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Citizens contesting science: a case study of public participation in the management of a contaminated site in Western Australia

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university.

Signature:

Date: February 2016

ABSTRACT

This thesis addresses the problem of involving citizens in regulatory debates rich in the discourse of science. Through a detailed case study of the ANI-Bradken site redevelopment project, the public participatory practices within Western Australian environmental regulatory processes are scrutinised. From the perspective of a community group (the South Fremantle/Hamilton Hill Residents' Association Inc.) contesting the redevelopment, the thesis examines the barriers to effective public participation using a theoretical framework developed within the sociology of scientific knowledge.

The case study of the thesis documents the community group's attempts to debate critical safety issues associated with a contaminated site redevelopment project near Fremantle, Western Australia (WA). The study draws attention to the influential role of scientific knowledge in environmental management and, specifically, in the management of contaminated sites. It also clarifies how, and why, regulatory authorities utilise scientific knowledge to influence the public participatory processes. The thesis argues that the regulatory application of scientific knowledge influences public participatory processes through two mechanisms. First, in the location of expertise, whereby lay knowledge is devalued when measured against professional expertise. Second, in the translation of research science to regulatory science, whereby uncertainties of knowledge are downplayed to facilitate decision-making, thus negating public debate.

The study also examines the role of statutory arrangements in informing the nature of public engagement in the management of contaminated sites. Although Australian regulatory mechanisms endorse public participation in decision-making for contaminated land redevelopment projects, in the WA application statutory mechanisms for inclusion are commonly absent or dysfunctional. The study traces the community group's reactions to the WA regulatory system in response to redevelopment plans for the ANI- Bradken site. It was observed that in the absence of functional statutory-backed arrangements for citizens to contest scientific

knowledge claims, even where public debate was scientifically framed and expert mediated, the role and nature of public participation was significantly curbed.

The thesis concludes by making explicit the challenges inherent in citizen involvement in science-based decision-making and by presenting targets to improve public participation in environmental regulatory processes in WA. These targets for improvement should include provisions for statutory enforcement of precautionary safeguards, legislative changes to the provisions for public participation, alongside the creation of a space where alternative knowledge claims can be assessed for their legitimacy. However, the most critical change must be to the social positioning of science - allowing for knowledge dichotomies to be defeated, and for knowledge itself to be laid open to public scrutiny and to public contestation, to validate any claims to objectivity.

This thesis is dedicated to the memory of

My father
James Duckworth
1926-1998

South Fremantle community member and campaigner
Loreta McMaster (née Scenna)
1966-2006

TABLE OF CONTENTS

ABSTRACT I
ACKNOWLEDGEMENTS VII
ACRONYMS AND ABBREVIATIONS VIII

CHAPTER 1: INTRODUCTION ..... - 2 -

1.1 BACKGROUND: NATURE AND CONTEXT OF THE PROBLEM ..... - 2 -
1.2 RESEARCH QUESTIONS ..... - 3 -
1.3 SCOPE ..... - 4 -
1.4 SIGNIFICANCE ..... - 5 -
1.5 THE CASE STUDY: OVERVIEW ..... - 5 -
1.6 NOTES ON SOME TERMS USED ..... - 7 -
1.7 THESIS STRUCTURE AND OVERVIEW OF CHAPTERS ..... - 12 -

CHAPTER 2: RESEARCH METHODS ..... - 15 -

2.1 METHOD ..... - 15 -
2.2 DATA COLLECTION AND ANALYSIS METHODS ..... - 17 -
2.3 ETHICAL CONSIDERATIONS, BIAS, AND POSITIONING ..... - 18 -

CHAPTER 3: A THEORETICAL FRAMEWORK FOR ASSESSING PUBLIC PARTICIPATION UNDER REGULATORY SCIENCE ..... - 22 -

3.1 THE IDEALS OF RESEARCH SCIENCE ..... - 24 -
3.1.1 Seeing is believing: empiricist and positivist accounts of objectivity ..... - 24 -
3.1.2 Popper and Kuhn: falsificationism and normal science ..... - 25 -
3.1.3 Partial perspective and the biology of sensory perception ..... - 27 -
3.1.4 What are the most reliable methods for science? ..... - 29 -
3.2 THE EXPERT DRIVEN MODEL OF SCIENCE AND ITS PUBLIC POSITIONING ..... - 30 -
3.2.1 Defining expertise ..... - 30 -
3.2.2 Problematising expertise ..... - 32 -
3.3 THE STANDING OF REGULATORY SCIENCE ..... - 34 -
3.3.1 The regulatory and research science divide: the problem of uncertainty ..... - 34 -
3.3.2 Risk assessment as an extension of regulatory science ..... - 38 -
3.3.3 The application of precautionary context-based risk models under regulatory science - 40 -
3.3.4 Is the peer review system adequate for science decision-making? ..... - 42 -
3.4 PUBLIC PARTICIPATION IN SCIENTIFIC DECISION-MAKING ..... - 45 -
3.4.1 The positioning of lay knowledge and public participation in scientific debate ..... - 47 -
3.4.2 The cultural nature of risk in regulatory science ..... - 50 -
3.4.3 The impacts on public participation from the expert-lay divide and the 'deficit model' for public understanding of science ..... - 53 -
3.4.4 The significance of critical positioning to public participation ..... - 55 -
3.5 SUMMARY AND CONCLUSIONS ..... - 58 -

CHAPTER 4: THE REGULATION OF CONTAMINATED SITES ..... - 62 -

4.1 INTERNATIONAL APPROACHES INFORMING THE REGULATION OF CONTAMINATED SITES IN AUSTRALIA ..... - 63 -
4.1.1 The US approach ..... - 63 -
4.1.2 The UK approach ..... - 66 -
4.1.3 The Australian application ..... - 69 -
4.2 THE OVERARCHING STRATEGIES USED IN THE ASSESSMENT OF RISK AT CONTAMINATED SITES IN AUSTRALIA ..... - 71 -
4.2.1 Using science to define safety and risk ..... - 72 -
4.2.2 Context-based assessments ..... - 74 -
4.2.3 The precautionary principle ..... - 78 -
4.3 THE INSTITUTIONAL PROCEDURES FOR MANAGING CONTAMINATED SITES IN WESTERN AUSTRALIA ..... - 79 -

4.3.1 EPA responsibilities ..... *- 80 -*
4.3.2 DEC responsibilities ..... *- 81 -*
4.3.3 Hazard screening by DEC and DOH ..... *- 81 -*
4.3.4 Involvement of other regulatory agencies ..... *- 82 -*
4.3.5 Peer review ..... *- 82 -*
4.4 THE APPLICATION OF HEALTH RISK ASSESSMENT - THE EXAMPLE OF LEAD CONTAMINATION. - 83 -
4.4.1 Australian lead safety guidelines ..... *- 83 -*
4.4.2 Guideline value formulation utilises a pragmatic approach ..... *- 85 -*
4.4.3 Complicating factors for the regulation of lead exposure ..... *- 86 -*
4.5 COMMUNITY CONSULTATION IN THE MANAGEMENT OF CONTAMINATED SITES IN WESTERN AUSTRALIA ..... - 88 -
4.5.1 Overarching provisions for community consultation ..... *- 88 -*
4.5.2 Statutory provisions for consultation in environmental/health decision-making ..... *- 90 -*
4.5.3 Non-statutory provisions for consultation in environmental/health decision-making ..... *- 92 -*
4.6 PROBLEMATIC REGULATION OF CONTAMINATED SITES IN WESTERN AUSTRALIA ..... - 94 -
4.7 SUMMARY AND CONCLUSIONS ..... - 101 -

CHAPTER 5: THE ANI-BRADKEN SITE REDEVELOPMENT CASE STUDY ..... - 104 -

5.1 THE ANI SITE AND ITS INDUSTRIAL HISTORY ..... - 105 -
Figure 1: The ANI Bradken site - location ..... *- 108 -*
Figure 2: The ANI Bradken site and surrounding areas (2008) ..... *- 108 -*
5.2 THE COMMUNITY GROUP ..... - 109 -
5.3 THE LANDUSE PLANNING PROCESS ..... - 110 -
5.3.1 The Metropolitan Region Scheme Amendment ..... *- 111 -*
5.3.2 Coastal setback provisions ..... *- 114 -*
5.3.3 Structure planning ..... *- 116 -*
5.3.4 Aboriginal heritage ..... *- 119 -*
5.4 THE MANAGEMENT OF SITE CONTAMINATION AND THE REGULATORY RESPONSE ..... - 122 -
5.4.1 The ANI remediation plan in brief ..... *- 123 -*
5.4.2 Regulatory and community responses to the remediation plan ..... *- 127 -*
5.5 COMMUNITY CONSULTATION FOR THE ANI SITE REDEVELOPMENT ..... - 132 -
5.6 THE COMMUNITY LEGAL ACTION AND OUTCOMES ..... - 138 -
5.6.1 The Supreme Court challenge ..... *- 138 -*
5.6.2 Independent review of the remediation plan version 3 ..... *- 143 -*
5.7 SUMMARY AND CONCLUSIONS ..... - 145 -

CHAPTER 6: ANALYSIS OF THE CASE STUDY ..... - 148 -

6.1 EXPERT-LAY KNOWLEDGE DICHOTOMIES ARE USED TO EXCLUDE CITIZENS FROM DEBATE ON THE APPLICATIONS OF SCIENCE ..... - 149 -
6.2 INFORMATION AND RESOURCE ACCESS DISPARITIES EXIST BETWEEN PUBLICS AND REGULATORY BODIES ..... - 153 -
6.3 THE UNCERTAINTIES OF SCIENTIFIC KNOWLEDGE ARE BEING OBSCURED, PRODUCING SHORTCOMINGS IN THE REGULATORY APPLICATION OF PRECAUTION ..... - 155 -
6.4 POOR PUBLIC PARTICIPATORY PRACTICE IS PROMOTING MISTRUST OF REGULATORY INSTITUTIONS AND GREATER OPPOSITION TO CONTENTIOUS PROJECTS ..... - 159 -
6.5 ENFORCEMENT OF SCIENTIFIC ASSESSMENTS AND PUBLIC PARTICIPATION RELIES ON LEGAL CONSTRUCTS ..... - 161 -

CHAPTER 7: DISCUSSION AND CONCLUSIONS ..... - 166 -

7.1 ADDRESSING THE THESIS RESEARCH QUESTIONS ..... - 166 -
7.1.1 How is science used in the regulation of contaminated sites? ..... *- 166 -*
7.1.2 What are the mechanisms for public participation in the management of contaminated sites? ..... *- 168 -*
7.1.3 What is the impact of different forms of science on public participation? ..... *- 170 -*
7.1.4 Are citizens allowed to contest science? ..... *- 171 -*
7.2 HOW CAN CITIZEN INVOLVEMENT IN SCIENCE-RICH DEBATES BE IMPROVED? ..... - 172 -
7.2.1 The critical examination of science ..... *- 173 -*
7.2.2 Creating spaces for citizens to question and contest science ..... *- 179 -*
7.3 APPLICATION TO WESTERN AUSTRALIA ..... - 182 -
7.3.1 Legislative change ..... *- 184 -*

7.3.2 Re-framing public participation ..... *- 187 -*
7.3.3 Concluding comments ..... *- 189 -*
POSTSCRIPT ..... - 191 -
APPENDICES ..... - 193 -
Appendix A: ANI-Bradken site timeline ..... *- 193 -*
Appendix B: Issues raised in public submissions to the MRS Amendment ..... *- 195 -*
Appendix C: IAP2 Public Participation Spectrum ..... *- 197 -*
Appendix D: Comparative test results: maximum analyte levels ANI-Bradken site ..... *- 198 -*
Appendix E: Clean-up Criteria (CUC) ANI-Bradken site ..... *- 199 -*
Appendix F: The Fremantle Smelting Works ..... *- 200 -*
Appendix G: The 1908 sewerage map ..... *- 200 -*
Appendix H: South Beach (1918) ..... *- 201 -*
Appendix I: The ANI-Bradken foundry (2004) ..... *- 201 -*
Appendix J: 'Dunes' to the west of the ANI-Bradken site (2003) ..... *- 202 -*
Appendix K: The Islands apartments (2015) ..... *- 202 -*
REFERENCES ..... - 203 -

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ACRONYMS AND ABBREVIATIONS

ABC	Australian Broadcasting Corporation
ALARA	As low as reasonably achievable
ALP	Australian Labor Party
ANI	Australian National Industries Limited
The ANI site	The former ANI-Bradken foundry site, North Coogee (formerly Hamilton Hill)
ANZECC	Australian and New Zealand Environment and Conservation Council
AQMB	The Air Quality Management Branch of the DOE
ARC	Australian Research Council
ASC	Assessment of site contamination
ATSDR	Agency for Toxic Substances and Disease Registry (US)
AVCC	Australian Vice Chancellors' Committee
BLL	Blood-lead level
Brookdale LWTF	Brookdale Liquid Waste Treatment Facility
CCC	WA Crime and Corruption Commission
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSM	Conceptual site model
DEC	WA Department of Environment and Conservation (formed on the 1 July 2006 from the amalgamation of the Department of Environment and the Department of Conservation and Land Management (CALM)). On the 1 July 2013 the DEC was split to form the Department of Parks and Wildlife (DPAW) and DER
DEP	WA Department of Environmental Protection (which became DOE, then DEC, then DER)
DER	WA Department of Environment Regulation
DOE	WA Department of Environment (which became DEC, then DER)
DOH	WA Department of Health
DOW	WA Department of Water
DPC	WA Department of Premier and Cabinet
EDO	WA Environmental Defender's Office
EIA	Environmental Impact Assessment
EIL	Ecological Investigation Level
EMP	Environmental Management Plan/Program
EPA	WA Environmental Protection Authority
FOI	Freedom of Information
HIL-A	Health-based Investigation Level - residential
IAP2	International Association for Public Participation
IPCC	Intergovernmental Panel on Climate Change
MP	Member of Parliament (a member of the House of Representatives, being the lower house of the Australian Commonwealth Parliament).
MWG	Marine Water Guideline
MLA	Member of the Legislative Assembly (WA State parliamentary lower house)

MLC	Member of the Legislative Council (WA State parliamentary upper house)
NEPC	National Environment Protection Council (Australia)
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council (Australia)
NGO	Non-governmental organisation
NOAEL	No observed adverse effect level
NPL	National Priority List (US)
OC/OP	Organochlorine/organophosphate (pesticides)
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PNS	Post-normal science
The Residents' Association	The South Fremantle/Hamilton Hill Residents' Association Incorporated
SAT	WA State Administrative Tribunal
SSK	Sociology of scientific knowledge
TPH	Total petroleum hydrocarbon
US EPA	Environmental Protection Agency (US)
VOC	Volatile organic compound
WA	Western Australia/n
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION

CHAPTER 1: INTRODUCTION

The management of contaminated sites in Australia relies on a range of legislative and other administrative instruments to support public and environmental health outcomes. Remediation strategies, which aim to decontaminate sites to standards defined using scientific and other sources of data, are a key management practice. A more recent feature in the management of contaminated sites in Australia is the involvement of citizens in the decision-making processes governing the management of these sites. The extent to which citizens can be officially involved in these processes varies between different applications and administering bodies, however, it is widely accepted that public participation provides valuable local knowledge, and makes government decision-making (and the information used) open and democratically accountable.

Through the example of a Western Australian case study, this thesis addresses the complexity of the administrative processes used in managing contaminated sites and the difficulties that present in public participatory approaches, particularly under models of knowledge creation that uphold the ideals of certain knowledge traditions and professional expertise.

This chapter introduces the thesis by providing background information on the nature and context of the problem of public participation in the management of contaminated sites in Western Australia (WA), and includes an overview of the case study.

This chapter also addresses organisational aspects, including the research questions, scope, and significance of the thesis. The chapter ends by providing notes on terminology, the thesis structure, and a brief overview of the chapters.

1.1 Background: nature and context of the problem

This thesis discusses a community action by a group of residents in South Fremantle, WA, who lived close to a former industrial precinct known locally as the ANI-Bradken site (the ANI site). The members of this group had an intimate relationship

with their neighbourhood, held a significant level of local knowledge of past industrial practices and of the environmental conditions of the region, and stood to be affected by the redevelopment. Despite this, when the group sought inclusion as a stakeholder in the decision-making for the management of the ANI site, it met with considerable resistance from both the WA State Government regulatory agencies and the private developer. The reasons for the exclusion of the residents' group from the decision-making processes of the Government regulatory agencies is the focus of this thesis.

Through a careful and detailed exploration of public participation in the ANI site redevelopment project, this thesis examines the mechanisms for, and practice of, public participation within WA's contaminated land development processes. The thesis identifies the problematic features of public participation in these processes and, in drawing on contemporary scholarly debates, concludes by presenting targets to facilitate citizen involvement in the management of contaminated sites in WA.

This thesis also examines the legitimising role of science in public debate. Within this context, it discusses the relationship between the differing conceptual ideals of science and, in particular, the tension existing between approaches to knowledge creation under 'research' and 'regulatory' forms of science. The thesis distinguishes between these two forms of science on the basis that research science forms the intellectual imperative to understand the world, whereas regulatory science applies this knowledge within social and political contexts. Significantly, while research science is able to maintain a level of open-endedness in knowledge creation, acknowledging uncertainty, regulatory science must conform to legal norms and provide irrevocability in its judgements. This thesis examines these terms and distinctions and analyses their significance for public participation. The ANI site redevelopment project provides a particularly interesting case to explore these issues since scientific knowledge informed much of the public campaign.

1.2 Research questions

Drawing on a detailed case study analysis, this thesis seeks to embrace contingency and contestability as guiding principles in regulatory science, thus accommodating a

model based on both reliable and trustworthy knowledge, open to and supported by public critique and validation.

To draw conclusions from the case study analysis, this thesis asks the following research questions:

1. How is science used in the regulation of contaminated sites?
2. What are the mechanisms for public participation in the management of contaminated sites?
3. What is the impact of different forms of science on public participation?
4. Are citizens allowed to contest science?
5. How can citizen involvement in science-rich debates be improved?

The thesis directs these questions specifically to the management of contaminated sites in WA and explicitly addresses each of the questions in the concluding chapter.

1.3 Scope

This thesis restricts its focus to the role of science in regulation and the legitimacy of public participation under the regulatory system of managing contaminated sites in WA.

A number of themes emerging from this thesis have not been examined in depth. These include: (i) the significance of indigenous civil rights in contaminated site redevelopment projects; (ii) the function of local communities' socio-economic status in shaping the actions and outcomes of disputes; (iii) the role of gender in determining participatory outcomes; and (iv) the influence of economic factors in defining social and scientific priorities.

Furthermore, this is not a comparative study of the regulation of contaminated sites. This thesis focuses on the application of regulatory criteria in the WA context, using a single case study, with a view to making explicit any shortcomings of process in this setting. The thesis, nevertheless, provides some introductory material on the regulatory systems in the United States of America (US) and the United Kingdom

(UK), to demonstrate the main mechanisms upon which the Australian system for managing contaminated sites is founded.

The thesis acknowledges that different State or Territorial jurisdictions in Australia can have significantly different approaches to implementing national guidelines, entailing different administrative directives and enforcement powers, and using different government agencies (and links between different agencies) to administer regulatory directives. This thesis assesses the regulatory systems for the management of contaminated sites in WA, but not of other Australian jurisdictions.

1.4 Significance

This thesis aims to make explicit the practical application of public participatory mechanisms in the management of contaminated sites in WA. Using a local case study, insights are drawn and the utility of community-based knowledges by regulatory experts within the context of a techno-scientific application clarified. This, in turn, will demonstrate the strengths and weaknesses of the theoretical arguments concerning the adoption of extended knowledge communities.

The study develops a thesis regarding the management of contaminated sites in an Australian jurisdiction - identifying any legal shortcomings and problematic applications of science in both the mechanisms for risk appraisal and for public participation. It is expected that the insights provided by this Australian case study will have relevance in other contexts involving public participation in contentious debates and for other jurisdictions beyond WA, and that the thesis will contribute to the international and Australian discourse on public participation in contentious regulatory debates involving scientific knowledge.

1.5 The case study: overview

The thesis develops its analysis by means of a detailed case study about the redevelopment of the ANI site, near South Fremantle, WA. Since 1898, the ANI site had been used for heavy industrial purposes, originally as a primary lead and gold smelter and more recently as a ferrous metal foundry. In 2000, the WA Planning Commission (WAPC) received an application from a WA property developer to

change the industrial landuse for the ANI site, with a view to redeveloping the land for residential housing. The ANI site redevelopment project would involve the remediation of the derelict ferrous metal foundry land and the establishment of a residential housing precinct.

As part of the WA planning processes to redevelop the ANI site, separate assessment by environmental and health regulatory agencies was necessary to determine the suitability of the land for the intended new landuse. Early site investigations (1998: see Appendix D) by the developer's environmental consultants revealed the land contamination was minimal and that the redevelopment program would be a low safety risk to surrounding communities. The preliminary remediation proposal for the site, being judged a low risk, went unchallenged by the local community. However, when further data (2005: see Appendix D), presented by a different environmental consultant, revealed that the land was much more heavily contaminated than previously reported, members of the community living near the site began to raise concerns over the safety of the remediation and redevelopment proposal. A group of residents representing the local community argued that, for the project to continue, more stringent safety assessments and major alterations to the project were necessary.

To facilitate ongoing community consultation with the government regulatory bodies, the host community employed independent scientific advisors to examine the environmental and planning reports for the project. The community-commissioned scientific assessments uncovered a range of anomalies in the official regulatory assessment, further prompting the community group to challenge the redevelopment proposal approvals.

At the time of the ANI site redevelopment, WA Government guidelines (see WA Department of Premier and Cabinet, 2002; WA Department of Premier and Cabinet, 2003) explicitly upheld the fundamental right of citizens to be meaningfully consulted in public affairs, in accord with the International Association for Public Participation's 'IAP2 spectrum' (see Appendix C). Consequently, the community group expected direct involvement in decision-making and a collaborative role alongside official decision-makers. However, even when the community group was

able to demonstrate flaws in the official scientific assessments, the regulators did not afford the group any opportunity to influence or negotiate the outcomes of the decision-making. This point of contention between the community group and the regulatory bodies triggered years of dispute and culminated in a WA Supreme Court legal action by the group against the WA Government and the private development company.

1.6 Notes on some terms used

The black box metaphor

The black box metaphor has been used to describe the social processes through which the practices of scientific and technical work can be hidden (and therefore made impervious to critique) under the mask of their own success.

> *When a machine runs efficiently, when a matter of fact is settled, one need focus only on its inputs and outputs and not on its internal complexity. Thus, paradoxically, the more science and technology succeed, the more opaque and obscure they become. (Latour, 1999, p. 304)*

The value in acknowledging the 'black boxing' of the intricacies of scientific practice or theory is in its corrective role, "by emphasising that the notion of science being 'founded on a solid bedrock of fact' is illusory" (Dolby, 2002, p. 38).

Community consultation and public participation

Throughout this thesis several terms have been applied to denote citizen involvement in decision-making. Two in particular have been preferentially applied - 'community consultation' and 'public participation'. There is no significant or consistently applied distinction between the two under WA Government administrative provisions, or in this thesis. The terms both refer to practices that include information sharing, involvement, collaboration, and empowerment in decision-making (see International Association for Public Participation Australasia, 2000).

Of significance to the case study discussed in this thesis is the ideal of genuine or 'meaningful' public participation, where the provisions on offer meet the

expectations of citizens. Assigning public participation at an appropriate level is critical to meeting the aim of meaningful public participation. The model for public participation supported by the WA Premier and Cabinet (2002, 2003) draws on the International Association for Public Participation's 'IAP2 Spectrum' (see Appendix C), which provides direction on the use of various modes of public participation, adapted to fulfil different outcomes.

The ecovillage model

The ecovillage model has arisen in response to the effects of modern day living on the natural world (Kirby, 2003) and it recognises human-ecosystem interdependence (Kasper, 2008). The concept of the ecovillage draws on a number of principles aimed towards broad sustainability goals, using social, economic, and ecological measures. Human-scale communities, delivering the daily needs of the community (residential, food, leisure, social, and commercial), which are ecologically integrated, and sustaining of human health, provide the basis of the ecovillage model.

The key WA Government agencies

During the course of the ANI site redevelopment and, later, during the writing of this thesis, the WA Government environment agency was involved in several departmental restructures, resulting in agency name changes. The WA Department of Environmental Protection (DEP) became the WA Department of Environment (DOE), which then amalgamated with the WA Department of Conservation and Land Management (CALM), creating the WA Department of Environment and Conservation (DEC). This thesis uses all three departmental names as they apply to various historical points of the ANI site redevelopment and as used by various authors in the official documents. The reader can treat the DEP, DOE, and DEC as the same body.

During 2013, the DEC was split to form the WA Department of Parks and Wildlife (DPAW) and the WA Department of Environment Regulation (DER) - DPAW being the former CALM, and DER the former DEP/DOE/DEC.

The WA Environmental Protection Authority (EPA), however, maintains a separation from the DEP/DOE/DEC (now DER) as a statutory authority, and is not

under Ministerial direction. The EPA plays a role in conducting environmental impact assessments, preparing environmental protection guidelines and statutory policies, and providing strategic advice to the Minister for Environment.

The WA Department of Health (DOH) operates independently of the environment agency (DER). Within the context of contaminated site redevelopments, the DOH is concerned with human health impacts.

The WA Planning Commission (WAPC) is the statutory authority responsible for decision-making as it relates to the strategic landuse planning and development in urban and regional WA. The WAPC operates independently of environment or human health government agencies.

Objectivism

In objectivism, an objective reality exists external to the mind. Through objectivism, knowledge of the real world can be derived reliably from sense experiences, as separate from feelings and thoughts. Objective knowledge in this sense is "*knowledge without a knowing subject*" (Popper, 1979, pp. 108-109, emphasis in original). Within an objectivist epistemology it is possible to offer a certainty of knowing and the ideal of 'truth', as derived from sensory experience and reason.

Objectivism differs from empiricism (discussed in section 3.1.1) in that the former claims an objective reality separate from consciousness, whereas the latter claims the ability to gain knowledge consciously via the senses, especially via visual observation.

Within the context of this thesis, reference to objectivism or objectivist knowledge traditions is a reference to their truth seeking agenda.

Positivism

The term positivism has come to be equated with scientific knowledge (Bullock, Stallybrass, & Trombley, 1990) and has been maintained as a framework for the creation of knowledge because it enables a certainty for knowledge of the world (Hughes, 1990, p. 17). In philosophy, the meaning of positivism "...revolves around

the contention, or the implicit assumption, that the notions and statements of science contribute a framework by reference to which the nature of any form of knowledge may be determined" (Giddens, 1975, p. 3).

This thesis uses the term positivism to refer to scientific knowledge grounded in sense experience, where value judgements are not afforded comparable status to knowledge claims. Positivism is further discussed in section 3.1.1.

Regulatory science

Jasanoff (1990, p. 76) defined regulatory science as 'science used in policy-making' and she drew a distinction between regulatory science and research science on the basis of both context and content. In particular, Jasanoff (1990, p. 77: citing Weinberg) recognised that the norms of proof in regulatory science were less demanding than for 'ordinary science', with less scientific peer review. "Though regulatory science derives constant legitimation from the label 'science', it is a vastly different kind of activity from basic research, at least as that is ideally conceived" (Jasanoff, 2005, p. 108).

Research science

This thesis uses the term 'research science' to describe the activities of research scientists, using the dominant theories of scientific method (as discussed in Chapter 3), under conditions of peer review and 'normal science' (see section 3.1.2).

The analytical nature of scientific endeavour under the research science model is emphasised, as contrasted with 'regulatory science', which applies this received wisdom within a socio-political context.

Science

The UK Science Council (2014) defines 'science' in general terms as "the pursuit and application of knowledge and understanding of the natural and social world following a systematic methodology based on evidence". Its methods include:

- *Objective observation: Measurement and data (possibly although not necessarily using mathematics as a tool)*

- *Evidence*
- *Experiment and/or observation as benchmarks for testing hypotheses*
- *Induction: reasoning to establish general rules or conclusions drawn from facts or examples*
- *Repetition*
- *Critical analysis*
- *Verification and testing: critical exposure to scrutiny, peer review and assessment. (UK Science Council, 2014)*

In common usage, 'science' denotes a practice that holds authority by virtue of producing objective knowledge. The empirical method - principally using careful observation and experiment - is held as paramount to supporting the objectivity claims of science. However, a universal definition for science and the manner in which it seeks objective truths about the world is both elusive and problematic. Feyerabend (1975), in fact, maintained that science is not one entity with clearly defined principles but contains many approaches. In accord with this, Wynne (2006) argued:

> *Indeed, in general, there are so many different practices, discourses and cultures which are referred to under the 'science' title that it becomes virtually meaningless without further clarification. Nevertheless, it remains true that institutional science in many domains, from new technologies to public health, environment, and policy across the board, does indeed suffer from association in public experience with problematic and sometimes downright provocative institutional conditions, practices, assumptions, purposes and inconsistencies; and* ***these are conducted in the name of science****, normally with silent acquiescence, or positive support, from scientific institutions. (pp. 211-212, emphasis in original)*

In this thesis, the term 'science' has been used to apply to the practice of 'scientists', most commonly under methodological conditions of observation and experimentation, working *towards* precision, but being continually open to review and update to maintain consistency and to offer the best representation of the world. This model of science is held as the exemplar of 'research science'. However, as discussed in this thesis, even this definition of science becomes problematic, with the term applied in a variety of ways, commonly in conflict with this ideal, or as

portrayed by either the UK Science Council (2014, see above) or Wynne (2006, see above).

Nevertheless, in whichever way 'science' is represented, the inference remains that knowledge that is designated 'scientific' holds higher levels of authority and legitimacy, on the basis that it speaks the truth, whether or not such certainty of knowledge is attainable.

1.7 Thesis structure and overview of chapters

This thesis is structured into seven chapters.

Following this introductory chapter, Chapter 2 describes the research methods used to answer the research questions, the data collection and analysis methods and, finally, discusses a range of ethical considerations for the researcher.

Chapter 3, 'A theoretical framework for assessing public participation under regulatory science', introduces the 'sociology of scientific knowledge' (SSK) as a theoretical framework for the assessment of the thesis case study, providing detail of the central themes that apply to analysis, while introducing the key literature. This chapter introduces and discusses the role of the dominant frameworks of science influencing scientific practice, regulation, and public participation, and it provides an overview of the fundamental challenges, both theoretical and practical, facing citizens in their struggle for inclusion in decision-making processes informed by science.

Chapter 4, 'The regulation of contaminated sites', introduces the international approaches informing the Australian and Western Australian environmental regulation of contaminated sites - specifically, the US and UK models. However, the main purpose of this chapter is to document the regulations that applied to the ANI site redevelopment under the WA approach, providing an overview of the key regulatory procedures used in the management of contaminated sites in WA.

The chapter examines the application of guidance documents, policies, and laws relating to environmental and health risk assessment under dominant knowledge frameworks, and how public participation/community consultation is structured within these procedures.

Chapter 5, 'The ANI-Bradken site redevelopment case study' provides the background, chronology, and substantive detail of the ANI site project, including a site history, the features of the contamination problem, the regulatory processes, the processes of public participation, and the key issues of the community group's action. The ANI site case study also sets the foundation for the discussion of several elements in the management of contaminated sites in WA, including the environmental regulation of contaminated sites through statutory and other administrative procedures, the modes of scientific assessment, as well as the provisions for public participation.

Chapter 6 analyses the case study by identifying the significant themes and reviewing these using theories developed in the SSK.

Chapter 7 concludes this thesis by using the significant themes developed in the ANI site case study (and discussed in Chapter 6) to respond to the thesis research questions. This chapter explores the options available to facilitate citizen involvement in science, applicable to the management of contaminated sites in WA.

Appendices to the thesis provide a timeline for the ANI site, details of the public submissions, the IAP2 Public Participation Spectrum, the soil test results and remediation standards, and several historical and contemporary photographs showing various aspects of the ANI site.

This thesis adopts APA style for referencing, using the 'Publication manual of the American Psychological Association' (2003).

CHAPTER 2

RESEARCH METHODS

CHAPTER 2: RESEARCH METHODS

This chapter describes the research methods used to answer the research questions, the data collection and analysis methods and, finally, discusses a range of ethical considerations for the researcher.

2.1 Method

The method used for analysis follows a qualitative approach, applying a single case study. A qualitative research method was chosen because

> *[q]ualitative research is essential for understanding the dynamics of social and decision processes. It provides for understanding of the perspective of the individual through their own words and actions, and over such a comparatively lengthy period allows for examination of the dynamic process of expertise sharing, development and impact at the interface...it is qualitative research which more effectively deals with the context-specificity of public perception and information requirements. (Petts, 1997, p. 367)*

Furthermore, a qualitative approach enables the researcher to counter the highly empirical nature of the experimental method used in science, recognising that "…social phenomena are too variable and context-bound to permit very significant empirical generalisations" (Cronbach, 1975, p. 487: cited in Patton, 1990, p. 122).

In support of qualitative method for socio-environmental studies, Elliott and Williams (2004) found that

> *…the use of in-depth qualitative data provided…a better understanding of how the determinants of health interrelate and impinge in the real and meaningful conditions in which people find themselves. It is because this data is contextual that it provides evidence that improves our understanding of the human condition. (p. 239)*

The case study

This thesis draws on a single case study. The case study is viewed by many scholars (e.g., Cronbach, 1975; Dreyfus & Dreyfus, 1986; Flyvbjerg, 2006; Patton, 1990, p. 99; Yin, 1989; 2003, p. xi) to be a useful way of evaluating and gathering data and information about real-life situations and events.

> *In general, case studies are the preferred strategy when 'how' or 'why' questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. (Yin, 1989, p. 13)*

The case study usually "refers to research that investigates a few cases, often just one, in considerable depth" (Gomm, Hammersley, & Foster, 2000, p. 3), with its goals being "…to reconstruct and analyse a case from a sociological perspective" (Hamel, Dufour, & Fortin, 1993, p. 1). Within the context of a debate supported by the framework of science, a case study provides the opportunity to critique the ways in which particular constructions and practices of science are imposed on others, while also maintaining socially rooted meaning for the subjects of the research. Moreover, the case study provides opportunities for theory building, opening up new insights and implications (Judd, Smith, & Kidder, 1991, p. 24), the replication of logic, and the creation of bridges from qualitative evidence to mainstream deductive research (Eisenhardt & Graebner, 2007, p. 25).

Many authors (e.g., Lincoln & Guba, 2000; Popper, 2002; Schofield, 2000)[1] have argued that generalisability or theoretical inference is the goal of a quantitatively orientated science, but as Gomm et al. (2000) noted "…case studies need not make any claims about the generalisability of their findings, that what is crucial is the use others make of them…" (p. 5). Stake (2000) added to this, arguing that case studies

> *…may be epistemologically in harmony with the reader's experience and thus to that person a natural basis for generalisation…[therefore] it is reasonable to conclude that one of the more effective means of adding to understanding for all*

[1] Popper (2002) argued: "every application of science is based upon an inference from scientific hypotheses (which are universal) to singular cases..." (p. 43). However, many authors, including Popper himself, have also disputed the validity of the generalisability or universality claims of scientific theories or methods.

> *readers will be by approximating, through the words and illustrations of our reports, the natural experience acquired in ordinary personal involvement. (p. 19)*

Similarly, Polanyi (cited in Stake, 2000, p. 20) recognised the significance of the tacit knowledge held by individuals, whether expert or novice, through which new understandings may be built. "For policy makers who are interested only in aggregates, not individuals, and for whom questions of meaning and perspective have been resolved, the traditional notion of generalisability will do just fine..." (Donmoyer, 2000, p. 66), however, for social scientists, where meaning and perspective are important, the traditional ways we talk and think about generalisability are no longer adequate (Donmoyer, 2000, p. 66).

Therefore, qualitative case study research provides detailed stories, offering nuanced insight into complex issues. This, in turn, improves understanding and, ultimately, enables public empowerment by humanising the evaluation.

2.2 Data collection and analysis methods

This section defines and describes the unit of analysis, the data collection, and the data analysis methods, as applied to the case study of this thesis.

Unit of analysis

The unit of analysis for this study was the management of a contaminated site in WA. By following the activities of a community group and, in particular, the group's interactions with regulatory bodies and land developers, the study was able to examine the regulatory processes and practices involved and how they functioned.

Data collection

The ANI site redevelopment case study utilised archival records as the source of data. Archival records are useful in research spanning long periods of time, can be applied to diverse analyses, including social analysis; the data can be easily accessible; and the method socially unobtrusive, removing any undesirable 'unnatural' aspects or otherwise biased responses that may occur in questionnaire or interview modes of research (Judd et al., 1991, pp. 270, 287).

The records used for the ANI site case study included: government departmental documents (some accessed via the *WA Freedom of Information Act* (*1992*)), legislation, policy and other regulatory guidance documents, court transcripts, media accounts, documentaries, minutes of meetings, and community website notes. These records were used to analyse 'social artefacts', including the interactions between publics, regulators, developers, and the courts.

The data used spanned from the preliminary ANI site evaluations and for the duration of the redevelopment activities (1998-2007).

Thematic analysis

The data was analysed thematically. Thematic analysis has frequently been used in investigating texts, directing attention to the qualitative aspects - especially meaning in context - of the material under analysis (Joffe & Yardley, 2004, pp. 57-58). For this thesis, the thematic analysis was used to identify patterns, stances, or concerns evident in the data, which were interpreted in reference to the existing theories from the sociology of scientific knowledge (SSK) discussed in Chapter 3.

2.3 Ethical considerations, bias, and positioning

"No research question, method or result can be separated from its social context" (Farquhar & Wing cited in: Minkler, 2004, p. 694). Accordingly, the role of the researcher concerns more than collecting and analysing data and must involve a much broader reflection on a range of social aspects related to the research, both in the collection and disclosure of data. For example, the research must address issues concerning compliance with institutional ethical guidelines and codes, the risks to research participants from powerful players, and the personal responsibilities that arise in the course of the activities of the researcher. This section addresses the ethical considerations arising from the thesis research project.

Compliance with Australian institutional guidelines

The research methods of this thesis conform to the guidelines laid out in Section 1 of the 'National Statement of Ethical Conduct in Human Research' (NHMRC, ARC, & AVCC, 2007, updated Mar 2014). The case study of this thesis did not directly involve

human participants in interviews, however, it did use the stories of community members and others party to the case study, accessed through archival records. With the exception of documents accessed under the *WA Freedom of Information Act (1992)* (FOI), this thesis relied on records freely available in the public domain. As part of the requirement for FOI release of documents, administering government agencies are required to seek approval from individuals or organisations where the data are commercially sensitive or where documents identify individuals or their personal information.

Irrespective of the availability of information in the public domain or after assessment under FOI legislative provisions, the impact of identifying individuals was carefully considered in the preparation of this thesis. Even where personal stories were publicly accessible or where FOI legislative provisions allowed the release of individuals' data, the protection of the identity of individuals was a priority. In this thesis, only the names of high profile and front-line community representatives, politicians, government agencies, and corporate bodies were used, or where it was necessary for data referencing purposes (e.g., authors of official correspondence, reports, and legal documents).

Personal bias and positioning

Prior to my PhD candidacy, I was involved in the activities of the community group host to the ANI site redevelopment (2003-2006). I came to be involved in this group through my community associations with other members. With a background in the biological and environmental sciences, and science policy, I offered to review the environmental reports for the project. What struck me about this project was the extremely high level of soil contamination at the ANI site and the potential for off-site impacts if the remediation practices were not well managed. It was clear to me from the outset that the concerns being raised by the local community were legitimate and that the group formed to represent the interests of the local community should play an active role in the decision-making for the project.

In my association with the group, I attended meetings as a community member and was involved in informal discussions on procedural, organisational, and personal matters. In a more formal capacity, I attended meetings with regulatory and local government

officials, and I assessed the developer's environmental reports for the project, as one of the community group's scientific advisors. In the lead-up to the ANI site remediation, I also provided practical advice[2] to residents who were choosing to stay in their homes during the remediation.

Through this work, and through meetings and personal dealings, I have had close contact with many of the community members involved in this action. Furthermore, as a member of the Fremantle community and through my links with a local primary school, I have formed friendships with many of the families involved in the community action.

As Scriven (1972) noted, the goal of qualitative research is not to distance oneself from the phenomenon being studied, as "distance does not guarantee objectivity; it merely guarantees distance" (cited in Patton, 1990, p. 480). Although the data for this thesis derives solely from archival records and not from direct interviews, my involvement in the community group has allowed me to develop insights into and make interpretations of the data, which would otherwise not have been possible. Nevertheless, by incorporating a multidisciplinary assessment and by applying documentary transparency, I allow the reader to judge the quality of the data and analysis.

During the latter stages of the writing of this thesis, I became a member of the Alliance for a Clean Environment Inc.[3], an NGO that advocates for communities on matters of air quality, and environmental health and justice in WA. I have no other official corporate associations.

I am not a member of any political party.

Funding for this thesis was through a university-based academic scholarship.

[2] For example, advising on risk minimisation in the home, the safety of consuming home-grown produce, and general exposure sources and dust management practices.
[3] The WA Alliance for a Clean Environment Inc. is a member group of the WA Conservation Council.

CHAPTER 3

A THEORETICAL FRAMEWORK FOR ASSESSING PUBLIC PARTICIPATION UNDER REGULATORY SCIENCE

CHAPTER 3: A THEORETICAL FRAMEWORK FOR ASSESSING PUBLIC PARTICIPATION UNDER REGULATORY SCIENCE

The analysis of contentious debates involving scientific knowledge can be undertaken applying a range of strategies (Martin & Richards, 1995). Some of these strategies use analyses that rely on a positivist epistemology, accepting the orthodox scientific view, while others use a relativist epistemology, critiquing the very nature of scientific objectivity.

This thesis applies the latter approach, using theories developed within the sociology of scientific knowledge (SSK) program, to provide the primary framework for analysis and, in particular, address the problem of public participation as it arises in the SSK.

> *The central achievement of SSK has been the demonstration that even the most esoteric features of scientific and mathematical knowledge can be understood as constructs; that scientific facts are not so much reflections of the world as persuasive texts, accomplished with and shaped by a complex of contingencies and circumstances. (Ashmore, 1989, p. xvii)*

The key attribute of SSK lies in its acknowledgement of "…knowing as a social process, and knowledge as a collective accomplishment" (Bloor, 2004, p. 919). The value of SSK lies in its analysis of both the wider social dynamics and the scientific knowledge itself, relying on the central programmatic claim that scientific knowledge is socially created or constructed (Martin & Richards, 1995, p. 5).

Wynne (1996c) argued that the reflexive use of SSK in policy debates produces "…richer, more multivalent understanding of what is at stake in any 'given' issue…" (p. 357), while allowing policy actors the insight into the contingencies of the knowledge upon which they rely. Making explicit the social mechanisms that hold certain knowledge frameworks as authoritative, and which produce barriers to public participation, is a critical strategy used in the SSK to produce a shift in thinking. It is

through this explicit characterisation of the prevailing shortcomings in public participation in science-rich discourse that these problematic procedural elements are addressed.

This chapter begins by identifying the dominant approaches to the creation of scientific knowledge, how science establishes its objective view of the world, and how scientific knowledge has been problematised, focussing on the negotiable and socially constructed nature of scientific knowledge, as developed by key scholars. While the discussion provided in parts of this section is well-rehearsed in the scholarly literature, the key points are restated to establish their significance to analysis of the standing of publics in debates relying on scientific knowledge.

The next section describes the expert driven model of science. The construction and problematisation of expertise in scientific knowledge frameworks and the relevance of expertise to public participation are the key features of the discussion.

Following from this, the core precepts of regulatory science and its dominant applications in environmental regulation in Australia are described. This discussion has a particular focus on the translation of research to regulatory science in health safety assessments, and the provision for negotiated safety outcomes and a precautionary perspective. The discussion then considers the application of the context-based safety assessments within Australian environmental regulation[4] and within the formulation of regulatory science. Although the emphasis is on clarifying the operation of regulatory science and the manner in which it applies evidence-based knowledge created under research science, research science itself is not beyond critique. This section directs its attention to recognising the construction of knowledge within these two forms of science, while coming to agreement on the best way to apply evidence-based knowledge to regulation.

The chapter concludes with a discussion of public participation within scientific debates, drawing on notions of expertise and critical positioning to contextualise the significance of involving publics in decision-making relying on science.

[4] Chapter 4 provides a more detailed discussion of the regulation of contaminated sites in WA.

This chapter discusses these theoretical aspects relating to the application of science in regulatory decision-making, and in the operation of public participation within this context, while introducing the key literature in the area.

The knowledge frameworks and theories discussed in this chapter form the basis for the thematic analysis of the case study of this thesis, detailed in Chapter 5.

3.1 The ideals of research science

> *Science does not rest upon a solid bedrock. The bold structure of its theories rises as it were, above a swamp. It is like a building erected on piles. The piles are driven down from above into the swamp, but not down to any natural or 'given' base; and if we stop driving the piles deeper, it is not because we have reached firm ground. We simply stop when we are satisfied that the piles are firm enough to carry the structure, at least for the time being. (Popper, 2002, p. 94)*

This section overviews some key standpoint theories of science - from empiricism, positivism, falsificationism, and normal science, through to critical and constructivist positionings. The discussion highlights the problematic elements of the scientific method and looks to inclusive and multidisciplinary methods to produce objective knowledge. In accordance with Popper (2002), the thesis asserts that what is most commonly understood to be 'science' is evidence-based 'research science', and that this form of science is uncertain and thus open-ended. It is this uncertainty and open-endedness of research science that is crucial to upholding its claims to objectivity.

3.1.1 Seeing is believing: empiricist and positivist accounts of objectivity

Empiricism is knowledge grounded in perception, and relies on rigorous observations and experiments from which the laws and theories of science are subsequently derived (Chalmers, 1982, p. xvi). In idealised terms, empiricism emphasises the derivation of knowledge via sense experience, and rejects knowledge that is innate (Van Fraassen, 2002, p. 209) or derived from tradition. Accordingly, empiricism claims the production of knowledge without interference from subjective cultural

value systems and, therefore, is strongly associated with the production of objective knowledge (see Hughes, 1990, p. 18; Woolhouse, 1988) [5].

In this thesis, 'empiricism' is referred to largely in terms of its methodological traditions, which favour "observational and experimental procedures in the search for knowledge" (Woolhouse, 1988, p. 2).

Expanding on the standard of empiricism, positivism (in its rudimentary form) maintains that science, grounded in sense experience, is the only 'true' form of knowledge. Under positivism, moral and value judgements are unverifiable through empirical means and, therefore, cannot be afforded a similar status in their knowledge claims. A positivist science thus promotes exclusionary mechanisms, forcing a dichotomy between (empirical) scientific knowledge and other knowledge traditions. In turn, this encourages a deterministic conception of humans and society by underplaying factors normally regarded as uniquely human (Hughes, 1990, p. 20).

Sociological and philosophical critiques of positivism (e.g., see Feyerabend, 1993; Giddens, 1975, p. 21; Kuhn, 1962) contend that although it creates a system of rules for defining what counts as valid knowledge and what does not, positivism fails to reflect on its own theoretical and ideological construction within socio-political frameworks. Nevertheless, positivism has been maintained as a framework for the creation of knowledge because it facilitates a certainty for knowledge of the world (Hughes, 1990, p. 17).

This thesis uses the term 'positivism' to refer to scientific knowledge grounded in sense experience, where value judgements are not afforded comparable status to knowledge claims.

3.1.2 Popper and Kuhn: falsificationism and normal science

Popper (2002) argued that science is inherently open-ended; that we reach agreement on the claims of knowledge, not simply on the basis that we are certain but because we are satisfied, at least for the time being, that the knowledge is valid according to conditions of an accepted convention or theory. The reliability of science-based

[5] Bacon's method of science entailed controlled observation of nature, "achieved by collecting facts through organised observation and deriving theories from them" (Chalmers, 1982, p. xvii).

'fact' finding thus concerns not only the knowledge itself, but also the rules under which it operates - rules that are continually challenged and negotiated, according to experimental tradition, social convention, or by simply using the best data available.

While supporting the observational criteria of the empirical method of science, Popper (see Charlesworth, 1982, p. 23) criticised the way in which the observational tools of science are used to connect the real world with the generalisations (laws and theories) of science. Instead, Popper (see Giddens, 1975, p. 18) saw the function of observation in experimental practice to be a means of checking and refuting, rather than proving the theories of science. He saw these experimental practices as the review systems of science, and thus crucial to upholding any claim to objectivity.

Popper presented the scientific statement as one that was falsifiable; that we arrive at objective or 'truthful' statements about the world by defining those that are not. That is, "the enterprise of science consists in the proposal of highly falsifiable hypotheses, followed by deliberate and tenacious attempts to falsify them….We learn from our *mistakes*. Science progresses by trial and *error*" (Chalmers, 1982, p. 43 emphasis in original).

Under Kuhn's (1962) 'normal science' thesis, "good science is delimited not by rules such as Popper's criteria of falsifiability, or positivist meaning postulates, or even by more content-laden rules specific to the discipline, but by how practitioners perceive and apply these 'exemplars'…" (Nickles, 2003, pp. 1-2). Kuhn concluded that knowledge produced under normal science proceeds in a cumulative fashion (while not contesting the accepted knowledge tradition), however, under 'revolutionary science' scientific knowledge may be carried in a different direction, and so producing a paradigm shift. In other words, science advances not simply by knowledge accretion in its 'normal' phases, but by 'revolutionary' shifts in a particular knowledge tradition, which occur when the shared framework, under which a particular paradigm operates, no longer provides an adequate explanation of the subjects of investigation. Accordingly, Kuhn argued that scientific knowledge did not constitute an objective truth but operated according to social traditions in which paradigms uncritically guide observations and experiments, that is until an assigned paradigm was no longer useful in describing the world.

Popper (1970, p. 52) agreed that Kuhn's representation of normal science was significant in highlighting the potential for dogmatism and indoctrination when "we approach everything in the light of a preconceived theory", and that any deviation from an accepted belief system occurs only by means of 'bandwagon effect', when it becomes fashionable to do so. However, Popper countered this operational system of normal science, arguing that in science it *is* possible to "evaluate, critically and rationally, our former views, in the light of new ones...[that] a critical comparison of the competing theories, of the competing frameworks is always possible. And the denial of this possibility is a mistake" (Popper, 1970, p. 57). Popper's criticism of normal science emphasises the role science should play in critical thinking, and in so doing creates a space where scientific thinking can be revolutionary all the time, and not just at times of paradigmatic disharmony.

Kuhn's (1962) paradigmatic thesis of 'normal science', however, remains important in comprehending the role of power constructs in defining science. That is, if the scientist is trained within, and works according to, the edicts of a particular paradigm, which is itself a product of the scientific community; and if within a paradigm, scientific work can only be generated successfully according to the accepted paradigm, any work emanating from outside the accepted paradigm cannot be recognised or published as part of that particular paradigm. Normal science thus polices the boundaries of science and maintains order through the exclusion of those operating from beyond its own traditions. Science does not only progress by virtue of its own (assumed) impartiality and constancy, but can establish its direction, power, and efficiency by excluding those who cross its path.

3.1.3 Partial perspective and the biology of sensory perception

Some authors hold that the observational method of science can offer neither objectivity nor truth. Haraway (1988), for example, objected to the claim that science possesses an all-encompassing objectivity through sensory experience. She argued that although science does teach a particular way of seeing and of observing, it is not necessarily *the* objective vision. Haraway (1988) referred to the method of science as 'unlocatable', and described the objective knowledge claims of science as irresponsible (p. 583) - the "...conquering gaze from no-where" (p. 581).

Nevertheless, Haraway (1988) recognised the importance of the 'persistence of vision' - not as a naive tool of objectivity but as a means of embodying objectivity by "understanding how these visual systems work, technically, socially and psychically..." (p. 583).

Rather than promoting an objectivity, which she viewed as a "...particular and specific embodiment and definitely not about the false vision promising transcendence of all limits and responsibility" (Haraway, 1988, pp. 582-583), Haraway pursued 'partial perspective' as the only possibility for objective vision. Whereas science claims the 'god trick' promising the infinite vision from everywhere and no-where equally, partial perspective promises a way through all the visualising tricks and powers of modern science, and so transforms the objectivity debate by recognising that the vision of the observational method is a socially constructed one.

Haraway (1988) re-asserted the principle that 'we learn how to see' but also offered a new positioning on objectivity, which instead of asserting privilege, recognised privilege, while not claiming infallibility. This model provides an important critique of the observational criteria of empiricism, and extends Kuhn's (1962) social-constructivist account of science[6] by bringing an ethical component to the objectivity debate - deliberating on how science ought to operate to best serve society.

Further enhancing our understanding of the problematic nature of the objectivity claim by science, and in accord with Haraway's hypothesis, Paulos (1988, p. 80) discussed the ubiquity of 'filtering' - that we may unintentionally filter out the impressions we do not want to consider. Supporting Paulos's notion of filtering, neurological studies have extended our understanding of the role of the brain in interpreting incoming data, showing that sensory experience does not adequately inform us about reality (Greenfield, 2000). Furthermore, the past experiences of an individual have been shown to guide expectations in the way incoming information is interpreted, and this informs an individual's fundamental understanding of the world. The human brain has the capacity to 'fill in gaps' to enable and support an expected outcome, whereas unusual events may be blocked or filtered, and expected

[6] Longino (2003) argued, "...Kuhn would have had serious reservations about these [feminist] applications [of his work], as he had about many of those in science studies who took his views as a mandate to inquire into the social nature of scientific inquiry" (p. 261).

outcomes overlaid. Effectively, the brain may fail to 'see' the unexpected, or be unable to accept that which is too difficult for the individual to comprehend.

The use of empirical methods to inform science and to rationalise its objectivity claims must be evaluated in view of these insights into the biology of sensory perception. Other methodological traditions for use alongside empiricism, or to bolster empirical claims, therefore, provide opportunities to produce improvements to the production of objective knowledge.

3.1.4 What are the most reliable methods for science?

The previous discussion highlights the problematic positioning of the key methodological traditions used in science. Importantly, in the application of these traditions, a model for objective knowledge creation is pursued, which is free of the constraints of politics and society, and free from the values and subjectivities that derive from such associations, thus promoting an exclusionary model for objective knowledge creation. However, it is in the exploration of the relationship between science and the socio-political that the promise for inclusion and change lies. This is precisely why it is so important to facilitate a more comprehensive, external, and independent review of science, its methods, and its different applications.

Feyerabend (1993) argued:

> *we need an **external** standard of criticism, we need a set of alternative assumptions...**proliferation of theories is beneficial for science, while uniformity impairs its critical powers**" (pp. 22, 24, emphasis in original)....[and drawing on Mill and Bohr] a pluralism of ideas and forms of life is an essential part of any rational inquiry concerning the nature of things....**Variety of opinion is necessary for objective knowledge. And a method that encourages variety is also the only method that is compatible with a humanitarian outlook**. (pp. 31-32 emphasis in original)*

Therefore, providing a critically positioned review of what we understand to be scientific knowledge is fundamental to producing objective knowledge. This thesis investigates citizen involvement in science as a means by which to ground research in local context, pursue social value, and to challenge the knowledge dichotomies

developed under objectivist accounts of science. The exclusivity of science, nevertheless, remains an ongoing problem for public inclusion in its processes and practices.

3.2 The expert driven model of science and its public positioning

The foundation for producing reliability and proficiency in science rests on certain methodological approaches to produce objectivity in knowledge creation. Section 3.1 offers empiricism as the methodological exemplar of evidence-based science but highlights the problems inherent in this approach. The discussion presents the ideals of uncertainty, of the social construction of knowledge, and of the need for a critically positioned science, as points for consideration. However, the conditions under which dominant scientific methodologies prevail in the absence of critical appraisal, especially under regulatory usage, require clarification. The discussion in this section expands on these concepts and, in particular, focuses on whether the traditional formulation of expertise (and of the expert) addresses the power imbalance between those in authority over knowledge and those subject to authority.

3.2.1 Defining expertise

McKechnie (1996) argued that experts "...play an increasingly important social role...[but] we know very little about the basis of the credibility of expertise" (p. 127). McKechnie asserted that it was the whole of society that participates in defining expertise, in much the same way as it defines science (p. 130). Thus, the social construction of the expert and of expertise is significant to analysis in debates involving scientific knowledge.

Krosnick (1990, p. 3) proposed that the critical feature in characterising the expert was in establishing a separation from the non-expert, on the basis that experts:

- view information in terms of large, meaningful patterns;
- represent information at a deeper, more principled level;
- spend more time on qualitative analysis prior to implementation of problem solving strategies;

- have a greater self-awareness, giving greater insight into the accuracy of their decisions;
- have more domain-relevant knowledge, enabling them to learn more quickly and easily; and
- show reduced speed-accuracy trade-offs - rushing experts does not impact greatly on performance.

Krosnick's definition is important because it does not offer a fundamental location for the expert. That is, expertise may exist in many spheres of knowing.

Other scholars (e.g., Ericsson, 2005; Jasper, 1994; Johnson, 1995), however, have made this distinction and, for example, have demarcated expertise on the basis of inclusion in a professional body (such as a scientific organisation or a government agency), through professional acknowledgement, or from training and extended deliberate practice under formal professional systems. The manner in which expertise is so closely tied to a particular profession's view of itself, in turn, affords a further legitimation function that is institutionalised as part of the governing processes of a particular body (Johnson, 1995, p. 16). In other words, in order to claim expert status, membership of (or formal association with) a professional body is commonly required, and because experts are associated with a particular professional body, this supports the view that the two - expert and professional body - are in some way inextricably linked. The definition and identification of expertise within this context thus shifts the dichotomy beyond expert-lay, to professional-lay. For scientists operating on behalf of the public, this further separation between professional and lay knowledge is particularly significant and can see these scientists delegated to the rank of 'non-expert'. Expertise no longer simply rests on knowledge claims but as a function of association with, or location within, a particular group[7].

Waage and Benediktsson (2010, p. 6) positioned expert practices as performative, that is, conditioned by the very discourses they help to create and sustain. To overcome this and other problems associated with defining expertise, Waage and Benediktsson argued that definitions of expertise must be broadened to include

[7] Kothari (2005), for example, discusses a range of characteristics used to create exclusive forms of knowledge in the international development context, including the professionalisation of expertise, and the effect of this in marginalising other groups.

expertise acquired from other sources, including personal experience and formal qualifications.

Petts (1997) noted that the separation between expert and lay knowledge continued to afford justification for informational inequities between the parties represented under these knowledge groupings (p. 374), thereby creating yet another defining characteristic of the expert-lay dichotomy - information access. Although lay publics (and their representatives) are increasingly able to access and interpret scientific data, and so weakening the link between expertise and the scientist or technical expert (Petts, 1997, p. 373), it is through the professional association that experts are able to access more easily *all* the resources needed to support their expert claims. This professional association may even facilitate practices that obstruct public access to information, for example, in the commercial secrecy provisions of freedom of information (FOI) legislation or in the financial or technical requirements needed to access and interpret information.

Petts (1997, p. 359) claimed that it is expressly the location of knowledge which is important in environmental debates. She argued that expertise is a communicating and learning process that necessarily involves the use of source-linked information, best accessed through special interest groups and the public. Therefore, in restricting the definition of expertise or limiting information resources, opportunities for communicating and learning are also restricted and, consequently, knowledge creation is stifled.

3.2.2 Problematising expertise

Code (1991) argued that the "...maintenance of authoritarian expertise is associated with practices of keeping judicious distance from the people subject to expert authority" (p. 248) for the express purpose of asserting power. Paying attention to the manner in which bodies in authority define expertise, locate expertise, and enable access to informational resources, therefore, is critical to redressing the power imbalance between those in authority and those subject to authority. For decision-making to be productive and democratic, the public must be offered "opportunities to deliberate the numerous judgements and value-laden decisions that permeate the

policy implementation process and the process of generating, disseminating, and using scientific knowledge" (Cortner, 2000, p. 25).

While not denying the importance of science and professional expertise, Bäckstrand (2004) argued that in order to counter dualist notions of expertise it is necessary to:

- create a better understanding of the boundaries or distinctions between science and non-science, expert and lay, universal and local knowledge;
- understand that "...all expert knowledge is situated in a specific local, political and cultural context, inherently value-laden and imbued with worldviews..." (p. 706);
- recognise that tensions exist between expert systems and citizens, insofar as there exists a contradiction in the manner in which environmental problems are considered best resolved by technical expertise, rather than democratic deliberation (pp. 695-696); and
- advance the role of a wider spectrum of stakeholders in decision-making (p. 702).

Wynne (1996a) argued that the explicit problematisation of expert knowledge is important in developing "...new forms of political, moral and epistemic order - ones enjoying greater public identification, and reinvigorated democratic grounding..." (p. 73). That substantive intellectual status exists within lay knowledges (see Wynne, 1996a, p. 74) must be appreciated, however distinct such knowledges remain from objectivist approaches. Importantly,

> *once one introduces the idea that scientific expert knowledge itself embodies a particular culture - that is, it disseminates and imposes particular and problematic normative versions of the human and the social - then this fundamental divide is no longer tenable. (Wynne, 1996a, p. 75)*

Wynne (1996a), nevertheless, understood that merely declaring the cultural embodiment of scientific expert knowledge fails to adequately address the means by which dominant models of expertise continue to maintain power and vice versa. He recognised the need to find strands of mutual commitment, but that this was not attainable without "…new elements of practice, relationships and identity

emerging…" (p. 75), to address the power relationships inherent within the dominant discourse that serve to strengthen its authority over subordinate positionings.

Code (1991) too saw the significance in understanding that "...power confers the status of knowledge on products of inquiry better characterised as conjectural, hypothetical, working theories; and how knowledge itself confers and is conferred by power, *perpetuating these complex social structures*" (p. 218, emphasis added). Therefore, tackling the problem of the mutually dependent character of lay and expert knowledges, in practical terms, must involve a redistribution of power and authority from the bodies that control expertise to the marginalised participants reliant on expert assessments.

3.3 The standing of regulatory science

This section expands on the introductory notes on 'research science' and 'regulatory science' provided in Chapter 1 and examines in more detail the distinction between, and the practical applications of, these different forms of science. The discussion will address issues of scientific uncertainty, the function of risk assessment in regulatory judgements, the application of precautionary context-based risk assessments, and the peer review system, highlighting the significance of extended peer review for regulatory applications.

This section discusses the problematic application of regulatory science to decision-making, particularly when it impedes citizen involvement or is unable to respond promptly to new evidence. Chapter 4 will return to the discussion of the application of research science to the regulatory frameworks used in the management of contaminated sites in WA.

3.3.1 The regulatory and research science divide: the problem of uncertainty

Popper (2002) argued that the methods of science provide a means by which to check and refute knowledge. Research science, operating under these provisions, upholds uncertainty and thus produces knowledge that is open to review[8] and subject to

[8] For example, the UK Science Council (2014) presents a model for science that is informed by observation and measurement, evidence, hypothesis testing, inductive reasoning, repetition, critical analysis, verification, and testing via exposure to scrutiny and peer review.

update. Holding knowledge to account in this manner makes it better able to lay claim to objectivity.

Although the provisional and contested character of this form of science operates comfortably within Popper's logic of scientific discovery, for regulatory decision-making it presents some unique challenges. In particular, regulatory science must have the capacity to provide definitive and irrevocable judgments for decision-making purposes, within diverse arenas and different socio-political contexts. Under these conditions, the norms of proof in regulatory science are less demanding than for research science (Weinberg, 1985) and the uncertainty thesis underpinning the research scientific endeavour is necessarily downplayed or rejected.

Irwin, Rothstein, Yearley, and McCarthy (1997) argued that on the basis of moderated proof requirements, regulatory science has been categorised as inferior to research science and, accordingly, "...this leaves the methods and results of regulatory science open to challenge on the grounds that they are just policy strategies disguised in scientific language" (p. 19). Moreover, Irwin et al. (1997, p. 29) believed that it was precisely the reference to regulatory science as inferior to research science that led to the differences between these two forms of science being overlooked in the appraisal of regulatory approaches.

Nevertheless, regulatory science remains a necessary element of decision-making, while also serving a political goal - producing policy[9] that is able to deflect criticism and public dissent, and so circumvent political stalemate (J. Jones, 2008). That is, in presenting policy-based decisions as irrevocable, while based on scientific evidence (portrayed as certain), decision-makers can appear to the public more credible and trustworthy and their decisions legitimate (Shackley & Wynne, 1996, p. 276; Wynne, 1987, p. 269).

Wynne (1988) highlighted that the blurred distinctions between different forms of science, however, can become more openly acknowledged in contentious debates, and especially under failed regulatory initiatives. For example, in the use of

[9] The term 'policy' has been retained here according to other authors' use, however, the preferential use of the term 'regulation' has been applied to this thesis, to refer to the range of administrative processes and directives, which apply to the Australian context.

technological systems relying on expert knowledge, Wynne (1988) described how differences between the 'tidy' world of scientific analysis and the practical application of technologies are necessarily revealed in decision-making after an 'unexpected' event occurs. Wynne (1988) suggested that in such circumstances decision-makers are forced to openly acknowledge the uncertainties inherent in the science, even while the same science is being used to allude to certainty in its real world scientific applications.

> *(to paraphrase) 'Why did you ever think there was such a thing as zero risk, and how naive can you be to imagine that technical knowledge does not harbour areas of uncertainty, even legitimate ignorance? We cannot be blamed for the inevitable uncertainties that exist in developing expert knowledge and technological systems'. (Wynne, 1988, p. 150)*

In other words, although the suppression of uncertainty is common in science-based decision-making and technical application, when problems arise and the uncertainties of knowledge revealed, this does not necessarily result in decision-makers conceding failure. Rather, the uncertainty of scientific knowledge itself is more openly invoked and used as a defence for failures of decision-making and the scientific technologies used. Therefore, failures of science and scientific decision-making are being expressed as unavoidable shortcomings of the evidence-based knowledge as applied to decision-making, or of limitations in the technologies themselves. Accordingly, contentious decision-making debates are often characterised by citizens reacting to mechanisms that hold science to the pressures of decision-making by obscuring uncertainties of knowledge, which at the same time rely on the uncertainties of knowledge to explain failures of the system.

Under these system failures, resulting from the suppression of uncertainty, public mistrust of the regulatory application of science and of the regulatory officials is a recognised outcome. For example, in the UK bovine spongiform encephalopathy (BSE) outbreak it was demonstrated that when there is a pre-occupation with preventing public 'alarmist over-reaction', and the use of official claims of 'no risk', the legitimacy of science itself can come under attack (Lord Phillips of Worth Matravers, Bridgeman, & Ferguson-Smith, 2000, p. xviii). In the BSE outbreak example, the UK House of Lords Select Committee Report into Science and

Technology (UK House of Lords, 2000) highlighted that the suppression of uncertainty diminished public trust and respect and, furthermore, the inaccurate 'scientific' framing of a problem, to the exclusion of moral, social, ethical, and other concerns, invited hostility and suspicion. Therefore, the attempt to produce greater public confidence in the (regulatory) applications of science by offering a certainty of knowledge and a 'no risk' scenario can result in a contrary response - producing an increasing lack of public confidence in both the scientific knowledge and the regulatory institutions responsible for offering public reassurance by advancing a certainty of knowledge.

Wynne's accounts of radioactive contamination of sheep grazing lands in Cumbria in north-east England (Wynne, 1996a)[10] and the Challenger space shuttle disaster (Wynne, 1988) [11] are further examples demonstrating the disconnect between scientific/technical knowledge, the manner of its contextualisation in real world applications, and the effect on public trust of science and those in charge of scientific decision-making.

Instead of recognising the evident failings of these framings of uncertainty in science, regulatory institutions have tended to increase their reliance on the same systems of logic that produced the problem in the first place - using objectivist models of science and quantitative risk assessments to (re)assert legitimacy and certainty. Therefore, the cycle of public mistrust and subsequent intensification of scientific assessment continues, but under a system in which the uncertainties of science are not openly acknowledged. Revisiting the issue, Wynne (2014) and Irwin (2014) expressed frustration that the 'public understanding of science' movement had made little inroad into producing the sought after awareness of this problem in science.

[10] Wynne's (1996a) study followed Cumbrian sheep farmers whose grazing lands were radioactively contaminated. Wynne's study demonstrated that trust of expert assessments of risk were not only reliant on the scientific knowledge used but involved judgements on the quality of the institutions in charge of defining and managing risks.

[11] Wynne (1988) discussed the identified shortcomings in the Challenger space shuttle mission risk assessment, in which failures to recognise the contingencies of scientific knowledge, within real world applications, led to shortcomings in the risk assessment for the project and the eventual explosion, which resulted in the loss of the shuttle and those on board. Feynman (1986) also discussed the risk assessment shortcomings of this case.

3.3.2 Risk assessment as an extension of regulatory science

Risk assessment forms a key component of environmental regulation. Assessments largely take the form of probabilistic applications identifying and calculating the likelihood of impact from a vast array of pollutants or activities, on different species or populations within variable environmental, technological, and cultural contexts. It is evident, within these variable contexts, that the body of knowledge necessary to quantify risk adequately must be extensive. The requirement for such a large body of information to support a risk assessment, in turn, means that risk assessments can become extremely complex. To this end, Ekeland (cited in Cole, 1998) conceded:

> *a single neglected or unrecognised risk can invalidate all the reliability calculations, which are based on known risk… [Therefore] calculating risks can be very tricky because not everything is known about every situation…. There is always a risk, in other words, that the risk assessment itself is wrong. (p. 36)*

Jasanoff (2005, p. 265) argued that it is the claim to scientific rationality in risk assessment that makes it so important in regulatory judgements - to enable such judgements to take on the mantle of scientific objectivity and thus appear objective in their own right. But in reality, risk assessment is

> *…far from objective method: indeed, that it is a highly particular means of framing perceptions, narrowing analysis, erasing uncertainty, and diffusing politics. Nonetheless, the discourse of science that gathered around risk assessment proved irresistible to regulators and modernist managers of every stripe, all of whom found risk assessment to be an invaluable tool for hiding judgement and making the complexity of biopower[12] politically defensible as well as administratively tractable. (Jasanoff, 2005, p. 266)*

Beck's (1992) account of risk is also significant. Lash and Wynne (1992) explained that Beck's analysis pointed to the social component of risk and not just the scientific meaning. They outlined the three important observations made by Beck:

[12] A term coined by Foucault and used to describe the practice of managing people through the subjugation of bodies.

> *(1)…physical risks are always created and effected in social systems, for example by organisations and institutions which are supposed to manage and control the risky activity…*
> *(2)…the magnitude of the physical risks is therefore a direct function of the quality of social relations and processes.*
> *(3)…the primary risk, even for the most technically intensive activities…, is therefore that of social dependency upon institutions and actors who may well be - and arguably are increasingly - alien, obscure and inaccessible to most people affected by the risks in question. (p. 4)*

Therefore, the function of risk assessments in regulation should not only be to apply evidence-based science, but also to place scientific knowledge within its social setting. If, as a regulatory application, risk assessment is approached simply as a quantitative undertaking, important questions concerning both scientific and procedural uncertainty can be overlooked and the fundamental openness of both scientific and public meaning can go unnoticed.

Wynne (2005: citing Marris et al., 2001), however, argued that discourses on risk are deficient and this deflects attention away from alternative meanings.

> *[T]here is an apparently unseen but extensive openness of meaning underlying the self-consciously scientific public discourses of 'risk issues' and there are immense pressures to routinize and reify a supposed unambiguous 'object' in the face of deep ambiguities as to what the object(s) of attention and meaning should be. This largely unrecognised tension may require fundamentally different approaches from simply presuming a scientific meaning. Yet this predicament appears not even to have been understood, and not just by modern policy and scientific actors involved in the governance of such issues, but also by too many social science experts on risk. If people try to bring other meanings to the issue, they are likely to be excluded and patronised by expert institutions and some social science as* ***misperceiving*** *the 'true' object. (p. 71, emphasis in original)*

Under conditions of disproportionate power and influence by big industry, citizens can become wary of distorted communications of risk and resort to their own cultural logic, examining the risk issues and the official assessments according to their own

experiences (Fischer, 2005, p. 57). Nevertheless, the significant points to which publics assign meaning to risk (e.g., ethical considerations, commercial bias, disclosure of uncertainty, trustworthiness of regulators) are undervalued, suppressed, or simply not taken seriously under official assessment. Importantly, perceptual differences between lay and scientistic modes of risk assessment are being framed in such a way as to position the lay response as little more than 'public irrationalities' and nothing to do with real technical knowledge (Wynne, 1987, p. 270). The expert led scientistic framing of the problem is thus failing to critically position scientific knowledge (and the manner in which it is applied in regulatory risk assessment) to its own social construction.

Section 3.4.2 provides further discussion on risk discourse and its significance to public participation in science.

3.3.3 The application of precautionary context-based risk models under regulatory science

The context-based model for environmental risk assessment provides an opportunity for broader analyses to take into account the complexities of (local) application of the (scientific) regulatory criteria. In the Australian application, environmental safety criteria defined within this system consider "...scientific, technological, social, political and economic factors" (National Environment Protection Council, 1999b, p. 12). When used comprehensively, context-based models offer high levels of public and environmental health protection by critically applying the available scientific data to a unique set of circumstances.

Nevertheless, the regulatory application of context-based safety criteria can be hindered by the requisites of regulatory science itself. That is, context-based safety criteria are inherently open-ended and precautionary in nature and, therefore, when regulatory risk assessors seek clarity through certainty, the application of these criteria can present as an obstacle to decision-making. When combined with poor legal enforcement provisions, context-based assessments are being inadequately utilised and replaced with 'single number' claims to provide the sought after assurance of accuracy in risk modelling (see National Environment Protection Council, 2006b).

Jones (2008) recognised the problematic application of precautionary regulatory directives in Australia and argued the importance of greater transparency in decision-making to counter any shortcomings. Jones, however, also recognised inconsistencies in implementation, particularly in the legal obligation to provide for transparency in regulatory decision-making and in applying the most current or best available science.

> *In Australia, public administrators are not generally obliged by law to provide reasons for their environmental approvals. Although occasionally governments might volunteer reasons for approving a project, generally the public is kept in the dark as to the exact basis for an approval.*
>
> *What kind of scientific information on predicted harm was accepted or rejected by the decision-maker? What level of uncertainty or risk of environmental and other harm is the government accepting when approving a project? These are important questions for opponents to a development and for an understanding of a government's environmental policy. Yet because there is no legal obligation to provide reasons, they usually have no clear answer. Further, there are limited avenues through the courts for appeal or review of the scientific or factual basis of the decisions - and there are many administrators, judges and legal academics who argue that judicial deference to fact finding and policy-driven decision-making by public administrators is entirely appropriate.... What must be recognized is that public administrators can only make decisions consistent with laws passed by parliament, and at present there is an enormous gulf between what this science is saying about the need for environmental protection and what the law requires public administrators to decide. (J. Jones, 2008 no page number)*

Via the *National Environment Protection Council Act (1994)*, it was originally intended that Australia-wide National Environment Protection Measures (NEPMs), which include many context-based criteria, be incorporated into State laws. However, as it stands, the guidelines presented through the NEPC and other government health bodies are not mandatory. In fact,

> *the definition sections in all the NEPC Acts are silent regarding the mandatory nature of standards and guidelines. Thus...it is unlikely as a matter of definition, that a court would hold that NEPMs are legally binding or sufficient to limit environmental decisions made by government. (Meyers, Potter, & Leane, 1997 no page number)*

Chapter 4 provides more detail on the use of context-based assessments under the Australian and WA models, as used in the management of contaminated sites.

3.3.4 Is the peer review system adequate for science decision-making?

Peer review is a mechanism devised by scientists to validate each other's discoveries through examination of both the quality of the work and the aptitude of the scientist (Jasanoff, 1987, p. 196). However, the approach to peer review under different forms of science occurs under different conditions, and the indeterminate character of the science used in decision-making commonly makes the products of review more difficult to discern (Jasanoff, 1987, p. 218). Despite this, peer review practices in regulatory applications of science continue to derive legitimacy from their less ambiguous application in research science.

While acknowledging that peer review in the research sector is not without its own problems, for example, in scientific publishing (see Bohannon, 2013; Bornmann, 2011; Butler, 2013; Teixeira da Silva, 2013), this section will address the review of the science used in support of regulatory decision-making.

For the management of contaminated sites in Australia, the data used to inform the assessment guidelines is derived from peer reviewed published research data. National regulatory bodies review the assessment guidelines from time to time, typically when new research data becomes available or when the research data comes into question. Procedurally, these regulatory reviews can be lengthy and, therefore, are not always immediately responsive to new data (see section 4.2.1 for more detail). Nevertheless, they form the main mechanism to evaluate and update the regulatory criteria.

The review of the regulatory criteria also occurs at the local (individual site) level, where regulatory assessors evaluate the available data and the regulatory assessment

guidelines within the context of a specific project. This process to produce locally relevant environmental assessments does not necessarily contain formal mechanisms to review the data or the assessors' work, or to ensure high procedural standards. Without formalised procedural mechanisms to control for the accuracy and accountability in the translation of the research and (universal) regulatory data to context-based data, opportunities for mismanagement in regulatory assessments exist.

The review processes for regulatory science in Australia thus differ from the review processes for research science in:

- the timeliness and responsiveness of regulatory science to new data;
- the application of data to different contexts;
- the interpretation of data by regulators; and
- the accountability of regulators in their role as reviewer.

Furthermore, and as Jasanoff argued, "…the credibility of regulatory science ultimately rests upon factors that have more to do with accountability in terms of democratic politics, than with the quality of science as assessed by scientific peers" (Jasanoff, 2003b, p. 233). Yet, as Turnhout, Bloomfield, Hulme, Vogel, and Wynne (2012) recognised, the use of peer-reviewed science to inform policy decisions "…omits many other important stakeholders and knowledge holders, including indigenous people, businesses, farmers, community partnerships and fishers. What counts as legitimate knowledge, and how it is generated, influences its practical effectiveness" (p. 454). Accordingly, although key regulatory review processes rest on establishing functionality and accuracy through broader stakeholder inclusion in review processes, they continue to operate under a system that references the review processes observed in formal research science, where review is closed to wider evaluation, but in which assessors are protected from external scrutiny through the informality of process. It is this culture of governance, "entailing the mechanisms and substance of participation" that Jasanoff (2003b, p. 238) maintained needed further evaluation to expose any shortcomings.

In recognising these systems of exclusion for 'non-expert' groups in regulatory (and research) science applications, Jasanoff (1998, p. 77; 2005, pp. 267, 269) and Funtowicz and Ravetz (cited in Jasanoff, 2005, p. 232) pointed to the significance of extended peer review, especially in 'post-normal science', comprising "the highly uncertain, contested knowledge generated in support of health, safety and environmental decisions…." (Jasanoff, 2005, p. 232). Ravetz (2005) noted:

> *In the absence of an 'extended peer community' with their 'extended facts', it is all too likely that the decision will reflect the limited experience of those who inhabit a tidy world of well-behaved natural processes and well-behaved laboratory assistants. (p. 48)*

Using examples from several international contexts, Jasanoff (2005) demonstrated that close scrutiny from all interested parties was the best way to identify personal bias and subjectivity, and to maintain accountability (pp. 267, 269), but she also recognised that support by experts for scrutiny from 'non-expert' groups was not always forthcoming, particularly when expert groups constructed boundaries to protect their sphere of influence (Jasanoff, 1998, p. 77). That is,

> *a properly functioning review system also promotes the collective interest of scientists in maintaining a monopoly over knowledge-claims, because such a system reaffirms the proposition that only scientists are qualified to judge the validity of work done by their professional peers. In this respect, peer review articulates with the self-regulatory procedures and codes of conduct that numerous professional groups have adopted over time to enhance their autonomy and social prestige (Jasanoff, 1985, p. 22).*

Hisschemöller, Hoppe, Groenewegen, and Midden (2001) similarly argued that "the problematic relation between knowledge use and political choice can be understood as a particular instance of boundary work at the politics-science nexus" (p. 438). The 'black-boxing' of peer review in policy, entailing its use exclusively as a tool to be used by science (both research and regulatory), thus excludes public involvement and transcends transparency and accountability. Hisschemöller et al. (2001) interpreted Funtowicz's and Ravetz's proposals for new rules in post-normal science as "an attempt to reframe the potential dilemma between knowledge use and political

participation as a paradox, manageable through quality control of knowledge production and use through discursive and institutional designs for internally and externally extended peer review"(Hisschemöller et al., 2001, p. 438).

Scott (2007, p. 828) recognised the importance of pressures from science policy, democratisation of science, and new social and scientific challenges in redirecting science and its peer review practices to a more relevant stance. He argued that extended peer communities play an important role in "addressing the right questions; incorporating the knowledge of these non-academic experts in the analysis; and adequately testing the validity and practicality of any prescriptions researchers are proposing" (Scott, 2007, p. 829). Scott's analysis emphasised that research that is relevant to pressing social problems "need[ed] to take into account a wider set of criteria than is normal in 'traditional' peer review" (Scott, 2007, p. 840).

Despite increased demands by public officials to manage environmental and health risks by using 'good science', it is not always possible to establish that a risk exists, no matter the quality of the science, or level of expert standing. Knowledge, therefore, must always be supplemented by discretion (Jasanoff, 1990, p. 42). Determining what constitutes 'good science', how to harness 'good science', and how to apply discretion under any model of science, which is closed to external review, are important points to consider. As Wynne (1996a) argued, notions of 'good science' and of the privilege afforded such, is "...not naturally given but culturally validated" (p. 74).

3.4 Public participation in scientific decision-making

The importance and value of public participation in decision-making is widely appreciated under frameworks supporting democratic principles (Caddy & Vergez, 2001; United Nations Conference on Environment and Development, 1992; WA Department of Premier and Cabinet, 2002). Public participatory approaches advance ethical perspectives, recognise the public as knowledgeable, and thus promote respectful interactions between regulatory bodies and the groups whose interests they represent (WA Department of Premier and Cabinet, 2003). Moreover, public participation offers a range of benefits over non-participatory mechanisms,

supporting grounding in real-world operating conditions, and offering independence from the narrow outlook of the professional expert (Grove-White, Macnaghten, & Wynne, 2000; Wilsdon & Wills, 2004).

In WA, public participation/community consultation is viewed as important in creating a more inclusive and equitable society, while strengthening democratic institutions (WA Department of Premier and Cabinet, 2002), and it is promoted as a "must do" element of WA Government decision-making (WA Department of Premier and Cabinet, 2003, p. 4).

> *Consultation promotes active citizenship by encouraging individuals to provide real input into public life and decision-making. The benefits of genuine consultation, involving listening and actively responding to concerns and issues raised, cannot be overstated. It means decision-makers are better placed to make informed judgements by tapping into fresh ideas and new sources of information. For individual citizens this provides an opportunity to express their views and influence the outcomes of decisions that affect them." (WA Department of Premier and Cabinet, 2002, p. i)*

In scientific decision-making, public participation is especially important. Wynne (2005, p. 67) argued that through public participation the human purposes driving science and innovation, along with the instrumental consequences, are brought into view. Accordingly, public participation in scientific debates allows for a re-focus on important questions regularly overlooked by scientific experts (Fischer, 2005, p. 64). Nevertheless, publics continue to be marginalised under mechanisms for participation that situate lay knowledge as inferior to that offered under regulatory expert control.

This section expands on the frameworks discussed previously in this chapter and, in particular, addresses:

- the positioning of lay knowledge and public participation in scientific debate;
- the cultural nature of risk in regulatory science;
- the impacts on public participation from the expert-lay divide and the 'deficit model' for public understanding of science; and

- the significance of critical positioning to public participation.

3.4.1 The positioning of lay knowledge and public participation in scientific debate

The strength of lay knowledge, being located in the "…observation of specific areas of everyday reality…contextualises public 'understandings' and compensates for science's search for universality" (Eden, 1996, p. 192). It is the grounding of public participation in real world operations that underpins its validity, as opposed to the traditional scientific approach, which does not reflect on matters of saliency (Harremoës et al., 2001, p. 177). However, it is not that lay publics are more knowledgeable; rather, knowledge that is situated is more robust. The legitimacy of the public participatory mechanism, therefore, lies in the belief that lay knowledge is robust knowledge.

The idea that scientists act impartially, whereas local citizens are motivated by community interests, is precisely the characteristic that is interesting (Fischer, 1997, p. 189). Public participation, and particularly the exploration of local knowledge and the perceptions of those for whom the research concerns or affects, ensures that regulatory process takes into consideration matters important to the public, therefore, maintaining its attachment to prevailing ethical and social values (Cornwall & Jewkes, 1995, p. 1674;1668; Gristock, 2001, p. 3; Harremoës et al., 2001, pp. 177-178). In turn, this improves the quality of the research and the decisions that derive from it, and enhances both the acceptability and the legitimacy of scientific regulatory appraisals (Irwin, 2001).

Nevertheless, in their study of coastal governance, Clark et al. (2013) determined that "conventional systems of government have not adequately responded to, or represented, the variety of voices and knowledges present…[and] more collaborative approaches to governance that incorporate these voices and knowledges are required…" (p. 89). Moreover, studies by Cornwall and Jewkes (1995) and Elliott and Williams (2004, p. 233) found that even where citizens were involved in participatory research mechanisms, they remained disconnected from issues of agenda setting, ownership of results and, ultimately, power and control.

> *Much of what passes as 'participatory' research goes no further than contracting people into projects which are entirely scientist-led, designed and managed…In many cases people are 'participated' in a process which lies outside their ultimate control. Researchers continue to set the agendas and take responsibility for analysis and representation of outcomes. (Cornwall & Jewkes, 1995, p. 1669)*

In fact, Eden (1996) believed that even formal processes to involve publics in decision-making were not increasing the effectiveness of public participation in policy-making. This effect was especially significant when the dichotomy drawn between lay and expert knowledge was maintained.

Shortfalls in public participation, therefore, persist because questions concerning the application of a 'scientific' framework for assessment (entailing explicit separation of expert and lay knowledge) are inadequately addressed, or not addressed at all. Furthermore, being grounded in local context and the pursuit of social meaning and value, public participation is discordant with the positivist account of knowledge creation at a very fundamental level. Fischer (1997, p. 192) argued that this had the effect of undermining the importance of public participation, subjugating or eliminating contextualised local knowledges, while upholding universal knowledge traditions. As Fischer (1997) recognised, "for most professionals, the idea that ordinary citizens should participate in the production of knowledge borders on the absurd" (p. 190). That is, ordinary citizens are not considered capable of possessing the attributes necessary to enable involvement in science-based decision-making within these strongly defended scientistic traditions. The attempt to broaden debate and attribute social meaning and value to scientific and technical data, via public participation, thus fails from its inception if positivist representations of science go uncontested.

Still another problem exists where industry control of a project limits access to information and free debate. Gristock's (2001) study noted that "the pressure to innovate through industry is preventing access to scientific results and data. It is also eroding *trust*: the key element of the democratic process" (p. 4, emphasis in original). Under industry control, the trend is towards increasing commercial secrecy and active obstruction of public participation where private investors view participatory

processes as costing them time and money. Positioning publics as incapable of understanding science and reiterating the expert-lay divide thereby becomes a key strategy to exclude publics from decision-making and to preserve commercial interest above public interest. Thus, a 'tyranny of participation'[13] exists where burgeoning commitment by development institutions to public engagement is identified as something of a mirage (Cooke & Kothari, 2001: cited by Wynne, 2005, p. 68).

In posing the question: 'how might lay publics be involved in shaping a socially reflexive science?' Wynne (1996a) recognised that "in the dominant approaches, the answer is by default - not at all" (p. 61). This acknowledgement returns us to the paradigmatic dilemma of how to support the incorporation of public meaning and enable public participation under forms of science and governance that exclude public involvement based on public knowledge being value-laden, subjective, and irrational. How then might the cultural nature of science be captured when the constructivist conception of scientific knowledge is absent from debate, and when public responses to the validity of expert assumptions about real-world conditions are under-recognised (Wynne, 1996a, p. 59)?

In one notable attempt to resolve the crisis of public trust in science[14], the UK House of Lords Select Committee on Science and Technology (UK House of Lords, 2000) surmised that this could be achieved through:

- *'public understanding of science' activities...;*
- *by improved communication of uncertainty and risk...; [and]*
- *most importantly, by changing the culture of policy-making so that it becomes normal to bring science and the public into dialogue about new developments at an early stage. (section 1.19)*

Despite offering these judgements, the House of Lords Select Committee recognised that a problem existed in situating the public as ignorant and how it is commonly supposed that it is the public that must improve *its* understanding of science and of

[13] See Cooke and Kothari (2001) 'Participation: the new tyranny'.
[14] This report was a response to failed risk assessments in the UK BSE outbreaks and the subsequent rejection of scientific authority by the UK public.

risk assessment in order to resolve the crisis (UK House of Lords, 2000 section 3.9). That is, the House of Lords Select Committee recognised that the solution itself was problematic because it was the lay public that was being positioned as ignorant of science and as risk and uncertainty averse, as set against, what Wynne (1993) referred to as, "the epitome of reflexive self-criticism" (p. 321) of science. Under a model of enquiry that continues to position the lay public as ignorant of science, questions concerning the legitimacy of science, the manner in which publics (including citizen scientists) are involved in scientific debates and, importantly, the value assigned to lay knowledge, remain unaddressed. Therefore, the public deficit model of understanding science is upheld, and it continues to deride the public's absence of trust in science simply as a function of the public's inability to comprehend science and the strategies for risk definition that regulatory science applies.

"What scientists interpret as a naïve and impractical public expectation of a zero-risk can thus be seen instead as an expression of zero trust in institutions which claim to be able to manage large scale risks throughout society" (Irwin & Wynne, 1996a, p. 218), but where mistrust and hostility in social relations have the effect of amplifying risk in the minds of the public. The complexity of this "...supremely logical, rational and necessary question deriving from an intellectual insight about lack of predictive control...appears to escape institutional science itself" (Wynne, 2007, p. 498). Moreover, it is not just that the public are aware that science, poorly applied, cannot offer sound predictive power, but it is aware that it is entirely dependent on official sources of science and the institutions that implement science to manage the risks appropriately (Wynne, 2007, p. 498), and that expertise residing in these institutions is not necessarily tailored to social need.

3.4.2 The cultural nature of risk in regulatory science

Scientific appraisals are indispensable in risk assessment, however, expert framing of the 'risk problem' has consistently failed to critically position scientific knowledge in relation to its own social construction and, so too, risk assessment using scientific knowledge. Furthermore, with risk assessment deriving its influence from an empirically based and expertly framed science, the inclusion of inexpert and 'anti-

science' publics (Welsh & Wynne, 2013) in risk assessment strategies remains problematic.

Cortner (2000, p. 25) argued that the use of risk as an extension of the technical language of the expert must be avoided in order to prevent the public perception of risk and vulnerability being cast aside. In keeping with this, Visvanathan (2005) argued the significance of breaking free of dominant scientistic risk discourses and of moving "...beyond the normal rhetoric of participation to an understanding of the democratic implications of cognitive representation and empowerment…to recognise the plurality of knowledge systems, and the underlying relationship between knowledge, livelihoods and ways of being" (p. 42). Importantly, it is "the context-dependent character of 'hazard'..." referred to by Wynne (1987, p. 297) that underscores the need to draw attention to risk within a broader framework - beyond that determined to contain scientific meaning. The re-establishment of context in risk assessment, in turn, is dependent on adapting the scientistic positioning to accommodate public involvement. If, as Jasanoff (2005, p. 13) argued, the application of risk assessments in environmental regulation relies on 'deep-seated social assumptions' that rob them of universal validity, then such regulatory appraisals should be applied more intensely at the local level, where community involvement and local context are key considerations, and where the process of negotiation affords legitimacy to knowledge.

Further in support of wider citizen involvement, studies of both expert and lay assessments of risk by Lash and Wynne (cited in Beck, 1992, pp. 4-5), Wynne (1988; 1996a, p. 46), and Lloyd-Smith and Bell (2003)[15], demonstrated that expert assessments of risk are not necessarily better informed than lay public assessments - in some cases they are less informed - but, importantly, are differently informed. For instance, while policy makers might be asking "what are the risks?", publics are

[15]These studies provided examples of: (i) the use of agricultural pesticides and the differences between technical experts' definitions of how they should be safely used under 'ideal' conditions, compared to farmers' practical application of the chemicals under 'actual' conditions; (ii) the management of methyl isocyanate by French port workers, in the wake of the Bhopal tragedy, revealing that the extra precautions necessary for safety did not correspond with normal operational handling practices and worker productivity schedules; (iii) the radioactive contamination of Cumbrian sheep grazing lands, highlighting the gap between technical and real-world applications of risk, of trust in experts, as well as the social dependency of publics on institutions in charge of defining or controlling the risks; and (iv) a range of regulatory failures in the management of a hazardous waste facility in WA, highlighting shortcomings in risk assessment practice, and suppression of public enquiry and comment.

asking "what might be the unanticipated effects" (Wilsdon & Wills, 2004, p. 26)? Moreover, Adams et al. (2011) showed public interpretations of science were multifaceted, with technical and lived experience intertwined. The community's history with local industry, its relationships with regulators, the nature of environmental problems in the local community, and the standing of advocacy groups all played a role in the public definition of risk.

Nevertheless, even where the examination of the worldviews of publics reveals a richness of meaning, not normally addressed as part of a risk assessment, scientistic approaches continue to be preferentially upheld and used to "help people see the irrationality of their anxieties" (Fischer, 2005, p. 54). Under elaborate procedural factors, which influence real-world applications, the scientific idiom of certainty and control (in contrast to the ethos of acceptance of uncertainty and flexible adaptation) masked the assumptions and commitments built into technologies and regulatory directives (Wynne, 1988; 1996b, p. 26). Unsurprisingly, under conditions of 'acceptable risk', in which presumptions of scientific control are customary, public concerns become heightened and, subsequently, the conviction that "...ordinary citizens are irrational in matters pertaining to science and technology" (Fischer, 2005, p. 54) is reconfirmed. That is, in posing questions and raising concerns, the capacity of publics to assess rationally the legitimacy of a scientifically derived risk assessment is invalidated.

Beck (1992) makes a further point in his assessment of risk, that "...one must assume an *ethical point of view* in order to discuss risks meaningfully at all" (p. 29, emphasis in original). In so doing, Beck explains why the approach to risk framed only in empirical or quantitative terms is flawed, and why public acceptance of risk assessment modelled in this style is not so forthcoming. The question he poses, "how do we wish to live?" (p. 28) is of critical significance in these public debates on risk.

Accordingly, public judgements on the legitimacy of regulatory risk assessments necessarily highlight questions concerning the application of scientific knowledge under diverse contexts. The characterisation of risk to acknowledge its cultural embodiment - connecting local context and broader ethical evaluations with

scientific assessment - must involve a process of engagement and negotiation with publics, especially with those subject to the risks.

3.4.3 The impacts on public participation from the expert-lay divide and the 'deficit model' for public understanding of science

Section 3.2 described the role of the expert in scientific deliberations and the dichotomous representation of expert and lay knowledges. The discussion shed light on how this distinction serves to exclude publics and their representatives from participatory processes and from broader decision-making mechanisms. Compounding the expert-lay dichotomy is the belief that because the lay public operate outside of the expert world (from which they are excluded), they are incapable of operating within the expert world; that they possess a deficit in understanding.

Wynne (2006, pp. 216-217; 2014, p. 63) argued that the use of the deficit model for public understanding of science to justify public exclusion from scientific debates has taken several turns over the years but remains a persistent theme. Even where the public deficit model has been authoritatively contested and a model of active engagement with the public in scientific debates applied, attention is paid "only to downstream impacts, and not to making upstream driving purposes, about the *human ends* of knowledge, not only its instrumental consequences, more accountable and human" (Wynne, 2006, pp. 217-218, emphasis in original). That is, even where public participation is permitted, it may be superficially constructed without provision for public definition of meaning (e.g., on questions of ethical enquiry), or for public objection to different agendas (e.g., commercial agenda above community agenda) in both research and regulatory elements of science.

> *There is no room left for constructive negotiation of possible alternatives, multiple trajectories, and different technologies, including of different social ends. Nor is there room for negotiation of the proper conditions under which an otherwise unacceptable technology might be acceptable - and which need to be ensured consistently in practice. (Wynne, 2006, p. 218)*

Moreover, the loss of accountability to the public and socio-political intervention in these decision-making processes in science brings into play other conceptual

problems concerning the function of scientific endeavour. With publics distanced from the upstream driving purposes of science, and with other forms of socio-political intervention minimised, science can have no means by which to define public meaning, other than by framing public meaning itself. In turn, the practice of framing public meaning can become institutionalised as the legitimate work of science, and produced and practiced as 'public' knowledge, further negating the need for public involvement and socio-political intrusion. "…[E]xtending from *informing* policy, to *justifying* resultant political commitments, science now plays a further role - with no debate over its rights, wrongs or conditions - as *de facto* author of public meanings, thus also of proper public concerns" (Wynne, 2014, p. 62 emphasis in original). Therefore, the human dimension of meaning in science is narrowed - not simply through exclusion of lay publics, but by redefining what public meaning entails and who is able to define and express it.

The narrowing of the human dimension in science deliberations through these processes produces still further problems, creating an environment in which true public meaning can be misperceived. For example, rather than recognising public aversion to risk, or mistrust, fear, or veto of science as a function of the loss of socio-political accountability by science, it can be misjudged as irrationality and/or ignorance of science (Beck, 1992, p. 58; Irwin & Wynne, 1996a, p. 215). However, Irwin and Wynne's (1996a) research has highlighted "...no such naiveté on the part of the public; indeed it show[ed] the central kind of risk being faced as that of dependency upon increasingly expert-imbued social institutions, the basis for trust in which is obscure" (p. 215).

There is, nevertheless, a point to constructing the public and public understanding of science in terms of lacking rational insight or being ignorant - it "...deflects attention away from critical debate about science and scientific institutions, about the ownership and control of science and its products, and about the implicit social visions these carry" (Irwin & Wynne, 1996a, p. 215). Rather than believing that public resistance to, alienation from, and failure to comprehend science, is a result of something "…wrong with the organisation, control, and conduct of 'science' (in addition to just its 'communication')" (Irwin & Wynne, 1996a, p. 214), the deficit

remains with the public understanding of the complexity of science, necessarily requiring ongoing expert interpretation.

Jasanoff (2014) argued that "…communities at risk from hazardous enterprises have shown that - when the stakes are high - they can learn intricate technical details about the nature of their problems and act knowledgeably to solve them" (p. 23). McNew-Birren (2014) also demonstrated that the participants in her study of a lead contaminated community were well-informed on the scientific topics as well as the health and regulatory issues related to the debate. However, that the public *is* able to acquire scientific or para-scientific competence given the opportunity (Wynne, 1991, p. 118) and, therefore, is able to competently participate in debates relating to science, are matters not raised under a model for science that controls public knowledge, and which positions itself as able to comprehend the complexities of public meaning. Nevertheless, maintaining these structures of epistemic privilege is significant in creating dependence on these same structures. There is no better way in which to create dependence by the public on expert knowledge than by undermining the public claim to cognitive authority (Code, 1992: cited in Price, 1996, p. 96). Accordingly, the deficit model of public understanding is criticised "for taking a one dimensional, paternalistic perspective, where lay knowledge and expertise is subordinated to the expertise of scientists" (Adams et al., 2011, p. 182).

The fundamental role of public participation in deliberating, not only what science should investigate, but what it is that defines 'knowledge' and how knowledge is validated, therefore, has been undermined by dichotomies representing the public as irrational and incapable of engagement with science and scientific knowledge. In addition to objectivity in science deriving from the acknowledgement of its uncertainty, partiality, and negotiated character, it is the involvement of citizens in the characterisation of science that is vital to maintaining its connection with local context, and its legitimacy as a tool for producing objective knowledge.

3.4.4 The significance of critical positioning to public participation

For Harding (cited in Code, 1991, p. 21) it was the "empiricist model of mind" in science which implicitly supported the kinds of social hierarchies that sanction underclass stereotypes, leaving "no place for creativity, for historical self-

conscientiousness, or for the adoption of a critical stance". Haraway (1988), similarly, was at odds with the methods used in science to produce objectivity. While not denying the visionary nature of science, Haraway (1988) argued that dominant approaches to scientific knowledge creation do not necessarily produce *the* objective vision but that "translation is always interpretive, critical and partial" (p. 589). Haraway (1991) maintained that it is the "single vision [that] produces worse illusions than double or many headed monsters" (p. 154); that "[w]e do not need a totality in order to work well" (p. 173). Haraway thus proposed a new objectivity, a new vision, a new way of seeing - not some ambiguous, all-encompassing objective knowledge, but critical positioning. Haraway's (1988, 1991) response moves beyond epistemology, defies dualist distinctions, and repositions debate; a shift from knowing to being.

Taking up the challenge to confront and to override the single vision of objectivist and empiricist models of scientific investigation, communities have created their own models for investigating their worlds of being, to create meaning-rich context - these being evident in the varied strategies presented to improve public involvement. Yet, there is a common thread in these diverse involvement strategies - the belief that different perspectives and local context *is* significant, while "...claims about universality and the rationality of dialogue are critiqued as promoting the biases of powerful groups" (Leach & Scoones, 2005, p. 26).

Nevertheless, not all forms of civic engagement explicitly support critical positioning, and here is where strategies presented for community involvement need to be assessed carefully. Many, for instance, attempt to involve citizens in the dominant or traditional scientific practices, and do little to counter anti-democratic practices that exist within them. This problem of 'democratising science' via community science projects was examined by Bowling and Martin (1985).

> *First, democratisation, if carried out without close attention to wider structural aspects of patriarchy, may simply 'democratise' the existing male power structures: research might be done co-operatively and be more oriented to community needs while still being male dominated. Second, uncritical orientation of present science to 'community needs' may incorporate too many*

> *features of current scientific knowledge and practice: community-based scientific research might still be oriented to manipulation and control. (p. 315)*

Therefore, it is important not to blindly apply public involvement strategies that position the public in relation to 'science', but without relating science to social context; or that relate to dialectic method, assuming that through (seemingly) open dialogue and debate, logic or reason will prevail. The complexity of environmental problems, coupled with conditions of uncertainty, contingency, and indeterminacy, necessitates a reflexive scientific expertise that incorporates a multiplicity of perspectives from lay and local knowledges, along with a more open-ended process (Bäckstrand, 2003, p. 32). Bäckstrand (2003, citing Wynne, 1994) argued that although a science that incorporates lay knowledges is not "... necessarily truer, better or greener" (p. 32), citizens should be allowed to participate and deliberate on matters that affect their lives (Bäckstrand, 2003, p. 33, citing Harding, 2000). Scientific claims must be connected to 'place-based' knowledge (International Council for Science, 2002, pp. 19-20), and indigenous knowledge recognised as a legitimate form of expertise (Bäckstrand, 2003, p. 35; 37).

Nevertheless, sociological accounts (e.g., Irwin, 2001; Irwin & Wynne, 1996b; Nisbet & Goidel, 2007) of citizen involvement in science decision-making continue to demonstrate shortfalls in the strategies applied, because publics are deemed unqualified to do the work of science. Furthermore, the focus on scientific literacy to serve a political purpose for scientific institutions persists. That is, by emphasising what is wrong with the public's knowledge, attention can be deflected away from problems with the scientific knowledge and from its governance (which are contributing to social contention). Even so, when public scientific literacy is promoted, it may be viewed simply in terms of boosting public acceptance of the scientific worldview. Rather than attributing ongoing public opposition to projects informed by science to failures of public engagement and continued use of deficit representations of the public, opposition is presented as a symptom of enduring public illiteracy on matters of science and its applications.

While government institutions widely advocate increasing public involvement and dialogue in science (Royal Commission of Environment Pollution (RCEP), 1998; UK House of Lords, 2000), the construction of the 'scientific citizen' within policy

and decision-making debates can be overlooked. When science (in its many forms) defines itself so clearly as the practice of scientists, the concept of "...'science by the people' is virtually a contradiction in terms....Popular knowledge, no matter how useful, accurate or systematised, is not accepted as scientific" (Bowling & Martin, 1985, p. 313). Claims to a superior capacity by science to reach the most objective decisions, therefore, continue to reflect a need to establish social power and privilege, as set above genuine citizen involvement.

To describe how science retains its social advantage and remains resistant to change and critique, the 'black-box' metaphor[16] (after Latour, 1999) has been applied. This practice of 'black-boxing' presents a significant barrier to transparency and accountability and, ultimately, the formation of a critically positioned science. If scientific institutions do not provide adequate mechanisms for transparency of process, accountability by practitioners, or citizen involvement, the creation of a knowledge base that is open to critique and revision remains problematic. Therefore, to produce a situated and critical positioning for science, it is important to first account for several major obstacles. Understanding the socio-political forces that maintain dominant approaches and exclusionary processes of science, while adopting strategies to facilitate the meaningful inclusion of publics in science-based decision-making, remain a priority.

3.5 Summary and conclusions

This chapter outlined the sociology of scientific knowledge (SSK) as a framework for analysis in contentious debates involving scientific knowledge. The value of the SSK lies in its analysis of both the wider social dynamics and the construction of scientific knowledge itself. Accordingly, topics covering the sociological accounts of knowledge creation and use, the mechanisms of authority, and the function of public participation within these knowledge structures, formed the basis of the discussion.

The chapter introduced Popper's account of the inherently open-ended and uncertain nature of the modern scientific endeavour, and explored the fundamental conflicts between this understanding of science and models of science presented as

[16] Section 1.6 provides an outline of the black-box metaphor.

determinate and certain, as portrayed in regulatory frameworks. In particular, the discussion clarified the distinctions between different forms of science, specifically research and regulatory science, and the derivation of environmental and health safety criteria within these contexts.

The literature demonstrated that the use of precautionary context-based environmental and health criteria within the regulatory setting provides the opportunity for wider appraisals and for inclusion of locally contextual knowledge. These precautionary regulatory applications accept the partial and situated character of research scientific knowledge. However, being 'open-ended', these applications continue to present as problematic under regulatory science mechanisms that seek to reaffirm certainty and privilege a legal benchmark. That is, in favouring the uncertainty thesis, precautionary context-based approaches to science challenge the regulatory management of uncertainty. Coupled with poor legal standing in some jurisdictions, the application of context-based criteria is further complicated.

This chapter also highlighted the mechanisms that undermine scrutiny and review of scientific knowledge, and the implications of this for accuracy in decision-making. It was noted that in the absence of mechanisms for wider review, elements of the universal and pseudo-objectivist representation of science that are incongruous with regulatory application go unnoticed and, accordingly, imprecise models of data derivation continue to be upheld as objective, authoritative, and are preferentially applied to suit the (often absent) legal administrative context favouring 'single number' safety criteria.

If precision in science derives from acceptance of its own uncertainty, of its partiality, and of its situated character, regulatory science can only lay claim to objectivity if it acknowledges shortcomings in the mechanisms it applies to assess risk. The literature argued that broader and more inclusive approaches to knowledge creation and application are useful in overcoming shortcomings in regulatory science. Accordingly, mechanisms to support the use of a wider knowledge base and the creation of a space where knowledge can be openly critiqued and reviewed are presented as key objectives for regulatory science.

The final section of this chapter emphasised the value of public participation in regulatory decision-making and, in particular, the literature highlighted its importance in scientific debates at both research and regulatory levels. Public participation enables the exploration of local knowledges, and supports attachment to prevailing ethical and social values, while also validating formal scientific assessments by making science open to public scrutiny, and thus more socially accountable.

The discussion drew on the work of scholars (including Bäckstrand, Eden, Irwin, Jasanoff, Leach, and Wynne) who argued that citizen involvement in science provides a means by which to ground research in local context, pursue social value, and challenge the knowledge dichotomies developed under objectivist accounts of science. Nevertheless, the literature clarified that the mechanisms for public participation in scientific debates were problematic. Of note was the maintenance of the dichotomy drawn between lay and expert knowledge systems, which presented as an ongoing obstacle to improvements to public participation.

Countering the problematic components of public participation in scientific decision-making, models that incorporate a situated and critical positioning - creating a space where claims to authority and knowledge can be contested, uncertainties of knowledge disclosed, and legal rights addressed - are presented as key elements to generate change. It is not that public participation ensures the best or ‘greenest’ outcomes; rather, it is the recognition of the fundamental right of citizens to be allowed to participate and deliberate on matters that affect their lives that is important.

CHAPTER 4

THE ENVIRONMENTAL REGULATION OF CONTAMINATED SITES

CHAPTER 4: THE REGULATION OF CONTAMINATED SITES

The development and strengthening of legislative and policy frameworks for managing contaminated sites derive from an increasing awareness of the health risks from hazardous substances, commonly in the wake of serious pollution releases. Relying largely on scientific data, these regulatory management frameworks have attempted to define what is meant by 'contamination', the level at which contaminants pose public and environmental health threats, and to develop appropriate remediation and/or redevelopment practices based on this information.

While the focus of this chapter is the Australian and, more specifically, the Western Australian (WA) approaches to environmental regulation of contaminated sites, the discussion begins by outlining other leading international approaches that inform Australian modes of regulation. This chapter also examines the overarching strategies applied, the institutional frameworks used, the practical application of risk assessments, and it details the significance of lead (Pb) as an environmental pollutant, to illustrate how scientific principles are utilised in the production of safety guidelines.

The discussion considers the regulation of contaminated sites in WA prior to the full enactment of the *WA Contaminated Sites Act (2003),* when the *WA Environmental Protection Act (1986)* was the primary statutory instrument for managing environmental contamination. Although the *WA Contaminated Sites Act (2003)* provides additional statutory mechanisms to identify, record, and manage the remediation of contaminated sites, the *WA Environmental Protection Act (1986),* nevertheless, functions to address environmental contamination broadly, with precaution as a guiding principle.

The role of landuse planning agencies in the management of contaminated sites is also introduced; however, Chapter 5 provides more detail of environmental regulation within landuse planning, as it related to the thesis case study.

A more recent development in the management of contaminated sites is the ideal of community consultation[17]. This chapter presents the key features of community consultation, as used in WA environmental regulation, and discusses its functionality within regulatory science.

The chapter concludes by briefly outlining a number of WA projects involving the management of environmental pollution. Within each context, the management of the projects by government agencies and private consultants is described.

This chapter provides critical context to the application of the WA regulatory system, as it applied to the ANI site redevelopment, detailed in Chapter 5.

4.1 International approaches informing the regulation of contaminated sites in Australia

The Australian approach to assessing and managing contaminated sites follows a pattern similar to that used in other major industrialised nations, but draws heavily on the United States of America (US) and the United Kingdom (UK) models, being risk-based and applying a range of guidelines, policies, standards, legislation, and other procedures for defining risk. This section provides a brief outline of the key regulatory instruments used to manage contaminated sites in the US and the UK, offering insight into the role of both scientific knowledge and legal mechanisms in the management of contaminated sites in Australia.

4.1.1 The US approach

In the US, several federal government agencies regulate environmental pollution, utilising a range of legislative instruments, policies, and guidelines. The federal system of statutory control is supported by further controls at a State level.
The US EPA is the key agency in the development and enforcement of environmental regulations, providing a research function and setting national standards (US EPA, 2008). The US EPA also provides resources and financial assistance to support public participation, including technical grants, environmental

[17] The term 'community consultation' is widely used in the relevant guidelines applied in WA, but it contains the same meaning and approaches as 'public participation'. The discussion retains the original terminology used in each of the guidelines.

education projects (US EPA, 2011), and general departmental budgeting for public outreach and involvement (US EPA, 2001). Environmental incidents, for example, the Love Canal[18] disaster, have been a major force in the strengthening of procedures to deal with the management of contaminated sites in the US.

The US EPA has statutory powers to enforce the remediation of a contaminated site by the polluter or, alternatively, manage the remediation of the site itself, with reimbursement from the polluter. Enforcement of response and remediation, where no responsible party can be held accountable, is funded through the provisions of the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA), also referred to as the Superfund. The Superfund legislation

> *…created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous wastes that might endanger public health or the environment…the tax went to a trust fund for cleaning up abandoned or uncontrolled hazardous waste sites. (US EPA, 2007)*

The US model of environmental regulation, as described above:

- supports an extensive research function, which is drawn on widely in the international arena;
- offers a comprehensive and publicly available electronic information resource;
- holds statutory powers to force polluters to remediate contaminated sites;
- provides funding for contaminated site remediations, via industry taxes; and

[18] Love Canal is located in Niagara Falls, New York. Between 1942 and 1952, Love Canal was used as a landfill site to dispose of tens of thousands of tons of chemical wastes. The site was closed in 1952. In 1953, the site was sold to the City of Niagara Falls Board of Education. The area was redeveloped for residential purposes, and an elementary school was built in the central portion of the site. During the 1970s, high rates of rainfall resulted in an elevation of the water table and, subsequently, chemical contaminants were brought to the surface. The US EPA investigated the site after residents complained about odours and illness, and it issued an order to restrict access to the site. During 1978, a State of Emergency was declared at the site, and a remediation action initiated. This involved the construction of a leachate collection system, placement of a clay cover over the site, and the erection of an onsite treatment facility. In 1980, a second Federal Emergency was declared at the site, due to the identification of an 'unusual level' of chromosomal damage in residents. Residents were removed from the area. In 1982, the areas adjacent to the site were approved for habitation (US EPA, 2009). While the toxic containment area remains, residential redevelopment was approved in nearby areas, renamed Black Creek Village (CNN, 1998).

- holds statutory powers to invoke and fund public participation.

Despite these comprehensive operations of the US EPA, several authors have highlighted the flawed application of many elements of its regulatory function, for example:

- its insufficient administrative resources and support in the implementation of so many environmental statutes (Cortner, 2000, p. 21);
- its 'impotence' in many forms of health safety and regulation (Magat & Viscusi, 1990, p. 360);
- its problems with the regulation of toxic metals (McBride, 1995); and
- its tendency to "…employ private cost rather than social cost to evaluate environmental quality regulations" (Hazilla & Kopp, 1990, p. 853), reflecting an individualistic political and legal culture (Howes, 2005, p. xix) and "…sacred precepts of American democratic society such as property rights and capitalism" (Cortner, 2000).

In addition to these problematic elements of the US EPA's regulatory function, Lee (2003) and Lee and Jones-Lee (1994, 2004) have been highly critical of its application of health standards, which are assumed to be protective indefinitely, along with the increasing pressures to rapidly remediate Superfund sites under the minimum application of regulatory requirements. They viewed the US EPA remediation strategies as being applied without regard for more comprehensive protection of public and environmental health (Lee & Jones-Lee, 1994) and with a tendency towards providing misleading statements[19] in certain elements of Superfund site management (Lee, 2003).

The President's Cancer Panel (2010) described the US regulation of environmental contaminants by its government agencies as largely reactionary, rather than precautionary, and as being rendered ineffective through: "(i) inadequate funding and insufficient staffing, (ii) fragmented and overlapping authorities coupled with uneven

[19] For example, "mounting a propaganda campaign in an attempt to mislead the public into believing that [some categories of] landfills will be protective of groundwater resources, public health and the environment from pollution by landfill leachate, as well as releases of landfill gases, including odors, for as long as the waste in the landfill will be a threat" (Lee, 2003).

and decentralized enforcement, (iii) excessive regulatory complexity, (iv) weak laws and regulations, and (v) undue industry influence" (p. ii). Furthermore, the prevailing regulatory approach in the US:

- *Requires incontrovertible evidence of harm before preventive action is taken.*
- *Places the burden on the public to show that a given chemical is harmful.*
- *Does not consider potential health and environmental impacts when designing new technologies.*
- *Discourages public participation in decision-making about the control of hazards and the introduction of new technologies, chemicals, or other exposures. (The President's Cancer Panel. US Department of Health and Human Services, 2010, p. 16)*

Despite the provision for high level public health assessments and monitoring by the US EPA and other US Government regulatory agencies, and statutory levels of management for contaminated sites and for public participation, many of the criticisms raised (e.g., those cited by The President's Cancer Panel) are the same as for systems of lesser regulation and/or lesser statutory enforcement. The opportunities to effect change in the manner of derivation and application of scientific data, and the authority afforded scientific expertise, are points inadequately addressed in this jurisdiction.

4.1.2 The UK approach

The key government agencies involved in the management of contaminated sites in the UK are the Environment Agency (and Scottish Environmental Protection Agency) and the Department for Environment, Food and Rural Affairs (DEFRA), operating under the *Environment Act 1995* (amending the *Environmental Protection Act 1990)*. Administration for the management of contaminated sites occurs primarily through the Environment Agency and local government authorities, which provide different institutional expertise and represent a range of interests (Christie & Teeuw, 2000; Scotford & Robinson, 2013). That is, various levels of local government are delegated statutory powers, generally acting under central government supervision.

In recent years, there have been changes to the manner in which the UK uses scientific knowledge in relation to environmental contamination. In part, this was triggered by the BSE scandal (mentioned previously in section 3.3.1), in which government secrecy and, ultimately, the inaccurate scientific assessment of the problem, resulted in a crisis of public trust. The BSE Report (Lord Phillips of Worth Matravers et al., 2000) findings stated:

> *The Government did not lie to the public about BSE. It believed that the risks posed by BSE to humans were remote. The Government was preoccupied with preventing an alarmist over-reaction to BSE because it believed that the risk was remote. It is now clear that this campaign of reassurance was a mistake. When on 20 March 1996 the Government announced that BSE had probably been transmitted to humans, the public felt that they had been betrayed. Confidence in government pronouncements about risk was a further casualty of BSE. (p. xviii)*

In the BSE case, the UK Government's official claim of 'no risk' had played a significant role in changing the public perception of the overall acceptability of the UK approach to dealing with contamination issues. Furthermore, the UK House of Lords Select Committee Report into Science and Technology (UK House of Lords, 2000) determined that:

- people were becoming increasingly questioning of all authority, including scientific authority;
- the UK culture of government secrecy invited public suspicion;
- the inaccurate 'scientific' framing of a problem to the exclusion of moral, social, ethical, and other concerns invited hostility;
- public acceptability does not necessarily correspond to objective risk as understood by science;
- the suppression of uncertainty diminished public trust and respect; and
- people placed greater trust in independent scientific authority but this had become problematic in view of increasing commercialisation of research.

Wynne (1987) explained that the (earlier) UK culture of regulation, which was less precise and more discretionary than the US model, required "…a relatively quiescent

public…" (p. 416). Therefore, after the BSE scandal (and apparent loss of public quiescence), the tightening of scientific precision to counter uncertainty was understandable, even if it presented a contradictory response to public criticism and mistrust of the lack of responsiveness to values in science. Although the use of clearer guidance and standardisation processes have eased regulators' concerns over consistency and transparency in defining contamination and health impacts, there is limited evidence that the issue of public mistrust in conventional modes of scientific enquiry has been meaningfully considered within these arenas.

On the updated UK approach to the management of contaminated sites, Rivett, Petts, Butler, and Martin (2002) described it in practical terms as:

- "…fundamentally risk-based focusing on site-specific conditions, the nature and level of contamination and the risk management context…" (p. 253);
- "…largely reactive - that is, sites were considered as the need (for redevelopment) arose or where there were public complaints about the condition of a site", even though legislative changes to implement more proactive identification of contaminated sites were in place[20] (p. 252);
- soil (and not water) remediation focused, reflecting a land development led response (p. 264); and
- reliant on discretionary Soil Guidance Values borrowed from other regulatory regimes, without sufficient attention to "…the basis of the derivation of the numbers, the relevance of this to British policy, and also to the sampling and analytical requirements underpinning the guidelines/standards. This is evidence of a much broader lack of understanding of the objectives of contaminated land risk management and particularly of risk-based approaches to identification and assessment" (pp. 263-264).

The UK contaminated sites legislation was further strengthened in 2006 under a series of additional tools (e.g., see UK Department for Environment Food and Rural Affairs, 2006) to assist in risk assessment processes, making more explicit the definitions of contamination. This had the effect of increasing the reliance by

[20] Rivett et al. (2002, p. 252) also refer to the Australian system of risk management as proactive in its approach, yet, at this time, the development of specific legislation relating to the proactive management of contaminated sites was still only in its elementary stages in Western Australia.

regulators on toxicological data and 'scientifically derived' guidance levels. These changes were brought about by a need for consistency in regional approaches and with regard for international methods (UK Department for Environment Food and Rural Affairs, 2006).

Reflecting on this strengthening of the position of scientific knowledge, Holmes and Clark (2008) argued that the emphasis in UK science policy-making is on data and not dogma (p. 703). Moreover, Holmes and Clark (2008) recognised that the guidelines on policy-making well reflect "the nuanced interplay of evidence and politics" (p. 710), but that practice had not yet caught up with the guidelines.

4.1.3 The Australian application

Contaminated sites in Australia are managed at the State or Territorial level and, as a general rule, each State or Territory shares management functions between government environment agencies, health agencies, planning agencies, and local authorities, using a range of State and federal legislative, policy, and guidance provisions (more detail is provided in section 4.2, using the example of the WA model). The administrative provisions and their enforcement (under statute, policy, or guideline) can differ between different Australian jurisdictions.

The research functions of government and independent organisations are consolidated through the National Environment Protection Council (NEPC), and other national bodies such as the enHealth Council, the National Health and Medical Research Council (NHMRC), and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). These bodies also provide guidance on a range of scientific approaches to assessment, and some offer guidelines on community consultation within specific contexts.

The Australian approach to environmental protection and the assessment of contaminated sites adopted by bodies such as the NEPC is modelled on European and North American systems and in response to both international and local pollution events. The major concerns in the European and North American contexts, and subsequently in the Australian context, have related to groundwater contamination, abandoned industrial and waste disposal sites, and the residential redevelopment of former industrial, commercial, or agricultural land (Auditor General for Western

Australia, 2002, p. 11). The bulk of remediation practices concern soil, which stems directly from the focus being one of land redevelopment.

The Australian, US, and UK systems for regulating contaminated sites all use a combination of national level guidance and control, with local administrative tools to support management. That is, all systems utilise both higher and lower tiers of government. A cursory comparison of Australian, US, and UK[21] frameworks reveals evidence-based science playing a central role in risk assessment and broader policy-making in all three regions. The level to which administrative provisions are set in statute, however, does vary. For example, the US system shows a higher level of statutory enforcement provisions than both the UK and Australian systems, for regulatory science and public participation. Nevertheless, all assume current standards or guidance values to be protective indefinitely[22] and all contain provisions for the recognition of unique aspects of local context. Whether the local context provisions or statutory provisions are invoked meaningfully in each of the frameworks remains an overriding question. Section 4.2.2 provides more detail of the application of context-based risk assessments in WA and discusses these issues of implementation.

Although 'standardisation' is referred to in Australian assessment standards, and is considered a favoured approach in the international setting, standardisation models have their limitations. For example, different scientific testing regimes, different institutional contexts, and/or different political cultures and their relationship to the processes involved, can produce considerable variations in different nations' 'scientifically' defined pollution standards. As Dowling and Linnerooth (1987) observed from the US and European management of hazardous waste:

> *…the rules adopted in each country, and therefore the outcomes of an apparently technical problem, ultimately reflected the political and legal frameworks in that country. The systems adopted were shaped to a large extent by social and administrative factors, even down to fine levels of technical detail,*

[21] Similarities between Australian and UK approaches are outlined in Rivett et al. (2002)
[22] This is particularly important to contaminated land redevelopments. Remediation strategies, being based on the available risk data, must assume this data to be protective indefinitely, and that the data adequately apply the precautionary principle.

> *and this explains the difficulties encountered by international organisations in attempting to develop standardised classification systems. (pp. 140-141)*

In reference to US and European environmental regulation, Renn (cited in commentaries to Löfstedt & Vogel, 2001) similarly argued that

> *[r]egulatory actions rest on two components: knowledge and legally prescribed procedures. Even if the same knowledge is processed by different regulatory styles, the prescriptions may differ in many aspects concerning selection rules, interpretive frames, different action plans for dealing with evidence, and different forms of incorporating anecdotal evidence and public knowledge. (pp. 406-407)*

Accordingly, although the management strategies for contaminated sites in the US, UK, and Australia show similar institutional contexts (Howes, 2005, p. xix), and follow a conventional approach, using a range of laws, policies, and guidelines, which are strongly influenced by a scientific knowledge framework, the extent to which contaminated site regulation is governed by statutory enforcement and is influenced by external bodies can vary, and this affects its jurisdictional applications.

4.2 The overarching strategies used in the assessment of risk at contaminated sites in Australia

Determining what constitutes ‘contamination’, which substances are ‘hazardous’, and the levels at which a substance is considered dangerous to health, are critical to the effective management of contaminated sites. In Australia, the key bodies responsible for the development of regulatory guidelines adopt a range of strategies to address these complexities in defining the risks from environmental contamination. This section will review the overarching strategies applied in Australia, entailing, the use of science to define safety and risk, the context-based assessments, and the precautionary principle.

4.2.1 Using science to define safety and risk

In Australia, the 'standardised'[23] heath safety criteria applied to the assessment of contaminated sites are defined using a variety of strategies, but are primarily informed by quantitative descriptions, derived from toxicity data (including dose-response patterns) and toxicant behaviours (e.g., severity of effects, carcinogenesis, non-carcinogenesis) in humans and animals. These data typically are sourced from published studies, or from research previously accepted by other reputable scientific organisations or regulatory bodies worldwide. From the collected data, a 'tolerable intake' for safety is established (National Environment Protection Council, 1999b, p. 2). Where a threshold[24] for toxic effects is exhibited, expressions of uncertainty, using 'uncertainty factors'[25] (i.e., precautionary reassurance factors), are applied in deriving final tolerable intakes[26]. These numerical uncertainty factors provide an additional measure of safety to account for any deficiencies in the scientific data.

The review of the evidence applied by national standard-setting bodies occurs from time to time, for example, to discuss new evidence or advances in theories or methodologies, or when health safety data comes into question. Procedurally, these regulatory reviews can be lengthy, and are unlikely to be immediately responsive to new evidence[27].

The application of numerical safety criteria under regulatory guidance entails a much broader approach, utilising a risk assessment framework. The enHealth Council (2002) characterises risk assessment within both the environmental and public health contexts as follows:

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[23] 'Standardisation' refers to the development of compatible and consistent technical procedures across a region. In Australia, the standardised procedures for environmental sampling are provided in government agency guidelines or by Standards Australia.

[24] The safety threshold utilises the ideal of a level below which individual toxicants pose a negligible or manageable risk.

[25] Uncertainty factors usually vary in the magnitude of 10 to 10,000 and take into account whether the data are derived from animal or human studies, and the overall quality of the research. Reliable human-based studies normally use a default uncertainty factor of 10, whereas an uncertainty factor of 100 applies to animal studies (being a factor of 10 for interspecies variation and a factor of 10 for intraspecies variation) (National Environment Protection Council, 1999b, p. 2).

[26] For greater detail of this process, see National Environment Protection Council (1999b) and World Health Organization (1994).

[27] For example, the review of the Assessment of Site Contamination (ASC) NEPM commenced in 2004, with the final report completed in 2013, and implementing a one year phase out period for the former ASC NEPM. The review procedures relating to the lead safety guidelines are discussed in section 4.4.1.

> *Risk assessment provides a systematic approach for characterising the nature and magnitude of the risks associated with environmental health hazards. All activities, processes and products have some degree of risk. The ultimate aim of risk assessment is to provide the best possible scientific, social and practical information about the risks, so that these can be discussed more broadly and the best decisions made as to what to do about them....Situation specific risk assessments can be undertaken where there is an actual or potential environmental hazard such as contaminated land or industrial emissions from a proposed factory and should take into account factors relevant to those particular circumstances. (p. xi)*

Accordingly, a site-specific risk assessment applies data derived from tests on various media (e.g., air, water, and soil), collected according to standardised criteria, and analysed by accredited laboratories. The levels of contaminants defined under these testing procedures are then measured against the health safety criteria (defined in accordance with procedures outlined above) and a range of exposure criteria[28], including proposed landuse (e.g., residential, commercial, food production) and environmental conditions (e.g., location, potential for leaching to groundwater), to determine the risk.

The NEPC (1999d) characterises the site-specific risk assessment of contaminated sites in terms of providing "complete" information to risk managers, policy makers and regulators, to ensure the best decisions are made. These assessments take into account uncertainties and assumptions, and may involve "...gathering further information, the incorporation of safety factors (e.g., in the development of safety criteria) and conservatism, and professional judgement…" (National Environment Protection Council, 1999d, p. 2).

The guidance provisions for characterising safety and risk in Australia explicitly acknowledge that regulatory assessments must be context-based and socially grounded, and not solely reliant on scientifically derived data. Nevertheless, under conflicting opinion or public dispute, there is a tendency for regulatory agencies to provide a fall-back position that is couched largely in objectivist terms, and that

[28] The exposure criteria assessments can account for differences in biological risk between different populations, the likelihood of exposure, or other contributing factors that could produce an environmental or health risk above or below that defined under the standardised data.

commonly uses expressions of risk derived from universally derived 'single number' assessments.

The procedures for defining safety and risk in Australia are similar to other international approaches (see section 4.1). However, the health safety criteria themselves may be considerably different to the health safety criteria used in other nations, and may even vary between different Australian jurisdictions. These differences can be due to different institutional approaches to the way in which data are collected and assessed, the level to which industry or public groups are included in decision-making, or the use of different local contexts (e.g., the geo-physical, geo-chemical, climatic conditions, or social context of the site under assessment). The NEPC (1999d, p. 3: citing ANZECC & NHMRC, 1992) noted that because numerical estimates of risk are not always feasible due to the limitations of toxicological data, and because risk assessment is based on mathematical probability rather than absolutes, decision-making should take into account these fundamental uncertainties.

While Hughes (1990, p. 16) argued that the use of statistical modelling and hypothesis testing to guide decision-making reflects the influence of positivist scientific approaches on the research methods applied, Von Moltke (1996) made clear the shortcomings of this approach:

> *...while science makes the environment speak in the policy process it virtually never provides an articulation which has the necessary clarity and unambiguity for the purpose of decision-making....[The] environment is just too complex for any science to define.... However, inappropriate or not, scientific research is the only acceptable means of identifying environmental issues for policy purposes. (p. 99)*

4.2.2 Context-based assessments

As a component of the risk assessment process, regulators use the context-based provisions (introduced in sections 3.3.3 and 4.2.1) to account for scientific uncertainties and broader cultural aspects of safety administration. By critically applying the regulatory safety guidance values (trigger guidance values) to a unique

set of circumstances, context-based assessments seek to provide high levels of public and environmental health protection.

The guidelines for refining safety guidance values utilise a conceptual site model (CSM) to represent

> *site-related information regarding contaminant sources, receptors and the exposure pathways between those sources and receptors. The development of a CSM is an essential part of all site assessments and provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or in the future. (National Environment Protection Council, 1999d, p. 2)*

Factors to be considered include:

- *the typical and maximum concentrations of contaminants on-site;*
- *the vertical and horizontal distribution of the contaminants;*
- *the physical and chemical properties of the contaminants and their likely mobility in the environment;*
- *the physical properties associated with the geology and hydrogeology underlying the site;*
- *the potential presence of subsurface geology or structures that may act as preferential pathways for vapour migration on and off the site;*
- *the people who may be exposed to the contaminants;*
- *the means by which exposure could occur and the frequency of exposure. (National Environment Protection Council, 1999d, p. 2)*

The enHealth Council/NEPC recognises that the accurate use of the context-based guidance values relies not only on quantitative scientific approaches, but also on a much broader approach, adopting "…facts, data, assumptions, inferences and sometimes professional judgement…" (Taylor, Langley, & enHealth Council, 2001, p. 2; Taylor, Langley, & NEPC, 1999).

Two evaluation tools utilising a context-based assessment, namely the trigger guidance values and chemical mixtures assessment, are discussed here in more detail[29].

The trigger guidance values

One of the most commonly applied safety evaluation tools in Australian environmental assessments are the 'trigger' guidance values. While trigger guidance values, such as the Health-based Investigation Levels (HILs), do provide a ballpark figure of contamination acceptability, these guidance criteria are not intended to be used as a scientifically-based safety standard (National Environment Protection Council, 1999a, p. 4; 2006b; Taylor et al., 2001). Rather, the trigger guidance values are designed to be refined under a context-based appraisal. For example, if a toxicant is identified in soil at a concentration of 100mg/kg, and the HIL for the particular landuse (e.g., residential) is also 100mg/kg, this does not necessarily mean the toxicant is present at safe levels, or that the HIL trigger value for that toxicant can be used as a clean-up standard. Instead, it is suggested by the enHealth Council/NEPC (see Taylor et al., 2001; Taylor et al., 1999) that additional assessments be undertaken to determine whether a health or environmental risk exists (albeit within the context of the existing evidence on risk).

However, in the absence of regulatory resources or legal obligation to undertake these additional assessments, the single number default data provided as the 'trigger' are being used to denote a precise and protective health standard for use as remediation clean-up criteria[30]. That is, although the enHealth Council/NEPC (see Taylor et al., 2001; Taylor et al., 1999) direct government regulators to more critically assess the default single-number health safety criteria (trigger guidance values) against specific local contexts, this is not being done and, instead, default trigger guidance values (such as the HILs) are being applied as de facto standards and are being represented by regulators as scientifically guaranteed measures of safety.

[29] These two mechanisms featured strongly as contentious elements in the case study of this thesis. These mechanisms are significant as modifying components within a model for regulatory science that forces a certainty of knowledge.

[30] This problematic feature in applying the context-based assessment was noted in submissions to the *National Environment Protection (Assessment of Site Contamination) Measure Review* (2006a, p. 15; 2006b).

Chemical mixtures

The NEPC recognises that contaminated sites frequently contain mixtures of chemicals and that safety assessments should take into account this factor. However, the NEPC also acknowledges that "[g]uideline values for soil contaminants are generally derived for single substances and there are no established techniques for deriving soil guidelines for such mixtures" (National Environment Protection Council, 2006a, p. 44). That is, although the NEPC advocates the application of chemical mixtures assessments, the evaluation of chemical interactions data can be complicated and the data to support assessment are often absent. When there are few resources to apply to the assessment task and when there is no legal obligation to carry out additional (and complicated) appraisals, there is a tendency by government regulators to ignore these assessments.

These problems associated with assessing risks from chemical mixtures are widely acknowledged internationally. Cory-Slechta (2005, p. 492), for example, argued that under real environmental conditions, human chemical exposures never occur in isolation, but always to a mixture of agents under complex physiological responses, and under a range of lifestyle factors. Although Cory-Slechta (2005) recognised the significance of current methods of hazard identification in providing a 'first step' in safeguarding human health, she argued that if information on chemical mixtures is ignored there is the danger of "...propagation of unsound information and thus possibly inadequate protection" (p. 507). This position has also been reiterated by the US President's Cancer Panel (2010):

> *Our science looks at a substance-by-substance exposure and doesn't take into account the multitude of exposures we experience in daily life. If we did, it might change our risk paradigm. The potential risks associated with extremely low-level exposure may be underestimated or missed entirely. (p. 11)*

More recent reviews to the NEPC risk assessment guidelines, nevertheless, have continued to downplay the importance of chemical mixtures and provide only limited guidance on the application of risk characterisation methodologies for certain groups of chemicals (see 2013 review of National Environment Protection Council, 1999d, p. 58), while overlooking complex chemical mixture exposures.

4.2.3 The precautionary principle

The precautionary principle is a recognised policy and statutory approach in Australian environmental regulation, viewed simply as the principle of adopting a conservative approach when all the information needed to make a decision is limited.

The precautionary principle is defined in the declaration of the 'Third Conference on the North Sea' (Ministerial Declaration, 1990) (re-affirmed in the Bergen Declaration, 2002) as:

> *...action to avoid potentially damaging impacts of substances that are persistent, toxic and liable to bioaccumulate even where there is no scientific evidence to prove a causal link between effects and emissions.*

The precautionary principle includes the following core precepts:

- *Taking preventive action in the face of uncertainty.*
- *Shifting the burden of proof to proponents of an activity.*
- *Exploring a wide range of alternatives to possibly harmful actions.*
- *Including public participation in decision making. (The President's Cancer Panel. US Department of Health and Human Services, 2010, p. 17)*

Importantly, the precautionary principle "...assumes that science does not always provide the insights needed to protect the environment effectively, and that undesirable effects may result if measures are taken only when science does provide such insights" (Freestone & Hey, 1996, p. 12). Quiggin (2007) argued that the precautionary principle "remains controversial, and its implications in particular cases are not always clear" (p. 20). However, it provides an important guide to decision-making in complex systems characterised by uncertainty and in response to threats to environmental health (Quiggin, 2007, p. 15).

In the Australian context, it is primarily State legislative provisions that provide the explicit recognition of the precautionary principle for the management of contaminated sites (see Peel, 2005) and, in WA, the *Environmental Protection Act (1986)* (see section 4.3.1).

Increasing moves towards standardisation in regulating contaminated sites (see section 4.1), however, can push scientific knowledge towards an uncritical stance, undermining alternative knowledge frameworks and limiting the application of precautionary approaches. Löfstedt and Vogel (2001), for example, recognised that the application of precaution to risk management is widely applied across international jurisdictions (albeit in different forms), but that the ambiguity of precaution in legal terms undermines the intent of such approaches (see Renn cited in Löfstedt & Vogel, 2001, p. 406).

4.3 The institutional procedures for managing contaminated sites in Western Australia

The regulation and administration of contaminated sites in WA operates at State level, using a range of State and federal Australian Government regulatory instruments. The key functions are shared between several (separate) State Government agencies and local government authorities.

Until 2003, the primary legislative provision for the regulation of contaminated sites in WA was the *WA Environmental Protection Act (1986)*. However, after several serious hazardous waste pollution events[31], the need for specific legislation to manage the legacy of environmental contamination prompted the development of the *WA Contaminated Sites Act (2003)*. It was not until December 2006 that all provisions of the *WA Contaminated Sites Act (2003)* came into force. This legislative provision was not in force at the time of the ANI site redevelopment.

This section provides an overview of the key institutional procedures used in the management of contaminated sites in WA.

[31] For example, the Bellevue Omex oil dump, where land contaminated during the 1970s and 1980s was overlooked by the regulatory authorities until the 1990s, by which time the contamination was found to have leached into residential properties; and the Bellevue Waste Control fire in 2001 (see section 4.6).

4.3.1 EPA responsibilities

The first step in a redevelopment proposal of a known or potentially contaminated site is to have the proposal referred to the WA Environmental Protection Authority (EPA) for assessment. The statutory procedures provide instruction to any decision-making body on whether a project should be referred to the EPA for assessment. As a rule of thumb, "...significant contaminated sites where redevelopment is proposed; and major marine and coastal developments..." (WA Environmental Protection Authority, 2002) are referred. Nevertheless, the EPA is not bound to assess all referred projects.

Environmental risk assessment is formalised at the preliminary stages of decision-making under the Environmental Impact Assessment (EIA) procedures of the *WA Environmental Protection Act (1986)*[32]. The EIA process relies on the proponent body providing to the regulatory and/or Ministerial body detailed information - both quantitative and qualitative - describing the proposal, and how the proponent will mitigate environmental impact.

Although some operational explanations (see Wallington, 2002, p. 35) locate the EIA process employed by the EPA as a science-based practice, when undertaking an assessment the EPA relies strongly upon professional judgements to ascertain the 'environmental value of an area', the 'resilience of the area' or even the 'degree of public interest' (WA Government Gazette, 2012, pp. 5942-5943).

Any assessments by the EPA must take into account the precautionary principle, being a core value and objective of the *WA Environmental Protection Act (1986)* (Section 4A)[33], and which states:

> *Where there are threats of serious or irreversible 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, decisions should be guided by*

[32] This is the process as it was broadly applied prior to the enforcement of the *WA Contaminated Sites Act (2003)*, and as it applied to the ANI site redevelopment case study detailed in Chapter 5.
[33] The precautionary principle is not explicitly represented in the *WA Contaminated Sites Act (2003).*

> *(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and*
> *(b) an assessment of the risk-weighted consequences of various options.*

For the management of contaminated sites, the precautionary principle provides a leading approach to account for shortcomings in technical and scientific knowledge and practice. Precautionary safety criteria, including context-based assessments, therefore, form key assessment tools for defining the risks from contamination and for determining appropriate management strategies.

4.3.2 DEC responsibilities

The DEC (DER) responsibility for contaminated sites is broader than that of the EPA, covering regulatory management following EPA approval, as well as more general management of contaminated sites (now under the direction of the *WA Contaminated Sites Act (2003)*). The DEC environmental risk assessment procedures involve a multi-staged approach under its 'Contaminated sites management series guidelines' (2006b), drawing on national guidelines for risk assessment, with "all aspects of contamination exposure" given consideration (WA Department of Environment and Conservation, 2006b, p. 6).

The DEC plays no role in the actual site assessments, environmental monitoring, or remediation processes. Rather, its role is to assess the proposals and activities of industry bodies against the regulatory requirements, forcing compliance as necessary.

4.3.3 Hazard screening by DEC and DOH

The primary procedure for hazard screening by the DEC involves comparing the levels of toxicants present at a site with the default trigger values. "If the concentrations are below the human health [HIL] and ecological [EIL] investigation or assessment levels then this suggests that no further action is required..." (WA Department of Environment and Conservation, 2006b, p. 7). Any modifications to the default exposure settings[34] deemed necessary must be assessed and approved by the DEC, WA Department of Health (DOH), and/or an accredited auditor (WA Department of Environment and Conservation, 2006b, p. 8). The DEC directive on

[34] Default exposure settings relate to the trigger values defined for different exposure criteria, for example, under residential landuse exposures, industrial exposures, or food production exposures.

the application of the trigger value suggests that it is acceptable to apply the default trigger value as a single number denoting an upper limit for safety. This approach, however, is not entirely consistent with the ideal of the context-based directive by the NEPC, and does not allow for an adequate assessment of risk from chemical mixtures.

The assessment of risk to human health comes under separate review by the WA Department of Health (DOH), and draws on national health risk assessment guidelines provided by the enHealth Council/NEPC. The DOH also maintains its own guidance document (see WA Department of Health, 2008), based on the national guidelines, which recommends that project proponents follow the methodology proposed by the enHealth Council (2002). The health risk assessment element of the broader risk analysis provides "...available and relevant information about the nature and magnitude of potential risks of a particular situation" and is considered an "objective"[35] process (WA Department of Health, 2006, p. 7).

4.3.4 Involvement of other regulatory agencies

In addition to the application of environmental and human health safety criteria, when remediation precedes redevelopment, or when a change of landuse is necessary (e.g., from industrial to residential landuse), landuse planning regulatory criteria apply. In these circumstances, it is common practice for the redevelopment of a contaminated site to be administered by the State Government landuse planning agency (the WA Planning Commission (WAPC)), using a range of statutory and non-statutory criteria, and involving the delegation of formal contaminated site assessments to DEC, DOH, or other relevant agencies. In the thesis case study (detailed in Chapter 5), the WAPC formed its judgements based on assessments made by the DEC and DOH.

4.3.5 Peer review

The explicit application of scientific peer review to regulatory decision-making is not formalised in WA, although it can involve ad hoc arrangements between regulatory agencies and scientists affiliated with research institutions, (private) auditor review, or rely on the infrequent national reviews of health criteria via 'standard setting'

[35] Other components of health risk analysis, such as risk management and communication, are said to encompass the "subjective" elements of the process.

procedures (e.g., by the NEPC and other relevant bodies). Even so, peer review within these contexts remains problematic. For example, ad hoc and/or auditor peer review may not provide the necessary level of independence from either the assessing regulatory agencies or the private proponents, and is not always open to public scrutiny. Furthermore, national 'standard setting' reviews are not as responsive to local context and can operate under the influence of powerful industry lobby groups. As discussed in section 3.3.4 and as noted by Jasanoff (1985), peer review of regulatory[36] science is not subject to the same "systemic pressures that help preserve its integrity in other areas of science" (p. 29).

4.4 The application of health risk assessment - the example of lead contamination

Section 4.3 provided an overview of the procedures for managing the risks from contaminated sites in WA. This section, through the example of lead contamination, further discusses the application of these procedures in health risk assessment. The debate on environmental lead contamination is especially pertinent to the case study of this thesis since lead was identified as a major soil contaminant at the ANI site. The accurate application of safety criteria for this metal, therefore, became an important issue for the community host to the remediation project. However, with lead safety represented in terms of a definable threshold (which, according to the current scientific literature, is not known to exist), where interactions[37] data is absent from assessment, and context-based safety criteria legally unenforceable, the management of lead contamination presents a challenge for Australian regulators.

4.4.1 Australian lead safety guidelines

In 1993, the Australian safety guidelines for blood-lead levels (BLL) were reduced from 25µg/dl to 10µg/dl. During 2005, and in the midst of international debate on the accuracy of lead safety data[38], Australia rescinded its blood-lead safety level of

[36] Jasanoff refers to 'policy-related' peer review. Within the Australian context, this equates to a broad range of decision-making judgements, which are referred to in this thesis as 'regulatory' criteria.
[37] Lead interacts with other environmental pollutants, producing additive health impacts. For example, lead interacts with several other metals (see section 4.4.3) increasing their toxicity. Furthermore, for those who are chronically ill, who have vitamin deficiencies, who smoke, or who drink alcohol to excess, there is an elevated level of risk (Agency for Toxic Substances and Disease Registry, 2007).
[38] The WHO recognise that 10µg/dl is no longer protective of children's health and that there exist no safe levels for lead in blood (European Environment and Health Information System, 2007). The

10µg/dl. In 2009, the 10µg/dl blood lead level was reconfirmed (National Health and Medical Research Council, 2009), although "...not intended to be interpreted as either a 'safe' level of exposure or a 'level of concern' " (National Environment Protection Council, 2010, p. 82). There is currently no guideline offered on the safety of lead in blood, although it is generally asserted that levels much lower than 10µg/dl must apply, especially to children (National Health and Medical Research Council, 2009)[39]. Even so, BLL safety values that do not reflect the zero safety threshold[40] continue to be used to calculate other lead safety guideline values and standards, including those for soil, water, and air, and so inadvertently are applied as a measure of safety, albeit buried in the contributory data.

In the absence of a clearly defined BLL safety value, the WA DOH, nevertheless, has applied arbitrarily defined 'safety' levels, below 10µg/dl. For example, during the lead pollution event in the southern WA township of Esperance (see section 4.6), 5µg/dl was assigned as the action or trigger level for children, denoting the need for further health assessments if this level was exceeded. But even this lower trigger level is questionable as a measure of safety, when judged against the body of evidence demonstrating that there is no safety threshold for lead (as measured by BLL).

An additional flaw in the application of any 'protective' trigger or safety value for lead in soil or other media is that it is ultimately a futile exercise if biomonitoring (biological monitoring) for lead is not routinely undertaken. In fact, despite the recognition that biomonitoring is valuable in standard setting (National Health and Medical Research Council & Environmental Health Committee (enHealth), 2006, p. 15), it is under-utilised in the WA context (except in occupational applications[41]), and is only likely to be applied where there have been serious and obvious pollution events and, even then, commonly only under strong community or political pressure (see Lloyd-Smith & Bell, 2003, p. 19). To come to a better understanding of the

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revised Californian residential soil screening levels are based on maintaining children's blood-lead levels below 1µg/dl.

[39] The NHMRC advice, current at 2014.

[40] The HIL-A for lead in soil of 300mg/kg is calculated as a measure of safety using, as one of its criteria, the blood-lead goal of 7.5µg/dl (based on a NOAEL of 15µg/dl with a 2-fold safety factor) (National Environment Protection Council, 2013 s.8.2). That is, the HIL-A, even after a 2-fold safety adjustment, assumes a BLL safety threshold of 7.5µg/dl, where none exists in the scientific literature.

[41] Under the *WA Occupational Safety and Health Regulations* (*1996*), there exist statutory requirements to employ biomonitoring in high-risk occupational settings.

relationship between environmental lead levels, lead exposure, blood-lead levels, and health impact, it is imperative that environmental monitoring and biomonitoring be undertaken. Biomonitoring programs, in particular, are considered by the US Centers for Disease Control (2012) as "...the most health-relevant assessments of exposure because they measure the amount of the chemical that actually gets into people, not the amount that may get into people". Moreover, biomonitoring is especially valuable in lead exposure assessments, because of the damage that can occur to the nervous system and other organ systems without overt symptoms of poisoning.

However, in WA, public lead safety continues to be defined using simple comparisons of the default trigger values for exposure media (e.g., soil, groundwater, air) against available site data (where uncertainties of this process go unrecognised), and in the absence of comprehensive biomonitoring programs. Therefore, for the residential exposure setting, in the absence of detailed context-based assessments, the HIL-A of 300mg/kg[42] of lead in soil is considered 'safe' and deemed unlikely to produce harmful BLLs (above 10µg/dl) under typical residential application (where home-grown produce is not consumed beyond 10% total intake, or where poultry is not kept for eggs or meat[43]).

4.4.2 Guideline value formulation utilises a pragmatic approach

Taylor and Langley (1999) recognised that environmental standards and guideline values in Australia "...are determined by considering environmental interests, economic and social interests and technical options (the guiding principle for negotiation and consideration being known as the ALARA principle - As Low As Reasonably Achievable)..." (p. 4). However, values for lead considered 'safe' and values for lead 'as low as reasonably achievable' are not necessarily the same thing.

Baghurst (cited in Edwards, 2006) argued that the arbitrary assignment of a 'safety value' for lead is well-acknowledged as merely "an achievable target…a pragmatic level", one negotiated between industry and health regulators, rather than a demonstrated and defensible safety standard. Needleman (cited in Needleman &

[42] The HILs for lead and other contaminants were revised in 2013 (see National Environment Protection Council, 2013). The HIL-A for lead remained unchanged.
[43] The NEPC recognises that higher residential lead exposures may occur under conditions in which home-grown produce is consumed or where children exhibit pica behaviours. The NEPC offers no trigger value advice for residential soils under these conditions.

Bellinger, 2001; Rosner & Markowitz, 2005) and Grandjean (cited in N. Mitchell, 2007) both highlighted the role of the lead industry in advocating the ALARA principle ahead of safety limits, while also undermining research into the impacts of low level lead exposure, and negotiating with governments to induce them to continue using lead, despite the known risks.

Furthermore, Lee and Jones-Lee (1994, p. 8) highlighted the problem with using *any* toxicant guideline level as a measure of safety. They noted:

- a high degree of uncertainty about the reliability of the current standards that are used as clean-up objectives;
- that existing standards are subject to future revision; and
- that there is often a significant lag time of 5-10 years or even longer for new information to be incorporated into new standards or public policy.

There is, however, little need for debate on the toxic nature of lead - there is a large body of scientific evidence on the human and environmental impacts - its health effects are well understood. Accordingly, one might assume that lead standards offer some of the highest levels of health protection. But as noted by Needleman and Grandjean (see above), whether the available scientific data on lead safety are being appropriately applied, particularly under industry influence, remains an important consideration.

4.4.3 Complicating factors for the regulation of lead exposure

In addition to the problems in defining the levels at which lead is 'safe' for the purposes of regulation, many of the characteristics of lead as an environmental pollutant and biological toxicant further complicate its regulatory management.

1. Lead contamination is widespread and persistent

Lead, being an elemental metal, does not break down in the environment. Therefore, lead from past industrial and other sources is persistent and tends to remain an exposure risk once released into the environment. Although some lead compounds are more biologically active than others (see Agency for Toxic Substances and Disease Registry, 2007), many lead compounds can produce significant exposure

risks under certain conditions (e.g., under conditions of mineral weathering and mobilisation).

Furthermore, because lead has been a component of widely used domestic products, amongst them petrol (gasoline) and house paint, means that lead contamination is typically widespread. For communities surrounding polluting industries using, processing, or disposing of lead or lead ores, there are additional sources of environmental lead exposure[44].

2. Lead poisoning can be asymptomatic

Levels of lead in blood that medical researchers now accept are harmful are well below those causing overt symptoms of poisoning. Accordingly, without biomonitoring, raised lead levels in blood can go unnoticed, while producing insidious or delayed health impacts. Without obvious indicators of community ill health, comprehensive biomonitoring programs are less likely to be undertaken. Without monitoring data, lead contamination continues to remain invisible, and regulatory testing continues to be poorly applied.

Furthermore, with Australian health guideline values inadequately reflecting the 'zero threshold' position put forward in the scientific research, together with such values being ambiguous in their legal enforcement, lead can be deemed innocent (that is, 'safe') (after Grandjean: cited in N. Mitchell, 2007). In other words, if identified quantities (in the environment or in blood samples) meet with regulatory requirements, whether or not these truly represent a measure of safety, a determination of 'manageable risk' or 'no risk' is likely.

3. Lead interacts with other chemicals

Cory-Slechta (cited in N. Mitchell, 2007) noted there are always a number of risk factors (e.g., genetic predisposition, behavioural profiles, nutritional status) that every individual must contend with. Importantly, every individual is exposed to a number of chemicals at any one time. The interactions between chemicals in a

[44] Two studies on the BLLs for children in the Fremantle region have been undertaken (see Guttinger, Pascoe, Rossi, Kotecha, & Willis, 2008; Willis, Rossi, Bulsara, & Slattery, 1995). These studies, however, did not attempt to delineate the extent of lead contamination in the region, nor did they determine broader (adult) population exposure levels, only early childhood exposures.

mixture and the range of individual risk factors is, therefore, over-simplified when chemicals are studied in isolation from one another, and this provides misleading data upon which to define 'safe' levels of exposure for regulatory purposes. Cory-Slechta argued that current testing strategies used in risk assessments do not mimic the human reality of chemical exposure or the individual responses to multiple exposures.

Although the pertinent interactions data are not available for a wide range of chemicals, lead is an exception - there is strong evidence presented for additive effects between lead and a number of other toxicants. Therefore, and as noted by the US ATSDR (Agency for Toxic Substances and Disease Registry, 2004a), "...a health assessment approach that deals with each metal separately may underestimate the potential for mixtures of these metals to cause effects" (p. 103).

4.5 Community consultation in the management of contaminated sites in Western Australia

The WA State Government relies on a range of administrative instruments to direct its community consultation, covering both statutory and non-statutory mechanisms. This section provides an overview of these mechanisms as they apply in the management of contaminated sites.

4.5.1 Overarching provisions for community consultation

The WA Department of Premier and Cabinet (2003) commits to "developing a society where everyone is able to participate effectively, creatively, and critically in all aspects of community life" (p. i), and it has developed a detailed account of best practice public participation and community consultation[45]. This entails promoting a culture of consultation, applying reflective practice, and integrating public participation with risk management practice. The methods the WA Department of Premier and Cabinet (DPC) proposes to address various levels of participation range from simple 'educate and inform' programs through to 'partnership' models, designed with a view to citizen collaboration and empowerment.

[45] This thesis uses the terms 'public participation' and 'community consultation' interchangeably. Some sources, however, do distinguish between these modes of involvement, placing consultation as a subset of public participation, often with a lesser obligation for public empowerment.

Furthermore, the DPC (2002) recognises that "citizens' rights to access information, provide feedback, be consulted and actively participate in policy making must be firmly grounded in law and policy" (p. 2), with an obligation by government to "ensure that the policy-making process is open, transparent and amenable to external scrutiny and review" (p. 2), to support accountability.

> *It is neither effective nor appropriate to consult if a final decision has already been made, or if the commissioning body cannot influence a final decision, or when there is insufficient time and/or resources available.*
>
> *Ineffective or inappropriate consultation is counterproductive and increases apathy and cynicism - not only towards future consultations, but also political processes, public institutions and our systems of governance. (WA Department of Premier and Cabinet, 2002, p. 6)*

In addition to these departmental guidelines, there exist fundamental legal principles relating to procedural fairness (natural justice), which extol the ideals presented under the DPC guidelines.

> *Natural justice comprises two common law rules which have been developed largely by the courts to ensure that decisions of government and certain public bodies affecting the rights or interests of individuals are made fairly. The first rule is that a decision maker must afford an opportunity to be heard to a person whose interests will be adversely affected by the decision.*
>
> *The second rule is that a decision maker must be disinterested or unbiased in the matter to be decided. Bias is defined in case law to include actual bias or apparent bias. (Mark Robinson SC, 1991, p. 1)*

The Ombudsman WA also offers guidelines for procedural fairness in administrative decision-making, which "mainly apply to decisions that negatively affect an existing interest of a person or corporation" where "procedural fairness protects legitimate expectations as well as legal rights" (Ombudsman Western Australia, 2009, p. 1).

These ideals of procedural fairness stem from the concept of giving the public a 'voice' to provide for a level of local control, and are premised on notions of accountability and participation (Folger, 1977; Platow, Brewer, & Eggins, 2008). However, "in order to be perceived as procedurally fair, policy makers need to ensure that citizens' views are listened to and considered in the decision-making process" (King & Murphy, 2009, p. 107). The challenge is to provide decision-making processes that reflect on and represent the voice of citizens.

4.5.2 Statutory provisions for consultation in environmental/health decision-making

Statutory public comment periods for planning reviews and proposals deemed to be of environmental significance are provided under both the *WA Planning and Development Act (2005)*[46] and the *WA Environmental Protection Act (1986)*. These provisions are binding upon both the WAPC and the EPA. Public comment periods for planning and environmental proposals extend for prescribed periods, with opportunities for public hearings and appeals. For amendments to a Metropolitan Region Scheme[47] (e.g., where an industrial site is reclassified for residential use), there is an additional obligation under the *WA Planning and Development Act* (*2005*) to make reasonable endeavours to consult with public authorities and those considered likely to be affected by the amendments. Nevertheless, the concept of 'community consultation' is poorly defined under these WA statutory mechanisms and, therefore, standards for best practice within these contexts are lacking. In an attempt to clarify the meaning of consultation, a WA Supreme Court case[48] (post-dating the ANI site redevelopment) reviewed the case law on consultation. It stated that "rather than mere notification, consultation requires provision of sufficient information and a sufficient opportunity to respond" (Environmental Defender's Office Western Australia, 2006).

[46] This legislative provision replaced the *WA Town Planning and Development Act (1982)* and the *WA Metropolitan Region Town Planning Scheme Act (1959)*. The requirement for public consultation, however, remains largely unchanged in regards to environmental conditions or changes to a Metropolitan Region Scheme.

[47] The WA Metropolitan Region Scheme (MRS) classifies landuse in the Perth metropolitan area. See section 5.3.1 for more detail.

[48] See *Yallingup Residents Association (Inc) -v- State Administrative Tribunal & Ors [2006] WASC 162*.

When a development has the potential to cause environmental impacts, the provisions for public comment under the *WA Environmental Protection Act (1986)* typically support the identification of any 'fatal flaws' in a project, but are not intended to measure the public acceptability of a project (despite explicit provisions for this under Gazetted direction, see section 4.3.2) . These consultative mechanisms largely judge public comment against scientific or legal criteria, and the knowledge traditions operating within these institutions (e.g., evidence-based knowledge).

Third party appeals

An additional avenue for statutory appeal of government environmental/health decisions in WA lies with the State Administrative Tribunal (SAT), created with the goals of being able to scrutinise government decisions and to avoid expensive legal battles. The SAT legislation, however, has no provision for third party appeals and does not deal with appeals under the *WA Environmental Protection Act (1986)*. For other aspects of contaminated site redevelopments, only project proponents (e.g., developers or site owners) have the power to appeal a government decision (McGlynn, 2005) using the SAT provisions.

Despite many years of lobbying by the WA Environmental Defender's Office (EDO)[49] to have third party appeals included as part of the SAT legislation, such provisions have not yet been included.

WA remains the only Australian State in which there is no third party participation in the environmental planning appeals process. In response to criticism over this matter, the Minister for Planning and Infrastructure responded: "I guess we [the WAPC] need to make a judgement about what is in the best interests of the community" (WA Legislative Assembly, 2007).

Freedom of Information

Beyond the explicit requirements for public inclusion via consultative provisions, Freedom of Information (FOI) legislation offers a supplementary method to make

[49] The WA EDO is "a non-profit, non-government community legal centre specialising in public interest environmental law" providing, as one of its services, legal advice and representation on environmental issues to community groups and individuals (Environmental Defender's Office Western Australia, no date).

information available to the public. In WA, the legislative instrument for access to government documents is the *WA Freedom of Information Act (1992)*. The Office of the Information Commissioner (2010), however, has consistently argued that government agencies should be making information available outside of the FOI process as much as possible.

4.5.3 Non-statutory provisions for consultation in environmental/health decision-making

The National Environment Protection Council (NEPC) provides an overarching guideline to non-statutory forms of community consultation as part of contaminated site assessments. The NEPC (1999c) guideline is comprehensive and recognises the significance of early and ongoing consultation, of the impacts of avoiding consultation or providing 'unfair' processes, and accepts that

> *interaction with the community cannot simply be a technical process, it requires skills in listening and communicating and should be a two-way process....for sites with contentious issues, consultation with the community is considered to be essential. This is particularly the case when the contamination at the site has the potential (or **perceived** potential) to have an impact on any stakeholder. (National Environment Protection Council, 1999c, p. 2 emphasis in original)*

Following the NEPC lead, the WA DEC (DER) commits to community consultative processes, and recognises a range of procedures that can be applied, from simple education/information programs, through to joint planning/decision-making, or facilitated community decision-making. The DEC (2006a) acknowledges the benefits of community consultation as being:

- *less resistance to appropriate proposals;*
- *better decision-making and sustainable outcomes - the community can offer new perspectives and solutions on issues, which may even result in financial savings;*
- *relationship/partnership development;*
- *increased openness and trust;*
- *demonstrated commitment to accountability, democracy and transparency;*
- *shared understanding of problems and dilemmas; [and]*

- *community pride in organisations that work collaboratively with the community. (p. 1)*

The DEC (2006a) cites the risks of not conducting effective community consultation as:

- *delays for a project, requiring additional investigations or consultation to be undertaken and adding to the project cost;*
- *community outrage;*
- *media scrutiny;*
- *damage to a company's reputation and ability to conduct business*[50]*; [and]*
- *potential litigation. (p. 1)*

Nevertheless, the consultative provisions applied by the DEC do not mean that the public has direct access to, or involvement with, the regulatory decision-maker. Rather, DEC guidelines direct the regulator to refer the public on to the proponent - commonly a private development body. These private bodies are, however, under no legal obligation to consult with the public. The DEC (2009) maintains its consultative process is "...objective, open, fair and carried out in a responsible and accountable manner", emphasising the sharing of information.

The approach by the DOH is similar to that of the DEC, with the responsibility for consultation delegated to project proponents. Furthermore, the consultation guidelines offered by the DOH (and DEC) do not accept that communities can hold expertise equal to that of the project proponent or State Government agency. Instead, the process is primarily one of information dissemination, and not the two-way and active learning process, as recommended by the NEPC (1999c; 1999d, pp. 3-6). Ultimately, power rests with the project proponent to initiate, direct, and determine the extent and limits of consultation.

For health risk assessment, the DOH (2006) guideline recognises the importance of maintaining an approach to risk assessment that involves stakeholders and minimises public mistrust.

[50] This DEC statement assigns responsibility for community consultation, and any failures of process, to the proponent body. The DEC does not represent itself as a party to these processes.

> *Whilst the main focus of health risk assessment is the protection of human health, the benefits are not restricted to issues of health. If failure to conduct a thorough, well managed health risk assessment ultimately leads to a situation where significant adverse health effects are experienced, the flow-on effects can be significant. If the community believes that the appropriate steps to assess and minimise the risk to their health have not been properly carried out, then the level of community mistrust and anger can be very high. Regaining community trust in such situations is extremely difficult. (WA Department of Health, 2006, p. 7)*
>
> *Each project undergoing a health risk assessment will involve a range of stakeholders. These typically include those proposing the project (the proponent), members of the community or workers potentially affected by the project, government representatives from all levels of government, other experts and consultants, environmental planners and other health officials.*
>
> *Any health risk assessment should consider relevant stakeholder concerns. (p. 9)*

Public involvement in health risk assessment is deemed by the DOH (2006, p. 10) an important consideration, with transparency of process being a underlying principle governing an assessment.

4.6 Problematic regulation of contaminated sites in Western Australia

This section discusses several WA projects involving the management of environmental pollution[51]. Questions concerning the adequacy of scientific assessments, the expertise of government agencies and private consultants, the accountability of various institutions, and the avenues for public participation in decision-making, are highlighted.

The projects cited had ongoing problems with pollution monitoring and/or actual pollution, and there was a demonstrated unwillingness by government agencies to

[51] Strangio (2001) and McPhillips (2002) provide further accounts of Australian grassroots campaigns against environmental contamination.

undertake biomonitoring of people at risk of exposure, or who had been exposed to known pollution events. In some cases, developers/project proponents claimed that pollution releases (e.g., dust) observed by local communities were 'coming from elsewhere' or that their own monitoring data demonstrated that there had been no pollution releases (*The Gazette*, 2005a, p. 21), and these claims of 'no risk' were commonly supported by the regulatory agencies (*The Gazette*, 2005b, p. 10). In other cases, the defining traits of 'contamination' became so reliant on abstract modelling data, incorporating the judgements of assessors, that unacceptable[52] (or even undetermined) levels of contamination were dismissed by regulators as 'no risk' to public health. These cases demonstrated problematic consultative processes, poor mechanisms for independent testing of contaminated sites by community groups, and shortcomings in safety validation procedures.

These cases provide a backdrop to the primary case study of this thesis, and many of the examples informed public opinion on the operations to be applied to the ANI site redevelopment.

The Bellevue Waste Control facility

The Bellevue Waste Control facility, operating from a north-eastern suburb of Perth, WA, was used to stockpile hazardous wastes and was being managed in an unconventional way, with drums of different chemicals stored together, some leaking, some unlabelled. Despite knowledge by WA Government regulators of the danger the facility posed, it remained trading until explosions and fire destroyed the premises in 2001, causing significant environmental pollution and public health impacts (McDonell, 2002).

Lloyd-Smith and Bell (2003) detailed the issues associated with the management of the facility, the release of contamination, and the subsequent assessment and clean-up of contamination. Their account highlighted mismanagement of the waste control industry by WA Government agencies, inadequate emergency control measures, inadequate health surveillance of nearby residents, and claims by WA Government

[52] This was particularly evident when regulatory criteria conflicted with new scientific evidence, yet regulators measured safety and risk solely against the regulatory criteria. The updates to blood-lead safety criteria are a pertinent example (see section 4.4).

officials that there was 'no risk', "despite obvious and serious contamination" (Lloyd-Smith & Bell, 2003, p. 19).

> *Many in the affected communities saw risk assessment simply as a powerful tool used by industry and government after the event to dismiss community concerns and provide legitimation for predetermined action. The case studies also demonstrated that power influences the acceptability of risk, with each definition of risk making a distinct political statement regarding what society should value. It is those with power (economic, informational, expert) who define what is of value and subsequently, what is an 'acceptable risk.' (Lloyd-Smith & Bell, 2003, p. 21)*

The remediation of this site was ongoing more than ten years after the fire that destroyed the premises.

The Brookdale Liquid Waste Treatment Facility

Operating since 1988 from a south-eastern suburb of Perth, the Brookdale Liquid Waste Treatment Facility (Brookdale LWTF) traded as a biological and industrial waste treatment plant. In 1999, the EPA determined that the facility was functioning outside of its license conditions (Appeals Convenor for the *Environmental Protection Act (1986)*, 2002). The site closed in 2003 amid community concerns that the facility was causing health impacts to the nearby community.

Flint (2005, p. 4) reported that despite ongoing complaints by residents of health impacts, the WA Government regulators continued to claim there was 'no risk' and no plausible contaminant exposure pathway. Flint (2005) outlined inaccurate and illegal management practices at the plant that continued "…with the knowledge and encouragement of government officials…", and stated that this had continued for over a decade (pp. 51-52).

An independent study, commissioned by the local community, established the regulatory claims of 'no risk' to be incorrect. A community initiated independent health study of 358 people in the area found a high incidence of eye, throat, and immune system disorders from those living mainly within 3km of the facility. A subsequent DOH (2004a) health survey supported these findings and determined that

there was a higher incidence of diabetes and nosebleeds in the community even after accounting for demographics and lifestyle. Furthermore, levels of lead at a primary school, 700 metres from the plant - initially described by the Government's environmental consultant as within acceptable limits - were discovered to be 75 times higher than the World Health Organisation and Australian guidelines (Flint, 2005). A CSIRO report (Gras & Gillett, no date) confirmed the Government's environmental consultant used faulty methodology, and had misread the results.

A review of the WA Government response to the community's concerns (see Priestly, 2005) determined that the approaches by the WA Government agencies were of a sufficient standard and maintained that there was no evidence to support the community's claims of health impact. The review stated: "[i]t is clear that the airborne lead levels reported in the 2002 GHD [the Government's environmental consultant] survey have injected real mischief into community perceptions of possible risks relating to lead emissions from the Brookdale LWTF" (p. 3). In relation to community concerns about contamination at the local school, the Priestly review (2005) explained that further monitoring had showed the contamination levels and children's blood-lead levels to be within acceptable standards.

The Midland railway workshops

The Midland railway workshops, north-east of Perth, operated from 1897-1994. The site housed a foundry associated with railways operations and several other buildings associated with brickworks and munitions manufacture. The redevelopment proposal for the 17 hectare site included provision for residential, retail, commercial, public open space, and heritage preservation.

Documents released under the *WA Freedom of Information Act (1992)* (FOI) revealed the environmental consultant (the same employed to manage the remediation of the ANI site) had not carried out the work according to Australian safety guidelines.

Greens MLC Lynn McLaren stated that the official reports show:

> *…toxic water was sprayed all over the site, despite warnings not to, dust monitoring standards were breached and no action was taken…and high levels of concern were expressed by senior government officials about the ability of the contractors to undertake the work. (Fremantle Rooster, 2005)*

Furthermore, the documents released under FOI revealed a series of inconsistencies in approach between the Air Quality Management Branch (AQMB) and the Audit Branch of the DOE (WA Department of Environment, 2004f), highlighting flaws in intra-departmental communications at the DOE and the exclusion of key agency specialists from crucial decision-making. The AQMB was particularly concerned that project approvals had been cleared without adequate overview and review by its branch and noted that this had occurred on previous occasions with other remediation projects. It was understood by the AQMB that its approval was an audit condition (WA Department of Environment, 2004d).

> *Please note that AQMB continues to be concerned about the management of Midland. Remediation activities have commenced at [remediation area] BCD, and in effect we are providing retrospective advice as to the adequacy of the monitoring strategy at this site, notwithstanding the existing approvals for remediation activities.*
>
> *AQMB provided initial advice a year ago in the Draft EMP, but we had no involvement or knowledge of actual activities underway. Given the information provided and the history of the monitoring program at Helena West [another portion of the redevelopment], we have concerns about current activities and, importantly, the apparent failure of the developer to incorporate learnings from Helena West into the current works." (WA Department of Environment, 2004e)*

Port Coogee

Located approximately 2km south of the ANI site and under the same local government jurisdiction, the Port Coogee development plan involved infill of ocean bed for residential development and the creation of a marina.

In February 2007, the WA Corruption and Crime Commission (CCC) alleged that lobbyists, working on behalf of a major development company for the Port Coogee project, had influenced the City of Cockburn Mayor by providing financial support to

his election campaign. The CCC hearings raised questions concerning the Mayor's independence from the coastal development approvals process (B. Mitchell, 2007). In the wake of the CCC hearings into Port Coogee, ALP MP Dr Carmen Lawrence stated "...the real tragedy was that despite the revelations of [the Mayor's] close links with [the developer] the most controversial aspects of the marina project were - with his support - now underway" (D'Anger, 2007).

By 2009, the management of contamination at the site was proving problematic. Despite the groundwater at the Port Coogee development site containing arsenic, heavy metals, and hydrocarbons (Foster, 2009b), poor coordination between WA Government regulatory agencies had resulted in the Department of Water (DOW) approving the use of groundwater to reticulate parks and gardens, despite statements by the DEC that the water was too contaminated for such use (Foster, 2009a; WA Labor Party, 2009).

Further problems arose when a directive by the DEC to place restrictive memorials[53] on land titles, to warn potential purchasers of the contamination, was not implemented prior to land sales. The DEC, therefore, directed the restrictive memorials be placed on land titles retrospectively. This became a major point of contention for new landowners, not informed of the contamination prior to purchase (Grant, 2009). By November 2009, and under the threat of legal action by local landowners, the DEC removed most of the memorials and, instead, claimed that further testing had revealed the contamination levels to be low.

The Esperance lead pollution events

During 2006-2007, WA regulatory agencies confirmed that the cause of the deaths of an estimated 9,500 wild birds in the southern WA township of Esperance was lead pollution. A large-scale investigation into the management of lead-carbonate transport through Esperance Port followed.

A submission to the parliamentary inquiry into the pollution events stated:

[53] The WAPC (2009) defines a restrictive memorial as "*a notice on a Certificate of Title, registerable by an authority under powers given to the authority by legislation, alerting interested persons to some characteristic of the land in question, or the ability to register further dealings in relation to the land…[or] alerting owners or prospective owners of the land, of a factor affecting the use or enjoyment of the land...*"

> *If you want to know what the cause of the pollution was, I can tell you that without an inquiry. If you transport toxic material in unsealed containers, such as kibbles, and then load it into a ship's hold via an open conveyor belt, the toxic material will escape and cause pollution. The foregoing holds true for pelletised as well as granulated concentrate. If the containers are not sealed and the conveyors are open, the product will escape. If the product that escapes is toxic, we then have pollution. It's not really rocket science. (Education and Health Standing Committee, 2007, p. 4)*

Amongst the 192 findings of the parliamentary inquiry into the lead pollution events at Esperance, identified deficiencies included:

- poor management of the lead product during transport from the mine to the port, with potential releases of lead all the way from the mine-site to Esperance - a distance of approximately 900km;
- reliance on bird deaths to warn communities of pollution;
- grossly inadequate government regulation;
- a "lack of compliance culture" within the DEC and lack of robust regulatory approach;
- a lack of expertise in WA Government regulatory agencies;
- poor legislative provisions for the DOH to respond to public health emergencies;
- poor coordination between agencies, for example, the DEC and EPA failed to respond to the DOH recommendations and pollution monitoring requirements;
- a lack of regulatory capacity in WA Government agencies but an unwillingness to accept public assistance;
- reliance on self-regulation by the project proponent;
- inadequate pollution monitoring;
- failure by the Port Authority to notify the DEC of dust events and significant spills at the port;
- inappropriate advice by regulatory agencies to householders, demonstrating a lack of knowledge and experience, for example, advising householders to empty lead-contaminated rainwater tanks onto their gardens;

- a poorly coordinated response to the problem;
- failure to acknowledge the simplest and most common-sense predictions on the outcomes of poor pollution management;
- down-playing the human risks and impacts from pollutants;
- claims of 'no risk' by regulatory agencies when environmental assessments were inadequate, absent, or incomplete; and
- a failed public consultation process.

The Canadian mining company responsible for the transport of lead in granular form was not prosecuted. It argued that it did not breach its WA Government approved management proposal and it was not responsible for the manner in which the Esperance Port Authority handled its product (Perpitch, 2008). The DEC was successful in securing a prosecution of only one of the industries party to the pollution incident, fining the Port Authority $525,000[54]. Although the private project proponent (the mining company) offered a $10 million clean-up package towards remediating the town and port and the creation of a community fund, the legal responsibility for the clean-up remained with the WA Government, with various tasks outsourced to private consultants (Weber, 2009). The final cost for the clean-up was $25 million (Trenwith, 2012).

Lead contaminated materials from Esperance were transported over 700km for landfill disposal at a facility in the eastern suburbs of Perth. In 2009, the lead-carbonate transport project was relocated from Esperance to Fremantle Port. The lead-carbonate rail transport now runs through metropolitan Perth and alongside the ANI site housing redevelopment, en route to Fremantle Port.

4.7 Summary and conclusions

The Australian system for the regulation of contaminated sites is influenced by international models and utilises a range of quantitative and qualitative methods to guide statutory and non-statutory administrative processes. The US approach to managing contaminated sites is of interest, being a more highly regulated system

[54] With the Esperance Port Authority being a WA Government trading enterprise, any penalty was ultimately borne by the taxpayer.

using statutory enforcement powers, yet experiencing similar shortcomings to those management systems of lesser regulation, for example, the Australian system.

In WA, the management of contaminated sites uses both national and State regulatory frameworks, administered by government agencies in the fields of planning, environmental protection, and public health. Research and regulatory bodies define and manage the hazards associated with contaminated sites using scientific evidence, context-based assessments, formalised risk assessments, and the precautionary principle.

The use of non-statutory context-based assessments in the assessment and management of contaminated sites is of particular significance. While aiming to better accommodate the contingencies of scientific knowledge and the creation of a situated knowledge, context-based assessments falter under both practical and legal application when set against pre-defined universal 'single number' criteria. Therefore, the application of these non-statutory assessments under regulatory scientific mechanisms, which seek clarity and certainty in decision-making, is problematic.

Within these management mechanisms, public participation operates at a range of different levels, upheld in common law, statutory provisions, or under guidelines. Nevertheless, in practice, provisions for public participation operate to restricted timeframes, some are only available under certain legislative applications (e.g., *WA Environmental Protection Act* (*1986*)), and the non-statutory provisions are commonly poorly implemented.

These regulatory applications have been briefly discussed using the example of the regulation of lead contamination, and through several contemporary regulatory actions involving contaminated sites in WA. Providing a backdrop to the primary case study of this thesis, these cases demonstrated well-established problems relating to consultative processes, mechanisms for independent testing of contaminated sites by community groups, and safety validation procedures.

CHAPTER 5

THE ANI-BRADKEN SITE REDEVELOPMENT CASE STUDY

CHAPTER 5: THE ANI-BRADKEN SITE REDEVELOPMENT CASE STUDY

> *It's always difficult to get the balance right between existing residents' needs and interests and new development. I think in this case the desire to make money on the part of the developers has overwhelmed what I think is reasonable, thoughtful decision-making and planning. Unfortunately the Government has seen fit to not listen in the end, I think, sufficiently well to the local people, and I regret that, especially since they are my own Party colleagues. (ALP MP Dr Carmen Lawrence: cited in Meszaros, 2006)*

> *If the community had been involved right from the beginning we could have saved this long and expensive, drawn-out process that is going on right now, where residents have to go to the supreme court to ensure a simple right that they're not going to be poisoned. No-one is saying we don't want this land developed but what we are saying is that it should be done within responsible guidelines. (Greens MLC Lynn MacLaren: cited in McGlynn, 2005, p. 4)*

This chapter introduces the ANI-Bradken site (the ANI site), its location, the industrial history of the area, the contamination issues, the redevelopment proposal, the community group contesting the proposal, and the grounds for community opposition to the proposal.

The ANI site redevelopment case study provides a useful examination of the Western Australian (WA) regulatory procedures required to rezone, remediate, and redevelop a contaminated site, close to existing residential areas and adjacent to the marine environment. The case study is used to identify and explore the complexities and conflicts inherent in the regulatory procedures for landuse planning, environmental and health safety, and public participation, clarifying the utility of community-based knowledges by regulatory experts, within the context of a techno-scientific application.

Appendices A-K offer additional information and provide a procedural time-line, details of the public submissions, the contamination data, the broader regulatory and administrative procedures for the project, along with photographic evidence.

During the course of the ANI site redevelopment, the WA Government agency responsible for environmental regulation was involved in two name changes. Since the completion of the project, there was a further name change. In this chapter, reference to the DEP, DOE, DEC, or DER are all references to the same environmental regulatory agency.

5.1 The ANI site and its industrial history

Over the last three decades, population growth in WA's capital city of Perth[55] and a Metropolitan Land Use Scheme favouring in-fill development (see WA Department of Planning and Urban Development, 1990; WA Planning Commission, 2004) have prompted the use of disused industrial sites for residential redevelopment. With increasing evidence that these former industrial sites present environmental and public health risks, their remediation was, and remains, a pressing issue. However, the activities to decontaminate these sites - for both redevelopment and safety objectives - are, in themselves, not always safe and do not necessarily render contaminated land environmentally benign or suitable for sensitive[56] landuse. The provision for well-founded, objective decision-making to address the management of contaminated sites, is one of many challenges of the WA system.

The ANI site is located on the coast and within 200m of the residential area of South Fremantle, a suburb of Perth, WA (see Fig. 1). The site is a 2.61 hectare portion of land of a larger redevelopment site, known as the South Beach Village. The ANI site lies within the local government authority of the City of Cockburn, but is on the boundary of the City of Fremantle. The residents living closest to the site live within the City of Fremantle.

[55] Perth's population grew from 922,037 in 1981 (WA Planning Commission, 1995) to 1,728,867 by 2011 (Australian Bureau of Statistics, 2012).
[56] In this context 'sensitive' refers to residential or other uses that include potential pollutant exposures by children, the elderly, the infirm, etc., or under conditions where food crops are grown or livestock is kept.

The ANI site land has a long industrial history, most recently as a ferrous metal foundry (1953-1998) but most notably as a primary lead and gold smelter (1898-1920). The contamination uncovered at the ANI site was regarded by the site developer's environmental consultant as consistent with industrial waste being used as fill material to reclaim land westwards (ENV Australia, 2003, p. 4), and to protect the existing industrial premises against the effects of coastal erosion[57]. There also exist anecdotal accounts[58], supported by photographic evidence and soil test results, indicating that the Fremantle Smelting Works had stockpiled slag wastes in other areas beyond the present-day boundaries of the ANI site, and that these waste stockpiles had remained in situ until the late 1940s. Although the precise location of the final disposal area for the bulk of the lead smelter waste is not known, there is documentation of slag waste being trialled to surface roads in central Fremantle (see Dowson, 2003, p. 186), and there is evidence of slag waste having washed offshore and forming a 'slag reef' (WA Department of Health, 2004c). The disposal of the large volumes of industrial waste produced is likely to have presented a major problem for local industries, and explains why waste stockpiles remained in the area long after the industrial operations had ceased.

Surrounding the ANI site are several other industrially contaminated sites. These include an oil and coal fired power station (operating 1951-1985; unremediated), the Robb Jetty Abattoir (operating ca 1898-1994) and associated livestock processing industries (see Gutteridge Haskins and Davey Pty Ltd, 1996, pp. 4-5), the South Fremantle Landfill Site (SFLS) (operating 1930s to 1991[59]; unremediated) (see Golder Associates Pty Ltd, 2005), the Robb Jetty Freight Terminal site (remediated 2005), and the Fremantle sewerage works (1912-unknown) (see Lund & Martin, 1996).

[57] Prior to the remediation works, some of this waste was visible in the eroded sand dunes (see Appendix J). The visibly contaminated dunes to the west of the ANI site were levelled in 2009 as part of the remediation program.

[58] This evidence was provided at a public meeting on behalf of an elderly resident who recalled playing on the slag stockpiles as a child. This meeting, held on 6 May 2005, at the offices of the City of Fremantle, related to the remediation of the Robb Jetty site, adjoining the ANI site. Representatives of the WA Government developer, its environmental consultant, DOE, DOH, City of Fremantle, other industry groups, and community members attended the meeting.

[59] According to Dunnett (2004), the SFLS operated between 1931 and 1986, citing the City of Fremantle as the source of this information. However, DEC/DER records (see DEC/DER Contaminated Sites Database entry for Lot 52 on Plan 7217 South Fremantle WA 6162) show the SFLS to have been decommissioned in stages, commencing in 1956 in the western areas, to 1991 in the eastern areas.

Regardless of the industrial history of the ANI site and the contamination of surrounding sites, its association with the pre-existing residential infrastructure of South Fremantle and its close proximity to the coast and to inner city Fremantle, made the ANI site highly prized in terms of development potential[60].

Land developers purchased the ANI site in the late 1990s for the purpose of residential redevelopment, at a time when it was still zoned for 'General Industry' use. The site was rezoned from 'General Industry' use to 'Urban' use in 2001.

[60]Bond (2000a, 2000b) identified a range of factors influencing the acceptability of contaminated sites for housing uses. Amongst them, views, access to beaches, and access to public transport and cycle/pedestrian pathways.

Figure 1: The ANI Bradken site - location

Figure 2: The ANI Bradken site and surrounding areas (2008)

(Aerial maps courtesy Google, 2009)

5.2 The community group

The group that formed to represent the interests of the local community comprised of approximately 100 residents from the nearby suburbs of South Fremantle and Hamilton Hill. The group itself came from a close-knit community, with personal contacts through their children's school networks and other neighbourhood associations. The group, to begin, was informally based, however, in 2003 it became an incorporated body using the name the South Fremantle/Hamilton Hill Residents' Association Incorporated (hereafter referred to as the 'Residents' Association'). The incorporated status of the Residents' Association formalised the objectives of the group, provided an official status and a clearer point of contact for government agencies, and presented the group as a unified body for community representative purposes, bound by the rules and regulations of the *WA Associations Incorporation Act (1987)*. Importantly, the incorporated status of the group afforded individual members legal protections from any proceedings instituted by the private developer.

The Residents' Association demographic, although broad, reflected a well-educated, middle to higher socio-economic status. The Residents' Association contained members with educational/professional backgrounds in teaching, law, science, and several other academic and technical disciplines. Many of the local residents had young children and were drawn to membership of the Residents' Association based on perceived risks to children's health from the proposed ANI site works.

Acknowledging the authority that came with specialist scientific training, the Residents' Association engaged its own experts to assess the official scientific interpretations for the project and to act on its behalf[61]. The Residents' Association believed that the word of one with links to 'science', or who could be assigned the title of 'scientist', would be held with authority both within the scientific, regulatory, and public arenas. The Residents' Association tacitly understood the legitimising function of scientific knowledge and of the authority afforded expertise.

[61] The Residents' Association used the services of community members qualified in the geological, environmental, and biological sciences. The Residents' Association also approached the City of Fremantle to fund an independent environmental assessor and auditor for the project. In section 2.3, my own involvement with the group is outlined.

No other local resident groups were active for the ANI site actions - the views of the Residents' Association represented a strongly held perspective of local citizens, and of the broader Perth community. The concerns of the broader Perth community were characterised in the Perth Coastal Planning Strategy (WA Planning Commission, 2005) and established agreement on several key coastal management issues, namely:

- *It is important for Perth to protect its natural coastal environment.*
- *It is necessary that some sections of coast be used for industry and ports. Development in coastal areas should be concentrated in specifically chosen areas rather than spread evenly along the coast.*
- *Planning for the future should focus more on the needs of the community than on the needs of business and industry. (p. 5)*

The Strategy concluded that there was no dispute amongst Perth's citizens, who held "considerable concerns for the future of the coast, in particular for the risk of damage caused by increased usage and concerns about higher-rise development" (WA Planning Commission, 2005, p. 1).

5.3 The landuse planning process

The regulation of landuse planning and development in WA's metropolitan urban areas rests on the following overarching principles (after WA Planning Commission, 2006b):

- Environmental sustainability
- Social responsiveness
- Support for economic activity under principles of sustainable development
- Facilitation of infrastructure development

For contaminated sites earmarked for redevelopment, planning approvals are dependent on determining a site's suitability for the proposed landuse, and include separate assessment by environment and health agencies (operating independently of the planning agency) to establish the need for remediation, measured against national and State safety criteria (see Chapter 4). Under these administrative processes for the redevelopment of contaminated sites, the State Government landuse planning agency

holds primary responsibility for the regulation of a project, but relies on the expertise located in other State Government agencies to determine the safety of a project, but only as an adjunct to planning assessments. Accordingly, although assessments of the contamination status of land and groundwater formed a crucial element of the overall planning process for the ANI site, these were addressed as a subsidiary matter to be managed or resolved subsequent to landuse planning conditions being met[62].

This section discusses in more detail the key planning provisions for the ANI site redevelopment. The management of site contamination is discussed separately in section 5.4.

5.3.1 The Metropolitan Region Scheme Amendment

The WA Metropolitan Region Scheme (MRS) classifies landuse in the Perth metropolitan area[63]. Industrial sites earmarked for residential redevelopment require application for amendment from 'General Industry' landuse zoning to 'Urban' landuse zoning. The procedures necessary to support the MRS Amendment for the ANI site included:

- preliminary soil testing to be undertaken by the project proponent (for results, see section 5.4 & Appendix D);
- environmental review by the WA Environmental Protection Authority (EPA);
- consideration of coastal planning provisions by the WA Planning Commission (WAPC); and
- implementation of community consultative procedures to define issues of importance to the local and broader community.

As part of the MRS Amendment process, public submissions were accepted under the combined WAPC and EPA assessment, and this formed the only statutory

[62] Following the full enactment of the *WA Contaminated Sites Act (2003)* in 2006, the provision for planning and development relating to contaminated sites was changed to prevent approvals without first seeking advice from the CEO of the DEC. Nevertheless, for decision-making concerning the development of contaminated sites, the WAPC continues to be placed in prime position to judge the contamination status of a site, determine whether a site investigation is adequate, or if 'fatal flaws' exist in a project. The WAPC is, therefore, still empowered to make critical environmental and public health assessments without referral to the DEC or DOH (see WA Department of Environment, 2006, pp. v-vi).

[63] The City of Fremantle and the City of Cockburn are local government municipalities of the Perth metropolitan area.

opportunity for public comment on the proposal. The key concerns identified in these public submissions related to the contamination risks from the nearby South Fremantle Landfill Site, incompatible landuse, coastal setback provisions, traffic and parking issues, conservation of the coastal dunes, and the need for green belts and more public open space. The public concerns, along with the EPA and WAPC responses, are summarised in Appendix B. The MRS Amendment for the ANI site was finalised in 2001, and the site rezoned with relatively little public opposition.

The absence of critical appraisal of the full contamination at the site as part of the MRS Amendment was subsequently highlighted in correspondence between Carles Solicitors (acting on behalf of the Residents' Association) and the WA Planning Commission (2003a, 2003b). The Carles Solicitors' correspondence provided an overview of the MRS Amendment for the ANI site and, after community-based researchers discovered evidence of a lead smelting industry in the area[64], noted a change in the significance of the contamination issues to the local community.

Carles Solicitors highlighted that in the original application to support rezoning to 'Urban', the lead smelter was not mentioned. In fact, the lead smelter had not been noted in any of the rezoning documents or environmental reports dating back as far as 1996. As a result of this, the environmental assessment for the MRS Amendment was concerned only with "surface soil contamination...on the foundry site, contamination on the railway reserve, and possible soil asbestos contamination from buildings" (Carles Solicitors, 2003b). The contaminating impacts of lead, arsenic, and other heavy metals/metalloids, below the soil surface and along the beachfront, had not been considered under the regulatory appraisal.

Furthermore, until 2003, neither the developer, its environmental consultant, nor the WAPC, had officially released information to the EPA or to the public on the history of lead smelting at the ANI site, despite knowing of this from the outset[65]. Therefore,

[64] Carles Solicitors noted that in late 2003 its researchers discovered the existence of the lead smelter via a 1908 sewerage map (see Appendix G), publicly accessible at the local library.
[65] "South Beach Village managing director Mike Hulme said the consortium behind the project was aware of the smelter when it bought the site in 1998" (Kelly, 2003). It was also reported in the West Australian newspaper: "[the ALP Minister for Planning and Infrastructure] Ms MacTiernan said that the existence of the lead smelter factory had been known by the Government and the developers before the project started" (Lam, 2003).

the EPA's official environmental evaluation of the redevelopment proposal had been undertaken relying on incomplete evidence.

Although the WAPC eventually revealed the site's lead smelting history, the late presentation of this information meant that it had not been available for consideration by the EPA or the public at the time of the formal assessment for the MRS Amendment, and during the statutory community consultation period. By the time this information was publicly available, it was too late to present the information and include it as part of the overall assessment (Carles Solicitors, 2004)[66]. In effect, the necessary planning requirements for the project to proceed had already been approved, but without all the information on the levels of contamination being released to the public or being presented for formal environmental regulatory assessment.

The Residents' Association believed that without having undergone a scientific assessment based on an accurate industrial history, the regulators should have reappraised the redevelopment of the ANI site, and its suitability for residential redevelopment reassessed in light of the new data. However, there existed no formal procedures to set-aside or reconsider the keystone planning approvals - it was not possible within the regulatory framework to re-evaluate the decision to rezone and redevelop the land, based on these different contamination circumstances.

The Residents' Association viewed the remediation of a former lead smelter site to be entirely different to that required for a former ferrous metal foundry site. The soil contaminants were more hazardous and the remediation considered more difficult and more dangerous. Carles Solicitors (2003b) questioned whether the WA Government had the necessary experience to undertake or oversee such a hazardous remediation.

[66] Carles Solicitors cite a briefing note to the Minister for Planning and Infrastructure dated 19 Aug 2003. The Director General responded: "it is not appropriate…to now suggest to the public that they can make further comments on detailed technical issues and that their comments will influence the outcome."

Despite ongoing criticism by the Residents' Association and its representatives of the plan to rezone and redevelop the ANI site, the Minister for Planning defended her department's support for the project.

> *We are not prepared to sit on our hands and let this ugly blight, which has seen contaminated and disused industrial properties remaining on the key waterfront areas remain…These areas should be available for the public*[67] *to use. We are absolutely committed to cleaning this up and the way forward is to proceed with the planning process as we are doing. (Lam, 2003)*

5.3.2 Coastal setback provisions

Another element of the rezoning decision requiring consideration by the WAPC was the geological stability of the coastal location, in order to determine the coastal setback buffer distance. Although the Residents' Association raised concerns over the setback provisions issued for the site, the WAPC supported the rezoning relying on the following justification.

> *Pt Lot 1815 [the ANI site] is private property with an Industrial zoning in the MRS and local scheme which would allow for the site to be developed and used now*[68] *(subject to appropriate approvals) - it is not appropriate for the WAPC to prevent a change in zoning on the basis of coastal management issues when there is no basis to suggest that a change in zoning will affect the exposure of the land to erosion, particularly when the available information suggests the adjacent coastline is stable or accreting. (WA Planning Commission, 2000, p. 61)*

However, other evidence on the geological stability of the area, combined with projected sea level rises, provided in reports by an independent geologist (on behalf of the Residents' Association), the IPCC (2001), the CSIRO (2002), and Geoscience Australia (2005), demonstrated that it *was* possible that this site was at greater risk from the impacts of erosion than the WAPC was willing to accept. Furthermore,

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[67] This was an interesting interpretation by the Minister for Planning of 'public use' since the land was privately owned and was being redeveloped for the purpose of private residential use.

[68] That the soil testing for the site, undertaken soon after the WAPC released this statement, revealed that soil contamination levels would not meet Australian regulatory guideline requirements for commercial or industrial premises, and that remediation would be necessary before the site could be redeveloped, even for commercial or industrial uses, pointed to a serious flaw in the WAPC assessment.

contrary to the WAPC's justification for its decision, the public concern was not whether a change in zoning would "affect the exposure of the land to erosion" (WA Planning Commission, 2000, p. 61) (clearly it would not); rather, a risk from erosion existed, yet the land was being proposed for residential redevelopment. Whether it was either a sustainable development practice or an ethical practice to allow a private housing development on land subject to erosion were matters, in the view of the Residents' Association, not adequately taken into account in the WAPC's assessment.

Ongoing criticisms presented by the Residents' Association concerning the WAPC coastal setback assessment were challenged by the developer's lawyers who highlighted that the scientific evidence outlined only a 'worst case scenario' and that "…planning and environmental studies for the site had been properly addressed as part of the subdivision process" (D'Anger, 2006b, p. 3). The developer's lawyers called on the Residents' Association to provide a "…*credible* scientific study that addresses erosion and accretion at South Beach..." (D'Anger, 2006b, p. 3, emphasis added).

The coastal setback provision for the site, nevertheless, remained as a key element of the campaign by the Residents' Association against the ANI site redevelopment proposal. At a City of Cockburn Council meeting, the Residents' Association representative, Adele Carles, tabled a petition with 3,000 signatures calling for the WAPC's own 100-metre coastal setback policy to apply to the South Beach Village development. Upon asking whether the Council had sought advice on the effect of rising sea levels on the development, Ms Carles was informed by the Council's Planning and Development Director that the Council had not sought specific feedback on sea level changes at the lot. Ms Carles called on the Council to seek public comment on the plan along with scientific and legal advice. However, the plan was approved at this same meeting, without regard for further investigation into erosion or sea level rises and their potential impacts on the site (O'Brien, 2007, p. 7).

The Residents' Association, therefore, viewed coastal planning for the ANI site to have bypassed critical scientific evidence on the geological stability of the site, and applied an under-protective setback for development. Ultimately, the cost of any

impacts from erosion at the development site would be borne by local ratepayers or future residents of the site.

5.3.3 Structure planning

Many of the public submissions to the MRS Amendment (see Appendix B) expressed concerns that could not be addressed as part of a Scheme Amendment. These issues needed to be addressed as part of the non-statutory policy process of 'structure planning'.

The Structure Plan of a project is administered by the local government authority, under the direction of the WAPC, and provides

> *a framework for the coordinated provision and arrangement of future land use, subdivision and development including the provision of transport networks; public open space; utility and service networks; urban water management; development standards; and community infrastructure and other investment and staging programs." (Planning Western Australia, 2012)*

With whom or how regular the community consultation for the Structure Plan ought to be, are matters open to interpretation by the administering local authority. Furthermore, with no clear incentives or benefits for one local authority to service residents from another local authority under the structure planning consultative process, cross-boundary consultation between local government authorities can be ineffective. For residents closest to the South Beach Village redevelopment, and who lived within the City of Fremantle, management of the structure planning process by the City of Cockburn proved to be problematic at several points.

The call for public comment on the South Beach Structure Plan was first advertised by the City of Cockburn during May and June of 2002, with signs being erected at the ANI site, notices placed in the local newspaper, displays placed in City of Cockburn public libraries, and letters sent to adjoining landowners[69]. The City of Cockburn (2002) noted that the developer had already held public workshops and

[69] No South Fremantle residents are known to have been directly contacted by the City of Cockburn with regard to the Structure Plan for the ANI site. The City of Cockburn did not identify South Fremantle residents as 'adjoining' landowners, despite their proximity to the site, because development companies or commercial businesses owned most of the land abutting the ANI site.

presentations during March 2002 and, therefore, further consultative forums were deemed unnecessary.

The City of Cockburn Council adopted the South Beach Structure Plan in July 2002 subject to a number of restrictions and further reviews. Although the 2002 Structure Plan addressed several outstanding issues from the MRS Amendment process, it acknowledged that some matters relating to contamination, both at the ANI site and at surrounding sites, would remain outstanding, to be addressed at a later date (City of Cockburn, 2002).

Housing density

In 2005, a revision to the South Beach Structure Plan was adopted by the City of Cockburn Council. This revision included increases to the residential density requirements (R-Codes) for some portions of the South Beach Village and variations to the road layout (City of Cockburn, 2005). There was no requirement to advertise this revision for public comment.

In 2006, the City of Cockburn proposed a further revision to the Structure Plan, specifically relating to the ANI site portion of the South Beach Village. This revision included changes to the residential density codes from 20 residential lots ranging from R20 - R100, to R80[70] for the entire site. This amounted to a change from predominantly single lot subdivision to four apartment blocks of six storeys (City of Fremantle, 2007). The City of Cockburn (2006) advised:

> *The South Beach Structure Plan has already been through a comprehensive public consultation program, which included workshops [in March 2002 - more than 4 years earlier]. The proposed structure plan changes do not materially alter the intent of the Structure Plan and therefore no further public consultation is required.*

The City of Fremantle, however, viewed this differently. The City of Fremantle Mayor claimed "…the changes to the structure plan were significant and should have

[70] These R-codes refer to the allowable design, scale, and density criteria for the area. For example, "R20 generally indicates a density of 20 dwellings per hectare" typically representing a single lot dwelling of 500m^2 (WA Planning Commission, 2008, p. 3). For further information see 'Residential Design Codes of Western Australia: explanatory guidelines' (WA Planning Commission, 2008).

gone out for consultation…they're changing the structure plan without going through the democratic process" (D'Anger, 2006c, p. 8).

Therefore, not only would the redevelopment project involve unearthing more heavily contaminated soils but the building structure would also be significantly larger than originally proposed. Local residents viewed these housing density changes in terms of more people competing for the same resources and placing greater pressures on the local natural environment.

Railway buffer

The matter of the proximity of the ANI site housing development to the freight railway line was deferred under the WAPC/EPA (WA Planning Commission, 2000) assessment, and considered better addressed through noise attenuation as part of the building criteria. Fremantle ALP MP Dr Carmen Lawrence's response to this (cited in Meszaros, 2006), by way of identifying the railway setback requirements, highlights the irregular application of planning safety features.

> *It seems to me unthinkable that you would knowingly place people right beside what will be a very active railway line, especially when again the railway's own bylaws require it to be 65 metres, I understand, on either side.*

Future projections by Fremantle Ports on its use of the freight railway line pointed to substantial increases in traffic (WA Planning Commission, 2000). The types of freight to be transported to the port, which included hazardous materials, further established the critical importance of more carefully considering placement of the new residential housing development within the rail buffer area.

Given the narrow aspect of the ANI site, and its location between the ocean and the freight railway line (see Figs 1 & 2), default setback requirements (for either coastal or railway buffers) would have been impossible to apply anyway, and comprised planning elements best disregarded or superficially considered by decision-makers, if the project was to go ahead.

5.3.4 Aboriginal heritage

For the planning approval of the ANI site to proceed, there remained one further barrier to development - the ANI site and surrounds were included as part of an area of significance to the local indigenous people. Although the Aboriginal heritage of the ANI site does not feature significantly in this thesis, nor in the actions of the Residents' Association[71], the release of vital site history for the Aboriginal heritage assessment offers further insight into the irregularity of the regulatory assessment of this contaminated site and, ultimately, into the disregard given important cultural matters.

The use of the land near the ANI site by the Noongar[72] people is detailed in two ethnographic surveys commissioned by the developers of the South Beach Village project. The first of these reports, being an 'Ethnographic survey of the Aboriginal Heritage values of the proposed South Beach Village development South Fremantle' (McDonald, 2003) was undertaken to determine the significance of the area to the local indigenous people, with a view to establishing the procedures required for development of the area under the *WA Aboriginal Heritage Act (1972).* The second report by Parker and Maling (2003) aimed to complete the consultation process with the Combined Metropolitan Working Group Native Title Claimants representatives.

McDonald (2003) reported that the ANI site was included as part of the Robb Jetty Camp, which is recognised as an area of significance to local indigenous groups, but noted that

> *…the ANI Foundry has been used as an industrial site since 1898 when the Fremantle Smelter was established on the land and therefore it was argued that the area should not have been included within the boundaries of the Robb Jetty Camp site (Site ID 3707[73]) which had reportedly been used as a campsite since approximately 1910 (O'Connor, Bodney, & Little, 1985). A submission was made to the Aboriginal Cultural Material Committee (ACMC) in this*

[71] The actions by the Aboriginal group were separate from the actions by the Residents' Association. The Aboriginal group addressed the Aboriginal heritage issues, while the Residents' Association addressed the concerns of the local, (predominately) non-Aboriginal residents, as detailed elsewhere in the case study of this thesis.

[72] The spelling of 'Noongar' (IPA pronunciation: nju:ŋgə) is variable and may also be seen as Nyungah, Nyungar, Noongah, Nyoongar or Nungar. Each author's original spelling has been retained in text.

[73] This number denotes an area reference used under the *WA Aboriginal Heritage Act (1972).*

> *regard at its October 2003 meeting. The ACMC, however, requested that the proponents lodge a Section 18 application for the Robb Jetty Camp and noted that it would reconsider the matter in the light of the historical and ethnographic information provided. (pp. i-ii)*

It is also important to note that the Aboriginal group raised concerns over "…the remediation and rehabilitation of the landscape and, in particular, the coastal dunes and the reintroduction of native flora and fauna to the area", along with the social mix, density, and allowable building heights of the proposed South Beach Village housing program. One of the group raised the issue of native title, pointing out "…the land originally belonged to Aboriginal people and…Aborigines had not ceded their land to settlers. [This same group member] expressed the view that Nyungars should be compensated for their loss" (McDonald, 2003, p. 26).

The Parker and Maling report concluded:

- *The coastal strip along which the Nyungah people once travelled, camped and hunted is a significant area for today's Elders.*
- *The Indian Ocean and the three islands mentioned in the text are also places of significance to the Nyungah Elders.*
- *The whole of the project area will impact upon the country included in site ID 3707, however, the area included in the development has been completely cleared and developed in the past and any physical vestige of surface expressions of any site will have been destroyed or removed…. (p. 17)*

The Parker and Maling report recommended "…a section 18 application[74] be made to the Minister for permission to disturb that area within site ID 3707… [and] that the project be allowed to proceed" (p. 18). The section 18 application to enable consent to the project under the *WA Aboriginal Heritage Act (1972)* was granted.

Although the Aboriginal heritage assessment, submitted during 2003 by the developer, was very clear in its assignment of the smelter location, the developer's

[74] This application was made under the *WA Aboriginal Heritage Act(1972)*, being, "an Act to make provision for the preservation on behalf of the community of places and objects customarily used by or traditional to the original inhabitants of Australia or their descendants, or associated herewith, and for the purposes incidental thereto." Section 18 pertains to 'consent to certain uses'.

environmental consultant was still referring to evidence of a smelter in the area as merely 'anecdotal' in the official Department of Environment (DOE) Site Summary Form, as late as May 2004 (WA Department of Environment, 2004g). From this information, it would appear that the developer was keen to acknowledge the presence of the smelter, if it meant overturning an Aboriginal heritage claim, which might have restricted development. At the same time, this information was not released either to the public or environmental agencies, possibly because it could have resulted in more stringent environmental restrictions and greater public opposition.

The views of the wider Perth Noongar community, provided during the 2005-6 WAPC Perth Coastal Planning Strategy forum, reflected those of the Fremantle Noongar community. This forum emphasised that the indigenous people of Perth believed they were being excluded from the planning processes; that uncontrolled development of the coast was occurring without regard for future needs; that unpredictable changes to the coast were not being adequately considered; and that places of cultural significance[75], spiritual dreaming[76], and environmental value were being destroyed (WA Planning Commission, 2006a, p. 3).

> *One cannot extricate Aboriginal heritage from the surrounding natural environment as Aboriginal cultural heritage and history is written in the landscape. To destroy that landscape is tantamount to destroying their cultural heritage and history….With the rapid development of the Perth metropolitan coastal strip, indigenous people feel a sense of loss, powerlessness and anger....being equated with a loss of culture.*
>
> *When there is a proposal to destroy coastal heath, shrubland and its related dunal system, or natural bushland containing mature trees, Nyungars invariably react with an admixture of hostility and anxiety, claiming that white people have not only tried to destroy their people, culture and spirituality, but now they intend to finish them off by destroying the last remaining tangible*

[75] For example, the cultural heritage of the coast from which Aboriginal peoples derived food, medicine, and mythology.
[76] For example, the Dreaming Track of the Waugal. The Waugal represents the south Western Australian Aboriginal peoples' mythological serpent creator. Sites created and inhabited by the Waugal have profound spiritual and cultural significance to the Noongar people.

> *symbols of their traditional culture: the remnant bushscape and in coastal regions, the remnant dunescape. (WA Planning Commission, 2006a, p. 42)*

The Noongar Elders who attended the forum maintained that they had little faith in the Government's ability to manage the coastal environment.

5.4 The management of site contamination and the regulatory response

Until 2003, the ANI site had been classified by the developer, its environmental consultants, and the planning regulatory body, as a former ferrous metal foundry. Therefore, the developer's environmental consultant had deployed environmental testing programs to standards that would best detect contaminants for that industry type, and in the relevant areas, being primarily at the soil surface. The results from an early suite of tests, deployed to the required standard, showed only minor exceedances of the Australian soil guideline values (see Appendix D), further supporting the regulators' and developer's claim that the contamination at this site was manageable.

Following the finalisation of the planning approvals, the management of the site was re-evaluated, based on two 'new' findings. Firstly, more comprehensive testing of the site, under direction by the EPA (see WA Planning Commission, 2000) and in accordance with DOE requirements (see ENV Australia, 2004b, p. 11), revealed more extensive contamination than had been previously identified (see Appendix D)[77]. Secondly, the 'anecdotal' evidence of lead smelting in the area was replaced by more concrete evidence[78] of a pre-Bradken industrial history, as provided by local

[77] For example, earlier test results for lead showed it exceeded the residential guidance criteria little more than two times. More comprehensive testing, however, revealed the same safety criteria were exceeded up to 53 times, and lead was identified over the entire site and throughout the soil profile to groundwater levels down to six metres.

[78] The 1908 sewerage map (see Appendix G) showed the location of the smelter buildings and slag heaps relative to other local landmarks, while the historical aerial maps showed the extent of waste disposal, evident more than 25 years after the smelter's closure. Photographic evidence of the smelter is now known to be extensive.

community researchers[79] - a primary lead and gold smelter had indeed operated from the ANI site and the land surrounding it.

Furthermore, with the lead smelting history of the site finally revealed and with lead well established as the primary contaminant at the ANI site, local residents were now questioning the safety of its disturbance. However, with the keystone planning approvals in place and statutory public comment periods closed, the best the local community could hope for was to negotiate with the developer for improvements to its environmental management program, to control any contamination releases.

The remediation of lead contaminated sites is known to be difficult. These types of remediations present with problems relating to the toxicity of the contaminant, its environmental persistence, and its removal without further environmental mobilisation. In fact, it is understood that lead remediation activities can result in higher environmental exposures (Mushak, 2003, p. 36) if the activities are not well controlled. The remediation activities proposed by the developer for the ANI site, therefore, needed to not only reduce the levels of contamination in the soils, but also prevent any impacts from contaminant-laden dust on surrounding areas and public health during the remediation works.

5.4.1 The ANI remediation plan in brief

In order to meet with the specific requirements of the new landuse, namely residential, the WA EPA (see WA Planning Commission, 2000) stipulated that the ANI site was to have soil remediated to a level consistent with relevant Australian health safety criteria, as defined by the National Environment Protection Council (NEPC) (1999a, 1999b) guidelines. Any dust or runoff from the site during remediation was deemed a risk to human and environmental health (WA Planning Commission, 2000) and, therefore, strategies to manage site activities, likely to produce contaminated dust or stormwater runoff, were to be developed and deployed.

There was no explicit requirement by the EPA (see WA Planning Commission, 2000) to have the contaminated groundwater[80] under the site remediated[81]. And

[79] Carles Solicitors, acting for the Residents' Association, claimed it was community researchers who were first to provide the environmental regulators with evidence of the Fremantle Smelting Works via the 1908 sewerage map, which was publicly accessible at the local library.

regardless of the potential for contaminated groundwater to be discharged at the beach-marine interface[82], no restrictions were placed on recreational fishing or public use of the beach. The foreshore area was, in fact, determined to be 'not contaminated' by the City of Cockburn, despite evidence to the contrary[83].

Post remediation, the ANI site would be considered suitable for any landuse, provided that the groundwater was not abstracted (WA Department of Environment and Conservation, 2008). Nevertheless, because residual contaminants would remain after remediation, soil was not to be used for the cultivation of vegetables and was deemed a health risk if ingested by children (Hately, 2005a, p. 1).

The proposed remediation was to involve a 'dig and dump' program with the excavation of approximately 75,000m^3 of soil[84]. The developer's remediation contractors would assess the contamination content of excavated soil. If the soil was deemed 'clean' - that is, meeting the site specific clean-up criteria (CUC) - it would be returned to the excavations. Alternatively, if the soil did not meet the CUC it would be removed for disposal to an appropriately classed landfill site.

The site specific CUC for soil (see Appendix E) were determined using the Australian Health-based Investigation Levels[85] - sensitive land uses (HIL-A), the Ecological Investigation Levels (EIL), and the results from leachate tests[86]. However,

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[80] Groundwater analysis during 2003 revealed contamination by fluoride, arsenic, chromium, copper, manganese, molybdenum, nickel, zinc, and lead. Copper and lead exceeded the Marine Water Guidelines (ENV Australia, 2004b, pp. 22-23).

[81] Groundwater remediation responses in WA largely comprise of monitored natural attenuation, modelled on the UK process (WA Department of Environment, 2004a, p. 4), designed to monitor the concentrations and movement of groundwater contamination plumes. The WA environmental regulatory agency does not routinely apply active remediation or barriers to prevent contaminated groundwater plumes reaching sensitive water bodies.

[82] ENV Australia (2004b, p. 5) cite the groundwater flow as being in a westerly direction, that is, towards the ocean.

[83] DOH biological samples from the ocean revealed elevated levels of lead in sea squirts, but the DOH concluded that there was no risk to public health because such animals were not eaten by humans (WA Department of Health, 2004c). Despite the results from these tests on marine organisms indicating a source of marine contamination, no further testing of the beach or the water was undertaken and the City of Cockburn concluded that these areas were not contaminated.

[84] The actual works involved the excavation and testing of over 110,000m^3 of soil, with approximately half of this removed to landfill. The total time to complete the works was 209 days (Stockland, 2007). It is of interest that an earlier assessment by the developer's environmental consultants reported that only 10,000m^3 of soil would need to be removed from the site (see ENV Australia, 2004a, p. 2).

[85] These criteria are discussed in section 4.2.2.

[86] Leachate tests measure how mobile a contaminant is in soil, under controlled conditions. Leachate tests determine whether groundwater is likely to be impacted and they determine the landfill

a report released by community-based scientists (see Dingle, Bell, & Duckworth, 2005) questioned whether the Australian health safety criteria had been applied in the most comprehensive manner and in accordance with NEPC guidelines and, furthermore, whether the official regulatory data reflected the latest research findings on health impacts from lead at low levels[87]. The community-based scientists also reported that the environmental consultant's assessment of the leachate test results showed a number of anomalies. For example, it was noted that some data had been dismissed, and one dismissed data set showed lead to be capable of impacting on the marine environment at very low soil concentrations, below the HIL-A. Therefore, it was feasible that the data used to define the safety standard for the site operations were inaccurate, and possibly under-protective. The community-based scientists concluded:

> *the model being used to predict the CUC value is not robust enough to provide an upper limit for lead in soil, which will not impact on the marine environment. A regression line (line of best fit) is being used as a model to set safety standards. Given that the regression line has a low R^2 value, this regression line does not hold strong predictive power, and as such does not offer a sound model upon which to base a safety standard. (Dingle et al., 2005, p. 12)*

Despite these (and other[88]) assessment anomalies being highlighted in the community-based scientists' report, the data provided by the developer to support its safety criteria for the ANI site remediation were accepted under DEC and DOH appraisal. Neither the developer nor the WA Government assessors responded to the criticisms of the safety criteria raised by the community-based scientists.

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classification for contaminated soil. Leachate tests provide context-based information about soils at a specific site.

[87] The action level for lead in blood for young children, declared protective at the time of the ANI site redevelopment, was 10µg/dl. This action level was soon to come under review by WA DOH in its assessment of other lead pollution events, and replaced with 5µg/dl. International research at this time (see Menke, Muntner, Batuman, Silbergeld, & Guallar, 2006) was demonstrating chronic health impacts from BLLs as low as 2µg/dl. However, this point was irrelevant because no biomonitoring was undertaken for the duration of the ANI site redevelopment project.

[88] Of particular concern was the absence in the official records of a detailed health risk assessment and the failure to assess the additional risks from chemical mixtures. Of the many toxicants identified from the ANI site, arsenic, cadmium, manganese, zinc, copper, and mercury, for example, are all demonstrated to have additive effects with lead for impacts on various organ systems (Agency for Toxic Substances and Disease Registry, 2004a, 2004b, 2006).

Therefore, the local community was left believing that the soil safety standards defined for the ANI site were under-protective and that the application of the national guidelines (including context-based appraisals) was being mishandled by WA Government regulators.

Dust suppression during the remediation works involved using a combination of soil wetting, storage of stockpiled soil (awaiting testing) in the old foundry buildings[89], and by 'taking due care'. Dust monitoring, from three monitoring stations positioned within the 2.61 hectare site, was used to alert the contract workers to any breaches of the air quality standards.

The remediation works commenced in May 2006 and were near completion by December 2006. The developer's rationale for a late autumn commencement for excavation works was to ensure the best climatic conditions to minimise dust dispersal and to take into account the reduced usage of the surrounding recreational areas during this time of year. The local community responded that the area was heavily used all year round and, furthermore, with the onset of storms during autumn and winter (May-August) and associated strong wind conditions, the developer's commencement of site works at this time was problematic.

Predictive models, reliant on limited data on soil contamination and air quality, provided the primary means by which to measure the (possible) human and environmental contamination exposures from the remediation activities at the ANI site. In an attempt to develop a strategy to address any community-wide increases in blood-lead levels, and to provide a more accurate account of the actual biological exposures from the remediation activities, community members requested that the DOH also initiate a biomonitoring program (e.g., blood or urine screening)[90]. This program would alert local residents to any changes in their exposure to lead or other contaminants, would support early health interventions, and prompt further investigation of the site management strategies. However, the ALP Minister for

[89] This method of dust suppression could only be undertaken while the foundry buildings were still standing. However, it was necessary for the buildings to be demolished to excavate the contaminated soils under them. Therefore, the building's protective function could never be employed for the entire remediation. The regulatory authorities overlooked this obvious failing of the dust management plan.
[90] Langley (1993: cited in enHealth Council, 2002) noted that "direct measurement of the exposures of the (potentially) affected population provides the best exposure data but this is not always available or practicable and default exposure data is often required" (Langley, 1993, p. 90).

Health, The Hon. Jim McGinty[91] rejected this request. A local resident recalled: "…he [Mr McGinty] just said there was no need for them...he said the developer would enforce controls to mitigate the risk of contamination, and conduct air monitoring to ensure the controls were working" (Burnett, 2005, p. 3).

In response to the community's ongoing fears that contaminated dust would be released during the ANI site remediation, and that this would cause health impacts before it was detected and managed, the City of Fremantle negotiated directly with the developer on the subject of enclosing the site. City of Fremantle Councillors claimed "…the potential health damage was obvious and the council should do its utmost to help the community..." (O'Brien, 2006, p. 1). However, the developer refused to apply any site cover, claiming that the strategies to be put in place were adequate and had been approved by the DOE and DOH as safe.

5.4.2 Regulatory and community responses to the remediation plan

The developer's final Environmental Management Program (EMP) document was the fourth to have been submitted to the WA Departments of Environment and Health for appraisal. Versions 1 and 2 (submitted 2 March and 7 May 2004 respectively) were both rejected on the grounds of "…not having addressed the issues of major significance" (WA Department of Environment, 2004c). Amongst more than twenty points in the DOE's rejection letter for the EMP version 2, noted deficiencies included:

- questions on whether the dust could be effectively managed in such a windy location, in close proximity to the residential area;
- insufficient detail on the management of stormwater on site;
- ambiguity of some of the terminology used and poor explanation of how certain data were derived;
- the lack of critical audit details and other specifics of the remediation works, required to assess the program;

[91] Mr McGinty was also the ALP Member of the Legislative Assembly (State parliamentary lower house) representing Fremantle.

- inappropriate use of 'visual' inspections to determine contamination levels in soil[92];
- serious flaws with the interpretation of modelling data in the 'Contaminant Fate and Transport Assessment Former South Beach ANI Bradken Site' report; and
- an inability by the developer's environmental consultants to satisfactorily address and incorporate departmental recommendations into revised documents (WA Department of Environment, 2004b).

The DOH's Acting Principal Toxicologist (WA Department of Health, 2004b) provided the following comments on the EMP version 2:

> *It is suffice to state that DOH is not satisfied that the developer has presented detailed information on the location of contaminated zones or how disturbance of 75,000m^3 of fill, interspersed with these highly impacted zones, will be managed in an appropriate manner so as not to cause a public health risk...Concerns remain that the developer is proposing to disturb significant volumes of fill that is dispersed with zones containing high levels of heavy metals on a site that is prone to gusty wind conditions and in close proximity to residential areas...Any dusts generated from this site need to be considered as potentially contaminated and managed accordingly. This will be a difficult task given the high level of disturbance that will result from the strategy proposed, a situation that will be magnified by the coastal foreshore location that is exposed to onshore winds and is in close proximity of residential areas…Consequently, I am not satisfied that the proponent has demonstrated their capacity to carry out the remediation in a manner that will not present a public health risk. In support of this view I advise that it is disconcerting that issues already identified by the regulatory agencies as requiring attention have not been addressed in the REMP [the revised document] and this does not instil confidence that issues requiring attention during the remediation process will be addressed at that time.*

[92] The developer's environmental consultants overlooked some soils for contamination testing simply because they 'looked' clean.

Further to this, the DOE (2004b) noted that, "…with the issues that have arisen with version 1 and 2 of the EMP…it is our opinion that it is likely that remediation of the site may not be able to be performed in accordance with an approved EMP".

The DOE (2005d) acknowledged that the site, as it remained, was relatively safe compared to the risks that could result from excavation works.

> *From a contaminated sites perspective the site currently does not pose a risk to human health or the environment as heavy metal contamination is located beneath hardstand. Site demolition and remediation will however raise the potential hazard level as heavy metal contaminated soil will be excavated, screened and stockpiled at the site with the potential to generate considerable dust problems given the volume of fill being excavated and the location of the site in a coastal environment.*

Despite voicing these reservations over the safety of the proposed remediation, instead of rejecting the proposal outright, the DOE and DOH consulted and, subsequently, recommended that the developer employ a New South Wales or Victorian EPA accredited contaminated sites auditor to undertake a peer review of the EMP version 2; to oversee the remediation works and audit compliance; and also employ a suitably qualified geochemist to determine the relationship between soil contamination and groundwater, and its capacity to impact on the marine environment (WA Department of Environment, 2004b). After initially suggesting that the remediation was a risky proposition, the DOE and DOH went on to support the project in principle.

During December 2004, the WAPC approved the auditor endorsed EMP version 3, amid community claims that there had not been adequate community consultation or independent review of the remediation program. In fact, community opposition to the project became so strong that during 2005 the Residents' Association mounted a legal action against the WA Government and the developer. Section 5.6 provides a more detailed account of the legal action by the Residents' Association.

In response to ongoing community unease over the impending remediation, the DOE and DOH (2006) collaborated on an information brochure, targeting residents living

near the ANI site. The brochure provided a brief and optimistic overview of the remediation plan and included several statements that contradicted earlier concerns expressed by the same agencies, while significantly understating any risks they had previously attributed to the project (see WA Department of Environment, 2004b, 2005d; WA Department of Health, 2004b). For further information, the DOE and DOH referred residents to the developer's website or the developer's Site Operations Officer on matters arising from the remediation.

Many community members viewed with disbelief this response from the DOE and DOH. In their view, the regulatory agencies had moved beyond their independent role and had become the spokespersons for the developer. Importantly, the precautionary approaches dominating earlier regulatory debate over the management of the site had been replaced with a greater certainty in the safety of the project.

Despite assurances by the developer and the DOH that the site controls would be protective of public health (*The Gazette*, 2006, p. 2), the Residents' Association representative, Adele Carles, noted that the local community had "…assessed the information available and decided that the potential risks associated with this open-styled remediation outweigh the benefits of staying in [their] homes" (Hately, 2005c, p. 1). Ms Carles claimed the work marked the opening of a toxic Pandora's Box - "those of us with kids are just getting out" (Kelly, 2005, p. 13).

While some community members felt that they must physically relocate (some temporarily, others permanently) to avoid the risks from contaminated dust, others felt indignant that the community was being forced into this predicament. Resident and community campaigner, Bobby Wilson, expressed deep concerns about how the clean-up of the ANI site was splitting the local community - residents, especially those with young children, were leaving and felt disheartened that they had not been given the opportunity to be heard. "Why should we have to leave our homes to be safe" (Wilson, 2006)?[93]

[93] Some of the content of Bobby Wilson's site monitoring campaign is provided at https://savesouthbeach.wordpress.com/category/contamination/

The ANI site remediation continued, but was watched closely by the local residents who had opted to stay. The local precinct meeting[94] reported:

> *…the developers continue to develop the site as required by government departments albeit some of the residents are experiencing an increase in the level of dust on cars and windows, the developers maintain the dust does not come from the ANI site[95]. (South Fremantle Community Precinct, 2006)*

One local resident claimed: "since work started on the South Beach Village and ANI site thick dark grey dust routinely filter[ed] into her Daly Street home through a skylight...'I can't stay there it imposes on my health'" (D'Anger, 2006a).

Many high velocity wind events did occur during the remediation operations, and exceedances of Total Suspended Particulates were regularly recorded, but the environmental auditors attributed these exceedances to events 'external' to the ANI site activities. These dust events typically followed a pattern already observed by the local community - there were no management strategies to counter the effects of high winds on the local soils, where even water-saturated beach sand was known to be carried significant distances under local wind conditions[96]. Armed with this knowledge, the local community understood this could mean only one thing - contaminant-laden dust *was* being blown into the residential area during the remediation. Anecdotal reports of dust build-up in the residential area during the remediation operations further reinforced this belief. However, without official dust monitoring of the residential area or biomonitoring of local residents by the WA Government regulatory agencies, community claims of impact from contaminated dust could never be verified.

[94] The City of Fremantle precinct system is a form of community engagement. The precinct group comprises local residents working in partnership with the City, on matters of local interest and importance, for the good of the community (City of Fremantle, 2012).

[95] Over the years, local residents had become highly knowledgeable on the colour and texture of the various dusts coming from surrounding sites - dust from the beach and other surrounding sites could be differentiated. Therefore, claims by regulatory bodies and the developer that dust was not emanating from a particular location, when the evidence suggested otherwise, were met with a high level of suspicion and cynicism by the local community.

[96] Coastal Fremantle regularly experiences storms and strong winds gusting to over 100km/hr.

5.5 Community consultation for the ANI site redevelopment

The earliest community consultation for the ANI site redevelopment occurred as part of the MRS Amendment. Under this process, the public was able to access information on the preliminary environmental testing and was permitted to comment on a range of matters relating to planning and environmental management for the site. This was the main statutory mechanism available for community consultation for the duration of the project, yet it was finalised long before comprehensive contamination testing of the site and before several key planning criteria were released for discussion.

Following the approval of the (2001) MRS Amendment, the earliest (2002) non-statutory consultative programs for the ANI site remediation included a series of well-attended workshops, with opportunities for local community members to provide input into the overall street and building design for the site. The issues discussed at these workshops included housing density, building height, and the social make-up of the new development. However, at this time, the public was still not aware of the full contamination history of the site.

The redevelopment model initially pursued was of a much smaller scale and was to follow the 'ecovillage model'. There was noted commitment by the developer[97] to sustainability principles, with the South Beach Village being flagged as an "…urban development that has the potential to become a leading Australian example of sustainable urban settlement" (Ruane, ca. 2002). In fact, early on, the local community viewed the proposal for an ecologically sustainable urban development for the South Beach Village site positively.

During 2004, the main advocate of the ecovillage model withdrew from the project and sold its share of the South Beach Village (including the ANI site) to Stockland Pty Ltd, one of Australia's largest and most profitable property developers[98]. Under

[97] South Beach Pty Ltd was initially owned by Mike Hulme, Tony Ruse, and the Peron Group but was sold to Stockland Pty Ltd.

[98] Stockland received the 2005 Housing Industry Association National GreenSmart Professional of the Year Award "recognising the most environmentally responsible approach to residential development". For the same period Stockland also won the NSW Greens Bad Developer Award 2005 being named Australia's "worst of the worst" 'Bad Developer of the Year' for their "…development of a fragile coastal headland and Aboriginal burial and tool-making site dating to 5000BC at Sandon Point, North of Wollongong" (The Greens NSW, 2007).

Stockland's new proposal for the South Beach Village, the earlier vision for a sustainable urban village was replaced with the concept of the 'boutique estate', which catered for the upper end of the property market. The original plan to create a "…community that promotes and caters for a diverse mix of people" (Ruane, ca. 2002) was unlikely to be realised under the Stockland 'boutique estate' plan.

Although the original project proponent had advocated community involvement in the site development strategy, the evidence presented to the community concerning site contamination was, at the time, fragmentary. Accordingly, opportunities for the local community to contribute to decision-making in an informed and, therefore, meaningful manner had been restricted. The eventual disclosure of more extensive contamination at the ANI site, however, did not require a revision of the original plan, or entitle the local community to further consultation. The new developer was not even obliged to retain the development proposal that was the subject of the earlier consultative process. With the preliminary planning approvals complete and the community consultation requirements finalised, the new project developer was now free to pursue development under a model of its choosing and with its regulatory obligations fulfilled.

The new developer, nevertheless, did respond to community requests for 'inclusion' but only by way of newsletters, a dedicated website, and community information sessions. However, when the local community took the initiative to ask questions or point out flaws in the proposal (particularly via local media), the developer portrayed any critical enquiry as lacking scientific insight or as being anti-development (and thus ideologically motivated). The developer suggested that community members were "...exaggerating contamination fears to support their aim of preventing homes being built within 100m of the beach..." (Kelly, 2003), and it expressed hostility at the community's use of the media, and ultimately a legal challenge, to assert its rights.

The developer's account of its community consultations was epitomised in its advertising:

> *Stockland has invested significant time, capital and effort into ensuring the clean-up process was completed to the highest possible standards. The feedback received from the local community and key stakeholders acknowledge the extensive planning and careful site works put into this project. Specifically, it was suggested that the remediation project and communications program be used as a benchmark for remediation works and community consultation for other projects. Stockland will share this best practice result with the relevant industry bodies and across all our other projects to ensure the positive learnings are transferred. (Stockland, 2007)*

The shortcomings of the developer's community consultation program, however, can be explained by its legal obligation (or, rather, absence of legal obligation) to work to higher standards. And even though the developer was eventually forced under a legal ruling to recognise the Residents' Association as the representative body of the local community, the legal criteria for 'consultation' remained ambiguous, and there were no provisions in place to force the developer to take into consideration any of the concerns raised by the public. Effectively, the rights of the public to be afforded a genuine and meaningful consultative role could not be guaranteed under the existing regulatory provisions.

Furthermore, even via the local government stakeholder involvement strategy the local residents were not assigned any special status. The City of Cockburn targeted only 'adjoining' landowners (being the proponent itself, other land developers, and smaller commercial businesses) (Mitchell & Burnett, 2005) in its consultative mechanisms and, in fact, determined that consultation with local residents (who mainly lived within the City of Fremantle) did not need to be ongoing. Instead, the City of Cockburn relied on consultative mechanisms that had occurred several years earlier, and under a significantly different project proposal, to claim that it had met its consultation targets. Both the City of Cockburn and the developer, under the non-statutory mechanisms for consultation, neglected the local community's request for early and ongoing consultation, and the expectation that it could influence decision-making for the site.

Although the Residents' Association remained focussed on the need to negotiate with the decision-makers and not the developer, the WA Government regulatory agencies

commonly declined meetings or hearings with the group and there is no evidence that the regulatory agencies considered community submissions in any detail. In fact, the non-statutory consultative mechanisms that applied did not explicitly support direct consultation between the Residents' Association and the decision-makers. Instead, the group was referred by the regulators to the developer (the proponent), or even the developer's representative (see WA Department of Environment and Conservation, 2006a, p. 8). Any submissions lodged with the regulators by the Residents' Association were forwarded on to the developer, and it was the developer's responses that would be reviewed by the regulators. Therefore, regulators gave the developer power to decide which issues raised by the community were worthy of a response (see WA Department of Environment, 2005a, 2005b). The developer, however, was under no obligation to consider or act upon well-founded community opposition, irrespective of the validity of its arguments.

In the absence of meaningful modes of engagement with either the developer, the local government authority, or the regulators, the Residents' Association relied on information accessed through FOI to glean insight into the grounds for decisions. Consistent with the many documented flaws in WA's FOI provisions (see Lidberg, 2006; McKinnon, 2008; WA Office of the Information Commissioner, 2010, pp. 5-7), these applications by the Residents' Association and its representatives proved expensive and offered very little by way of illuminating the underlying justifications for government agency decisions. Furthermore, appeal to the State Administrative Tribunal (SAT) - a process designed to manage problems involving public decision-making - was not allowable under the WA Government criteria (see section 4.5.2). Greens MLC Lynn MacLaren noted: "South Beach highlight[ed] the weaknesses in both SAT and WA's planning and development structure" (McGlynn, 2005, p. 4).

With no official mechanisms available to assure its meaningful and ongoing involvement, the local community applied alternative strategies. To elicit wider community support and negotiate a place as a stakeholder in the decision-making process, the Residents' Association had been formally established, politicians lobbied, independent experts employed to assess the remediation plans, community

actions and events launched[99], fund raising activities organised, a website created[100], involvement in the formal political process negotiated[101], and legal avenues ultimately pursued. These actions created the opportunity for access to and dissemination of information, wider community involvement and ownership of the campaign, and also elicited the support of local, State, and federal politicians, environmental lobby groups, high profile scientists, celebrities, and local businesses, thus producing a politically, socially, and scientifically viable backdrop to the campaign.

The members of the Residents' Association were adept at using local media sources to argue their position, but also made use of State-wide and national media coverage to harness growing community unease over coastal redevelopment, environmental pollution and, in particular, the impact of lead pollution on children. The Residents' Association also used local media to document private interactions with the State Government agencies and the developer, to respond to government and developer comment, to educate the broader community, to further debate the scientific qualities of the project, to prompt action, and gain wider support. The local story even sparked the interest of a Community Television documentary-maker, who produced a short film, 'Power and greed versus common-sense: the South Beach saga' (Meszaros, 2006) for public viewing and television broadcast. Finally, having failed in its personal negotiations to have its members' views considered as part of the official decision-making process, the Residents' Association took its concerns to the WA Supreme Court (see section 5.6).

The strategies employed were an attempt to appeal to morals and values, in parallel with the rationality offered via the evidence-based science. The use of diverse and

[99] For a short video of the fund-raising concert, see http://www.youtube.com/watch?v=HwbY_ZVBdyc.

[100] The original SaveSouthBeach.com website is no longer operational. Some of its content has been transferred to http://savesouthbeachfremantle.tripod.com/. During 2006, the developer created its own website using the community's signature slogan. Thus, SaveSouthBeach.com.**au** would take you to the Stockland South Beach Village promotional website. Carles Solicitors (2006) described this as a "hijacking" of the community website and the act of a "desperate" corporation.

[101] In 2005, several community activists ran against the standing Australian Labor Party (ALP) members in the WA State election, as part of a Coastal Coalition ticket covering the Fremantle and Cockburn electorates. The success of the Coastal Coalition provided further ammunition to argue against the developer and WA Government's claim that this was only a minority protest group. In 2008, community representative Adele Carles ran against the standing ALP member as the Greens WA candidate. The election outcome further pointed to increasing community dissatisfaction with the major political parties in their management of the coastal environment.

multi-dimensional strategies towards the common goals of coastal protection, public health protection, appropriate and sustainable development, and public inclusion in decision-making processes, thus challenged the economic, technical rationalist, and legalistic approaches of the private developer and regulatory agencies.

In the absence of official inclusion, either as a stakeholder or under partnership, the Residents' Association maintained a strong public voice, asserting its right to be included, and utilising a range of alternative strategies to publicise:

- its moral and common law legal rights to comment on the potential impacts to the health of local residents from the remediation project;
- its concern for changes to the local 'sense of place' and the disruption to community life;
- identified technical and scientific flaws in the site management plan;
- a lack of trust in the developer to work beyond an economic or legal rationale;
- an absence of independent scrutiny of the project and the perception that "everyone is on Stockland's payroll" (Save South Beach, 2006);
- questions over the transparency of official process, the accountability of decision-makers, and the prevailing goals of developers and politicians and their relevance to community requirement; and
- the remoteness of decision-makers from community debate.

The redevelopment process for the ANI site covered many years and changes of site ownership. The remediation would be a large and potentially hazardous project and, therefore, the Residents' Association had expected extensive, meaningful, and ongoing consultation, given the potential health and social impacts its members faced from this project, and given the 'partnership model' of community consultation being promoted at this time within WA Government (see WA Department of Premier and Cabinet, 2003). Nevertheless, the Residents' Association was met with exclusion from the appropriate levels of involvement, had limited access to official documents, experienced a dismissive attitude to legitimate concerns and questions regarding the risks involved, and encountered hostility from the developer to its insistence on being consulted.

5.6 The community legal action and outcomes

This section outlines the factors leading up to the community legal action, presents the major arguments and the outcomes of the legal action, and also discusses the reviews of the redevelopment project by researchers independent of the developer and regulators. The problematic application of WA community consultative instruments used in the management of contaminated sites, under unenforceable and ambiguous procedural mechanisms, is highlighted.

5.6.1 The Supreme Court challenge

The ANI site Environmental Management Programme version 3 (EMP3) was approved immediately prior to the 2004 Christmas holiday period[102]. Having had no meaningful response from the regulatory agencies to the concerns raised in the earlier community reviews of the EMP2 and having been 'locked out' of the decision-making processes, the Residents' Association mounted a WA Supreme Court challenge to the approval decision on the basis that it was made without procedural fairness.

Via local newspaper media, Adele Carles (cited in Oakley, 2004), spokesperson for the Residents' Association, stated:

> *...it was 'a matter of law' that residents who stand to be directly affected by the risks posed by the lead smelter clean-up…have a right to the information and to be heard. 'We believe there has been a clear breach of procedural fairness and natural justice in the way government handled this proposal….'*

Because the remediation was to take place without a cover, with the risk of airborne contaminants being released over Fremantle, and because the EPA was to have no formal role in overseeing the remediation, Ms Carles stressed that legal action was the sole recourse available to concerned residents (Oakley, 2004).

Furthermore, the principal WA Government regulator (the WAPC) had not permitted the Residents' Association access to the latest version of the EMP prior to the final

[102] The timing of the approval was significant in that many community members were unavailable to work on an appeal at this time, the key regulatory staff were on leave, and the WA Government departments, and other support bodies, had closed for the holiday period.

government sign-off. Without this document being publicly available, there was no way for the Residents' Association to determine what the proposed remediation would entail. The WAPC argued that it was not its responsibility to release the document for public scrutiny - this was up to the developer. The WAPC claimed that "the departments of health and environment advised the commission that the plan was satisfactory and that it would achieve the desired outcome" (Oakley, 2004). That the key environmental and public health agencies had provided their sign-off was sufficient for the WAPC to grant its approval to the project, whether or not representatives of the host community had seen the EMP3 document.

Ms Carles attempted to access EMP3 via FOI but her application to the WAPC was refused because the owner of the documents (the developer) had denied access, claiming the documents contained confidential business information (Hately, 2005b, p. 2). Nevertheless, the developer made an undertaking to release the plan for public comment in due course, but only after it had been approved. The Residents' Association argued that its scientists should also be party to these decision-making processes but were not given the opportunity (Hately, 2005b, p. 2).

> *So this is where our litigation has come into play because we realised we had no legal or statutory right, but believed there must be a common law right, because this decision stands to affect our health. As we live so close to the site we must have that right, based on natural justice and fairness. (Carles: cited in McGlynn, 2005, p. 4)*

> *We have heard that the remediation for the ANI site is set to start this May/June and will take at least 5 months. Following this, there will be the lengthy earthworks period too - so it will be at least a 12 month period of toxic dust being handled on our windy coast. Stockland are refusing to cover the site to contain the dust, even though the cost of this would be negligible in the scheme of the profits they will make....We have unwittingly found ourselves embroiled in this David and Goliath battle because our State Government has chosen to turn a blind eye to the numerous problems associated with the plans for the ANI site. When I recently sought support from Jim McGinty [ALP Member for Fremantle and WA Minister for Health] in relation to requiring Stockland to cover this site, his staffer said to me 'you don't expect Jim to get involved for 200 residents do you when there are 26,000 people living in Fremantle'. Even I was*

> *amazed by this blunt admission that it is simply about numbers for Jim McGinty. (Carles, 2006)*

The Supreme Court challenge by the Residents' Association was met with mixed reactions from the respondents. The developer's General Manager was vocal in his criticism of the actions by the Residents' Association, viewing the legal challenge as nothing more than 'grandstanding to grab media attention'. The Minister for Planning and Infrastructure, on the other hand, responded by saying she was confident the WA Government had followed the letter of the law. "This plan has been rigorously scrutinised by both the Department of Health and Environment" (D'Anger & Rule, 2005, p. 65).

The legal case by the Residents' Association rested on two key arguments: (i) the community group had a fundamental right to be consulted under common law; and (ii) the group held its own expertise and, therefore, was able to competently assess the remediation plan as it applied locally. The obligations of individual government agencies to consult with community groups, including the legal imprecision of 'community consultation' and its varying interpretations by the government agencies, developer, and community (Supreme Court of Western Australia, 2005a, pp. 50-51), were presented as matters to be considered.

On the application of community consultation, when it ought to occur and with whom, the legal representative for the Residents' Association argued:

> *not only is it after the event but it purports to be consultation not with the decision-makers but with the proponent, the advocate of the proposal with which we take issue....we say that the undertaking of this exercise, a Clayton's[103] consultation, as we might call it, is either disingenuous or, at best, it certainly is a distraction from the fundamental legal principles which apply. (Supreme Court of Western Australia, 2005a, pp. 53-54)*

The legal representative for the DOE argued that "the practice of the department was not to require community consultation to be undertaken for all sites but only

[103] Claytons' (an alcohol replacement beverage) Australian advertising campaign during the 1970s and 1980s promoted it as 'the drink you have when you're not having a drink'. The analogy drawn here is that WA consultative process is the 'consultation you have when you're not having consultation'.

recommend that it be undertaken…" (Supreme Court of Western Australia, 2005a, p. 75). The DOE's legal representative further maintained that the DOE had

> *…no statutory authority to require community consultation in relation to this project. Nevertheless, it has highlighted on several occasions to the developers the importance of community consultation and has requested that they formalise a consultation plan within the remediation strategy for the site. (Supreme Court of Western Australia, 2005a, p. 96)*

The DOE had referred the community's concerns about consultation to the WAPC for its consideration (Supreme Court of Western Australia, 2005a, p. 96). However, the Residents' Association's legal representative argued that the WAPC had declined to send a representative to listen to the community's concerns (Supreme Court of Western Australia, 2005a, p. 64). The WAPC acknowledged that it had never consulted with the community (and thus there was no precedent set or expectation on the part of the Residents' Association), but maintained that it did not have any obligation to consult with any member of the community in relation to EMP3 before making its decision (Supreme Court of Western Australia, 2005a, p. 63).

The developer's General Manager viewed the application by the Residents' Association to be largely vexatious and claimed that it *had* consulted and continued to consult widely with the "...public at large and the relevant government departments", but that the applicant had withdrawn from the consultative process. However, under the Supreme Court judgement, these statements were not recognised as reasonable grounds for excluding the Residents' Association.

> *On the evidence as it now stands, it appears clear that although Stockland may have consulted widely it has refused to consult with the applicant, as the body established for the purpose of representing the persons who are likely to be most affected by the remediation works to the ANI site. The applicant withdrew from the consultation process when it emerged that Stockland was not prepared to cooperate, apparently against the wishes of the relevant government departments. (Supreme Court of Western Australia, 2005b, p. 18)*

> *They [the Residents' Association] were getting the run around. They would go to one department who said 'No, it's not us, it's the other one.' The other one says, 'It's not us.' It's very difficult to say they withdrew from community consultation of their own volition. (Supreme Court of Western Australia, 2005a, p. 98)*

Although the interpretation of the scientific data itself did not feature in the legal action by the Residents' Association, the existence of scientific expertise was established, and from this an inferred capacity by those held to have expertise to be competent in the interpretation of the scientific data relating to the ANI site. Nevertheless, the legal establishment of community-based scientific expertise did little to counter the problem of conflicting expert evidence and did not address the hierarchical classification that positioned community-based science as inferior to regulatory agency derived science. However, with financial barriers preventing further litigation by the Residents' Association, the ability of the courts to resolve these conflicts was not tested.

The Supreme Court found in favour of the Residents' Association - that there had been a lack of procedural fairness, in that the group formed to represent the local community was excluded from the process. This judgement upheld the right of the Residents' Association to be consulted, and it granted that expertise existed within the community group, enabling it to make a legitimate assessment of the knowledge being used to support the remediation plan for the ANI site. The legal ruling forced the WAPC project approval to be set aside until the experts operating on behalf of the Residents' Association had been given the opportunity to comment on the developer's most recent EMP.

Despite the Residents' Association being provided the opportunity to comment on the EMP, it is not evident that any of the important issues raised under the community review (see section 5.6.2) were considered for implementation by the regulatory authorities, or that the core value of community consultation, which "…includes the promise that the public's contribution will influence the decision" (B. Holmes, 2011, p. 58), was either understood or accepted.

The developer stood its ground:

> *The fact is that the protest[104] group have been offered an opportunity to make submissions, it does not automatically give them any rights to dictate how the site should be managed. (WA Department of Environment, 2005c, citing correspondence from Stockland)*

While the 'South Beach' case made explicit to WA regulatory bodies the common law rights of communities to be consulted beyond any statutory requirement, these rights are not clearly enshrined in government agency procedural guidelines. On this matter, the WA EDO (2006) expressed its concerns about the DEC's 'Interim Industry Guide to Community Involvement'.

> *Although the Guide is focused on the duties of industry members to consult, it is clear from the South Beach case that a refusal by industry to consult will not absolve the Government from lack of consultation based on privacy grounds. Therefore the Guide should make it clear that the DEC has a common law duty to consult in certain situations and if industry will not cooperate, the DEC will not be able to proceed with the approval until it does cooperate.*
>
> *…The Guide should make it clear that the mere provision of information without the opportunity for meaningful input is not consultation and will not meet the minimum standard of consultation required by the Department." (Environmental Defender's Office Western Australia, 2006)*

5.6.2 Independent review of the remediation plan version 3

Following the Supreme Court ruling, which permitted further community input on various aspects of the ANI site project, both the Residents' Association and the City of Fremantle provided comprehensive reviews of the EMP3.

The Dingle et al. (2005) and City of Fremantle (see Duckworth, 2005a, 2005b) reviews made explicit the many outstanding questions regarding the safety of the remediation plan. Furthermore, it was not always evident that the developer was adhering to national and/or State Government policy and guidance statements in the

[104] The developer refused to acknowledge the Residents' Association as a legitimate body representing the local community and, instead, continued to use terminology that denigrated the group's official status.

management of the ANI site remediation, and there were a number of serious inaccuracies in the quantitative analyses undertaken by the developer's environmental consultant.

The documentation released by the regulatory agencies under FOI showed the assessment of both the Residents' Association and the City of Fremantle reviews to be cursory, and that the WA Government regulators did not fully address key questions on the application of safety criteria and the accuracy of test data. Of the recommendations offered by the community-based scientists to improve safety at the site and alleviate the community's fears, none were implemented. In fact, most of the issues raised in the Dingle et al. (2005) report were either dismissed or ignored by both the developer and assessing regulatory agencies, and the DOH later challenged the report, stating that "…the technical issues raised by the community will not stand up to scientific scrutiny" (WA Department of Health, 2005b), but without providing further clarification on the grounds for this belief[105].

The issue of the increased risks from the interaction of the many mixtures of contaminants at the ANI site, raised by Dingle et al. was, nevertheless, acknowledged by the DOH (2005a) as requiring further consideration by the developer. However, there is no available documentation to indicate that this recommendation was actioned by the developer, or that the regulatory bodies confirmed the developer's compliance. Furthermore, the failure to address the issue of chemical mixtures not only fell short of community expectation, but it contravened a national guidance statement, which specified: "the potential importance of toxicological interactions of soil contaminants is recognised in Australia. *Such interactions must be considered in the evaluation of sites where a mixture of contaminants is present*" (National Environment Protection Council, 1999b, p. 15, emphasis added).

Correspondence between the developer and the DOE offers an explanation for the failure by regulators to consider adequately the effects of mixtures of contaminants and other environmental/health shortcomings of the remediation plan. An excerpt from the correspondence reads:

[105] The Dingle et al. report did not offer technical advice, but posed questions relating to the analysis of the data used by the developer. These questions remained unaddressed.

> *A serious departure from that approved plan [being EMP3] would raise many questions about the quality of the auditor's work who you [the DOE] recommended and also the quality of the approval process that was administered by DOE and DOH following the extra process our company was put through. There could be alternate measures suggested (like a tent cover) that we do not have to entertain whatsoever. (WA Department of Environment, 2005c, citing correspondence from Stockland)*[106]

In other words, if the regulatory authorities acknowledged errors and flaws in the management plan after approving it, the credibility of the national accreditation process for contaminated sites auditors, which the DOE endorsed, would be brought into question. Furthermore, it would highlight the failure by the DOE/DOH to identify major flaws in the plan, and thus bring into question their level of expertise and competence in making assessments. Whether the developer was legally bound to make any further changes is implied and, accordingly, the DOE would also need to be mindful that any recommended changes be supported under statute, or the DOE itself was likely to face legal challenge by the developer.

The regulators treated the City of Fremantle review similarly, despite the City's report recognising a range of uncertainties, methodological anomalies, and areas in which health outcomes could be compromised[107].

5.7 Summary and conclusions

The case study followed the ANI-Bradken site redevelopment through the regulatory approvals to the remediation works, examining the procedures involved in managing a contaminated site in Western Australia. The chapter closes with a discussion on the legal action by the Residents' Association against the developer and the key WA Government agencies.

[106] The original source of this statement was not made available under FOI (presumably under the FOI Act's confidentiality provisions). However, this statement by the developer is available as quoted in a secondary document owned by the DOE.
[107] The criticisms of the project raised under the Council funded review are detailed in Duckworth (2005a).

Several critical issues concerning the implementation of successful public participatory strategies emerge from this case study. Of significance to the WA debate was the use of particular knowledge traditions to inform the regulatory agenda, and the control of knowledge by select institutions exerting expert authority, to the exclusion of citizen involvement in decision-making. The establishment of a counter expertise by the Residents' Association, as a response to expert authority located within professional bodies, produced insights into the use of alternative knowledge structures under the dominant regulatory assessment models. The case study demonstrates that the functionality of public participation, even within the context of a counter expertise, remains disputed, particularly under mechanisms that provide few legal entitlements for citizens to be involved and where the regulatory safety criteria hold no legal status.

The previous chapters of this thesis discussed these themes more broadly, depicting the interplay between authoritative knowledge traditions, policy formulation, and public participation. The discussion placed a particular emphasis on the form science takes within regulatory contexts, along with the significance of power relationships in creating assessments biased towards informational inequity, expert knowledge dichotomies, and their effect on functional public participation in decision-making.

In the final chapters of this thesis, the themes emerging from the ANI site case study will be further characterised and analysed in more detail and, finally, targets for change discussed.

CHAPTER 6

ANALYSIS OF THE CASE STUDY

CHAPTER 6: ANALYSIS OF THE CASE STUDY

Using the ANI site redevelopment as a case study, this thesis has explored the characteristics of public participation in expert debates. The study clarifies the significance of several aspects of regulatory practice in WA that influence the outcomes of public participation.

In particular, the study demonstrated how the regulatory model for decision-making applied to the ANI site redevelopment forced science towards an uncritical mode in its appraisals, eliminating the need for public involvement in debate, and reaffirming the expert-lay dichotomy. Moreover, with the regulatory agencies and private land developers in control of the information relating to the ANI site redevelopment, these bodies were placed in an authoritative position to accept (or reject) the validity and application of data, to decide who to include in decision-making, or to determine whether to make information publicly accessible.

To clarify further the marginalisation of public participation under these modes of decision-making, this chapter will examine in more detail the following five themes emerging from the ANI site case study:

1. Expert-lay knowledge dichotomies are used to exclude citizens from debate on the applications of science.
2. Information and resource access disparities exist between publics and regulatory bodies.
3. The uncertainties of scientific knowledge are being obscured, producing shortcomings in the regulatory application of precaution.
4. Poor public participatory practice is promoting mistrust of regulatory institutions and greater opposition to contentious projects.
5. Enforcement of scientific assessments and public participation relies on legal constructs.

These themes will be reviewed and analysed according to concepts developed within the Sociology of Scientific Knowledge (SSK), as discussed in Chapter 3. The

analysis supports the ideal of the uncertainty of scientific knowledge and of the potential for empiricist and positivist accounts of knowledge to restrict the application of other knowledge frameworks. The centrality of expert-lay dichotomies within the dominant knowledge frameworks and the operation of public participation within these mechanisms, further support SSK accounts, whereby experts retain control and authority over both knowledge and citizen involvement in decision-making processes.

6.1 Expert-lay knowledge dichotomies are used to exclude citizens from debate on the applications of science

With technical and scientific information a dominant feature in the regulatory assessment of the ANI site redevelopment project, questions on the manner in which developers and regulators applied this information formed an important part of the community debate. The accuracy of the scientific data, its applicability under local contexts, the provision for inclusion of other knowledge traditions, the social or institutional affiliations and biases of experts and, importantly, whether the information was open to independent scrutiny, critique, and revision, all formed key points for clarification in the actions of the Residents' Association.

The Residents' Association's case centred on the belief that knowledge that is open, accountable, involves a wide range of stakeholders, and reflects on its partial perspective, is better able to lay claim to objectivity. This view supports Eden's (1996) findings - that although environmental debates rely on scientific knowledge to identify and document issues "...science is neither the primary motivator of environmental action nor the main source of environmental knowledge" (p. 191). It is the first-hand experience from public observations, along with the 'second-hand non-experience of science' that is an equally important source of knowledge in these debates (Eden, 1996, p. 191).

Nevertheless, in recognition of the authority afforded a techno-scientific rationality and to facilitate inclusive participatory processes with institutionally based scientific experts, the Residents' Association called on the input of officially recognised scientists, and others within the community with specialist knowledge, to review the

data and to argue alternative interpretations. The Residents' Association endeavoured to meet the government regulatory agency authority with an authority of its own, but one over which it had control, which represented concerns raised by the community, and through which it was able to critically, and 'expertly', evaluate government-led assessments. In so doing, the Residents' Association aimed to meet government decision-makers on an equal footing, in order to influence decision-making.

Whether a community-based expertise (being critically positioned and applying precautionary assessments) could be accommodated officially, while operating outside of the accepted professional bodies, or any statutory mechanism for public inclusion, nevertheless, remains a point of contention. Moreover, a model of scientific expertise operating under citizen control was at odds with the regulatory agency-based expertise, which asserted authority over other interpretations (however accurate or otherwise valid these were). In effect, the ideal of expertise as a function of formal scientific qualification *and* as a function of the location of knowledge - in this case within the regulatory body (or developer's consultant) - was the dominant formulation used to assess the validity of expert claims. Accordingly, even where the regulatory agencies (or legal ruling) deemed the Residents' Association's experts' assessments allowable, it is evident that the Residents' Association's experts' criticisms and recommendations would be dismissed or ignored on the same exclusionary grounds as for 'inexpert' lay knowledge - because they were located outside of the customarily applied regulatory expertise. Under a system that dismisses knowledge claims using these exclusionary conditions, even alternative expert assessment cannot hold standing or be examined to establish its validity.

Consistent with Wynne's (2006, 2007) findings, misrepresentations of the public (and its representatives) as incompetent and irrational were directing developer and regulatory discourse. In particular, these misrepresentations of the public were limiting debate on key issues relating to the predictive control of science, the social and health benefits from redevelopment, and the mechanisms through which to respond to these issues. That is, the exclusion of publics from these decision-making mechanisms reflected a deep-seated belief in the inability by publics to comprehend science and the professional world in which science exists.

Also in common with Wynne's (1996b) account of Cumbrian sheep farmers' engagement with scientific and technical information, the Residents' Association's engagement with the information revealed "complex consistency in public reasoning" (Wynne, 1996b, pp. 40-41), commonly not recognised under simplistic models for public understanding of science and risk. Although the Residents' Association used scientific modes of rationality to uphold objectivity claims and to deflect criticism in a similar way to the regulator and developer, the manner in which scientific claims were used to define problems and solutions varied between the groups, particularly in the absence of a clear demarcation of what a 'scientific' claim entailed. The distinction drawn between research and regulatory models of science is pertinent here. Arguably, the community group expected a scientific claim to be supported by well-established evidence, to be open to critical review, and to be precautionary in nature (insofar as acknowledging its inherent uncertainty). In practice, the regulatory model for the application of scientific knowledge differed from this public expectation. Moreover, with precautionary approaches to regulatory science expressly supported in national and State regulatory guidance documents, the community group had a legitimate right to be concerned by the application of a more standardised and universal regulatory model under WA regulatory application.

Nevertheless, positioning the local community external to, and as ignorant of, science was an important tool used by the WA Government regulators and the private developer to defeat any opposition to the project by the Residents' Association, and to legitimise public exclusion from debate and decision-making. Furthermore, for the developer to present the Residents' Association as anti-development, it was able to dismiss the group's objections to the project on the grounds that they were ideological in origin (i.e., lacking in scientific merit), and oppositional to the economic benefits (and implicit social benefits) that came with redevelopment of the area. The Residents' Association, however, was debating a higher standard for science, in addition to pursuing positive social outcomes for the local community, and it was demanding sound regulatory overview of the presenting issues. The Residents' Association was not simply concerned about the ability of science to define the problem but, rather, it was concerned about the mode of its application and enforcement, whereby the contingencies of science were not open to

contestation, and critique of the social benefits of increasing development of the coastline was absent.

Locating expertise within powerful institutions, which exercise authority over knowledge that is located outside of the recognised institutions, thus reinforces and re-establishes the expert-lay dichotomy in the face of a counter-expertise. For this reason, it is overly simplistic to expect publics to be able to effectively challenge the expert-lay dichotomy and confront regulatory authority using a counter-expertise, when the debate does not merely concern knowledge but the control of knowledge through mechanisms such as the institutionalisation of expertise. In situating the control of knowledge within the regulatory body (and to those *it* delegates power), a community-based interpretation, even in the hands of 'experts', continues to be conceived of as subjective, biased, and emanating from an entity considered intellectually vacuous, by way of being located outside of institutionalised (objective) science.

The absence of legal mechanisms to include independent sources of expertise lends further support to unaccountability in regulatory assessments. Although the WA Government promotes high standards for public participation (e.g., see the WA Department of Premier and Cabinet guidelines and section 4.5.1), there are few legal rights extended to WA citizens to be involved in decision-making, and few legal powers extended to regulatory agencies to allow citizen involvement. Accordingly, for the ANI site redevelopment, WA regulators were not required to examine alternative findings or interpretations emanating from beyond the officially recognised sources and, therefore, any shortcomings in the official assessment identified via other ('illegitimate') mechanisms could be ignored, and mishandling (perceived or otherwise) of the project obscured from public view. This is not to suggest the process was corrupt; rather, regulators believed that they did not have the legal power to operate to more stringent safety or development criteria. Regulators were likely to have understood that to include publics in decision-making, which they (publics) had no legal power to influence, would be a disingenuous act. However, instead of explicitly declaring these shortcomings of process, regulators reaffirmed the authority and legitimacy of their scientific assessments, while restricting those of publics.

Even though local knowledges may be "…more logical, effective, and fair than imported scientific methods of intervening in socio-ecological processes" (Jasanoff & Long Martello, 2004, p. 15), problematic notions of knowledge validity dominated WA regulatory processes for the ANI site redevelopment. Consensus and mutual respect between lay and expert is a common objective of participatory process, however, neither the 'political underbelly' nor the dynamic of authority are acknowledged (Tutton, Kerr, & Cunningham-Burley, 2005, p. 111) [108]. Participatory processes thus remain of limited value if, from the outset, knowledge is non-negotiable.

6.2 Information and resource access disparities exist between publics and regulatory bodies

Lloyd-Smith and Bell (2003) identified access to information and resources in toxic disputes in Australia as a key factor in the production of inequities between parties, and that this access was being influenced by commercial and legislative restrictions, and the availability of expertise between parties. That is, poor access to information prevented public scrutiny of data, procedures, and decisions, while the inequitable access by publics to equivalent expertise further sustained the dominant positioning of the official source of data.

Although the Residents' Association was privileged to have access to expertise within its own membership[109], limited access to *all* the official data hampered the ability of the group's experts to fully assess the data on an equal footing with government regulators and the developer's technical experts. In the absence of informal mechanisms for information sharing between WA government regulatory agencies and community stakeholders, the Residents' Association relied on accessing much of the official information about the proposed redevelopment through the formality of applications made under the *WA Freedom of Information Act (1992).* This mechanism for accessing information, however, did not guarantee access to

[108] In this case, the Tutton et al. (2005) discussion concerns the inclusion of publics in genetics debates, but it is no less applicable to environmental debates.
[109] This thesis does not discuss the factors that support better community access to technical expertise, but a cursory comparison of the Lloyd-Smith and Bell case studies and the ANI site case study points to the need for further investigation into the influence of socio-economic factors in the WA context.

official reports in their entirety, did not support public access under the commercial confidentiality provisions of the *FOI Act* and, even when a higher standard of information access was granted, the rationale for regulatory decisions was not always clearly established.

These information access problems encountered by the Residents' Association under FOI provisions are not remarkable. A report by the WA Office of the Information Commissioner (2010) showed the FOI legislation to be inconsistently applied - entailing irregular processing of applications, a disregard for deadlines, and judgement calls or unusual interpretations on certain components of the *FOI Act* (pp. 5-6). Some government agencies were even found to take into account irrelevant factors in the release of information, including "the potential for political fallout or litigation" (p. 7). Furthermore, the Office of the Information Commissioner (2010) recognised that exclusion clauses (e.g., those relating to commercial confidentiality) were limiting access to documents and, therefore, the release of uncensored documents could not be guaranteed. In fact, during 2007, WA parliamentarians highlighted the problem of document censorship as part of a complaint to the Corruption and Crime Commission. The ensuing investigation exposed serious flaws in WA's FOI procedures and, in particular, found that departmental data storage systems were being poorly maintained and that information *was* being publicly withheld (McKinnon, 2008).

Despite reviews of FOI being undertaken (e.g., see Independent audit into the state of media freedom in Australia, 2007; WA Office of the Information Commissioner, 2010), deficiencies identified, and updates to FOI legislation and practice implemented, these have failed to resolve the significant problems relating to public access to data. While the intent of FOI regimes is to increase transparency in government decision-making and to encourage public participation in the political process (Lidberg, 2006, p. 3), the Australian FOI system "…falls far short of delivering on its legislative promises" (Lidberg, 2006, p. 159).

Access to information under FOI provisions in Australia can also be costly to under-resourced community groups. This can be especially significant to debates in which citizens require access to lengthy reports (in WA, charged on a page-by-page basis

and staffing rates). The Residents' Association was fortunate to have many services, including FOI costs, provided on an ex gratia basis by community members or others interested in the case[110]. However, raising enough funds (or external support) to maintain ongoing FOI applications, technical input and, in particular, to sustain legal action against a large private land development company, is an unrealistic expectation for any community group, even those considered well-funded.

For contaminated site appraisals, a further problem exists in the use of knowledge dichotomies in determining the extent of regulatory agencies' release of information to the public. That is, if the information required by the public is of a technical nature and if publics are deemed inexpert (and unable to comprehend technical meaning), free exchange of information can be impeded. Therefore, not only are FOI administrative deficiencies failing publics; public access to the information that influences government decision-making processes can be deemed unnecessary (or undesirable) if the information is considered best assessed only by institutionally-based experts. Moreover, if regulatory agencies view the formal procedures (e.g., FOI or community consultation) to be already serving informational access requirements (whether or not these processes are functional), the informal release of information between regulatory agencies and citizens can also be deemed unnecessary or irrelevant.

The information and resource deficiencies noted in the ANI site redevelopment confirm the findings of Lloyd-Smith and Bell (2003) and these issues remain an ongoing impediment to public participation in the management of contaminated sites in WA.

6.3 The uncertainties of scientific knowledge are being obscured, producing shortcomings in the regulatory application of precaution

The Residents' Association expressed the concern that regulators could not manage the ANI site redevelopment project safely in the absence of effective assessments of

[110] A wide support-base and large volunteer network also assisted in securing financial support from the local council (for independent scientific assessment of the project), from local business (gifting products, services, and direct funding), and through community fund-raising events.

local context[111]. For the Residents' Association, it was not enough to apply standardised, universal regulatory criteria and to expect these to offer protection from risks under the complexities of local context. Accordingly, when regulators applied context-based studies inappropriately, inaccurately, or not at all; when they used standardised rules to direct local risk assessments and environmental practice; or when they inadequately applied the precautionary principle, local residents became highly critical of any claims that the redevelopment project would be safe.

However, the problem does not only concern the regulatory application or overview of the precautionary context-based rules, but of the regulatory capacity to force the application of these non-statutory rules[112]. Where private proponents hold regulators to the strict enforcement of the legal 'standard', or in this case, absence thereof, they covertly reject and trivialise context-based assessments, and reinforce the use of a standardised model for regulatory science. Under these conditions, regulatory criteria that are presented as complete, precise, and non-negotiable, are set above modes of regulation that provide a precautionary approach.

In his research into the management of hazardous waste in the UK and Europe, Wynne (1987) argued:

> *the symbolic reassurance discourse of science emphasised standardised, universal risk and regulation frameworks. But the dispersed and heterogeneous nature of hazardous waste life-cycles requires the particularistic, situation specific, analysis of risks, in the descriptive or empirical mode. The pressure upon regulatory bodies to appear credible and to reassure may more sharply than for other issues conflict with accurate situational analysis (p. 12)...In other words, the symbolic credibility dimension forbids acknowledgement of the contingent property of current scientific beliefs, because credibility currently attaches to a universalistic image of scientific knowledge. (p. 13)*

[111] For example, using comprehensive dust monitoring and biomonitoring, or assessing the additional risks from other nearby contaminated sites and/or mixtures of chemicals present at the ANI site.
[112] Meyers et al. (1997) question whether any components of the NEPM are legally enforceable in WA.

Wynne's assessment is particularly relevant to systems of regulation that hold no statutory power, where the need to appear credible forces regulators to apply the safety guidelines as single number, universal criteria, even though it is intended that these guidelines be modified to the context of their use. Moreover, the practice of using single number, universal criteria subjugates contextualised local knowledges because "preoccupation with 'universal knowledge' necessarily depends on the systematic narrowing and obscuring of social categories" (Fischer, 1997, p. 192). That is, the use of standardised universal criteria not only restricts the use of a more comprehensive scientific knowledge base, but it also restricts local citizens' involvement, and the opportunity for local citizens to contest the scientific data applied in site assessments, or to use criteria beyond a scientific framing.

Publics recognise that generic claims to superior knowledge by regulators invoking the 'objectivity of science' are problematic. However, publics are not only questioning the accuracy of the 'official' scientific claims; rather, they understand that without their input, review, overview, and moderation, it is not possible to establish whether the available scientific knowledge *is* being applied according to principles of precision, accuracy, and social benefit. The Residents' Association enthusiastically and actively sought to be involved in interpreting the scientific data applied and the assessments made, and employed its own scientists to assist with a context-based scientific interpretation. However, with the interpretation and application of the scientific data under the control of regulatory agents, who had few legal powers to act, and who operated under poor procedural transparency and unaccountability, the public viewed these regulatory agents as untrustworthy and, consequently, the science they applied, unreliable.

As discussed in section 4.2.3, the NEPC context-based assessment guidelines do not hold statutory force in WA, however, the precautionary principle *is* established in environmental law and, accordingly, could provide a mechanism for higher levels of assessment. Nevertheless, the application of the precautionary principle remains out of favour under the dominant regulatory scientific framework. This being particularly evident where:

- its application remains subordinate to scientistic modes of investigation;

- it is set against the gains that come from economic risk taking;
- the legal burden of proof rests with the regulatory assessor/prosecutor and not the polluter (or potential polluter); and
- the ethical and public participatory dimensions have been misplaced.

Furthermore, because the precautionary principle can be presented as a default position, often taken in the absence of scientific data or where the data are uncertain, it may be considered subjective, biased, deceptive, and inferior to the scientistic approach to risk assessment. Precautionary measures may also be seen as a waste of time and money - that many of the problems predicted may never arise, and if they did arise could be remedied or 'hindsight managed' (after Earll, 1992, p. 186). Therefore, even though the precautionary principle is recognised in WA environmental law, and in most international treaty and policy documents relating to protection and preservation of the environment (so it would seem that its use is well supported), impediments to its application exist.

Jasanoff (1990) pointed out that "mandates to act precautionarily or within specified time limits, for instance, are often antithetical to agency efforts to project an image of technical impartiality and expertise" (p. 83). When science claims a certainty of knowledge, as per its regulatory application, it downplays the need for precaution. To assert a certainty of knowledge, to offer 'single number' data solutions, thus removes the need to deal with uncertainty, indeterminacy, or ignorance. If these sources of conflict in knowledge are eliminated - if knowledge is presented as certain - precautionary mandates can be ignored and, so too, the underlying philosophies, from which emerge shared responsibilities, negotiated partnerships and, ultimately, defendable and sustainable decision-making.

Therefore, the application of the precautionary safeguards in WA environmental decision-making stalls at several points - they can be confusing in practical application, they function poorly when set against conflicting agendas, and can be legally ambiguous. Without clear direction on the application of the precautionary principle, and the safeguards utilising precautionary modes of thinking, the scene is set for what Ravetz (2005) refers to as policies "based on the assumption that

'absence of conclusive evidence of harm' is the same as 'conclusive evidence of absence of harm'" (p. 47).

6.4 Poor public participatory practice is promoting mistrust of regulatory institutions and greater opposition to contentious projects

The application of public participation for the ANI site redevelopment is revealed to be inconsistent with the mechanisms proposed by the WA Department of Premier and Cabinet (2003) and under other regulatory directives, which advise on the incorporation of transparency, accountability, scientific objectivity, and a partnership approach. The ANI site redevelopment was to be a large and potentially dangerous project - the Residents' Association expected high standards for public participation from the WA Government, akin to the IAP2 Public Participation Spectrum (see Appendix C) collaborative model. However, the participatory mechanisms, where they existed, more closely resembled a model designed simply to inform publics.

Furthermore, beyond the statutory requirements for public participation adopted under the MRS Amendment process, there were no other mechanisms to secure ongoing and meaningful citizen involvement, in accordance with the standards expected by the Residents' Association. And despite establishing legal standing for its common law right to public participation with government decision-makers under a WA Supreme Court ruling, the Residents' Association would require ongoing (costly) legal actions if it was to uphold and maintain this right.

The right of the Residents' Association to a collaborative role in participatory processes was also held in check by the expert status of the regulatory agencies and their specialist application of scientific knowledge. The manner in which regulators responded to the questions raised by the Residents' Association, as the ANI site redevelopment progressed, is of particular note. As community opposition mounted, it was contained by providing more ('expert' derived) assurances of 'no risk' or 'manageable risk' or by presenting legitimate community fears as unfounded, irrational, or lacking in substance. As discussed in sections 6.1 and 6.3, with publics deemed inexpert and science represented as certain, determinate, and uncontestable, the need to test the validity of science or its public acceptability became unnecessary.

Therefore, regulators could legitimately reject ('subjective') public debate on any of the contentious, yet salient, points for consideration for the ANI site redevelopment.

The restriction of public comment is also apparent in the assessment of public submissions as part of the statutory WA planning and environmental consultative processes for the MRS Amendment (see Appendix B). The bias towards evidence-based knowledge and legal standpoints in these procedures exposed a tendency by the key regulatory agencies to dismiss the legitimacy of cultural, ethical, or any other aspect of debate, that could not be expressed according to the legal or evidence-based procedural terms of reference.

Furthermore, regulators did not account for the importance assigned to the social relationships that existed between the government agencies in authority and the citizens they served in the construction of public perceptions of risk. However, as Wynne (1987, p. 359)[113](1996b, p. 31) argued, public responses to risk cannot be dissociated from authority figures' attitudes and the social relations between parties. The narrowing of debate - to the exclusion of a social agenda - was, therefore, leading the Residents' Association to believe that regulatory processes were unbalanced or even fraudulent, that decisions were being politically manipulated and controlled to facilitate contentious project approvals, and that the institutions in control of decision-making were untrustworthy. Episodes of unaddressed scientific inconsistency, secrecy, and unaccountability within the WA regulatory context served only to increase the public perception of the untrustworthiness of the regulatory bodies in control of the application of science and definition of risk.

Although WA regulatory and review bodies' guidelines explicitly acknowledge that shortcomings in public participation produce both increased opposition to redevelopment projects and public mistrust of regulatory agencies (e.g., see Auditor General for Western Australia, 2002, p. 33; WA Department of Environment and Conservation, 2006a, pp. 1, 3), the ANI site case study provided evidence that these issues are not being meaningfully addressed. The ANI site legal action by the Residents' Association, in fact, demonstrated how ingrained the dysfunctional public participatory practices were in the WA regulatory agencies - some key agencies did

[113] Wynne uses the experiences of industrial plant workers and the application of occupational risks by the management body to demonstrate this point.

not support even the most basic levels of public participation and some applied public participation under such narrow criteria as to render it inoperative. In practice, none of the regulatory agencies understood their obligation to consult meaningfully with publics, or the role of poor public participatory practice in promoting mistrust of regulatory institutions and greater opposition to contentious projects.

Public reactions to contentious projects, such as the ANI site redevelopment, therefore, are being presented as irrational and subjective perceptions of risk (from overdevelopment or contamination), rather than complex interactions between institutional settings, behavioural factors, and technical knowledge (Wynne, 1987, p. 3). Wynne (1987) recognised that science plays a dual role in regulation: using the descriptive or empirical dimensions, but also a role in 'public justification'. That is, the negotiation of public credibility, which involves "...projecting reassurance and persuasion that public expectations of trustworthiness and credibility have been fulfilled" (p. 11). Yet, in attempts by regulators to make an uncertain science appear irrefutable, and defective decision-making legitimate, they fall into the trap of alienating those whom they are trying so hard to win over.

6.5 Enforcement of scientific assessments and public participation relies on legal constructs

The Residents' Association's assessment of the official ANI site records (see section 5.6.2) revealed patterns of poor statutory guidance, of perfunctory regulatory intervention, and of dubious or inaccurate interpretation of data sets and application of safety guideline values. Despite the Residents' Association raising concerns about conflicting or errant management practices, the regulators provided only limited feedback on the group's expert-mediated critique and largely dismissed its assessments.

This thesis presents issues of expertise and certainty of knowledge as underlying features of public exclusion in scientific debates; however, these accounts do not fully represent the problematic response by WA regulators to public engagement. As explained in Chapter 4, under WA regulation of contaminated site redevelopments, regulatory bodies are not obliged to apply (or authorised to force) the most detailed

of scientific assessments, nor are they required to respond to public questions on the application of science within the regulatory context. Importantly, without the authority to work beyond any statutory requirement, WA regulators are limited in their powers to reject a development proposal on health or environmental safety grounds. Accordingly, regulators can position public opposition to a development proposal as immaterial to decision-making, even when the opposition is well founded and scientifically framed. As long as a redevelopment proposal clears the minimum safety criteria and statutory requirements, there is no cause for regulators to involve publics in meaningful consultative processes.

Moreover, when projects are under the regulatory control of the planning agency and not the environmental or health agencies, any concerns that contaminated land may be unsuitable for residential redevelopment, or cannot be made completely safe for residential habitation, may not be effectively addressed. That is, when there is conflict between the development directive and the environmental/health safety criteria, scientific evidence denoting risk can be held in check by the subordinate role environmental/health agencies play in regulation (in addition to the legal shortcomings of the environmental/health criteria), where important questions concerning safety can be overridden by incentives to capitalise on development. In fact, Wood and Bailey (1994: cited in Wallington, 2002, p. 38) argued that outright rejection of these kinds of projects in WA is extremely rare and the main recourse available to government environmental assessors is one of minimising environmental impacts through the incorporation of mitigation measures. Furthermore, Wallington (2002, p. 37) noted that WA EIA processes are usually invoked too late to have any meaningful impact on a developer's decisions concerning project design or location. This places WA's environmental regulatory bodies in the awkward position of merely offering suggestions to ease environmental impact, under legally unenforceable safety criteria, but under the public illusion that a proposal can be rejected if it does not meet environmental safety criteria.

This approach to the regulation of contaminated sites in WA, whereby development planning approvals proceed with relative ease (in the absence of enforceable safety criteria, social assessment, comprehensive regulatory overview, or meaningful public participation), highlights an orthodoxy with which development proposals can or

must be approved in one form or another. Nevertheless, government regulatory agencies continue to uphold the appearance of formality under this routine approvals process and operate under the impression of being the advocates of safety. Regulatory bodies achieve this by projecting a façade of expertise, by undertaking cursory assessments in order to fulfil minimum requirements, by downplaying risks, and all the while restricting outside opposition[114]. Without the legal obligation to include publics in decision-making processes and with no legal requirement to clarify or justify a decision, however imperfect, unsound proposals can be approved with a minimum of fuss. And as Ravetz (2005, p. 49) argued, responsible officials can be corrupted by the requirements of their role to cover up the dangers.

Jasanoff (2005, p. 108) described these processes as a function of boundary setting and regulatory black-boxing - ensuring that regulatory bodies are able to fulfil the social or political function carved out for them, while denying their "provisional or indeterminate status" to maintain credibility. With no legal obligation to defend decisions, confrontation can be avoided, professional reputations protected, and power politics can control decision-making processes.

If regulatory bodies are themselves not empowered to uphold best practice (e.g., consider compelling new safety data, utilise precautionary thinking, or apply high standards of public participation), or are not inclined to work in accordance with public sector codes of ethics[115], community groups can have no power to influence decision-making on matters of risk. The absence of legally enforceable precautionary safety criteria thus remains problematic for community groups demanding higher management standards for contaminated site redevelopments. Under expanding commercialisation and pressure by developers to force regulators to operate in strict accordance with (minimalist or absent) legal requirement, and under a model in which best practice and ethical codes remain subordinate to the statutory criteria, these private institutions have thus become the gatekeepers of legal enforcement.

[114] Lloyd-Smith and Bell (2003, p. 17) discussed the role of government 'experts' in downplaying health risks from contamination. However, they also highlighted that as the public becomes more competent in assessing the risks for themselves, government agencies become unwilling to debate the risks or accept an alternative to agency derived assessments of risk.

[115] WA public sector codes of ethics embody the duty of scrupulous decision-making, which is influenced by the principle of service to the community, where "all parties potentially affected by a matter must have the opportunity to put their case, and have all relevant arguments considered, before a decision is made" (WA Office of Public Sector Standards, 2002, p. 5).

Even though the WA Supreme Court ruled the community consultation for the ANI site redevelopment legally binding upon the government agencies and the developer, under the ambiguous meanings assigned to community consultation, this fundamental right was not upheld. The community's right to contest the safety of legally unclear safety criteria, or to play a substantive role in decision-making as it related to 'expert' or 'scientific' knowledge, remained unchallenged. Regulators were bound to accept community input, but only in the assessment of the (pre-defined) scientific knowledge claims for the project, and only within the limits of legal applicability (which did not exist). The Supreme Court granted the Residents' Association the right to view and review the updated Environmental Management Plan, but did not grant it any power to influence decision-making.

Therefore, the barriers to public participation in WA contaminated site redevelopment are complex. They encompass more than marginalisation of publics via debates concerning scientific knowledge and expertise, and include notions of legal enforceability of safety criteria and of public participation itself. With the complexities of public dissent being reduced to lay subjectivities and irrationalities, and the only opportunities for input resting on legalised notions of risk, the problem is further intensified. For the ANI site redevelopment, the public debate concerning the adoption of safety criteria, using comprehensive (but legally unenforceable) context-based data, was largely irrelevant, precisely because regulators were legally powerless to hold private industry to the highest standards of safety. The (absent) legal content of environmental and public participatory controls in the management of contaminated sites in WA thus serves to support the location and control of scientific knowledge by regulatory and industry bodies' 'experts', and privilege the rights of these parties over those of publics.

CHAPTER 7

DISCUSSION AND CONCLUSIONS

CHAPTER 7: DISCUSSION AND CONCLUSIONS

Drawing on the discourses analysed, this thesis argues the significance and value of public participation in scientific debates. The findings of the ANI-Bradken redevelopment site case study support the key accounts provided in the sociological and regulatory data, highlighting the marginalisation of public participation under modes of decision-making that affirm knowledge dichotomies, uncritically apply science, and that are influenced by legal standpoints.

This concluding chapter addresses the thesis research questions, and responds in more detail to the final research question by exploring the available options to improve citizen involvement in science-rich debates, and which are applicable to the management of contaminated sites in WA. While many challenges exist in facilitating citizen involvement in science-based decision-making, this chapter will re-think the identified problems and offer targets for improvement.

7.1 Addressing the thesis research questions

This section will respond to the first four of the research questions of this thesis, which are:

1. How is science used in the regulation of contaminated sites?
2. What are the mechanisms for public participation in the management of contaminated sites?
3. What is the impact of different forms of science on public participation?
4. Are citizens allowed to contest science?

The discussion considers each of these questions alongside the significant trends of the ANI site case study, examined in Chapter 6.

7.1.1 How is science used in the regulation of contaminated sites?

The regulation of contaminated sites in WA relies on evidence-based scientific research, underpinned by positivist postulates, but supported by precautionary

context-based safety criteria. Experts located in professional bodies play a key role in defining and directing process and practice. The separation of expert from lay knowledges within these mechanisms maintains the deficit model for public understanding of science and, accordingly, upholds the exclusion of publics from debate on crucial definitions of knowledge construction and use. Aberrant representations of publics (and their representatives) as less informed thus restrict debate on key issues relating to the predictive control of science.

Furthermore, the ANI site redevelopment case study demonstrated the problematic application of rules and decision-making under applications of science that assumed a legitimising role to control both the inputs and outputs of regulation. The application of public participation and legal enforcement of safety criteria reflected this approach, whereby regulatory agencies and developers applied a certainty of knowledge to deflect criticism and minimise public debate. Without clear statutory provision for public inclusion in these regulatory decision-making processes, or a willingness by regulators to extend notions of scientific expertise beyond regulatory control, the knowledge created and applied under regulatory instruction remained publicly uncontestable.

The involvement of private industry in WA environmental regulation remains particularly important. With a growing trend towards industry self-regulation - in regulatory ideals, in the assessment of risk, and in the authority hierarchies placing the rights of commercial enterprise over those of local communities - environmental protection, increasingly, is being measured against economic outcomes. Therefore, as Wynne (1991, p. 121; 2006, p. 217) recognised, public understanding of and interactions with science reflect the use of science as a private resource rather than a public good, whereby citizens are subjected to private commercial priorities buried in 'science', rather than engaging with a science that is accountable to public interest. Moreover, Wynne (2014) noted

> *…the continuing public mystifications which science as authority articulates, mediates, and cultivates, while denying its role in them. This is where the ideological roles of science as public authority discourse interweave with the political-economic forces which shape not only those discourses but the material forms of innovation, society, and culture which undermine the rational*

> *exploration of sustainable and just alternative trajectories of knowledge, relationships, and practices. (p. 66)*

7.1.2 What are the mechanisms for public participation in the management of contaminated sites?

The mechanisms applied by the Residents' Association to secure the group's involvement in ongoing dialogue and input into decision-making included several well supported strategies (see Sewell, 1985: cited in Perlgut, 1994, p. 4). These included:

- concentrating on a few critical issues;
- accessing technical expertise;
- drawing on the strengths of members in leadership, organisation, and in understanding the corridors of power;
- establishing dialogue within the community, which served as an educational resource and produced a shared sense of identity between divergent elements of the community;
- implementing fundraising activities to ensure ample financial resources;
- maintaining a favourable relationship with the media;
- actively seeking involvement in both statutory and non-statutory processes;
- drawing on political and community support;
- successfully making use of a Supreme Court legal challenge; and
- becoming involved in the formal political processes.

However, the ANI case study demonstrated that neither good organisation, funds, publicity, skilfully directed activism, counter-expertise, pursuing all official avenues, nor positive outcomes in legal challenge, guaranteed access to the levels of public participation the Residents' Association sought.

Fundamentally, the Residents' Association, representing the local community, demonstrated a desire to work in partnership with the regulatory decision-makers on a project that directly affected the lives of those living near the ANI site redevelopment. Although the guidelines promoted by the WA Government recommend partnership approaches to public participation in redevelopment projects

of this scale and public interest, the regulatory agencies involved in the ANI site redevelopment did not offer this level of involvement.

Rather than allowing publics to debate, to have any control over, or to assign different meanings to the scientific knowledge applied, the regulatory bodies offered public participation as a one-way model of communication, in which publics had little opportunity to influence decision-making. While the regulatory agencies (and developers) justified their approaches based on the explicit statutory entitlements to public participation, they ignored the clear guideline directives from WA Department of Premier and Cabinet, NEPC, and other government agencies, at several stages of the administrative procedures. This thesis proposed that it is the treatment of publics merely as recipients of knowledge, and not active participants, that underlies the restrictive formulation of public participation in regulatory processes, and whereby legal standards take precedence over fundamental citizens' rights. The dichotomies drawn between expert and lay knowledge frameworks are at play in these restrictive formulations of public participation.

Despite the attempt by the Residents' Association to dismantle the hierarchy of expertise by employing its own experts and by establishing its legitimate common law right to participate, that regulators ought to seek advice from, or seriously consider the views of a community group challenging traditional regulatory instruction, remained at odds with the regulatory positioning. Therefore, for the Residents' Association, the extension of expertise, and the recognition of its legal right to be involved in participatory mechanisms, was not forthcoming, despite a WA Supreme Court ruling in the group's favour. In fact, the developer and the regulatory agencies claimed that the established legal right of the Residents' Association to participate did not equate to a legal obligation to include the community stakeholders' group or its expert representatives in official decision-making processes. That is, a common law right for citizens to be 'consulted' did not extend, in the view of the developer and regulatory decision-makers, to the right of citizens to influence decisions. The government regulators thus overlooked a guiding principle of public participation, rejected the opportunity for learning and, instead, reinstated a system in which the official sources of knowledge and official meanings were unchallengeable.

7.1.3 What is the impact of different forms of science on public participation?

This thesis argued that the translation of research science to a form that is applicable to regulatory contexts influences the manner in which knowledge is articulated. That is, the need for certainty and irrevocability in decision-making generates a form of science that resists critique and review. In turn, this affects the application of public participation.

Although regulators in WA rely on precautionary mechanisms (e.g., the context-based safety criteria) to support the transition of research to regulatory science, for the ANI site redevelopment these criteria were not applied strictly in accordance with national regulatory bodies' instruction. Supported by (absent) legal provisions and the requisites of regulatory science itself (to provide irrevocability in decision-making), WA regulators were able to overlook any complexities and uncertainties in the knowledge used for environmental and health assessments. Accordingly, standardised and universal modes of science regulation formed the dominant approach to managing the contamination risks at the ANI site.

Moreover, regulatory practices that presented knowledge as precise and complete undermined external review processes, and this further limited the opportunities for public participation in defining the risks and in determining safe practice. In the ANI site case, the regulatory bodies were able to ignore attempts by the Residents' Association to highlight the shortcomings in the regulatory risk assessments and to reassert precautionary context-based approaches, under knowledge conventions that positioned publics external to science, using procedures that were legally unenforceable, and where regulators were unaccountable for their actions.

However, the ANI site case study demonstrated that the problem with WA regulatory mechanisms to manage contaminated sites does not necessarily lie with science, scientific knowledge, or scientific expertise, but in the manner of their use - in this case to assert regulatory authority and legitimacy, to the exclusion of public dialogue. In particular, the use of regulatory science, represented as 'certain' knowledge, restricted opportunities for external input or evaluation. These problematic applications of science produced not only the means by which to

legitimately justify exclusion of ('inexpert') publics in decision-making processes, but also served to hamper critical review of the 'black-boxed' practices of science and scientific practitioners. Publics were offered no opportunities to meaningfully debate, control, or assign different meanings to the scientific knowledge being applied.

7.1.4 Are citizens allowed to contest science?

In alignment with Beck (1992), Fischer (2005) argued that the critical factor upon which the possibility of participatory democracy hinges is the social division between those with and without knowledge. However, first it is necessary to lay bare the question "can citizens actually participate" (Fischer, 2005, p. 54)? While Fischer's assessment focuses on deficit accounts of public understanding, the ANI site case study demonstrated that shortcomings in WA's public participatory mechanisms present additional problems. These relate to the location of expert knowledge (entailing the professionalisation of the expert), the positioning of public debate within regulatory accounts of science (whereby a certainty of knowledge limits debate or review), and the fundamental legal rights of citizens to participate in the construction of knowledge. This thesis has argued that although WA Government bodies regularly present public participation as essential to sound decision-making, the (non-statutory) strategies applied do not adequately acknowledge the role played by an authoritatively positioned science in undermining opportunities for citizen involvement in the creation and critique of both local knowledge and formal regulatory knowledge. This thesis, therefore, expands on the deficit accounts used to explain the exclusion of citizens, and explicitly recognises other mechanisms that preclude citizen involvement in scientific and technical decision-making.

To support improvements to public participation in debates relying on scientific knowledge, and to the democratic functioning of science itself, this thesis argued that a contestable model for science is necessary. However, for this to occur (under administrative mechanisms that hold no legal force), there needs to be a willingness by official decision-makers to accept public input, to accept the time constraints that this process involves, and to accept the inherent difficulties in enabling new approaches to regulatory science. Appreciating that lay-publics *are* able to comprehend (and critique) the science being applied is crucial. However, this

account must be supported by a fundamental re-framing of the models for, and practices of, public participation in scientific debates, and the reformulation of strategies to challenge the underlying mechanisms for exclusion, to allow fuller public participation.

7.2 How can citizen involvement in science-rich debates be improved?

In her review of the regulation of environmental toxics across different international contexts, Jasanoff (1991) argued there were two major challenges in environmental policy implementation: (i) the need for inclusive frameworks for negotiation; and (ii) the appropriate use of science to ensure that it is applied constructively and appropriately, while ensuring "... that the fragile baby of reliable knowledge is not thrown out with the bathwater of technical deconstruction" (p. 117).

Jasanoff's findings, nevertheless, illustrated shortcomings in participatory procedures in regulatory science processes when the political underbelly of debate was not recognised. This was because "...broad citizen participation alone cannot legitimate decisions that do not command the respect of the scientific community" (Jasanoff, 1990, p. 17). Jasanoff (1990, p. 38) argued that neither legitimation of science through public participation (the democratic approach) nor legitimation by outside experts (the technocratic approach) forestalled the disputes in the US cases she reviewed.

While the problems of the Western Australian system reflect the findings of Jasanoff's research, her proposal for litigation as an alternative channel for debating science remains problematic under Australian legal mechanisms. When citizens have limited access to the judiciary (e.g., due to a lack of financial resources) and under systems in which scientific guidance is not always legally binding (i.e., where the judiciary has no control over the information applied), the limitations of a litigious approach become clear. In fact, this thesis has highlighted that the shortcomings in the legal standing of regulatory mechanisms in WA, in addition to the application of ambiguous, yet socio-politically powerful and exclusive frameworks for science, are restricting citizen involvement in scientific debates.

Wynne (2007) suggested that the key element of the contemporary science and governance problematic is cultural and that we should not restrict ourselves to practical policy contexts. Rather, "in order to be effective, [solutions have] to be informed by a more radical cultural and historical perspective, which illuminates the sheer contingency, sometimes laughable absurdity, of what we encounter in those technoscience, social science and 'policy' worlds" (Wynne, 2007, p. 500). Therefore, to facilitate the involvement of citizens in debates rich in the discourse of science, the focus cannot be on public participation in isolation from the operation of science and the way it manages and controls knowledge, or the governance of science via legislative mechanisms. Nevertheless, in addressing the democratic transformation of science there remains the problem of a circular logic - where the end goal of meaningful dialogue between science and citizens, can become reliant on breaking down the exclusionary power structures of science, which can only come from meaningful dialogue between science and citizens. The value of dialogue, in fact, remains questionable if the truth claims of science are not transparent, not laid open to critique, or if accountability is absent.

To prioritise and improve the involvement of citizens in science-rich debates it is, therefore, necessary to make explicit the origins and the enduring defence of public exclusion in decision-making processes using scientific knowledge. The following paragraphs outline several strategies (frequently overlapping and interwoven) to address the problem of citizen involvement in scientific debates. The focus is on models that support the democratic transformation of science. The discussion does not offer a single strategy approach to effect change but, instead, outlines diverse frameworks, multi-disciplinary approaches, and adaptable strategies.

The discussion condenses the targets for change into two key mechanisms: (i) 'the critical examination of science'; and (ii) 'creating spaces for citizens to question and contest science'.

7.2.1 The critical examination of science

Funtowicz and Ravetz (1993, p. 750) argued that normal science is no longer adequate to resolve policy issues concerning risk and environment. Instead, they proposed 'post-normal science' (PNS) as a path to democratise science, giving

weight to assessment of uncertainty, reductionism, dichotomous thinking, and a "plurality of legitimate perspectives" (Funtowicz & Ravetz, 1993, p. 739). Under the PNS vision, science must be held secondary to the values concerning 'the kind of world we want to live in', and whereby new conceptions of scientific methodology, the legitimacy of an extended peer community, and mutual respect for different perspectives and forms of knowing are brought to the fore. That is, it is necessary to produce new responses to "the social practice of science as much as in its intellectual structures" (Funtowicz & Ravetz, 1993, p. 742).

Nevertheless, Funtowicz and Ravetz (1993, p. 755) did not argue "for the democratisation of science on the basis of a generalized wish for the greatest possible extension of democracy in society." Rather, they recognised that

> *the epistemological analysis of PNS, rooted in practical tasks of quality assurance, shows that such an extension of peer communities, with the corresponding extension of facts, is necessary for the effectiveness of science in meeting the new challenges of global environmental problems." (Funtowicz & Ravetz, 1993, p. 755)*

"[F]or these new problems, the maintenance of quality depends on open dialogue between all those affected" (Funtowicz & Ravetz, 2003, p. 6) and the public must be a source of direction for decision-making, both in terms of producing questions and guiding analysis.

Within the context of debates concerning environmental contamination, PNS is particularly useful. It provides a reflexive approach to scientific knowledge creation and the policy applications that derive from this knowledge - linking epistemology and governance (Funtowicz & Ravetz, 2003, p. 3), while recognising that facts and values are irrevocably intertwined.

These key points discussed under PNS are complemented by a large body of work by many scholars. The various approaches are expressed under different banners; however, as a key element they address the importance of democratic theory to public participation (and vice versa) and, also, the difficulties in applying public participation at a practical level. The discussion in this section will explore some of

the approaches that offer further clarification of the problems arising from citizen involvement in public debate. In particular, the discussion emphasises Bäckstrand's 'civic expertise', which focuses on the significance of utilising different knowledge traditions, and Mouffe's 'agonistic pluralism', which transforms the understanding of democratic theory as applied to contentious debates.

Under any new mechanisms, diffusing the stronghold of science and improving the overall outcomes of decision-making, along with producing a shared sense of responsibility and social learning that comes from involvement of publics in science (Wynne, 1987, p. 437), are important goals. These mechanisms must bring to the fore the question (posed by Beck and introduced in section 3.4.2), "how do we wish to live" (Beck, 1992, p. 28)?

Challenging the location of expertise

Finding new and respectful ways to appreciate different forms of knowledge creation, while challenging the dominant methodological traditions that create dichotomies between those with and without knowledge, is a central theme for many scholars investigating citizen involvement in science decision-making. Advancing a model for science that redresses the power relationships between those in authority (and through whom expertise is asserted) and those who are subject to authority, is a key goal.

To override the authority dimension of expertise and to produce decision-making that holds legitimacy, the sought after model must present the 'facts' and assumptions of regulatory science as openly contestable. For local communities, whose members are well placed to understand failures of monitoring or pollution control (e.g., observing dust coming from a remediation site and depositing in the residential area; observing local illness patterns or cancer clusters), the ability to contest officially presented regimes of control is paramount for better safety outcomes. In fact, Wynne (1988, p. 157) argued that this form of analysis changes the notion of the expert to one which is less hierarchical; addressing public demands for transparency and accountability, which are problematic under private negotiation of rules and practices under private contingencies (Wynne, 1988, p. 161).

Bäckstrand's (2004) model for a 'civic expertise' recognised the importance of the epistemological, normative, and institutional dimensions to re-thinking science and to supporting public participation within science.

> *The epistemological dimension revolves around the nature of scientific knowledge and what counts as expertise. The normative relates to the goal to democratise scientific expertise by enhancing representation, transparency, participation and accountability in the scientific realm. The institutional refers to inventing deliberative mechanisms for public participation in the new context and governance of science. (Bäckstrand, 2004, p. 705)*

Bäckstrand (2004) saw the value of a civic expertise lying in its "promise to steer between the wholesale rejection of scientific rationality and the uncritical acceptance that science can provide ultimate solutions to the environmental crisis" (p. 696). The de-monopolisation and democratisation of science is a key aspect of this process, whereby "scientific decision-making on environmental risks is opened up for social rationality and wider participation" (pp. 701-702).

> *Authoritative decisions cannot be made by a narrow group of experts but have to include a wider spectrum of stakeholders….Unless there is recognition of the power practices and cultural biases found in the construction of 'environmental threats', there will be no reflexive and critical turn in environmental politics. (Bäckstrand, 2004, pp. 701-702)*

Recognising the boundaries between science and non-science, expert and lay, universal and local knowledge and, importantly, critiquing the validity of these distinctions, is vital to countering defective public participatory strategies. Aiming to "…better understand the interaction between technical fact and cultural values, science and non-science and the powers at work when defining those boundaries" (Bäckstrand, 2004, p. 706) supports a shift from a unitary notion of science to one that is multi-paradigmatic, and whereby the necessary participatory bottom-up approach can be supported.

Wynne (1988) argued that experts will lose some power under a system that accepts the need for greater citizen involvement.

> *However, the experts would exchange lost power for greater legitimacy. Greater public acceptance of uncertainty as a general principle could be achieved. Thus a more mutually respectful, dialectical interaction between experts and publics could become the context of negotiation of those ambiguous judgements and responsibilities which experts currently have to exercise furtively, behind a screen of objective, rule-controlled myth. If this created a change in the overall social balance of control of technology, that would be no bad thing as far as social justice is concerned." (Wynne, 1988, p. 163)*

Transforming democratic thinking in contentious debates

While 'civic expertise' adopts an overarching approach, recognising the significance of the epistemological, normative, and institutional dimensions, Mouffe argued the centrality of new approaches to democracy itself. Her 'agonistic pluralism'[116] model proposes that "instead of trying to erase the traces of power and exclusion, democratic politics requires that they be brought to the fore, making them visible so that they can enter the terrain of contestation" (Mouffe, 2000, pp. 33-34) whereby "tropes of normative universality" (Butler: cited in Mouffe, 1993, p. 143) can be uncovered. In alignment with the PNS model, Mouffe's approach assigns public participation a key role in redressing the power interplays between citizens and decision-makers, while also providing a mechanism to contest the claims of science, which is becoming increasingly undemocratic in its policy applications. Mouffe's contribution explains shortcomings in democratic processes that look for legitimate and effective policy decisions and outcomes, but where these fail to represent adequately the conflicts inherent in political life.

Mouffe's (2005) model - one that supports difference and accepts the possibility that such difference may not be reconcilable via simple consensus - provides an additional point of reference to establish a workable model for change and an alternative model for scientific endeavour, in order to promote a "...public sphere of

[116] Mouffe's (2000, pp. 101-102) agonistic pluralism constructs the 'them' in democratic politics, not as an enemy to destroy, but as an 'adversary' - someone whose ideas we combat, but whose right to defend those ideas we uphold. Although Mouffe's agonistic pluralism has been criticised by scholars defending liberalism, for example, by Crowder (2006), in its "Foucauldian reduction of values to power, and by its irrationalist account of choice under value pluralism" (p. 2), within the context of the science regulatory debate of this thesis, it holds clear value in the weight it gives to a plurality of views and, therefore, in presenting a theory to support disparate voices.

contestation where different hegemonic political projects can be confronted" (Mouffe, 2005, p. 3). It is not that participation offers a clear-cut solution - it may in fact produce conflict - but importantly it creates a point at which discussion and debate may occur. Mouffe (2005) argued that in accepting that conflict exists we create valid avenues to legitimate forms of expression of such conflict, while not attempting to create consensus or reconciliation via dialogue. It is not the aim to overcome conflict through consensus but to "...construct conflict in a way that energises the democratic confrontation" (Mouffe, 2005, p. 6).

Code (1991, p. 23) argued that the adversarial[117] method (akin to Mouffe's 'antagonism') relies on an artificial isolation of claims and arguments from their context. Adversarial method, therefore, produces bad reasoning where, rather than offering explanation, exploration, and understanding, it forces the adoption of an approach best suited to defeat an opponent (Moulton: cited in Code, 1991, p. 24). Furthermore, by excluding the public from rational, non-adversarial involvement, the public is forced into the mode of adversary, as the only path through which they may be included. This, in turn, leads to the very elements of community debate that government agencies and proponents do not want, for example, the use of litigation by citizens - fighting regulators on their own adversarial terms. Within this context, the value of Mouffe's (2000) transformation of antagonism to agonistic pluralism becomes clearer, whereby a framework can be adopted to choose between real alternatives, rather than artificial and flawed reasoning established in a one-dimensional framework for decision-making.

Although consensus is necessary in social life, this must be accompanied by dissent - a conflictual consensus (Mouffe, 2000, p. 113). It is precisely the disagreements that arise in these situations that is the stuff of democratic politics (Mouffe, 2000, p. 114). In presenting environmental debate in such a way that makes it open to contestation, the characterisation of safety criteria can be made transparent, and health and environmental protection better supported, while bringing the democratic

[117] Code used the term 'adversarial' differently to Mouffe, and more akin to Mouffe's notion of 'antagonism', that is, a struggle between 'enemies'. Agonism, on the other hand, is a struggle between 'adversaries' (Mouffe, 2000, pp. 102-103). Mouffe defined an adversary as "...somebody whose ideas we combat but whose right to defend those ideas we do not put into question....To accept the view of the adversary is to undergo a radical change in political identity. It is more a sort of conversion than a process of rational persuasion (in the same way as Thomas Kuhn has argued that adherence to a new scientific paradigm is a conversion)" (Mouffe, 2000, p. 102).

responsibilities of science to the fore. Advancing this democratic and critical approach to science, particularly under dominant models for knowledge creation - which actively perpetuate the ideal of a natural consensus in the objectivity claims of science[118] - can only come through inclusivity.

The major shortfall in application to regulatory responses is that many of the procedures to invigorate democratic debate do not offer universal or conclusive interpretations. Nevertheless, there is, as Fischer (1997) noted, value in determining how problems are defined within local knowledges, namely, "...the explication of arguments, the revealing paradoxes, myths and enigmas" (p. 192). Fischer countered the criticism of post-positivist approaches being 'hopelessly relativist and without criteria to judge competing claims', as "…outmoded relics of positivist epistemology" (p. 192). The post- positivist strategy instead focuses on the "…social contexts that make meaningful judgements possible" (p. 192), and where people and places can be positioned above the 'sacred text' of science.

Carolan (2008) argued that the hidden value systems within science must be brought to the fore. "That is, while these controversies may appear on the surface to rest on disputed questions of fact, beneath often reside differing positions of value; values that can give shape to differing understandings of what the 'the facts' are (Carolan, 2008, pp. 733-734). It is not that science needs to be more objective, instead it needs "better political mechanisms to bring those hidden values, which lie *within* science, to the forefront of the discussion" (Carolan, 2008, p. 735 emphasis in original) to allow for explication of facts and values. These mechanisms for environmental contestation "…need not be linked solely to politics or ideology *but to science itself*" (Carolan, 2008, p. 725 emphasis in original). Importantly, changes to the way in which dialogue takes place between science, government, industry, and the public are necessary for the democratic transformation of science to occur (Bäckstrand, 2004, pp. 704-705).

7.2.2 Creating spaces for citizens to question and contest science

In order for citizens to be meaningfully involved in scientific decision-making, a fundamental starting point is to accept that citizens "are keen to take part in

[118] Wynne (1987, p. 432) argued that the natural consensus held by science remains a shortcoming, as it encourages an erosion of credibility.

'scientific decision making' and...are entirely capable of doing so" (Wynne, 2006, p. 219). Furthermore, resources "to enhance public capacity and uptake of science…ones that emphasise advice, negotiation, and support rather than control of people's interpretations" (Wynne, 1991, p. 118) need to be developed. As Jasanoff (2003a) argued, there is a need to avoid propositions framed in 'either/or' terms. Instead, effort needs to be given to developing a model for citizen involvement that can uphold both democratic principles and high-quality expertise. For Jasanoff (2003a), the question was, "how to integrate the two in disparate contexts so as to achieve a humane and reasoned balance between power and knowledge, between deliberation and analysis" (p. 398)?

Accordingly, new approaches to power sharing are needed; moving from explanatory modes of science, to interaction and discussion, and where dialogue can be adapted to local contexts (Gristock, 2001, p. 22). In debates concerning environmental pollutants, this model for science decision-making should not simply reflect on issues of safety; "it is a debate about the kind of world we want" (Sir Robert May: cited in Gristock, 2001, p. 13).

This section discusses the challenges associated with developing mechanisms to involve citizens in decision-making rich in the discourse of science at a practical and meaningful level. However, as argued elsewhere in this thesis, presenting citizens' participatory rights as fully achievable under socio-political mechanisms that exclude them, highlights a circularity of argument. Nevertheless, the establishment of a 'transactional space' where all perspectives are laid on the table (after D. Parr Greenpeace: cited in Gristock, 2001, p. 14), cannot not be dismissed simply because it appears, in light of the discussion, unattainable.

Cash et al. (2003) recognised the need for boundary spanning institutions or procedures to bridge communication 'problems' between different groups, especially in the interface between science and policy, relying on organisational arrangements for communication, translation, and mediation. Yet, Cash et al. (2003) also acknowledged that the structure of these institutions or procedures remains a "question for scholarly research, practical experimentation, and comparative learning" (p. 8090).

Young (2001) recognised the significance of the authority invoking dimensions of science and how "...democratic processes that appear to conform to the norms of deliberation are usually biased toward more powerful agents" (p. 671). Although she highlighted the value of the deliberative democratic approach, Young acknowledged the difficulties in working through several significant problems. Amongst them, she noted the inequities that come with naïve attempts to 'bracket' power (p. 675), the terms of reference presented for debate and assessment (p. 678), the blanket labelling of activists as 'unreasonable', 'irrational', or 'extremist' (pp. 675-676), and the absence of positive institutional change to support the examination of the basic social and economic structures (pp. 684-685), which are producing injustice for communities (p. 681). Similarly, Wynne (2002: cited in Wynne 2005, pp. 71-72) warned of the model of 'citizen' that curtailed crucial elements of democratic citizenship, and which instead relied on institutionalised science and the power structures informing it - where science has moved beyond merely informing policy but has become the culture of policy.

Therefore, it is not only that mechanisms or 'spaces' are required for citizens to debate science and its policy applications, but also an arena to address the authority invoking dimensions of science. The establishment of such an arena, however, returns debate to the procedures that challenge the legitimacy of citizen involvement - the expert-lay boundary and the approach to science decision-making which uses 'certainty' to further confront disputed meanings. While the solutions remain complex and often impenetrable, challenging the expert-lay knowledge dichotomy and the objectivist ideal are important strategies to establish legitimate transactional spaces for citizen involvement.

By re-establishing lay knowledge (i.e., that which can provide a situated perspective) as robust knowledge we break down the dichotomy created to produce control and power over knowledge, and we are drawn to a new theory of expert knowledge, in which models of participation and mutual learning can prevail (e.g., see Cornwall & Jewkes, 1995). Under these conditions, citizens are able to play a more significant role in agenda setting, and public discourse moves beyond mere confirmation of scientific knowledge to involvement in the creation of knowledge, producing shared

responsibilities. Wynne (1987, p. 436) argued that rather than producing an environment in which the interference by those judged 'inexpert' is feared, these shared responsibilities between citizens and scientific experts produce better outcomes in which social learning is developed. In fact, Irwin, Dale, and Smith (1996, p. 64) argued the need for more than one source of technical information within any given context - alternatives that are local, accessible, and sympathetic to the needs of citizens, rather than science being the final arbiter of community need.

Importantly, locations of power and authority need to be identified. But, as argued by Mouffe (1993, 2000), this is not to suggest that all traces of power and exclusion be erased, rather that they be made visible to support open contestation. In alignment with Gristock (2001) and Cash et al. (2003), Mouffe (1993) saw this to involve "...the establishment of a set of institutions through which they can be limited and contested" (Mouffe, 1993, p. 146) - the creation of a space where claims to authority and knowledge can be challenged, uncertainties disclosed, and legal rights addressed. Public participatory processes that are just veiled mechanisms of power and control must be avoided (see Craig & Porter, 1997, p. 230; Cohen, 1985: cited in Kothari, 2005, p. 441).

The following section will draw on the findings of the ANI site case to further explore the ideas presented in this section and examine mechanisms for a practical response, whereby citizens in WA can more effectively be involved in the management of contaminated sites specifically and environmental and landuse planning debates more broadly.

7.3 Application to Western Australia

This thesis has drawn on evidence from the ANI site case study to examine public participation trends in WA and has established the significance of involving citizens in debates using scientific knowledge. In particular, the case study highlighted the problematic application of public participation under mechanisms that hold no statutory legal standing and that position citizens as peripheral to expert debate. Furthermore, the thesis highlighted problematic application of the current model for regulatory science to the management of contaminated sites, and demonstrated how

the strategies used to bridge the knowledge gap between research and regulatory models of science are dysfunctional under WA regulatory mechanisms. That is, the application of precautionary assessments and categorisation of contaminated sites that *are* expressly incomplete, and that *ought* to support a wider interpretation - offering a means to address the problem of inclusivity in knowledge creation - falter in practical application. In WA, these problems reflect shortcomings in the enforceability of safety criteria and in the frameworks of science that position it beyond socio-political intrusion. This final section will further discuss these issues in WA with a view to producing pathways for change.

To recap briefly, the dominant features of the management of contaminated sites in WA include:

- provisions for citizen involvement in environmental debates, but mainly in non-statutory forms;
- public participation/community consultation that can present as ambiguous in legal application[119];
- precautionary approaches to environmental regulation, but mainly in non-statutory forms;
- statutory and guideline definitions of precaution that are ambiguous in practical application;
- regulatory application of (ambiguous) participatory or precautionary approaches, but only where the right is enshrined in statute;
- separation of landuse planning and environmental/health assessment, invoking the subordination of health safety and environmental protection to land development;
- regulatory mechanisms that rest on positivist approaches to science and scientific knowledge creation; and

[119] The WA EDO (2006), nevertheless, recognised that from the case law consultation is required when:

- *A private right or interest is affected…*
- *A group contains members whose private rights or interests will be affected*
- *An individual has a 'special interest' in the outcome of a decision*
- *A group contains members who have a special interest.*

- regulatory and socio-political mechanisms that maintain undemocratic applications of science, expert-lay knowledge dichotomies, and corporate intrusion in decision-making.

The overarching strategies of PNS, as promoted by Funtowicz and Ravetz (discussed in section 7.3.1), are positioned as valuable in supporting a plurality of ideals, and in establishing a role for science that complements community standards for a liveable and just society. So too, Bäckstrand's key points for re-thinking science (entailing epistemological, normative, and institutional change), and Mouffe's agonistic pluralism (aimed at making power and exclusion visible), seek to invigorate democratic ideals, while addressing the inherent failures of current modes of public participation in scientific debates. The applicability of these modes of engagement to public participation mechanisms in WA, however, relies on first redressing the administrative structures that block institutional change. Administrative changes to public participation and environmental regulation, in particular, are necessary before epistemological and normative challenges to science can take place.

This discussion thus sets the groundwork for producing non-hierarchical forms of governance, albeit paradoxically via hierarchical mechanisms, relying on legislative change. The discussion opens by looking at the key elements of 'legislative change', then more broadly 're-framing public participation', and it concludes by returning to an important question presented by this thesis, 'are citizens allowed to contest science?'

7.3.1 Legislative change

Government commitment to citizen involvement in decision-making, alone, is insufficient to guarantee public participation in WA. The 'softer' decentralised forms of steering aimed at strengthening democratic quality and performance of environmental policies, favoured by Bäckstrand et al. (2010, p. 4), therefore, must first be supplemented by legislative change. Citizens need strong legal rights to secure their participation and their safety from polluting activities.

Jasanoff defended litigation (see section 7.2) as a means to resolve the problem of citizen involvement in regulatory scientific debates. However, as demonstrated in the

ANI site case study, without formal statutory rules advocating context-based appraisals or public participation in decision-making, regulators are powerless to act and citizens have no legal capacity to hold regulators and developers to higher standards of practice. Accordingly, improvement to the legal standing of both the precautionary safety criteria and public participation (including the creation of a 'transactional space' to debate the delineation, application, and enforcement of safety criteria), is a key target for the management of contaminated sites in WA.

Improvement to the statutory rights of citizens also produces opportunities to apply Funtowicz and Ravetz's model for 'extended peer review' (introduced in section 3.3.4), whereby citizens can play a more active role in quality control and in determining the uses of regulatory science. Nevertheless, there remains an unresolved component to public involvement in regulatory science. That is, although regulatory scientific decision-making benefits from wider review, especially by those subject to the decisions, the legal need for irrevocability assigns regulatory science a greater obligation to provide a certainty of knowledge. This makes the knowledge less permeable to review, even in the face of obvious uncertainties.

However, a solution to the problem of legal irrevocability is possible if legal enforcement of context-based assessments (i.e., the procedural elements, although not necessarily the safety 'values' themselves, which remain context-bound) is mandated and, importantly, if enforceable procedures are adopted to support open debate on the critical (context-bound) features of the safety values used to manage contamination. In other words, although contexts may differ from project to project, it is possible to implement procedures to ensure that a wide range of factors are given due consideration (using extended peer review processes), and that the data are critically positioned. Arguably, these types of procedures (in the form of 'guidelines') are already in place in WA, but are failing precisely because the bodies in control of implementing the procedures are not delegated any statutory powers. With statutory powers granted, regulators can be authorised to force context-based provisions and to incorporate local knowledges (to supplement universal accounts of knowledge), and can be held to account by citizens if they fail to do so.

A further question arising from the ANI site case study landuse rezoning assessment processes is, 'how do we deal with new knowledge?' - how can decision-making take into account any emerging environmental hazards from a project? To address this question, again, statutory provisions are necessary to ensure that decisions can be set aside while the new information (e.g., on the contamination or the geological stability of a site) is assessed against safety or landuse planning standards. Moreover, strong legislative provisions to set aside or even terminate a project provide an incentive to ensure that contamination issues, alongside socio-political factors, are considered and comprehensively investigated at the earliest available opportunity. Jones (2014, p. 28) also noted that involving publics 'upstream', before decisions on trajectories become locked in, facilitates the steering of science-based decisions in socially acceptable directions.

With participatory rights and precautionary assessments enshrined in law, local communities can be provided some leverage to establish stronger safety objectives, or to prevent a project that cannot meet the precautionary safety criteria. In fact, under the types of regulatory conditions proposed, the ANI site redevelopment could have been made acceptable to the local community, and without lengthy dispute and legal action. For example, more comprehensive soil investigations and historical research would have uncovered the lead smelting history at an earlier point in decision-making[120], forcing a re-think on the development proposal. If the project was then approved under more stringent legal provisions, the ANI site redevelopment program could have been forced to apply higher standards for environmental monitoring (using more site monitors, off-site monitors, and off-site soil and water testing); human health monitoring could have been undertaken (adopting physical barriers between contaminating activities and sensitive receptors during the remediation works); and changes to the Structure Plan process implemented (being dependent on further public participation and the guarantee that all decision-making be transparent and decision-makers accountable).

Although the implementation of legal provisions relating to regulatory science, public participation, and other procedural aspects, address the non-statutory features of citizen involvement in decision-making, they remain insufficient to secure

[120] Arguably, the developer and some regulatory bodies did have access to this information but did not release the information widely.

meaningful citizen involvement or produce a critically positioned stance for science. As outlined in section 4.1, systems of higher statutory enforcement do not guarantee these sought after outcomes. Instead, a new cultural narrative for the management of environmental toxics, of science, and of public policy, is needed to supplement regulatory systems. The relocation of authority and the sharing of responsibilities between regulatory agencies and citizens are crucial factors in defining the success of this process.

7.3.2 Re-framing public participation

To effect change to the status of publics and the role of science in decision-making is a more daunting task than that of legislative change. However, in focussing on the dichotomy drawn between expert and lay knowledges, it is possible to confront the problem.

The Residents' Association involved in the ANI site actions applied sound strategies to assert its expert understanding of the problem and to establish its positioning as a key stakeholder, yet the regulatory bodies still disregarded the group's actions and its undeniable status as a contributor to local knowledge. Whether this outcome represented an unwillingness by regulators to engage with publics beyond any statutory requirement, or the recognition that to engage would be disingenuous without the power to legally uphold public comment, has not been determined in this study. However, under conditions where regulators maintain the expert-lay dichotomy to discount public input, any strategy to support public involvement in debates involving expert knowledge, even where public participation is upheld in a statutory form, will continue to meet with resistance. Legislative routes for public participation are, therefore, likely to prove unsatisfactory if rights to knowledge production and review are not extended to community representatives or independent experts operating from beyond the professional remit of the regulator.

This thesis acknowledges a challenge exists in getting to that point where the scientistic model used in regulation can become more reflexive and effectively embrace frames of knowledge production external to professionalised expertise, along with the ethical and socio-political perspectives represented by these knowledges. Therefore, improved mechanisms for citizens to negotiate the terms of

reference in decision-making processes are essential to effect institutional changes to science. Wynne (2007) maintained, "pragmatic effect requires radical imagination" (p. 496). However, without provision for negotiation between (equal) parties, without conditions that support the realisation of a public agenda, without opportunities for citizens to radically (re)imagine science, a defective model of public participation will continue to operate. It is not enough to assume that simple information dissemination, or any strategy that serves only to restrict citizen involvement (via time constrains, access to information, the terms of reference for debate, the types of knowledge used, or absent legal frameworks), will produce an adequate outcome. A framework that supports community knowledge and a counter-expertise offers the only assurance of citizen involvement in the interpretation and application of technical data.

Gristock (2001) argued that governments need to stop focussing on the avoidance of public panic regarding the use of science and technological solutions, and instead offer openness, accountability, and responsibility. However, Gristock also noted that pressures on governments to deal with competing pressures and obligations made it "...difficult for the needs and wishes of the people to become embodied in the routes that science and technology developments take" (p. 23). Nevertheless, it is precisely the 'needs and wishes of the people' that must feature in a new regulatory model for science, if it is to embody the requisites of good governance[121] and be held as publicly acceptable.

Wide institutional changes and personal and political transformations are necessary to accommodate a more meaningful approach to public participation in WA. Public participation is an interactive process - there must be a willingness and commitment by regulatory institutions to engage with citizens, citizen scientists, and alternative knowledge frameworks and worldviews, rather than ignoring them or simply labelling them inexpert, emotive, or ignorant. If government, industry, and science bodies are sincere in their desire to communicate more effectively, they must reappraise their intellectual structures and implement changes to support the incorporation of broader and more inclusive knowledge traditions.

[121] Entailing the ideals of openness, accountability, coherence, and effectiveness (after Bäckstrand et al., 2010, p. 10)

7.3.3 Concluding comments

This thesis sought to construct a path through the complicating elements of scientific knowledge, its regulatory applications, and its ideological roles, with a view to improving public participatory mechanisms in science-rich debates. While this thesis has highlighted the importance of citizen involvement in science decision-making, it has also highlighted that in Western Australia this involvement has been restricted by mechanisms that uphold the dominance and authority of 'science' and limit the opportunity for publics to contest knowledge that is scientifically framed. Returning to the question, 'are citizens allowed to contest science?' - given the data presented in this thesis, the answer is 'no'. Nevertheless, the thesis argued that there *are* avenues to produce a new participatory framework for science decision-making.

Legislative reforms provide a preliminary mode through which to achieve institutional change, but only insofar as supporting a stronger foundation for the authorisation of some elements of regulatory science and of public participation, not an epistemological foundation for change. To meet the epistemological challenge, a new cultural narrative for managing contaminated sites, for science, and for public policy, is necessary. Importantly, for changes to occur to the positioning of publics within expert debates, and to the way other knowledge locations or frameworks are valued within objectivist accounts, focus must remain on redressing the intellectual traditions that assert authority over knowledge and hamper citizen involvement in decision-making. This thesis argued that critically positioned and context driven combinations of strategies are crucial to effect these changes.

Popper's critique of normal science (see section 3.1.2) emphasises the role science should play in critical thinking, creating a space where science can be revolutionary all the time and not just at times of paradigmatic disharmony. The possibility for producing the sought after critical and situated positioning lies in the understanding that the systems of science are not just there, rather we create them and regularly recreate and redefine them. Drawing on the underlying posits of a science that claims open-endedness, but which fundamentally accepts that problems are there to be solved, new pathways to disentangle seemingly intractable problems can be made possible. However, it is important not to de-politicise the problem - how we frame public participation in relation to the assessment of the ideology of science is

important. Analysis must focus on the "…overarching discourses that structure our ways of thinking and thus communicating" (Fischer & Gottweis, 2012, p. 16).

Although the link between knowledge, expertise, and authority is evident, expert endorsement of science cannot confer truth on its knowledge claims (Code, 1991, p. 181). Petts (1997, p. 359) (see section 3.2.1) asserted that it is expressly the location of knowledge that is important in environmental debates. She argued that expertise is a communicating and learning process, which necessarily involves the use of source-linked information, best accessed through special interest groups and the public. If the problem of the framing of public participation and of science is lost from debate, inferior outcomes for public policy will continue to be produced. The focus of science is to look for solutions and this is how the problem of public participation within science can also be framed.

POSTSCRIPT

On the 16 May 2009, community leader and activist Adele Carles was elected to the Legislative Assembly of the Western Australian Parliament, being the first Greens candidate in WA to win a lower house seat and the second in Australian history. This was the first time in any State or Territorial election that the Greens had outpolled the Australian Labor Party (ALP) on the primary vote, exceeding 44% (Australian Broadcasting Corporation, 2009). The ALP had held the lower house seat for the State electorate of Fremantle since 1924. Carles held the seat for one term, until March 2013.

In August 2009, and following the ANI site remediation, the rail corridor adjacent to the ANI site was found to be contaminated with levels of lead exceeding the residential health criteria by more than 4 times. Ms Carles called for a halt to building works in the South Beach area until the full extent of the lead contamination could be determined.

> *Contaminated site remediation in Western Australia is still in its infancy in terms of methodology and public health protection. The primary means of remediation in WA are dig and dump approaches with poor dust control, no vapour control and inadequate air monitoring techniques. The South Fremantle community were subjected to the remediation of the former lead smelter site in 2005. I represented this community in the Supreme Court in which we attempted to have the WA Government adopt best practice remediation by removing all risks to local residents and beach users....Unfortunately the responsible government agencies in WA refused to take this preventative action and approved a plan which did not remove the risk of lead dust being released over South Fremantle. The departments gave public assurances that nothing would go wrong and site specific risk assessments that generated 'tolerable' levels of contaminants. These assessments did not take into account the special sensitivities of the elderly, infants and pregnant women. They also failed to account for the accumulative and synergistic impacts of the hazardous chemicals released and ignore the pre-existing body burdens of likely receptors. Ultimately many families with young children, including mine, made the*

> *difficult decision to leave our homes voluntarily while the developer conducted its remediation over an 18 month period. Some families never returned. The unfortunate legacy of this remediation has left a scar on our community. (Carles, 2010, pp. 5-6)*

Regardless of the South Fremantle/Hamilton Hill Residents' Association's legal challenge to the ANI site project and the long period of community dispute over this contaminated site redevelopment, other development projects in WA continue to be approved under similar conditions. The legislative provisions in WA for the inclusion of citizens in development projects continue as detailed in this thesis, and the question of inclusion of publics in scientific debate remains an unresolved issue.

APPENDICES

Appendix A: ANI-Bradken site timeline

1898-1920	Fremantle Smelting Works operates from the southern portions of the ANI site and surrounds.
Late 1940s	Smelter waste stockpiles remain onsite, decades after the smelter closes.
1947	Aerial photographic evidence shows a new industrial use of the site.
1953	Bradford Kendall ferrous metal foundry is commissioned.
1982	Bradken acquires ANI.
1995	The Fremantle Lead Study is released, showing raised blood-lead levels in children of the area.
1998	The ANI-Bradken foundry ceases operations.
	Steiger Aust Asia Pty Ltd purchases the ANI-Bradken foundry site with a view to residential redevelopment.
	An early suite of soil tests shows only minor exceedances of contamination trigger values.
2000	A statutory 3 month public comment period for the MRS amendment under the *Metropolitan Region Town Planning Scheme Act (1959)* and *Environmental Protection Act (1986)* is applied.
2001	The ANI site is rezoned under the MRS from General Industry to Urban landuse.
2002	The developer holds public workshops and presentations for the local community.
	The first of the South Beach Structure Plans is advertised and subsequently adopted.
2003	October: Solicitors for the Residents' Association officially submit 'new' evidence of the lead smelting industry at the ANI site.
	October: The developer undertakes ethnographic surveys. Approval under the *WA Aboriginal Heritage Act (1972)* follows.
	November: The developer and the Minister for Planning and Infrastructure claim to have known of the smelter's existence from the outset of the project.
	Wide scale soil testing reveals extensive soil contamination at the ANI site.
	The developer's environmental consultant reports on 'anecdotal' evidence of a lead smelter in the area.
	The City of Cockburn tests the dunes adjacent to the ANI site for contamination.
2004	April: DOH finds lead in filter feeding sea animals off the coast from the ANI site but concludes 'no risk' to public health.
	May: The developer's environmental consultant reports to the DOE the 'suspected' presence of a lead smelter in the vicinity of the project.
	The original advocate of the ecovillage redevelopment model withdraws from the project and the site becomes the sole enterprise of Stockland Pty Ltd.
	The regulator rejects Versions 1 and 2 of the EMP.
	December: The regulator approves Version 3 of the EMP.
2005	The Residents' Association commences legal action against the developer and the WA Government. The WA Supreme Court finds in favour of the Residents' Association and the approval of EMP Version 3 is set aside until the Residents' Association and City of Fremantle have completed their reviews.
	The Residents' Association and City of Fremantle release reviews of the remediation plan.
	The WA Government rejects local residents' request for a blood-lead monitoring

	program.
	The suburban coastal strip of Hamilton Hill, where the ANI redevelopment site is located, is renamed North Coogee.
	Community activists stand as candidates in Fremantle and Cockburn electorates in the State election.
2005-6	The WAPC convenes a public participatory program as part of the Perth Coastal Planning Strategy.
2006	Residential density requirements for the ANI site are altered under a revision of the Structure Plan.
	A Community Television documentary on the ANI site redevelopment is released.
	Remediation works commence in May and are close to completion by December.
	Many residents relocate during the remediation.
	The *WA Contaminated Sites Act (2003)* comes into full force.
2007	The ANI site is renamed 'The Islands'.
	Community leader, Adele Carles, tables a petition with the City of Cockburn calling for a review of the development coastal setback.
2008	Adele Carles stands as a Greens WA candidate in the State election.
2009	Adele Carles is elected to the Legislative Assembly as the Greens WA Member for Fremantle.
	The Islands development is completed and the dunes to the west of the ANI site are levelled.
	The rail corridor adjacent to the ANI site is found to be contaminated with lead.
	The WA Government approves the relocation of the lead carbonate export from Esperance to Fremantle, using the rail link running alongside the ANI site.

Appendix B: Issues raised in public submissions to the MRS Amendment

(abridged list)

Public concerns	EPA/WAPC responses
Contaminated groundwater from the nearby landfill site could produce health impacts.	• Groundwater should not be extruded from the development area as this could pose an environmental or human health risk. • Ongoing groundwater monitoring is necessary, but contamination is manageable.
Disturbing the landfill site could cause health impacts.	• The landfill site is not under consideration because it is not part of this Amendment. • The possibility of a groundwater nitrogen plume has been addressed as part of the Environmental Review.
Residential redevelopment is not viable adjacent to a freight railway line with proposed increases in use by Fremantle Ports 24 hours/day. Residential redevelopment is not viable so close to existing commercial and industrial premises that operate 24 hours/day, 7 days/week.	• Noise issues can be addressed through setbacks and adequate building insulation provisions. • Assessment of vibration issues should be deferred but will be considered at a subsequent planning stage. • WAPC and local authorities will place restrictions on subdivision and future development proposal to manage potential residential noise impacts. • Noise issues are not considered a fatal flaw and can be managed at the structure plan/development stage.
Incompatible landuse: There are likely impacts on the proposed residential area from existing industry by way of noise, dust, odours, and other emissions.	• Adequate separation distances between industrial and sensitive landuses will be provided. • Incompatible landuse issues will be identified as a condition of the MRS Amendment. • Odours from nearby industrial sources are required to be controlled on-site and adequate buffers in place. • Incompatible landuse issues are considered manageable.
Proposed increases in traffic, from up to 1,200 extra cars, will impact on existing residential areas in South Fremantle.	• While increases in traffic based on the 1996-1999 levels are possible, increased levels of traffic from the new development will not increase traffic to the former industrial usage levels. • Noise impacts from increased traffic levels will be negligible. • This issue is for resolution via the structure planning process.
Hazardous materials are transported via the adjacent freight railway line.	• The freight railway line already passes through residential and other sensitive landuse areas. The risks would therefore already need to be considered as part of standard risk management procedures.
Industry needs to be protected from encroaching residential areas that could place restrictions on its operations.	• To be considered as part of structure planning process. • To be managed through normal regulatory processes and industrial setback requirements.

Coastal setback provisions are necessary for the ANI site. No development should occur west of the railway reserve. The ANI site should become a coastal reserve.	• The issue of coastal stability and dynamics of this particular area needs to be investigated to determine the appropriate setback for the site. • Coastal foreshore issues will be managed through the planning process. • The coastline in the area has accreted since 1942. The coastline is stable and not eroding. • That development is inappropriate west of the railway reserve has not been proven in submissions. • There is no proof in submissions that there is a need for a coastal reserve in the vicinity.
There are risks to the dunal vegetation with increased development.	• Not considered a relevant environmental factor by the EPA. • Protection will be via coastal setback provisions. • The City of Cockburn is to manage dune fencing and beach access.
There should be provision for a green belt between the existing residential area and new development.	• Large expanses of parks and recreation reservation already exist in the South Fremantle/Hamilton Hill localities. There is no evidence provided in submissions that there is a need for additional land for such purposes.
There are risks to the marine environment from the development.	• There will be benefits from the development. With contaminated land being remediated, the marine environment will be protected from the risk of contaminated leachate.
Increased usage of the area will place pressure on existing facilities, such as parks and reserves.	• The need for additional public open space will be considered at the structure planning and subdivision approval stages.
Solar principles should be applied to the development.	• To be considered during structure planning and subdivision planning, not MRS Amendment.

Appendix C: IAP2 Public Participation Spectrum

(Copied from International Association for Public Participation (2000) www.iap2.org)

	Inform	**Consult**	**Involve**	**Collaborate**	**Empower**
Public Participation goal	To provide the public with balanced and objective information to assist them in understanding the problems, alternatives and/or solutions.	To obtain feedback on analysis, alternatives and/or decision.	To work directly with the public throughout the process to ensure that public issues and concerns are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
Promise to the public	We will keep you informed.	We will keep you informed, listen and acknowledge concerns and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and issues are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for direct advice and innovation in formulating solutions and incorporate your advice and recommendations into decisions to the maximum extent possible.	We will implement what you decide.
Example tools	-Fact sheets -Websites -Open houses	-Public comment -Focus groups -Surveys -Public meetings	-Workshops -Deliberate polling	-Citizen advisory committees -Consensus building -Participatory decision-making	-Citizen juries -Ballots -Delegated decisions

Appendix D: Comparative test results: maximum analyte levels ANI-Bradken site

Analyte mg/kg	MPL Test results (1998)	Dames & Moore Test results (1998)	ENV Australia Test results (2005)	Dutch Target Value soil (ecol. risk)	Dutch Intervention Value (human risk)	Aust. EIL	Aust. HIL-A [122]
Antimony			**18**	3	15	-	31
Arsenic			**330**	29	55	20	100
Cadmium			**590**	0.8	12	3	20
Chromium (total)	170	180	**1,200**	100	380	50	210
Copper			**1,400**	36	190	100	1,000
Lead	770		**16,000**	85	530	600	300
Mercury			**19**	0.3	10	1	15
Manganese	1,110	940	**25,000**			500	1,500
Molybdenum			**130**	3	200	40	390
Nickel	610	120	**340**	35	210	60	600
Zinc		370	**13,000**	140	720	200	7,000
Asbestos			**Neg**				
PAH (benzo(a)pyrene)			**1 sample 2x Target Value**	1 (total)		1	1
Phenols (total)			**Neg**	0.05		1	
Cyanide (free)			**Pos**	50 (free)		10	250
Fluoride			**3 samples exceeded Target Value**				
PCBs (total)*			**Neg**			1	10
TPH			**Pos**				
OC/OP pesticides			**Neg**				
VOCs			**Neg**				
Iron	42,500						

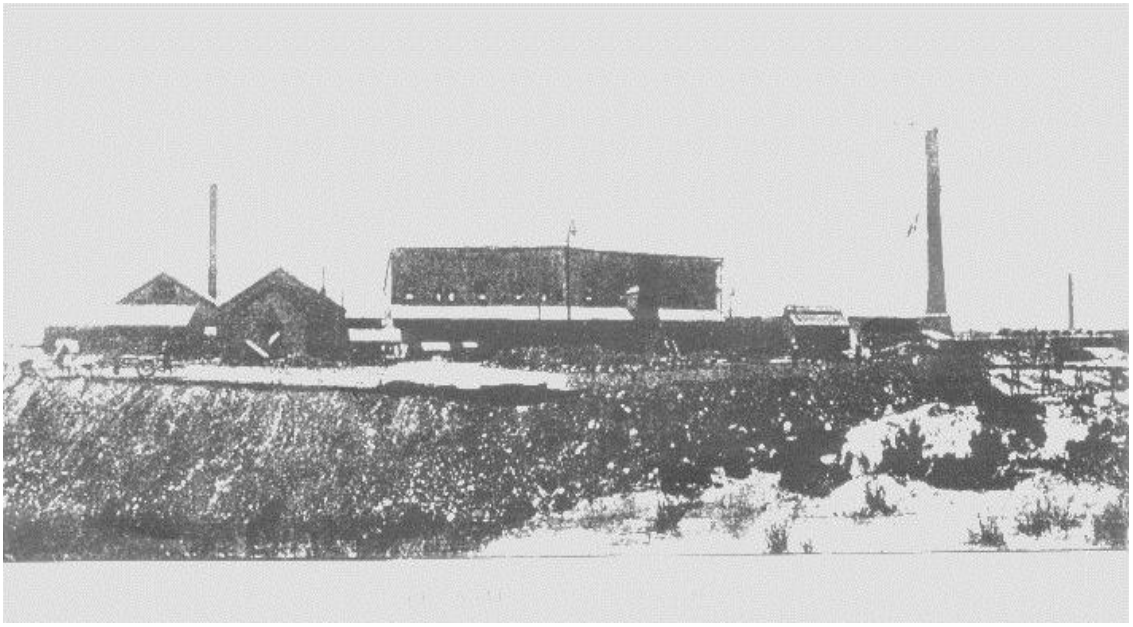
* The location of a PCB dump, as reported by a former ANI employee, was never uncovered.

[122] The Australian HIL, EIL, and other guidance criteria were reviewed in 2011. See NEPM (Assessment of site contamination) measure April 2011 Schedule B1 Guideline on investigation levels for soil and groundwater.

Appendix E: Clean-up Criteria (CUC) ANI-Bradken site

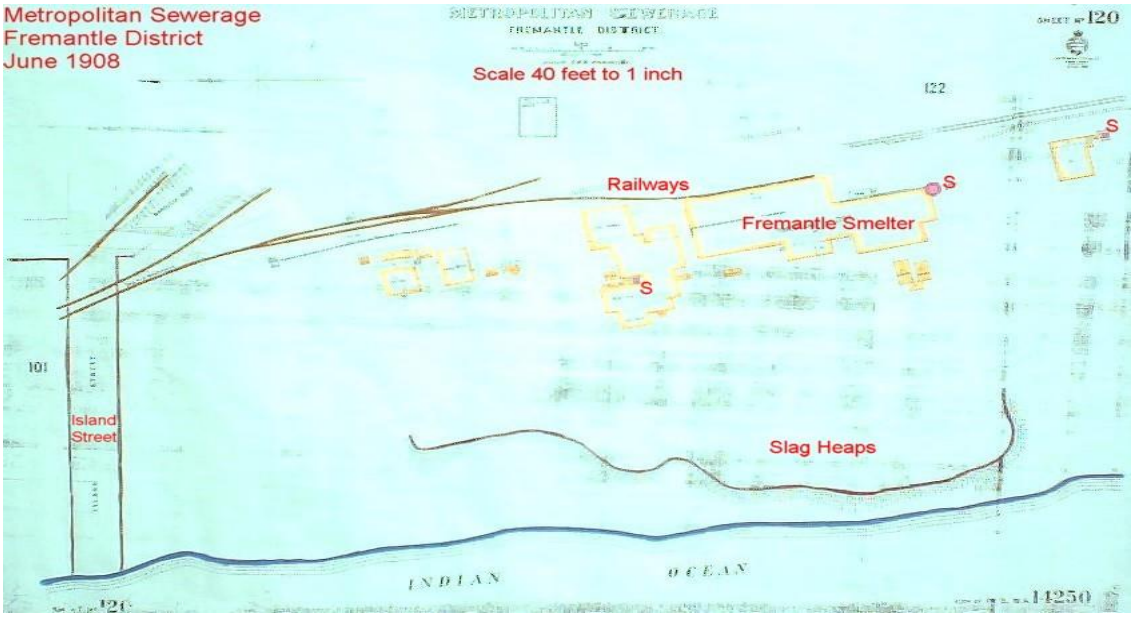
Metal/metalloid	EIL	HIL - A	CUC EMP3
Arsenic	20	100	**100**
Cadmium	3	20	**5**
Chromium (total)	50	210	**50**
Copper	100	1,000	**60**
Lead	600	300	**300**
Mercury	1	15	**1**
Manganese	500	1,500	**1,500**
Molybdenum	40	390	**40**
Nickel	60	600	**60**
Zinc	200	7,000	**600**

Appendix F: The Fremantle Smelting Works



Copied from 'Twentieth Century Impressions of Western Australia' (P.W.H. Thiel & Co., 1901)

Appendix G: The 1908 sewerage map



Appendix H: South Beach (1918)

Swimming next to the smelter

(Photo courtesy City of Fremantle Library)

Appendix I: The ANI-Bradken foundry (2004)

Appendix J: 'Dunes' to the west of the ANI-Bradken site (2003)

Soil erosion reveals residual industrial waste below a capping layer of limestone.

(Photo courtesy SaveSouthBeach)

Appendix K: The Islands apartments (2015)

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