the residents' perception of the locality. Knowing the use to which a particular site is, or may be, put may affect a person's perception of amenity: *Broad v Brisbane City Council* (1986) 59 LGRA 296 at 305. See also *Venus Enterprises Pty Ltd v Parramatta City Council* (1981) 43 LGRA 67 at 69; *Novak v Woodville City Corporation* (1990) 70 LGRA 233 at 236-237; and *Optus Communications Pty Ltd v Corporation of the City of Kensington and Norwood* [1998] SAERDC 480 (29 May 1998) at 6.

191 The very wide concept of amenity expounded in cases like *Broad v Brisbane City Council* applies with even greater force in a statutory scheme like the EPA Act which in s 79C(1) gives effect to the widest conceivable scope of 'likely impacts' of a proposed development, including environmental, economic and social impact, without employing the term amenity: *Perry Properties Pty Ltd v Ashfield Council (No. 2)* [2001] NSWLEC 62; (2001) 113 LGERA 301 at 318[64].

192 In determining the nature and scope of amenity and the impact of a proposed development on it, the

consent authority may consider the community responses to the proposed development as set out in the submissions made to the consent authority: s 79C(1)(d) and (e) of the EPA Act. The community responses are aspects of the public interest within the meaning of s 79C(1)(e) in securing the advancement of one of the express objects of the Act "to provide increased opportunity for public involvement and participation in environmental planning and assessment": s 5(c) of the EPA Act. See also *Kulin Holdings Pty Ltd v Penrith City Council* [1999] NSWLEC 157; (1999) 103 LGERA 402 at 415; and *New Century Developments Pty Ltd v Baulkham Hills Shire Council* [2003] NSWLEC 154; (2003) 127 LGERA 303 at 316[58].

193 However, in considering the community responses, an evaluation must be made of the reasonableness of the claimed perceptions of adverse effect on the amenity of the locality. An evaluation of reasonableness involves the identification of evidence that can be objectively assessed to ascertain whether it supports a factual finding of an adverse effect on the amenity of the locality.

194 In *Broad v Brisbane City Council* (1986) 59 LGERA 296 at 304, de Jersey J stated:

"In determining the likely effect on a proposed development on the amenity of a neighbourhood the Local Government Court is clearly entitled to have regard to the views of residents of the area. The question is whether a resident's view should be disregarded where it appears to be purely subjectively based, with no suggested justification in objective, observable likely consequences of the establishment of the proposed use.

In my opinion, such a subjective view need not necessarily be disregarded. Very often, of course, the evidence of such a view would be accorded little, if any, weight. In forming his own view on the likely effect of a proposed development on the amenity of an area a judge would, I think, ordinarily prefer views from residents which find justification in specific, concrete, likely effects of the proposed development":

See also *Dixon v Burwood Council* [2002] NSWLEC 190; (2002) 123 LGERA 253 at 264[53] and *New Century Developments Pty Ltd v Baulkham Hills Shire Council* [2003] NSWLEC 154; (2003) 127 LGERA 303 at 316[61] and 317[63].

195 A fear or concern without rational or justified foundation is not a matter which, by itself, can be considered as an amenity or social impact pursuant to s 79C(1) of the EPA Act: *Newton v Wyong Shire Council*, unreported, LEC No. 40135 of 1982, 6 September 1983, McClelland J, pp 110, 111; *Jarasius v Forestry Commission of New South Wales* (1988) 71 LGRA 79 at 92; *Perry Properties Pty Ltd v Ashfield Municipal Council* [2000] NSWLEC 188; (2000) 110 LGERA 345 at 350 22]; *New Century Developments Pty Ltd v Baulkham Hills Shire Council* [2003] NSWLEC 154; (2003) 127 LGERA 303 at 316[62]. "Mere local prejudice" or "the resistance of uninformed opinion to innovation" is not a basis for rejecting a proposal: *Cecec (No. 8) Pty Ltd v Mosman Municipal Council* (1960) 5 LGRA 251 at 263; *Foreman v Sutherland Shire Council* (1964) 10 LGRA 261 at 269.

196 In this case, the residents' perceptions of an adverse effect on the health and safety of residents and on the environment by exposure to RF EME emitted from the proposed base station are without justification in objective, observable, likely consequences. The claimed effects are unsubstantiated and without reasonable evidentiary foundation.

197 The concerns expressed by the residents as to RF EME emitted from the proposed base station do not relate to intangible matters. Rather, the concerns relate to matters which are capable of measurement and testing against established standards to see whether the concerns are justified or not: *Telstra Corporation Ltd v Pine Rivers Shire Council & Ors* [2001] QPELR 350 at 364. Testing against the relevant Australian Standard RPS3 proves that concerns are not justified.

198 In these circumstances, little, if any, weight can be given to the residents' perceptions. This has been the consistent conclusion of other courts and tribunals which have determined other cases involving unsubstantiated community perceptions of adverse effects on amenity from exposure to RF EME from a proposed development: see *McIntyre v Christchurch City Council* [1996] NZRMA 289 (5 March 1996), New Zealand Planning Tribunal at 314-315; *Optus Communications Pty Ltd v Corporation of the City of Kensington and Norwood* [1998] SAERDC 480 (29 May 1998) at 6; *Shirley Primary School v Telecom Mobile Communications Limited* [1998] NZEnvC 394; [1999] NZRMA 66 (14 December 1998), New Zealand Environment Court, at 140[241]; *Hyett v Corangamite Shire Council & Telstra* [1999] VCAT 794 (30 April 1999) at 6; *Vertical Telecoms Pty Ltd v Hornsby Shire Council* [2000] NSWLEC 172 (10 August 2000) at [69]-[70]; *Telstra Corporation Limited v Pine Rivers Shire Council & Ors* [2001] QPELR 350 at 364[60]; *Lucent Technologies v Maribyrnong City Council & Ors* [2001] VCAT 1955 (27 September 2001) at [56]; *Blake Dawson Waldron on behalf of Telstra Corporation v West Tamar Council* [2004] TASRMPAT 201 (20 August 2004) at [46].

199 There is also a broader policy reason for the Court making its determination on the basis of reason and substantiated evidence. As Galligan notes:

"A basic aspect of rational action is that facts on which decisions are founded should be supported by good evidence.

...unless there is a substratum of objective evidence for the reasons and policies acted on, discretionary decisions are liable to the charge of arbitrariness": D J Galligan, *Discretionary Powers: A Legal Study of Official Discretion,* Clarendon Press, Oxford, 1990 at pp. 314 and 316.

200 This is the foundation for the no evidence ground of judicial review in administrative law: see generally, M Aronson, B Dyer and and M Groves, *Judicial Review of Administrative Action*, 3rd ed, Lawbook Co, 2004 at pp. 193-195 and 239-245. As Diplock CJ said in *Regina v Deputy Industrial Injuries Commissioner; Ex parte Moore* [1965] 1 QB 456 at 488:

"The requirement that a person exercising quasi-judicial functions must base his decisions on evidence means no more than it must be based upon material which tends logically to show the existence or non-existence of facts relevant to the issue to be determined, or to show the likelihood or unlikelihood of some future event the occurrence of which would be relevant. It means that he must not spin a coin or consult an astrologer, but he may take into account any material which, as a matter of reason, has some probative value in the sense mentioned above".

See also *Mahon v Air New Zealand* [1983] UKPC 29; [1984] 1 AC 808 at 820.

201 In *Bruce v Cole* (1998) 45 NSWLR 163 at 189, Spigelman CJ held:

"In my opinion, at common law, a decision-maker who acts without probative evidence - to which conduct the work 'perversely' has appropriately been attached – does not make a valid decision. It is the equivalent of acting without evidence".

202 In *Hill v Green* [1999] NSWCA 477; (1999) 48 NSWLR 161 at 174[72]-175, Spigelman CJ added:

"In my opinion, where a statute or regulation makes provision for an administrative decision in terminology which does not confer an unfettered discretion on the decision-maker, the courts should approach the construction of the statute or regulation with a presumption that the parliament or author of the regulation intended the decision-maker to reach a decision by a process of logical reasoning and a contrary interpretation would require clear and unambiguous words".

203 The EPA Act does not confer an unfettered discretion on the consent authority (or this Court on a merits review appeal) to determine a development application. The EPA Act requires the consent authority to take into consideration the relevant matters, including those in s 79C(1): *Weal v Bathurst City Council* [2000] NSWCA 88; (2000) 111 LGERA 181 at 185[9]-[13] and 201[80]-[82]; *Zhang v Canterbury City Council* [2001] NSWCA 167; (2001) 51 NSWLR 589 at 601[62]-[63] and 602[75]-603[77]; and *Kindimindi Investments Pty Ltd v Lane Cove Council* [2006] NSWCA 23 (31 January 2006) at [74]-[79]. Consideration of the relevant matters must be based on probative evidence. The decision reached must also involve a process of logical reasoning.

204 In the present case, there is no probative evidence upon which the Court could make findings of adverse effects on the amenity of the locality or on the health and safety of persons in the locality or on the environment. Equally, there is no logical basis upon which a decision could reasonably be made to refuse consent to the proposed base station where there is no such probative evidence of effects. To make such a decision would be to infringe these principles of proper administrative decision-making. The charge of arbitrariness would be made out.

205 As Mahoney JA stated in *BP Australia Ltd v Campbelltown City Council* (1994) 83 LGERA 274 at 279:

"Ordinarily, it would not be right for such a [decision-making] body to conclude that the effect of the relevant considerations is that one thing should be done and yet, without more, to do another. The grant of a discretion is the grant of the authority to do what the authority sees as the discretionary considerations to warrant being done."

206 To make such an arbitrary decision would cause a greater disservice to the community than making a rational one. It would raise unnecessarily the fears of the community. This is the reason for the responsible authority ARPANSA stating in the Australian Standard RPS3 that incorporation of additional safety factors

beyond the exposure limits of the Standard is not supported: p i and p 29. Similarly, the World Health Organisation has urged:

"...that scientific assessments of risk and science-based exposure limits should not be undermined by the adoption of arbitrary cautionary approaches. That would occur, for example, if limit values were lowered to levels that bear no relationship to the established hazards or have inappropriate arbitrary adjustments to the limit values to account for the extent of scientific uncertainty": World Health Organisation, "Electromagnetic fields and public health cautionary policies", *WHO Backgrounder*, March 2000 at p. 5.

207 Community concerns are best corrected by proper application of the authoritative adopted standards, including the Australian Standard RPS3, and the provision of proper information, not by responding to unsubstantiated and unreasonable fears: *Vertical Telecoms Pty Ltd v Hornsby Shire Council* [2000] NSWLEC 172 (10 August 2000) at [63]; and *Telstra Corporation Ltd v Moreland City Council & Ors* [2002] VCAT 1294 (23 October 2002) at [24].

208 Sunstein makes a similar point when discussing how democratic government should respond to public fear. Sunstein argues that well-functioning governments should aspire to be deliberative democracies. Responsiveness to public fear should be complemented by a commitment to deliberation in the form of reflection and reason giving. If the public is fearful about a trivial risk, a deliberative democracy should not respond by reducing that risk. Rather, it should use its institutions to dispel public fear that is, by hypothesis, without foundation. In this way, deliberative democracies avoid the tendency of popularist systems to fall prey to public fear when it is baseless. They use institutional safeguards to check public panics: C R Sunstein, *Laws of Fear; Beyond Precautionary Principle*, Cambridge University Press, 2005 at p. 1.

The need for the facility

209 Mr Papadatos states that the two principal reasons for the proposed facility are to improve coverage along the railway corridor through Cheltenham and particularly into Cheltenham railway station and to improve the overall quality of Telstra's network performance. Although Cheltenham does receive some mobile telephone coverage, it is generally coverage from distant cells that were not designed to serve the Cheltenham area. Consequently, this results in a weaker than desirable signal strength that can result in dropped calls or an inability to make or receive calls in nearby residential dwellings or when using the train.

210 To support the applicant's contention that the coverage is inadequate in the area, signal strength tests were undertaken along the railway line and Beecroft Rd. The tests along the railway line generally indicated a signal strength of –120 to –91dBm. This falls within the lower range of signal strength. The tests along Beecroft Road provided a greater variation in signal strength with some readings in the optimal classification of 0 to –82 dBm but the majority in the unacceptable -90 to –93 dBm range.

211 While it was argued that there was no record of complaints about dropped calls, I accept that the evidence on the signal strength tests should be preferred over more anecdotal evidence suggested by the Council and the residents. The signal strength tests clearly indicate an unacceptable level of coverage within the Cheltenham area. The results are also consistent with the evidence of Mr Papadatos that there is sporadic but not consistent or acceptable levels of coverage in the area.

212 There is some doubt as to whether the need for a proposed development is a relevant consideration under s 79C(1) of the EPA Act. Ordinarily, these are matters to be resolved by market forces: *Fabcot Pty Ltd v Hawkesbury City Council* [1997] NSWLEC 27; (1997) 93 LGERA 373 at 379. (This aspect of the decision was not canvassed in the Court of Appeal's judgment in *Randall Pty Ltd v Willoughby City Council* [2005] NSWCA 205 (27 June 2005)). However, I do not decide this question. A need for the facility is established in this case.

Alternative locations

213 Mr Papadatos states that there are no suitable existing Telstra facilities or other carrier's facilities that would redress the unacceptable coverage at Cheltenham. The coverage hole is too large and too distant for the optimisation or fine-tuning of any existing Telstra base station facilities. Additionally, modelling of the Optus facility, approximately one kilometre to the south-west has shown that co-locating would not adequately address Cheltenham's coverage hole.

214 In his assessment, Mr Papadatos stated that only the subject site and a site containing an existing monopole at Cheltenham railway station were potentially deemed to meet the coverage objectives. The latter site, notwithstanding its greater coverage, was rejected as it would be necessary to replace the existing monopole structure with a bulkier pole, some five metres higher than the existing structure. It was also seen to be unacceptable by Mr Papadatos because of its highly visible nature and closer proximity to residences and schools.

215 Even though Mr Papadatos was cross-examined on his evidence, no evidence was produced to refute or challenge his conclusions. Much of the cross-examination centred on the replacement of the existing monopole at Cheltenham railway station. Notwithstanding that greater coverage would be achieved in this location and Dr Black's evidence that a replacement monopole would likely satisfy the ARPANSA exposure limit, Mr Papadatos was not satisfied that this location should be preferred to the proposed location.

216 On the issue of alternative locations, I accept the conclusions of Mr Papadatos. Accepting that the replacement of the existing monopole at Cheltenham railway station is the only viable alternative to the proposed location and that no specific details were provided on the replacement of monopole, it is likely that a replacement monopole in this location would be seen as a generally less desirable location because of its increased visibility, proximity to additional people using the railway station and proximity to uses that may be seen to be more sensitive to EME.

Matters raised by local residents

Heritage

217 The applicant provided an Assessment of Heritage Impact prepared by Ms Louise Powell, a heritage consultant. The assessment addressed the requirements in LEP 1994 in relation to development within a heritage conservation area and development in the vicinity of heritage items. The report concluded that "*there are no adverse impacts on the heritage significance of the site and the neighbouring LEP heritage listed items from the proposed development*".

218 The heritage impact of the proposal was also considered by the Council in the assessment of the application, including a referral to the Council's Heritage Advisory Committee. The Committee reached a similar conclusion to that reached by Ms Powell.

219 With the benefit of the inspection of the site and surrounding areas, I agree with the conclusions reached by Ms Powell and the Heritage Advisory Committee. Consequently, I find that the proposed development satisfies the objective in cl 18 and has no effect on the heritage conservation area and any heritage items in the vicinity pursuant to cl 18(5) of the LEP.

Visual impact

220 The proposed antennas extend to a height of two metres above the existing roof level of the clubhouse. They are located generally in the centre of the north western and south eastern elevations. The proposal also provides for shrouding which is moulded and painted to represent brickwork chimneys.

221 On the site view, an estimation was made of the location and height of the proposed antennas on the clubhouse and observations made from different locations within the immediate area of the potential visual impact.

222 With the benefit of this exercise, I accept that the proposed antennas will have little, if any, visual impact on the immediate area. While visible, the antennas are relatively small in size and will be generally be seen as part of the clubhouse over time.

Co-location of facilities

223 The residents argued that the approval of the base station would lead to other carriers seeking to use the facility. This, they fear, could lead to greater levels of EME being emitted from the site.

224 The cumulative effect of multiple transmitters has been taken into account in the assessments that have already been undertaken by Telstra and Mr Bangay, in accordance with accepted procedure. The issue of cumulative effect over time is taken into account in the Australian Standard RP3: see also *Hyett v Corangamite Shire Council v Telstra* [1999] VCAT 794 (30 April 1999) at 5; and *Vertical Telecoms Pty Ltd v Hornsby Shire Council* [2000] NSWLEC 172 (10 August 2000) at [62]-[63].

225 While the potential does exist for the use of the site by other carriers, there was no evidence produced at the hearing to suggest that this is likely to occur. Mr Cole's evidence was that the Cheltenham Recreation Club has not been approached by any other carrier wishing to co-locate at the site.

226 In the event that another carrier seeks to use the site, a development application would be required to be submitted and would be subject to the same assessment as the current proposal. Any consent granted by the Court authorises the erection and use only of the proposed base station and antennas as currently described and in accordance with the approved plans. The base station and antennas can neither be used for other purposes without a fresh consent nor be modified without modification of the existing consent or the obtaining of a new consent: see similarly *Hyett v Corangamite Shire Council* [1999] VCAT 794 (30 April 1999) at 5.

227 Finally, the potential for co-location cannot properly be prevented by the imposition of conditions on the present consent: *Hutchison Telecommunications (Australia) Pty Ltd v Baulkham Hills Shire Council* [2004] NSWLEC 104 (26 March 2004) at [31]-[33].

228 The potential co-location of facilities is not a matter that would warrant the refusal of this development application.

Conclusion

229 The proposed development is meritorious and should be approved. The parties have agreed on conditions appropriate to be imposed should consent be granted.

Orders

230 The Court orders:

1. The appeal be upheld.

2. Development consent is granted to Development Application No 1514/2004 for installation of telecommunication equipment and alterations and additions to an existing building in accordance with Drawings No TT26958 Sheets 1 to 15 prepared by TCI, subject to the conditions in Annexure A.

3. The exhibits are returned with the exception of exhibit K.

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TELSTRA CORPORATION LIMITED V HORNSBY SHIRE COUNCIL

11097 of 2005

ANNEXURE A

CONDITIONS OF CONSENT

60-74 The Crescent, Cheltenham NSW 2119

Development Application No 1514/2004 for installation of telecommunication equipment and alterations & additions to an existing building is approved in accordance with Drawings No. TT26958 Sheets 1 to 15 prepared by TCI and subject to the following conditions:-

GENERAL

1. The finished surface materials, including colours and texture of any building and/or hard paved areas, shall blend with the surrounding environment and shall be non-glare.

2. The proposed pergola columns are to be deleted and replaced with low brick piers and timber posts, to achieve a more contemporary design. Details to be submitted with the Construction Certificate application.

BUILDING SURVEYOR

Site Works

3. No site works, including the removal of vegetation or any demolition works, shall be commenced prior to:

3.1 A construction certificate being issued.

Construction Certificate - Building

4. In order to certify that detailed construction plans and specifications are in accordance with the requirements of the Building Code of Australia, development consent and relevant Australian Standards, a construction certificate must be obtained from either Council or an accredited certifier prior to building works commencing.

Principal Certifying Authority

5. Before any construction works commence, you are required to appoint a Principal Certifying Authority as required by section 81A of the Environmental Planning & Assessment Act, 1979. The Principal Certifying Authority is responsible for ensuring that all the works are carried out in accordance with the approved plans and specifications.

Notifying Council of Commencement of Works

6. It is a requirement of the Environmental Planning and Assessment Act section 81A(2)(c) that you notify Hornsby Council at least two (2) days prior to the intention to commence works.

Where works are to be undertaken in a public place, such notice must be accompanied by evidence of the contractor's Public Liability and Workers' Compensation Insurances. The public risk policy shall be such an amount as determined by Council (not being less than $10,000,000.00) and shall cover the owner and the Council against any injury, loss or damage sustained by any person, firm or company.

Building Code of Australia

7. All building work must be carried out in accordance with the requirements of the *Building Code of Australia*.

Should there be any alternative solutions listed as Category 2 Fire Safety Provisions and outlined in the Environmental Planning and Assessment Regulation 2000, a fire engineering report should be forwarded to the Brigades for comment under Clause 144 of the Environmental Planning and Assessment Regulation 2000.

Engineer's – certification

8. A chartered professional structural engineer shall inspect the fixing of the two antennas and certify that they are structurally sound.

Hours of Construction

9. In order to maintain the amenity of adjoining properties, site works shall be restricted to between 7.00 am and 6.00 pm, Monday to Friday and 8.00 am to 1.00 pm Saturday. No work shall be undertaken on Sundays or public holidays. Plant, goods or materials shall not be delivered to the site outside the approved hours of site works unless otherwise approved by Council.

Inspections – Building

10. The building works must be inspected by the Principal Certifying Authority certifying that the works comply with the development consent and the approved plans and specifications for the following nominated stages: -

· The building or structure when completed and before occupation or use is commenced.

It is the responsibility of the builder/applicant to organise the required inspections and compliance certificates in accordance with the development consent. Should Council be nominated as the certifier of works, inspections can be arranged by contacting Council on 9847 6760 during normal business hours.

ENVIRONMENTAL HEALTH & PROTECTION

11. Following completion of the works, noise levels generated by the development must comply with AS2107 - 2000 - Acoustics - Recommended design sound levels and reverberation times for (residential) building interiors.

12. The addition of the communication infrastructure to the existing building must be in compliance with:

· ARPANSA, Australian Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency fields - 3khz to 300GHz, in Radiation Protection Standard RPS3 2002, ARPANSA: Australian, clause 5.7, pages 28-29, as amended from time to time; and

· The Australian Communication Industry Forum Code 'ACIF' C564:2004 (December 2004).

13. The applicant is to provide certification of the operation of the communication facility in accordance with the approved electromagnetic energy (EME) levels, prior to the commissioning of the facility.

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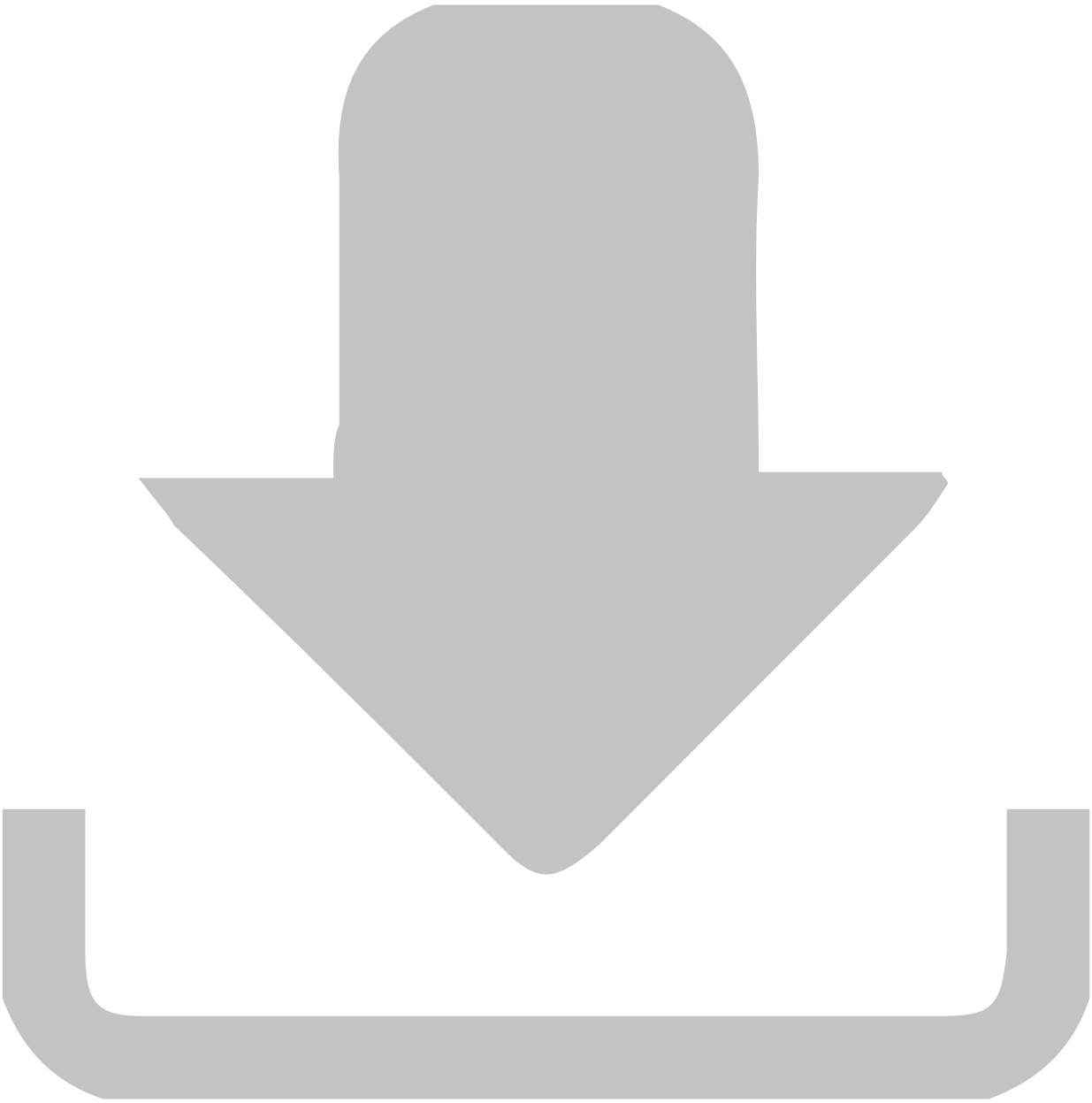

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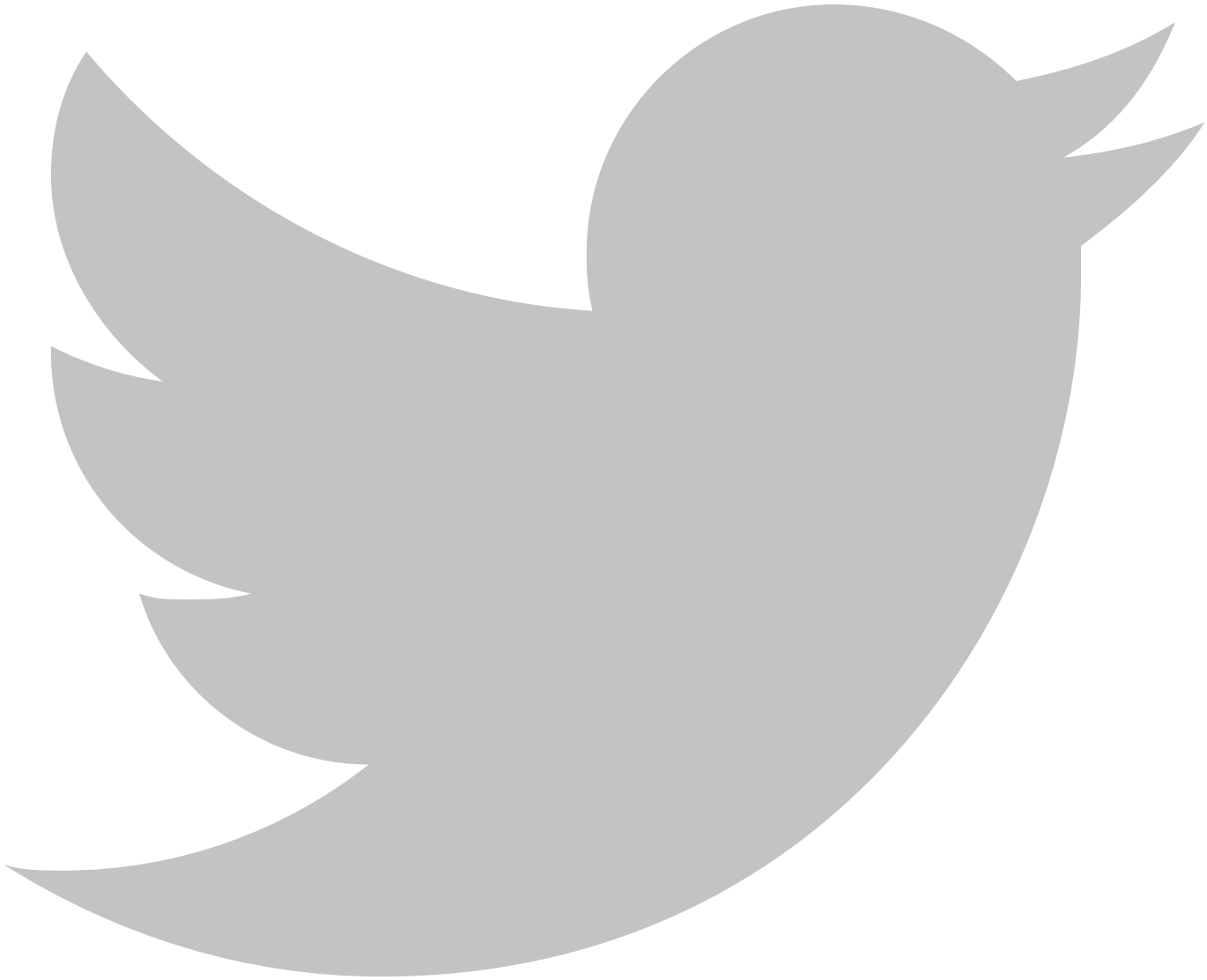

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