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Impacts Project – Data Items

Robert Power and Bella Robinson

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Enquiries should be addressed to:

Robert Power
CSIRO ICT Centre
Computer Science and Information Technology Bld (Building 108) ANU
North Road Acton ACT
GPO Box 664 Canberra ACT 2601 Australia
Telephone: +61 2 6216 7039
Email: robert.power@csiro.au
Web: www.csiro.au

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1.0	May 2012	Final Version. Incorporate feedback from FRNSW

Distribution list

Melanie Stutchbury Fire & Rescue NSW Project Manager

Nick Nicolopoulos Fire & Rescue NSW Business Owner

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EXECUTIVE SUMMARY

The Impact of Natural Disasters and Fire Emergencies Project, referred to as the Impacts Project, is a national initiative to better understand the economic, social, and environmental impacts on communities due to natural disasters and fire emergencies. This will enable governments, communities, and Emergency Service Organisations to decide where best to allocate investment across the prevention, preparedness, response and recovery (PPRR) spectrum to increase community safety and reduce the impacts of fire emergencies and natural disasters.

This report describes the process and preliminary result of identifying and obtaining data items related to the Impacts Framework for use in the Pilot Impacts Portal. The process is summarised as follows:

- Investigate and understand the Impacts Framework.
- Determine the data required.
- Establish who has the data.
- Define the criteria to evaluate the suitability of the data for use in the online portal.
- Contact the data custodians:
 - Communicate information about the Impacts Project.
 - Survey the custodians to identify existing relevant data items.
 - Collect responses.
 - Identify relevant data items using the above criteria.
- Obtain data items.
- Document the data found.

The target data items are grouped into the following categories, derived from the Impacts Framework:

- The Impacts Framework.
The content of the Impacts Framework has been loaded into a database and forms part of the data repository of the Pilot Impacts Portal.
- Event data.
Details of specific instances of the natural disaster or fire emergency events defined by the Impacts Framework.
- Impacts data.
The measured impacts resulting from a specific instance of a natural hazard or fire emergency event.
- Mitigation and Recovery
The history of funds spent and actions performed in a region for disaster prevention, preparedness, response or recovery.

- **Baseline data.**
The baseline data is the context in which the natural disaster and fire emergency event occurs.

The task of identifying and obtaining the data items was performed by contacting relevant government agencies and other institutions by phone and email, having face to face meetings and by visiting relevant web sites. A total of 39 agencies were contacted during the course of the project. This was not expected to be an exhaustive consultation of all the relevant government agencies, private companies, universities and research institutions. It was aimed to target a representative cross section of the relevant data custodians.

A selection of prospective data custodians and potential users was invited to a national workshop held in mid October 2011 to discuss the project aims and objectives. During the workshop, a preliminary list of relevant data items was identified including a contact person when known. A data items survey was sent to these contacts with the aim of establishing what data currently exists, who maintains it, the format it is in, if it is available for use in the portal, and the terms and conditions of using it.

Eleven agencies were sent surveys in mid December 2011 and by the end of March 2012 five were completed and returned. Of the five, three indicated they had no relevant data items (AGD Emergency Management Capability Development Branch, Bushfire CRC and DCCEE), one had data but indicated that it would not be readily available for use in the portal (AGD National Disaster Recovery Programs Branch) while one agency had data and provided it to CSIRO (GA National Exposure Information System).

An initial collection of 25 data items have been obtained and used for the development of the Pilot Impacts Portal. The first data item is the Impacts Framework itself. Five data items describe events and four of these include information about resulting impacts. The remaining 19 data items are in the baseline category.

Note that not all potential data custodians have been contacted. Although the workshop identified a preliminary list of custodians, the workshop participants did not include all possible custodians. A representative cross section of the relevant data items custodians has been contacted. This will be an ongoing activity for the duration of the project and will continue throughout the hosting period.

A summary of the data items found is shown in the table below.

Data Item	Custodian	Category
Impacts Framework	FRNSW	Framework
Boundaries	ABS	Baseline
Population 2010	ABS	Baseline
Livestock Products	ABS	Baseline

Data Item	Custodian	Category
Livestock and Meat	ABS	Baseline
Business Counts	ABS	Baseline
Retail Trade	ABS	Baseline
Census of Population and Housing: Basic Community Profile	ABS	Baseline
Federal Electoral Boundaries	AEC	Baseline
AIRS	AFAC	Event, Impacts
Disasters database	AGD	Event, Impacts
Tropical Cyclones	BOM	Event, Impacts
Geofabric	BOM	Baseline
9 Second DEM Derived Streams	GA	Baseline
GEODATA TOPO 250K Series 3	GA	Baseline
NEXIS (March 2010)	GA	Baseline
Earthquakes	GA	Event
Dartmouth Flood Observatory	University of Colorado	Event, Impacts
Register of National Estate	DSEWPC	Baseline
Australian World Heritage List	DSEWPC	Baseline
Commonwealth Heritage List	DSEWPC	Baseline
National Heritage List	DSEWPC	Baseline
IBRA	DSEWPC	Baseline
Landscape Health	DSEWPC	Baseline
Land Use	ABARES	Baseline

This data has been compared against the contents of the Impacts Framework to identify the current gaps in information. For the collection of 25 data items obtained the following gaps have been identified:

- There are no event data items describing meteorite strikes, storm surges, or Tsunamis.
- The impacts data items do not reference 35 of the 51 objects described by the Impacts Framework.
- No Mitigation and Recovery data items have as yet been identified for use in the portal.
- There are no baseline data items identified for 25 of the 51 objects described by the Impacts Framework.

The Impacts Framework contains specific details of the impacts that may occur from a natural disaster or fire emergency event. While this is useful to help understand the full economic, social, and environmental impacts, losses and benefits resulting from a natural disaster or fire emergency, finding existing data items that match the level of detail that exists in the framework is a challenge and may not be achievable for historical events.

There have been a number of issues and obstacles encountered:

- **The Impacts Framework Model**
Further work needs to be undertaken to better understand the model underlying the Impacts Framework. This will allow:
 - Improved linkage of data items to the Impacts Framework content.
 - Improved understanding of indirect impacts.
 - Incorporating methods to measure impacts.
 - Extensions to the framework to be included.
- **Data Availability**
Some data custodians have data, but it is not readily available for use in the portal due to cost, licensing constraints, availability, or sensitivity of the data. For example, the PSMA data costs approximately \$50,000 per year to licence and data from Risk Frontiers could not be made publically available.
- **Data Currency**
The process of identifying and obtaining the data items is to build a data repository for the Pilot Impacts Portal. During the consultation process there were concerns raised about the data becoming out of date.
- **Data Coverage**
As noted above, there are gaps in the collected data items in terms of the content of the Impacts Framework.
- **Data Completeness**
Some of the data items identified do not contain the level of detail required by the Impacts Framework.

- **Data Custodian Engagement**
Obtaining responses to the data custodian survey was difficult. Some custodians did not respond to emails or phone calls, others indicated that they would complete the survey but didn't. Most of those that did respond stated they had no relevant data.
- **User engagement**
There has not been a successful engagement with potential users of the portal to determine specifically how they might use it and thus determine what data they require.
- **Existing Data Repositories**
There are data items relating to the Impacts Framework which exist as collections of reports describing, for example, specific natural disaster events, post event surveys, and risk studies. Some of these reports have been collected when they are available from web sites for use in the portal. However in many cases these reports exist, but are not available for the following reasons:
 - the reports are not managed as a single resource;
 - the report contents are often an aggregation of data from other sources (and these original sources should be identified for use in the portal);
 - the data items are distributed throughout the organisation;
 - no single person knows where they are located.
- There have been no Mitigation and Recovery data items identified for use in the portal. While such data does exist, in discussions with some agencies the availability of this data has been an issue. Although they have data, it is not readily accessible since it only exists in individual reports distributed throughout the organisation. Accessing these reports is problematic for the same reasons outlined above.

The following recommendations would enhance the usefulness of the identified data items:

- **In-House Deployment**
The Pilot Impacts Portal should be made available as an application that can be deployed in-house for an agency that wishes to incorporate data items that are not to be made publically available.
- **Targeted User Engagement**
Early adopters for the Pilot Impacts Portal should be identified to focus the features required of the portal and the data items to include.

- **Portal Hosting**
Allow development of portal features and the integration of new data items to occur within the portal hosting period.
- **Online Tool for Gathering Post Incident Impact Information**
Develop an online tool based on the content of the Impacts Framework to guide users to create PPRR data items and manage this information in the portal.
- **The Impacts Framework Model**
Define a model for the Impacts Framework.
- **Ontologies**
Create an ontology and supporting tools based on the developed Impacts Framework model.
- **Report Registry**
Allow the portal user community to contribute information to the portal for others to access. This information would be reports describing events and their impacts and be processed by supporting tools to link the reports to the content of the Impacts Framework. The registry would manage URL links to reports managed by the report owners.
- **Develop Standards for information exchange**
The Impacts Framework model could be the basis for a standard format for information exchange describing natural disaster and fire emergency data. Tools could be developed to help data custodians with existing data to translate their data into the format required and for new data items to be created in the new format.

1. INTRODUCTION

The Impact of Natural Disasters and Fire Emergencies Project, referred to as the Impacts Project, is a national initiative to better understand the economic, social, and environmental impacts on communities due to natural disasters and fire emergencies. The project will improve the availability of relevant data for the purposes of:

- informed discussion and decision making by governments and communities;
- policy development, planning and accountability for the emergency management sector.

The Impacts Project is divided into a number of deliverables:

Phase 1

Part A

Development of a framework for collecting and reporting the impacts and costs of natural disasters and fire emergencies.

Part B

Identification of existing sources of data to support (i.e. populate) the Impacts Framework (including a supporting glossary of terms and definitions and an agreement from the data owner to share the data in the online Framework).

Part C

The development of a nationally agreed directory of questions to measure household preparedness.

Phase 2

Part A – Pilot Impacts Portal

The establishment of a pilot online portal to publish the sourced data into the Impacts Framework, including mechanisms for stakeholders to deliver, share, query and report data.

This report describes the process of identifying and obtaining data items related to the Impacts Framework: Phase 1 Part B above.

This report is organised as follows. The introductory section defines the purpose of the report, its scope, the intended audience, definition of terms, and the references used and the consultation undertaken. Section 2 contains an overview of the two CSIRO contributions to the Impacts Project: the Data Items and Pilot Impacts Portal. Section 3 describes the process of gathering the data items. Section 4 reports the results of the data gathering process and a summary is presented in Section 5. The report concludes with a summary of the issues and obstacles encountered and recommendations for future work. The appendices contain a glossary of terms, the details of the consultation undertaken, a copy of the survey questions sent to prospective data custodians, a detailed description of the content of the Impacts Framework, the schema used to represent the Impacts Framework content in a database, the participants to the

national workshop, the metadata of the collected data items, and an example licence to use one of the identified data items. It is advised that the reader understands the content of the appendices since the data items being collected need to reference the Impacts Framework.

1.1 Purpose

The purpose of this report is to describe the process of identifying and obtaining data items related to the Impacts Framework for use in the Pilot Impacts Portal.

1.2 Scope

This report describes the process used to identify relevant data items and includes a description of the data items obtained. This process includes a determination by the CSIRO project team of the terms and conditions (the licensing agreements and copyright statements) for using the data items in the Pilot Impacts Portal. This assessment may not be correct and legal advice should be sought. Similarly, the CSIRO project team has made an assessment of the sensitivity and cost of the data items.

The report does not describe:

- How the data items are used in the Pilot Impacts Portal.
- How to maintain the data items so that they are kept up to date in the portal.
- How the individual data items may be integrated with other data items in the portal.

While every effort has been made to identify representative data items and custodians relevant to the Impacts Project, complete coverage in this area is not guaranteed.

1.3 Audience

The target audience is the internal CSIRO and FRNSW project teams and the Impacts Project Steering Committee and Advisory Group.

1.4 Abbreviations Used

AGDRP	Australian Government Disaster Recovery Payment
AHGF	Australian Hydrological Geospatial Fabric
AIRS	Australian Incident Reporting System
ALUM	Australian Land Use and Management
ASGC	Australian Standard Geographical Classification
ASRIS	Australian Soil Resource Information System
AURIN	Australian Urban Research Infrastructure Network
CD	Collection District

CIPMA	Critical Infrastructure Program for Modelling and Analysis
CSV	Comma Separated Values
DDMG	District Disaster Management Group
DEM	Digital Elevation Model
EMIDP	Emergency Management Information Development Plan
GDACS	Global Disaster Alert and Coordination System Archive
GNAF	Geocoded National Address File
HTML	Hypertext Markup Language
IBRA	Interim Biogeographic Regionalisation for Australia
IT	Information Technology
JSON	JavaScript Object Notation
LDMG	Local Disaster Management Group
LGA	Local Government Area
MODAPS	MODIS Adaptive Processing System
MODIS	Moderate Resolution Imaging Spectroradiometer
NDMP	Natural Disaster Mitigation Programme
NERAG	National Emergency Risk Assessment Guidelines
NEXIS	National Exposure Information System
NRIS	National Registration and Enquiry System
NSDR	National Strategy for Disaster Resilience
PDF	Portable Document Format
PPRR	Prevention, Preparedness, Response and Recovery
RDSI	Research Data Storage Infrastructure
SCPEM	Standing Council on Police and Emergency Management
SDMG	State Disaster Management Group
SIMS	Spatial Information and Mapping System
SLA	Statistical Local Area
SQL	Structured Query Language
TISN	Trusted Information Sharing Network
URL	Uniform Resource Locator
XLS	Microsoft Excel spreadsheet, from the 3 letter file extension used
XML	Extensible Markup Language

The following abbreviations refer to government agencies or organisations mentioned in the report:

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
AEC	Australian Electoral Commission
AFAC	Australasian Fire and Emergency Service Authorities Council
AGD	Attorney-General's Department
AIHW	Australian Institute of Health and Welfare
ALA	Atlas of Living Australia
ANDS	Australian National Data Service
BOM	Bureau of Meteorology
CCC	Crisis Coordination Centre
COAG	Council of Australian Governments

CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEE	Department of Climate Change and Energy Efficiency
DEH	Department for Environment and Heritage
DERM	Department of Environment and Resource Management
DIGO	Defence Imagery and Geospatial Organisation
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EICU	Emergency Information Coordination Unit
EMA	Emergency Management Australia
EMQ	Emergency Management Queensland
EMWA	Emergency Management Western Australia
FRNSW	Fire and Rescue New South Wales
GA	Geoscience Australia
IAG	Insurance Australia Group
ICA	Insurance Council of Australia
LPMA	NSW Land and Property Management Authority (now abolished)
MDS	Map Data Services
MPES	Ministry for Police and Emergency Services
PM&C	Prime Minister & Cabinet
PSMA	Public Sector Mapping Agency
Qld FRS	Queensland Fire and Rescue Service
SAFECOM	South Australian Fire and Emergency Services Commission
SES	State Emergency Service
VBRRA	Victorian Bushfire Reconstruction and Recovery Authority

1.5 Consultation Undertaken

This report was prepared from discussions between CSIRO and FRNSW staff, the background project information [1-10], and from the national workshop held in Canberra on 13 October. This workshop obtained feedback on the planned Pilot Impacts Portal from the project stakeholders and is described in Appendix E of the Requirements Specification [11].

The task of identifying and obtaining the data items was performed by contacting relevant government agencies and other institutions by phone and email, having face to face meetings and by visiting relevant web sites. The list of agencies contacted is shown in Table 1. The complete listing of all contacts made during the course of the project can found in Appendix B.

ABARES	ABCB	ABS
ACT Emergency Services Bureau	AEC	AFAC
AGD	AIHW	ALA

ANDS	ANU	AURIN
BOM	Bushfire CRC	COAG
CSIRO	DAFF	DCCEE
DSEWPC	EMWA	Flinders University
FRNSW	GA	IAG
MDS	NSW LPMA	NSW MPES
NSW SES	PSMA	Qld DERM
Qld FRS	Qld Reconstruction Authority	RFS
Risk Frontiers	RMIT	SAFECOM
University of Colorado	University of Maryland	VBRAA

Table 1: Summary of Agencies Consulted

The interim version of this report, version 0.6, describes the initial rounds of gathering data items for use in the Pilot Impacts Portal. This process is expected to continue during the development of the portal, due for completion at the end of May 2012.

In April 2012, FRNSW undertook a data items gathering exercise targeting various Australian Government departments and relevant agencies asking them for data items for use in the portal. This process was pursued due to the limited success that CSIRO had achieved at obtaining data items. This new round of identifying and locating data items is being managed by FRNSW. As new data items are obtained, they will be considered for inclusion in the portal in consultation with CSIRO. A copy of the FRNSW letter sent can be found in Appendix I and the list of agencies contacted in Appendix J.

This report is a deliverable of Phase 1 Part B of the Impacts Project that requires approval by the Advisory Group and Steering Committee.

1.6 Acknowledgements

This project is financially supported under the Natural Disaster Mitigation Program, through the Ministry for Police and Emergency Services (MPES), with joint funding from the Commonwealth of Australia and the NSW government. This support does not represent an endorsement of the contents or conclusions of the Impacts Project.

Thanks to CSIRO colleague Mark Cameron for help in identifying some of the data items and for recommending the use of the symbols ('✓', '✗', '?') to summarise the selection criteria evaluation results. Thanks to FRNSW collaborators Melanie

Stutchbury and Nick Nicolopoulos for their thorough review of previous versions and valuable contributions.

The October workshop helped shape the process of identifying data items, custodians and the selection criteria. This was a valuable contribution to the project and thanks go to the participants listed in the Appendix F.

1.7 References

- [1] FRNSW Australian Natural Disasters Impacts Framework Project
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2. BACKGROUND

The Impacts Project is a national initiative to better understand the economic, social, and environmental impacts on communities due to natural disasters and fire emergencies. This will then enable governments, communities and Emergency Service Organisations to decide where best to allocate investment across the prevention, preparedness, response and recovery (PPRR) spectrum to increase community safety and reduce the impacts of fire emergencies and natural disasters.

Having completed the Directory of Questions for Household Preparedness [2] and the Impacts Framework [3] the final deliverables of the project are being developed in collaboration with the CSIRO. These deliverables are:

- Data Items Component
The identification of existing data (relating to demographics and historic natural disasters) to populate the portal. [7]
- Pilot Impacts Portal Component
An online portal to communicate the Impacts Framework and supporting data items. [8]

The Pilot Impacts Portal will be a prototype system to demonstrate the utility of the Impacts Framework and the supporting data items for providing information about the impacts of natural disasters and fire emergencies. The aim of the system is to promote the Impacts Framework and related data items to the emergency management community and other users. It will be a platform to show the benefits of having a single point of access to a wide collection of data items that can be used for evidence based decision making.

The project activities are broadly defined as:

- Requirements gathering
- Data acquisition
- Data integration
- Portal development
- Portal hosting and maintenance

The deployed portal will be operational by June 2012 and be hosted on CSIRO facilities for a 12 month evaluation period to assess its usefulness to the Australian emergency management community.

These two project components are described below.

2.1 Data Items

Previous work in the Impacts Project has produced the Impacts Framework. The Impacts Framework is based on economic principles and steps through the process one would take to determine the economic, social and environmental impacts, losses and benefits in the event of a natural disaster or fire emergency [4]. An Impacts Framework data spreadsheet identifies the actual data items that the online framework would seek to populate [3]. The framework has been used to guide the identification of existing data items to be made available to the portal.

The data items are categorised as follows:

- The Impacts Framework.
The framework is used as a guide to determine and measure the impacts resulting from an event. The content of the Excel spreadsheet has been loaded into a database and forms part of the data repository of the Pilot Impacts Portal.
- Event data.
Details of specific instances of natural disaster or fire emergency events. The list of events is defined as: bushfire, cyclone, earthquake, fire emergency, flood, landslide, meteorite strike, storm, storm surge, tornado, and tsunami.
- Impacts data.
The measured impacts resulting from a specific instance of a natural hazard or fire emergency event.
- Mitigation and Recovery
The history of funds spent and actions performed in a region for disaster prevention, preparedness, response or recovery.
- Baseline data.
The baseline data provides the backdrop for the natural disaster and fire emergency event. This data will consist of demographic information, details of the built environment, local government areas, zoning information, land use details and so on. The baseline data places the other data items into context for the user of the Pilot Impacts Portal and supplements the event and impacts data with details of the surroundings in which the event occurs.

All data items obtained must be in one of the above categories. Where possible, the data items should link to the Impacts Framework, as described Appendix D.

2.2 Pilot Impacts Portal

The Pilot Impacts Portal consists of a web accessible end user client interface and the supporting server side software to access the data warehouse of data items. The client

interface will be operated using a standard web browser allowing users to navigate the various datasets available in the portal and to produce reports.

A user can access the available data geographically, for example by navigating a map of Australia using pan and zoom functions or by specifying a starting state or region, and by focusing on a specific hazard type: bushfire, cyclone, flood, and so on. The user interface functionality is defined in the Requirements Specification [11].

A user is expected to produce reports based on information available in the portal. These reports will support the Impacts Project goals of helping governments and communities to make informed decisions and for policy development. The reports are based on three scenarios of pre incident investigation, during a natural disaster or fire emergency, and after an event. The reports may also require accompanying data to be exported from the portal, for example as CSV files.

3. METHODOLOGY FOR COLLECTING THE IMPACTS PROJECT DATA ITEMS

The process to identify existing data items relating to the Impacts Framework for use in the Pilot Impacts Portal is summarised as follows:

- Investigate and understand the Impacts Framework.
- Determine the data required.
- Establish who has the data.
- Define the criteria to evaluate the suitability of the data for use in the online portal
- Contact the data custodians:
 - Communicate information about the Impacts Project.
 - Survey the custodians to identify existing relevant data items.
 - Collect responses.
 - Identify relevant data items using the above criteria.
- Obtain data items.
- Document the data found.

Each of these steps is discussed in the following sections.

3.1 Investigate and Understand the Impacts Framework

The first step was to investigate and understand the structure and content of the Impacts Framework. The Impacts Framework identifies the steps and process to be undertaken [4] and is supported by the identification of actual data items [3]. The Framework has been used to determine the data items required by the portal and these data items need to be linked to the Framework. In this regard, the Impacts Framework can be considered metadata describing the data items or a thesaurus categorising the data items which are included in the repository.

The following is an overview of the Impacts Framework. This information is a summary of the process used to explore the Impacts Framework as documented in Appendix D. In the discussion below, each element of the Framework is first defined from the Impacts Framework for Natural Disasters and Fire Emergencies [4], followed by the details from the Microsoft Excel spreadsheet [3].

3.1.1 Event

An incident or situation that occurs in a particular place during a particular interval of time.

There are 11 predefined events being considered by the Impacts Framework: bushfire, cyclone, earthquake, fire emergency, flood, landslide, meteorite strike, storm, storm surge, tornado, and tsunami. These are defined in Table 14 in Appendix D.

3.1.2 Event Characteristics

The physical features produced by an event.

Each event has characteristics associated with it which are the different features of the event that can cause an impact. It is recognised that there will be cases where the specific characteristic of an event causing an impact is unknown. In this situation, the event itself is identified as causing the impact. There are a total of 24 event characteristics defined as shown in Table 15 in Appendix D.

3.1.3 Object

The physical objects being impacted by each event characteristic, which may include people, fauna, flora, buildings and infrastructure.

The Impacts Framework Excel spreadsheet lists the objects in the real world that may interact with an event resulting in an impact. These objects are consistently used for all the different events and are used to describe the direct impacts that may occur. There are a large number of objects listed in the Framework and this is managed by organising them into a three level hierarchy, described below.

1. Object Category
The grouping used to categorise the objects. There are 16 different categories as shown in Table 16 in Appendix D.
2. Object
The objects are the real world items that can be impacted by an event. There are 53 objects identified in the Impacts Framework.
3. Sub object
An object may be further categorised into sub-objects. For example, the object *Agricultural Fencing* may be further classified as *Boundary Fencing*, *Crown Boundary Fencing* or *Internal Fencing*. There are a total of 85 sub objects.

The full listing of the objects including their categories and sub objects as defined in the Impacts Framework is shown in Table 17 in Appendix D.

3.1.4 Harm

The initial impact on an object, categorised as destroyed, damaged or not harmed for inanimate objects, and fatality, major injury, minor injury and not harmed for people and

fauna. For ease of accessing data it is recommended hospital admissions relating to the event be used as a surrogate for major injuries whilst those treated but not admitted to hospital be used as a surrogate for minor injuries.

The categorisation of harm depending on the kind of object impacted, inanimate or animate, as described above. The determination of whether an object is animate or not is defined at the object category level and there is only one animate category: *People and Community*. This means that livestock, horticultural products (for example fruit and vegetable crops, grapes vines and so on), flora and fauna are all categorised as inanimate by the Impacts Framework. This is because the harm to these objects due to an impact is measured by the descriptions under the inanimate category.

3.1.5 Impacts

Is the broadest term and includes both market-based (i.e. tangible) and non-market (i.e. intangible) effects. Individual impacts can be either negative or positive.

Impacts are further described as being a direct impact or an indirect one, as defined below. The impacts element forms the bulk of the Impacts Framework. There are a total of 2,839 direct impacts and 29,972 indirect impacts defined in the Microsoft Excel spreadsheet [3].

Direct Impacts

Impacts that result from direct contact with the event.

An impact has three aspects to it: an event (more specifically, the event characteristic) affects an object resulting in harm. It is the combination of these elements that produces the large number of impacts.

Indirect Impacts

Impacts that arise as a consequence of the impacts of the event. For example, disruption to the flow of goods and services in and out of the affected area.

An indirect impact is an impact that results as the consequence of an impact that has already occurred. As noted above, there are a total of 29,972 indirect impacts defined in the Microsoft Excel spreadsheet. A direct impact is caused by an event whereas an indirect impact occurs due to a previous impact.

The Impacts Framework allows for a total of up to five indirect impacts resulting as a consequence of a previous impact. There is a lot of redundancy in the recording of the indirect impacts in the Microsoft Excel spreadsheet. Of the total 29,972 indirect impacts there are only 509 distinct (unique) ones.

3.1.6 Mitigation

Mitigation concerns the prevention and preparedness activities performed in a region to reduce the impact of potential events. From the Impacts Framework [4]:

Prevention and preparedness activities are undertaken before the event, and can include altering the event characteristics (e.g. flood mitigation works), reducing the harm or impacts (e.g. compatible building code), and altering the object to make it less susceptible to harm or to increase its capacity to recover (e.g. community resilience).

The Impacts Framework as depicted is concerned with the impacts associated with natural disaster and fire emergency events. The PPRR (prevention, preparedness, response and recovery) aspects are assumed to be part of existing emergency management practices.

3.1.7 Recovery

Recovery concerns the response and recovery activities performed in a region as a result of an event. From the Impacts Framework [4]:

Response and recovery are activated when an event is imminent or as it occurs, and can be directed at reducing the impacts, either immediate or longer-term, and so focus on the affected object, generally on infrastructure, people and communities, their livelihoods and ecosystems.

3.2 Determine the Data Required

The data items required have been categorised as described in Section 2.1: the Impacts Framework, event data, impacts data, mitigation and response, and baseline. All data items required for the Impacts Project must belong to one of these categories.

The Impacts Framework is already defined and has been loaded into the portal data repository (an Oracle database). The baseline category provides the context for the other data items available in the portal and consists of information about the location where natural disaster and fire emergency events may occur. Identifying baseline data consisted of two steps:

1. The Impacts Framework Objects.
The objects described in the Impacts Framework, see Appendix D.3, define the information needed to be available in the portal.
2. Other data items considered relevant.
These data items were identified through consultation with FRNSW and the participants of the national workshop.

The remaining categories, events, impacts, and mitigation and response, are all defined in reference to the Impacts Framework as described in Appendix D. The various data items identified in each category are listed in Section 5.

3.3 Establish Who Has the Data

3.3.1 National Workshop

The national Impacts Project workshop held in Canberra in mid October consisted of 33 participants from stakeholder agencies. A list of those invited and who attended is shown in Appendix F. The purpose of the workshop was to discuss:

- The online portal to communicate the previously developed Impacts Framework.
- The identification of existing data (relating to demographics and historic natural disasters) to populate the portal.

The attendees consisted of a mix of potential portal users and data custodians. There was a session dedicated to exploring the data items required for use in the portal and identifying the contact person to obtain these data items from, when know. A summary of the findings is shown in Table 2. For each identified data item, the category is noted.

Some of the identified data items can be directly obtained from a web site while others require personal contact. CSIRO have obtained data where possible and contact is currently underway with various custodians to establish what data is available for use in the portal. A summary of the data items obtained so far is found in Section 5.

Data Item	Custodian	Category	Workshop Contact
Fire	AFAC	Event, Impacts	Nick Nicolopoulos
Flood insurance database	Insurance Council of Aust	Mitigation and Recovery	Cath Brinkley
Flood risk database	GA	Mitigation and Recovery	Mark Edwards
BOM	BOM	Event	Linda Anderson-Berry
ABS Data	ABS	Baseline	Michelene Bruce
Bush Fire CRC	Bushfire CRC	Event, Impacts	Lindsay Wright
NEXIS	GA	Baseline	Greg, Krishna
NSW SES flood data	NSW SES	Event, Impacts	Michelle Bouvet
Historical Risk database since 1900	Risk Frontiers	Mitigation and Recovery	Felipe Dimer
Funding (from commonwealth to states)	AGD	Mitigation and Recovery	Faruk Yay
Risk rating database	Risk Frontiers	Mitigation and Recovery	Felipe Dimer
Houses lost (bushfire)	CSIRO, Bushfire CRC	Impacts	Justin Lennard
National injury surveillance	AIHW	Mitigation and Recovery	James Harrison - Flinders Uni
What is insured (& losses) govt owned	Australian Local Govt Association	Mitigation and Recovery	

Data Item	Custodian	Category	Workshop Contact
Voting information & electoral boundaries	Australian Electoral Commission	Baseline	
Business counts and sizes	ABS	Baseline	Michelene Bruce
Actions arising from COAG enquiries	COAG unit in PM&C	Mitigation and Recovery	Kath Buchanan
What data they have - and what they need	Qld Reconstruction Authority	Mitigation and Recovery	Cath Brinkley
Wage assistance	Dept of Workplace Relations Disaster Recovery Committee	Mitigation and Recovery	Melissa London
Building Stds & Codes & when they changed	Aust building codes board	Mitigation and Recovery	Nick Nicolopoulos
NSW Infrastructure /Geo survey	Various State Departments	Mitigation and Recovery	
Biodiversity info "GAP"	Office of Heritage and Environment	Baseline	Nick Nicolopoulos
ROTAP	DEH (NSW)	Baseline	
Disaster recovery payments	AGDRP (AGD)	Mitigation and Recovery	
Spatial info (elevation, bathymetry, landform)	GA, CSIRO, CRCs (SI ACE), DIGO	Baseline	Faruk Yay, Mark Edwards

Table 2: Workshop Identified Data Items and Custodians.

3.3.2 Ongoing Consultation

The workshop participants were nominated by FRNSW as being some of the stakeholders for the Impacts Project. Some of the participants were identified as being target data custodians and these were the initial point of contact for locating data items. Contact was made with a number of these participants, through email exchanges, phone calls and face to face meetings. The aim was to either source relevant data items directly, or to be directed to the relevant data custodian that should be contacted.

The data items of most interest to the project are those describing impacts resulting from a natural disaster or fire emergency event. Representative agencies expecting to have such information were identified from the workshop participants, through consultation with FRNSW and in reference to the agencies listed in the EMIDP.

3.4 Define the Selection Criteria

In order for the identified data items to be easily made available to the portal in the project time frame, the data should meet the following criteria:

1. The data already exists.
2. The terms and conditions for using the data are defined.
3. The terms and conditions are acceptable for the data to be used in the Impacts Portal.
4. The data does not contain sensitive information.
5. The data includes a description of its quality.
6. The data can be made available for free or at a nominal cost.
7. The data is in electronic format.
8. The data is in an open format.
9. The data must be in a structured format, for example XML, CSV, JSON, that can be easily imported into a database. Unstructured, free text is not appropriate.
10. The data items must clearly map to the elements of the Impacts Framework.
11. The data is readily obtainable.

The above selection criteria were accepted by the Steering Committee on the 20th December 2011 as part of the NDMP Impacts Project Steering Committee meeting.

In discussions with some agencies the availability of data has been an issue. Although they have data, it is not readily accessible since it only exists in individual reports. This is especially true of data items in the *Mitigation and Response* category. For this reason a data items survey was produced to help guide the discussion of identifying relevant data items for use in the Pilot Impacts Portal. This survey was used to help custodians describe the data they manage. A copy of the survey is shown in Appendix C.

When one or more of the criteria are not met for a data item, its suitability for use in the portal will need to be assessed individually. Of the 11 criteria listed above, the following must be true for the data item to be useable in the portal: 1, 2, 3, 4, 6, 7, 9, 11. When criteria 5, 8 and 10 are not met, the data item may still be used for the following reasons:

- Criteria 5.
A description of the data quality is useful to allow the user to make an informed decision as to the applicability of the data to the user's needs. When the data quality is not known, this can be indicated for the data item so the user is forewarned.
- Criteria 8.
When the data item is not in an open format, the content may still be easily

processed using available tools. For example, Microsoft Excel files or ESRI Shapefiles.

- Criteria 10.
The task of identifying data items for use in the Pilot Impacts Portal is based on the data item being able to be linked to the content of the Impacts Framework. For baseline data, however, the data item may provide context information for the other data items. For example, ABS statistic regions and AEC electoral boundaries are not directly related to the Impacts Framework, but they are useful to help structure the other data items.

3.5 Contact the Data Custodians

The following approaches were made to contact data custodians in order to obtain data items related to the Impacts Framework for use in the portal.

3.5.1 Workshop Contacts

Following the workshop held in Canberra, CSIRO made contact with various data custodians that were identified as having data sources relevant to the Impacts Project. This contact was made through phone interviews, email exchanges and face to face meetings. This process did not reveal any suitable data items and the consultation process was slow.

3.5.2 Data Items Survey

In order to improve the progress of identifying data items, a survey was prepared to guide the custodians in identifying data sources required for use in the Pilot Impacts Portal. A copy of this survey can be found in Appendix C.

Eleven agencies were sent surveys in mid December 2011 and by the end of March 2012 five were completed and returned. Of the five, three indicated they had no relevant data items (AGD Emergency Management Capability Development Branch, Bushfire CRC and DCCEE), one had data but indicated that it would not be readily available for use in the portal (AGD National Disaster Recovery Programs Branch) while one agency had data and provided it to CSIRO (GA National Exposure Information System).

The following groups did not complete the survey:

- DAFF Biosecurity Emergency Management Unit
- AGD Emergency Management
- Australian Emergency Management Institute
- GA Engineering, Economics and Exposure Project
- NSW SES
- AIHW

3.5.3 Ongoing Custodian Contacts

The emergency management community in Australia is diverse spanning various levels of government (federal, state, local), consisting of differing functions (administrative, operational, industry organisations and associations) and is partly managed by numerous steering committees and groups. There are also other agencies with an overlapping interest with the activities of these groups for example the ICA and the ABCB.

The total number of possible agencies that could be contacted to obtain comprehensive coverage of all possible data custodians would be in the order of 100 or more. An example list can be seen in the EMIDP [12]. Contacting this many agencies was not attempted. Instead, a representative collection of target data custodians was identified and approached to determine the data holdings relevant for the impacts framework.

The complete listing of all contacts made during the course of the project can be found in Appendix B.

3.6 Obtain Data Items

The data items were mostly obtained by downloading them from the custodian's web site. In two cases data products were purchased, one was delivered via email while another via courier.

Obtaining the data does not guarantee that it will be integrated into the online portal. The data may be obtained in the belief that it will be suitable but this can only be determined by preparing it for use in the portal. The licensing conditions may also restrict the use of the data in the portal.

The data obtained is described in Section 4 and a summary provided in Section 5.

3.7 Document the Data Found

3.7.1 Metadata

A description of all data items obtained has been collected. This information forms the metadata for the data items and consists of the following:

- A brief description of the data item.
- Details of the data custodian.
- The contact person the data was obtained from.
- How the data was obtained.
- The date it was obtained.

- The date the data item was created.
- The date the data item was last updated.
- External link to a description of the data item.
- The constraints for use of the data in the portal.
- The obligations for use of the data in the portal.
- The geographic extent of the data.
- The coordinate system used for geographic data.

This information has been compiled for the data items obtained and can be found in Appendix G.

3.7.2 Linkage to the Impacts Framework

The underlying reason for obtaining a data item is that it needs to support the Impacts Framework. The data items will have been identified since they reference, or link to, the content of the Framework. These linkages will be noted as part of the documentation process of the data item for use in the portal.

4. IDENTIFIED DATA ITEMS

The selection criteria defined Section 3.4 were applied to the data items identified at the workshop and listed in Table 2. This process was performed for each of the data item categories, excluding the Impacts Framework which has previously been loaded into a database. The results are shown below for the different data item categories.

These results are presented in two sets of tables. First the identified data items are mapped to the corresponding elements of the Impacts Framework. For event data items, this is one of the event types from the Impacts Framework; one of bushfire, cyclone, earthquake, fire emergency, flood, landslide, meteorite strike, storm, storm surge, tornado, and tsunami. The other data item categories need to describe information about harmed objects; refer to the objects listed in Table 18 in Appendix D.

The second table for each data item category shows the results of applying the selection criteria from Section 3.4 to each of the identified data items. Note that the evaluation of the selection criteria is reported using the symbols: '✓', '✗', '?'. A '✓' indicates that the criteria is met, a '✗' means it is not, while a '?' means there is not enough information currently available in order to make a decision. A summary of obtained data items is shown in Section 5.

Two sets of tables are presented since a single data item can often be associated with multiple elements of the Impacts Framework. Using two tables means the selection criteria is only shown once.

4.1 Events

The event data items are shown in Table 3. Each of the 11 event types from the Impacts Framework are listed followed by the identified data items that contain information about that event type.

Impacts Framework Event	Custodian: Data Item
Bushfire	AFAC: Australian Incident Reporting System
	EMA: AGD Disasters Database
	GA: Sentinel Hotspot data
Cyclone	BOM: Tropical Cyclone Database
	EMA: AGD Disasters Database
	GDACS: Global Disaster Alert and Coordination System Archive
Earthquake	GA: Earthquake Database
	EMA: AGD Disasters Database
	GDACS: Global Disaster Alert and Coordination System Archive
Fire emergency	AFAC: Australian Incident Reporting System
	EMA: AGD Disasters Database
Flood	EMA: AGD Disasters Database

Impacts Framework Event	Custodian: Data Item
	GDACS: Global Disaster Alert and Coordination System Archive
	University of Colorado: Dartmouth Flood Observatory
Landslide	EMA: AGD Disasters Database
Meteorite Strike	
Storm	EMA: AGD Disasters Database
Storm Surge	
Tornado	EMA: AGD Disasters Database
Tsunami	

Table 3: Events Data Items.

There are seven data items currently identified with event information. Six have been obtained and their evaluation against the selection criteria is shown in Table 4.

Custodian: Data Item	Selection Criteria											Obtained
	1	2	3	4	5	6	7	8	9	10	11	
AFAC: Australian Incident Reporting System	✓	✓	✓	?	?	✓	✓	x	✓	✓	✓	yes
BOM: Tropical Cyclone Database	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes
EMA: AGD Disasters Database	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	yes
GA: Earthquake Database	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	yes
GA: Sentinel Hotspot data	✓	✓	✓	✓	✓	?	✓	✓	✓	✓	?	no
GDACS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	yes
University of Colorado: Dartmouth Flood Observatory	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes

Table 4: Event Data Items Selection Criteria.

4.2 Impacts

The impacts data items measure the harm that has occurred to an object due to a specific natural disaster or fire emergency event. Some of the data items describing events also include impact data. Table 5 lists the objects defined in the Impacts Framework and for each notes the data items that record impacts information about it.

Note that the list of objects in Table 5 correspond only to the *Objects* listed in Table 18 and ignores the category the object is in and the sub objects. Also, a blank field in the *Custodian: Data Item* column means a corresponding data item could not be found.

Impacts Framework Object	Custodian: Data Item
Agricultural Fencing	¹
Agricultural Structures (excludes residence)	
Agricultural equipment	
Air	
Apicultural products	
Aquacultural products	
Bridges	EMA: AGD Disasters Database
Buses	EMA: AGD Disasters Database
Cars	EMA: AGD Disasters Database
Cultural Heritage	
Electricity	
Facilities	
Fauna	
Feed	
Fencing	
Field Crops	EMA: AGD Disasters Database
	BOM: Tropical Cyclone Database
Fire Towers	
Flora	

¹ A blank field in this column means a corresponding data item could not be found.

Impacts Framework Object	Custodian: Data Item
Fruit and Vegetable crops	
Gas	BOM: Tropical Cyclone Database
Grape vines (i.e. for viticulture)	
Horticultural equipment	
Livestock	
Lookouts	
Memorabilia	
Mining products	
Natural Resources equipment	
Offices	AFAC: Australian Incident Reporting System
Other structures	AFAC: Australian Incident Reporting System
Other vehicle types	EMA: AGD Disasters Database
Park signage	
People and Community	AFAC: Australian Incident Reporting System
	EMA: AGD Disasters Database
	BOM: Tropical Cyclone Database
	University of Colorado: Dartmouth Flood Observatory
Plants for the cut flower industry	
Plants for the nursery industry	
Property - Commercial	AFAC: Australian Incident Reporting System
	EMA: AGD Disasters Database
	BOM: Tropical Cyclone Database
Property - Industrial	AFAC: Australian Incident Reporting System
	EMA: AGD Disasters Database

Impacts Framework Object	Custodian: Data Item
	BOM: Tropical Cyclone Database
Property - Public (i.e. Government)	AFAC: Australian Incident Reporting System
	EMA: AGD Disasters Database
	BOM: Tropical Cyclone Database
Property - Residential	AFAC: Australian Incident Reporting System
	EMA: AGD Disasters Database
	BOM: Tropical Cyclone Database
Railways	BOM: Tropical Cyclone Database
Residential Fencing	
Road signage	
Roads	EMA: AGD Disasters Database
	BOM: Tropical Cyclone Database
Roofed accommodation (inc. huts and staff accom.)	
Soil	
Telecommunications	
Timber	
Trade	EMA: AGD Disasters Database
	BOM: Tropical Cyclone Database
Trucks	
Walking trails	
Water	
Waterways	

Table 5: Impacts Data Items for the Impacts Framework Objects.

There are four data items currently identified with impacts information. Their evaluation against the selection criteria is shown in Table 6. Note that three of these data items also contain event information and have been previously described in Table 4 above. The cyclone reports from the BOM contain detailed information about cyclones. The

URLs to these reports have been obtained and integrated into the Pilot Impacts Portal, but not the reports themselves.

Custodian: Data Item	Selection Criteria											Obtained
	1	2	3	4	5	6	7	8	9	10	11	
AFAC: Australian Incident Reporting System	✓	✓	✓	?	?	✓	✓	x	✓	✓	✓	In progress
BOM: Tropical Cyclone Database	✓	✓	?	✓	✓	✓	✓	✓	x	x	✓	no
EMA: AGD Disasters Database	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	yes
University of Colorado: Dartmouth Flood Observatory	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes

Table 6: Impacts Data Items Selection Criteria.

4.3 Mitigation and Recovery

There have been no Mitigation and Recovery data items identified for use in the portal. While such data does exist, in discussions with some agencies the availability of this data has been an issue. Although they have data, it is not readily accessible since it only exists in individual reports distributed throughout the organisation.

These issues can be summarised by:

- the reports are not managed as a single resource;
- the report contents are often an aggregation of data from other sources (and these original sources should be identified for use in the portal);
- the data items are distributed throughout the organisation;
- no single person knows where they are located.

Collections of reports have been identified for future investigation. For example 78 flood reports are available from Geoscience Australia² including descriptions of historical flood events, flood scenarios, post flood event surveys and so on. Similarly,

² <http://www.ga.gov.au/hazards/flood/reports.html>

AFAC³ have similar reports concerning flood events, action plans, management practices, cyclone studies and so on.

This information should be available to users of the portal, but linking it with the Impacts Framework would be difficult. This is discussed more in Section 6.

4.4 Baseline

The baseline data provides the backdrop or context for the other data items available in the portal. Information about the Impacts Framework objects should be available as well as other data items considered relevant. Table 7 shows the identified baseline data items that contain information about the objects described by the Impacts Framework⁴.

Table 7 is followed by a list of the data items also obtained which do not directly relate to objects defined in the Impacts Framework but which are considered useful as context for the portal, as described in Section 3.2 above.

Impacts Framework Object	Custodian: Data Item
Agricultural Fencing	GA: GEODATA TOPO 250K Series 3
Agricultural Structures (excludes residence)	⁵
Agricultural equipment	
Air	
Apicultural products	
Aquacultural products	
Bridges	
Buses	
Cars	
Cultural Heritage	PSMA: Points of Interest
	DSEWPC: Register of National Estate
	DSEWPC: Australian World Heritage Areas

³ http://knowledgeweb.afac.com.au/research/natural_hazards

⁴ Only the objects as shown in Table 18 and not the object category or the sub objects as described for the Impacts data items in Section 4.2. Also, a blank field in the right hand column means a corresponding data item could not be found.

⁵ A blank field in this column means a corresponding data item could not be found.

Impacts Framework Object	Custodian: Data Item
	DSEWPC: Commonwealth Heritage List
	DSEWPC: National Heritage List
Electricity	GA: GEODATA TOPO 250K Series 3
Facilities	
Fauna	DSEWPC: IBRA
	DSEWPC: Landscape Health
Feed	ABARES: Land Use
Fencing	GA: GEODATA TOPO 250K Series 3
Field Crops	ABARES: Land Use
Fire Towers	
Flora	DSEWPC: IBRA
	DSEWPC: Landscape Health
	ABARES: Land Use
Fruit and Vegetable crops	ABARES: Land Use
Gas	GA: GEODATA TOPO 250K Series 3
Grape vines (i.e. for viticulture)	
Horticultural equipment	
Livestock	ABS: Livestock Products
	ABS: Livestock and Meat
Lookouts	
Memorabilia	
Mining products	PSMA: Points of Interest
	ABARES: Land Use
Natural Resources equipment	
Offices	
Other structures	GA: NEXIS
Other vehicle types	

Impacts Framework Object	Custodian: Data Item
Park signage	
People and Community	ABS: population data
	GA: NEXIS
Plants for the cut flower industry	
Plants for the nursery industry	
Property - Commercial	GA: NEXIS
Property - Industrial	GA: NEXIS
Property - Public (i.e. Government)	GA: NEXIS
Property - Residential	GA: NEXIS
Railways	GA: GEODATA TOPO 250K Series 3
	PSMA: Transport & Topography
Residential Fencing	GA: GEODATA TOPO 250K Series 3
Road signage	
Roads	GA: GEODATA TOPO 250K Series 3
	PSMA: Transport & Topography
Roofed accommodation (inc. huts and staff accom.)	
Soil	CSIRO: ASRIS
	GA: Soil pH map
Telecommunications	
Timber	ABARES: Land Use
Trade	ABS: Business counts
	ABS: Retail Trade
Trucks	
Walking trails	
Water	PSMA: Transport & Topography
	GA: 9 Second DEM Derived Streams
	GA: GEODATA TOPO 250K Series 3

Impacts Framework Object	Custodian: Data Item
	BOM: Geofabric
Waterways	PSMA: Transport & Topography
	GA: 9 Second DEM Derived Streams
	GA: GEODATA TOPO 250K Series 3
	BOM: Geofabric

Table 7: Baseline Data Items for the Impacts Framework Objects.

The following baseline data items have also been obtained:

- **ABS Boundaries**
The Australian Bureau of Statistics (ABS) boundaries data consists of various regions used by the Bureau to report statistical information. These boundaries change over time and different data from the Bureau must align with the correct boundaries. The boundaries consist of:
 - Local Government Areas (LGAs)
 - Statistical Local Areas (SLAs)
 - Collection Districts (CDs)
- **ABS Census of Population and Housing**
2006 Census of Population and Housing Community Profile data for all of Australia to the Collection District (CD) level.
- **Federal Electoral Boundaries**
The AEC Federal electoral boundary data.
- **Google Maps**
The prototype Pilot Impacts Portal makes use of the Google Maps API to provide street map, terrain and satellite imagery backdrops for Australia. This information has not directly been obtained in the sense of the other data items mentioned above, but it is currently the main backdrop for the prototype portal. Note that the information provided by Google may be several months or years out of date.

There are 22 data items currently identified containing baseline information. Some of these have been obtained and their evaluation against the selection criteria is shown in Table 8.

Custodian: Data Item	Selection Criteria											Obtained
	1	2	3	4	5	6	7	8	9	10	11	
ABARES: Land Use	✓	✓	✓	✓	✓	✓	✓	x	✓	?	✓	yes
ABS: Business counts	✓	✓	✓	✓	✓	✓	✓	x	✓	?	✓	yes
ABS: Boundaries	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	yes
ABS: Livestock and Meat	✓	✓	✓	✓	✓	✓	✓	x	✓	?	✓	yes
ABS: Livestock Products	✓	✓	✓	✓	✓	✓	✓	x	✓	?	✓	yes
ABS: Retail Trade	✓	✓	✓	✓	✓	✓	✓	x	✓	?	✓	yes
ABS: Census of Population and Housing: Basic Community Profile	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	yes
AEC: Electoral Boundaries	✓	✓	✓	✓	✓	✓	✓	x	✓	x	✓	yes
BOM: Geofabric	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	yes
CSIRO: ASRIS	✓	x	?	✓	✓	x	?	?	?	✓	x	no
DSEWPC: Australian World Heritage Areas	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes
DSEWPC: Commonwealth Heritage List	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes
DSEWPC: National Heritage List	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes
DSEWPC: IBRA	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes
DSEWPC: Landscape Health	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes
DSEWPC: Register of National Estate	✓	✓	?	✓	✓	✓	✓	x	✓	✓	✓	yes
GA: 9 Second DEM Derived Streams	✓	✓	✓	✓	✓	✓	✓	x	x	✓	✓	yes
GA: GEODATA TOPO 250K Series 3	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	yes
GA: NEXIS	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	yes

Custodian: Data Item	Selection Criteria											Obtained
	1	2	3	4	5	6	7	8	9	10	11	
GA: Soil pH map	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	no
PSMA: Points of Interest	✓	✓	x	✓	✓	x	✓	x	✓	✓	✓	no
PSMA: Transport & Topography	✓	✓	x	✓	✓	x	✓	x	✓	✓	✓	no

Table 8: Baseline Data Items Selection Criteria.

The DSEWPC data was obtained using the “DIG” (Discover Information Geographically) tool⁶. This provides a searching interface to the Department’s data holdings allowing the user to search for various categories of downloadable data. This process generates a licence for the data; an example licence for the Landscape Health data items has been included in Appendix H. These terms and conditions appear to allow the use of the data in the Pilot Impacts Portal, except for the following:

The Licence is limited to personal use of the Data or use within the Licensee's organisation only

This requires legal advice: it could mean that the data is not allowed to be placed on a portal which is accessed outside of CSIRO, or simply that the data must reside within CSIRO.

The two soil data items (ASRIS and the soil pH map) have not been obtained since it is not clear how useful they will be for the portal. The PSMA data is expensive to obtain. One quote was for over \$50,000 per year.

⁶ See <http://www.environment.gov.au/metadataexplorer/explorer.jsp>.

5. SUMMARY

A summary of the data items collected so far and made available to the online portal is shown in Table 9. This summary includes the name of the data item, the custodian it was obtained from, the category of the data item, and where available links to the location of where the data was obtained, the licensing conditions for its use and the copyright statement.

Data Item	Custodian	Category	Source	Licence Links	Copyright Link
Impacts Framework	FRNSW	Framework	data		
Boundaries	ABS	Baseline	data	CC BY 2.5	copyright
Population 2010	ABS	Baseline	data	CC BY 2.5	copyright
Livestock Products	ABS	Baseline	data	CC BY 2.5	copyright
Livestock and Meat	ABS	Baseline	data	CC BY 2.5	copyright
Business Counts	ABS	Baseline	data	CC BY 2.5	copyright
Retail Trade	ABS	Baseline	data	CC BY 2.5	copyright
Census of Population and Housing: Basic Community Profile	ABS	Baseline	data	CC BY 2.5	copyright
Federal Electoral Boundaries	AEC	Baseline	data	licence	copyright
AIRS	AFAC	Event, Impacts	Request via FRNSW	Terms and conditions conditions	copyright
Disasters database	AGD	Event, Impacts	data	CC BY 3.0	copyright
Tropical Cyclones	BOM	Event, Impacts	data		copyright
Geofabric	BOM	Baseline	data	CC BY 3.0	copyright
9 Second DEM Derived Streams	GA	Baseline	data	CC BY 3.0	copyright
GEODATA TOPO 250K Series 3	GA	Baseline	data	CC BY 3.0	copyright

Data Item	Custodian	Category	Source	Licence Links	Copyright Link
NEXIS (March 2010)	GA	Baseline	Via email data	CC BY-NC 2.5 CC BY 3.0	copyright
Earthquakes	GA	Event	data	CC BY 3.0	copyright
Dartmouth Flood Observatory	University of Colorado	Event, Impacts	data	CC BY 3.0	
Register of National Estate	DSEWPC	Baseline	data	generated	copyright
Australian World Heritage List	DSEWPC	Baseline	data	generated	copyright
Commonwealth Heritage List	DSEWPC	Baseline	data	generated	copyright
National Heritage List	DSEWPC	Baseline	data	generated	copyright
IBRA (Interim Biogeographic Regionalisation of Australia)	DSEWPC	Baseline	data	generated	copyright
Landscape Health	DSEWPC	Baseline	data	generated	copyright
Land Use	ABARES	Baseline	data	licence	copyright

Table 9: Summary of Data Items Obtained.

A description of each data item in Table 9 follows.

- Impacts Framework
The content of the Excel spreadsheet has been loaded into a database. The framework consists of: 11 Events, 32 Event Characteristics, 107 Objects, 9 Harm Categories, 2,839 Direct Impacts, and 29,972 Indirect Impacts.
- Boundaries
The Australian Bureau of Statistics (ABS) boundaries data consists of various regions used by the Bureau to report statistical information. These boundaries change over time and different data from the Bureau must align with the correct boundaries. Numerous boundaries have been obtained corresponding to the years 2006, 2008, 2010 and 2011. The boundaries consist of:
 - Local Government Areas (LGAs)
 - Statistical Local Areas (SLAs)
 - Collection Districts (CDs)

- **Population 2010**
Includes total population, age and sex distribution, median age, children (under 15 years of age) , working age population (aged 15-64 years), people aged 65 years and over, and sex ratio. The information is based on the ABS 2010 boundaries.
- **Livestock Products**
Quarterly statistics on livestock and poultry slaughterings, meat production, receivals of taxable wool by brokers and dealers, exports of live sheep and cattle and exports of fresh, chilled, frozen and processed meat.
- **Livestock and Meat**
Statistics on livestock slaughterings and meat production.
- **Business Counts**
Counts of Australian Businesses, including Entries and Exits.
- **Retail Trade**
Estimates of the value of turnover of retail trade for Australian businesses classified by industry, and by state and territory.
- **Census of Population and Housing: Basic Community Profile**
2006 Census of Population and Housing Community Profile data for all of Australia to the Collection District (CD) level.
- **Federal Electoral Boundaries**
The AEC Federal electoral boundary data.
- **Australian Incident Reporting System**
AIRS records the details of an incident and the tasks performed by emergency response personnel. The information recorded describes the incident, who attended, the call details, casualties, response (for example rescue and evacuation). AIRS supports a national standard for incident reporting which is used by most of the Australian states fire and rescue services.

The AFAC National Database is a central repository combining the state based AIRS information.

- **Disasters Database**
High level event details per disaster category (bushfire, cyclone, and so on). Includes impact data for all loss structures for relevant categories.
- **Tropical Cyclones**
Raw cyclone track data until the end of the 2006 - 2007 season.
- **Geofabric**
The Geofabric is a collection of spatial datasets that describe water features such as rivers, lakes, dams, aquifers, diversions and monitoring points in the Australian landscape.
- **9 Second DEM Derived Streams**
The fully connected and directed stream network derived from the 9 second Digital Elevation Model of Australia by the Australian National University. This data is a part of the Geofabric. The BOM version is in vector format while the GA version is a raster.

- **GEODATA TOPO 250K Series 3**
This data item contains a number of layers (cartography, elevation, framework, habitation, hydrography, infrastructure, terrain, transport, utility, vegetation) of the major features appearing on 1:250,000 scale topographic maps.

While this information comprises a large portion of the Impacts Framework baseline data, it is not current, being created in 2006.

- **NEXIS (March 2010)**
The National Exposure Information System (NEXIS) contains detailed residential, commercial and industrial information about people, buildings and their replacement cost for every SLA (ABS 2010 boundaries) in Australia.

The original data obtained was via email. As of February 2012 the data is available online.

- **Earthquakes**
Australian earthquake data. We have only loaded data for earthquakes with magnitude ≥ 4.0 .
- **Dartmouth Flood Observatory**
Global flood data from Colorado University's Dartmouth Flood Observatory, includes event and minimal impact data for flood events from 1985-present.
- **Register of National Estate**
Location and attribute information for places of indigenous, historic or natural importance.
- **Australian World Heritage List**
The 20 Australian locations on the World Heritage List (as of August 2011).
- **National Heritage List**
Location and attribute information for places nominated to and included in the National Heritage List.
- **Commonwealth Heritage List**
Location and attribute information for places on the commonwealth heritage list.
- **IBRA**
Interim Biogeographic Regionalisation for Australia (IBRA), Version 6.1. A classification of the land surface of Australia producing 85 regions and 405 sub regions defining the occurrence of flora and fauna and their interaction with the physical environment.
- **Landscape Health**
The health of Australia's regional landscapes from a biodiversity / natural ecosystem perspective. This includes: native vegetation extent; fragmentation and clearing rates; land use; current extent and trend of dryland salinity; changed hydrological conditions; current extent and trend of weeds and feral animals; and the distribution of threatened species and ecosystems.
- **Land Use**
Land use polygon data using the ALUM classification system. The year the data was prepared varies for each state/region, ranges from 1997 to 2008.

6. CONCLUSIONS

6.1 Issues

The following issues have been encountered while identifying and gathering the data items.

6.1.1 The Impacts Framework Model

Further work needs to be undertaken to understand the model underlying the Impacts Framework. The Framework is a complex source of information describing what should be considered before, during and after a natural disaster or fire emergency event. The framework is central to the project: all sourced data items need to support or reference the Impacts Framework. This has been achieved by linking identified data items to the elements of the framework as described in Section 4.

There have been some problems in making the linkage of the information contained in a data item to the content of the Impacts Framework. For example, the AGD Disasters Database contains event and impacts information about historical natural disasters in Australia. Specifically, the disasters database includes details of buildings destroyed or damaged. Mapping this information to the Impacts Framework list of objects is difficult since it could be associated with a number of objects: *Property – Commercial*, *Property – Industrial*, *Property - Public (i.e. Government)* or *Property – Residential*. Similarly, the objects *Bridges* and *Roads* in the Impacts Framework appear under two categories: *Infrastructure - Parks and Reserves* and *Infrastructure - Public (excl. parks and reserves)*.

This hierarchical structuring of objects makes it non trivial to link data items to the Impacts Framework.

6.1.2 Linking Indirect Impacts

The objects identified from the Impacts Framework listed in Table 18 are for direct impacts. There are more real world objects described in the indirect impacts, however the indirect impacts are not structured in a regular way to allow the various objects to be easily defined.

Extracting the information described in the indirect impacts to identify the objects would be one of the outcomes of modelling the Impacts Framework, refer to Section 6.1.1.

6.1.3 Measuring Impacts

The Impacts Framework report [4] includes examples of how to measure specific impacts by defining a *measurement unit* and a *calculation case*. This information is not present in the corresponding MS Excel spreadsheet [3]. If this information is considered useful when linking identified impacts data items to the framework, it will need to be manually extracted from the report and incorporated into Pilot Impacts Portal repository.

6.1.4 Framework Extensions

The level of detail available in the Impacts Framework is extensive: there are 2,839 direct impacts and 29,972 indirect impacts defined. While this is an impressive result derived for a regular consideration of the problem space, it is unlikely that all possible impacts have been included in the spreadsheet. It is not clear how new impacts, direct or indirect, are to be included in the framework.

Again, one of the aims of defining a model for the Impacts Framework, as noted in Section 6.1.1, would be to include extension “hooks” to allow new impacts previously not considered to be included in the framework in a regular and controlled way.

6.1.5 Data Availability

Some data custodians have data, but it is not readily available for use in the portal due to cost, licensing constraints or sensitivity of the data.

In discussions with some agencies the availability of data has also been an issue. Although they have data, it is not readily accessible since it only exists in individual reports distributed throughout the organisation. The reports are not managed as a single resource; the report contents are often an aggregation of data from other sources (and these original sources should be identified for use in the portal); they are distributed throughout the organisation; no single person knows where they are located. This is especially true of data items in the PPRR category.

6.1.6 Data Currency

The process of identifying and obtaining the data items is to build a data repository for the Pilot Impacts Portal. During the consultation process there were concerns raised about the data becoming out of date. This can be managed in a number of ways:

- Replacing the data item with a new copy as it becomes available.
- Caching data items in the portal repository and employing protocols to ensure the cache is an up to date copy with the source.
- Applying regular updates to the data to keep it synchronised with the source.
- Access the data directly from the custodian without using a repository.

Each of these approaches has its own benefits and drawbacks. Maintaining synchronised data items through regular updates or caching requires the changes to the data to be well managed. Accessing the data directly means there is a single point of truth but the task of data integration from diverse custodians would have dramatic performance implications for the real time response of the portal.

The pragmatic solution adopted for the Pilot Impacts Portal is to regularly replace the items with new versions from the custodians when they are available. This places responsibility on the portal administrator to maintain the currency of the content.

6.1.7 Data Coverage

The process described in Section 4 to identify data items for use in the portal highlights gaps where data has not been identified. This can be directly seen from the tables presented above where there are empty cells in data items columns.

The coverage of identified data items in terms of the elements of the Impacts Framework can be directly seen from looking at the empty cells in Tables 3, 5 and 7 and the absence of Mitigation and Response data items.

Table 3 indicates there are no data items identified for the following events: meteorite strike, storm surge, or Tsunami. This could be due to there being no recorded instances of these events. While this could be true for meteorite strike and Tsunami, it is less likely for storm surge. It could be that storm surge events are not distinguished from storm events.

Table 10 lists the 35 objects from Table 5 which do not have identified impacts data.

Agricultural Fencing	Fire Towers	Plants for the nursery industry
Agricultural Structures (excludes residence)	Flora	Residential Fencing
Agricultural equipment	Fruit and Vegetable crops	Road signage
Air	Grape vines (i.e. for viticulture)	Roofed accommodation (inc. huts and staff accom.)
Apicultural products	Horticultural equipment	Soil
Aquacultural products	Livestock	Telecommunications
Cultural Heritage	Lookouts	Timber
Electricity	Memorabilia	Trucks
Facilities	Mining products	Walking trails
Fauna	Natural Resources equipment	Water
Feed	Park signage	Walking trails
Fencing	Plants for the cut flower industry	

Table 10: Missing Impacts Data Items for Objects.

Table 11 lists the 25 objects from Table 7 that do not have baseline data identified.

Agricultural Structures (excludes residence)	Fire Towers	Plants for the cut flower industry
Agricultural equipment	Grape vines (i.e. for viticulture)	Plants for the nursery industry
Air	Horticultural equipment	
Apicultural products	Lookouts	Road signage
Aquacultural products	Memorabilia	Roofed accommodation (inc. huts and staff accom.)

Bridges	Natural Resources equipment	Telecommunications
Buses	Offices	Trucks
Cars	Other vehicle types	Walking trails
Facilities	Park signage	

Table 11: Missing Baseline Data Items for Objects.

6.1.8 Data Completeness

There are also gaps in the identified data due to the amount of information available, referred to as *completeness*.

The association of a data item against an event in Table 3 or an Impacts Framework object in Tables 5 and 7 does not guarantee that the data item completely describes the corresponding Framework element. As noted before, the AGD Disasters database includes impact information for events that includes details of buildings destroyed or damaged. Mapping this information to the Impacts Framework objects of Table 18 is difficult since it could be associated with a number of objects: *Property – Commercial*, *Property – Industrial*, *Property - Public (i.e. Government)* or *Property – Residential*.

When mapping a data item to an element of the Impacts Framework, if there are multiple mappings that can be made, they all are. This may lead to an increased coverage when it is not really the case.

6.2 Obstacles

The following obstacles have been encountered while identifying and gathering the data items.

6.2.1 Finding data

To date only a relatively small number of data items have been identified and collected. One of aims of the Pilot Impacts Portal is to collect detailed information about the impacts of historical natural disaster and fire emergency events. This information is only available for large scale events and the impact information is at a “high level” making it difficult to link to the detailed descriptions of impacts available in the Impacts Framework.

6.2.2 Obtaining Data

There are currently some gaps in the identified data as noted in Sections 6.1.7 and 6.1.8. We were hopeful that the data items survey would reveal more data and more custodians, especially more impacts and PPRR data items. However, this did not eventuate.

6.2.3 User Engagement

The requirements [11] have been defined at a “high level” describing user stories of pre-incident, during an incident, and post event scenarios. To help clarify the portal

development it would be better to have specific users identified who are expected to use the portal for a particular reason. It was hoped that these people would be identified from the national workshop, but this has not eventuated.

6.2.4 Extensive Consultation Required

As described in Section 3.5.3, the emergency management community in Australia is diverse consisting of 100 or more possible data custodians. Instead of attempting to contact all agencies, a representative collection was targeted. This process was undertaken given the time frame of the project.

The October national Impacts Workshop did not identify all relevant data items custodians and therefore not all custodians have been approached. This will be an ongoing activity for the duration of the project and will continue throughout the hosting period.

6.3 Recommendations

The following recommendations have been identified over the course of the data items gathering activity.

6.3.1 In-House Deployment

The data items used in the Pilot Impacts Portal are accessible over the Internet to a wide user group. This level of access restricts the data that may be made available. Specific examples are:

- GA NEXIS data exists at the CD level, but this is not allowed to be used due to sensitivities in the data.
- ABS demographic data was purchased for CD regions but the licensing conditions only allow it to be used on an intranet, not the Internet.
- Centrelink data would be useful to further classify regions by the profile of government benefits received, but this information could not be made available to the wider emergency services community.

These issues could be resolved by deploying the Pilot Impacts Portal within an agency and providing mechanisms to integrate their sensitive data. Architectural solutions could be explored that allow the agency's internal system to be linked to the communal system, so that the internal deployment does not duplicate the publicly available portal data.

6.3.2 Targeted User Engagement

The original plan for the Impacts Project was to identify *user stories* detailing how the portal would be used by potential users. As mentioned above, Section 6.2.3, this has not eventuated. Since potential users have not been forthcoming, FRNSW have proactively identified the following people as target early adopters:

- RMIT (John Handmer and Catherine Stephenson)
- Bushfire CRC (Lyndsey Wright)
- Qld FRS (Selena Stanley)
- NSW SES (Helen Bow)
- Emergency Management WA (Darryl Ott and Carole Dowd)
- SA (Mark Dawson)

The early adopters will help focus the development of the portal and the data items required in the final stages prior to go-live in early June 2012. The aim is to involve these groups and get them on side so they can be advocates for the system.

These relationships will need to be fostered through face to face contact and ongoing engagement.

6.3.3 Portal Hosting

The Pilot Impacts Portal will finish development and be made available for a 12 month trial period from June 2012 until June 2013. The original plan was that no new data items would be included during this evaluation period. However, the user community may identify issues with the data items in the portal, for example, identify when data is out of date or provide new relevant data items. Also, the 2011 census results will be available in July 2012 and this information should be incorporated into the portal.

The data items in the portal need to be maintained during the hosting period and new relevant data made available for users.

6.3.4 Online Tool for Gathering Post Incident Impact Information

The main process of identifying and gathering data items for use in the portal has been to find custodians with data relating to historical natural disasters or fire emergencies and then link the data obtained to the Impacts Framework.

An alternative use of the framework is to use its content as a guide for a user to gather information about an event after it has happened. For example, if information is being gathered concerning a recent disaster, the content of the Impacts Framework could prompt a user for the information that should be obtained and how it should be measured.

This information could be targeted immediately following an event, the days or weeks after a disaster, or could be a long term assessment. These different scenarios would likely make use of different aspects of the framework: for immediate assessment, the direct impacts would be measured, whereas for long term assessments, the indirect impacts would be assessed.

6.3.5 Ontologies

The issues around a model for the Impacts Framework could be addressed by generating an ontology from the Impacts Framework. This would involve extracting the terms, definitions and relationships present in the framework and using them to establish a semantic structure supported by ontology tools and technologies. The advantage of this approach is that the tools would allow the existing Impacts Framework structure to be mapped to the ontology and similarly the identified data items could also be mapped. The intermediate ontology then provides a systematic way of linking data items to the Impacts Framework, a process which has been accomplished in a rudimentary way so far. These ideas may leverage advances in the emerging field of linked open data also.

6.3.6 Report Registry

The target data items were originally expected to be obtained and incorporated into the Pilot Impacts Portal data repository. There is also the need to include URL links to existing data items, namely reports, so the portal user community can reference relevant material via the portal.

These reports could be obtained and loaded into the portal, however this would require a high overhead on the portal administrator as the single person responsible for maintaining the portal content. Also, the source reports should be linked (and not loaded) to maintain currency of information (as the report contents are updated), to minimise data duplication, and to maintain the data point of truth.

An added issue is the potential for large number of reports to be processed and made available to the portal user community. For example, the Queensland Reconstruction Authority have a large collection of reports (almost 1000) that may be of relevance to the portal. Similarly, there is a lot of information available concerning the 2009 Victorian bushfire. Tools would need to be developed to aid the processing of this information for use in the portal.

Note that these sample reports are mostly PDF documents consisting of 'free text' in an unstructured format making it non-trivial to sensibly map the information in the reports to the Impacts Framework. Consequently, selection criteria 9 and 10 from Section 3.4 are not met. For this reason, data items as PDF documents have not been considered as suitable for the portal.

The portal user community should be able to include URL links to relevant information for reference by the portal user community. These links will need to be annotated with details of how the linked data item relates to the Impacts Framework content. For example, a report may describe events, impacts or PPRR details using terminology defined by the Impacts Framework, such as the objects impacted, the harm caused, or the event characteristics. This information needs to be included with the link to the report, and if possible to the location it is mentioned within the report, so the user can easily find relevant information using the portal. Note that this process can be aided using semantic and ontology tools.

APPENDIX A: GLOSSARY OF TERMS

Term	Definition
Baseline data	Data that provides context for an event relevant to the Impacts Framework. This data includes geographic information describing the built environment, local government boundaries, residential zoning, land use details and demographics as well as information described by the Impacts Framework such as bridges, road signage, fencing, national park facilities (BBQs, shower blocks, tables and chairs, shelters, toilets), telephone poles, the electricity network, walking trails, fire towers, field crops and so on.
Benefit*	Any benefits the economy receives as a result of the disaster. These may include financial benefits, such as payments by the government (e.g. recovery packages), donations or insurance payouts. It may also include environmental or social benefits. Enhanced business activity is another potential benefit.
Bushfire*	A general term to describe a fire in vegetation.
Built environment	Human made buildings and infrastructure.
Cyclone*	An intense low-pressure system that forms over warm ocean waters at low latitudes and is sufficiently intense to produce sustained gale-force winds of at least 63 km/h. If the sustained wind reaches hurricane force of at least 118 km/h, the system is defined as a severe tropical cyclone. In other parts of the world, they are called hurricanes or typhoons.
Data item	A dataset available in the Pilot Impacts Portal. The dataset will be relevant to natural disasters and fire emergencies (event and impacts data) or be baseline data.
Dataset	An electronic collection of data.
Direct impact*	Impacts that result from direct contact with the event.
Earthquake*	The shaking and vibration at the surface of the earth caused by underground movement along a fault plane or by volcanic activity.
Economic*	Pertaining to the production, distribution and use of income and wealth.
Environmental*	Impacts on the natural environment, including assets such as the soil, water, air, species, habitat, and flows such as ecosystem services.

Term	Definition
Event*	An incident or situation that occurs in a particular place during a particular interval of time. The Impacts Framework is concerned with the following events: bushfire, cyclone, earthquake, fire emergency, flood, landslide, meteorite strike, storm, storm surge, tornado, tsunami.
Event Characteristic*	The physical features produced by an event. These are defined for each event in the Impacts Framework.
Event data	The measurements associated with an event, for example wind speed, flame intensity, flood height.
Fire Emergency*	Relates to fires other than bushfires, such as structural fires and non-structural fires.
Flood*	A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waters from the unusual and rapid accumulation or runoff of surface waters from any source.
Harm*	The initial impact on an object, categorised as destroyed, damaged or not harmed for inanimate objects, and fatality, major injury, minor injury and not harmed for people and fauna.
Impact*	Is the broadest term and includes both market-based (i.e. tangible) and non-market (i.e. intangible) effects. Individual impacts can be negative or positive.
Impacts Framework	The Impacts Framework is based on economic principles and steps through the process one would take to determine the economic, social and environmental impacts, losses and benefits in the event of a natural disaster or fire emergency [4]. It is accompanied by a Microsoft Excel spreadsheet of supporting data items [3]
Indirect impact*	Impacts that arise as a consequence of the impacts of the event. For example, disruption to the flow of goods and services in and out of the affected area.
Infrastructure	The physical and organizational structures and facilities (e.g. bridges, roads, railways, and powerlines, sewerage, water pipes and gas supplies) needed for the operation of a community.
Intangible*	Items that are not normally bought or sold and for which therefore no agreement on their monetary value exists. In the context of the 'triple bottom line' approach used in this study, social and environmental impacts are considered to be intangible.

Term	Definition
Landslide*	A landslide is the movement of rock, debris or earth down a slope. Landslides result from the failure of the materials that make up the hill slope and are driven by the force of gravity. Landslides are known also as landslips, slumps or slope failures.
Loss*	In economic terms, it is a measure of the impact on a specific economy. It is taken as being equal to the resources lost by the specific area as a consequence of the disaster. The resources can be expressed in time, money or intangible loss.
Metadata	Information describing the structure and content of a dataset.
Meteorite Strike*	<p>A meteorite (strike) is a meteoroid that has survived entry through the atmosphere and reached the Earth's surface. Other related definitions:</p> <p>Meteoroid – a small piece of dust, rock, ice or metal moving through space. Meteoroids are at least the size of a speck of dust but smaller than an asteroid.</p> <p>Asteroid – small planet like bodies that orbit the sun lying mostly in the region between the orbits of Mars and Jupiter. Their diameters range from a few meters to hundreds of kilometres.</p>
Mitigation and Recovery data	The history of funds spent and actions performed in a region for disaster prevention, preparedness, response or recovery.
Model	A description of the essential features of a system under investigation, capturing their relationships and where appropriate their behaviours.
Natural Disaster*	The impact of abnormal or infrequent natural hazards on communities or geographic areas that are vulnerable to such hazards, causing substantial damage, disruption and possible casualties and leaving the affected communities unable to function normally. Thus, natural disasters concern the interaction of natural hazards and socio-economic systems, rather than natural hazards <i>per se</i> .
Natural Hazard	The disaster event.
Object*	The physical objects being impacted by each event characteristic, which may include people, fauna, flora, buildings and infrastructure.
Pilot Impacts Portal	A web accessible interface to the Impacts Framework and accompanying data items.

Term	Definition
Social*	Impacts relating to people, such as health (e.g. death, injury, mental health) and items or places of personal (e.g. memorabilia) or cultural (e.g. heritage buildings or sacred sites) significance. It also includes impacts to the broader 'social fabric' of the community.
Storm*	A general term for relatively small-scale convective processes that develop when warm, humid air near the ground receives an initial upward push from converging surface winds and rises quickly in an unstable atmosphere. Under these conditions, cumulonimbus clouds develop rapidly to potentially reach heights of up to 20 km with associated lightning, thunder, severe wind gusts from downdraughts, heavy rain and hail.
Storm Surge*	Storm surge is a raised dome of water about 60 to 80 km across and typically about 2 to 5 metres higher than the normal tide level. It is caused by a combination of strong winds driving water onshore and the lower atmospheric pressure in a tropical cyclone. In the southern hemisphere, the onshore winds occur to the left of the tropical cyclone's path. In Australia, this is the east side on the north-west and north coasts, and the south side on the east coast.
Tangible*	Items that are normally bought or sold and that are therefore easy to assess in monetary terms. In the context of the 'triple bottom line' approach used in the study, economic impacts are considered to be tangible.
Tornado*	A small mass of air that whirls rapidly about an almost vertical axis; made visible by clouds and by dust and debris sucked into the system.
Tsunami*	A sudden movement of the water column resulting from earthquakes, landslides or volcanic eruptions in or adjacent to oceans. A tsunami is different from wind-generated surface waves on the ocean, such as storm surges. The passage of a tsunami involves the movement of water from the surface to the sea floor, which means its spread is controlled by water depth. Consequently, as the wave approaches land reaches increasingly shallow water, it slows. However, the water column still in deeper water is moving slightly faster and catches up, resulting in the wave bunching up and becoming much higher. A tsunami often is a series of waves and the first may not necessarily be the largest.

Table 12: Glossary of Terms

Note a '*' indicates the term is defined in the Impacts Framework [4].

APPENDIX B: CONSULTATION UNDERTAKEN

Person/agency contacted	Contact dates & method	Reason	Outcome
Impacts Framework authors	Aug 2011 Email	Gain an understanding of the Impacts Framework and specifically what data items the authors originally intended to be included in the portal.	Initial contact with Lyndsey Wright. She advised that the principle author, Catherine Stephenson, had moved on from RMIT, Lyndsey would provide new contact details, and that John Handmer would be in touch. This did not happen. Lyndsey presented an overview of the Impacts Framework at the October workshop.
Dave Martin ALA	Aug 2011 Email 12/08/2011 Meeting	Possibility they have datasets that could be used as baseline data items for the portal.	They have a list of datasets here: http://collections.ala.org.au/public/dataSets This data could be used for baseline data items, but they are not the data custodians. Preference is given to obtaining the data from the source agency.
Shane Conserdyne NSW LPMA	Aug – Oct 2011 Email & Phone	Wanted to understand the data they use for emergency management: Spatial Information and Mapping System (SIMS), which provides detailed information about places, people and events that is easy to access and act on in emergency situations.	Initially he seemed interested and available to help. We tried to organise a visit, but it never eventuate. FRNSW also tried to contact him without success (he was on long service leave, then busy and unavailable). Graham Chapman (FRNSW) advised that FRNSW have SIMS data

Person/agency contacted	Contact dates & method	Reason	Outcome
ANDS	Sep 2011 Web	ANDS is a registry of information with links to databases, research groups, individual publications, descriptions of activities and services. Check if relevant data items are available in a national collection.	The information is largely unstructured and requires manual searching and sifting of large lists of results. Initial investigation found information already known about.
Graham Chapman FRNSW	Nov 2011 Email 23/02/2012 Meeting Mar 2012 Email	Understand data used by FRNSW for emergency management purposes and what data they may have for us.	FRNSW have SIMS data, but he recommended that it would not be useful in the portal. There are also confidentiality issues in using the data. FRNSW have up to data spatial data for the state of NSW. This is by special arrangement with the NSW government (Land and Property Management and EICU). We could not have this data from them. Would need to go to the source, but advised that we would not be allowed to have it for use in a public portal.
Paul Box CSIRO	Oct 2011 Email & Phone	Understand synergies with a similar disaster planning portal project run within CSIRO. His project, the United Nations Spatial Data Infrastructure (UNSDI) has a similar purpose. Specifically, he has access to gazetteer information that may be useful.	It was decided that a specific gazetteer data item was not needed. We are using online web services to resolve user provided locations. He was going to attend the October Workshop as an observer, but was unavailable on the day.

Person/agency contacted	Contact dates & method	Reason	Outcome
Mark Edwards GA	Sep 2011 Email 23/09/2011 Meeting	General enquiries about NEXIS data. Obtain impacts data.	A meeting was organised to discuss the data they have at GA. Mark agreed to supply NEXIS data to us. See follow up contacts with Krishna Nadimpalli and Mark Dunford. Mark Edwards also mentioned they have impacts data. GA conduct post disaster surveys. CSIRO asked for copies of this data and at first GA were willing to provide it, but there are confidentiality issues about the data content, and we have not been able to obtain the data.
Krishna Nadimpalli GA	Sep – Oct 2011 Email	Follow up enquires about obtaining NEXIS data.	Krishna indicated that they were preparing a new release of the NEXIS data. He agreed to supply an older version, dated Oct 2010, for experimental purposes
Mark Dunford GA	Oct 2011 Email	Supply NEXIS data and explain the terms and conditions for using it.	Obtained Oct 2010 NEXIS data Obtained Dec 2011 NEXIS data
Andrew Sullivan CSIRO	Oct 2011 Email	Possible custodian of bushfire or fire emergency data.	Andrew said CSIRO does not manage such data and that he doubts there is a national collection for it. He suggested Justin Leonard (CSIRO) as a contact who did not respond to email contacts.
Michelle Bouvet NSW SES	Oct - Mar 2011 Email	Determine the data items they may have to contribute and see what data items they would find most useful.	Difficult to contact. She went on holidays but forwarded the information to others to respond to. The NSW SES people were very busy responding to floods during the summer of 2011/12 and were difficult to get access to.

Person/agency contacted	Contact dates & method	Reason	Outcome
Faruk Yay AGD	Oct - Nov 2011 Email	Wanted to obtain information about payments from the federal government to state agencies in response to natural disasters. Also check if they have further data items relating to such events.	Recommended we focus on a specific event and gather specific event and impacts information about it. He suggested the Hunter Valley floods in 2007 and gave us the contact details of Jason Collins recommending that he would have relevant data. Also suggested CCC as a possible contact (we did not follow up this since their information would not be available publically).
Martine Woolfe GA	26/10/2011 Meeting Oct 2011 – Jan 2012 Email and Phone	She contacted after a referral from Lyndsey Wright. Martine wanted to discuss the Impacts Project. CSIRO wanted to learn if she had GA contacts with baseline or impacts data.	Turns out she was hoping we had impacts data as this is what she is most interested in. She provided a background on risk assessment, hazard assessment and impact assessment. She also suggested we look at outputs from models (for example a cyclone risk model). Not pursued since this is creating a data item.
ABS	Oct - Dec 2011 Web	Obtain ABS data from their web site	Downloaded the following: <ul style="list-style-type: none"> • 2006 ASGC LGA, SLA, CD digital boundaries • 2010 ASGC LGA, SLA, CD digital boundaries • Livestock products • Livestock and Meat • Business counts • Retail trade • 2006 Census of Population and Housing CD level data, purchased for \$99 (+GST) not yet allowed to use due to licensing constraints • 2010 Population Estimates
AGD	Oct 2011 Web	Obtain the AGD Disasters database.	Downloaded in October and an updated version obtained in February.
BOM	Oct 2011 Web	Obtain the Tropical Cyclones database.	Downloaded in October.
AEC	Oct 2011 Web	Obtain the Federal Electoral Boundaries	Downloaded in October.

Person/agency contacted	Contact dates & method	Reason	Outcome
GA	Nov 2011 Web	Obtain the GA Earthquake database	Downloaded in November.
University of Colorado	Nov 2011 Web	Obtain the Dartmouth Flood Observatory data.	Downloaded in November.
GA	Nov 2011 Web	Obtain the 9 second DEM derived Streams. Part of the AHGF.	Data is available for download from the MapConnect web site. However, this data had been previously obtained during a prior CSIRO project and this version was used instead. The data is in a raster format and a vector format was preferred. So the same data available from the BOM was obtained and used instead.
John McAneney Risk Frontiers	Nov 2011 Email	Enquire about their historical risk database and any other relevant data items.	They responded with details of various databases they have: <ul style="list-style-type: none"> • PerilAUS: database of natural hazard events that have caused loss of life or property since 1900. • FireAUS: database of every address in Australia categorised by shortest distance to nearest contiguous area of bushland > 0.5 km². Use of the data requires a commercial license and fee. It was decided not to use this data.
Rick McRae ACT Emergency Services Bureau	Nov 2011 Email & Phone	Determine the data items they may have to contribute and see what data items they would find most useful.	He was initially enthusiastic and wanted to organise a meeting with relevant people from his organisation. This did not eventuate. Repeated calls and emails were not returned.

Person/agency contacted	Contact dates & method	Reason	Outcome
Ged Mueller AGD	Nov - Dec 2011 Email 30/11/2011 Meeting	At the workshop he demonstrated knowledge about relevant data items available from federal government agencies.	He followed up with information about: <ul style="list-style-type: none"> • Flood data • EICU • TISN • CIPMA During further correspondence he indicated that critical infrastructure information (TISN and CIPMA) would not be available for a publically accessible system like ours. His other contacts were ones we already had (GA flood people and EICU).
Neil Lazarow DCCEE	17/11/2011 Meeting	At the workshop he demonstrated knowledge about data items that would be needed to support climate change scenarios.	He supplied hard copies of example reports containing information that would be useful to the portal. His agency does not manage relevant data items.
Jason Collins NSW Ministry for Police and Emergency Services	Nov – Dec 2011 Email	See the recommendation of Faruk Yay. The request was CC'ed to two colleagues of his (Rebecca Graham and Raechel Squires) on the advice of Melanie Stutchbury.	No response. Follow up email and phone calls were not successful. The final word from Jason was that the NRIS data would not be available for the portal. This data item was mentioned at the workshop, but had not been requested.
Rhys Bittner MDS	Nov 2011 Email & Phone	Enquiry about purchasing PSMA data. MDS are a “value added reseller” of PSMA data: the authoritative source of Australian government mapping data.	Only an initial ball park figure was obtained. The quote for GNAF, CadLite, RoadNet Presentation, and the MDS Routable Road dataset was for around \$55K in year 1 and \$43K in year 2. The licensing conditions to use the data in on online system were not clear. This was considered too expensive and not pursued.

Person/agency contacted	Contact dates & method	Reason	Outcome
DSEWPC	Dec 2011 Web	Explore data available on the web using the DSEWPC Discover Information Geographically (DIG) tool.	<p>The following were considered relevant as baseline data for the portal:</p> <ul style="list-style-type: none"> • Register of the National Estate • Australian World Heritage List • Commonwealth World Heritage List • National Heritage List • IBRA • Landscape Health <p>However, a licence file is generated during download which indicates the data cannot be used. An example licence can be found in Appendix H.</p>
ABARES	Dec 2011 Web	Obtain ALUM land use data polygon data.	Downloaded in December.
AURIN	Dec 2011 Web	Investigated their system to see if there are overlaps between the data they have and what we require.	AURIN is focused on urban data and has data items from GA, ABS, PSMA focused on built environment and urban researchers. They are not a relevant data custodian.
Mark Dawson SAFECOM	Dec 2011 – Mar 2012 Email and Phone	After the December Steering Committee meeting, Mark expressed interest in helping define use cases for the portal to support risk assessment plans. He would help identify what data is needed to support this and existing data repositories.	<p>Mark provided background material on:</p> <ul style="list-style-type: none"> • NSDR • NERAG <p>Mark provided URLs for example sites presenting impacts-related information and a GA contact (Miriam Middelmann-Fernandes) for flood events in terms of PPRR based investment mixes.</p>

Person/agency contacted	Contact dates & method	Reason	Outcome
AHGF generic inbox (Matthew Brooks) BOM	Dec 2011 Email	Obtain the AHGF data from the BOM. The data was only available on the web site as proprietary ESRI Geodatabase file format. We wanted shapefiles, and the web site indicated that this was possible upon request.	Sent request for shapefile data. The BOM made the data available for download from an FTP site. The data was obtained in early January 2012. Note that data is in the same format as the GA TOPO 250K data, but is more up to date.
Miriam Middelmann-Fernandes GA	Jan 2012 Email & Phone	Recommendation from Mark Dawson. She has flood event/impact data.	Miriam indicated that the flood reports available from GA are those from the online Australian Flood Studies Database. However, the search feature didn't provide many results. Miriam said the reports will be loaded over time and this is done by the report owners, not GA. This is a low priority and may take over a year. Obtained the reports available at: http://www.ga.gov.au/hazards/flood/reports.html as an example collection of flood reports for future exploration. 71 reports were obtained.
Global Hotspot University of Maryland	Jan-Feb 2012 Web	Obtain historical hotspot data for Australia from the University of Maryland	A request for the data was made. A week later the data was available for download: approximately 2.7 million rows in a 45 MB CSV file. The terms and conditions however indicate that the data cannot be used. In discussions with FRNSW, they decided we could have a copy of the AIRS database.

Person/agency contacted	Contact dates & method	Reason	Outcome
Alexander Herr (Herry) CSIRO	Jan – Mar 2012 Email & Phone	Neil Lazarow (DCCEE) mentioned Herry as a contact at CSIRO for bushfire and floodplain risk data.	He was initially busy finishing a project. Recommended we contact Andrew Sullivan (CSIRO). We have previously contacted Andrew, see above. Herry has produced a bushfire exposure map based on vegetation communities for DCCEE. Not yet publically available.
Brian Ashe ABCB	Feb 2012 Email & Phone	Recommended by FRNSW that we contact the ABCB to see what data they have to contribute.	Spoke to Brian and they have climate maps, but no flood/bushfire prone/risk maps. He will forward what he has later. Yet to follow up. Downloaded the climate maps. Similar to what's available from the BOM. Possible baseline data.
COAG	Feb 2012 Web	Find information detailing the previously allocated commonwealth funds used for recovery efforts in response to natural disasters. FRNSW indicates that this information should be available somewhere.	Initials investigations found the following references: http://www.coag.gov.au/coag_meeting_outcomes/2009-04-30/index.cfm plus a few others. No definitive list was found.
AGD	Feb 2012 Web	The COAG references above indicated that information should be available at the AGD.	Found the following: COAG report on natural disasters in Australia This report contains high level financials about commonwealth funding. Unclear how to link this to the Impacts Framework. May need to create a data item by extracting relevant information from the report.

Person/agency contacted	Contact dates & method	Reason	Outcome
Selena Stanley Qld FRS	Feb - Mar 2012 Email	Ask about data items used by Qld FRS, how they manage the data and if we might be able to use data in the portal.	She also spoke to Mark Wallace within her organisation about our request and responded by saying they don't have relevant data. They use AIRS data and capture time and personnel associated with activities such as assisting the LDMG, DDMG, EMQ and other community recovery tasks. She suggested we should look at the Qld Reconstruction Authority: http://www.qldreconstruction.org.au/
FRNSW & AFAC	Feb - Mar 2012 Email	Obtain an extract of the AIRS database. AIRS is a national database that records information about responses to emergency incidents, mostly those attended by fire and rescue services.	The data obtained is an SQL Server database extract. This will be loaded into SQL Server and then migrated to an Oracle database for use in the portal. Electronic copy of the AIRS manuals received 23 Feb. Data obtained on 27 Mar.
Shweta Morkhandikar IAG	Mar 2012 Email & Phone	FRNSW provided Shweta as a contact in the insurance industry. Not expecting to get data, but to understand what data they use to see if we can get similar data items from elsewhere to make the portal useful for insurance industry sector.	Shweta is going to discuss with her colleagues and get back to CSIRO. She suggested a face to face meeting in Sydney would be the best method to progress this relationship.

Person/agency contacted	Contact dates & method	Reason	Outcome
Daryl Ott EMWA	Mar 2012 Email & Phone	Contact proposed from Carole Dowd. EMWA are collecting data to support risk assessments aligned with the NERAG. This data may be available for the portal.	Daryl's focus is to gather evidence of historical natural disasters in WA, initially for cyclones and floods. He has data available in an extranet which we can access. The data is evidence (newspaper clippings, PDF reports, CSV files, anything and everything) supporting historical events and he is extracting the relevant information from the evidence to collate a summary. This summary will be more useful than the "raw" data currently available. CSIRO have joined the extranet to obtain the data. No data obtained yet. Will wait for Daryl's summary.
Alexander Herr CSIRO	Jan – Mar 2012 Email & Phone	Neil Lazarow (DCCEE) mentioned that Alex as a contact at CSIRO for bushfire and floodplain risk data.	He was initially busy. Still following up.
Monica Osuchowski GA	Mar 2012 Email 23/03/2012 Meeting	Understand Emergency Management work underway at GA. Determine if there are any data items available at GA that we don't yet know about.	Monica has had dealings with the CCC who want GA data to provide a context for emergencies when they happen. CCC are interested in some of the same data we are and have (for example NEXIS and ABS demographics) but also other datasets to identify vulnerable people in the community (hospital locations, nursing homes, schools and so on) but she is not aware of the existence of this information, especially on a national scale.

Person/agency contacted	Contact dates & method	Reason	Outcome
Queensland Reconstruction Authority	Mar 2012 Web	Recommended by Selena Stanley. They should have impacts data for the Queensland floods of summer 2010/11.	<p>There is a lot of information available here. For example interactive maps showing recent NDRAA regions for Queensland:</p> <p>http://www.qldreconstruction.org.au/maps/ndrra-map</p> <p>We gathered all the reports we could (978 PDFs) but have not yet attempted to process or review this information. They have good summaries as dashboards, for example:</p> <p>http://www.qldreconstruction.org.au/u/lib/cms/Dashboard-QRA-CEO.pdf</p>
Victorian bushfires	Mar 2012 Web	Motivated by the above collection of information about the Queensland floods, went looking for data about the 2009 Victoria bushfires.	<p>A total of 84 reports were gathered from 9 web sites. A sample being:</p> <ul style="list-style-type: none"> • Royal Commission Final Report • Wilderness Society • VBRAA (now inactive, but archived) • Medical Journal of Australia <p>This information is yet to be reviewed for use in the portal.</p>

Person/agency contacted	Contact dates & method	Reason	Outcome
Steve Jacoby Qld DERM	Mar 2012 Web & Conference	Mark Cameron attended the Association of Public-Safety Communications Officials (APCO) Australasia 2012 on the Gold Coast and saw a presentation by Steve. He mentioned that Qld FRS performed rapid impact assessments after the Qld floods and that this data will become publically available.	<p>Could not find the rapid impact assessments. Have asked Selena Stanley for information. Enquiries ongoing.</p> <p>Did find the flood extents for the 2010/11 Qld floods was downloaded as shapefiles from:</p> <p>http://dds.information.qld.gov.au/DDS/Search.aspx</p> <p>Had a look at the data. Available for integration into the portal.</p>

Table 13: Consultation Undertaken

APPENDIX C: CUSTODIAN SURVEY

The following survey questions were sent to the data custodians identified at the workshop, listed in Table 2. The survey included background information about the Impacts Project to help orient the recipient to complete the questions.

This survey is for custodians and users of data relevant to the Pilot Impacts Portal. The survey will establish what data currently exists, who maintains it, the format it is in, if it is available for use in the portal, and the terms and conditions of using it. The survey is divided into three sections:

1. The preliminary questions determine if your agency manages data items relevant to the Impacts Project.
2. The next set of questions records the metadata about your data items.
3. The last section asks you to list the data items you use that are managed by another agency.

In the case where your agency manages more than one data item please complete Section 2 for each.

C.1 Preliminary Questions

The following questions indicate if your agency has data items relevant to the Impacts Project and notes who the contact person is. A description of the target data items are defined above.

If your agency does not have relevant data, please complete this section in the negative. This information will identify those agencies that don't have data as well as those that do.

Name of agency:	
Name of the section within the agency responding to the survey:	
Does your section manage data relevant for use in the Pilot Impacts Portal?	Yes / No <i>If yes, please complete Section 2 for each data item.</i>
Contact details of person completing the survey:	
Name	
Job title	
Phone number	
Email	

C.2 Data Item Description

This section is only to be completed when an agency manages a data item relevant for use in the Pilot Impacts Portal. Please complete even if the data will *not* be made available to the portal. Complete Section 2 once for each data item.

Name of the data item:	
Data item category:	Baseline/Event/Impact/Mitigation and Recovery:
Number of entries in the data item:	<i>The number of rows in a database or Excel spreadsheet, or the number of events described in a report.</i>
Brief description of the data item:	
URL to data item description (if available):	
URL to data item (if available):	
Title or role of person/group responsible for maintaining the data item:	
Is the data item contained in a document, spreadsheet or database?	Yes/No
Describe how the data is managed:	
In what format is the data available?	<i>MS Excel / Word / PDF / CSV / XML / etc</i>
Is there sensitive information in the data? If so, briefly describe:	Yes/No
Is there a data quality statement? If so, briefly describe:	Yes/No
Data quality URL (if available):	
Terms and conditions for using the data:	
URL to the terms and conditions:	
Is the data available free of charge?	Yes/No
If no, then at what cost?	
When was the data item first created?	

How frequently is the data updated?	<i>Never / daily / weekly / monthly / yearly / other</i>
If other, please specify:	
Can the data item be made available to the Pilot Impacts Portal?	Yes/No

C.3 Other Data Items

Please list all the data items relevant to the Impacts Project that your agency uses but for which you are not the custodian. It is expected that a single agency may be responsible for one or more relevant data items.

Data Item Category	Custodian Agency	Data Item Names	Custodian Contact Details		
			Name	Phone	Email

APPENDIX D: THE IMPACTS FRAMEWORK

The Impacts Framework, depicted in Figure 1, encapsulates the process used to determine the economic, social, and environmental impacts, losses and benefits resulting from a natural disaster or fire emergency. The framework is used as a guide to determine and measure the impacts resulting from an event.

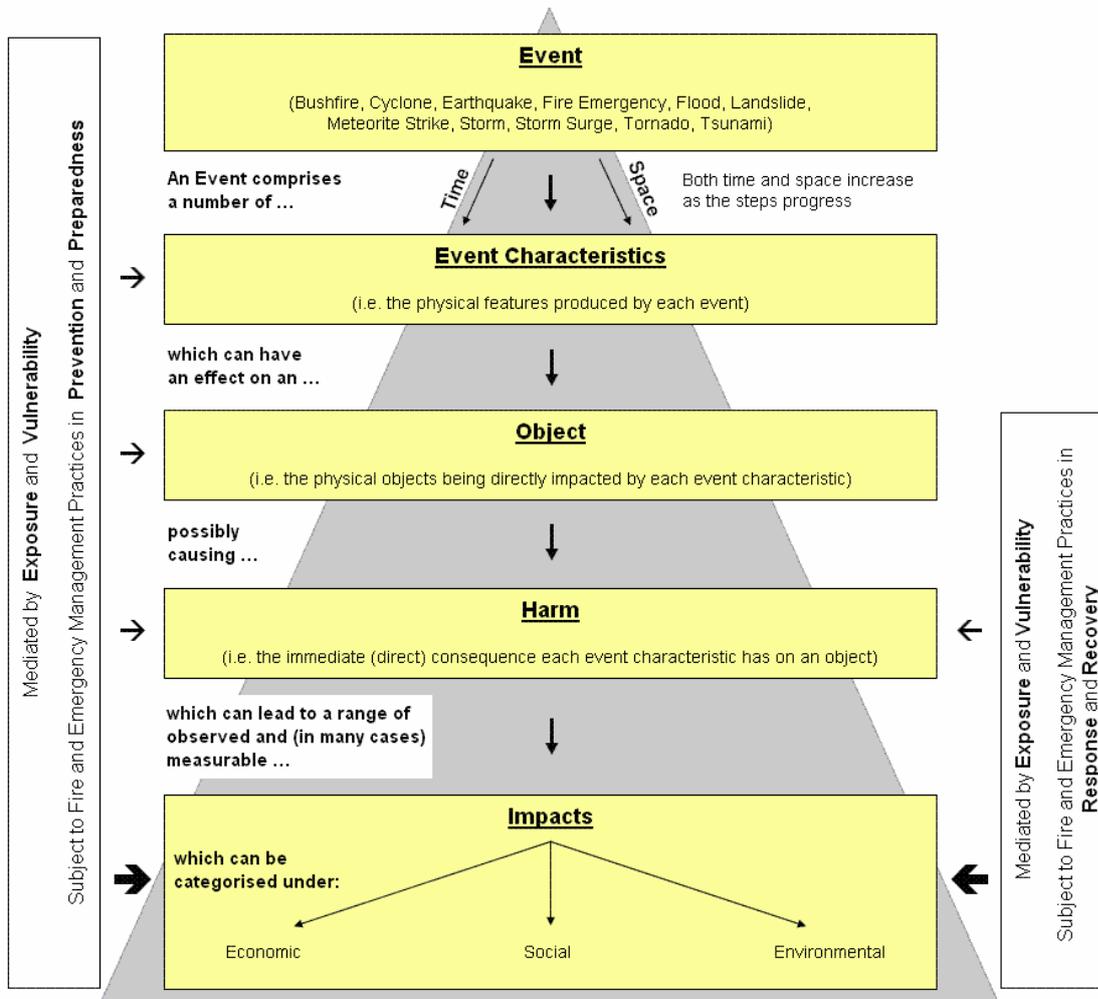


Figure 1: The Impacts Framework [3].

Figure 1 can be interpreted from top to bottom using the text below each yellow box to explain the process of identifying an impact. Doing so reveals the following: an *event* comprises a number of *event characteristics* which have an effect on an *object* possibly causing *harm* which can lead to a range of observed and (in many cases) measurable *impacts*, which can be categorised as being *economic*, *social* or *environmental*. Also, the prevention and preparedness aspects of emergency management practices are shown on the left while the role of response and recovery are on the right.

The Impacts Framework is a Microsoft Excel spreadsheet [3] with supporting documentation [4]. The Framework has been used to determine the data items required by the portal and these data items need to be linked to the Framework. In this

regard, the Impacts Framework can be considered metadata describing the data items or a thesaurus categorising the data items which are included in the repository.

The following details about the Impacts Framework are necessary to describe how the data items relate to the Framework. Each element of the Framework depicted in Figure 1 is first defined from the Impacts Framework for Natural Disasters and Fire Emergencies [4], followed by the details from the Microsoft Excel spreadsheet [3]. This process was enabled by loading the content of the Impacts Framework Microsoft Excel spreadsheet into an Oracle database and exploring the information using SQL queries. This was a useful exercise to better understand the content of the Impacts Framework in terms of the data item categories, defined in Section 2.1.

D.1 Event

An incident or situation that occurs in a particular place during a particular interval of time.

There are 11 predefined events being considered by the Impacts Framework: bushfire, cyclone, earthquake, fire emergency, flood, landslide, meteorite strike, storm, storm surge, tornado, and tsunami. These are defined in Table 14 below, from the Impacts Framework for Natural Disasters and Fire Emergencies [4].

Event	Definition
bushfire	A general term to describe a fire in vegetation
cyclone	An intense low-pressure system that forms over warm ocean waters at low latitudes and is sufficiently intense to produce sustained gale-force winds of at least 63 km/h. If the sustained wind hurricane force of at least 118 km/h, the system is defined as a severe tropical cyclone. In other parts of the world, they are called hurricanes or typhoons.
earthquake	The shaking and vibration at the surface of the earth caused by underground movement along a fault plane or by volcanic activity.
fire emergency	Relates to fires other than bushfires, such as structural fires.
flood	A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waters from the unusual and rapid accumulation or runoff of surface waters from any source.
landslide	A landslide is the movement of rock, debris or earth down a slope. Landslides result from the failure of the materials that make up the hill slope and are driven by the force of gravity. Landslides are known also as landslips, slumps or slope failure.

Event	Definition
meteorite strike	<p>A meteorite (strike) is a meteoroid that has survived entry through the atmosphere and reached the Earth's surface. Other related definitions:</p> <p>Meteoroid – a small piece of dust, rock, ice or metal moving through space. Meteoroids are at least the size of a speck of dust but smaller than an asteroid.</p> <p>Asteroid – small planet like bodies that orbit the sun lying mostly in the region between the orbits of Mars and Jupiter. Their diameters range from a few meters to hundreds of kilometres.</p>
storm	<p>A general term for relatively small-scale convective processes that develop when warm, humid air near the ground receives an initial upward push from converging surface winds and rises quickly in an unstable atmosphere. Under these conditions, cumulonimbus clouds develop rapidly to potentially reach heights of up to 20 km with associated lightning, thunder, severe wind gusts from downdraughts, heavy rain and hail.</p>
storm surge	<p>Storm surge is a raised dome of water about 60 to 80 km across and typically about 2 to 5 metres higher than the normal tide level. It is caused by a combination of strong winds driving water onshore and the lower atmospheric pressure in a tropical cyclone. In the southern hemisphere, the onshore winds occur to the left of the tropical cyclone's path. In Australia, this is the east side on the north-west and north coasts, and the south side on the east coast.</p>
tornado	<p>A small mass of air that whirls rapidly about an almost vertical axis; made visible by clouds and by dust and debris sucked into the system.</p>
tsunami	<p>A sudden movement of the water column resulting from earthquakes, landslides or volcanic eruptions in or adjacent to oceans.</p> <p>A tsunami is different from wind-generated surface waves on the ocean, such as storm surges. The passage of a tsunami involves the movement of water from the surface to the sea floor, which means its spread is controlled by water depth. Consequently, as the wave approaches land and reaches increasingly shallow water, it slows. However, the water column still in deeper water is moving slightly faster and catches up, resulting in the wave bunching up and becoming much higher. A tsunami often is a series of waves and the first may not necessarily be the largest.</p>

Table 14: Event Definitions.

D.2 Event Characteristics

The physical features produced by an event.

Each event has characteristics associated with it which are the different features of the event that can cause an impact. It is recognised that there will be cases where the specific characteristic of an event causing an impact is unknown. In this situation, the

event itself is identified as causing the impact. There are a total of 24 event characteristics defined as shown in Table 15 below.

Event	Characteristic	Event	Characteristic
bushfire	flame	flood	inundation
bushfire	heat	landslide	movement of soil, rock or debris down a slope
bushfire	smoke	meteorite strike	impact with the earth
cyclone	rain	storm	hail
cyclone	wind	storm	lightning
earthquake	ground collapse	storm	rain
earthquake	ground tremors	storm	wind
earthquake	particles become airborne (e.g. dust, fungal spores)	storm surge	flowing water
fire emergency	flame	storm surge	inundation
fire emergency	heat	tornado	wind
fire emergency	smoke	tsunami	flowing water
flood	flowing water	tsunami	inundation

Table 15: Event Characteristic Definitions

D.3 Object

The physical objects being impacted by each event characteristic, which may include people, fauna, flora, buildings and infrastructure.

The Impacts Framework Excel spreadsheet lists the objects in the real world that may interact with an event resulting in an impact. These objects are consistently used for all the different events and are used to describe the direct impacts that may occur. There are a large number of objects listed in the Framework and this is managed by organising them into a three level hierarchy, described below.

1. Object Category

The grouping used to categorise the objects. There are 16 different categories as shown in Table 16.

2. Object

The objects are the real world items that can be impacted by an event. There are 53 objects identified in the Impacts Framework.

3. Sub object

An object may be further categorised into sub-objects. For example, the object *Agricultural Fencing* may be further classified as *Boundary Fencing*, *Crown Boundary Fencing* or *Internal Fencing*. There are a total of 85 sub objects.

The full listing of the objects including their categories and sub objects as defined in the Impacts Framework is shown in Table 18 below.

Infrastructure – Private	Agricultural Products and Equipment
Infrastructure - Parks and Reserves	Horticultural Products and Equipment
Infrastructure - Public (excl. parks and reserves)	Natural Resources and Equipment
Property – Commercial	Trade
Property – Industrial	People and Community
Property - Public (i.e. Government)	Cultural Heritage
Property – Residential	Memorabilia
Vehicles	Natural Environment and Ecosystem Services

Table 16: Object Categories.

Note that each object belongs to an object category however 22 objects do not have a sub object. These are shown in Table 17 with an empty ‘sub-object’. The following eight objects have the same name as their object category:

- Property – Commercial
- Property – Industrial
- Property - Public (i.e. Government)
- Property – Residential
- Trade
- People and Community
- Cultural Heritage
- Memorabilia.

Also, the objects *Bridges* and *Roads* appear under two categories: *Infrastructure - Parks and Reserves* and *Infrastructure - Public (excl. parks and reserves)*. This hierarchical structuring of objects makes it non trivial to link data items to the Impacts Framework as discussed in Section 4.

Object Category	Object	Sub object
Infrastructure - Private	Agricultural Fencing	Boundary Fencing
Infrastructure - Private	Agricultural Fencing	Crown Boundary Fencing
Infrastructure - Private	Agricultural Fencing	Internal Fencing
Infrastructure - Private	Agricultural Structures (excludes residence)	Dairy Sheds (structure and contents)
Infrastructure - Private	Agricultural Structures (excludes residence)	Wool Sheds (structure and contents)
Infrastructure - Private	Agricultural Structures (excludes residence)	Other Structures (structure and contents)
Infrastructure - Private	Residential Fencing	
Infrastructure - Parks and Reserves	Roofed accommodation (inc. huts and staff accom.)	Structure
Infrastructure - Parks and Reserves	Roofed accommodation (inc. huts and staff accom.)	Contents
Infrastructure - Parks and Reserves	Offices	Structure
Infrastructure - Parks and Reserves	Offices	Contents
Infrastructure - Parks and Reserves	Facilities	BBQs
Infrastructure - Parks and Reserves	Facilities	Shower blocks
Infrastructure - Parks and Reserves	Facilities	Shelters
Infrastructure - Parks and Reserves	Facilities	Table / seats
Infrastructure - Parks and Reserves	Facilities	Toilets
Infrastructure - Parks and Reserves	Bridges	
Infrastructure - Parks and Reserves	Fencing	Boundary fencing
Infrastructure - Parks and Reserves	Fencing	Internal fencing
Infrastructure - Parks and Reserves	Fire Towers	
Infrastructure - Parks and Reserves	Lookouts	
Infrastructure - Parks and Reserves	Park signage	
Infrastructure - Parks and Reserves	Roads	Dirt road
Infrastructure - Parks and Reserves	Roads	Tarred road
Infrastructure - Parks and Reserves	Walking trails	
Infrastructure - Parks and Reserves	Other structures	Structure
Infrastructure - Parks and Reserves	Other structures	Contents

Object Category	Object	Sub object
Infrastructure - Public (excl. parks and reserves)	Bridges	Dirt road
Infrastructure - Public (excl. parks and reserves)	Bridges	Local (tarred) road
Infrastructure - Public (excl. parks and reserves)	Bridges	Major arterial road (fwy, hwy)
Infrastructure - Public (excl. parks and reserves)	Bridges	Minor arterial (main road through city, town)
Infrastructure - Public (excl. parks and reserves)	Railways	Overhead cables
Infrastructure - Public (excl. parks and reserves)	Railways	Signals
Infrastructure - Public (excl. parks and reserves)	Railways	Track work
Infrastructure - Public (excl. parks and reserves)	Roads	Dirt road
Infrastructure - Public (excl. parks and reserves)	Roads	Local (tarred) road
Infrastructure - Public (excl. parks and reserves)	Roads	Major arterial road (fwy, hwy)
Infrastructure - Public (excl. parks and reserves)	Roads	Minor arterial (main road through city, town)
Infrastructure - Public (excl. parks and reserves)	Road signage	
Infrastructure - Public (excl. parks and reserves)	Electricity	Infrastructure
Infrastructure - Public (excl. parks and reserves)	Electricity	Supply
Infrastructure - Public (excl. parks and reserves)	Gas	Infrastructure
Infrastructure - Public (excl. parks and reserves)	Gas	Supply
Infrastructure - Public (excl. parks and reserves)	Telecommunications	Infrastructure

Object Category	Object	Sub object
Infrastructure - Public (excl. parks and reserves)	Telecommunications	Supply
Infrastructure - Public (excl. parks and reserves)	Water	Infrastructure
Infrastructure - Public (excl. parks and reserves)	Water	Supply
Property - Commercial	Property - Commercial	Structure
Property - Commercial	Property - Commercial	Contents
Property - Industrial	Property - Industrial	Structure
Property - Industrial	Property - Industrial	Contents
Property - Public (i.e. Government)	Property - Public (i.e. Government)	Structure
Property - Public (i.e. Government)	Property - Public (i.e. Government)	Contents
Property - Residential	Property - Residential	Principle place of residence - Home (structure and contents)
Property - Residential	Property - Residential	Principle place of residence - Caravan or something similar (structure and contents)
Property - Residential	Property - Residential	Non-principle place (structure and contents)
Vehicles	Buses	
Vehicles	Cars	
Vehicles	Trucks	
Vehicles	Other vehicle types	
Agricultural Products and Equipment	Feed	Hay
Agricultural Products and Equipment	Feed	Grain
Agricultural Products and Equipment	Feed	Pasture
Agricultural Products and Equipment	Feed	Other feed types
Agricultural Products and Equipment	Field Crops	Barley
Agricultural Products and Equipment	Field Crops	Wheat
Agricultural Products and Equipment	Field Crops	Other field crops
Agricultural Products and Equipment	Livestock	Cattle (for beef and dairy)
Agricultural Products and Equipment	Livestock	Goats (for dairy and wool)
Agricultural Products and Equipment	Livestock	Horses

Object Category	Object	Sub object
Agricultural Products and Equipment	Livestock	Poultry
Agricultural Products and Equipment	Livestock	Sheep (for dairy, meat and wool)
Agricultural Products and Equipment	Livestock	Other stock
Agricultural Products and Equipment	Apicultural products	Bees
Agricultural Products and Equipment	Apicultural products	Hives
Agricultural Products and Equipment	Apicultural products	Honey
Agricultural Products and Equipment	Agricultural equipment	Tractors
Agricultural Products and Equipment	Agricultural equipment	Harvesters
Agricultural Products and Equipment	Agricultural equipment	Other equipment
Horticultural Products and Equipment	Fruit and Vegetable crops	
Horticultural Products and Equipment	Grape vines (i.e. for viticulture)	
Horticultural Products and Equipment	Plants for the cut flower industry	
Horticultural Products and Equipment	Plants for the nursery industry	
Horticultural Products and Equipment	Horticultural equipment	Irrigation equipment
Horticultural Products and Equipment	Horticultural equipment	Fruit harvesters
Horticultural Products and Equipment	Horticultural equipment	Other equipment
Natural Resources and Equipment	Aquacultural products	
Natural Resources and Equipment	Timber	Private hardwood plantations on private land
Natural Resources and Equipment	Timber	Private softwood plantations on private land
Natural Resources and Equipment	Timber	Private softwood plantations on leased crown land
Natural Resources and Equipment	Timber	Government owned softwood plantations
Natural Resources and Equipment	Timber	Government owned hardwood plantations
Natural Resources and Equipment	Timber	State forest available for harvest
Natural Resources and Equipment	Mining products	
Natural Resources and Equipment	Natural Resources equipment	Aquaculture operations

Object Category	Object	Sub object
Natural Resources and Equipment	Natural Resources equipment	Timber operations
Natural Resources and Equipment	Natural Resources equipment	Mining operations
Trade	Trade	
People and Community	People and Community	
Cultural Heritage	Cultural Heritage	Indigenous (structures and artifacts)
Cultural Heritage	Cultural Heritage	Non-Indigenous (structures and artifacts)
Memorabilia	Memorabilia	
Natural Environment and Ecosystem Services	Air	
Natural Environment and Ecosystem Services	Fauna	both native and introduced
Natural Environment and Ecosystem Services	Flora	both native and introduced
Natural Environment and Ecosystem Services	Soil	
Natural Environment and Ecosystem Services	Waterways	rivers, lakes, etc.

Table 17: Impacts Framework Hierarchy of Objects.

The listing in Table 17 highlights the way the Impacts Framework Excel spreadsheet organises objects. The sub objects provide further examples to help the user understand what is being described. For example the *Livestock* object in the *Agricultural Products and Equipment* category has six sub objects:

- | | |
|-----------------------------|----------------------------------|
| Cattle (for beef and dairy) | Poultry |
| Goats (for dairy and wool) | Sheep (for dairy, meat and wool) |
| Horses | Other stock |

In terms of impacts defined in the Impacts Framework, sub objects are treated the same as their parent object. Also, the object category is used to organise the objects to make the Impacts Framework Excel spreadsheet contents manageable for a user. For the purposes of identifying data items relevant to the Impacts Framework, when considering objects described in the Framework, only the objects, and not the object category or sub-objects from Table 17 are considered. These objects are shown in Table 18 below.

Agricultural Fencing	Flora	Property - Commercial
Agricultural Structures (excludes residence)	Fruit and Vegetable crops	Property - Industrial
Agricultural equipment	Gas	Property - Public (i.e. Government)
Air	Grape vines (i.e. for viticulture)	Property - Residential
Apicultural products	Horticultural equipment	Railways
Aquacultural products	Livestock	Residential Fencing
Bridges	Lookouts	Road signage
Buses	Memorabilia	Roads
Cars	Mining products	Roofed accommodation (inc. huts and staff accom.)
Cultural Heritage	Natural Resources equipment	Soil
Electricity	Offices	Telecommunications
Facilities	Other structures	Timber
Fauna	Other vehicle types	Trade
Feed	Park signage	Trucks
Fencing	People and Community	Walking trails
Field Crops	Plants for the cut flower industry	Water
Fire Towers	Plants for the nursery industry	Waterways

Table 18: Impacts Framework Objects

The objects in Table 18 can be placed in context in terms of the Impacts Framework object hierarchy by cross referencing to the corresponding entry in Table 17. For example, the object *Timber* in Table 18 is listed under the object category *Natural Resources and Equipment* in Table 17 and has the following sub objects:

Private hardwood plantations on private land	Government owned softwood plantations
Private softwood plantations on private land	Government owned hardwood plantations
Private softwood plantations on leased crown land	State forest available for harvest

Note there are 51 objects listed in Table 18 while there are 53 objects defined in the Framework. This is because two objects, *Bridges* and *Roads*, are included in two object categories as mentioned above.

D.4 Harm

The initial impact on an object, categorised as destroyed, damaged or not harmed for inanimate objects, and fatality, major injury, minor injury and not harmed for people and fauna. For ease of accessing data it is recommended hospital admissions relating to

the event be used as a surrogate for major injuries whilst those treated but not admitted to hospital be used as a surrogate for minor injuries.

The categorisation of harm depending on the kind of object impacted, inanimate or animate, is shown in Table 19. The determination of whether an object is animate or not is defined at the object category level, see Table 16, and there is only one animate category: People and Community. This means that livestock, horticultural products (for example fruit and vegetable crops, grapes vines and so on), flora and fauna are all categorised as inanimate by the Impacts Framework. This is because the harm to these objects due to an impact is measured by the descriptions under the inanimate category.

Inanimate	Animate
destroyed	fatality
damaged	major injury
major damage	minor injury
minor damage	not harmed
not harmed	

Table 19: Harm Categories.

D.5 Impacts

Is the broadest term and includes both market-based (i.e. tangible) and non-market (i.e. intangible) effects. Individual impacts can be either negative or positive.

Impacts are further described as being a direct impact or an indirect one, as defined below. The impacts element forms the bulk of the Impacts Framework. There are a total of 2,839 direct impacts and 29,972 indirect impacts defined in the Microsoft Excel spreadsheet [3].

D.5.1 Direct Impacts

Impacts that result from direct contact with the event.

An impact has three aspects to it: an *event* (more specifically, the *event characteristic*) affects an *object* resulting in *harm*. It is the combination of these elements that produces the large number of impacts. Note the total number of impacts is potentially:

$$32 \text{ event characteristics} * 51 \text{ objects} * \text{a maximum of } 5 \text{ harm categories} = 8,160$$

The actual figure of 2,839 is due to the fact that not all event characteristics interact with all *objects* under all *harm* categories. Note that the object count of 51 is used above, from Table 18, since the sub-objects are impacted in the same way as the

common ‘parent’ object. For example, agricultural fencing is impacted in the same way (damaged, destroyed or not harmed) regardless if it is boundary fencing, crown boundary fencing or internal fencing.

The Impacts Framework defines an impact in two parts:

1. Description
A short description of the impact.
2. Measure
How to measure the impact.

For example, flame from a bushfire can destroy agricultural fencing (an object within the category of *Infrastructure- private* which includes the sub objects of *Boundary Fencing, Crown Boundary Fencing* and *Internal Fencing*). This is defined as an impact in the Framework as:

1. Description: Destruction of Agricultural Fencing
2. Measure: km's of fencing destroyed

The different aspects of the bushfire’s event characteristics (*flame, heat, and smoke*) and the different harm categories (*destroyed, damaged, major damage, minor damage, and not harmed*) are each similarly described where applicable in the Impacts Framework for Agricultural Fencing as shown in Table 20 below.

Characteristic	Harm	Description	Measure
Flame	Destroyed	Destruction of Agricultural Fencing	km's of fencing destroyed
Flame	Damaged	Damage to Agricultural Fencing	km's of fencing damaged
Flame	Not Harmed	No harm to Agricultural Fencing	km's of fencing in impact zone unharmed
Heat	Damaged	Damage to Agricultural Fencing	km's of fencing damaged
Heat	Not Harmed	No harm to Agricultural Fencing	km's of fencing in impact zone unharmed

Table 20: Example Impacts for Agricultural Fencing due to a Bushfire event.

This example highlights the following about the impacts:

- Not all *bushfire* Event Characteristics are present. In this example, *smoke* is missing.

- Not all Harm categories are present. Those missing are deemed not applicable by the Framework. For example:
 - Heat from a bushfire event does not destroy fencing.
 - There is no distinction between *damaged*, *major damage*, and *minor damage*.
- When there is a Harm category for an object, *Not Harmed* is included as a defined impact.
- The definition of the impact, the description and the measure, are similar and mostly have the following pattern:
 - Description: <harm> of <object>
 - Measure: <metric> of <object> <harm>

The <metric> is how the impact is measured.

The Framework spreadsheet colours the impacts, the description and measure pair, to indicate the type of impact corresponding to economic, social, or environmental impacts. When an impact has no colour, that is, it is left white, then it cannot be measured. This is usually the case when the impact has a follow on indirect impact which can be categorised.

The above example demonstrates that there is a lot of redundancy in the definition of the impacts. This leads to the large number of impacts defined in the Framework which is necessary and useful when exploring the Framework for a specific combination of event, harm and object. However, the redundant information can be filtered to derive the common features of an impact to an object regardless of the harm or the event characteristic that caused it. This common information is the metric used to measure the impact and the type of the impact, one of economic, social, environmental or undefined.

Using the example above, the common information is the metric of “km’s” to measure the amount of fencing impacted, regardless of whether it is destroyed, damaged or not harmed and also regardless if the impact is due to a bushfire, flood, earthquake and so on. Although not noted above, the Framework categorises this example impact as being economic.

The different metrics used by the framework are shown in Table 21. The occurrences column shows the number of times that metric is used as a direct impact.

Metric	Occurrences	Metric	Occurrences
no.	1781	ha's / tonnes	76
km's	601	tonnes	45
ha's	131	ha or m ³	28
ha's / no.	103	level	4

Table 21: Metrics used by the Impacts Framework.

The first seven metrics are self explanatory while the last is not; 'level' is used as follows:

level of particulate matter in the air (PM10)

The above measure is used four times for *smoke* (the Event Characteristic) from a *bushfire* or *fire emergency* (the Event) when the *air* (the Object) is *destroyed* or *damaged* (the Harm).

The result of reducing the direct impacts to discover the various ways in which they are measured along with their type is shown in Table 22. There are 61 different impact definitions found using this method. Note the harm categories are not distinguished and neither are the event characteristics. The event corresponding to the event characteristics are noted in the Event Code column of Table 22 with the code corresponding to the Event. For example, 'B' is bushfire, 'C' is cyclone and so on, with 'T' for tornado and 'Ts' for Tsunami. There are seven cases where the impact type is unknown, left blank in Table 22, and there are no social direct impacts defined.

This method of reducing the information described by the impacts is focused on the objects and includes the object category. For example *Agricultural Fencing (Infrastructure - Private)*. Note there are 53 objects but 61 entries in Table 22. This is because there are eight cases where the Impacts Framework uses different metrics. These can be seen by the repeated object names. For example, *Waterways (Natural Environment and Ecosystem Services)*, can be measured in *no.* or *tonnes* due to the different impacts that occur. The waterway may be damaged or destroyed by soil (measured in tonnes) moving into the waterway as a result of a landslide or bushfire, whereas for a flood, a count of the number of waterways affected is measured.

Table 22 is used to determine the metric used by the Impacts Framework to measure an impact resulting from an event interacting with an object under all harm possibilities. For example, agricultural equipment is counted (the *no.* metric) whereas roads, fencing, walking trials, electricity infrastructure and so on are measured by the kilometre (the *km's* metric).

Metric	Object (Object Category)	Type	Event Code
km's	Agricultural Fencing (Infrastructure - Private)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Agricultural Structures (excludes residence) (Infrastructure - Private)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Agricultural equipment (Agricultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
level	Air (Natural Environment and Ecosystem Services)	environmental	B,FE
no.	Apicultural products (Agricultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Aquacultural products (Natural Resources and Equipment)	economic	C,E,MS,S
no.	Bridges (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Bridges (Infrastructure - Public (excl. parks and reserves))	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Buses (Vehicles)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Cars (Vehicles)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Cultural Heritage (Cultural Heritage)		B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Electricity (Infrastructure - Public (excl. parks and reserves))	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Facilities (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Fauna (Natural Environment and Ecosystem Services)	environmental	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Feed (Agricultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Fencing (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's	Field Crops (Agricultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Field Crops (Agricultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Fire Towers (Infrastructure - Parks and Reserves)	economic	B,C,E,FE,L,MS,S,T
ha's	Flora (Natural Environment and Ecosystem Services)	environmental	F,SS,Ts
ha's / no.	Flora (Natural Environment and Ecosystem Services)	environmental	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's	Fruit and Vegetable crops (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's / tonnes	Fruit and Vegetable crops (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Gas (Infrastructure - Public (excl. parks and reserves))	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's	Grape vines (i.e. for viticulture) (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's / tonnes	Grape vines (i.e. for viticulture) (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Horticultural equipment (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Livestock (Agricultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Lookouts (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Memorabilia (Memorabilia)		B,C,E,F,FE,L,MS,S,SS,T,Ts
tonnes	Mining products (Natural Resources and Equipment)	economic	B,E,FE,MS,T

no.	Natural Resources equipment (Natural Resources and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Offices (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Other structures (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Other vehicle types (Vehicles)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Park signage (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	People and Community (People and Community)		B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's	Plants for the cut flower industry (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's / no.	Plants for the cut flower industry (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's	Plants for the nursery industry (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's / no.	Plants for the nursery industry (Horticultural Products and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Property - Commercial (Property - Commercial)		B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Property - Industrial (Property - Industrial)		B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Property - Public (i.e. Government) (Property - Public (i.e. Government))		B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Property - Residential (Property - Residential)		B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Railways (Infrastructure - Public (excl. parks and reserves))	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Residential Fencing (Infrastructure - Private)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Road signage (Infrastructure - Public (excl. parks and reserves))	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Roads (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Roads (Infrastructure - Public (excl. parks and reserves))	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Roofed accommodation (inc. huts and staff accom.) (Infrastructure – P&R)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
tonnes	Soil (Natural Environment and Ecosystem Services)	environmental	B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Telecommunications (Infrastructure - Public (excl. parks and reserves))	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha or m3	Timber (Natural Resources and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
ha's	Timber (Natural Resources and Equipment)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Trade (Trade)		B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Trucks (Vehicles)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Walking trails (Infrastructure - Parks and Reserves)	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
km's	Water (Infrastructure - Public (excl. parks and reserves))	economic	B,C,E,F,FE,L,MS,S,SS,T,Ts
no.	Waterways (Natural Environment and Ecosystem Services)	environmental	F,SS,Ts
tonnes	Waterways (Natural Environment and Ecosystem Services)	environmental	B,FE,L,MS

Table 22: Measuring direct impacts.

D.5.2 Indirect Impacts

Impacts that arise as a consequence of the impacts of the event. For example, disruption to the flow of goods and services in and out of the affected area.

An indirect impact is an impact that results as the consequence of an impact that has already occurred. As noted above, there are a total of 29,972 indirect impacts defined in the Microsoft Excel spreadsheet. A direct impact is caused by an event whereas an indirect impact occurs due to a previous impact.

The Impacts Framework allows for a total of up to five indirect impacts resulting as a consequence of a previous impact. As with direct impacts, there is a lot of redundancy in the recording of the indirect impacts in the Microsoft Excel spreadsheet. Of the total 29,972 indirect impacts there are only 509 distinct (unique) ones with the different impact types shown in Table 23. Note there are two totals presented for the various impact types (*economic, social, environmental, and not recorded*): the first is for the unique impacts (the description and the measure as described above) while the second is for all impacts. This shows that while there are a lot of indirect impacts defined in the Impacts Framework, this number is reduced when considering only the different kinds of impacts described. The totals for each column are shown as a cross check that all indirect impacts have been accounted for.

Impact Type	Count (unique)	Count (total)
Economic	332	21,214
Social	30	4,295
Environmental	27	314
<i>not recorded</i>	120	4,149
total	509	29,972

Table 23: Indirect Impact Types.

For example, the flame from a bushfire can destroy agricultural fencing in the object category of *Infrastructure –Private*. There are 16 other ways that this kind of fencing can be destroyed as shown in Table 24.

Event	Characteristic	Event	Characteristic
bushfire	flame	meteorite strike	impact with the earth
cyclone	wind	storm	lightning
earthquake	ground collapse	storm	wind
earthquake	ground tremors	storm surge	flowing water
fire emergency	flame	storm surge	inundation
flood	flowing water	tornado	wind
flood	inundation	tsunami	flowing water
landslide	movement of soil, rock or debris down a slope	tsunami	inundation

Table 24: Events that can destroy agricultural fencing (a direct impact).

The consequential indirect impacts that result from the destruction of agricultural fencing as recorded by the Impacts Framework are shown in Table 25. Note that this table was obtained using the Framework Explorer⁷, setting the following values for the Impacts Framework elements, and downloading the result:

Event	bushfire
Event Characteristic	flame
Object Category	Infrastructure - Private
Object	Agricultural Fencing
Harm	destroyed

Table 25 is interpreted from left to right, then top to bottom with the economic impacts shown in yellow, the social impacts in peach and no colour when not defined. The direct impact is shown in the first column and there are three level 1 indirect impacts that follow: the stock can escape, other animals can move in, and the fence needs to be replaced. The first two indirect impacts each have two subsequent follow on impacts (level 2) which are alternative scenarios of what can occur when the fence is no longer present: the animals within the fencing are 'lost' (killed or escape) or they remain. The remaining impacts (levels 3-5) are the same regardless of why the animals are lost.

⁷ Refer to the prototype: <http://ict-www-cdc.csiro.au:8080/portal/frameworkExplorer.jsf>

Direct Impact	Indirect Impact Level 1	Indirect Impact Level 2	Indirect Impact Level 3	Indirect Impact Level 4	Indirect Impact Level 5
Destruction of Agricultural Fencing (km's of fencing destroyed)	Stock able to move away from property (no. of stock escaped from property)	A proportion of stock do not return (e.g. due to death or being lost) (no. of stock that did not return)	Reduction in profits due to lost revenue from stock (loss in revenue)	Further loss in revenue, as more stock is purchased (cost to purchase stock)	Increase in revenue for person / company selling stock (revenue from selling stock)
					Increased stress placed on farmer purchasing stock (no. of days farmer is not working / cost of professional counselling)
		All stock return to property			
	Feral animals able to move onto property (no. of feral animals sighted on property)	A proportion of stock killed or injured by feral animals (no. of stock killed by feral animals)	Reduction in profits due to lost revenue from stock (loss in revenue)	Further loss in revenue, as more stock is purchased (cost to purchase stock)	Increase in revenue for person / company selling stock (revenue from selling stock)
					Increased stress placed on farmer purchasing stock (no. of days farmer is not working / cost of professional counselling)
		All livestock unharmed by feral animals			
	Replace fencing (cost of replacing fencing)				

Table 25: Indirect Impacts as a result of the Destruction of agricultural fencing.

The indirect impacts have a similar structure as the direct ones. They consist of a description and a measure (in brackets in Table 25). The description for the indirect impacts does not follow the regular pattern as was found for the direct impacts, while the measure has some structure to it.

Table 26 shows the first two words used in the Impacts Framework for the measure of the indirect impacts along with the count of the number times they are used in descending order of these counts. There are 45 different ways the measure begins.

Note that the second most frequent measure in Table 26 is empty – there is no measure recorded. Some of these measures don’t make much sense; for example *diameter and*. Also, the same measure is sometimes expressed slightly differently, for example *cost of, cost to, costs to, costs of, Cost of*.

Metric	Count	Metric	Count	Metric	Count
no. of	9669	revenue from	136	costs of	36
	6839	total costs	120	no. businesses	36
amount of	3281	total medical	96	ha's now	36
cost of	2644	revenue for	88	length of	36
amount paid	1838	clean up	80	no. people	36
loss in	1154	type of	74	amount selling	36
amount insurance	990	total insurance	72	no. /	33
increase in	568	increased cost	72	tonnes of	26
cost to	411	% of	72	ha's of	20
set up	222	ha's damaged	70	amount waterway	12
amount revenue	218	costs to	59	Cost of	12
total additional	204	total loss	48	level of	8
amount income	198	total cost	48	ha of	6
medical costs	144	additional loss	36	diameter and	4
additional time	142	time commuters	36	new course	2

Table 26: Indirect Impact Metrics.

The indirect impacts as defined in the Impacts Framework are useful information that should be considered when conducting impact assessments. The indirect impacts cannot easily be summarised as was done for direct impacts in Table 22. When impacts data items are collected for use in the portal, the indirect impacts as defined in the framework should be consulted for the specific impacts information being gathered.

D.6 Mitigation

Mitigation concerns the prevention and preparedness activities performed in a region to reduce the impact of potential events. From the Impacts Framework [4]:

Prevention and preparedness activities are undertaken before the event, and can include altering the event characteristics (e.g. flood mitigation works), reducing the harm or impacts (e.g. compatible building code), and altering the object to make it less susceptible to harm or to increase its capacity to recover (e.g. community resilience).

The Impacts Framework as depicted in Figure 1 is mostly concerned with the impacts associated with natural disaster and fire emergency events. The PPRR (prevention, preparedness, response and recovery) aspects are assumed to be part of existing emergency management practices.

D.7 Recovery

Recovery concerns the response and recovery activities performed in a region as result of an event. From the Impacts Framework [4]:

Response and recovery are activated when an event is imminent or as it occurs, and can be directed at reducing the impacts, either immediate or longer-term, and so focus on the affected object, generally on infrastructure, people and communities, their livelihoods and ecosystems.

APPENDIX E: IMPACTS FRAMEWORK DATABASE SCHEMA

The Impacts Framework diagram, see Figure 1, was used to define a data model corresponding to the impacts information contained in the Impacts Framework Microsoft Excel spreadsheet. This data model was the basis for a database schema to store the content of the spreadsheet for use in the portal. This database schema is shown in Figure 2.

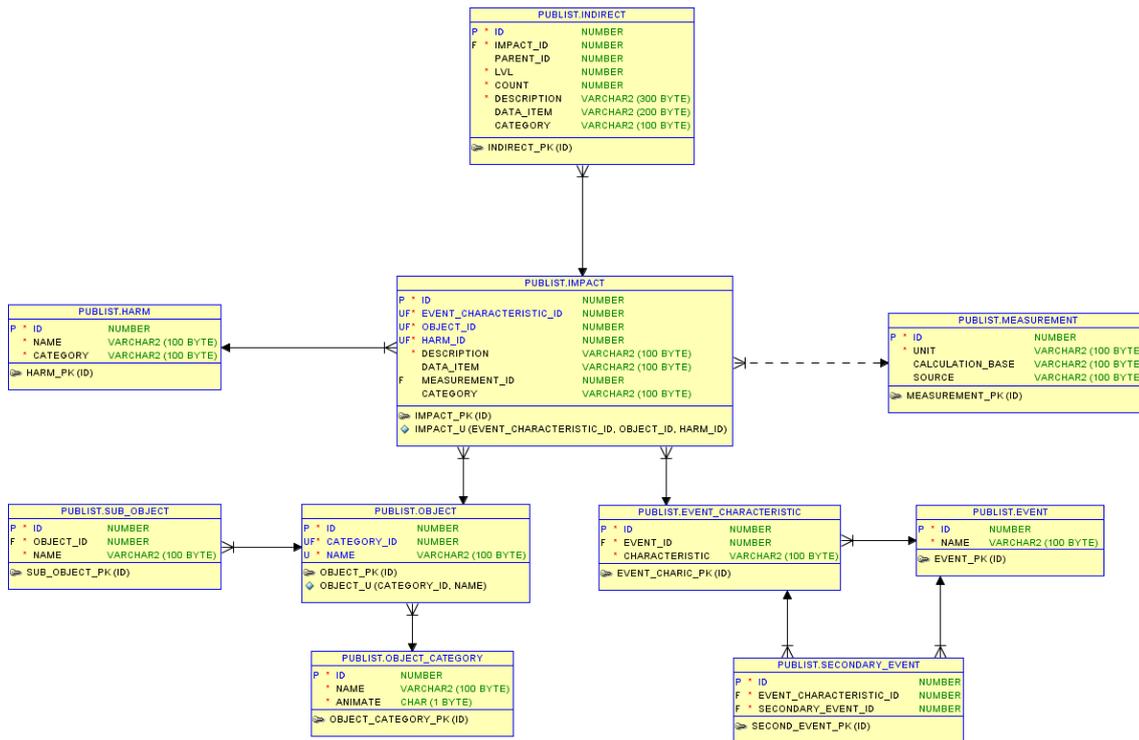


Figure 2: Impacts Framework Database Schema

The above schema was derived from the Impacts Framework diagram, the content of the MS Excel spreadsheet [3] and the supporting documentation [4]. The database schema, the Impacts Framework diagram and the Excel spreadsheet all represent the same information, but do so in different ways:

- The Impacts Framework diagram follows a top down approach to describe how to arrive at an impact starting from an event, a particular event characteristic, interacting with an object, causing harm giving an impact.
- The spreadsheet has a lot more detail and presents it as large table (worksheet) for each event. Each worksheet includes the result of the event characteristics interacting with a predefined list (or category) of 16 data objects, where the interaction is classified in terms of the harm that is caused. The harm that is caused is the impact. There can be many impacts that result and for each there are flow on impacts termed indirect ones (up to a maximum of five).

- The database schema is a normalisation of the single worksheet. The central feature of the model is the *impact*. As similarly described above, an impact occurs when three things happen: an event (more specifically, the *event characteristic*) meets an *object* causing *harm*. An object belongs to one of the 16 predefined categories (commercial property, memorabilia, vehicles and so on) and objects are often further divided into sub-objects (for example facilities includes BBQs, shower blocks, shelters, tables/seats, toilets). *Measurement* refers to how the impacts are measured (see appendix 2 of the Impacts Framework report [4]) with *indirect* impacts associated with their causing *impact*.

The diagram of Figure 2 shows the tables (as boxes, table name in the first section), columns (middle section of the boxes) and constraints in the lower section. The constraints are primary keys (column names with a 'P' prefix), unique columns (column names with a 'U' prefix), and foreign key relationships (column name with a 'F' prefix). The column names with a red '*' before them are mandatory: empty (null) values are not allowed. The lines between boxes (tables) show the foreign key relationships. The solid lines are mandatory (for example, an *object* must belong to an 'object_category') while the dashed lines are optional (an *impact* may have a *measurement*).

APPENDIX F: NATIONAL WORKSHOP PARTICIPANTS

The participants invited to the National Workshop, the agencies they represent and whether or not they attended is shown in Table 27. These attendees were identified by FRNSW as being some of the stakeholders for the project.

First Name	Last Name	Agency	Attended
Darren	Bretherton	AGD	No
Katherine	Buchanan	AGD	Yes
Angela	Lilford	AGD	Yes
Natalie	Dean	AGD	Yes
Melissa	London	AGD	Yes
Faruk	Yay	AGD	Yes
Michael	Reedy	AGD	Yes
Neil	Thomas	AGD	No
Cath	Brinkley	AGD	Yes
Ged	Mueller	AGD	Yes
Mark	Dawson	SAFECOM	Yes
Jason	Collins	MPES NSW	Yes
Linda	Anderson Berry	BOM	No
Mark	Edwards	GA	Yes
Krishna	Nadimpalli	GA	Yes
Michael	Cole	DAFF	No
Kate	Mannion	DAFF	Yes
Teresa	Lo Pilato	DAFF	Yes
Selena	Stanley	QLD FRS	Yes
Lyndsey	Wright	Bushfire CRC	Yes
Helena	Clayton	ANU	Yes
Michelene	Bruce	ABS	Yes
Robyn	Kingham-Edwards	AIHW	Yes
Peter	McKechnie	RFS	Yes
John	Koole	RFS	Yes
Glen	Benson	RFS	Yes
Felipe	Dimer	Macquarie University	Yes
Paul	Somerville	Macquarie University	No
Neil	Lazarow	DCCEE	Yes
Michelle	Bouvet	NSW SES	Yes
Mark	Cameron	CSIRO	Yes
Ron	Jones	CSIRO	Yes
Steve	Giugni	CSIRO	Yes
Robert	Power	CSIRO	Yes
Bella	Robinson	CSIRO	Yes
Grant	Griffiths	CSIRO	Yes
Fatima	Abbas	FRNSW	No
Darryl	Dunbar	FR NSW	No
Melanie	Stutchbury	FR NSW	Yes
Nick	Nicolopoulos	FR NSW	Yes

Table 27: Workshop Participants

APPENDIX G: DATA ITEMS METADATA

The summary in Section 5 provides an overview of the data items obtained for use in the portal. This description should be suitable for most portal users however a more detailed description of the data may be required. While the definitive reference to the description of all data items rests with the custodian, a metadata description is included below.

Metadata provides a description of other data. The description allows the data to be understood by those not familiar with it and may include information about how the data was created, for what purpose, who is expected to use it and the plan for maintaining the data over time.

Metadata is typically a high level description of the data. A more detailed description of data content is usually termed a data dictionary. This provides comprehensive information about the content of the data. It describes the meaning of the data (the semantics), the relationships to other data, its structure and format (the use of data types to represent data content).

The data items in the portal are managed in Oracle, a Relational Database Management System (RDBMS), also referred to simply as a database. This is a complex suite of software applications that collectively control the organisation, storage, and retrieval of data. A DBMS achieves this by supporting a data model, a query language, and a transaction processing mechanism.

A Geospatial Database is a database designed to store, query, and manipulate geographic information and spatial data. The spatial data is treated in the same way as any other kind of data in the database. Vector data types such as points, lines, and polygons can be used alongside traditional data types, for example character strings and numbers. A Geospatial Database includes functions to manipulate spatial data. For example, find the nearest petrol station to a given location. Oracle includes a spatial extension which is used by the portal to manage and query geospatial data.

A data model is the set of data structures used to represent the data and the rules defining relationships between these structures. The data model supports some aspects of the data dictionary: the structure, format and relationships. A specific implementation of a data model in a database is referred to as a schema.

Some of the data items available in the portal include information that makes use of custodian specific terminology and encodings. For example, the ABS LGA boundary data includes nine "state codes" ranging in values of 1 to 9 inclusive. These codes are defined as shown in Table 28. In most cases, such codes will not be displayed in the portal; the meaningful values they represent will be used instead. For this reason, in the discussion that follows, only the codes visible to a user of the portal are defined. If a user obtains the source data from the custodian for their own purposes, then they will also need to obtain the metadata descriptions in order to understand how to use it. It is not the role of the portal to duplicate this level of detail.

State code	State
1	New South Wales
2	Victoria
3	Queensland
4	South Australia
5	Western Australia
6	Tasmania
7	Northern Territory
8	Australian Capital Territory
9	Other Territories

Table 28: ABS State codes

The following metadata descriptions for the data items available in the portal are defined by including a general description of the data item (obtained from the custodian), URL links to further details of the metadata from the custodian, an overview of how the data was loaded into the portal and a depiction of the Oracle schema with explanatory notes.

G.1 ABS Boundaries

G.1.1 Description

The ABS boundaries are used in the portal to define regions of interest. These regions are a hierarchical collection of interrelated areas determined by the ABS for collating information about Australia. These regions change over time. For example, the census data published by the ABS for the years 2006 and 2011 reference different regions. For the 2006 census, the Australian Standard Geographical Classification (ASGC) was used. Note the ASGC regions are refined periodically as the ABS releases data updates. These revisions are referred to as “intercensal”.

On July 1 2011 the ABS defined a new method for defining the reporting regions: the Australian Statistical Geography Standard (ASGS). All new data published by the ABS references the ASGS.

The demographic information currently published by the ABS is based on the 2006 census and so the portal used the ASGC boundaries. When the 2011 census data is published, expected in June 2012, the demographic data will reference the ASGS boundaries.

The boundaries used in the portal are as follows:

- LGA
Local Government Area
- SLA
Statistical Local Area

- CCD
Census Collection District. Also referred to as a Collection District (CD).

These regions form a non overlapping hierarchy of regions. For example, one or more CCDs are grouped to form a single SLA and one or more SLAs are grouped to form a single LGA. The CCD is the smallest region for which statistics are reported by the ABS.

The ABS demographics data is updated each year as an estimate. The portal uses two sources of population data, the 2006 CCD and the 2010 estimates for SLA and LGA. For this reason, the portal uses the following boundary data items:

- LGA 2010
- SLA 2010
- CCD 2006

G.1.2 Custodian Metadata Reference

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1216.0Main+Features1July%202011?OpenDocument>

G.1.3 Data Overview

The ASGC 2010 LGA, ASGC 2010 SLA and ASGC 2006 CCD boundaries are released in MIF/MID and Shapefile formats. MIF/MID files are converted into Shapefiles using the GDAL ogr2ogr tool. Shapefiles are loaded using the Oracle shp2sdo tool.

G.1.4 Database Schema

The table structures are shown in Figure 3. These tables contain geographic data in the "GOEM" column which is of type "SDO_GEOMETRY". This is the Oracle specific data type used to store all vector based geographic data.

Further information about these tables is listed below.

Table name	Row count	Primary key
CD06AAUST	38 704	CD_CODE_20
SLA10AAUST	1 389	SLA_5DIGIT
LGA10AAUST	565	LGA_CODE10

The primary keys for these tables are the unique reference for the regions and are used in the portal to define the different ABS reporting region. For example, when

viewing the SLA regions for the portal, the suburb of Flynn in Canberra corresponds to the SLA number 82709. This number uniquely identifies this SLA region. The primary keys are highlighted in Figure 3 by the use of blue font for the column name and a 'P' on its left. In Oracle, primary keys are supported by indexes and these are noted below the column definitions. Note that the red "*" indicates

LGA10AAUST	
STATE_CODE	VARCHAR2 (1)
P * LGA_CODE10	VARCHAR2 (5)
LGA_NAME10	VARCHAR2 (50)
GEOM	SDO_GEOMETRY
LGA10AAUST__IDX (LGA_CODE10)	

SLA10AAUST	
STATE_CODE	VARCHAR2 (1)
SLA_CODE10	VARCHAR2 (9)
SLA_NAME10	VARCHAR2 (50)
P * SLA_5DIGIT	VARCHAR2 (5)
SLA_REG10	VARCHAR2 (9)
GEOM	SDO_GEOMETRY
SLA10AAUST__IDX (SLA_5DIGIT)	

CD06AAUST	
STATE_CODE	VARCHAR2 (8)
P * CD_CODE_20	VARCHAR2 (8)
SLA_MAINCO	VARCHAR2 (10)
SLA_NAME_2	VARCHAR2 (50)
LGA_CODE_2	VARCHAR2 (10)
LGA_NAME_2	VARCHAR2 (50)
GEOM	SDO_GEOMETRY
CD06AAUST__IDX (CD_CODE_20)	

Figure 3: ABS ASGC Tables

G.2 ABS Populations 2010

G.2.1 Description

This data item contains estimates of the resident SLA and LGA populations at 30 June 2005 and 30 June 2010, by age and sex.

G.2.2 Custodian Metadata Reference

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3235.0Main+Features12010?OpenDocument>

G.2.3 Data Overview

The data is available as a collection of Microsoft Excel spreadsheet files: file extension XLS. There is one file per state and each file has a different worksheet for details of males, females and all persons. A Perl script was used to translate the XLS file into CSV format. This was then loaded into Oracle using their data loader tool sqlldr.

G.2.4 Database Schema

The table structures are shown in Figure 4. These tables contain individual fields for each of the five year age brackets 0-4, 5-9, and so on up to the last bracket of those aged over 85 (“p85_plus”). There is also a summarising total (“pTotal”) and various columns for the ABS boundary regions. The portal makes use of the “SLA_code” and “LGA_code” columns.

Note the “SLA_code” is the primary key and that the structure of each table is exactly the same: the table names distinguish the different content for each.

pop_2010_females		pop_2010_males		pop_2010_persons	
* state_code	INTEGER	* state_code	INTEGER	* state_code	INTEGER
* state_name	VARCHAR2 (50)	* state_name	VARCHAR2 (50)	* state_name	VARCHAR2 (50)
* SD_code	INTEGER	* SD_code	INTEGER	* SD_code	INTEGER
* SD_name	VARCHAR2 (50)	* SD_name	VARCHAR2 (50)	* SD_name	VARCHAR2 (50)
* SSD_code	INTEGER	* SSD_code	INTEGER	* SSD_code	INTEGER
* SSD_name	VARCHAR2 (50)	* SSD_name	VARCHAR2 (50)	* SSD_name	VARCHAR2 (50)
* LGA_code	INTEGER	* LGA_code	INTEGER	* LGA_code	INTEGER
* LGA_name	VARCHAR2 (50)	* LGA_name	VARCHAR2 (50)	* LGA_name	VARCHAR2 (50)
P * SLA_code	INTEGER	P * SLA_code	INTEGER	P * SLA_code	INTEGER
* SLA_name	VARCHAR2 (50)	* SLA_name	VARCHAR2 (50)	* SLA_name	VARCHAR2 (50)
* p0_4	INTEGER	* p0_4	INTEGER	* p0_4	INTEGER
* p5_9	INTEGER	* p5_9	INTEGER	* p5_9	INTEGER
* p10_14	INTEGER	* p10_14	INTEGER	* p10_14	INTEGER
* p15_19	INTEGER	* p15_19	INTEGER	* p15_19	INTEGER
* p20_24	INTEGER	* p20_24	INTEGER	* p20_24	INTEGER
* p25_29	INTEGER	* p25_29	INTEGER	* p25_29	INTEGER
* p30_34	INTEGER	* p30_34	INTEGER	* p30_34	INTEGER
* p35_39	INTEGER	* p35_39	INTEGER	* p35_39	INTEGER
* p40_44	INTEGER	* p40_44	INTEGER	* p40_44	INTEGER
* p45_49	INTEGER	* p45_49	INTEGER	* p45_49	INTEGER
* p50_54	INTEGER	* p50_54	INTEGER	* p50_54	INTEGER
* p55_59	INTEGER	* p55_59	INTEGER	* p55_59	INTEGER
* p60_64	INTEGER	* p60_64	INTEGER	* p60_64	INTEGER
* p65_69	INTEGER	* p65_69	INTEGER	* p65_69	INTEGER
* p70_74	INTEGER	* p70_74	INTEGER	* p70_74	INTEGER
* p75_79	INTEGER	* p75_79	INTEGER	* p75_79	INTEGER
* p80_84	INTEGER	* p80_84	INTEGER	* p80_84	INTEGER
* p85_plus	INTEGER	* p85_plus	INTEGER	* p85_plus	INTEGER
* pTotal	INTEGER	* pTotal	INTEGER	* pTotal	INTEGER
pop_2010_females__IDX (SLA_code)		pop_2010_males__IDX (SLA_code)		pop_2010_persons__IDX (SLA_code)	

Figure 4: ABS 2010 Population Data

There are 1 386 records in each of these population tables whereas there are 1 389 records in the corresponding SLA10AAUST table. The difference is that the population data does not include the external territories. There are three of these: Jervis Bay, Christmas Island and Cocos (Keeling) Islands.

G.3 ABS 2006 Basic Community Profiles Data Packs

G.3.1 Description

The 2006 ABS Census of Population and Housing Community Profile contains information for all of Australia to the Collection District (CD) level.

G.3.2 Custodian Metadata Reference

[http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/BF9BEC7E072FDE1ECA257230001C24D8/\\$File/29010_2006%20%28reissue%29.pdf](http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/BF9BEC7E072FDE1ECA257230001C24D8/$File/29010_2006%20%28reissue%29.pdf)

<http://www.abs.gov.au/websitedbs/d3310114.nsf/4a256353001af3ed4b2562bb00121564/60fabd1bcba7bd2cca25721300127fad!OpenDocument>

G.3.3 Data Overview

The Basic Community Profile (BCP_ASGC_06_R2.1) data was purchased from the ABS through the National Information and Referral Service (NIRS) for \$115. The data was delivered as four CD-ROMs containing a large collection of CSV files: for each of the 13 statistical regions (CCD, SLA, LGA etc) there are 7 270 different cells of information determined by the ABS for the BCP. This information is organised into 45 different categories. The cells are labelled from “B1” up to “B7270” and the categories are labelled from “B01” up to “B45”⁸.

The BCP data is distributed as a collection of CSV files corresponding to the above description of cells and categories; with some caveats. Each CSV file has a region_id column (one of the 13 statistical regions noted above) and is limited to a maximum of 200 “B” cells. When a category has more than 200 “B” cells in it, then there are two CSV files used. These files are then labelled with a suffix “A”, “B” and so on. For example, category B04 has 306 “B” cells of information starting at B257 and going up to B456. The CSV files for category B04 are then B04_A (containing cells B257 – B456) and B04_B (cells B457 – B562). As a result, the 45 categories of data are contained in 63 files.

G.3.4 Database Schema

The original census CSV data is distributed as a large set of state based files, for example CD_NSW_B01.csv: “B” category 1 for the state of NSW at the census district (CD) level. During the load process into the database the various state based files are merged into a single table that covers the whole of Australia. The database table names can then use the following format: <region code>_B01, and so on. So for census districts the tables are CD_B01, CD_B02, and so on up to CD_B44_A, CD_B44_B and CD_B45.

These CSV files are loaded into 819 (13 ABS region * 63 files for the 45 categories) Oracle database tables populated from 7245 input CSV files.

The information describing what the 45 “B” categories and 7270 “B” cells describe can be found in the BCP2006_cell_desc and BCP2006_table_desc tables. For example, the first 10 rows of the BCP2006_table_desc table are shown below. Note the population column refers to the target for the data being collected. For example, “persons” refers to all people, while there are other categories such as people born overseas, employed people over 15 years of age and so on.

⁸ The “B” likely represents “Basic” from the BCP.

Table name	Description	Population
B01	Selected Person Characteristics by Sex (First Release Processing)	Persons
B02	Selected Medians and Averages	
B03	Place of Usual Residence on Census Night by Age	Persons
B04	Age by Sex	Persons
B05	Registered Marital Status by Age by Sex	Persons aged 15 years and over
B06	Social Marital Status by Age by Sex	Persons aged 15 years and over
B07	Indigenous Status by Age by Sex	Persons
B08	Ancestry by Country of Birth of Parents	Responses and persons
B09	Country of Birth of Person by Sex	Persons
B10	Country of Birth of Person by Year of Arrival in Australia	Persons born overseas

The portal currently only makes use of a small subset of the available data to display the population distributions for Collection Districts (CD). This data is contained in the tables: CD_B04_A and CD_B04_B. This information corresponds to the ABS 2010 population estimate described above. The relevant columns used are shown below:

Cell id	Description
B274	Age (years): 0-4 years
B292	Age (years): 5-9 years
B310	Age (years): 10-14 years
B328	Age (years): 15-19 years
B346	Age (years): 20-24 years
B364	Age (years): 25-29 years
B382	Age (years): 30-34 years
B400	Age (years): 35-39 years
B418	Age (years): 40-44 years
B436	Age (years): 45-49 years
B454	Age (years): 50-54 years
B472	Age (years): 55-59 years
B490	Age (years): 60-64 years
B508	Age (years): 65-69 years
B526	Age (years): 70-74 years
B544	Age (years): 75-79 years
B547	Age (years): 80-84 years
B550	Age (years): 85-89 years

Cell id	Description
B553	Age (years): 90-94 years
B556	Age (years): 95-99 years
B559	Age (years): 100 years and over

There is also an Excel metadata file describing the region label, size and location information for the various ABS regions used in the BCP. This information can be found in the Census2006_geog_desc table.

The table structure for the 2006 census district population data used by the portal is shown in Figure 5. Note that this is a logical view of the information used: all 819 tables are present in the database as described above, and a query is made on the CD_B04_A and CD_B04_B tables to retrieve the required data.

cd_pop_2006_persons	
P * REGION_ID	VARCHAR2 (32)
B292	NUMBER
B310	NUMBER
B328	NUMBER
B346	NUMBER
B364	NUMBER
B382	NUMBER
B400	NUMBER
B418	NUMBER
B436	NUMBER
B454	NUMBER
B472	NUMBER
B490	NUMBER
B508	NUMBER
B526	NUMBER
B544	NUMBER
B547	NUMBER
B550	NUMBER
B553	NUMBER
B556	NUMBER
B559	NUMBER

cd_pop_2006_persons__IDX (REGION_ID)

Figure 5: ABS 2006 Basic Community Profile Population Data

G.4 AGD Disasters Database

G.4.1 Description

The Attorney-General's Department Disaster's Database contains records of all natural and non-natural disasters within Australia, and outside Australia where a number of Australians have been affected, dating from 1622 to the present day. The content of the database is currently being revised by the AGD and during the course of the project there has been a decline in the number of disasters described.

G.4.2 Custodian Metadata Reference

<http://www.disasters.ema.gov.au/Default.aspx>

G.4.3 Data Overview

The content of the disasters database is available from a web interface⁹ that allows a user to select a disaster category, perform a search, and then save the results by clicking the “Export to Excel” button. This produces an XLS file describing the disaster events. There are nine disaster event type relevant to the portal: bushfire, cyclone, earthquake, flood, landslide, storm, tornado, tsunami and urban fire. To find the details of the impacts associated with the events, the same web interface is used, but “Reports” are chosen instead.

The downloaded data was processed using the xls2csv tool which converts the Microsoft Excel format data into a CSV file. Unfortunately there were issues with some of the files: there were UTF8 characters present which caused problems with the xls2csv tool. These problematic characters were manually removed before processing the files.

The disasters are identified within the database by a disaster id. Details about it can be obtained as a web query in the following form:

<http://www.disasters.ema.gov.au/Browse%20Details/DisasterEventDetails.aspx?DisasterEventID=408>

The identifiers for each disaster are used by the portal to directly a user to directly access the event details.

The process of obtaining the XLS data files and loading them into the portal has been performed three times as described below. Each time there are fewer disasters described by the database.

Date Obtained	# Events	# Impacts
26 Oct 2011	790	232
1 Feb 2012	517	180
7 May 2012	244	102

G.4.4 Database Schema

The events and impacts information is loaded into the AGD_Disaster_Events and AGD_Disaster_Impacts tables. The table structures used by the portal are shown in Figure 6.

⁹ <http://www.disasters.ema.gov.au/Browse/Search.aspx>

AGD_Disaster_Events	
* EventTitle	VARCHAR2 (200)
Zone	VARCHAR2 (100)
* Region	VARCHAR2 (400)
* StartDate	DATE
* EndDate	DATE
Dead	NUMBER
Injured	NUMBER
InsuredCost	NUMBER
* link	NUMBER
* disaster	VARCHAR2 (50)

AGD_Disaster_Impacts	
* Title	VARCHAR2 (100)
Region	VARCHAR2 (400)
Zone	VARCHAR2 (100)
Commercial_and_Industry_Cost	NUMBER
Insured_Cost	NUMBER
Loss_Assessment_Cost	NUMBER
People_Affected	NUMBER
People_Evacuated	NUMBER
People_Injured	NUMBER
People_Killed	NUMBER
Total_Cost	NUMBER
Aircraft_Damaged	NUMBER
Aircraft_Destroyed	NUMBER
Boats_Damaged	NUMBER
Boats_Destroyed	NUMBER
Bridges_Damaged	NUMBER
Bridges_Destroyed	NUMBER
Buildings_Damaged	NUMBER
Buildings_Destroyed	NUMBER
Business_Damaged	NUMBER
Business_Destroyed	NUMBER
ComPremises_Damaged	NUMBER
ComPremises_Destroyed	NUMBER
Crops_Damaged	NUMBER
Crops_Destroyed	NUMBER
Farms_Damaged	NUMBER
Farms_Destroyed	NUMBER
Homes_Damaged	NUMBER
Homes_Destroyed	NUMBER
IndPremises_Damaged	NUMBER
IndPremises_Destroyed	NUMBER
Infrastructure_Damaged	NUMBER
Infrastructure_Destroyed	NUMBER
Livestock_Damaged	NUMBER
Livestock_Destroyed	NUMBER
MotorVehicles_Damaged	NUMBER
MotorVehicles_Destroyed	NUMBER
Roads_Damaged	NUMBER
Roads_Destroyed	NUMBER
Ships_Damaged	NUMBER
Ships_Destroyed	NUMBER
Trains_Damaged	NUMBER
Trains_Destroyed	NUMBER

AGD_Disaster_Regions	
* Region	VARCHAR2 (100)
* MinLat	NUMBER
* MaxLat	NUMBER
* MinLon	NUMBER
* MaxLon	NUMBER

AGD_Event_bounds	
* link	NUMBER
* minLat	NUMBER
* minLon	NUMBER
* maxLat	NUMBER
* maxLon	NUMBER
* precision	VARCHAR2 (16)

AGD_Event_locations	
* link	NUMBER
* lat	NUMBER
* lon	NUMBER
* precision	VARCHAR2 (16)

AGD_Event_details	
* link	NUMBER
* details	CLOB

Figure 6: AGD Disasters Database Tables

The Disasters Database only includes a very rough idea of where the event was geographically located. Each event is assigned to one or more map regions¹⁰ defining a grid for Australia. The extents of each of these regions were manually entered into the table AGD_Disaster_Regions. In addition to these disaster regions, the event title sometimes contains a place name providing an indication of where the event was located.

In order to place the events onto the portal map a combination of the region bounds and event title was used. The Yahoo GeoPlanet web service¹¹ is used in an attempt to find a suitable place match. If no matches are found then a central point within the region's bounds is used. The results of this process are stored within the AGD_Event_bounds and AGD_Event_locations tables. The precision field in both tables is used to indicate whether the location or bounds are approximate or not.

The AGD_Event_details table stores the Details section of the individual event reports from the Disasters Database web site. A Java program was written to extract this information from the html page for each event. Refer to the Details section in the

¹⁰ There are 143 regions, see <http://www.disasters.ema.gov.au/Browse/ZoneMap.aspx>.

¹¹ See <http://developer.yahoo.com/geo/geoplanet/>.

following report to see an example of the data stored:

<http://www.disasters.ema.gov.au/Browse%20Details/DisasterEventDetails.aspx?DisasterEventID=408>

G.5 BOM Australian Hydrological Geospatial Fabric

G.5.1 Description

The AHGF is a collection of spatial datasets describing the water features (rivers, lakes, dams, aquifers, diversions and monitoring points) in the Australian landscape. The data is hydrologically correct and is based on the Geoscience Australia GEODATA TOPO 250K dataset. The AHGF includes flow directed water course lines, water bodies, springs, cliffs, canals and identification of contracted nodes. The product is intended to be used for feature identification, visualisation and mapping.

G.5.2 Custodian Metadata Reference

<http://www.bom.gov.au/water/geofabric/documentation.shtml>

G.5.3 Data Overview

The data was obtained from the BOM as a collection of ESRI Shapefiles. There are a number of layers of water available in the AHGF:

- surface hydrography
- surface network
- surface catchments
- groundwater cartography
- hydrology reporting catchments
- hydrology reporting regions

For the portal, the data considered relevant is the rivers and lakes (surface hydrography) and the catchment boundaries (surface catchments).

G.5.4 Database Schema

The structure of the rivers (AHGFMappedStream) and lakes (AHGFWaterbody) tables is shown in Figure 7. These tables include information not used by the portal but which is useful for hydrological studies, for example the flow direction for the stream segments and the connectivity between features. The catchment boundary tables have not been included in Figure 7 since they are not currently used in the portal.

AHGFMAPPEDSTREAM		AHGFWATERBODY	
P *	HydroID	NUMBER	NUMBER
	AHGFFType	NUMBER	NUMBER
	Name	VARCHAR2 (60)	VARCHAR2 (60)
	Hierarchy	VARCHAR2 (254)	VARCHAR2 (254)
	Perennial	VARCHAR2 (254)	VARCHAR2 (254)
	AusHydroID	NUMBER	
	From_Node	NUMBER	
	To_Node	NUMBER	
	NextDownID	NUMBER	
	Enabled	NUMBER	
	FlowDir	NUMBER	
	SrcFCName	VARCHAR2 (25)	
	SrcFType	VARCHAR2 (32)	
	SrcType	NUMBER	
	SourceID	NUMBER	
	FeatRel	NUMBER	
	FSource	VARCHAR2 (25)	
	AttrRel	NUMBER	
	AttrSource	VARCHAR2 (25)	
	PlanAcc	NUMBER	
	Symbol	NUMBER	
	TextNote	VARCHAR2 (50)	
	GeodesLen	NUMBER	
	UpstrGeoLn	NUMBER	
	Shape_Leng	NUMBER	
	GEOM	SDO_GEOMETRY	
AHGFMAPPEDSTREAM__IDX (HydroID)		AHGFWATERBODY__IDX (HydroID)	

Figure 7: AHGF Rivers and Lakes tables

There are nearly 2 million river segments present in the AHGFMappedStream table. This level of detail does not provide a clear picture of the rivers present in a given region. To achieve this, the major perennial rivers are used instead. An example of the difference in the level of detail is shown in Figure 8. Both figures show the same region near the ACT: on the left all river segments are shown; on the right only the major perennial ones are shown.



Figure 8: Sample region of AHGF mapped streams

There are 28 824 river segments classified as being major perennial and 27 920 of these have associated names. There are 821 distinct river names associated with the major perennial rivers and a total of 12 557 distinct names used for all river segments.

There are 120 767 lakes in the AHGFWaterbody table. All lakes are shown in the portal.

G.6 BOM Tropical Cyclones DB

G.6.1 Description

Raw cyclone track data from Jan 1907 – Feb 2011 plus hyperlinks back to the detailed BOM cyclone reports.

G.6.2 Custodian Metadata Reference

<http://www.bom.gov.au/cyclone/history/index.shtml>

http://www.bom.gov.au/cyclone/history/database/TC_Database_Structure_Oct2011.pdf

G.6.3 Data Overview

The raw cyclone track data was downloaded from the BOM's Pacific Tropical Cyclone Data Portal¹² as a CSV file. This file was then loaded into Oracle using the sqldr tool.

The cyclone links were extracted by simply cutting and pasting the table at the bottom of the BOM web page: <http://www.bom.gov.au/cyclone/history/index.shtml>. Some manual editing was required to turn this into a CSV file which was then loaded into Oracle using the sqldr tool.

G.6.4 Database Schema

There are 23 624 records in the cyclone tracks table with 426 records with distinct names. There are 426 records in the cyclone links table.

Only a subset of the cyclone data is used within the portal. The fields retrieved via our cyclone data service are:

- **NAME:**
The name of the cyclone, if it was named, Null if the cyclone was not given a name because there was no naming convention at the time (pre 1964) or "Unnamed" if the cyclone was not named, usually occurs when a system is only recognised as a cyclone after the event.
- **DISTURBANCE_ID:**
The unique cyclone ID.

¹² <http://www.bom.gov.au/cyclone/history/index.shtml>

cyclone_links	
* link	VARCHAR2 (64)
* title	VARCHAR2 (64)
* date_range	VARCHAR2 (48)
* name	VARCHAR2 (32)

cyclone_tracks	
NAME	VARCHAR2 (30)
* DISTURBANCE_ID	VARCHAR2 (12)
* TM	DATE
* TYPE	VARCHAR2 (1)
DATA_SRC	NUMBER (2)
SURFACE_CODE	NUMBER (1)
CYC_TYPE	NUMBER (2)
* LAT	NUMBER (4,2)
* LON	NUMBER (5,2)
POSITION_METHOD	NUMBER (2)
POSITION_UNCERTAINTY	NUMBER (3)
DVORAK_DATA_T_NO	NUMBER (2,1)
DVORAK_MODEL_T_NO	NUMBER (2,1)
DVORAK_PATTERN_T_NO	NUMBER (2,1)
DVORAK_FINAL_T_NO	NUMBER (2,1)
DVORAK_CI_NO	NUMBER (2,1)
CENTRAL_PRES	NUMBER (4)
CENTRAL_PRES_UNCERTAINTY	NUMBER (2)
CENTRAL_PRES_METHOD	NUMBER (2)
PRES_WIND_RELATION_USED	NUMBER (2)
ENV_PRES	NUMBER (4)
ENV_PRES_UNCERTAINTY	NUMBER (2)
MN_RADIUS_OUTER_ISOBAR	NUMBER (4)
MN_RAD_OUT_ISOBAR_UNCERTAINTY	NUMBER (3)
MN_RADIUS_GF_WIND	NUMBER (4)
MN_RADIUS_GF_SECNE	NUMBER (4)
MN_RADIUS_GF_SECSE	NUMBER (4)
MN_RADIUS_GF_SECSW	NUMBER (4)
MN_RADIUS_GF_SECNW	NUMBER (4)
MN_RADIUS_SF_WIND	NUMBER (4)
MN_RADIUS_SF_SECNE	NUMBER (4)
MN_RADIUS_SF_SECSE	NUMBER (4)
MN_RADIUS_SF_SECSW	NUMBER (4)
MN_RADIUS_SF_SECNW	NUMBER (4)
MN_RADIUS_HF_WIND	NUMBER (4)
MN_RADIUS_HF_SECNE	NUMBER (4)
MN_RADIUS_HF_SECSE	NUMBER (4)
MN_RADIUS_HF_SECSW	NUMBER (4)
MN_RADIUS_HF_SECNW	NUMBER (4)
MN_RADIUS_MAX_WIND	NUMBER (4)
MN_RADIUS_MAX_WIND_UNCERTAINTY	NUMBER (2)
MN_RADIUS_GF_WIND_UNCERTAINTY	NUMBER (2)
MN_RADIUS_SF_WIND_UNCERTAINTY	NUMBER (2)
MN_RADIUS_HF_WIND_UNCERTAINTY	NUMBER (2)
MN_RADIUS_MAX_WIND_METHOD	NUMBER (2)
MN_RADIUS_GF_WIND_METHOD	NUMBER (2)
MN_RADIUS_SF_WIND_METHOD	NUMBER (2)
MN_RADIUS_HF_WIND_METHOD	NUMBER (2)
WIND_SPD_PER	NUMBER (2)
MAX_WIND_SPD	NUMBER (4,1)
MAX_WIND_SPD_UNCERTAINTY	NUMBER (3,1)
MAX_WIND_SPD_METHOD	NUMBER (2)
MAX_WIND_GUST_PER	NUMBER (2)
MAX_WIND_GUST	NUMBER (4,1)
MAX_WIND_GUST_METHOD	NUMBER (2)
MN_EYE_RAD	NUMBER (3,1)
MN_EYE_RAD_UNCERTAINTY	NUMBER (2)
MN_EYE_RAD_METHOD	NUMBER (2)
MAX_REP_WIND_SPD	NUMBER (4,1)
MAX_REP_WIND_DIR	NUMBER (3)
MAX_REP_WIND_METHOD	NUMBER (2)
MAX_REP_WIND_LON	NUMBER (5,2)
MAX_REP_WIND_LAT	NUMBER (4,2)
MAX_REP_WAV_HT	NUMBER (3,1)
MAX_REP_WAV_METHOD	NUMBER (1)
MAX_REP_WAV_LON	NUMBER (5,2)
MAX_REP_WAV_LAT	NUMBER (4,2)
MAX_REP_SWL_HT	NUMBER (4,1)
MAX_REP_SWL_DIR	NUMBER (3)
MAX_REP_SWL_PER	NUMBER (2)
MAX_REP_SWL_METHOD	NUMBER (1)
MAX_REP_SWL_LON	NUMBER (5,2)
MAX_REP_SWL_LAT	NUMBER (4,2)
MAX_REP_TIDE_ANOM	NUMBER (3,1)
MAX_REP_TIDE_ANOM_UNCERTAINTY	NUMBER (2,1)
MAX_REP_TIDE_ANOM_METHOD	NUMBER (2)
MAX_REP_TIDE_ANOM_LON	NUMBER (5,2)
MAX_REP_TIDE_ANOM_LAT	NUMBER (4,2)
COMMENTS	VARCHAR2 (240)

Figure 9: BOM Cyclone Tables

- **TM:**
The date/time to which the table entry is related.
- **LAT, LON:**
The latitude and longitude of the cyclone centre. Units are decimal degrees.
- **CENTRAL_PRES:**
This is the central pressure of cyclone. Units are hectopascals.
- **MAX_WIND_SPD:**
This is the estimated maximum mean wind around the cyclone – that is in the vicinity of the centre. Units are metres per second.
- **MAX_WIND_GUST:**
This is the estimated maximum wind gust around the cyclone – that is in the vicinity of the centre based on open terrain estimate. Units are meters per second.

G.7 GA Earthquakes DB

G.7.1 Description

Australian earthquake data from 1897 to 2011. We have only loaded data for earthquakes with magnitude ≥ 4.0 .

G.7.2 Custodian Metadata Reference

<http://www.ga.gov.au/earthquakes/staticPageController.do?page=glossary>

G.7.3 Data Overview

The earthquake data was downloaded from GA's earthquake database search web page¹³ using the search and export facilities. The search criteria used was:

- Earthquake occurred "Within a broad region" > "Australia";
- Magnitude between 4.0 and 9.9;
- Period: 01/01/y1 00:00 to 31/12/y2 23:59
setting y1 and y2 to be start and end years, data was downloaded in 10 year batches;
- depth: between 0 and 1000km;
- include: "All earthquakes".

¹³ <http://www.ga.gov.au/earthquakes/searchQuake.do>

The data returned is then exported using the “Export Data” button, selecting all fields, the “csv” format option and navigating to "Export" > "Download File". The following is a brief description of the earthquake magnitude types referenced in the database:

- **ML (local magnitude)**
A numerical calculation that defines the strength (magnitude) of an earthquake based on seismograms from recording stations within a 600 km radius; also commonly known as Richter magnitude. As initially defined by Charles Richter, ML represented the largest deflection of the needle on a standard seismograph at a distance of 100 km from the epicentre of a shallow earthquake that was recorded in southern California.
- **MS (surface-wave magnitude)**
The magnitude of an earthquake determined from surface waves on a seismogram from a teleseismic earthquake (one located more than 20° [~2000 km] away). Surface waves are seismic waves that travel over the surface of the Earth, as opposed to those that travel through the Earth, such as P-waves and S-waves. MS magnitudes are measured from surface waves that have a period of about 20 seconds.
- **MB (body-wave magnitude)**
The magnitude of an earthquake determined by measuring the maximum amplitude of the primary wave (P-wave) on a seismogram of the event. P-waves are compressional waves that have the highest velocity of all waves generated by earthquakes.
- **MW (moment magnitude)**
The magnitude calculated from an earthquake's total energy (seismic moment). The seismic moment is a function of the amount of slip on a fault, the area of the fault that slips, and the average strength of the rocks that are faulted. Because MW is directly related to the energy released by an earthquake, it is a uniform means of measuring earthquake magnitude and has become the standard measure of earthquake magnitude in modern seismology.
- **MWp**
The moment magnitude calculated on P wave.

G.7.4 Database Schema

The table structure is shown Figure 10. The following columns are used within the portal:

- **Magnitude:**
The magnitude is a way of measuring the size of an earthquake from measurements of shaking made on a seismograph. Magnitude scales are logarithmic, so a magnitude 6.0 earthquake releases about 32 times the energy of a magnitude 5.0, which in turn releases about 1000 times the energy of a magnitude 4.0. The first magnitude scale developed was the Richter or local magnitude scale. Other magnitude scales such as the surface wave, body

wave, and moment magnitude scales determine the size of the earthquake using different methods.

earthquakes	
Magnitude	NUMBER
UTC	DATE
Cnb_Syd_Melb_time	DATE
Latitude	NUMBER
Longitude	NUMBER
Approximate_location	VARCHAR2 (1024)
Solution_finalised	VARCHAR2 (32)
Significant	VARCHAR2 (5)
Magnitude_Type	VARCHAR2 (5)
Solution_last_updated	TIMESTAMP
Tsunamigenic	VARCHAR2 (32)
Source	VARCHAR2 (32)
Depth_km	INTEGER
Mb	NUMBER
Mw	NUMBER
Longitude_unc_km	NUMBER
Phases_used	INTEGER
Gap_Angle	NUMBER
Location_algorithm	VARCHAR2 (32)
ML	NUMBER
Latitude_unc_km	NUMBER
Total_phases	INTEGER
RMS_Residual	NUMBER
Nearest_station	VARCHAR2 (32)
Ms	NUMBER
Time_unc_s	NUMBER
Stations_used	INTEGER
Mwp	NUMBER
Depth_unc_km	NUMBER
Total_stations	INTEGER
EVENT_ID	INTEGER
ORIGIN_ID	INTEGER

Figure 10: The Earthquake table

- **Magnitude_Type:**
One of Mwp, MB, MS, ML. See above for definitions of these.
- **Cnb_Syd_Melb_Time:**
The Canberra/Sydney/Melbourne time at which the fault causing the earthquake began to rupture.
- **Latitude, Longitude:**
The latitude, longitude of where the fault causing the earthquake begins to rupture. This three dimensional location is known as the hypocentre. The two dimensional location of latitude and longitude is known the epicentre. The latitude is the number of degrees north (+) or south (-) of the equator and

varies from 0 at the equator to 90 at the poles. The longitude is the number of degrees east (+) or west (-) of the zero longitude through Greenwich.

- **Approximate_Location:**
The nearest region, city or town and country for the epicentre of a teleseismic (distant) earthquake. The nearest city, town or general locality and state for a local (Australian) earthquake.
- **Depth_km:**
The depth (in kilometres) at which the fault causing the earthquake begins to rupture. This depth is expressed relative to sea-level.

G.8 GA National Exposure Information System (NEXIS)

G.8.1 Description

The National Exposure Information System (NEXIS) contains detailed residential, commercial and industrial information about people, buildings and their replacement cost for every SLA (ABS 2010 boundaries) in Australia.

G.8.2 Custodian Metadata Reference

https://www.ga.gov.au/products/servlet/controller?event=GEOCAT_DETAILS&catno=73071

G.8.3 Data Overview

The original data was obtained via email as a collection of XLS files, one for each state or territory in Australia. As of February 2012 the data is available online. The data is available for SLA or LGA boundaries: the portal uses the SLA boundaries and aggregates these when LGA information is required.

The data was loaded into Oracle by first converting into CSV files using the xls2csv tools and then using the Oracle sqlldr tool.

G.8.4 Database Schema

Figure 11 shows the structure of the NEXIS tables when loaded into Oracle. There are 1088 records in the commercial table, 676 industrial and 1321 residential. Each of the tables is described below.

Residential

- SLA Code and Name as provided by the ABS Census 2008
- Total population
- Total number of residences (A structure in which people live within i.e. house, flat)
- Total number of residential buildings (A building consisting of one or more dwelling units)

- Total number of buildings built: pre and including 1980, post 1981 or unknown
- Total number of separate houses
- Total number of semi-detached houses
- Total number of apartment buildings with up to 2 storeys
- Total number of apartment buildings with 3 storeys
- Total number of apartment buildings with 4 or more storeys
- Total number of buildings with the wall type: brick veneer, double brick, concrete steel frame, fibro or timber
- Total number of buildings with the roof type: fibro, metal or tile
- Total structure value (\$) for all buildings in the SLA (rounded to the nearest million). This is the cost to rebuild the existing structure at current standards
- Total contents value (\$) for all buildings in the SLA (rounded to the nearest million)
- Total number of households with a gross weekly income: low (\$0-\$499), middle (\$500-\$1699) or high (greater than \$1700)
- Total building footprint area for residential buildings (m2)
- Total floor area by separate and semi-detached house, and apartments 2, 3 and 4 plus storeys.

NEXIS_Commercial		NEXIS_Industrial		NEXIS_Residential	
* SLA_CODE	NUMBER	* SLA_CODE	NUMBER	* SLA_CODE	NUMBER
* SLA_NAME	VARCHAR2(50)	* SLA_NAME	VARCHAR2(50)	* SLA_NAME	VARCHAR2(50)
* COMMERCIAL_BUSINESS_ADDRESSES	NUMBER	* INDUSTRIAL_BUSINESS_ADDRESSES	NUMBER	* TOTAL_POPULATION	NUMBER
* TOTAL_BUILDINGS	NUMBER	* TOTAL_BUILDINGS	NUMBER	* TOTAL_RESIDENCES	NUMBER
* BLDG_PRE_1980	NUMBER	* BLDG_PRE_1980	NUMBER	* TOTAL_BUILDINGS	NUMBER
* BLDG_POST_1981	NUMBER	* BLDG_POST_1981	NUMBER	* BLDG_PRE_1980	NUMBER
* BLDG_WITH_UNKNOWN_AGE	NUMBER	* BLDG_WITH_UNKNOWN_AGE	NUMBER	* BLDG_POST_1981	NUMBER
* N1_TO_3_C_LBM_T	NUMBER	* ISS_URM_PS	NUMBER	* BLDG_WITH_UNKNOWN_AGE	NUMBER
* N1_TO_3_C_LBM_C	NUMBER	* ISSB_CSPC_S	NUMBER	* SEPARATE_HOUSES	NUMBER
* N1_TO_3_C_LBM_S	NUMBER	* ISS_SPC_S	NUMBER	* SEMI_DETACHED_HOUSES	NUMBER
* N1_TO_3_C_URM	NUMBER	* ISS_SS_S	NUMBER	* N2_STOREY_APARTMENTS	NUMBER
* N1_TO_3_C_O	NUMBER	* IDS_CSURM_S	NUMBER	* N3_STOREY_APARTMENTS	NUMBER
* N1_TO_3_S_URM	NUMBER	* ISS_URM_S	NUMBER	* N4_PLUS_STOREY_APARTMENTS	NUMBER
* N1_TO_3_S_O	NUMBER	* IDS_CSPC_S	NUMBER	* BLDG_WITH_WALLS_BRICK_VENEER	NUMBER
* N4_TO_7_LBM_T	NUMBER	* IDS_CURM_S	NUMBER	* BLDG_WITH_WALLS_DOUBLE_BRICK	NUMBER
* N4_TO_7_LBM_C	NUMBER	* ISS_PC_S	NUMBER	* BLDG_WITH_WALLS_CONCRETE_FRAME	NUMBER
* N4_TO_7_LBM_S	NUMBER	* ISS_SSURM_S	NUMBER	* BLDG_WITH_WALLS_TIMBER	NUMBER
* N4_TO_7_C_URM	NUMBER	* ISS_SSPC_S	NUMBER	* BLDG_WITH_WALLS_FIBRO	NUMBER
* N4_TO_7_C_O	NUMBER	* ISSB_SSS_S	NUMBER	* BLDG_WITH_ROOF_TYPE_TILES	NUMBER
* N4_TO_7_S_URM	NUMBER	* ISS_RM_S	NUMBER	* BLDG_WITH_ROOF_TYPE_METAL	NUMBER
* N4_TO_7_S_O	NUMBER	* CARPARKS	NUMBER	* BLDG_WITH_ROOF_TYPE_FIBRO	NUMBER
* N8_TO_30_C	NUMBER	* TOTAL_INDUSTRIAL_BLD_FOOTPRINT	NUMBER	* TOTAL_STRUCTURAL_VALUE	NUMBER
* N8_TO_30_S	NUMBER	* TOTAL_STRUCTURAL_VALUE	NUMBER	* TOTAL_CONTENTS_VALUE	NUMBER
* CARPARKS	NUMBER	* FLR_AREA_ISS_SSURM_S	NUMBER	* BLDG_WITH_HIGH_INCOME	NUMBER
* TOTAL_COMMERCIAL_BLD_FOOTPRINT	NUMBER	* FLR_AREA_ISS_SSPC_S	NUMBER	* BLDG_WITH_MIDDLE_INCOME	NUMBER
* TOTAL_STRUCTURAL_VALUE	NUMBER	* FLR_AREA_ISS_SPC_S	NUMBER	* BLDG_WITH_LOW_INCOME	NUMBER
* FLR_AREA_1_TO_3_LBM_T	NUMBER	* FLR_AREA_IDS_CSURM_S	NUMBER	* TOTAL_RESIDENTIAL_FOOTPRINT	NUMBER
* FLR_AREA_1_TO_3_LBM_C	NUMBER	* FLR_AREA_ISS_URM_PS	NUMBER	* FLR_AREA_SEPARATE_HOUSES	NUMBER
* FLR_AREA_1_TO_3_LBM_S	NUMBER	* FLR_AREA_ISS_PC_S	NUMBER	* FLR_AREA_SEMI_DETACHED_HOUSES	NUMBER
* FLR_AREA_1_TO_3_C_URM	NUMBER	* FLR_AREA_IDS_CSURM_S	NUMBER	* FLR_AREA_2_STOREY_APARTMENTS	NUMBER
* FLR_AREA_1_TO_3_C_O	NUMBER	* FLR_AREA_ISS_RM_S	NUMBER	* FLR_AREA_3_STOREY_APARTMENTS	NUMBER
* FLR_AREA_1_TO_3_S_URM	NUMBER	* FLR_AREA_IDS_CURM_S	NUMBER	* FLR_AREA_4_PLUS_STOREY_APARTMENTS	NUMBER
* FLR_AREA_1_TO_3_S_O	NUMBER	* FLR_AREA_ISSB_CSPC_S	NUMBER		
* FLR_AREA_4_TO_7_LBM_T	NUMBER	* FLR_AREA_ISS_URM_S	NUMBER		
* FLR_AREA_4_TO_7_LBM_C	NUMBER	* FLR_AREA_ISS_SS_S	NUMBER		
* FLR_AREA_4_TO_7_LBM_S	NUMBER	* FLR_AREA_ISSB_SSS_S	NUMBER		
* FLR_AREA_4_TO_7_C_URM	NUMBER				
* FLR_AREA_4_TO_7_C_O	NUMBER				
* FLR_AREA_4_TO_7_S_URM	NUMBER				
* FLR_AREA_4_TO_7_S_O	NUMBER				
* FLR_AREA_8_TO_30_C	NUMBER				
* FLR_AREA_8_TO_30_S	NUMBER				

Figure 11: NEXIS tables

Commercial

- SLA Code and Name as provided by the ABS Census 2008
- Total number of commercial business addresses
- Total number of commercial buildings
- Total number of buildings built: pre and including 1980, and post 1981
- Total number of buildings by construction type (see table 1 for details)

- Total number of car parks (populated by local data only)
- Total building footprint area for commercial buildings (m2)
- Total structure value (\$) for all buildings in the SLA (rounded to the nearest million). This is the cost to rebuild the existing structure at current standards
- Total floor area by construction type (see Table 29 for details)

Number of Storeys	Construction Type	Description
1 – 3 Storeys	13_C_O	Concrete Frame; Other Exterior Walls
	13_C_URM	Concrete Frame; URM Exterior Walls
	13_LBM_C	Load Bearing Masonry; Concrete Column Floors
	13_LBM_S	Load Bearing Masonry; Steel Beams and Columns
	13_LBM_T	Load Bearing Masonry; Timber Column Floors
	13_S_O	Steel Frame; Other Exterior Walls
	13_S_URM	Steel Frame; URM Exterior Walls
4 – 7 Storeys	47_C_O	Concrete Frame; Other Exterior Walls
	47_C_URM	Concrete Frame; URM Exterior Walls
	47_LBM_C	Load Bearing Masonry; Concrete Column Floors
	47_LBM_S	Load Bearing Masonry; Steel Beams and Columns
	47_LBM_T	Load Bearing Masonry; Timber Column Floors
	47_S_O	Steel Frame; Other Exterior Walls
	47_S_URM	Steel Frame; URM Exterior Walls
8 – 30 Storeys	830_C	Concrete Frame
	830_S	Steel Frame

Table 29: NEXIS Floor Area by construction type (commercial)

Industrial

- SLA Code and Name as provided by the ABS Census 2008
- Total number of industrial business addresses
- Total number of industrial buildings
- Total number of buildings built: pre and including 1980, and post 1981
- Total number of buildings by construction type (see table 2 for details)
- Total number of car parks (populated by local data only)
- Total building footprint area for industrial buildings (m2)
- Total structure value (\$) for all buildings in the SLA (rounded to the nearest million). This is the cost to rebuild the existing structure at current standards
- Total floor area by construction type (see Table 30 for details)

Number of Storeys	Construction Type	Description
Single Storey	ISS_URM_S	URM Walls; Supporting Steel Roof
	ISS_URM_PS	URM; Steel Portal Frame and Roof
	ISS_RM_S	RM; Supporting Steel Roof
	ISS_SS_S	Steel Frame; Steel Clad Walls and Roof
	ISS_SSURM_S	Steel Frame; URM/Steel Clad Walls; Steel Roof
	ISS_SSPC_S	Steel Frame; Precast/Steel Clad Walls; Steel Roof
	ISS_SPC_S	Small Panel; Precast Walls; Steel Portal Frame and Roof
Double Storey	ISS_PC_S	Large Panel; Precast Walls; Supporting Steel Roof
	IDS_CSURM_S	Concrete First Floor; Steel Portal Above; URM walls; Steel Roof
	IDS_CSPC_S	Concrete First Floor; Steel Portal Above; Precast Walls; Steel Roof
Single Storey with Basement Car Park Structure	IDS_CURM_S	Concrete First Floor; URM Walls; Steel Roof
	ISSB_CSPC_S	Concrete Basement; Steel Portal Superstructure; Precast Walls
	ISSB_SSS_S	Steel Frame; Concrete Pan Basement; Steel Superstructure

Table 30: NEXIS Floor Area by construction type (industrial)

APPENDIX H: AGREEMENT FOR THE SUPPLY OF DATA

Important: The completed Schedule and Licence Conditions set out below will constitute a legal agreement between the Commonwealth of Australia ("the Commonwealth") and you ("the Licensee") in relation to the data. If you agree with the Conditions, please click on the appropriate button.

If you are entering into this agreement on behalf of a company or organisation, you warrant that you have the authority to do so.

The Schedule

Date Wed Dec 07 13:51:14 EST 2011

Commonwealth

The Commonwealth of Australia is represented by the Department of Sustainability, Environment, Water, Population and Communities. The contact details are:

Name/Title Geoff Richardson
Postal Address GPO Box 787
Canberra ACT 2601
Australia
Telephone +61 2 62741111
Email Address metadata@environment.gov.au

Licensee

Name Robert Power
Postal Address GPO Box 664 Canberra ACT 2601
Telephone 62167039
Email Address robert.power@csiro.au

The Data

Australia - Landscape Health Database 2001 - Australian Natural Resources Atlas

The Landscape Health Project was a joint initiative between the Australian Government, Department of the Environment and Heritage and the National Land and Water Resources Audit, supported by State and Territory agencies. The project assessed the health of Australia's regional landscapes from a biodiversity / natural ecosystem perspective, through the analysis of attributes indicative of landscape condition and trend.

These included: native vegetation extent; fragmentation and clearing rates; land use; current extent and trend of dryland salinity; changed hydrological conditions; current extent and trend of weeds and feral animals; and the distribution of threatened species and ecosystems.

The assessment used both quantitative and qualitative data. Analyses ranged from intersections of digital datasets to subjective classifications using expert opinion. All results are presented as classed values for IBRA 5.1 sub-regions. Actual values, class values and class intervals are presented and described in excel spreadsheets and an associated attribute class key document.

Data are supplied via electronic transfer media. Accompanying metadata for the data is also supplied.

Contributors

National Land and Water Resources
Audit

Additional Conditions

Use

The data will be used by the Licensee for:
Investigate use in the Pilot Impacts Portal

Licence Conditions

1 Interpretation

1.1 In these Conditions, unless the contrary intention appears:

"Commercialise" in respect of the Data or a product or service derived from the Data, includes distributing, giving away, selling, letting for hire, or by way of trade, offering or exposing for sale or hire any article embodying the Data or any product or service derived from or incorporating the Data;

"Contributor" means:

I. (in relation to the Commonwealth) an agency of the Commonwealth which is custodian of a particular item of Data on behalf of the Commonwealth; or

II. third party contributors

identified in the Schedule to this Agreement as having provided particular items of Data which are the subject of this Licence Agreement;

"Data" means the data to which access is made available, and which is listed in the Schedule and includes any Enhancements to the Data;

"Enhancement", in relation to the Data, includes any modification, adaption or redevelopment of the Data, any work derived from the Data, machine readable representations of any of the foregoing and any associated material intended at the time of its creation to be used primarily in conjunction with the Data;

"Intellectual Property" includes all copyright, and all rights in relation to registered and unregistered trademarks (including service marks), registered designs and confidential information (including trade secrets and know-how), and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields;

"Licence" means the licence referred to in Condition 3.

2 Duration

2.1 The Licence commences on the date of the Agreement as set out in the Schedule,

and continues in force for a period of five (5) years unless terminated in accordance with Condition 10.1.

3 Licence Conditions

3.1 The Commonwealth grants to the Licensee, a royalty-free, non-exclusive, non-transferable licence to use, reproduce, make Enhancements to and print the Data, and combine it with other data held by the Licensee.

3.2 The Licence is limited to personal use of the Data or use within the Licensee's organisation only.

3.3 The Licensee shall not Commercialise the Data or any product or service derived from the Data.

3.4 The Commonwealth warrants that the grant of the Licence does not infringe the Intellectual Property rights of any person and that it is entitled to grant the licence in relation to the data of third party Contributors.

3.5 Data items identified in the Schedule as having been provided by individual Contributors are subject to the additional conditions (if any) set out in the Schedule. In the event of any conflict between the terms of the Licence Conditions and any additional condition set out in the Schedule, the terms of the Licence Conditions shall take precedence.

4 Intellectual Property Rights Reserved

4.1 All rights not expressly granted to the Licensee under Condition 3 are reserved.

4.2 The Licensee acknowledges that the Data is a special, unique and valuable product in which the copyright and other applicable Intellectual Property rights vest in the Contributors as listed in the Schedule.

4.3 The Contributors of items of Data retain ownership of that Data, whether in its original form or as modified by the Licensee and of the Intellectual Property rights therein.

4.4 Intellectual Property in any Enhancement to the Data vests, upon its creation, in the Contributor named in the Schedule in relation to the relevant item of Data.

5 Custody of the Data

5.1 The Licensee shall maintain the Data in safe custody.

5.2 The Licensee shall take all reasonable steps to ensure that any person given access to the Data is aware of these Conditions and uses the Data only in accordance with this Agreement.

6 Precautions

6.1 THE COMMONWEALTH CANNOT GUARANTEE THAT THE DATA, INCLUDING

ANY THIRD PARTY DATA, IS FREE FROM ERRORS, AND DOES NOT WARRANT THE QUALITY, PERFORMANCE OR SUITABILITY OF THE DATA FOR ANY PURPOSE.

6.2 THE LICENSEE ASSUMES RESPONSIBILITY FOR SELECTION OF THE DATA TO ACHIEVE ANY INTENDED RESULTS, AND FOR ITS USE.

6.3 THE LICENSEE ASSUMES RESPONSIBILITY FOR THE INTERPRETATION OF ANY RESULTS OBTAINED FROM USE OF THE DATA, AND MUST EXERCISE ALL APPROPRIATE PRECAUTIONS BEFORE PLACING RELIANCE ON THOSE RESULTS.

7 Release and Indemnity

7.1 THE LICENSEE:

A) RELEASES THE COMMONWEALTH, ITS OFFICERS, EMPLOYEES AND AGENTS AND ALL CONTRIBUTORS IN RESPECT OF ALL LIABILITY FOR LOSS, DAMAGE OR INJURY WHICH MAY BE SUFFERED BY THE LICENSEE OR ARISING FROM THE LICENSEE'S USE OF THE DATA; AND

B) INDEMNIFIES THE COMMONWEALTH, ITS OFFICERS, EMPLOYEES AND AGENTS AND ALL CONTRIBUTORS IN RESPECT OF ALL LIABILITY FOR LOSS, DAMAGE OR INJURY, WHICH MAYBE SUFFERED BY ANY PERSON ARISING FROM THAT PERSON'S USE OF THE DATA.

8 Retention of Notices

8.1 The Licensee shall not remove, obscure or interfere with any copyright notice, trademark, warning or disclaimer incorporated in the Data.

9 Commercial Exploitation

9.1 The Licensee shall not Commercialise the Data or any product or service derived from incorporating the Data without the prior written consent of the relevant Contributor(s).

9.2 A Contributor may grant or refuse consent in their absolute discretion and subject to any condition whatsoever, including payment of royalties.

9.3 Any of the Data or any product or service derived from incorporating the Data which is Commercialised in accordance with this clause, must be accompanied by or incorporate an appropriate acknowledgment of the Contributor as the source of the Data in the terms specified in the Schedule.

10 Termination

10.1 If the Licensee breaches any of these Conditions, the Commonwealth may terminate the Agreement immediately by notice in writing to the Licensee.

10.2 The termination of the Agreement under Condition 10.1 shall be without prejudice

to the rights of either party accrued under the Agreement prior to termination.

10.3 The Licensee shall cease using the Data for any purpose from the date of termination of the Agreement and shall return the Data and any copies made of it to the Commonwealth within 30 days of the date of termination.

11 Entire Agreement

11.1 The Agreement supersedes all prior agreements and understandings between the parties relating to the Data and Data Products and constitutes the entire agreement between the parties.

12 Variation

12.1 No addition to or modification of any provision of the Agreement shall be binding unless in writing signed by both parties.

13 Assignment

13.1 The rights granted under the Licence are restricted solely to the Licensee and may not be assigned, transferred or sublicenced without the prior written consent of the Commonwealth.

13.2 The Commonwealth may grant or refuse consent in its absolute discretion and subject to any condition whatsoever.

14 Law

14.1 The Agreement shall be governed by and construed in accordance with the laws of the Australian Capital Territory.

15 Waiver

15.1 No forbearance, delay or indulgence by a party in enforcing the provisions of the Agreement shall prejudice or restrict the rights of that party, nor shall waiver of those rights operate as a waiver of any subsequent breach.

16 Severance

16.1 Any reading down or severance of a particular provision does not affect the remaining provisions of the Agreement.

17 Application

17.1 Where the Licensee is an agency of the Commonwealth of Australia, such that it is not permitted to enter into a binding legal agreement except as the Commonwealth, then the conditions shall be read as merely giving rise to an arrangement between the Department of the Environment, Water, Heritage and the Arts and the Licensee.

APPENDIX I: FRNSW DATA REQUEST LETTER

XX
Address

Date

Dear XX

I am writing to you seeking to obtain access to data to support the Impacts Project and Impacts Portal.

The Impacts Project is a national initiative to better understand the economic, social, and environmental impacts on communities due to natural disasters and fire emergencies. This will then enable governments and other stakeholders to decide where best to allocate investment across the prevention, preparedness, response and recovery (PPRR) spectrum to increase community safety and reduce the impacts of fire emergencies and natural disasters.

Additional information about the Project can be obtained by visiting the website link

<http://www.fire.nsw.gov.au/page.php?id=914>

The Impacts Portal has been developed as a result of the overarching Impacts Framework.

The Impacts Framework is based on economic principles and provides a basis to determine the economic, social and environmental impacts, losses and benefits in the event of a natural disaster or fire emergency. The framework achieves this by identifying the elements contributing to impacts and the relationship between them and by informing the collection of information on a wide range of natural disasters and fire emergencies. It can be used across any temporal or geographic scale, limited or broad. The framework provides an extensive list of possible impacts that the user can select depending on their area of interest and requirements.

We are currently developing an online portal to publish the sourced data into the Impacts framework including mechanisms for stakeholders to deliver, share, query and report data. This will be a prototype system to demonstrate the utility of the Impacts Framework and the supporting data items for providing information about the impacts of natural disasters and fire emergencies. The aim of the system is to promote the Impacts Framework and related data items to the emergency management community and other users. It will be a platform to show the benefits of having a single point of access to a wide collection of data items that can be used for evidence based decision making.

I would appreciate it if you could nominate a relevant officer from your agency with whom we may further discuss this Project. I can be contacted on either 0439 429 389 or at nick.nicolopoulos@fire.nsw.gov.au and look forward to hearing from you.

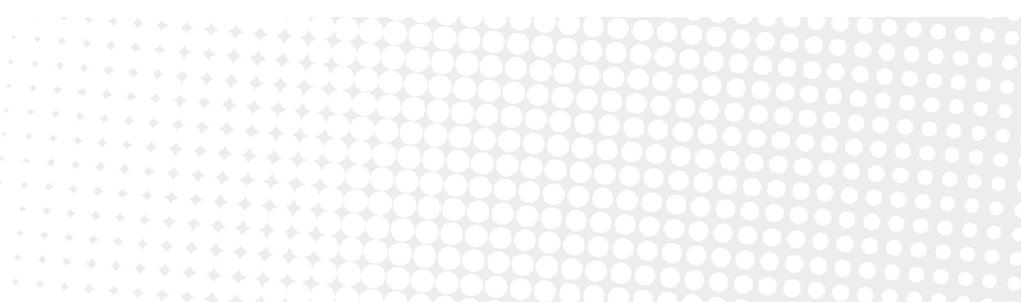
Yours sincerely

Nick Nicolopoulos
Business Owner &
Manager Strategic Information Unit
Fire and Rescue NSW

APPENDIX J: FRNSW AGENCIES CONTACTED

Agency/Organisation	Contact Name	Date of letter
Insurance Statistics Australia Limited	David Minty Manager	5-Apr-12
Department of Agriculture, Fisheries and Forestry	Dr Conall O'Connell Secretary	10-Apr-12
Department of Climate Change & Energy Efficiency	Mr Blair Comle Secretary	10-Apr-12
Department of Families, Housing, Community Services & Indigenous Affairs	Mr Finn Pratt Secretary	10-Apr-12
Department of Health & Ageing	Ms Jane Halton Secretary	10-Apr-12
Department of Human Services	Ms Kathryn Campbell Secretary	10-Apr-12
Department of Infrastructure & Transport	Mr Mile Mrdak Secretary	10-Apr-12
Department of Regional Australia, Local Government, Arts & Sport	Ms Glenys Beauchamp Secretary	10-Apr-12
Australian Fisheries Management Authority	Dr James Findlay CEO	20-Apr-12
Australian Institute of Aboriginal and Torres Strait Islander Studies	Russell Taylor Principal	20-Apr-12
Australian Trade Commission	Peter Grey CEO	20-Apr-12
Australian Transport Safety Bureau	Martin Dolan Chief Commissioner	20-Apr-12
Australian National Preventative Health Agency	Louise Sylvan CEO	20-Apr-12
Great Barrier Reef Marine Park Authority	Russell Reichelt Chief Executive	20-Apr-12
Murray-Darling Basin Authority	Dr Rhondda Dickson Chief Executive	20-Apr-12
National Water Commission	James Cameron CEO	20-Apr-12
Torres Strait Regional Authority	John Toshie Kris Chairperson	20-Apr-12
Wheat Exports Authority	Peter Woods CEO	20-Apr-12
Australian Electoral Commission	Ed Killesteyn Electoral Commissioner	27-Apr-12
Australian Institute of Family Studies	Alan Hayes CEO	27-Apr-12

National Environment Protection Council (NEPC) Service Corporation	Tony Burke MP Chair	27-Apr-12
National Transport Commission	Nick Dimopolous Chief Executive	27-Apr-12
National Mental Health Commission	Robyn Kruk CEO	27-Apr-12



Contact Us

Phone: 1300 363 400

+61 3 9545 2176

Email: enquiries@csiro.au

Web: www.csiro.au

Your CSIRO

Australia is founding its future on science and innovation. Its national science agency, CSIRO, is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.