National Library of New Zealand

Metadata Standards Framework – Preservation Metadata (Revised)

June 2003

Preservation Metadata

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1. <u>Executive Summary</u>

1.1. <u>Introduction</u>

The National Library of New Zealand (NLNZ), in common with other cultural institutions worldwide, is undergoing a period of intense change in the context of rapidly developing information technologies which are radically transforming information systems and services.

The Library has been developing its approach to the management of electronic material, the need for a Digital Archive and the desire to improve access to its collections via digitisation. As part of this work it has become clear that preservation of digital materials is emerging as a new business need for the Library and that preservation metadata is an integral component of successfully meeting that need.

NLNZ is committed to the establishment of a Digital Archive and to the management and preservation of its contents. The Digital Archive will enhance access to the Library's digital resources for all New Zealanders now and in the future. It is necessary if the Library is to achieve its mandate 'to collect, preserve and make available recorded knowledge, particularly that relating to New Zealand,' in an environment increasingly characterised by electronic resources, both online and offline.

This preservation metadata schema details the data elements needed to support the preservation of digital objects and will form the basis for the design of a database repository and input systems for collecting and storing preservation metadata. It incorporates a number of data elements needed to manage the metadata in addition to metadata relating to the digital object itself. The aim has been to produce a document that will serve as an implementation template while at the same time remaining consistent with standards being developed internationally around preservation metadata.

1.2. <u>Background</u>

In November 2002 the National Library of New Zealand released the first version of a preservation metadata schema designed to provide a working tool for the collection of preservation metadata to be held against the material held in the Library's digital collections.

Since the release of the schema the Library has continued work on extending the logical model to an implementable data model and on the development of a tool to automatically extract preservation metadata from the headers of a range of file types.

These activities have highlighted deficiencies in the original model which have been rectified including:

- inclusion of a Former Filename element to maintain the link between the original digital object and the defined Preservation Master

- addition of new elements 1.4 (Group Identifier) and 1.8 (Is Part of Group) to better describe and delineate the role of the object group (an arbitrary, intellectual construct)

- refinements to ensure better fit with other standards, eg. Tonal Resolution is now Bits Per Sample to match with the labeling in the NISO Z39.87 standard for digital still images (see Appendix Two for a list of changes in this revised version).

The Library hopes that this new version of the schema will be seen as an advance on the old version in the light of the Library's commitment to a dynamic and evolving approach to metadata.

This document is a continuation of the Library's efforts to create a systematic metadata environment which began with the release of its Metadata Standards Framework document in October 2000[1].

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[1] National Library of New Zealand. 2000. *Metadata Standards Framework for National Library of New Zealand.* http://www.natlib.govt.nz/en/whatsnew/4initiatives.html#meta

That document was based on the metadata taxonomy described in Kenney and Rieger's *Moving Theory into Practice*[2] and focused primarily on the core descriptive metadata standards and resources required to describe an object for the purposes of resource discovery, and the key protocols the Library would use for expressing and formatting that metadata in an online environment.

This document is the next step in the Library's implementation of this taxonomy. It details the preservation component of that 'technical and administrative' metadata needed to capture the essential attributes of Preservation Masters together with information regarding the processes and technologies required to manage them.

1.3. <u>Preservation Metadata for Digital Objects</u>

Preservation metadata is essential to support and facilitate the long-term retention of digital information. The following uses and objectives are based on an OCLC/RLG white paper released in 2001[3].

Preservation metadata will be used to:

- store information supporting preservation decisions and actions
- document preservation processes, such as migrations, transformations and emulations
- record the effects of preservation processes
- ensure the authenticity of Preservation Masters over time
- enable objects for which the library has assumed preservation responsibility to be identified.

Preservation metadata addresses two functional objectives:

1. providing the Library with sufficient knowledge to take appropriate actions in order to maintain a digital object's bit stream over the long-term.

2. ensuring that the content of an archived object can be rendered and interpreted, in spite of future changes in storage and access technologies.

1.4. <u>Approaches to Preservation Metadata</u>

This document has been developed in the light of international research into preservation metadata, particularly that undertaken by the National Library of Australia[4]. Initiatives through the CEDARS programme[5], OCLC/RLG activities[6] and the emerging consensus regarding the role of the OAIS Reference Model[7], ('a conceptual framework for an archival system dedicated to preserving and maintaining access to digital information over the long term'[8]), have also been taken into account.

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[2] Kenney, A. & Rieger, O. 2000. *Moving Theory into Practice: Digital Imaging for Libraries and Archives.* Mountain View, California: Research Libraries Group. Chapter 5.
[3] Research Libraries Group. 2001. *Preservation metadata for digital objects: A review of the state of the art.* Page 4. http://www.oclc.org/research/pmwg/presmeta_wp.pdf . See also http://www.oclc.org/research/pmwg/

[4] National Library of Australia. 1999. *Preservation Metadata for Digital Collections – Discussion Draft.* http://www.nla.gov.au/preserve/pmeta.html. Accessed 11 May 2002.
[5] Cedars: CURL exemplars in digital archives. 2002. *Cedars guide to: Preservation metadata.* http://www.leeds.ac.uk/cedars/guideto/metadata/guidetometadata.pdf . Accessed 11 May 2002.
[6] OCLC/RLG Preservation Metadata Working Group. http://www.oclc.org/research/pmwg/.
[7] Consultative Committee for Space Data Systems. 2001. *Reference model for an Open Archival Information System (OAIS).* http://www.ccsds.org/documents/pdf/CCSDS-650.0-R-2.pdf
[8] Lavoie, Brian. *Meeting the challenges of digital preservation: The OAIS reference model.* OCLC Newsletter January/February 2000

In these initiatives there is a constant tension between discussions of principles relating to the conceptual nature of preservation in the context of a Digital Archive and the practicalities of ensuring that the information necessary to describe the digital objects contained in the Digital Archive is captured. This is reflected in a recent OCLC/RLG document which emphasises 'that these elements are not necessarily atomic; it is easy to imagine cases where the needs and characteristics of particular digital archiving systems may require deconstruction of these elements into still more precise components'.[9]

This schema is designed to strike a balance between the principles of preservation metadata, as expressed through the OAIS Information Model, and the practicalities of implementing a working set of preservation metadata. The same incentive informs a recent OCLC/RLG report on the OAIS model[10] (see Appendix 6 for a mapping from the NLNZ schema to the OCLC/RLG framework).

The schema is predicated on the idea of a Preservation Master. Preservation metadata is held against the Preservation Master. In practice this means that various other manifestations, eg. dissemination formats, are not considered preservation objects and will not have preservation metadata retained about them.

The schema acknowledges that not all data key to preservation processes will necessarily be held as preservation metadata, eg data relating to rights management and archiving permissions will be recorded within a collection management system and drawn on from that source as and when required, and data related to data authentication will be contained within the application running the authentication process. Similarly, it is not yet clear how the elements described below will be decomposed into a Metadata Encoding & Transmission Standard (METS) implementation, eg the relationship between File Inventory and Administrative metadata.

Data relevant to preservation processes which will be stored in relevant collection management systems includes:

- acquisition preservation permission
- archiving decision
- date of archiving decision
- decision reason
- business unit responsible for archiving decision
- business unit with preservation responsibility
- date business unit assumed responsibility.

The model described below reflects the data elements that are considered significant to preservation activity, or the core minimum dataset that is unique to any given Preservation Master. Implicit in this method is the presumption that preservation metadata is just one component of a unified metadata structure describing any given object.

The Library recognises that adherence to standards does not in itself guarantee interoperability as standards can be implemented in different ways. It is important that NLNZ's implementation of its preservation metadata schema is in line with international best practice as this develops. The Library accepts that practical application of this schema is liable to change as international implementation guidelines develop over time.

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[9] OCLC/RLG Working Group on Preservation Metadata. 2002. *A Recommendation for Preservation Description Information*. http://www.oclc.org/research/pmwg/pres_desc_info.pdf. Accessed 11 May 2002.

[10] OCLC/RLG Working Group on Preservation Metadata. 2002. *Preservation Metadata and the OAIS Information Model: A Metadata Framework to Support the Preservation of Digital Objects*. http://www.oclc.org/research/pmwg/pm_framework.pdf

1.5. <u>Structure of Paper</u>

This document comprises the following sections:

Section 1   Executive Summary

Section 2   An overview of the metadata framework

Section 3   A detailed description of each metadata element and an introductory / explanatory text within data areas

Appendices   Preservation Metadata Model

                NLNZ Preservation Metadata Schema (Revised) Change Table

                Definitions

                Associated Documents

                The Preservation Master in the Digital Archive Workflow

                NLNZ Preservation Metadata Schema and the OCLC/RLG/OAIS Framework

                NLNZ Preservation Metadata Schema and NISO Z39.87 Technical Metadata for Digital Still Images

                NLNZ Preservation Metadata Schema and the NLA Discussion Draft

2. <u>Metadata Structure</u>

2.1. <u>Preservation Metadata Schema</u>

Preservation metadata will apply only to that instance of the digital object that is referred to as the Preservation Master and is held in the Digital Archive. However, the schema should also cater for objects that 'are not' or 'are no longer' Preservation Masters, eg. the CD-ROM on which the Library received the original digital object or a previous Preservation Master which has been superseded through hardware or software obsolescence.

A Preservation Master represents a 'best effort' creation of a working object, from some form of 'original' as supplied to or acquired by the library. This could range from a 'perfect' digital original to 'acceptable loss' from a Wordstar document retrieved from a corrupt 5¼-inch floppy disk. The Preservation Master will be a rendition of that 'original' into an object that can be preserved, managed and disseminated over time.

Preservation Masters are dynamic and will be subject to further preservation processes, eg. migration from an obsolete to a current format. This creates a life cycle of creation, use and eventual replacement. At any time there can be only one Preservation Master for an object and any object carrying the status of Preservation Master will be subject to the maximum preservation effort whilst it has that status.

Each set of preservation metadata will pertain to a single logical object. An object may, however, have multiple files or processes that are of relevance to preservation and for which data may be recorded. A history of changes made to the preservation metadata is modelled in Entity 4 - Metadata Modification. This acknowledges that the record is itself an important body of data about the object that requires management over time.

The following high-level relational data model structure shows each entity representing a group of related data elements. For a summary listing of all data elements identified within each entity, refer to Appendix 1.
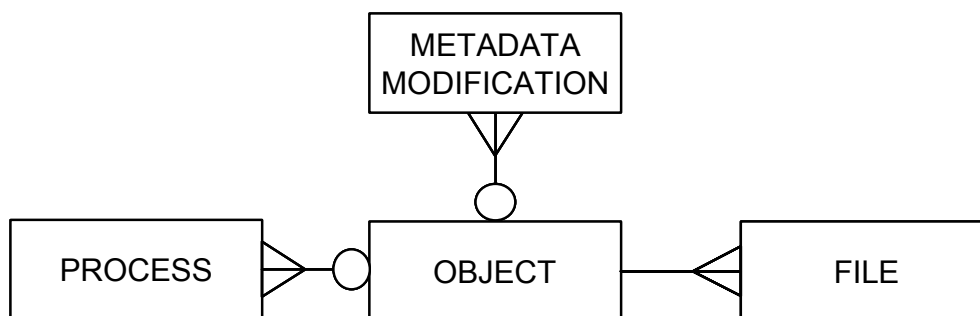
The above model specifies the following relationship rules:

- An Object **may** have one or more Processes associated with it
- An Object **may** have one or more Metadata Modifications associated with it
- An Object **must** have one or more Files associated with it

- A Process **must** always be associated with a single Object
- A Metadata Modification **must** always be associated with a single Object
- A File **must** always be associated with a single Object

2.2. <u>Types of Digital Objects</u>

As noted above preservation metadata will apply to a single logical object. This is an arbitrary construct allowing the Library to differentiate between simple objects, complex objects or object groups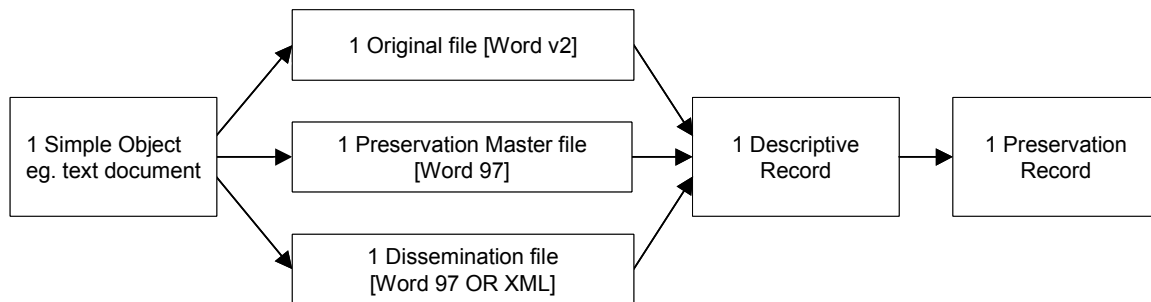. The following examples illustrate each of these logical objects. Practice will determine the viability of this model especially in relation to object groups and complex objects.

2.2.1. Simple object

Definition: One file intended to be viewed as one logical object (eg. a Word document comprising one essay).

```
                          ┌────────────────────────┐
                       ┌─▶│ 1 Original file [Word v2]│──┐
                       │  └────────────────────────┘   │
┌─────────────────┐    │  ┌────────────────────────┐   │  ┌──────────────┐   ┌──────────────┐
│ 1 Simple Object │────┼─▶│ 1 Preservation Master file│──┼─▶│ 1 Descriptive│──▶│ 1 Preservation│
│ eg. text document│    │  │ [Word 97]               │   │  │ Record       │   │ Record        │
└─────────────────┘    │  └────────────────────────┘   │  └──────────────┘   └──────────────┘
                       │  ┌────────────────────────┐   │
                       └─▶│ 1 Dissemination file    │──┘
                          │ [Word 97 OR XML]        │
                          └────────────────────────┘
```

2.2.2. Complex object

Definition: A group of dependent files intended to be viewed as a single logical object (a website or an object that is created as more than one file (eg a database)), and which doesn't function without all files being present in the right place.

```
                              ┌────────────────────────────┐
                           ┌─▶│ 100 Original files [HTML + gif]│──┐
                           │  └────────────────────────────┘   │
┌─────────────────┐        │  ┌────────────────────────────┐   │  ┌──────────────┐   ┌──────────────┐
│ 1 Complex Object│────────┼─▶│ 100 Preservation Master files│──┼─▶│ 1 Descriptive│──▶│ 1 Preservation│
│ eg. Web Site of 80│       │  │ [processed for local delivery]│  │  │ Record for 100│   │ Record for 100│
│ html files + 20 gifs│     │  └────────────────────────────┘   │  │ files [HTML + gif]│ │ files [HTML + gif]│
└─────────────────┘        │  ┌────────────────────────────┐   │  └──────────────┘   └──────────────┘
                           └─▶│ 100 Dissemination files     │──┘
                              │ [HTML + gif]                │
                              └────────────────────────────┘
```
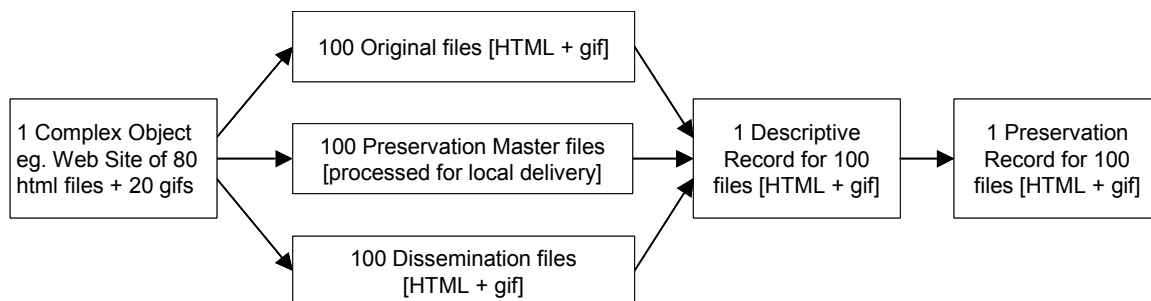
2.2.3. Object group

Definition: A group of files not dependent on each other in the manner of a complex file, eg a floppy disk containing 100 letters. This object may be broken up into (described as) 100 single objects or four discrete objects containing 25 letters each or it may be kept together as a single logical object (Joe Blogg's Letters).

```
                              ┌────────────────────────────┐
                           ┌─▶│ 200 Original files          │──┐
                           │  │ [WordPerfect, Word 95]      │  │
┌─────────────────┐        │  └────────────────────────────┘   │  ┌──────────────┐   ┌──────────────┐
│ 1 Object Group  │────────┼─▶│ 200 Preservation Master files│──┼─▶│ 1 Descriptive│──▶│ 200 Preservation│
│ eg. 200 letters from│     │  │ [Word 97]                   │  │  │ Record for 200 files│ │ Records for 200│
│ a donor         │        │  └────────────────────────────┘   │  │ [WordPerfect,│   │ files [WordPerfect,│
└─────────────────┘        │  ┌────────────────────────────┐   │  │ Word, XML]   │   │ Word, XML]    │
                           └─▶│ 200 Dissemination files     │──┘  └──────────────┘   └──────────────┘
                              │ [Word 97 OR XML]            │
                              └────────────────────────────┘
```
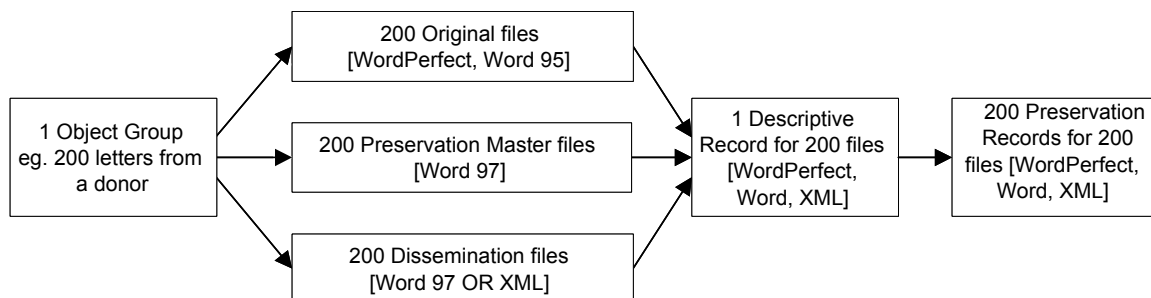
2.3. <u>Other Preservation Metadata Activities</u>

The data elements identified in this paper are those considered significant to preservation activity. Some of these elements are also likely to be required as part of descriptive or administrative metadata that supports other functions. Rationalisation of elements will occur at the design and implementation phases of the schema. This may involve holding duplicate elements only once, but enabling them to be referenced from either a preservation or descriptive viewpoint. Alternatively the elements may be held in multiple metadata repositories but with the data originating from a single source, eg the object's core descriptive record.

This schema is one component of the Library's approach to preservation metadata. Concurrent with work on the schema is:

- drafting of a data model as the basis for developing a preservation metadata repository
- development of automated extraction processes to programmatically derive selected preservation metadata from files (eg from within the headers of files).

3. <u>Entity List</u>

3.1. <u>Entity 1 – Object</u>

DEFINITION: An object is defined as the Preservation Master for which preservation metadata is created and maintained. It is derived from a digital original or a digitised version of non-digital material acquired or created by the Library.

PURPOSE: The Object entity contains information about a logical object that exists as a file or aggregation of associated files. The object is held in the Digital Archive and will also have a range of other metadata relating to it including descriptive and collection management records. This entity contains information that identifies the Preservation Master and describes those characteristics relevant to preservation management.

Element 1.1 Name of Object

Definition	Plain text name given to material by the creator/curator/selector.
Rationale	Provides a means to quickly identify material, without reference to the PID, IID or reference number (See 1.2 – 1.4).
Essential	Y
Format	Text
Examples	Freda Smith papers 1923 – 1999 Birds of New Zealand CD-Rom
Source	Manual entry or system derived
Overlaps	Shared with descriptive metadata
Remarks	None

Element 1.2 Reference Number

Definition	Reference number or identification number derived from the Library's core bibliographic/description or collection management applications.
Rationale	Way to uniquely identify material, without reference to the PID or IID. Provides an association between an object's preservation metadata and its bibliographic/description or collection management records.
Essential	Y
Format	Determined by source application
Examples	MSDL/0003 (NLNZ TAPUHI system collection management system number) 3 (Bibliographic ID)
Source	Manual entry or system derived
Overlaps	Shared with descriptive metadata
Remarks	None

Element 1.3– Object Identifier

Definition	An internal identifier assigned to digital objects within NLNZ.
Rationale	Each object needs to be uniquely identified within NLNZ.
Essential	Y
Format	Running number
Examples	875
Source	Manual entry
Overlaps	Shared with descriptive metadata
Remarks	This number is also used as an internal management tool to associate objects with all their metadata.

Element 1.4– Group Identifier

Definition	An internal identifier assigned to the files that comprise an object group within NLNZ (see 2.2.3 above).
Rationale	An object group is an arbitrary construct. In order to maintain the relationship between the files that make up an object group the group itself needs to be uniquely identified within NLNZ as well as the objects that go to make up that group.
Essential	Y (if the object is part of an object group – see 1.8)
Format	Running number
Examples	876
Source	System derived
Overlaps	Shared with descriptive metadata
Remarks	This number may be used as an internal management tool to associate the objects within an object group with all their metadata.

Element 1.5 Persistent Identifier

Definition	A published international identifier for digital objects. For identifiers assigned by NLNZ, this incorporates the Object Identifier (1.3).
Rationale	Each object or file described and independently accessible must have a persistent identifier to identify it uniquely on a global basis.
Essential	Y
Format	NLNZ Handle System[11] prefix dot sequence/Object Identifier (NLNZ sourced material only)
Examples	1727.10/47 (NLNZ assigned persistent identifier)
	10.1000/123456 (Externally assigned DOI number)
Source	Manual entry based on Object Identifier, NLNZ Handle prefix (1727)
Overlaps	Shared with descriptive metadata
Remarks	None

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[11] Handle System, Corporation for National Research Initiatives. See http://www.handle.net/

Element 1.6 Preservation Master Creation Date

Definition	Date that the Preservation Master came into being within NLNZ.
Rationale	The date, in combination with other metadata elements, provides evidence of the library's preservation responsibility for the digital object.
Essential	Y
Format	yyyy-mm-dd
Examples	20021113
Source	Manual entry or system derived
Overlaps	None
Remarks	Date will be expressed in a standard format (see Appendix 3).

Element 1.7 Logical Composition

Definition	A classification of the object based on the relationships between the files that make it up. This is an arbitrary construct as described in 2.2 above.
Rationale	Understanding the structure of the logical objects as well as their individual components will aid in the management of the preservation process.
Essential	Y
Format	Text
Examples	Simple Object Complex Object
Source	System derived
Overlaps	None
Remarks	A simple object comprises a single file (see 2.2.1 above) A complex object comprises a number of dependent files (see 2.2.2 above)

Element 1.8 – Is Part of Group

Definition	A classification of a set of distinct simple or complex objects as a group.
Rationale	An object group is an arbitrary construct. In order to maintain the relationship between the files that make up an object group the files first need to be defined as a group (see 2.2.3 above).
Essential	Y (if the object is part of an object group)
Format	Y/N
Examples	Y
Source	System derived
Overlaps	None
Remarks	None

Element 1.9 Structural Type

Definition	The type of object being described in the Preservation Metadata record.
Rationale	Choice of appropriate preservation strategy may depend on knowing the structural type.
Essential:	Y
Format	Text
Example	Image Interactive Resource
Source	Manual entry or system derived
Overlaps	May overlap with Descriptive record
Remarks	List of DCMI Types serves as a useful reference (see Appendix 4).

Element 1.10 Hardware Environment

Definition	Hardware environment required to access the Preservation Master.
Rationale	To identify the minimum required hardware environment in which the Preservation Master can function.
Essential	N
Format	Text
Examples	IBM Pentium III PC with 256MB RAM iMac PowerPC G4 with 256MB RAM
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 1.11 Software Environment

Definition	Software environment required to access the Preservation Master.
Rationale	To identify the minimum required software environment in which the Preservation Master can function.
Essential	N
Format	Text
Examples	Windows 2000 Version 5 Build 2195 Service Pack 2 Mac OS X Version 10.1.5
Source	Manual entry
Overlaps	None
Remarks	May describe the earliest compatible version if the object continues to be compatible with earlier version. May also describe such things as plug-ins required for operation or memory requirements for an uncompressed file.

Element 1.12 Installation Requirements

Definition	Any specialised requirements needed to install the object. Records any additional specific instructions, serial numbers or how to start the program, etc.
Rationale	To enable access to objects with special installation requirements.
Essential	N
Format	Text
Examples	Use product serial number [xxxxxx] See Readme.txt for instructions
Source	Manual entry
Overlaps	None
Remarks	This information will be particularly useful when undertaking future migrations.

Element 1.13 Access Inhibitors

Definition	Any method used to restrict access, such as encryption which may impact on preservation procedures.
Rationale	Without this information, the object may not be able to be accessed or migrated.
Essential	N
Format	Text
Examples	Use password [xxxxxx] Associated dongle is required Encrypted with PGP Vx. Use key [xxxxxx]
Source	Manual entry
Overlaps	None
Remarks	None

Element 1.14 Access Facilitators

Definition	Any system or method used to enhance access to the Preservation Master, which needs to be maintained over time.
Rationale	To enable access facilitators to be taken into account in any preservation process.
Essential	N
Format	Text
Examples	Object contains hypertext links between files / documents Video and text time code linked with on-screen digital counter See [Bib ID] for accompanying manual
Source	Manual entry
Overlaps	None
Remarks	None

Element 1.15 Quirks

Definition	Any characteristic of the original that may appear as a loss in functionality or change in the look and feel of a Preservation Master.
Rationale	To prevent time and effort being spent trying to solve problems that were inherent in the original.
Essential	N
Format	Text
Examples	For all Web documents in the object produced prior to HTML 4, the text format tag is no longer supported
	The Shockwave files could not be captured from the source document at the time of web harvesting
Source	Manual entry
Overlaps	None
Remarks	None

Element 1.16 Metadata Record Creator

Definition	The name(s) of the individual, business unit and/or agency that created this metadata record.
Rationale	To record a responsibility history for the metadata.
Essential	Y
Format	Text
Examples	Dave Thompson, Digital Library Transition Team, National Library of New Zealand
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 1.17 Date of Metadata Record Creation

Definition	The date of creation of the metadata record.
Rationale	To provide an audit trail of when the metadata record was created.
Essential	Y
Format	yyyy-mm-dd
Examples	20020705
Source	Manual entry or system derived
Overlaps	None
Remarks	Date will be expressed in a standard format (see Appendix 4).

Element 1.18 Structural Composition

Definition	The name of a file containing details of the individual files that comprise the object.
Rationale	This file describes for complex objects and object groups details of the individual files that comprise the object, including the overall directory structure and the hierarchical position of each file.
Essential	N
Format	Text
Examples	123456_ss.txt
Source	Manual entry
Overlaps	None
Remarks	This field is mandatory for complex objects and object groups. It is anticipated that the structural type file for complex objects will be held at the root level within the directory established for that object. For object groups the structural context file will exist in the same directory as the individual files.

Element 1.19 Comments

Definition	Any other information relevant to the preservation of the object or files.
Rationale	To cover anything that may not fit into other elements.
Essential	N
Format	Text
Examples	This object can be opened with any of the existing genealogical programmes in the Digital Archive but only if they are on a local drive
Source	Manual entry
Overlaps	None
Remarks	None

3.2. <u>Entity 2 – Process</u>

DEFINITION: A Process is defined as any action performed on a Preservation Master whether that Preservation Master is changed or not. A process is carried out by an individual, it has an objective, a result and takes place at a specific date and time.

PURPOSE: The Process entity records a complete history of actions performed on all Preservation Master objects.

The Process entity contains information about all relevant details of any processes applied to a Preservation Master throughout its life cycle. It includes the software used, specific settings or actions, details of all critical equipment and responsible persons and/or agencies. This entity records only processes carried out whilst the Preservation Master is the responsibility of NLNZ.

Element 2.1 Object Identifier

Definition	See 1.3 Object Identifier

Element 2.2 Process

Definition	Description of process carried out.
Rationale	To describe each process carried out against a Preservation Master.
Essential	Y
Format	Text
Examples	Migration – for obsolescence
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 2.3 Purpose

Definition	The reason why the process was carried out.
Rationale	To identify the desired outcome of the process.
Essential	Y
Format	Text
Examples	To create a new Preservation Master in a current format
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 2.4 Person/agency performing process

Definition	The individual(s), business unit and/or agency that carried out the process.
Rationale	Provides record and audit trail of persons/organisations responsible for the process.
Essential	Y
Format	Text
Example	Dave Thompson, Digital Library Transition Team, National Library of New Zealand
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 2.5 Permission

Definition	The individual(s), business unit and/or agency who approved the process.
Rationale	Provides audit trail of responsibility for authorising processes.
Essential	Y
Format	Text
Example	David Colquhoun, Curator Manuscripts, Alexander Turnbull Library, National Library of New Zealand
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 2.6 Permission Date

Definition	A record of the date on which permission was given to carry out the process.
Rationale	To provide an audit trail and history of processes carried out against an object.
Essential	Y
Format	yyyy-mm-dd
Examples	2002-06-15
Source	Manual entry or system derived
None	None
Remarks	Date will be expressed in a standard format (see Appendix 4).

Element 2.7 Hardware Used

Definition	Any hardware used to complete the process.
Rationale	To provide an audit trail and history of hardware used to complete the process and to identify components that may need to be retained for future use.
Essential	N
Format	Text
Example	5 ¼ inch disk drive
Source	Manual entry
Overlaps	None
Remarks	None

Element 2.8 Software Used

Definition	Any software used to complete the process.
Rationale	To provide an audit trail and history of software used to complete the process and to identify components that may need to be retained for future use.
Essential	N
Format	Text
Example	MS Word 2000
Source	Manual entry
Overlaps	None
Remarks	None

Element 2.9 Steps

Definition	A description of actions performed to initiate and complete the process.
Rationale	To provide information that enables the process to be reversed or repeated, and to capture knowledge gained during the process.
Essential	Y
Format	Text
Example	Wordstar document was downloaded to Digital Object Workbench Document was migrated to MS Word 2000 File was saved as MS Word 2000 document changing the file name to reflect change in role in relation to previous Preservation Master New Preservation Master was tested for accuracy Preservation master uploaded to Digital Archive
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 2.10 Result

Definition	The outcomes of the process.
Rationale	To provide a record of outcomes resulting from the process. Includes confirmation of intended changes and highlighting of unexpected changes, and to capture knowledge gained during the process.
Essential	Y
Format	Text
Example	Migration was successful
Source	Manual entry
Overlaps	None
Remarks	None

Element 2.11 Guidelines

Definition	Any standards or procedures followed when performing the process.
Rationale	To enable the processes to be carried out consistently.
Essential	N
Format	Text
Example	National Library of New Zealand Digital Object Workbench Operational Guidelines 2002
Source	Manual entry
Overlaps	None
Remarks	Could also include reference to specifications or to a location.

Element 2.12 Completion Date and Time

Definition	Date and time process completed.
Rationale	To identify the sequence of processes and to provide a record of dates and times significant to the history of the object.
Essential	Y
Format	yyyy-mm-ddthh:mm:ss
Example	2002-05-03 09:13:07
Source	Manual entry or system derived
Overlaps	None
Remarks	Date will be expressed in a standard format (see Appendix 4).

Element 2.13 Comments

Definition	A record of anything of relevance not covered elsewhere in Entity 2.
Rationale	To allow for information not covered elsewhere to be catered for.
Essential	N
Format	Text
Examples	Migration was complicated due to large number of embedded/linked graphics files
Source	Manual entry
Overlaps	None
Remarks	None

3.3. <u>Entity 3 – File</u>

DEFINITION: This entity contains technical information about the lowest level of digital objects – files.

PURPOSE: The File entity contains technical information about the characteristics of all files pertaining to a Preservation Master. It describes characteristics of the files that comprise this logical object and provides information to assist with the re-creation of the files if required. Elements 3.1 through to 3.9 are common to all file types. Elements numbered 3.10 onwards are specific to the file type specified.

Note that elements 3.10.1 through 3.10.8 have been mapped to the NISO Data Dictionary - Technical Metadata for Digital Still Images draft standard – see Appendix 6.

Element 3.1 Object Identifier

Definition	See 1.3 Object Identifier

Element 3.2 File Identifier

Definition	An internal identifier – a number assigned by NLNZ to a digital file within a complex object.
Rationale	To uniquely identify files within a complex object.
Essential	Y
Format	Running number
Examples	34-1, 34-2 etc 112-1, 112-2, 112-3 etc
Source	System derived
Overlaps	None
Remarks	The File Identifier will be created by adding a running number to the Object IID for that object. It will take the form IID-n as shown in the examples. The file name remains unaltered.

Element 3.3 File Path

Definition	The information about a files' place within a complex object.
Rationale	To provide a record of the essential internal relationship between files and folders within complex objects
Essential	N
Format	Text
Examples	…/birds-of-new-zealand/bird-songs/kiwi.wav (for a path in a complex object)
Source	Manually entered or system derived
Overlaps	None
Remarks	In the case of complex objects, the file names will remain unaltered.

Element 3.4 File Name and Extension

Definition	The file name and extension assigned to the file.
Rationale	Along with Object Identifier uniquely identifies each file.
Essential	Y
Format	Text
Examples	98_pm_01.doc
Source	Manually entered or system derived
Overlaps	None
Remarks	None

Element 3.5 Former File name

Definition	The name of the file(s) when originally acquired by the library
Rationale	To maintain an audit trail between the re-named Preservation Master file(s) and the file(s) originally acquired by the library
Essential	N
Format	Filename and extension
Examples	File & Folder Utilities version 1.doc /May_1999/letter to bank.doc
Source	Manually entered or system derived
Overlaps	Shared with descriptive metadata
Remarks	May include the path if appropriate

Element 3.6 File Size

Definition	The space occupied on a server by an individual file, expressed in a standard format.
Rationale	To facilitate storage planning in the Digital Archive.
Essential	Y
Format	Use standard abbreviations
Examples	200.6GB
Source	Manually entered or system derived
Overlaps	None
Remarks	Aggregation of file sizes may be used to determine total object server space including related back-up / restore and disaster recovery requirements.

Element 3.7 File Date and Time

Definition	The date / time that the file was created, taken from the file header information.
Rationale	To provide authenticity information.
Essential	N
Format	yyyy-mm-ddthh:mm:ss
Example	2002-04-18 14:32:51
Source	Manually entered or system derived
Overlaps	None
Remarks	Date will be expressed in a standard format (see Appendix 4).

Element 3.8 MIME Type

Definition	The file type or format, usually a MIME Type.
Rationale	To identify appropriate tools to open the file and to assist in readily identifying files of particular types.
Essential	Y
Format	Text
Examples	image/gif application/msword image/x-cdc
Source	Manual or system derived
Overlaps	None
Remarks	Where no standard MIME type exists for a given file type, 'x-' can be used to prefix the extension.

Element 3.9 File Format

Definition	The official name taken from the format documentation.
Rationale	To identify appropriate tools to open the file and to assist in readily identifying files of particular types.
Essential	Y
Format	Text
Examples	MS Word 2000, MPEG
Source	Manual or system derived
Overlaps	None
Remarks	None

Element 3.10 File Format Version

Definition	The version of the file format identified in 3.9.
Rationale	To identify appropriate tools to open the file and to assist in readily identifying files of particular types.
Essential	N
Format	Text
Examples	9.0.0042 RS-1, V2.0, XP
Source	Manual or system derived
Overlaps	None
Remarks	Although file format versions may be able to be verified against a list, the proliferation of new versions may make this impractical to enforce.

Element 3.11 Target Indicator

Definition	In the case of a complex object indicates that this file provides access to the whole of the object.
Rationale	To identify which file is required to successfully render a complex object in its entirety.
Essential	N
Format	Text
Examples	Yes or No
Source	Manual
Overlaps	None
Remarks	None

Element 3.12 Image	
3.12.1 Resolution	**Definition**: The spatial resolution of the image, expressed as pixels per inch or cm (ppi, p/cm) or dots per inch or cm (dpi, d/cm). **Examples**: 600 dpi; 320 dpi, 1500 d/cm
3.12.2 Dimensions	**Definition**: The dimensions of the image, expressed as the number of pixels along the vertical and horizontal. **Examples**: 4096 x 6144 pixels
3.12.3 Bits Per Sample	**Definition**: The number of bits per component for each pixel. **Examples**: 1 = 1 bit (bitonal) 4 = 4 bit grayscale 8 = 8 bit grayscale or palletised colour 8,8,8 = RGB 16,16,16 = TIFF, HDR (high dynamic range) 8,8,8,8 = CMYK
3.12.4 Colour Space	**Definition**: Designates the colour space of the decompressed image data. **Examples**:0, 1, 2, 3, 4, 5, 6, 7, 8
3.12.5 ICC Profile Name	**Definition**: The name of the International Color Consortium (ICC) profile used. **Examples**: PhotoCD; OptiCal; Profile/80; Softproof (Photoshop plug-in)
3.12.6 Colour Map Reference	**Definition**: The location of the file containing the colour map. **Examples**: [URL]
3.12.7 Orientation	**Definition**: Orientation of the image saved on disk e.g. normal, normal rotated 180°. **Examples**: 1 = normal*, 3 = normal rotated 180°, 6 = normal rotated cw 90°, 8 = normal rotated ccw 90°, 9 = unknown
3.12.8 Compression	**Definition**: The type and level of compression. **Examples**: 4 = ITU Group 4

Element 3.13 Audio	
3.13.1 Resolution	**Definition**: The rate of sampling, in samples per second, used to create the audio file. Also known as sample rate or sample frequency. **Examples**: 32100, 44100, 192000
3.13.2 Duration	**Definition**: The length of the audio recording in hours, minutes and seconds and three digits for representing decimal fractions of a second. **Examples**: 01:27:38:247
3.13.3 Bit Rate	**Definition**: The word length used to encode the audio. Consequently an indication of dynamic range. It is the maximum number of significant bits for the value without compression. **Examples**: 16, 20, 24
3.13.4 Compression	**Definition**: The name of the compression scheme, noise reduction scheme, or other non-linear processing applied to an audio signal. Note that audio compression, or bit rate reduction is a non-reversible, "lossy" process. **Examples**: MPEG 3, Dolby A
3.13.5 Encapsulation	**Definition**: The name and version level of the delivery format of the file. **Examples**: Real Audio II

3.13.6 Channels	**Definition**: A classification of the sound format type identifying the number of channels and how they are related to each other.
	
	  Examples:
	  Mono
	  2 channel stereo
	  5 channel surround
	
	  other

Elements 3.14 Video	
3.14.1 Frame Dimensions	**Definition**: The resolution in pixels of a single still frame. **Examples**: 640 pixels x 480 pixels
3.14.2 Duration	**Definition**: The length of the video recording in minutes and seconds, or minutes, seconds, 100ths of seconds. **Examples**: 01:27:38:247
3.14.3 Number of Frames	**Definition**: The number of frames present in the video recording. **Examples**: 10000
3.14.4 Frame Rate	**Definition**: The rate at which the video should be shown to achieve the intended effect – expressed in frames per second (fps). **Examples**: 25
3.14.5 Codec Method	**Definition**: The name, including version level, of the codec method applied to the video. Note that video compression, or bit rate reduction is a non-reversible "lossy" process. **Examples**: DivX 5.0.5
3.14.6 Aspect Ratio	**Definition**: The desired aspect ratio of the image on screen. **Examples:** 4:3
3.14.7 Scan Mode	**Definition:** An indicator showing whether the digital item is scanned in a progressive or interlaced mode. **Examples**: Progressive, Interlaced
3.14.8 Sound Indicator	**Definition**: An indicator of the presence of sound in the video file. **Examples**: Yes, No **Note**: If the value is 'yes', then the video file will also be associated with an instance of the Audio metadata (3.13) in addition to the Video metadata (3.14)

Element 3.15 Text	
3.15.1 Character Set	**Definition**: The character set used when creating the file. **Examples**: ASCII; Unicode; EBCDIC, UTF-8
3.15.2 Markup Language	**Definition**: The type of mark up language used to mark up the document. **Examples**: SGML, XML, HTML

3.16 Datasets – No unique fields, uses minimum set 3.1 - 3.11.

3.17 System Files – No unique fields, uses minimum set 3.1 - 3.11.

3.4. Entity 4 – Metadata Modification

DEFINITION: Metadata Modification is defined as changes or amendments to an existing metadata record.

PURPOSE: The Metadata Modification entity records information about the history of changes made (by whom and when) to the preservation metadata subsequent to the initial metadata creation. Recording changes to the preservation metadata record acknowledges that the record is itself an important body of data about the object that requires management over time.

Element 4.1 Object Identifier

Definition	See 1.3 Object Identifier

Element 4.2 Metadata Record Modifier

Definition	The name of the person who made this modification to the preservation metadata record.
Rationale	To provide a list of individuals who have been involved in modifications to this metadata record.
Essential	Y
Format	Text
Examples	Dave Thompson, Digital Library Transition Team
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 4.3 Date and Time

Definition	The date/time that this change to the preservation metadata was completed.
Rationale	To provide a history and sequence of changes.
Essential	Y
Format	yyyy-mm-ddthh:mm:ss
Example	2002-06-07 11:25:06
Source	Manually entered or system derived
Overlaps	None
Remarks	Date will be expressed in a standard format (see Appendix 4).

Element 4.4 Field Modified

Definition	A record of the field the modifications were made to.
Rationale	To provide a history of modifications made to this metadata record.
Essential	Y
Format	Text
Example	Completion date and time
Source	Manual entry or system derived
Overlaps	None
Remarks	None

Element 4.5 Data Modified

|	
Definition	A record of the data that was modified.
Rationale	To provide a history of modifications made to this metadata record.
Essential	Y
Format	Text
Example	2002-10-29 10:29:31 to 2002-11-17 14:29:28
Source	Manual entry or system derived
Overlaps	None
Remarks	Entries should not be so extensive as to repeat any Entity 2 Process details.

Appendix 1 – Preservation Metadata Model

```
                                    ┌──────────────┐
                                    │   METADATA   │
                                    │ MODIFICATION │
                                    └──────────────┘
                                           │
                                           ○
              ┌──────────┐        ┌──────────────┐        ┌──────────┐
              │ PROCESS  │─▷─○────│    OBJECT    │───◁────│   FILE   │
              └──────────┘        └──────────────┘        └──────────┘
```

ENTITY 1 - OBJECT

1.1	Name of object
1.2	Reference number
1.3	Object identifier
1.4	Group Identifier
1.5	Persistent identifier
1.6	Preservation Master Creation Date
1.7	Logical composition
1.8	Is part of group
1.9	Structural type
1.10	Hardware environment
1.11	Software environment
1.12	Installation requirements
1.13	Access inhibitors
1.14	Access facilitators
1.15	Quirks
1.16	Metadata record creator
1.17	Date of metadata record creation
1.18	Structural composition
1.19	Comments

ENTITY 2 - PROCESS

2.1	Object identifier
2.2	Process type
2.3	Purpose
2.4	Person/agency performing process
2.5	Permission
2.6	Permission date
2.7	Hardware used
2.8	Software used
2.9	Steps
2.10	Result
2.11	Guidelines
2.12	Completion date and time
2.13	Comments
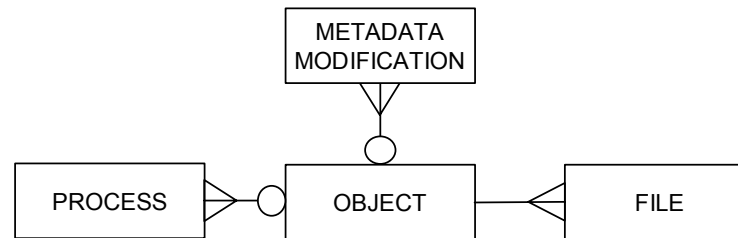
ENTITY 3 - FILE

3.1	Object identifier
3.2	File identifier
3.3	File path
3.4	Filename and extension
3.5	Former filename
3.6	File size
3.7	File date and time
3.8	MIME type
3.9	File format
3.10	File format version
3.11	Target indicator

3.12   IMAGE:
3.12.1	Resolution
3.12.2	Dimensions
3.12.3	Bits per sample
3.12.4	Colour space
3.12.5	Colour management
3.12.6	Colour map reference
3.12.7	Orientation
3.12.8	Compression

3.13   AUDIO:
3.13.1	Resolution
3.13.2	Duration
3.13.3	Bit rate
3.13.4	Compression
3.13.5	Encapsulation
3.13.6	Channels

ENTITY 3 – FILE (cont.)

3.14   VIDEO:
3.14.1	Frame dimensions
3.14.2	Duration
3.14.3	Number of frames
3.14.4	Frame rate
3.14.5	Codec method
3.14.6	Aspect ratio
3.14.7	Scan mode
3.14.8	Sound indicator

3.15   TEXT:
3.15.1	Character set
3.15.2	Mark up language

3.16   DATASETS:
Use common elements only

3.17   SYSTEM FILES:
Use common elements only

ENTITY 4 - METADATA MODIFICATION

4.1	Object identifier
4.2	Metadata record modifier
4.3	Date and time
4.4	Field modified
4.5	Data modified

Appendix 2 – NLNZ Preservation Metadata Schema (Revised) Change Table

The NLNZ Preservation Metadata Schema logical model has developed in light of increased experience and understanding of the data requirements for preservation. Changes in this second version of the model are a fine tuning of data requirements.

This table maps version 1 of the logical model of the NLNZ Schema to this version 2 of the logical model (consequential changes to label identifiers (eg 1.2, 1,3) are not reflected in the following table.

Three levels of change to this revised Logical Model

1. Refined = Minor semantic wording changes for consistency or clarification – no meaning or functional change,
2. Added = New elements added reflecting need for additional data,
3. Deleted = Elements deleted from version 2 as not necessary or data better held in other/additional elements

Logical Model Version 1	Logical Model Revised Version	Change	Reason for Change
Entity 1 – Object	**Entity 1 – Object**		
1.1 Name of object	1.1 Name of object		N/A
1.2 Reference number	1.2 Reference number	Refined	Minor wording change
1.3 Identifier - Object IID	1.3 Object Identifier	Refined	Minor wording change
	1.4 Group Identifier	Added	Provides a unique identifier for the intellectual construct 'object group'
1.4 Persistent Identifier – PID	1.5 Persistent Identifier	Refined	Minor wording change
1.5 UNIX location		Deleted	Files can always be located without this field being present
1.6 Date of creation of Preservation Master	1.6 Preservation Master creation date	Refined	Minor wording change
1.7 Technical composition		Deleted	Not relevant to entity 1 of the preservation metadata (see entity 3)
	1.7 Logical composition	Added	Flags whether the object is simple or complex
	1.8 Is Part of Group	Added	Flags that an individual object is part of a larger 'object group'
1.8 Structural type	1.9 Structural Type		N/AN/A
1.9 Hardware environment	1.10 Hardware environment	Refined	No longer essential
1.10 Software environment	1.11 Software environment	Refined	No longer essential
1.11 Installation requirements	1.12 Installation requirements	Refined	Minor wording change
1.12 Access inhibitors	1.13 Access inhibitors		N/A
1.13 Access facilitators	1.14 Access facilitators		N/A
1.14 Quirks	1.15 Quirks		N/A
1.15 Authentication		Deleted	Element deleted as data authentication is managed externally to the preservation process
1.16 Metadata record creator	1.16 Metadata record creator	Refined	Minor wording change

Logical Model Version 1	Logical Model Revised Version	Change	Reason for Change
1.17 Date of metadata record creation	1.17 Date of metadata record creation	Refined	Minor wording change
	1.18 Structural composition	Added	Describes for complex objects and object groups details of the individual files that comprise the object, including directory structure and the hierarchical position of each file.
1.18 Comments	1.19 Comments		N/A
Entity 2 – Process	**Entity 2 – Process**		
2.1 Object IID	2.1 Object identifier	Refined	Minor wording change
2.2 Process	2.2 Process		N/A
2.3 Purpose	2.3 Purpose		N/A
2.4 Name of the Individual, Business Unit or Agency	2.4 Person/agency performing process		Minor wording change
2.5 Permission	2.5 Permission		N/A
2.6 Date of permission	2.6 Date of permission	Refined	Minor wording change
2.7 Hardware used	2.7 Hardware used		N/A
2.8 Software used	2.8 Software used		N/A
2.9 Steps	2.9 Steps		N/A
2.10 Result	2.10 Result		N/A
2. 11 Guidelines	2. 11 Guidelines		N/A
2.12 Completion date and time	2.12 Completion date and time	Refined	Minor wording change
2.13 Comments	2.13 Comments		N/A
Entity 3 – FILE	**Entity 3 – FILE**		
3.1 Object IID	3.1 Object identifier	Refined	Minor wording change
3.2 File IID	3.2 File identifier	Refined	Refers now only to files that comprise a complex object
3.3 Structural context	3.3 File path	Refined	Distinguishes between files in a complex object with identical file names
3.4 Filename and extension	3.4 Filename and extension	Refined	Minor wording change
	3.5 Former filename	Added	Maintains the relationship between original file names and new file names applied as part of process to create preservation master
3.5 File size	3.6 File size		N/A
3.6 File date and time	3.7 File date and time	Refined	Minor wording change
3.7 MIME type/format	3.8 MIME type	Refined	This element was broken into two separate elements - MIME type and File Format
	3.9 File format	Added	Part of previous 3.7 MIME Type/Format
3.8 Version	3.10 File format version	Refined	Minor wording change
3.9 Target indicator	3.11 Target indicator	Refined	Minor wording change
3.10 IMAGE	**3.12 IMAGE**		

Logical Model Version 1	Logical Model Revised Version	Change	Reason for Change
3.10.1 Resolution	3.12.1 Resolution		N/A
3.10.2 Dimensions	3.12.2 Dimensions		N/A
3.10.3 Tonal resolution	3.12.3 Bits per sample	Refined	Changed to more accurately reflect NISO Z39.87
3.10.4 Colour space	3.12.4 Photometric Interpretation - Colour space	Refined	Changed to more accurately reflect NISO Z39.87
3.10.5 Colour management	3.12.5 Photometric Interpretation – ICC Profile Name	Refined	Changed to more accurately reflect NISO Z39.87
3.10.6 Colour lookup table	3.12.6 Colour map reference	Refined	Changed to more accurately reflect NISO Z39.87
3.10.7 Orientation	3.12.7 Orientation	Refined	Changed to more accurately reflect NISO Z39.87
3.10.8 Compression	3.12.8 Compression	Refined	Changed to more accurately reflect NISO Z39.87
3.11 AUDIO	**3.13 AUDIO**		
3.11.1 Resolution	3.13.1 Resolution	Refined	Changed to more accurately reflect the European Broadcasting Union's EBU P_Meta Semantic Metadata Scheme v 1.0
3.11.2 Duration	3.13.2 Duration	Refined	Changed to more accurately reflect the European Broadcasting Union's EBU P_Meta Semantic Metadata Scheme v 1.0
3.11.3 Bit rate	3.13.3 Bit rate	Refined	Changed to more accurately reflect the European Broadcasting Union's EBU P_Meta Semantic Metadata Scheme v 1.0
3.11.4 Compression	3.13.4 Compression	Refined	Changed to more accurately reflect the European Broadcasting Union's EBU P_Meta Semantic Metadata Scheme v 1.0
3.11.5 Encapsulation	3.13.5 Encapsulation	Refined	Minor wording change
3.11.6 Track number and type	3.13.6 Channels	Refined	Minor wording change
3.12 VIDEO	**3.14 VIDEO**		
3.12.1 Frame dimension	3.14.1 Frame dimensions		N/A
3.12.2 Duration	3.14.2 Duration	Refined	Minor wording change
	3.14.3 Number of frames	Added	New data required
3.12.3 Frame rate	3.14.4 Frame rate	Refined	Minor wording change
3.12.4 Compression		Deleted	Compression is an integral aspect of the refined 3.14.5 Codec
3.12.5 Video Encoding Structure	3.14.5 Codec method	Refined	Changed to reflect the distinction between the file format and the underlying encoding structure
	3.14.6 Aspect ratio	Added	New data required
	3.14.7 Scan mode	Added	New data required
3.12.6 Video Sound	3.14.8 Sound indicator	Refined	Minor wording change
3.13 TEXT	**3.15 TEXT**		
3.13.1 Compression		Deleted	This element was deleted as being unnecessary as text based objects will not be held as compressed preservation masters
3.13.2 Text Character set	3.15.1 Character set	Refined	Minor wording change

Logical Model Version 1	Logical Model Revised Version	Change	Reason for Change
3.13.3 Text Associated DTD		Deleted	This element was deleted as being unnecessary to the preservation process
3.13.4 Text Structural Divisions		Deleted	This element was deleted as being unnecessary to the preservation process
	3.15.2 Markup language	Added	This element added to better reflect properties of text based objects
3.14 DATASETS	**3.14 DATASETS**		
No unique fields, uses minimum set 3.1 - 3.9.	No unique fields, uses minimum set 3.1 - 3.11.	Refined	Minor wording change
3.15 SYSTEM FILES	**3.15 SYSTEM FILES**		
No unique fields, uses minimum set 3.1 - 3.9.	No unique fields, uses minimum set 3.1 - 3.11.	Refined	Minor wording change
Entity 4 – Metadata Modification	**Entity 4 – Metadata Modification**		
4.1 Object IID	4.1 Object identifier	Refined	Minor wording change
4.2 Modifier	4.2 Metadata record modifier	Refined	Minor wording change
4.3 Date and time	4.3 Date and time	Refined	Minor wording change
4.4 Field modified	4.4 Field modified		N/A
4.5 Data modified	4.5 Data modified	Refined	Minor wording change

Appendix 3 – Definitions

Authentication
A process of ensuring that the Preservation Master has not been altered, other than during processes which are recorded in the preservation metadata.

Complex Object
One Logical Object comprised of a group of dependent files, eg. a website or CD-Rom multimedia application.

Dissemination Format
A derivative of the Dissemination Source made for the purposes of access. Derivatives will be in different formats depending upon the type of access required (eg. thumbnail, preview).

Dissemination Source
A derivative of the Preservation Master made for the purpose of creating further Dissemination Formats that are delivered to users. The Dissemination Source minimises access-related processes carried out on the Preservation Master, and/or maximises the ease with which Dissemination Formats can be created.

Handle
An example of a Persistent Identifier scheme, developed by the Corporation for National Research Initiatives (see Appendix 4).

Object Identifier
An identifier assigned to digital objects within NLNZ as an internal management tool to associate objects with their metadata.

Logical Object
A coherent and discrete intellectual unit, which may be made up of one or more dependent or independent files. May be categorised as a Simple Object, a Complex Object or an Object Group.

Object Group
One Logical Object consisting of a group of independent files, eg. one floppy disk containing 100 letters. An intellectual structure imposed upon the files by the responsible curator may be reflected in changes to related metadata.

Original
The digital or non-digital material which is the source of the Preservation Master.

Persistent Identifier (PID)
A unique identifier permanently associated with a digital object that, when managed, will always provide permanent access to an object irrespective of any change in location of that object.

Preservation Master
The object, derived from the Original, which will be preserved, managed and disseminated over time.

Simple Object
One Logical Object comprised of a single file, eg. a Microsoft Word document consisting of one essay.

Appendix 4 – Associated Documents

The standards and frameworks contained in the following documents support the National Library's Metadata Standards Framework – Preservation Metadata by providing commonly accepted and pre-defined encoding standards for data entry. The purpose of using them is to avoid duplication of effort and to provide for interoperability with other systems.

This schema may be read in conjunction with the earlier version available at
http://www.natlib.govt.nz/en/whatsnew/4initiatives.html#meta

Adobe XMP – Extensible Metadata Platform
http://partners.adobe.com/asn/developer/xmp/pdf/MetadataFramework.pdf (Last accessed 24 October 2002)
The eXtensible Metadata Platform (XMP) provides Adobe applications with a common XML framework that standardises document metadata. XMP is based on the Resource Description Framework (RDF), W3C's open standard for metadata.

Data Dictionary - Technical Metadata for Digital Still Images
http://www.niso.org/standards/resources/Z39_87_trial_use.pdf (Last accessed 24 October 2002)
NISO Z39.87-2002/AIIM 20-2002 is a draft standard for trial use that specifies the technical metadata requirements for digital still images.

DCMI Type Vocabulary
http://www.dublincore.org/documents/2002/07/13/dcmi-type-vocabulary/ (Last accessed 19 May 2003)
The DCMI Type Vocabulary provides a general, cross-domain list of approved terms that may be used as values to identify the genre of a resource.

ISO 8601: 2000 : 1988 (E) Data elements and interchange formats – Information interchange – Representation of dates and times
http://www.iso.ch/ (Last accessed 24 October 2002)
ISO 8601: 2000 specifies numeric representations of date and time. This standard notation helps to avoid confusion in international communication caused by the many different national notations and increases the portability of computer user interfaces. The W3C date time format may also be used for better integration with the use of Dublin Core.

List of MIME Types
ftp://ftp.isi.edu/in-notes/iana/assignments/media-types/media-types (Last accessed 22 October 2002)
[RFC2045, RFC2046] specifies that Content Types, Content Subtypes, Character Sets, Access Types, and conversion values for MIME mail will be assigned and listed by the Internet Assigned Numbers Authority (IANA).

The Handle System
http://www.handle.net/ (Last accessed 23 October 2002)
Developed by the Corporation for National Research Initiatives (CNRI), the Handle System is a comprehensive system for assigning, managing, and resolving persistent identifiers, known as "handles," for digital objects.

Appendix 5 – The Preservation Master in the Digital Archive Workflow

This diagram shows a simplified NLNZ Digital Archive workflows, and the place of the Preservation Master within it.
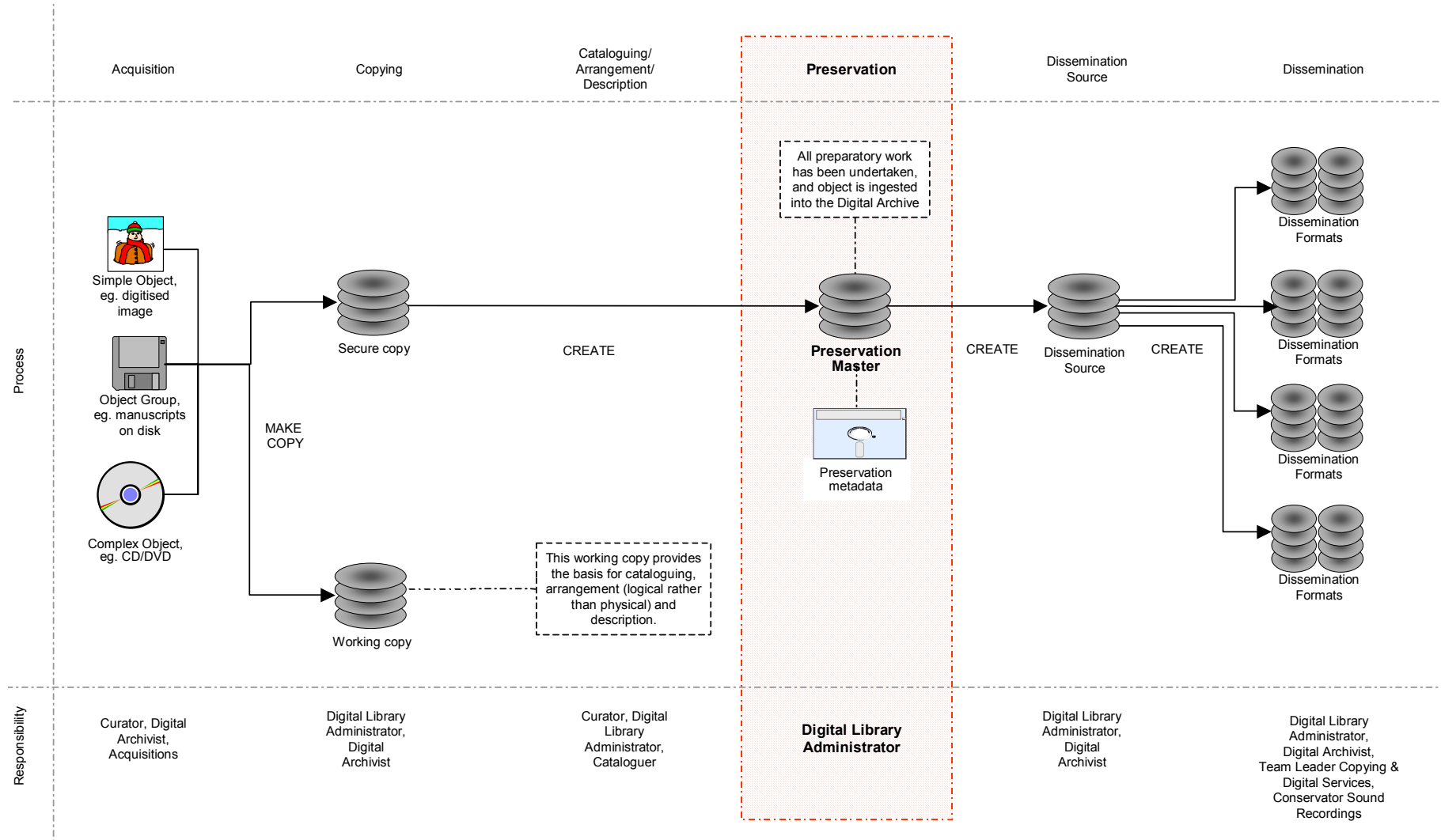
Appendix 6 – NLNZ Preservation Metadata Schema and the OCLC/RLG/OAIS Framework

The NLNZ Preservation Metadata Schema has been developed in the light of the emerging consensus regarding the role of the Open Archives Information System (OAIS) model and international research such as that undertaken by the OCLC/RLG Working Group on Preservation Metadata.

This table maps the NLNZ Schema to the framework proposed by the OCLC/RLG Working Group. The **Bold** words represent matches between NLNZ's and other models.

NLNZ	OCLC/RLG Framework			OAIS	
	Metadata Elements	**Sub-elements**	**High level framework**	**High level frameworks**	
Entity 1 – Object					
1.1 Name of object	**Resource description**	Existing metadata		Reference Information	Preservation Description
		Existing records			
1.2 Reference number	**Resource description**	Existing metadata		Reference Information	Preservation Description
		Existing records			
1.3 Object identifier	**Archival system id**	**Value**		Reference Information	Preservation Description
		Construction method			
		Responsible agency			
1.4 Group identifier					
1.5 Persistent identifier	**Global identification**	**Value**		Reference Information	Preservation Description
		Construction method			
		Responsible agency			
1.6 Preservation Master creation date					
1.7 Logical composition					
1.8 Is Part of Group					
1.9 Structural type	Structural type		Content Data Object Description	Representation Information	Content Information
1.10 Hardware environment			Environment Description	Representation Information	Content Information
			- **Hardware Environment**		
	Microprocessor requirements		- Computational Resources		
	Memory requirements				
	Documentation				
	Storage information		- Storage		

NLNZ	OCLC/RLG Framework			OAIS	
	Metadata Elements	**Sub-elements**	**High level framework**	**High level frameworks**	
	Documentation				
	Peripheral requirements		- Peripherals		
	Documentation				
1.11 Software environment			Environment Description	Representation Information	Content Information
			- Software Environment		
	Transformation process	Transformer engine	- Rendering Programs		
		- Parameters			
		- Input format			
		- Output format			
		- Location			
		- Documentation			
	Display/Access application	Input format			
		Output format			
		Location			
		Documentation			
1.12 Installation requirements	**Installation requirements**		Content Data Object Description	Representation Information	Content Information
1.13 Access inhibitors	**Access inhibitors**		Content Data Object Description	Representation Information	Content Information
1.14 Access facilitators	**Access facilitators**		Content Data Object Description	Representation Information	Content Information
1.15 Quirks	Quirks		Content Data Object Description	Representation Information	Content Information
1.16 Metadata record creator					
1.17 Date of metadata record creation					
1.18 Structural composition					
1.19 Comments					
Entity 2 - Process					
2.1 Object identifier	(see 1.3 object identifier)				
2.2 Process	Archival retention			Provenance Information	Preservation Description
	- Event	**Designation**			

NLNZ	OCLC/RLG Framework			OAIS	
	Metadata Elements	Sub-elements	High level framework	High level frameworks	
2.3 Purpose	Archival retention			Provenance Information	Preservation Description
	- Event				
2.4 Person/agency performing process	Archival retention			Provenance Information	Preservation Description
	- Event	Responsible agency			
2.5 Permission	Archival retention			Provenance Information	Preservation Description
	- Event				
2.6 Permission date	Archival retention			Provenance Information	Preservation Description
	- Event				
2.7 Hardware used	Archival retention			Provenance Information	Preservation Description
	- Event				
2.8 Software used	Archival retention			Provenance Information	Preservation Description
	- Event				
2.9 Steps	Archival retention			Provenance Information	Preservation Description
	- Event	Procedure			
2.10 Result	Archival retention			Provenance Information	Preservation Description
	- Event	Outcome			
2. 11 Guidelines	Archival retention			Provenance Information	Preservation Description
	- Event				
2.12 Completion date and time	Archival retention			Provenance Information	Preservation Description
	- Event	Date			
2.13 Comments	Archival retention			Provenance Information	Preservation Description
	- Event	Note			
Entity 3 – File					
3.1 Object identifier	(see 1.3 object identifier)				
3.2 File identifier					
	File Description		Content Data Object Description	Representation Information	Content Information
3.3 File path					
3.4 File name and extension					
3.5 Former file name					
3.6 File size					
3.7 File date and time					
3.8 MIME type					

NLNZ	OCLC/RLG Framework			OAIS	
	Metadata Elements	**Sub-elements**	**High level framework**	**High level frameworks**	
3.9 File format					
3.10 File format version					
3.11 Target indicator					
3.12 Image					
3.12.1 Resolution					
3.12.2 Dimensions					
3.12.3 Bits per sample					
3.12.4 Photometric interpretation – color space					
3.12.5 Photometric interpretation – ICC profile name					
3.12.6 Colour map reference					
3.12.7 Orientation					
3.12.8 Compression					
3.13 Audio					
3.13.1 Resolution					
3.13.2 Duration					
3.13.3 Bit rate					
3.13.4 Compression					
3.13.5 Encapsulation					
3.13.6 Channels					
3.14 Video					
3.14.1 Frame dimensions					
3.14.2 Duration					
3.14.3 Number of frames					
3.14.4 Frame rate					
3.14.5 Codec method					
3.14.6 Aspect ratio					
3.14.7 Scan mode					
3.14.8 Sound indicator					
3.15 Text					
3.15.1 Character set					
3.15.2 Markup language					
3.16 Datasets					

NLNZ	OCLC/RLG Framework			OAIS	
	Metadata Elements	**Sub-elements**	**High level framework**	**High level frameworks**	
3.17 System Files					
Entity 4 – Metadata Modification					
4.1 Object identifier	(see 1.3 object identifier)				
4.2 Metadata record modifier					
4.3 Date and time					
4.4 Field modified					
4.5 Date modified					

Appendix 7 – NLNZ Preservation Metadata Schema and NISO Z39.87 Technical Metadata for Digital Still Images

The NLNZ Preservation Metadata Schema will develop in light of emerging standards for metadata relating to the lowest level of digital objects – files.

This table maps the NLNZ Schema to one such standard, NISO Z39.87.

As NISO Z39.87 and similar standards for other file types evolve, they will be incorporated as appropriate.

NLNZ	NISO Z39.87 Technical metadata for still images		
	High level framework	**Metadata elements**	**Sub-elements**
Entity 1 – Object			
1.1 Name of object			
1.2 Reference number	7 Image creation	**7.2 SourceID**	
1.3 Object identifier	6 Basic image parameters	6.2 File	**6.2.1 ImageIdentifer**
1.4 Group Identifier			
1.5 Persistent identifier	6 Basic image parameters	6.2 File	**6.2.1 ImageIdentifer**
1.6 Preservation master creation date	9 Change history	9.1 Image processing	**9.1.1 DateTimeProcessed**
1.7 Logical composition			
1.8 Is Part of group			
1.9 Structural type			
1.10 Hardware environment	7 Image creation	**7.4 HostComputer**	7.4.1 OS (Operating System) 7.4.2 OS Version
1.11 Software environment			
1.12 Installation requirements			
1.13 Access inhibitors			
1.14 Access facilitators			
1.15 Quirks			
1.16 Metadata record creator			
1.17 Date of metadata record creation			
1.18 Structural composition			
1.19 Comments			
Entity 2 – Process			
2.1 Object identifier	6 Basic image parameters	6.2 File	**6.2.1 ImageIdentifer**
2.2 Process			

NLNZ	NISO Z39.87 Technical metadata for still images		
	High level framework	**Metadata elements**	**Sub-elements**
2.3 Purpose	7 Image creation	**7.10 Methodology**	
2.4 Person/agency performing process	9 Change history	9.1 Image processing	**9.1.3 ProcessingAgency**
2.5 Permission			
2.6 Permission date			
2.7 Hardware used	7 Image creation	7.6 ScanningSystemCapture	**7.6.1 ScanningSystem Hardware** - ScannerManufacturer - ScannerModel **7.7.1 Digital Camera Manufacturer** - Digital Camera Model
2.8 Software used	7 Image creation 9 Change history	7.6 ScanningSystemCapture 9.1 Image processing	**7.6.2 Scanning System Software** - ScanningSoftware - ScanningSoftware VersionNo - 7.6.2.3 ScannerCaptureSettings **OR** **9.1.4 ProcessingSoftware** - ProcessingSoftware Name - ProcessingSoftwareVersion
2.9 Steps	9 Change history	9.1 Image processing	**9.1.5 Processing Actions**
2.10 Result			
2. 11 Guidelines	7 Image creation	**7.10 Methodology**	
2.12 Completion date and time	9 Change history	9.1 Image processing	**9.1.1 DateTimeProcessed**
2.13 Comments			
Entity 3 – File			
3.1 Object identifier	6 Basic image parameters	6.2 File	**6.2.1 ImageIdentifer**
3.2 File identifier	6 Basic image parameters	6.2 File	**6.2.1 ImageIdentifer**
3.3 File path			
3.4 File name and extension	6 Basic image parameters	6.2 File	**6.2.1 ImageIdentifer**
3.5 Former file name			
3.6 File size	6 Basic image parameters	6.2 File	**6.2.2 FileSize**
3.7 File date and time	7 Image creation	**7.9 DateTimeCreated**	
3.8 MIME type	6 Basic image parameters	6.1 Format	**6.1.1 MIMEType**
3.9 File format			
3.10 File format version			
3.11 Target indicator			
3.12 Image			

NLNZ	NISO Z39.87 Technical metadata for still images		
	High level framework	Metadata elements	Sub-elements
3.12.1 Resolution	8 Imaging performance assessment	8.1 Spatial metrics	**8.1.2 SamplingFrequencyUnit AND 8.1.3 XSamplingFrequency AND 8.1.4 YsamplingFrequency**
3.12.2 Dimensions	8 Imaging performance assessment	8.1 Spatial metrics	**8.1.5 ImageWidth AND 8.1.6 ImageLength**
3.12.3 Bits per sample	8 Imaging performance assessment	8.2 Energetics	**8.2.1 BitsPerSample**
3.12.4 Photometric interpretation – color space	6 Basic image parameters	6.1 Format	6.1.4 Photometric interpretation **- ColorSpace**
3.12.5 Photometric interpretation – ICC profile name	9 Change history	9.1 Image processing	9.1.4 ProcessingSoftware
3.12.6 Colour map reference			**8.2.4 Colormap** - Colormap Reference - Colormap BitCodeValue - Colormap RedValue - Colormap GreenValue - Colormap BlueValue
3.12.7 Orientation	6 Basic image parameters	6.2 File	**6.2.4 Orientation**
3.12.8 Compression	6 Basic image parameters	6.1 Format	**6.1.3 Compression** - CompressionScheme - CompressionLevel
3.13 Audio …			
3.14 Video …			
3.15 Text …			
3.16 Datasets ...			
3.17 System Files ...			
Entity 4 – Metadata Modification			
4.1 Object identifier	6 Basic image parameters	6.2 File	**6.2.1 ImageIdentifer**
4.2 Metadata record modifier	9 Change history	**9.2 Previous image metadata**	
4.3 Date and time	9 Change history	**9.2 Previous image metadata**	
4.4 Field modified	9 Change history	**9.2 Previous image metadata**	
4.5 Data modified	9 Change history	**9.2 Previous image metadata**	

Appendix 8 – NLNZ Preservation Metadata Schema and the NLA Discussion Draft

The NLNZ Preservation Metadata Schema draws heavily on the work of the National Library of Australia's (NLA) Preservation Metadata for Digital Collections – Discussion Draft.

This table maps the NLA model with the NLNZ Schema. Additional and deleted elements are noted, as are elements which were retained, but with substantial changes to the definition of the element as it will be applied within NLNZ. Superficial changes, for example, to the wording of an element name, are not included.

NLA Original Element List	Elements added by National Library of New Zealand	Element Changed by National Library of New Zealand	Element Deleted by National Library of New Zealand	National Library of New Zealand Element Number
	Name of object			1.1
	Reference number			1.2
	Group identifier			1.4
1. Persistent identifier – type and identifier		Object identifier Persistent identifier		1.3 1.5
2. Date of creation		Preservation Master creation date		1.6
3. Structural type				
4. Technical infrastructure of complex object				
	Logical composition			1.7
	Is part of group			1.8
	Structural type			1.9
	Structural composition			1.18
	Comments			1.19
5. File description	N/A	N/A	N/A	
	Object identifier			3.1
	File identifier			3.2
	File path			3.3
	Filename and extension			3.4
	Former filename.			3.5
	File size			3.6
	File date/time			3.7
	MIME type			3.8
	File format			3.9

NLA Original Element List	Elements added by National Library of New Zealand	Element Changed by National Library of New Zealand	Element Deleted by National Library of New Zealand	National Library of New Zealand Element Number
	File format version			3.10
	Target indicator			3.11
5.1 Image	N/A	N/A	N/A	
5.1.1 Image format and version			Deleted	
5.1.2 Image resolution				3.12.1
5.1.3 Image dimensions				3.12.2
5.1.4 Image tonal resolution				
	Bits per sample			3.12.3
5.1.6 Image colour space	Photometric interpretation - colour space			3.12.4
5.1.7 Image colour management				
[	Photometric interpretation – ICC profile name			3.12.5
5.1.8 Image colour lookup table				
	Colour map reference			3.12.6
5.1.9 Image orientation				3.12.7
5.1.10 Image compression				3.12.8
5.2 Audio	N/A	N/A	N/A	
5.2.1 Audio format and version			Deleted	
5.2.2 Audio resolution				3.13.1
5.2.3 Audio duration				3.13.2
5.2.4 Audio bit rate				3.13.3
5.2.5 Audio compression				3.13.4
5.2.6 Audio encapsulation				3.13.5
5.2.7 Audio track number and type		Channels		3.13.6
5.3 Video	N/A	N/A	N/A	
5.3.1 Video file format and version			Deleted	
5.3.2 Video frame dimension				
	Frame dimension			3.14.1

NLA Original Element List	Elements added by National Library of New Zealand	Element Changed by National Library of New Zealand	Element Deleted by National Library of New Zealand	National Library of New Zealand Element Number
5.3.3 Video duration				3.14.2
	Number of frames			3.14.3
5.3.4 Video frame rate				3.14.4
	Codec method			3.14.5
	Aspect ratio			3.14.6
	Scan mode			3.14.7
5.3.5 Video compression			Deleted	
5.3.6 Video encoding source			Deleted	
5.3.7 Video sound		Sound indicator		3.14.8
5.4 Text	N/A	N/A	N/A	
5.4.1 Text format and version			Deleted	
5.4.2 Text compression			Deleted	
5.4.3 Text character set				3.15.1
5.4.4 Text associated DTD			Deleted	
5.4.5 Text structural divisions			Deleted	
		Markup language		3.15.2
5.5 Database	N/A	N/A	N/A	
	Datasets			3.1-3.11
5.5.1 Database format and version			Deleted	
5.5.2 Compression			Deleted	
5.5.3 Data type representation category			Deleted	
5.5.4 Representation form & layout			Deleted	
5.5.5 Maximum size of data element values			Deleted	
5.5.6 Minimum size of data element values			Deleted	
5.6 Executables	N/A	N/A	N/A	
	System files			3.1-3.11
5.6.1 Code type and version			Deleted	
6. Known system requirements			Deleted	
	Hardware environment			1.10
	Software environment			1.11

NLA Original Element List	Elements added by National Library of New Zealand	Element Changed by National Library of New Zealand	Element Deleted by National Library of New Zealand	National Library of New Zealand Element Number
7. Installation requirements				1.12
8. Storage information			Deleted	
9. Access inhibitors				1.13
10. Finding and searching aids, and access facilitators				1.14
11. Preservation action permission				2.5
12. Validation			Deleted	
13. Relationships			Deleted	
14. Quirks				1.15
15. Archiving decision – work			Deleted	
16. Decision reason – work			Deleted	
17. Institution responsible for archiving decision – work			Deleted	
18. Archiving decision – manifestation			Deleted	
19. Decision reason – manifestation			Deleted	
20. Institution responsible for archiving decision – manifestation			Deleted	
21 Intention type			Deleted	
22. Institution with preservation responsibility			Deleted	
			Deleted	
23. Process	N/A	N/A	N/A	
	Object identifier			2.1
23.1 Description of the process		Process		2.2
23.2 Name of the agency		Person/agency performing process		2.4
23.3 Critical hardware		Hardware used		2.7
23.4 Critical software		Software used		2.8
23.5 How process was carried out		Steps		2.9
23.6 Specifications		Guidelines		2.11

NLA Original Element List	Elements added by National Library of New Zealand	Element Changed by National Library of New Zealand	Element Deleted by National Library of New Zealand	National Library of New Zealand Element Number
23.7 Date and time		Completion date and time		2.12
23.8 Result		Result		2.10
23.9 Process rationale		Purpose		2.3
	Permission			2.5
	Permission date			2.6
23.11 Other		Comments		2.13
24. Record creator				1.16
	Date of metadata creation			1.17
	Object identifier			4.1
	Metadata record modifier			4.2
	Date and time			4.3
	Field modified			4.4
	Data modified			4.5
25. Other		Comments		1.19