Implementation of Data Alignment Measures for the Alignment of Planning, Lands and Public Works Data

Final Report (Volume 3B)
Appendices for Main Text

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Volume 3B – Appendices for Main Text

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Appendix A Methodology

1 General

1.1.1 Each CSU covers a different business domain. Six CSU sub-working groups, one each for every CSU, were formed. Prior discussions with major stakeholder PDs of the CSUs, questionnaires and selected examples helped expose the data alignment issues among PDs with respect to their CSU definitions. The close collaboration work on DAM 1 with the sub-working groups helped each PD understand the current practice, concerns of other PDs and the requirements with respect to the definition of the CSUs.

1.1.2 Implementation of DAM 1 would require a clear definition of each CSU. In addition to that, the Data Agent (the custodianship of each CSU would be included in the CSU specification) needs to prepare their facilities for data dissemination purpose. Also the Data Owners and Data Users of each CSU would need revamping.

2 CSU Specification

2.1.1 The CSU specification provides a definition of the CSU, CSU ID, common data attributes and data custodianship.

Definition

2.1.2 The CSU definition describes the scope of each CSU, delineation/segmentation rules of the polygons/lines.

CSU ID

2.1.3 The CSU ID is a unique persistent identifier representing a geospatial feature included in a theme of a CSU. A CSU identifier convention system for defining unique and persistent CSU ID of each CSU needs to be agreed among all PDs. If general consensus cannot be reached among the PDs for a particular identifier convention, or there is no existing identifier convention that can be adopted due to technical issues, a new identifier system will be created and agreed among members of the sub-working group;

2.1.4 On adoption of a CSU ID, both Data Users and Data Owners could choose either to use it as their own departmental database keys or maintain translation tables and conversion routines to translate their departmental IDs into the adopted CSU ID.

Common Data Attribute

2.1.5 PDs would need to exchange PLW data covering data domains of different CSU. Each CSU has a set of common attributes, which is derived through understandings of the collective needs of the PDs. When justified, the workflow would be revised to improve the efficiency and the effectiveness in the data exchange process falling within the CSU specification.

2.1.6 Each CSU feature is represented by its spatial properties together with a minimum set of non-locational attributes. The spatial data and non-locational attributes relevant to the CSU will be selected to form a set of common CSU data attributes. Each CSU attribute will be clearly defined, including its derivation and method of measurement, such that it is known and understood by all PDs. For example, the "elevation" attribute for the Building CSU may be defined as, "the top level of a building measured as mean height of the roof over the highest usable floor space in the building". Also abbreviation shall not be used.

2.1.7 When applicable, the common attributes shall conform to available standards. For example, ISO 10646 for Chinese encoded characters and other applicable standards stipulated in the latest version of the HKSAR Interoperability Framework.

2.1.8 As part of the CSU development process, the CSU attributes need to be normalized when required. Normalization is a common technique for analyzing relations based on their primary key and functional dependencies. The technique involves a series of rules that is used to test individual relations between datasets so that the database is flexible and constituent attributes can be combined as needed to support ad-hoc views and queries for new requirements.

2.1.9 Once the CSU's common attributes are identified, a data model, including the themes, data structures and applicable rules would be constructed.

2.1.10 There are issues that are common to DAM (in area of common attributes) and other similar initiatives of other B/Ds. These issues include the definition of address (e.g. how a district is defined) and the handling of Chinese characters. In the context of DAM 1, spatial geometry would partly resolve the address issue. Handling of the bilingual translation could be handled in two alternate ways:

(a) Develop a look-up routine

(i) A typical simple translation routine is a lookup routine made up of a mapping table between the English keywords and the Chinese counterpart. However, this only works for the attributes containing given values on the pre-defined list.

(b) Develop a automated translation routine

(i) A more advanced translation routine would be an automated translation tool, which typically requires successful modeling the words, grammar of the languages and the relationship between them. Apart from hard-coding these words, grammar and the relationships, some tools employ data-driven methods, the goal of which is to add on learning from a good collection of training examples of accurate translations.

(ii) A more sophisticated translation tool may consist of a source language automaton, a target language automaton, and an alignment table - a function which probabilistically links sequences of source and target language transitions that gives more flexibility in translation.

(iii) Despite the fact that the approach of automated translation tool can minimize effort of data entry and synchronization problem between English and Chinese attributes, it cannot be fully adopted to the CSUs as the semantic and wording of Chinese cannot be totally translated into English. For instance, "峭坡於教育路及西裕路交界" is the description of the Slope/Retaining wall location attribute in Chinese. After translation, it would become "cut slope between Education Road and West Yu Road". Yet the correct translation should have been "cut slope between Kau Yuk Road and Sai Yu Street" under the street jurisdiction. Thus, a precise translation would need a sophisticated translation tool and a comprehensive languages database.

(iv) Notwithstanding the comprehensiveness that could be improved, the automated translation tool would consume considerable resource of setting up the automated translation tool and language database, which has a tremendous cost implication on the overall project.

(v) On the other hand, PDs might have already maintained a pair of attributes in both English and Chinese for information without a pre-defined list of possible values. As such it would not induce additional data entry effort when it is adopted by CSU. Besides that, the cost implication of maintaining such pair attributes is much lower than that required for the translation tool and language database. This would be a practical option when keyword-mapping table is not applicable. However, it would have additional requirement on data storage in order to maintain a pair of attributes.

2.1.11 There might be situations that the existing systems are not 'Chinese-enabled' due to limitation posed by the existing version of GIS software which does not support the ISO 10646 standard for Chinese encoded characters, or when a database needed to be configured with double byte storage, thus enhancements to the existing system, software or database may be required to support bilingual languages.

Data Custodianship

2.1.12 On confirmation of the common data attributes, Data Agent and respective Data Owners would be identified. They would assist to confirm and agree the definition and requirements with respect to data quality and time currency with other concerned PDs.

Data Modelling

2.1.13 For data dissemination purpose, it is required to derive a data model for each selected CSU to illustrate how common data attributes are organized. The data model could help to identify the requirements of data interfacing and file format conversion, which also have an effect on the choice of a cost effective data dissemination option to support the data alignment measures. The standardisation of symbology for graphic entities (DAM 2) and standards on the file formats for exchanging data (DAM 3) will recommend the standards for the said conversion purposes.

2.1.14 The CSU Data Model includes themes, the data structures of common attributes and the applicable rules. The constraints imposed at different implementation stage could influence the data model to be adopted.

3 Data Modeling in DAF Implementation

3.1.1 The DAF is a long-term solution for a comprehensive data-sharing framework. The DAF is developed with reference to international best practices, including the key features in the spatial data infrastructures of leading countries on geographic information systems.

3.1.2 Some DAF models were discussed in previous PLW Study, e.g. the National Geospatial Data Framework (NGDF), Singapore Land Data Hub (LDH) Implementation and City of San Jose Implementation (discussed in Appendix 10 of the Final Report of the PLW Study). Singapore has implemented a centralised data hub in order to facilitate sharing of geospatial data between Government departments. The overall framework does contain all the major elements, including data, metadata, catalogue (search engine), standards and partnership. Singapore's implementation consolidates data and stores them in a single physical location.

3.1.3 Conceptually, the CSU Framework will consist of the following parts, as detailed in Table 1:

(a) CSU System;

(b) CSU_Theme Specification;

(c) CSU_ID Formation;

(d) Common Attribute Definition; and

(e) Data Ownership.

	Metadata Content
CSU System	Feature Metadata
CSU_Theme Specification	Theme Metadata
	Symbol Metadata
	Dataset Metadata
CSU_ID Formation	Feature Metadata
Common Attribute Definition	Feature Metadata
Data Ownership	Feature Metadata

Table 1 CSU Framework in DAF Implementation

3.1.4 The CSU system is a system that describes four kinds of metadata:

(a) Theme Metadata

(b) Feature Metadata

(c) Symbol Metadata, and

(d) Dataset Metadata

3.1.5 Feature metadata refer to the classification and identification of common spatial units (CSUs) and their constituent geospatial features developed, maintained, and mapped by agencies.

3.1.6 Symbol metadata refer to the definition of the representation of the themes of features and data within a map.

3.1.7 Dataset metadata refer to the details concerning the actual source data that are owned, proceeded, transformed and exchanged, and symbolized to represent the features within maps, reports and charts.

3.1.8 Feature Metadata consist of four data class components:

(a) CSU_Entity (a broad classification, consisting of semantically related themes of geospatial features, with a common set of relational attribute data, shared among users);

(b) CSU_Theme (a sub-classification of CSU_Entity, consisting of similar geospatial features and typically portrayed together with similar symbols and fonts in maps. The respective symbols and fonts of each CSU_Theme attribute can be referenced from the CSU_Subtheme which defines the minimum mapping unit for symbolization, representing the geographical phenomena from different perspectives. CSU_Subthemes are specific to map products and decision support applications);

(c) CSU_Feature (is a particular instance of a CSU_Theme. Each of which is a persistent uniquely identified geospatial feature, representing a facility or named place, mapped and managed by HKSAR). For each CSU_Feature, there are two metadata attributes: CSU_ID and CSU_Feature_Status;

(d) CSU_Dataset (is a group of geometry and attribute value data records, for a set of CSU_Features, that have identical lineage), is described here to support the reference to Feature Metadata as illustrated in the following figure:

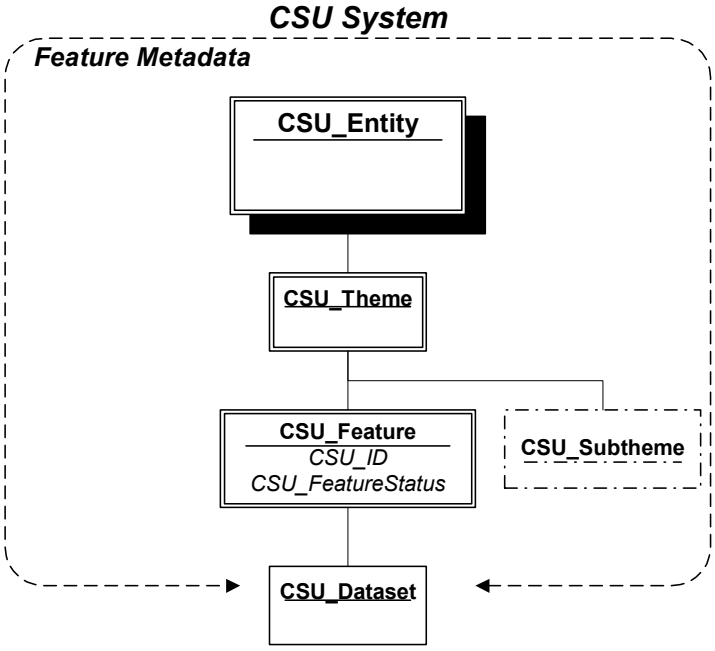

Figure 1 Feature Metadata of CSU System

3.1.9 Conceptually, the above CSU Framework might fit in well with the later DAF implementation, and it requires a sophisticated metadata catalog system for metadata distribution. However, since it might require extensive revamping to the system of the Data Owner who is responsible to provide the spatial data of the

CSU, this CSU framework might not be workable within the committed time frame and this framework could be more appropriate to be adopted in the DAF implementation.

3.1.10 Nevertheless, to interlink between DAM1, DAM2, and DAM3, the conceptual framework of Feature Metadata will be adopted in the DAM, of which DAM 2 will address the relationship between CSU_Theme and CSU_Subtheme; and DAM 3 will address the relationship between CSU_Theme and CSU_Dataset.

(a) CSU_Subtheme defines the minimum mapping unit for symbolization and it provides the basis for data alignment measures for symbolization (DAM 2). They are specific to map products and decision support applications.

(b) CSU_Dataset is a group of geometry and attribute value data records for a set of CSU_Features that have identical lineage. This will be discussed in DAM 3.

3.1.11 For long-term solution in DAF application, a more robust OO (Object Oriented) model could be considered in this CSU Framework. Although a few PDs (very limited number) have had implemented OO approach for trial use in some of the pilot schemes, most of the existing GIS systems of the PDs do not support OO.

4 Data Modelling in DAM Implementation

4.1.1 DAMs are short-term measures recommended for providing quick relief within a time frame of about one year. It is required to develop a workable technical specification covering the definition of the selected CSUs (DAM 1) together with file format (DAM 3) which could be implemented within the committed timeframe.

4.1.2 In the context of DAM 1, the CSU data model shall mean a logical model that describes how themes, features and common attributes are structured and the data model shall conform to the CSU specification. The proposed CSU data model shall be a workable model, which could meet the essential requirement for data alignment purpose in the exchange of CSU data.

Appendix B System Interfacing Building, Lot and Road Centreline

1 Introduction

1.1 Background

1.1.1 The Housing, Planning and Lands Bureau (HPLB) started an initiative to align the exchange of planning, lands and public works data among different participating departments in early 2000. Data Alignment Measures (DAM) are formulated as one of the components in the Data Alignment Strategy (DAS) to address the pressing data exchange problems existing within the participating departments (PDs).

1.1.2 Amongst all of the measures in DAM, DAM1 is to establish Common Spatial Units (CSU) - Slope, Building, Lot, TPU/SB (Tertiary Planning Units/Street Block), Road Centreline, and related thematic layers (CSU Themes) for solving the data definition problems.

1.1.3 Formulation of the data model for each CSU is to describe the logical structure of CSU data exchanged between the interfacing systems of PDs. The workflow process of CSU covered in different stages of data exchange is also identified in deriving the data model.

2 Interfacing Specification

2.1 Interfacing requirements

2.1.1 This section provides the background information describing the interfacing specification of the CSU dataset.

CSU Workflow

2.1.2 The Specification of Building CSU, Lot CSU and Road Centreline CSU for the sequence of data flow of the corresponding CSU summaries the data exchange processes in a generalized cycle, charting major data records and information exchanged amongst PDs. As such, the Data Owners and Data Agent could review when and what they have to provide to the particular CSU in a particular time frame and stages along the CSU lifespan.

CSU Data Structure

2.1.3 The Specification of Building CSU, Lot CSU and Road Centreline CSU describes the logical structure of CSU data exchanged between the interfacing systems of PDs.

2.1.4 In addition to the logical data structure, some of the background information regarding the scope of CSU, CSU ID, Data Ownership, CSU Status, Thematic Layers and Data Attributes is also specified.

2.1.5 PDs, as either Data Users or Data Owners, are not required to adopt the same logical data structure in their own departmental systems. However, each PD is required to maintain mappings between CSU and their departmental records in their respective departmental system(s) such that Data Owners can extract data from their departmental system according to definition of CSU and Data Users can import the CSU data into their departmental system for further processing/ analysis. Mapping of the unique CSU ID for a CSU with the departmental ID for all CSU data created after implementation of DAM is required, which may be a one-to-one, one-to-many or many-to-one relation (but a many-to-many relation is not recommended) depending on data definition of PDs' departmental records.

2.1.6 Particular for Lot CSU, the Lot CSU ID is available in several formats. PDs can choose any one format that most convenient to their departmental systems for building up mappings with their departmental records.

CSU Data Structure

2.1.7 Please refer to the Specification of the specific CSU, which describes the logical structure of CSU data exchanged between the interfacing systems of PDs.

2.1.8 In addition to the logical data structure, some of the background information regarding the scope of CSU, CSU ID, Data Ownership, CSU Status, Thematic Layers and Data Attributes is also specified.

2.1.9 PDs, as either Data Users or Data Owners, are not required to adopt the same logical data structure in their own departmental systems. However, each PD is required to maintain mappings between CSU and their departmental records in their respective departmental system(s) such that Data Owners can extract data from their departmental system according to definition of CSU and Data Users can import the CSU data into their departmental system for further processing/ analysis. Mapping of the unique CSU ID for a CSU with the departmental ID for all CSU data created after implementation of DAM is required, which may be a one-to-one, one-to-many or many-to-one relation (but a many-to-many relation is not recommended) depending on data definition of PDs' departmental records.

CSU Data Provision (from Data Owners to Data Agent)

2.1.10 The dataset that a Data Owner submits to the Data Agent should include all the entities/tables owned (no matter wholly or partially) by the Data Owner.

2.1.11 It is preferable for Data Owners to provide incremental updates, instead of full set of data they owned, to the Data Agent. For Data Owners who cannot identify

recently changed CSUs due to limitation of their legacy systems, they should provide the smallest set of identified data (e.g. for building polygons that currently maintained in tile-based manner instead of object-based, only the affected tiles should be provided to the Data Agent instead of all tiles). Data Agent may regard all records uploaded by Data Owners as recently changed, and the last upload timestamp of these records in the CSU dataset will be refreshed.

2.1.12 Entities owned by each PD are summarised below, while the details are defined in the Data Ownership part under each entity in the corresponding CSU's Specification:

(a) Building CSU

PD	**Entity**	**Ownership[1]**
ArchSD	Building Geographical Info	F
	Building Structural Info	F
	Geo-Struct Mapping	R
	Data Provision Date	R
BD	Building Geographical Info	F
	Building Structural Info	F
	Geo-Struct Mapping	R
	Building OP Info	T
	OP Info	T
	Building Lot No In OP	T
	Data Provision Date	R
LandsD[2]	Building Geographical Info	F
	Proposed Tower Polygon	T
	Proposed Podium Polygon	T
	Active Tower Polygon	T
	Active Podium Polygon	T
	Demolished Tower Polygon	T
	Demolished Podium Polygon	T
	Building Structural Info	F
	Geo-Struct Mapping	R
	Development Name	R
	Building Development Name	R

[1] Mode of Ownership: T - the PD owns the entire entity; R - the PD owns all attributes of particular records; F - the PD owns only particular attributes of particular records.

[2] LandsD would provide surveyed addresses for converted data for buildings constructed before implementation of DAM only. Hence, the Building Address entity is not included in the ongoing exchanged entity list above.

PD	Entity	Ownership[1]
	Building Name	R
	Data Provision Date	R
	Participating Department	T
	Renamed CSU	T
PlanD	Building Geographical Info	F
	Building Structural Info	F
	Geo-Struct Mapping	R
	Data Provision Date	R
RVD	Development Name	R
	Building Development Name	R
	Building Name	R
	Building Address	R
	Street Location	T
	Street Name	T
	Location Name	T
	Data Provision Date	R

Table 2 Ownership of entity for Building CSU

(b) Lot CSU

PD	Entity	Ownership[3]
LandsD	Land Info	T
	Resumption Notice	T
	Land Resumption Notice	T
	Lot Type Name	T
	Lot Type District	T
	Land Classification	T
	Area Unit	T
	Land Ownership	T
	Lease Condition Type	T
	Lease Use	T
	Lot Polygon	T
	Overlap Lot Polygon	T
LR	Lot Register	T
	Lot Register Lot Type	T

[3] Mode of Ownership: T - the PD owns the entire entity; R - the PD owns all attributes of particular records; F - the PD owns only particular attributes of particular records.

PD	Entity	Ownership[3]
	Lot Register Area	T
	Memorial	T
	Lot Register Memorial	T
	Memorial Nature	T
	Subdivision History	T

Table 3 Ownership of entity for Lot CSU

(c) Road Centreline CSU
LandsD is the sole Data Owner for Road Centreline CSU. All entities, as depicted in the specification, are owned by LandsD.

CSU Data Dissemination (from Data Agent to Data Users)

2.1.13 Upon the implementation of CSU, the Data Users have to acquire the data from the Data Agent, rather than obtaining data from each respective Data Owners, such that the data exchange processes would be streamlined.

2.1.14 To minimise redundant effort of data dissemination, CSU data should be disseminated from a single source, i.e. Data Agent. Among the PDs, the current mode of disseminating the PLW data that already covered by the CSU dataset will be ceased and replaced by the Data Agent's data dissemination option. On the other hand, for those PLW data which is yet to be included in the CSU dataset, the current mode of data exchange still applies.

2.1.15 Data dissemination Option A Stage 1 (Central Hub) is recommended for the Building CSU, Lot CSU and Road Centreline CSU. A dissemination system will be developed and hosted by the Data Agent. Subject to the final recommendation for the implementation of the data dissemination system of the CSUs,

(a) The system would include a central database, data upload facilities, data import programmes, data conversion tools and facilities to allow data download by Data Users for DAM 1 purpose. Web-based user interface might be considered as an option for data upload and download facilities.

(b) Data downloading from Data Agent to Data Users will be supported in both full dataset mode and incremental changes mode by the dissemination system hosted by the Data Agent. Periodically the Data Agent will pre-pack incremental changes in CSU information in all the supported file formats and make the packed files available for download from the dissemination system.

(c) Data Users can download the incremental changes in their preferred file format at their convenience. Full dataset download will be supported on ad hoc basis. Due to time needed for file format conversion for the large data volume, a full dataset in a requested file format may not be available for download on the fly but only after a couple of days. Meanwhile, all textual reference code tables will be available in full set mode only and will be refreshed at the same interval as the incremental changes.

CSU File format

2.1.16 DAM3 recommends the Standard File Formats for geospatial data exchange. The exchanges of CSU Data should conform to the standard. The recommended Standard File Formats include:

(a) Arc/Info Coverage 7.0 (in Arc/Info Export Format, i.e. E00); and

(b) DGN (Two-dimensional) version 7.0 (with Attributes storing in separated dBase IV Files).

2.1.17 Particular for Building CSU, notwithstanding the two suggested standard file formats, there might be some exceptions that prior consent need to be sought from Data Owner/Data Agent. For the Building CSU, ArchSD could only provide their data (the design drawings and as-built drawings, which serve as reference for LandsD to prepare the building polygons, together with the associated CSU textual attributes owned by ArchSD for Category 4 buildings) in DWG format to LandsD (the Data Owner of building spatial information as well as the Data Agent of the Building CSU).

2.1.18 Exchange of textual data usually occurs when a Data Owner provides only textual data to the Data Agent as geospatial data of the CSU are owned by another Data Owner. When there is exchange of pure textual data between Data Owners and Data Agent, recommended specification of Domain 3 of HKSARG Interoperability Framework (IF) will apply.

2.1.19 With respect to Standard File Formats, Data Owners should provide CSU data to the Data Agent in ANY ONE file format conforming to the standard file formats, whilst the Data Agent should disseminate the CSU data in ALL available standardised formats. In case when a PD (Data Agent, Data Owner or Data User) could not provide / receive the standardised file format(s), the PD should implement a Data Conversion Tool (DCT) to provide / receive the CSU data in the standardised file format(s).

Appendix C System Interfacing - Slope

1 Introduction

1.1 Background

1.1.1 The Housing, Planning and Lands Bureau (HPLB) started an initiative to align the exchange of planning, lands and public works data among different participating departments in early 2000. Data Alignment Measures (DAM) are formulated as one of the components in the Data Alignment Strategy (DAS) to address the pressing data exchange problems existing within the participating departments (PDs).

1.1.2 Amongst all of the measures in DAM, DAM1 is to establish Common Spatial Units (CSU) - Slope, Building, Lot, TPU/SB (Tertiary Planning Units/Street Block), Road Centreline, and related thematic layers (CSU Themes) for solving the data definition problems and provide a data model for data exchange purpose.

1.1.3 Formulation of the data model for each CSU is to describe the logical structure of CSU data exchanged between the interfacing systems of PDs. The workflow process of CSU covered in different stages of data exchange is also identified in deriving the data model.

2 Interfacing Specification

Interfacing requirements

2.1.1 This section provides the background information describing the interfacing specification of the Slope CSU dataset. In particular, workflow and logical data model from the Slope CSU Specification will be referred, process of data provision and data dissemination will be described to illustrate the system interfacing requirement for Data Agent, Data Owners and Data Users.

CSU Workflow

2.1.2 The Slope CSU Specification summaries the data exchange processes in a generalized cycle, charting major data records and information exchanged amongst PDs. As such, the Data Owners and Data Agent could review when and what they have to provide to the Slope CSU in a particular time frame and stages along the CSU lifespan.

CSU Data Structure

2.1.3 The Slope CSU Specification describes the logical structure of CSU data exchanged between the interfacing systems of PDs.

2.1.4 In addition to the logical data structure, some of the background information regarding the scope of CSU, CSU ID, Data Ownership, CSU Status, Thematic Layers and Data Attributes is also specified.

2.1.5 PDs, as either Data Users or Data Owners, are not required to adopt the same logical data structure in their own departmental systems. However, each PD is required to maintain mappings between CSU and their departmental records in their respective departmental system(s) such that Data Owners can extract data from their departmental system according to definition of CSU and Data Users can import the CSU data into their departmental system for further processing/ analysis. Mapping of the unique CSU ID for a CSU with the departmental ID for all CSU data created after implementation of DAM is required, which may be a one-to-one, one-to-many or many-to-one relation (but a many-to-many relation is not recommended) depending on data definition of PDs' departmental records.

CSU Data Provision (from Data Owners to Data Agent)

2.1.6 Periodically, the Works Department (Data Owner) would submit the incremental change of slope formation/inspection result to the Data Agent for registration and updating. The submission of slope plan and slope feature information should comply with the revised GeoGuide 5, that is, preferably using the CED' s Slope Information Input program for entering the textual information to ensure data integrity; and submitting the slope plan in hardcopy and agreed softcopy file format (whenever possible), that could streamline the Data Agent's efforts in updating the information. Such submission will go through an electronic channel, e.g. by means of FTP or as email attachment, to align with the e-Government strategy, and streamline the workflow.

2.1.7 LandsD (Data Owner) would submit the delta change of MR data (both spatial and textual data) to the Data Agent on a monthly basis. The Data Agent would then incorporate such data in the delta change, and convert them into supported file formats for downloading. Regarding the full set of MR data, LandsD would provide it to the Data Agent annually to facilitate data dissemination.

2.1.8 The Data Agent is regularly updating the slope information based on the submission of the Data Owners, and will prepare the incremental change of data (including the MR data) on a monthly basis for downloading. Besides, a full set of data will be provided to the Data Users on an ad-hoc basis.

CSU Data Dissemination (from Data Agent to Data Users)

2.1.9 Upon the implementation of CSU, the Data Users are encouraged to acquire CSU data from the Data Agent, rather than obtaining slope data from each respective Data Owner, such that the data exchange processes would be streamlined.

2.1.10 When the Slope CSU is implemented, CED will become the Data Agent providing a One-Stop service to disseminate both the slope feature and MR data.

2.1.11 To suit with future needs and also minimize additional effort, it is recommended to adopt CED 's existing Intranet web site for Slope CSU dissemination. Nevertheless, revamping of existing web site is required to cater for the Slope CSU requirement.

2.1.12 The CED's website would have a web interface to facilitate data uploading and downloading. This dissemination option will host the delta change of slope features and MR, as well as the full set of textual data for Data User downloading.

2.1.13 However, as the size of the full set spatial data of slope features and MR are huge, that might induce network traffic problem if they are also hosted in the CED 's web site for downloading without substantially upgrading the network infrastructure. On account of infrequent need of Data Users on acquiring the full set of spatial data (current practice is to disseminate them yearly), it is suggested to disseminate them in form of CD-ROM on an ad-hoc basis.

2.1.14 The Data Agent is required to prepare the data in form of CSU data model, and convert them into the file formats as recommended by DAM3, prior to placing them on the web site for the Data Users to download.

2.1.15 As the data dissemination is in offline mode, there is a time lag between the data preparation and the data dissemination.

CSU File format

2.1.16 DAM3 recommends the Standard File Formats for geospatial data exchange. The exchanges of CSU Data should conform to the standard. The Standard File Formats include:

(a) Arc/Info Coverage 7.0 (in Arc/Info Export Format, i.e. E00); and

(b) DGN (Two-dimensional) version 7.0 (with Attributes storing in separated dBase IV Files).

2.1.17 Exchange of textual data usually occurs when a Data Owner provides only textual data to the Data Agent as geospatial data of the CSU are owned by another Data Owner. When there is exchange of pure textual data between Data Owners and Data Agent, recommended specification of Domain 3 of HKSARG Interoperability Framework (IF) will apply.

2.1.18 With respect to Standard File Formats, Data Owners should provide CSU data to the Data Agent in ANY ONE file format conforming to the standard file formats, whilst the Data Agent should disseminate the CSU data in ALL available

standardized formats. In case when a PD (Data Agent, Data Owner or Data User) could not provide / receive the standardised file format(s), the PD should implement a Data Conversion Tool (DCT) to provide / receive the CSU data in the standardized file format(s).

Appendix D System Interfacing – TPU/SB

1 Introduction

1.1 Background

1.1.1 The Housing, Planning and Lands Bureau (HPLB) started an initiative to align the exchange of planning, lands and public works data among different participating departments in early 2000. Data Alignment Measures (DAM) are formulated as one of the components in the Data Alignment Strategy (DAS) to address the pressing data exchange problems existing within the participating departments (PDs).

1.1.2 Amongst all of the measures in DAM, DAM1 is to establish Common Spatial Units (CSU) - Slope, Building, Lot, TPU/SB (Tertiary Planning Unit/Street Block), Road Centreline, and related thematic layers (CSU Themes) for solving the data definition problems and provide a data model for data exchange purpose.

1.1.3 Formulation of the data model for each CSU is to describe the logical structure of CSU data exchanged between the interfacing systems of PDs. The workflow process of CSU covered in different stages of data exchange is also identified in deriving the data model.

2 Interfacing Specification

2.1 Interfacing requirements

2.1.1 This section provides the background information describing the interfacing specification of the TPU/SB CSU dataset. The PDs who are Data Agent/Data Users of the CSU dataset should read the following requirements before they start filling the cost estimation in Section 3.

CSU Workflow

2.1.2 Please refer to the TPU/SB CSU Specification for the sequence of data flow of the TPU/SB CSU. It summaries the data exchange processes in a generalized cycle, charting major data records and information exchanged amongst PDs. As such, the Data Agent (who is also the Data Owner) could review when and what they have to provide to the TPU/SB CSU in a particular time frame and stages along the CSU lifespan.

CSU Data Structure

2.1.3 Please refer to the TPU/SB CSU Specification, which describes the logical structure of CSU data exchanged between the interfacing systems of PDs.

2.1.4 In addition to the logical data structure, some of the background information regarding the scope of CSU, CSU ID, Data Ownership, Thematic Layers and Data Attributes is also specified.

2.1.5 PDs, as Data Users, are not required to adopt the same logical data structure in their own departmental systems. However, each PD is required to maintain mappings between CSU and the departmental records in their respective departmental system(s) such that Data Users can import the CSU data into their departmental system for further processing/ analysis.

CSU Data Dissemination (from Data Agent to Data Users)

2.1.6 Upon the implementation of CSU, the Data Users have to acquire the data from the Data Agent, rather than obtaining data separately from PlanD and WGPD, Data Owners of TPU/SB and Projected Population, such that the data exchange processes would be streamlined.

2.1.7 The TPU/SB CSU is composed of TPU polygon, SBVC polygon and the corresponding projected population data by TPU. Currently, PlanD is responsible for delineation and updating of the TPU and SB boundaries and will provide population data on behalf of WGPD. For the polygon data, the updating frequency is at about every five-year interval, while population projections are estimated and compiled on a yearly basis.

2.1.8 Since the Data Agent, PlanD, has an Intranet web site for disseminating their planning data, the resource spent on revamping it for hosting and disseminating the TPU/SB CSU could be considered.

2.1.9 Given that there is no immediate need to have real time data upload and download, it is recommended to adopt an off-line data dissemination method via the Data Agent's Intranet web site.

2.1.10 The Data Agent is required to prepare the data in form of the CSU data model, and convert them into the file formats as recommended by DAM3, prior to placing them on the website for the Data Users to download from.

CSU File format

2.1.11 DAM3 recommends the Standard File Formats for geospatial data exchange. The exchanges of CSU Data should conform to the standard. The tentative Standard File Formats include:

(a) Arc/Info Coverage 7.0 (in Arc/Info Export Format, i.e. E00); and

(b) DGN (Two-dimensional) version 7.0 (with Attributes storing in separated dBase IV Files).

2.1.12 Exchange of textual data usually occurs when a Data Agent provides only textual data to the Data Users in the annual updates of projected population data since geospatial data of the CSU are only updated once every 5 years. When there is exchange of pure textual data between Data Agent and Data Users, recommended specification of Domain 3 of HKSARG Interoperability Framework (IF) will apply.

2.1.13 With respect to Standard File Formats, the Data Agent should disseminate the CSU data in ALL available standardised formats. In case when a PD (Data Agent or Data User) could not provide / receive the standardised file format(s), the PD should implement a Data Conversion Tool (DCT) to provide / receive the CSU data in the standardised file format(s).

Appendix E Data Conversion Exercise - Building

1 Introduction

1.1.1 The objective of this one-off data conversion exercise is to consolidate data of existing buildings from PDs to establish an initial set of Building CSU data prior to the deployment of future Building CSU workflow. For the benefit of the data provider, respective data providers would ensure the completeness and timeliness of the data under their own jurisdiction and convert it to the requirement conforming to the agreed CSU specification while at the same time, they would maintain a mapping between their department ID of the dataset with the CSU ID. Existing buildings shall include the buildings already included in the spatial record of the latest version of BMS as of data conversion cutoff date. It includes those existing and proposed buildings already recorded by LandsD.

1.1.2 This document describes the agreed scope of conversion (with members of Building CSU subWG) and proposed arrangement for each responsible PD designated to convert information of existing buildings conforming to the Building CSU specification. These details, which were discussed in the sub-working group meetings on 10 July and 15 September 2003, are presented in the following sections. They include:

(a) General principle and assumptions of data conversion

(b) Scope of data conversion,

(i) By building categories and associated status, and

(ii) By attributes of building category

(iii) Provider PD of each attribute.

2 General Principles

2.1.1 Exchange of core building information of existing buildings is a collaboration process among PDs. Despite the problems (those problem types identified in the previous PLW Study) encountered, each PD has already managed to find ways to maintain their own set of building data of existing building good for their business use (e.g. for paper records, some PDs might have manually entered into their own systems). There is no imminent need to convert all textual attributes and complete the conversion by a pre-defined deadline.

2.1.2 For the existing buildings, data attributes of Building CSU not recorded in digital format will not be converted and these data attributes of the concerned records will be left blank in the initial CSU dataset. This is because conversion from paper

records would be costly while it may not be critical to have the data available in CSU dataset. If in case such data in hardcopy is converted into digital format during future maintenance, Data Owners are recommended to contribute the converted data to the CSU and make such data available to other PDs to improve efficiency and minimize duplication of effort within the government.

2.2 Assumptions

2.2.1 The followings are assumed in the formulation of the conversion plan:

(a) A compromised data accuracy (within reasonable limit) of both spatial and textual attributes of the existing buildings would be acceptable. For example, the first available set of podium polygons of existing buildings will be from PlanD and the originally adopted delineation rule may not conform to the revised BMS specification, which is mainly for the future buildings.

(b) The data conversion should be automated by using computer programs as far as possible. Manual conversion effort should be minimized.

3 Scope of Conversion

3.1 Building categories and associated status

3.1.1 All categories of existing buildings under the scope of the Building CSU will be included in the conversion exercise:

(a) Category 1: Both towers and podiums of Legal Private Buildings, and Housing Authority (HA) / Housing Society (HS) buildings under jurisdiction of the Buildings Ordinance (this includes HA's Home Ownership Scheme (HOS) buildings developed under the Private Sector Participation Scheme (PSPS) and HS's buildings that require an occupation permit and are under enforcement of the Buildings Ordinance);

(b) Category 2: New Territories Small Houses (a type of New Territories Exempted House (NTEH));

(c) Category 3: HA Buildings (including towers and podiums) - public housing and HOS estates (but except those under PSPS);

(d) Category 4: Other Government Buildings - including towers and podiums of government owned properties such as government offices, public schools, hospitals, etc.;

(e) Category 5: Miscellaneous Structures including temporary and open structures.

3.1.2 For each of the above building categories, the scope covers active buildings[4] only.

3.1.3 As of September 2003, the records of active buildings being maintained in PDs' computer systems are summarized as follows:

PD	No of Non-Podiums[5]	No of Podiums	Total
BD (with OP)	41,617	4,965	46,582
BD (w/ & w/o OP) (a)	92,400	5,008	97,408
C&SD (b)	-	-	183,200
LandsD (c)	190,800	-	190,800
PlanD (d)	103,847	1,495	105,342
RVD (Block) (e)	-	-	388,054
RVD (Building) (e)	-	-	324,517

Table 4 - Active Buildings in PDs

Notes:

(a) BD also has records of non-private buildings (i.e. buildings not under Category 1) maintained in their BCIS due to complaints/enquiries received from the public. These records are created on ad-hoc basis and only a small number of non-private buildings are recorded in their system.

(b) No indication of tower/podium is available in C&SD's Digital Mapping Sub-system.

(c) Only non-podium polygons are available on the BLDGPOLY layer of LandsD's B1000 Library.

(d) PlanD also maintains podium polygons. In the absence of consistent rules, PlanD will usually create podium polygons by joining building feature lines on the BLDG layer of LandsD's B1000 Library. Data accuracy (within reasonable limit) of both spatial and textual attributes of the existing podium polygons would need to be compromised. The first available set of podium polygons of existing buildings will be from PlanD and the originally adopted delineation rule may not conform to the revised BMS specification, which is mainly for the future buildings.

[4] The active buildings are those marked active as in data provider's system.

[5] Classification of podium and non-podium follows the definition of existing system (which may be different from that of the future CSU dataset).

(e) RVD defines their Building and Block records for each rateable property, and hence some of their Building/Block records may be out of scope of Building CSU (e.g. agricultural land, fish pond, open storage). RVD creates a Block record for each address (street name + building number). As shown in the Logical Data Model for System Interface document, one Building CSU can map to multiple RVD Blocks.

3.2 Attributes of buildings

3.2.1 Each tower or podium polygon will be converted to a Building CSU and assigned with a unique CSU ID by the Data Agent i.e. LandsD. The resultant dataset is a yet-to-complete Building CSU (a "base CSU") which contains the below information:

(a) CSU ID;

(b) Building Geographical Info record with all mandatory fields filled;

(c) Flag indicator that classify the record as an Active Tower Polygon / Active Podium Polygon.

3.2.2 Conversion of other attributes of Building CSU records will be carried out by various data providers. Data provider of an attribute of existing buildings is not necessarily the same as the Data Owner, since there are situations when the future Data Owner does not have electronic copy of the information in their existing system and the batch of data has to come from data provider, i.e. a PD who volunteers to offer their own available set as the first batch of the CSU data (e.g. LandsD is the Data Owner of podium data, but the first batch of podium data will come from PlanD).

3.2.3 All converted attribute data shall conform to the Building CSU specification and its logical data structure shall conform to the Logical Data Model documented in the System Interface document. Please refer to the Related Entity column in Table 5 for a mapping between an attribute and its related entities.

3.2.4 Each attribute of the Building CSU is assigned with priority with respect to conversion into the initial CSU dataset:

(a) C - Critical. Information for all CSUs must be converted into the initial CSU dataset.

(b) H - High. Information for all CSUs should be converted into the initial CSU dataset as far as possible.

(c) M - Medium. It is desirable to convert the information into the CSU dataset, but it is still acceptable to have the converted data available in a later stage.

(d) L - Low. It is acceptable for not converting the information into the CSU dataset, especially if considerable conversion cost is required for it.

3.2.5 The designated data providers, which are listed in the table below, will be responsible for converting their existing data into the CSU structure and ensuring correctness of the converted data.

3.2.6 Assignment of data providers, priority of conversion and related entity for each attribute are summarized in Table 5:

Common Attribute	Priority	Data Provider					Related Entity
		Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	
Building Polygon							
Tower Polygon	C	LandsD					Active Tower Polygon
Podium Polygon	C	PlanD					Active Podium Polygon
CSU ID	C	LandsD					Building Geographical Info
Status	C	LandsD					Building Geographical Info
Address							
Recorded Development Name	M	RVD					Development Name, Building Development Name
Surveyed Development Name	H	LandsD					Development Name, Building Development Name
Recorded Building Name	M	RVD					Building Name, Building Address
Surveyed Building Name	H	LandsD					Building Name
Street Name	H	LandsD					Building Address, Street Location, Street Name, Location Name
Building No.	H	LandsD					Building Address
Misc. Address Reference	L	RVD					Building Address
No. of Storey(s)	H	BD PlanD C&SD	PlanD C&SD	PlanD C&SD	PlanD C&SD		Building Structural Info
OP							
OP No.	M	BD					Building OP Info

Common Attribute	Prior-ity	Data Provider					Related Entity
		Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	
Lot No. as of OP	M	-					
Building Type as of OP	M	-					
OP Date	M	BD					OP Info, Building OP Info
Completion Year	M	BD	-	PlanD	PlanD		Building Structural Info
GFA	M	-					
Approximate Building Top Level	H	LandsD	LandsD	LandsD PlanD	LandsD PlanD	LandsD	Building Structural Info
Housing Scheme	M	PlanD		PlanD			Building Geographical Info
Certificate of Exemption Date	M		RVD				Building Geographical Info
Category	C	BD	-	PlanD	PlanD	-	Building Geographical Info, Building Structural Info
Demolition Completion Date	-	-	-	-	-	-	

Table 5 Data providers of Spatial and Textual Data for Existing Buildings

3.2.7 Remarks for particular attributes:

(a) Attributes that are not applicable for particular building categories are crossed-out and shaded in gray. E.g. OP related attributes for Category 2-5 buildings.

(b) Building Polygon -

(i) Towers - Each building polygon (after merging and dissolving for those lie on the tile borders of survey sheets) on the BLDGPOLY layer of the B1000 Library of LandsD will be converted as a tower polygon on the BLDGPOLY layer in the converted Building CSU dataset.

(ii) Podiums - Each podium polygon (after merging and dissolving for those lie on the tile borders of survey sheets) being maintained in TPIS of PlanD will be converted as a podium polygon on the PODPOLY layer in the converted Building CSU dataset.

(iii) Hence, as per Table 4, there will be around 192,295 CSUs converted into the initial dataset (190,800 non-podiums from LandsD + 1,495 podiums from PlanD).

(c) CSU ID -

(i) The Geo-reference No. component will reuse the Geo Reference No. of building polygons on the BLDGPOLY layer of the B1000 Library as far as possible.

(ii) To indicate converted records, the Record Creation Date component of all records will be assigned with a specific date prior to the conversion cut-off date. In case duplicate key is encountered using this specific date, the following date will be used for the second record, so and so forth.

(iii) The Polygon Type component will be assigned with 'T' for all tower polygons, while 'P' for all podium polygons.

(d) Status - Only active existing buildings will be converted into the CSU dataset, hence all converted CSU records will have Status set as 'A'.

(e) Surveyed Development Name, Surveyed Building Name - information not available for podium CSUs.

(f) Street Name, Building No -

(i) LandsD will provide the address as seen on site, but they have information for tower CSUs only but not for podium CSUs.

(ii) Meanwhile, RVD and PlanD will work together to check feasibility in finding out the recorded addresses for converted CSUs through RVD assessment numbers recorded in PlanD's TPIS. This approach may also help RVD in providing the Recorded Development Name, Recorded Building Name and Misc. Address Reference attribute data.

(g) No. of Storeys - If the value for a CSU record is available from multiple data providers, the value from BD (who have information on Category 1 buildings only) will be given priority for adoption into the CSU dataset, then PlanD's and finally C&SD's.

(h) Lot No. as of OP, Building Type as of OP - No PD has electronic data on hand now and hence these two attributes will not be converted for existing buildings.

(i) Completion Year - No PD has electronic data for Category 2 buildings on hand now, and hence the information will not be converted for existing Category 2 buildings.

(j) GFA - PlanD has GFA information per OP maintained in their existing system, but the corresponding OP No. is not recorded. Hence, they cannot contribute the information according to the future CSU logical data model for system interface.

(k) Approximate Building Top Level -

(i) LandsD has information of about 70% buildings as in late 1998.

(ii) PlanD is now trying to get the information from HD/ArchSD/GPA for Category 3/4 buildings that constructed after 1998. They can provide the approximate building top level for Category 3 and 4 buildings as at March 2003 by early December 2003.

(l) Housing Scheme - Information only applicable for Category 3 buildings, and those Category 1 HOS buildings which are constructed under the PSPS scheme.

(m) Certificate of Exemption Date - LandsD currently keeps the information in hardcopy only, while RVD has the information tied to their departmental building polygons (i.e. rating boundaries). RVD will provide the Certificate of Exemption Date information for those Building CSU records that can be linked up with their departmental building records. Yet, RVD may not have the information for all issued Certificate of Exemption and may provide the information for some non-Category 2 buildings. Hence, Data Users should not depend on this field value (null or non-null) to identify Category 2 buildings, instead the Category field should be referred.

(n) Category -

(i) BD will classify a Building CSU as Category 1 if it has OP information recorded in their system.

(ii) No PD has precise electronic data to identify Category 2 buildings.

(iii) PlanD can provide Category information for Category 3 buildings with an assumption that for all buildings including residential and commercial buildings located inside housing estate, they are under Category 3.

(iv) PlanD will identify Category 4 building mainly based on the building data collected from ArchSD and GPA. Yet, some education and utilities buildings may be private owned. They will

further check the list with lot layers and classify only those on government land as Category 4 buildings.

(v) For other converted records, '0' will be used to represent converted data for which Category information is not yet identified. Data Owner of the Category information may update these buildings to the appropriate Category after deployment of the future Building CSU workflow when they come across such buildings in their business operations.

(o) Demolition Date - Only active buildings will be converted and hence this attribute for all converted records will be left as null.

4 Conversion Approach

4.1 Overview of conversion process

4.1.1 The whole conversion process involves a number of sequential tasks which require input from LandsD, PlanD and other PDs. These tasks are:

(a) PlanD will provide the podium polygons to LandsD;

(b) Based on the tower and podium polygons information now available, LandsD will assign CSU ID to create the base CSU and pass these CSU information to PDs;

(c) PDs will carry out the conversion of the attribute information of the Building CSUs under their jurisdiction, and pass to LandsD.

(d) LandsD will complete conversion of attribute information of the Building CSUs for onward uploading to the DDS of the Building CSU.

4.2 Mapping between CSU ID and Departmental ID

4.2.1 A key step of the data conversion is for PDs to build up mappings between CSU IDs and Departmental IDs for existing buildings, so that data providers can extract information from their existing systems in terms of CSU ID.

4.2.2 Complexity of this mapping is well recognized. PDs may try to automate this through spatial overlay between CSU polygons and departmental polygons, and/or comparing address information like Street Name plus Building No, Building Name and Development Name. However, it is noted that there are considerable number of buildings which do not have Building Names, and some buildings in rural areas may not have official Building No assigned either. Due to the differences in business interpretation and focus, PDs may have their own departmental building polygons instead of adopting the polygons in the B1000

Library from LandsD. Typical differences may be merged or split in LandsD building polygons, or adopting site/lot polygons instead of building polygons to better suit individual departmental business needs. As a result, it is foreseen that an automated conversion cannot handle every CSU, and manual intervention is required to building up the mapping for the remaining set.

4.3 One-off conversion

Portion to be accomplished by software program

4.3.1 It is envisaged that the one-off conversion would require considerable manual conversion effort before DAM implementation. It would be acceptable not to complete 100% in the one off conversion exercise.

4.3.2 The one off conversion will be carried out with use of software program and it needs to be conducted before deployment of future CSU workflow.

(a) Use conversion programs to accomplish the best result achievable by the adopted algorithm. PDs can develop their own algorithm that best suit their departmental systems.

(b) Data providers for existing building information will then make use of the mapping results to extract the existing building information from their existing system and convert the data to conform to the CSU specification. This means that in the initial CSU dataset an attribute value of a CSU will not be available if the concerned data provider cannot successfully match this CSU with their departmental records in this exercise.

Portion to be accomplished manually

4.3.3 The portion that cannot be converted with the software program will have to be converted manually in on need basis, effort for this portion is not to be included in the resource estimation of data conversion:

(a) Manual mapping will be performed when there is a need for the departmental system to exchange information with the CSU database. It will only be performed after deployment of the future CSU workflow.

(b) Once a new mapping is built for a converted CSU, responsible Data Owner should contribute responsible attributes of this CSU to the CSU dataset. Note that data providers for attribute values of existing buildings after implementation of the Building CSU will follow the ongoing Data Ownership scheme (as documented in the Logical Data Model for System Interface document) instead of the assignment for one-off conversion exercise in Table 5.

(c) Data contribution for this part will make use of the ongoing data exchange channel (i.e. through the data dissemination system) and the interface data must conform to the ongoing interface data structure.

Trial / Fine-tuning

4.3.1 Apparently completeness of the data in the initial CSU dataset much depends on the ratio of records that can be handled with use of the software. Hence a trial conversion is suggested so that PDs can:

(a) Study/ verify feasibility of sharing existing data among PDs to facilitate/improve data mapping;

(b) Fine-tune their conversion program algorithm to handle more records which cannot be properly converted by the trial run version, so that more records can be converted automatically in actual execution;

(c) Obtain a better estimation on the ratio of departmental records that can be mapped to CSU by conversion programs, which is useful for assessing data completeness of the initial CSU dataset (i.e. the automated part) and potential costs for manual mapping for the remaining part.

5 Conversion Schedule

5.1 Stage Implementation

5.1.1 A schedule for the one-off data conversion exercise (i.e. the automated part) is proposed below. Description of each stage can be found in subsequent sections of this document.

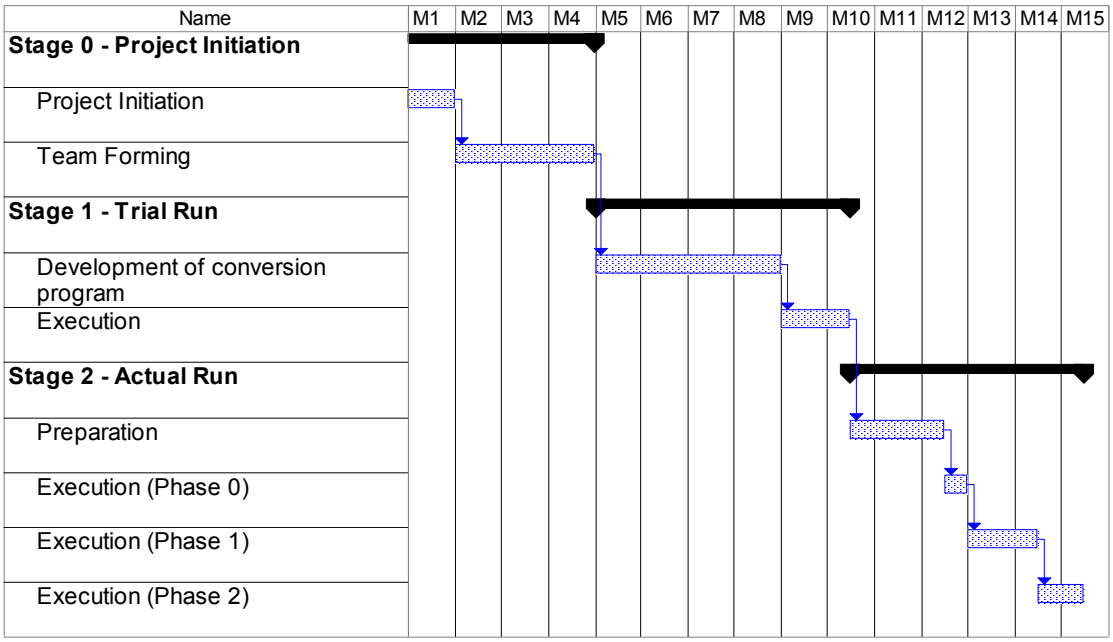

Figure 2 Proposed Schedule of Data Conversion for the Building CSU

Stage 0 - Preparation (4 months)

5.1.2 Project Initiation (1 month)

(a) A working team is to form with members nominated by Building CSU subWG. Members should include business and IT / GIS representatives from all Data Owners, all Data Users and the Data Agent. The working team will work out the detailed planning and monitor the progress of the conversion exercise.

(b) By the end of this sub-stage, a schedule for the trial run (i.e. Stage 1) should be agreed.

5.1.3 Team Forming (3 months)

(a) With assistance from HPLB, PDs will apply for funding for the data conversion exercise. The costs should cover trial run, refinement and execution of the actual run.

(b) For PDs who need to purchase new software or hardware for the revamping and conversion exercise, they need to carry out procurement, taking into account of the evaluation, procurement, delivery, installation and commissioning of such items.

(c) For PDs who opt to outsource the data conversion work, they should arrange procurement procedures to appoint consultant for the work.

(d) By the end of this sub-stage, each data provider should be ready to kick off data conversion work.

Stage 1 - Trial Run (5.5 months)

5.1.4 The implementation project team of the data dissemination system is suggested to join the working team starting from this stage, and is also recommended to be the coordinator for subsequent tasks.

5.1.5 The DDS implementation team shall review the conversion schedule with data providers, the working team members, and coordinate activities amongst the different parties, ensuring that activities are held according to plan. During Stage 1 and 2, the implementation team will play an active role in coordinating and leading the different activities, with close liaisons with all concerned parties.

5.1.6 Development of Conversion Program (4 months)

(a) An area with buildings from all categories is suggested for this trial. Both tower and podium polygons must be covered. It is suggested to have a trial set of not less than 10,000 building polygons (i.e. around 5% of all existing buildings).

(b) Physical data structure of a base CSU must be first agreed, which contains at least the tower/podium polygons plus the CSU ID.

(c) File formats for transient files should also be agreed beforehand:

(i) For the transient file of podium polygons from PlanD to LandsD, a file format that most convenient to both ends can be chosen.

(ii) For the transient file of base CSUs from LandsD to data providers, it is suggested that LandsD convert the data into multiple file formats so that all concerned PDs can read in the data. The actual list of supported file formats is subject to agreement by the working team, not necessarily follow the standard file formats as proposed in DAM3.

(d) To illustrate the agreed data structure and file format, a sample data file for base CSUs should be prepared for reference, which can contain only a couple of records.

(e) PDs will then design and develop their own conversion programs for:

(i) LandsD and PlanD - extract building polygons for buildings in the trial area.

(ii) LandsD - assign CSU ID to each building polygon, form base CSUs in agreed physical data structure, and convert the dataset of base CSUs into agreed file formats.

(iii) Data providers and future Data Users - map their departmental records with the base CSUs.

(iv) (Optional) Data providers - extract their responsible attributes in terms of the base CSUs, say into temporary tables. There is no need to write the extracted data into output interface file in this stage, because the physical data structure and file format are not yet finalized in this stage.

(f) By the end of this sub-stage, all data providers should have conversion programs ready for executing the trial run.

5.1.7 Execution (1.5 month)

(a) Trial conversion is executed:

(b) PlanD provides podium polygons to LandsD.

(c) LandsD creates base CSUs.

(d) Trial base CSUs disseminated to all working team members.

(e) Working team members execute their conversion programs for the trial base CSUs.

(f) PDs should report their conversion results to the working team, which cover:

(g) Number of CSUs that can be mapped with their departmental records;

(h) Number of CSUs with category identified (for data providers of the Category attribute only); and

(i) Analyze why the remaining set cannot be handled in the trial run. PDs should try to propose resolutions, especially for those failure case(s) that affect more records, and give an estimate on number of records that may be successfully handled in the actual run after implementing the resolutions.

Stage 2 - Actual Run (5 months)

5.1.8 Preparation (2 months)

(a) PDs start implementation of the resolutions proposed in the previous stage.

(b) At the same time the implementation project team of the data dissemination system should propose the physical data structure and file format of raw data files that to be contributed by data providers. If possible, the implementation project team can start this task earlier, e.g. during the execution period of trial run.

(c) After finalizing physical data structure and file format, data providers can develop export programs to create the raw data files.

(d) By the end of this sub-stage, PDs should have all conversion programs ready, and agreed on a data cut-off schedule.

5.1.9 Execution (Phase 0) (0.5 months)

(a) PlanD provides all on-hand podium polygons, regardless of area, to LandsD. LandsD create base CSUs using the podium polygons from

PlanD and the tower polygons from B1000 Library. Information of buildings that are constructed after the data cut-off date is to be exchanged according to the CSU Data Ownership scheme and through the future CSU channel.

(b) Constructed base CSUs are distributed to all PDs using CD-ROM.

5.1.10 Execution (Phase 1) (1.5 months)

(a) Only CSUs located in Hong Kong Island & Kowloon will be handled in this phase.

(b) Data providers will build up mapping between the base CSUs and their departmental records, and then extract their responsible data attributes into raw data files. Based on the conversion results data providers may implement minor enhancements on conversion programs for better handling of the remaining buildings in the next phase of execution.

(c) Implementation project team of the data dissemination system will collect raw data files from all data providers and merge them to form the initial CSU dataset. The implementation project team should provide the working team with a report on number of CSUs with converted values grouped by each building category and each attribute.

(d) If any issues found during data merging, the implementation project team of the data dissemination system will resolve the issues with concerned PDs. The project team may apply enhancements on the conversion program and re-execute the merging process wherever appropriate.

5.1.11 Execution (Phase 2) (1 month)

(a) Remaining CSUs will be handled in this phase.

(b) Data providers will build up mapping between the base CSUs and their departmental records, and then extract their responsible data attributes into raw data files.

(c) Implementation project team of the data dissemination system will collect raw data files from all data providers and merge them into the initial CSU dataset.

(d) If any issue found during data merging, the implementation project team of the data dissemination system will resolve the issues with concerned PDs.

Appendix F Data Conversion Exercise - Lot

1 Introduction

1.1.1 The objective of this one-off data conversion exercise is to consolidate data of existing lots from PDs and to establish an initial set of Lot CSU data prior to the deployment of future Lot CSU workflow. Respective data providers would ensure the completeness and timeliness of the data under their own jurisdiction and convert it to the requirement conforming to the agreed CSU specification. Existing lots shall include the lots already recorded by LandsD in the spatial record of the latest version of C1000 as of data conversion cutoff date.

1.1.2 This document describes the agreed scope of conversion (with members of Lot CSU sub-working group) and proposed arrangement for each responsible PD who is designated to convert information of existing Lots conforming to the Lot CSU specification. These details, which were discussed in the sub-working group meeting on 7 October 2003, are presented in the following sections. They include:

(a) General principle of data conversion;

(b) Scope of data conversion,

(c) Lots to be converted;

(d) Attributes of lot to be converted;

(e) Provider PD of each attributes

1.1.3 Also this document includes proposed conversion approach and proposed conversion schedule.

2 General Principle and Assumption

2.1.1 Despite the problems (as identified in the previous PLW Study) encountered in the data exchange of land lots information, each PD has already managed to find ways to maintain their own set of existing lot data good for their business use (e.g. for paper records, some PDs might have manually entered into their own systems). There is no imminent need to convert all textual attributes and complete the conversion by a pre-defined deadline.

2.1.2 For the existing lots, data attributes of Lot CSU not recorded in digital format will not be converted and these data attributes of the concerned records will be left blank in the initial CSU dataset. This is because conversion from paper records would be costly while it may not be critical to have the data available in CSU dataset.

2.1.3 As a general principle, this one-off data conversion exercise should target to be automated by using computer programs as far as possible. Manual conversion effort should be minimized.

3 Scope of Conversion

3.1 Lots to be converted

3.1.1 Only the active lot records are included in the scope of conversion. Inactive records are excluded. Inactive lot includes surrendered / resumed / subdivided lot.

3.1.2 As an estimation of data volume, as of July 2003, there are 365K lot boundaries in LOT and OVERLAP LOT layers maintained in LandsD's C1000 library.

3.1.3 It is noted the peculiar lots (around 2,650 out of total of 531K records in LR's LRS as in early 2003, which include both active and inactive lots) cannot be matched with the Lot CSU ID automatically.

3.2 Attributes of lot to be converted

3.2.1 The initial set of Lot CSUs will be created from the LOT and OVERLAPLOT layers in LandsD's C1000 library. The Lot ID in C1000-format will be used to uniquely identify the CSUs.

3.2.2 The following representations of Lot IDs will be converted from the active Lot Registers from LR's IRIS.

(a) LR's structural format (including eleven components, namely Lot Type, Lot Number, Section 1, Subsection 1, Section 2, Subsection 2, Section 3, Subsection 3, Section 4, Extension and Miscellaneous Item) as in the Land Registration System (LRS) to be used as part of address identifier in the Integrated Registration Information System (IRIS) - lot type, lot number, not more than 4 sections plus 3 subsections, extensions and an indicator of peculiar lots are stored in predefined fields.

(b) LR's Property Reference Number (PRN) to be adopted in IRIS - an 8-character unique identifier of lot registers.

(c) The full English lot description.

3.2.3 The designated data providers, which are listed in the table below, will be responsible for converting their existing data into the CSU structure and ensuring correctness of the converted data. Assignment of data providers, priority of conversion and related entity for each attribute are summarized in Table 5.

Common Attribute	Priority	Data Provider	Related Entity
Lot Boundary Polygon	C	LandsD	N/A
Lot ID (C1000-format)	C	LandsD	Land Info, Lot Register
Lot ID (LR structural format)	C	LR	Lot Register
Lot ID (PRN)	C	LR	Land Info, Lot Register
Lot ID (full English lot description)	C	LR	Lot Register
Class Code (Type of Grant)	M	LandsD	Land Info
Site Area	M	LandsD	Land Info
Site Area Units	M	LandsD	Land Info
Ownership Code	M	LandsD	Land Info
Condition Type	M	LandsD	Land Info
Condition Number	M	LandsD	Land Info
Use Code	M	LandsD	Land Info
Memorial Number	M	LR	Memorial
Date of Instrument	M	LR	Memorial
Nature Code of Memorial	M	LR	Memorial
District Code	H	LR	Lot Register
Consideration Part Code	M	LR	Memorial
Consideration	M	LR	Memorial
Nature Description	M	LR	Memorial
Lease Effective Date	H	LandsD	Land Info
Lease Term	H	LandsD	Land Info
Renewability	H	LandsD	Land Info
Resumption Notice Date	L	LandsD	Resumption Notice
Resumption Notice No	L	LandsD	Resumption Notice
Actual Reversion Date	L	LandsD	Resumption Notice
Certificate of Compliance Date	L	-	Land Info
Status	H	LandsD	Land Info

Common Attribute	Priority	Data Provider	Related Entity
Linkage between parent lot and subdivided lot	L	-	Subdivision History
Linkage between C1000-format and PRN Lot ID	H	LandsD	Land Info, Lot Register

Table 6: Data providers of Spatial and Textual Data for Existing Lot Records

3.2.4 Each attribute of the Lot CSU is assigned with a priority of conversion into the initial CSU dataset:

(a) C - Critical. Information for all CSUs must be converted into the initial CSU dataset.

(b) H - High. Information for all CSUs should be converted into the initial CSU dataset as far as possible.

(c) M - Medium. It is desirable to convert the information into the CSU dataset, but it is still acceptable to have the converted data available in a later stage.

(d) L - Low. It is acceptable for not converting the information into the CSU dataset.

3.2.5 Remarks for particular attributes:

(a) Lot Boundary Polygon –

(i) Directly extracted from LandsD's C1000 library. The active lot boundary polygons are organized in LOT and OVERLAPLOT layers.

(ii) To facilitate the spatial query and filtering operation, the full set of polygons should be maintained in a seamless manner, that is, the split polygons locating along the tile borders should be merged, and the borderlines should be dissolved in the process of initial data conversion.

(b) Due to historical reasons, the following attributes might not be available for every lot:

(i) Class Code (Type of Grant);

(ii) Site Area;

(iii) Site Area Units;

(iv) Ownership Code;

(v) Condition Type;

(vi) Condition Number;

(vii) Use Code;

(viii) Lease Effective Date;

(ix) Lease Term;

(x) Renewability.

(c) The one-off data conversion exercise might not completely map every lot from LandsD (Land Info record) with the corresponding lot register from LR (Lot Register record). As a result, after the full historical memorial data (Memorial and Lot Register Memorial records) is converted into the Lot CSU dataset for every active lot, Data Users might not be able to browse the full history from lot boundaries for the following memorial attributes even after initial data conversion:

(i) Memorial Number

(ii) Date of Instrument

(iii) Nature Code of Memorial

(iv) Consideration Part Code

(v) Consideration

(vi) Nature Description

(d) As only free-text lot description is available in LAS, significant manual effort would be required to match the free-text lot description with the C1000-format Lot ID. Therefore, it is suggested not to convert the following resumption notice attributes to avoid manual processing:

(i) Resumption Notice Date;

(ii) Resumption Notice No;

(iii) Actual Reversion Date.

(e) Certificate of Compliance Date (CC Date) – It is suggested not to convert the CC Date in the one-off data conversion due to the lack of complete lots records available from the Case Monitoring System (CMS) in LAO (lots

granted before launch of CMS in 1998 are not recorded in the system). Moreover, considerable effort would be required to link up the CC Date in CMS with the CSU polygon maintained in CLIS. The information will not be available in the initial CSU dataset.

(f) Status - Only active lots will be converted into the CSU dataset, hence all converted CSU records will have Status set as 'A'.

(g) Linkage between parent lot and subdivided lot – there is currently no electronic data available, so the information will not be available in the initial CSU dataset.

(h) Existing Linkage between C1000-format and PRN Lot ID – Data Dissemination System (DDS) team will be responsible for the mapping process of CSU IDs between LandsD's C1000 format and LR's PRN format. Such effort is not to be included in the resource estimation of this data conversion exercise.

4 Conversion Approach

4.1.1 LandsD and LR will be the data providers in the lot one-off data conversion. They will extract corresponding data from their internal system according to the agreed scope. Conversion programs may be developed to convert the data into the required format conform to the Lot CSU. LandsD and LR will be responsible for problem resolution of their concerned extraction processes in case of conversion problems or errors occur. Whereas the future Data Dissemination System team will be responsible for the data matching and data import part.

4.1.2 Data attributes contributed from LandsD and LR will be matched and linked up using LandsD's C1000 format CSU ID and LR's PRN format CSU ID to formulated a complete Lot CSU record. To match the corresponding data attributes between LandsD and LR, sophisticated conversion program will be developed to read in and analysis the free-text format lot description field.

(a) A higher matching rate may be achieved for the whole lots (i.e. without section/subsection parts)

(b) A higher matching rate for those first subdivided after enforcement of Code of Practice of the Land Survey Ordinance (Second Edition) in 1999

(c) The peculiar lots (around 2,650) cannot be matched automatically

4.1.3 Upon completion of matching process, the converted lot data will be imported into the finalized Lot CSU centralized database.

Manual Processing

4.1.4 One-off data conversion only includes the conversion by automatic process. An on-going manual matching process is required for those data failed to be matched automatically. The manual process will be performed on a need basis by LandsD provided that resources permit.

Mapping of Departmental ID and CSU ID

4.1.5 It is optional for Data Users to create mapping of departmental ID and Lot CSU ID for internal systems. If they are going to adopt completely the Lot CSU structure, the initial set of lot data after conversion can be used directly and no mapping is needed.

5 Conversion Schedule

5.1 Stage Implementation

5.1.1 A schedule for the one-off data conversion exercise is proposed below. Description of each stage can be found in subsequent sections of this document.

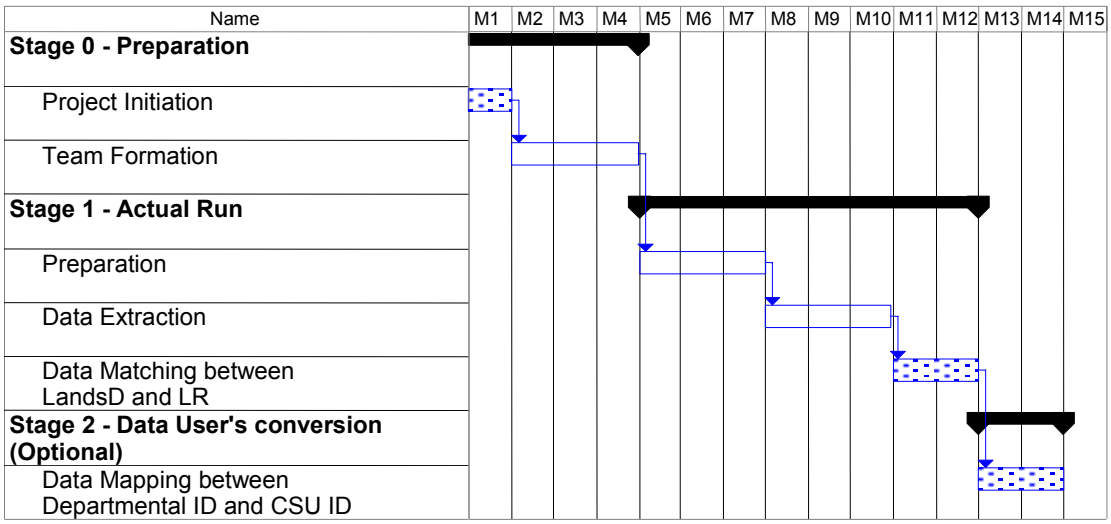

Figure 3 Proposed Schedule of Data Conversion for the Building CSU

Stage 0 - Preparation (4 months)

5.1.2 Project Initiation (1 month)

(a) A working team is to form with members nominated by Lot CSU subWG. Members should include business and IT / GIS representatives from all Data Owners, Data Users and the Data Agent. The working team will work out the detailed planning and monitor the progress of the conversion exercise.

(b) By the end of this sub-stage, a schedule for the Actual Run (i.e. Stage 1) should be agreed.

5.1.3 Team Formation (3 months)

(a) With assistance from HPLB, each data provider PD will apply funding for the one-off data conversion exercise.

(b) For PDs who need to purchase new software or hardware for the revamping and conversion exercise, they need to carry out procurement, taking into account of the evaluation, procurement, delivery, installation and commissioning of such items.

(c) For PDs, which opts to outsource the data conversion work, they should arrange procurement procedures and appoint consultant for the work.

(d) By the end of this sub-stage, each data provider should be ready to kicking off data conversion work.

Stage 1 - Actual Run Stage (8 months)

5.1.4 The implementation project team of the Data Dissemination System is suggested to join the working team starting from this stage, which is also recommended to be the coordinator for subsequent tasks.

5.1.5 Preparation (3 months)

(a) Physical data structure of lot CSU and file formats for transient files should be agreed and finalized

(b) To illustrate the agreed data structure and file format, a sample data file for the CSUs should be prepared for reference, which may contain only a couple of records.

(c) Based on the agreed transient files format:

(d) The corresponding data provider PD can start the development of conversion program

(e) The implementation team of the Data Dissemination System can start the development of the matching program.

5.1.6 Data Extraction (3 months)

(a) Data providers identify the target lot data needed to be converted from their internal systems.

(b) LandsD extracts LOT and OVERLAP LOG layout of lot polygon boundary from C1000 library to form the spatial Lot CSU data

(c) LandsD and LR should extract the corresponding textual attribute data and convert into Lot CSU data structure in the agreed transient file format.

(d) Working team should coordinates the extraction process and collect the result for the subsequent matching process

5.1.7 Data Matching Between LandsD and LR (2 months)

(a) LandsD and LR will provide sample data to Data Dissemination System team as reference to develop data matching program.

(b) The Data Dissemination System implementation team should utilize the matching program to build up data linkage automatically for the extracted data from LandsD and LR to formulate a complete Lot CSU data.

(c) Data Dissemination System team will be responsible for problem resolution in case of problems or errors occur in the data matching process.

(d) For those data cannot be matched automatically by the conversion program, they will be left as broken link data after imported into the lot CSU centralized database.

Stage 2 – Data User's Conversion (Optional) (2 months)

5.1.8 Data Mapping Between Departmental ID and CSU ID

(a) This is an optional stage for those PDs really need to maintain a mapping table between the departmental ID and the Lot CSU ID for the initial set of lot data.

Appendix G Data Conversion Exercise – Road Centreline

1 Introduction

1.1.1 The objective of this one-off data conversion exercise is to consolidate data of the existing road centrelines from the data provider to establish an initial set of Road Centreline CSU data prior to the deployment of future Road Centreline CSU workflow. The data provider would ensure the completeness and timeliness of the data under their own jurisdiction and convert it to the requirement conforming to the agreed CSU specification. Existing road centrelines shall include those already recorded by LandsD in the spatial record as of the data conversion cut-off date.

1.1.2 This paper proposes the scope of data conversion, approach and preliminary schedule for the conversion exercise.

2 General Principle

2.1.1 LandsD has recently prepared a set of Street Centreline Placing Guidelines on the delineation of road centrelines. These Guidelines are applicable to new road centrelines which will form a subset of the Road Centreline CSU. It was agreed with sub Working Group members that there is no imminent need to resolve all odd cases and data issues arising from the currently adopted delineation rules for existing road centrelines.

2.1.2 This data conversion means the one-off data conversion to be carried out via an automated means by the use of computer programs as far as possible. Manual conversion effort should be minimized.

3 Scope of Data Conversion

3.1 Road Centrelines

3.1.1 The data conversion exercise would cover the conversion of all existing road centrelines maintained in the Street layer of LandsD's Basic Mapping System (BMS) into the logical structure conforming to the Road Centreline CSU Specification. Existing road centrelines shall include those already recorded by LandsD as of the data conversion cut-off date.

3.1.2 All categories of existing road centrelines under the scope of the Road Centreline CSU will be included in the conversion exercise. The types include:-

(a) Expressway;

(b) Main Road;

(c) Secondary Road;

(d) Elevated Road, Flyover, Road Bridge;

(e) Tunnel;

(f) Non-motorable Track;

(g) Closed Road; and

(h) Restricted Access.

3.2 Attributes

3.2.1 Each road segment will be converted into a Road Centreline CSU and assigned with a unique CSU ID by the Data Agent i.e. LandsD, who is also the only data provider of road centreline data.

3.2.2 It is proposed that LandsD, as the data provider, would convert existing data into the CSU structure and ensuring the correctness of the converted data. A priority of conversion and related entity for each attribute are summarized in Table 1.

Data Item	**Priority**	**Related Entity**
1. Geometry (arc)	C	Road Segment Layer
2. Geometry (Node)	C	Road Intersection Layer
3. Street Code	C	Road Name, Road Segment Layer
4. Sub ID	C	Road Segment Layer
5. Start Intersection	H	Road Segment Layer
6. End Intersection	H	Road Segment Layer
7. Street Type	H	Road Segment Layer
8. Geo Reference Number	H	Road Intersection Layer, Road Intersection
9. Street Code at the Intersection	H	Road Intersection
10. Alternative Street Code at the Intersection	H	Road Intersection

Data Item	Priority	Related Entity
11. English Street Name	M	Road Name
12. Chinese Street Name	M	Road Name

Table 7 Spatial and Textual Data for Existing Road Centreline Data

3.2.3 Each attribute of the Road Centreline CSU is assigned with a priority of conversion into the initial CSU dataset:

(a) C - Critical. Information for all CSUs must be converted into the initial CSU dataset.

(b) H - High. Information for all CSUs should be converted into the initial CSU dataset as far as possible.

(c) M - Medium. It is desirable to convert the information into the CSU dataset, but it is still acceptable to have the converted data available in a later stage.

3.2.4 Remarks for particular attributes:

(a) Geometry (Arc and Node features) –

(b) Directly extracted from in the Street layer of LandsD's BMS.

(c) To facilitate the spatial query and filtering operation, the full set of spatial data should be maintained in a seamless manner, that is, the split lines locating along the tile borders should be merged, and the borderlines should be dissolved in the process of initial data conversion.

(d) Street Code and Sub ID – The CSU ID is a composition of Street Code and Sub ID. To ensure the CSU ID's uniqueness and persistence, LandsD is required to assign a sub-ID to each individual road segment in the Road Segment layer.

(e) Geo Reference Number – For pseudo nodes (which do not have geo-reference number assigned) formed at the tile border or that exists when the road segment's number of vertices exceeds 500, LandsD is required to assign a Geo Reference Number to each node to ensure the uniqueness of nodes formed.

(f) The following attributes will not be available for every road:

(i) English Street Name – private and ungazetted streets/ roundabouts, may not be associated with an English street name;

(ii) Chinese Street Name – private and ungazetted streets/ roundabouts, may not associated with a Chinese street name;

4 Data Conversion Approach

4.1 Overview of Conversion Process

4.1.1 LandsD will be the data provider in the one-off data conversion of road centrelines. LandsD will extract the corresponding data from their internal system according to the agreed scope. Conversion programs may be developed to convert the data into the required format conforming to the Road Centreline CSU. The future Data Dissemination System team will be responsible for the data import part.

4.1.2 It is optional for Data Users to create a mapping between their departmental ID with the CSU ID of the Road Centreline CSU, such that they can extract the information from the CSU for their internal systems. If the Data User is going to adopt the Road Centreline CSU structure in their internal system, then the initial set of Road Centreline CSU data converted by LandsD can be used directly and no mapping is needed.

4.1.3 It is recommended to automate the above data conversion tasks as far as possible.

4.2 One-off Conversion

4.2.1 Data conversion for Road Centreline CSU is comparatively simple. It is because the conversion only involves one data provider (LandsD). No collaborative effort is required from other PDs to contribute to the CSU data.

4.2.2 Below illustrates the sequential tasks involved in the data conversion exercise:

(a) LandsD will define the mapping rules and algorithm to transform their existing road centreline dataset stored in BMS into the Road Centreline CSU data model.

(b) Based on (a), the data conversion program will be developed to facilitate the automatic assignment of the sub-ID, and Geo. Ref. No. to the Road Segment layer and the Road Intersection layer respectively. Besides, the program would propagate the Geo. Ref. No from the Road Intersection to the Start and End Intersection attributes of the Road Segment layer.

(c) To disseminate the data in a seamless manner, the LandsD should merge, and dissolve the tile-based data into a seamless layer.

(d) Due to historical reason, it is envisaged that fully automatic conversion could not be achieved, as there are likely to be data issues arising from the existing road centrelines that are not delineated using a consistent rule. Therefore, if feasible, the conversion program should generate an error log to keep track of the records that cannot be processed appropriately. Examples of possible errors logged are the findings of discontinued road segments of the same street code and issues in the conversion from tile-based structure to seamless structure.

(e) Manual processing includes quality checking and data rectification. For the former, it would ensure the data accuracy and consistency, while for the latter, it would fix records with wrong value assigned by the conversion program.

Mapping of Departmental ID and CSU ID

4.2.3 It is optional for Data Users to create a mapping between their departmental ID with the CSU ID of the Road Centreline CSU. As the existing Street Code and the Geo. Ref. No are being used by most of the Data Users as their departmental ID, the mapping effort for the CSU ID of a road segment (Street Code together with the Sub-ID forming an unique composite key) should be minimal.

Manual Processing

4.2.4 The data that cannot be converted using the software program (logged during the one-off conversion exercise) will have to be converted manually on a need basis. This would be a recurrent effort and such effort is not to be included in the resource estimation of data conversion.

5 Data Conversion Schedule

5.1.1 A schedule for the one-off data conversion exercise is proposed below. Description of each stage can be found in subsequent sections of this document.

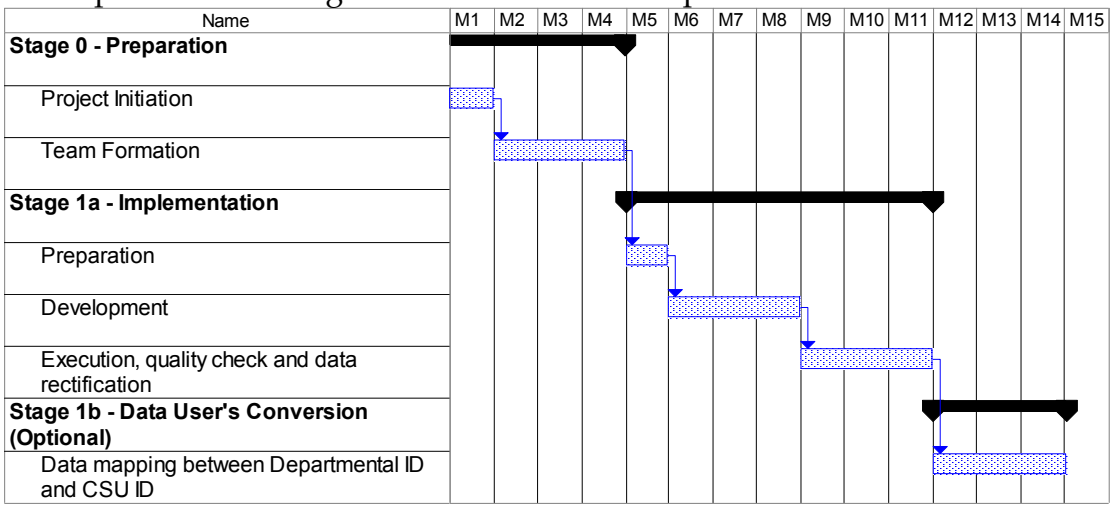

Figure 4 - Proposed schedule for Road Centreline CSU data conversion

Stage 0 - Preparation (4 months)

5.1.2 Project Initiation (1 month)

(a) A working team is to form with members nominated by Road Centreline CSU subWG. Members should include business and IT representatives from all Data Owner, Data Users and the Data Agent. The working team will work out the detailed planning and monitor the progress of the conversion exercise.

(b) By the end of this sub-stage, a schedule for implementation (i.e. Stage 1) should be agreed.

5.1.3 Team Forming (3 months)

(a) With assistance from HPLB, LandsD will apply for funding for the data conversion exercise.

(b) If it is opted to outsource the data conversion work, LandsD should arrange procurement procedures to appoint consultant for the work.

(c) If it is opted to carry the data conversion work by in-house staff, internal resources should be allocated appropriately.

(d) By the end of this sub-stage, the data provider should be ready to kick off data conversion work.

Stage 1a – Implementation (7 months)

5.1.4 Preparation (1 months)

(a) Mapping rules and algorithm for data conversion should be defined.

5.1.5 Development (3 months)

(a) By the end of this sub-stage, conversion program is developed to facilitate:

(i) Automatic assignment of the attributes;

(ii) Converting the existing data into the structure conforming to the CSU specification;

(iii) Merge and dissolve the tile-based data into a single seamless layer.

5.1.6 Execution, quality checking and data rectification (3months)

(a) Upon completion of Development sub-stage, a data conversion cut-off date should be determined.

(b) Execution will be conducted on the data as of the conversion cut-off date. Data will be extracted from existing system and converted to the agreed Road Centreline CSU-compliant format.

(c) Quality checking and data rectification will be performed on the resulting data from Execution sub-stage.

Stage 1b – Data User's Conversion (Optional) (2 months)

5.1.7 Data Mapping Between Departmental ID and CSU ID

(a) This is an optional stage for those PDs really need to maintain a mapping table between the departmental ID and the Road Centreline CSU ID for the initial set of road centreline data.

Appendix H Data Conversion and Dissemination of Slope

1 Introduction

1.1.1 This paper recommends the updating frequency, mode of data dissemination and data conversion of the Slope CSU.

2 Updating Frequency

2.1.1 To improve the maintenance of the Slope CSU data, each Data Owner should commit to provide their data to the agreed updating frequency. Data Owners should provide the latest changes on CSU relevant data to the Data Agent on a regular basis. All changes since the last data upload must be included in the interface data file in the new data upload.

2.1.2 The frequency of updating the CSU data should be determined by 1) Data Provision Frequency (i.e. the frequency of data provided from Data Owners to the Data Agent), and 2) Data Dissemination Frequency (i.e. the frequency of data downloaded from Data Agent to the Data User).

Data Provision Frequency

2.1.3 There are procedural requirements from GeoGuide5 which stipulate that Works Departments (Data Owners) and other responsible agents for slope works should submit the slope feature information to the CED for registration. These agents could include architects from private developments and public works consultants. These submissions could be for different purposes:

(a) Registration of newly formed slopes features

(b) Registration of the existing slopes features which are not included in the Slope Catalogue maintained by CED.

(c) Changes made to the slopes features on completion of slope maintenance or engineering inspection

2.1.4 Except for the submission for the registration of existing slope features (item b), there is no specific requirement from GeoGuide 5 stipulating when other submissions (item a and c) should be made to CED. The Data Provision Frequency in the context of DAM is different from data submission requirement from GeoGuide5. Although there could be overlap between the submission details in the GeoGuide 5 context and DAM context, it is mandatory that the submission of Slope CSU data must be from the respective PDs. It is recommended that PDs should carry out internal consultation within department

and review how these two submissions could be streamlined to reduce the administration overhead.

2.1.5 It is a requirement from the WBTC No. 9/2000 that Works Departments are required to submit the slope feature information (both textual and spatial data) for registration or updating of the Slope Catalogue:

(a) Upon the substantial completion of the feature formation/ modification work (no exact date specified)

(b) Within 2 months after the date of identification of the existing features

2.1.6 In general, slope works projects' Consultants/ Architects or responsible departments would submit the as built drawings of the slopes as soon as they were built.

2.1.7 For the slope maintenance, Works Departments have different practice in their submissions, e.g. the Engineer Inspection (EI) results to CED. Please see summary in Table 8.

Works Department (Data Owner)	**Submission of EI results**
ArchSD	Upon the completion of the whole Engineer Inspection exercise
CED	NA
DSD	Upon the completion of the whole Engineer Inspection exercise
HyD	Right after the completion of Engineer Inspection
TDD	
WSD	Bi-monthly

Table 8: Timeliness of EI submission

2.1.8 Since CED is now disseminating the slope data on a monthly basis, and the Data Users are satisfied with existing service level, it is recommended that the Data Provision Frequency should be compatible with that of the current data dissemination of slope data. Therefore, data provision frequency on monthly basis is recommended, i.e. Data Owners will have to provide the updated slope information on a monthly basis. The Data Owners can still use their inventory system or CED's Slope Input Program to input the data, and then export it for submission, providing that the exported data format is in compliance with the Slope CSU Logical Data Model specification as well as the standard file format recommended in DAM3. Nil submission will be required in case when there was no slope features completed or no Engineer Inspection result available in the

month. Data Owner can notify Data Agent via an email or a memo in the case of NIL submission.

2.1.9 LandsD, as the Data Owner of the Slope Maintenance Responsibility (MR) data, would provide the delta change of both spatial and textual data to the Data Agent on a monthly basis.

2.1.10 It is proposed that the Data Owners' submission of the slope maintenance data would be set by the 15th day of every month. On need basis, when considered appropriate, the Data Owners could choose to submit the CSU data more than once within the stipulated time interval, in order to speed up the registration process. This arrangement could be reviewed in the SAR stage. The data provision frequency for the future Slope CSU is summarized in Table 9.

Data Entities	**Data Owner**	**Data Provision Frequency**
Spatial		
1. Cut Slope Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
2. Fill Slope Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
3. Retaining Wall Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
4. Disturb Terrain Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
5. Natural Terrain Stability Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
6. Natural Terrain Defence Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
7. Slope Maintenance Responsibility Boundary	LandsD	Monthly
8. Overlapped Slope Maintenance Responsibility Boundary	LandsD	Monthly
Textual Entity		
Basic Information	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Construction & Ground Investigation	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Defence Measure	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Facility	CED	Ad-hoc[1]
Formation History	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Feature Status	CED	Monthly

Responsibility	LandsD	Monthly
Responsible Party	LandsD	Monthly
Renamed Feature	CED	Monthly
Slope Feature	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Stability Measures	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Structural Measures	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Wall Feature	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Utility Service	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly

Table 9: Data Provision Frequency for the Future Slope CSU

Note [1]: This entity is a look-up table, which is updated by CED on an ad-hoc basis.

Data Dissemination Frequency

2.1.11 CED will undertake a quality check on the slope data submitted by the Data Owners, and ensure a high degree of consistency between the spatial and textual data as well as completeness of the data.

2.1.12 CED will disseminate the delta change of slope feature and MR data on monthly basis, whereas they would disseminate the full set of slope feature and MR data on a need basis. For the monthly delta change, CED is recommended to update it by the 15th day of every month.

3 CSU Data Dissemination

Data Dissemination Option

3.1.1 On implementation of Slope CSU, CED will provide a one-stop service to disseminate both the slope feature and MR data which are included in the Slope CSU dataset. To minimize duplicated effort, LandsD could consider the possibility in minimizing the provision of MR data to the PDs, nevertheless, they will still provide the bi-monthly notification to each respective PDs regarding the change of MR.

3.1.2 As of Nov 2003, the slope feature data is disseminated via CED 's Hong Kong Slope Safety website (Intranet version). With consideration of resources and the earliest timeframe of implementing the Slope CSU data, the Project team recommends CED to enhance it to facilitate the Slope CSU dissemination.

3.1.3 It is noted that LandsD is going to develop a Data Dissemination System (DDS), which can facilitate the collaborative updating and disseminating the Building CSU, Lot CSU and Road Centreline CSU. The same facility could be used for other CSU dissemination, e.g. Slope CSU. Nevertheless, as its timeframe (planned

to be completed in 2005) cannot match with the operational requirement of the Slope CSU and there are other business considerations, e.g. dissemination of Slope CSU to non PDs and non government agencies, the DDS would not be considered.

3.1.4 The Slope Safety website is currently being hosted on the Central Cyber Government Office (CCGO), the latter of which is a one-stop intranet hub providing information and electronic services needed by government users to support their daily work, targets at becoming an intra-governmental information sharing centre, a webcasting station and an intra-governmental business centre. Its URL address will be: http://geosis.ccgo.hksarg/hkss/eng/whatsnew/updated_SIS/index.htm.

3.1.5 The website would have the following features to facilitate the data dissemination:

(a) Security. The CCGO has security provisions which allow only the authorized government officers to browse, search or download information from the CCGO.

(b) Data Downloading. The current practice of using Hyperlink to download the data will be retained. Data Agent (CED) is required to prepare the data conforming to the CSU logical data model, and then convert them into the standard file formats as recommended by DAM3, prior to placing them on the web site. In order to meet with the Data Users' requirement on data history, last 6 month archives of the slope CSU delta change will be placed for downloading.

(c) Data Uploading. An on-line uploading function is suggested to be incorporated in the DAF, while the Data Owners would adopt the existing practice to provide the slope CSU data to the Data Agent.

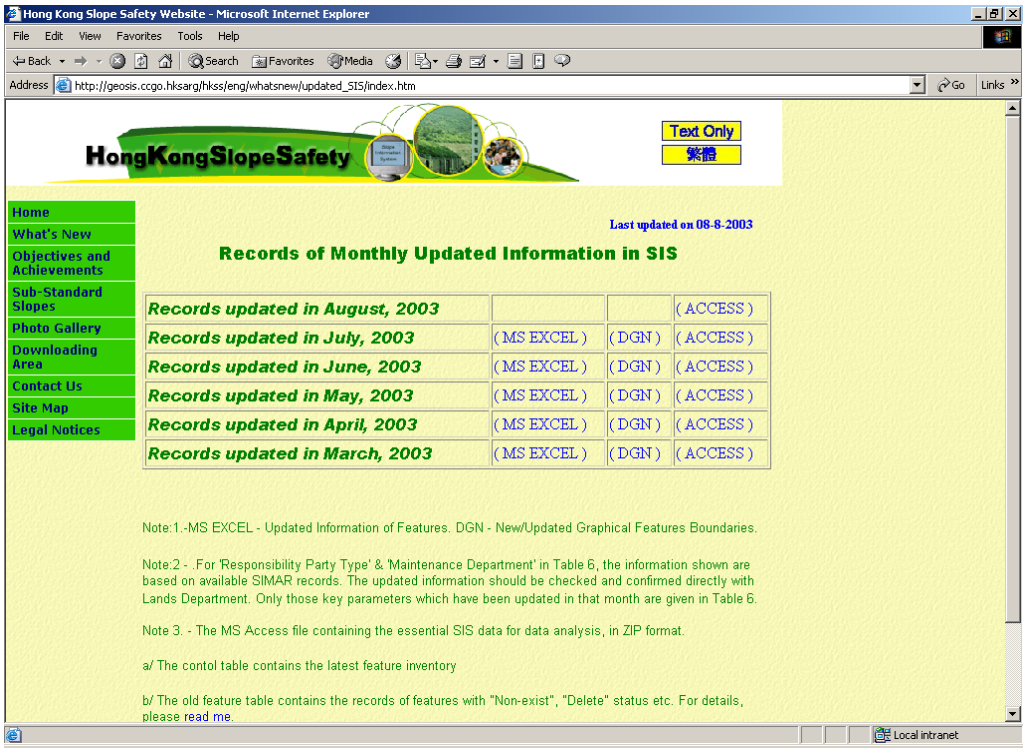

Figure 5: The Slope Safety Web Site (Intranet Version)

3.1.6 PDs seldom need a full set of Slope CSU data. Given the volume of the full set of CSU data, Data Agent would disseminate them in form of CD-ROM on an ad-hoc basis.

4 Data Conversion

Scopes of Data Conversion

4.1.1 The data conversion exercise would cover the conversion of all existing slope features and MR data currently maintained by CED 's Slope Information System (SIS) and LandsD's Slope Maintenance Responsibility Information System (SMRIS) respectively.

4.1.2 In addition to that, CED is required to update the attributes related to the CSU status and timestamp.

4.1.3 The existing SIS does not have information about the features of Defense Measure and Stability Measures, which are newly required from the latest version of the GeoGuide 5. In the context of slope registration, CED has agreed with other departments that one-off data conversion for these existing features would not be required since this information is currently not recorded in the departments' inventories. We recommend similar rule applies to Slope CSU since this information is currently not recorded in Data Owners' inventories and it would be

quite a costly exercise to collect this information. Nevertheless, information of new features of these kinds should be recorded in the Slope CSU.

4.1.4 As CED has a repository which keeps a record of all existing slope features now being maintained by various Data Owners, these Data Owners, except for LandsD, are not required to carry out data conversion programme of their own.

4.1.5 The following illustrates the tasks of Data Conversion to be carried out:

(a) Data Conversion by CED,

(i) Conversion of existing Cut Slope data into a seamless geo-spatial data conforming to the logical data structure of the Cut Slope Polygon layer.

(ii) Conversion of existing Fill Slope data into a seamless geo-spatial data conforming to the logical data structure of the Fill Slope Polygon layer.

(iii) Conversion of existing Retaining Wall data into a seamless geo-spatial data conforming to the logical data structure of the Retaining Wall Polygon layer.

(iv) Conversion of existing Disturb Terrain data into a seamless geo-spatial data conforming to the logical data structure of the Disturb Terrain Polygon layer.

(v) Conversion of existing Natural Terrain Defense Measure data into a seamless geo-spatial data conforming to the logical data structure of the Defense Measure Polygon layer, if available.

(vi) Conversion of existing Natural Terrain Stability Measure data into a seamless geo-spatial data conforming to the logical data structure of the Stability Measure Polygon layer, if available.

(vii) Data transformation of existing textual data from SIS into the Slope CSU's logical data entities including 1) Basic Information, 2) Construction, 3) Facility, 4) Formation History, 5) Feature Status, 6) Renamed Feature, 7) Slope Feature, 8) Structural Measures, 9) Wall Feature and 10) Utility Service.

(viii) Updating the attributes [CSU Status], [CSU Status Date] under the Basic Information Entity; [CED Released Date] under the Feature Status Entity; and [Party Initiated the Slope Registration] under the Responsibility Entity.

(b) Data Conversion by LandsD,

(i) Conversion of existing tile-based MR data into seamless geo-spatial data conforming to the logical data structure of the Slope Maintenance Responsibility Polygon.

(ii) Conversion of existing overlapped MR data slope into a seamless geo-spatial data conforming to the logical data structure of the Overlapped Slope Maintenance Responsibility Polygon, if any.

(iii) Data transformation of existing MR data from SMRIS into the Slope CSU's logical data entities including 1) Responsibility and 2) Responsible Party except for the attribute of [Party Initiated the Slope Registration].

(c) Data Conversion by other Data Owners.

(i) No one off data conversion is required. In general, each Data Owner would need to maintain the mapping between their departmental identifier of the slope dataset with the Slope CSU identifier. Since all of the Data Owners have already stored the CSU ID (which is identical to the Feature Number currently used by the CED's SIS) in their inventory systems, additional efforts for mapping are not required.

Data Conversion Programme

4.1.6 To speed up the data conversion process, it is recommended to automate the data conversion as far as possible.

4.1.7 The following outlines the stages to be carried for the data conversion of existing slope dataset into the Slope CSU:

(a) CED and LandsD define the mapping rules to transform their existing slope dataset stored in SIS and SMRIS into the slope CSU data model respectively.

(b) Based on (a), CED and LandsD prepare their data conversion tools to facilitate data conversion.

(c) Once the data conversion tool is available, LandsD will use it to convert the full set of MR data into the Slope CSU structure. Manual checking is required to ensure the data quality.

(d) LandsD will update the timestamp attribute – [LandsD Released Date] under the Responsibility entity. The full set of MR data (both spatial and textual) are then provided to CED.

(e) Having received LandsD's MR dataset, CED will freeze the receipt of MR data until the full set of Slope CSU is formed. CED will use the data conversion tool to convert the full set of Slope Feature into the Slope CSU structure. Manual checking is required to ensure the data quality.

(f) To incorporate the MR data into the Slope CSU dataset, CED will ensure the data consistency between their Slope Feature dataset against with the LandsD 's MR dataset with assistance of the automation tool. CED will perform different updating operations under the following conditions:

(g) For those features which co-exist in the MR dataset and the Slope Feature dataset, that means their maintenance responsibilities have been defined, CED will then update their [CSU Status] under the Basic Information entity to "Maintained".

(h) For those features which are only available in the Slope Feature dataset, but are absent in the MR dataset, that means their maintenance responsibilities have not been defined yet, CED will then update their attribute - [CSU Status] under the Basic Information entity as either "Registered" or "Defined" depending on the completeness of the slope data.

(i) For those features which are only available in the MR dataset, but are absent in the Slope Feature dataset, that means they have been demolished or renamed, CED will then update their attribute - [CSU Status] under the Basic Information entity as "Demolished", and notify LandsD about the status as well.

(j) For other cases, they will fall into the exceptional list, which requires CED 's manual verification.

(k) Under the above conditions, CED will assign the attribute - [CSU Status Date] under the Basic Information entity while updating the CSU status.

(l) In addition, CED will ensure the consistency between the graphical data and the textual data of the Slope CSU by storing all the data into the RDBMS empowered by their Spatial Engine. Only the matched features will be released as the Slope CSU data.

(m) Lastly, CED will update the attribute - [CED Released Date] under the Feature Status entity for all of the slope CSU records. Eventually, the full set of CSU data is formed.

4.1.8 The following table is the proposed schedule of data conversion with assumption that resource will be available by May 2004. This proposed schedule is subject to the refinement upon PDs' comments.

Task	Responsible PDs	Start	Duration
a) Define the mapping rules	LandsD, CED	May 2004	1 month
b1) Develop the data conversion tool	CED	Jun 2004	2 months
b2) Develop the data conversion tool	LandsD	Jun 2004	2 months
c) Convert existing Maintenance Responsibility (MR) data	LandsD	Aug 2004	2 months
d) Release MR data to CED with timestamp assigned	LandsD	Oct 2004	NA
e) Convert existing Slope Feature data	CED	Aug 2004	1 month
f) Ensure consistency between MR and Slope Feature Data	CED	Oct 2004	2 months (tentative)
g) Ensure the consistency between graphical and textual data	CED	Dec 2004	1 month
h) Release the data to the Data Users with timestamp assigned	CED	Feb 2005	NA

Table 10: The Proposed Data Conversion Schedule

Appendix I Data Conversion and Dissemination of TPU/SB

1 Introduction

1.1.1 Sub-working members (including Data Users, Data Owners and Data Agent) already reached consensus on updating frequency in the meeting held on 10 September 2003. Since the meeting, we also received confirmation from Data Agent about the details of data dissemination.

1.1.2 On receipt of returns from PDs on revamping requirements, this document also summarises the efforts of system revamping.

1.1.3 This document records the agreed arrangement for frequency of updating and data conversion. PDs are requested to review document, in particular the section on dissemination of the CSU data, data conversion and implementation schedule.

1.2 Updating Frequency

1.2.1 The frequency of updating the CSU data is determined by:-

(a) Data Provision Frequency (i.e. the frequency of data provided from Data Owners to the Data Agent), and

(b) Data Dissemination Frequency (i.e. the frequency of data downloaded from Data Users to the Data Agent).

Data Provision Frequency

1.2.2 In general, Data Owners should provide the latest changes on CSU relevant data to the Data Agent on a regular basis. All changes since the last data extraction must be included in the interfaced data file in each data uploading.

1.2.3 PlanD is the only Data Owner contributing data to TPU/SB CSU. The same arrangement will apply to PlanD.

1.2.4 Currently, the spatial boundary of TPU/SB is updated every five years and the updated data are released a year before conducting the Survey of Census and By-Census. For TPU/SB CSU, its spatial boundary would be identical to that of the TPU/SB currently maintained by PlanD. It is agreed among members that the same updating frequency, i.e. 5 years could be retained for the spatial boundary of TPU/SB CSU.

1.2.5 With respect to the textual attributes, PlanD will disseminate the first 7 years of population projections (by TPU), related mapping table, together with the TPU spatial boundary on yearly basis (September of the year).

Data Dissemination Frequency

1.2.6 Data downloading from the Data Agent to Data Users will be supported regularly. PlanD, as the Data Agent, will pre-pack the CSU data according to the recommended File Format Standard (from DAM3) and make the packed files available for download by Data Users in a pre-defined location. Details of disseminating CSU will be discussed in Section 1.3.

1.2.7 PlanD is the only Data Owner and also PlanD is the Data Agent of the TPU/SB CSU. The data provision frequency could be made equal to that of the data dissemination frequency.

1.2.8 Since the data attributes of TPU/SB CSU are relatively static, members (Data Users) agreed that this TPU/SB CSU data will be updated as per the following frequency schedule:

	Data Provision Frequency (also Data Dissemination Frequency)
TPU & SBVC Polygon	Every 5 Year
TPU	
a. TPU ID	Every 5 Year
b. TPU Area	Every 5 Year
SB_VC	
a. SB_VC Number	Every 5 Year
b. TPU Number	Every 5 Year
c. Area	Every 5 Year
TPU Mapping	
a. TPU ID	Yearly
b. Population ID	Yearly
c. Base Year	Yearly
Projected Population	
a. Population ID	Yearly
b. Base Year	Yearly
c. Base Year Projected Population	Yearly
d. First Year Projected Population	Yearly
e. Second Year Projected Population	Yearly
f. Third Year Projected Population	Yearly
g. Fourth Year Projected Population	Yearly
h.. Fifth Year Projected Population	Yearly
i. Sixth Year Projected Population	Yearly

Table 11 Updating Frequency of data attributes of TPU/SB CSU

1.3 CSU Data Dissemination

1.3.1 PlanD is required to prepare the data conforming to the CSU logical data model, and then convert them into the standard file formats (recommended in DAM3) prior to data dissemination.

1.3.2 The ultimate solution for disseminating the TPU/SB CSU is via the department portal programme (DPP) of PlanD, which will be implemented by mid 2004. This

portal will be launched as an Intranet portal with authentication and other advanced features such as download by criteria. Instead of collecting the data by CD-ROM (current practice), Data Users can access the Intranet and download the CSU data from this single source. Only the authorized government officers can browse, search or download TPU/SB CSU information from the website.

1.3.3 For earlier implementation of TPU/SB CSU, PlanD will offer an interim solution. PlanD will provide a hyperlink on its existing website placed in the Central Cyber Government Office (CCGO)[6] where PDs could access and download the TPU/SB CSU data. This data dissemination facility will be available by December 2003.

1.3.4 To streamline future data exchange process, PDs are encouraged to use the new dissemination facility, thus the existing channel(s) through written requests will no longer be supported. However, should PDs require population data (7+ years), which is classified as sensitive data, and not incorporated in the scope of the TPU/SB CSU, such requests, are still supported by PlanD on individual request.

1.4 Data Conversion

1.4.1 The common attributes included in the TPU/SB CSU Logical Data Model are in alignment with the existing data structure of TPU/SB. It is envisaged that with the help of existing conversion tool, PlanD could carry out the data conversion of TPU/SB data with minimal effort. Hence, no additional resource is required.

2 System Revamping Requirements

2.1 System Revamping Inventories

2.1.1 On receipt of the returns to the RFI of the System Interfacing Specification from PDs, information regarding the cost and time estimated to perform the revamping exercise is compiled and analyzed in this section.

Affected Existing System

2.1.2 Table 12 inventories PDs' systems, which will be the source/destination of the CSU data attributes in the data exchange process.

2.1.3 For Data Agent,

(a) PlanD will export all of the CSU data from their GIS Portal.

[6] Central Cyber Government Office (CCGO), which is a service-wide Intranet facility platform that could facilitate sharing information and conducting electronic services to support the daily work in government departments

2.1.4 For Data Users,

(a) C&SD and LandsD will import the TPU/SB CSU data to their Digital Mapping Sub-system and Computer Land Information System (CLIS) respectively.

(b) BD, DSD and TDD remarked that they do not have plan to import the CSU data to any of their systems in future. The columns representing this information are marked as '-' in Table 12.

Resource estimation of revamping system

2.1.5 Table 13 summarizes the estimated cost and time requirement from PDs who need to revamp their systems to meet the system interfacing specification.

2.1.6 In the time estimate, PDs provide the earliest month that they can start the revamping exercise and the duration they can complete the exercise.

2.1.7 In the cost estimate, PDs estimate the revamping effort according to the items of procurement, system enhancement and contract management.

Time

2.1.8 For the Data Agent,

(a) PlanD can complete the interim solution of data dissemination by December 2003, while the development of the ultimate solution will be started at the earliest in March 2004, and will last for two months.

2.1.9 For Data Users,

(a) LandsD will need 2 months to complete revamping, but they are unable to estimate the earliest month they can start the exercise since there are some dependencies tasks, which are beyond their estimation. Nevertheless, it is envisaged that effort to be incurred would be relatively small and LandsD could complete this exercise by end of 2004, but is still subject to the resource availability.

(b) Since BD, DSD and TDD will not import the CSU data to any of their systems, revamping is not applicable to them.

(c) C&SD indicates that no revamping is required.

2.1.10 Cost

(a) In Table 13, to quantify the cost of revamping PDs' systems, it is assumed that an average daily rate of the professional and technical staff is at $1,687

and $5,294 for respectively and 22 days/month will be assumed to standardize the rate/ man month. The same figures were adopted in the previous Study on PLW Data, and for the future benchmarking exercise on recurrent costs.

(b) For the Data Agent, PlanD needs around HK$50,000 to complete their development/enhancement of the data dissemination service.

(c) For Data Users, LandsD needs 3 man-days of Land Surveyor (LS), and 10 Man-days of Senior Technical Officer (STO). The total cost may be about HK$ 49,622. The revamping cost is not applicable to BD, DSD, TDD, and C&SD.

CSU Data to be import into / export from	**BD**	**C&SD**	**DSD**	**LandsD**	**PlanD**	**TDD**
	Import into	**Import into**	**Import into**	**Import into**	**Export from**	**Import into**
Spatial Data						
TPU & SBVC Polygon	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-
Textual Attribute						
1. TPU						
a. TPU Number	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-
b. TPU Area	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-
c. Date of Designation for the TPU	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-
d. Population Projection Date	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-
e. Population	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-
2. SB_VC						
a. SB_VC Number	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-
b. TPU Number	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-
c. SB Area	-	Digital Mapping Sub-system	-	CLIS	GIS Portal	-

Table 12 PDs system to import or export from relating the TPU/SB data

		[7]	BD	C&SD	DSD	LandsD	PlanD	TDD
Cost	Procurement Cost	Professional	-	-	-	-	-	-
			-	-	-	-	-	-
			-	-	-	-	-	-
	System Enhancement Cost	Professional	-	-	-	LS - 3 Days	CSA - 1 month	-
			-	-	-	STO - 10 Days	-	-
			-	-	-	-	50,000	-
	Contract Management Cost	Professional	-	-	-	-	-	-
			-	-	-	-	-	-
			-	-	-	-	-	-
	Total Cost (HK$)			-	-	49,622	50,000	-
Time	Earliest month of start revamping	-	-	-	-	Not yet decided due to uncertainty	03/2004	-
	Duration of revamp completion	-	-	-	-	2 month	2 month	-

Rank

Technical

Lump-sum

Technical

Lump-sum

Technical

Lump-sum

Table 13 Cost and Time estimated for the revamping exercise

-

[7] Rank and Man-day (or Man-month): This is applicable to in-house staff resources in government departments. PDs are requested to group resources under Professional and Technical category(s), where applicable. An average daily rate at $1,687 for technical staff and $5,294 for professional staff and 22 days/month will be assumed to standardize the rate/ man month. The same figures were adopted in the previous Study on PLW Data, and for the future bench marking exercise on recurrent costs.

3 Implementation Schedule

3.1.1 There are four milestones in the implementation schedule TPU/SB CSU:

(a) PlanD prepares existing TPU/SB data conforming to the CSU logical data model, and then converts them into the standard file formats as recommended in DAM3. As discussed in 1.4.1, the effort of one-off data conversion would be minimal with respect to time and cost. Also the data dissemination facility (interim solution) would be ready by Dec 2003. Thus, it is recommended PlanD should complete this data conversion task by December 2003.

(b) PlanD will implement their departmental portal programme (DPP), which will include facilities for TPU/SB CSU dissemination. While the interim data dissemination facility would be by December 2003, the permanent data dissemination facilities via the DPP would be available by May 2004.

(c) Data Users carry out the revamping of existing system to import the CSU data. Based on the return from the System Interfacing Specification, only LandsD is required to carry out the revamping exercise. Despite the fact that LandsD has not decided the earliest commencement of this exercise, it is envisaged that it could be completed by end of 2004, as the effort to be incurred would be relatively small, but is still subject to the resource availability.

(d) It is scheduled that TPU/SB CSU could be commissioned earliest by December 2003.

3.1.2 When the CSU is implemented, the sub-working group will regularly review the adequacy and efficiency of the CSU such that the data exchange process can be improved continuously.

3.1.3 Table 14 summarizes the schedule for the TPU/SB implementation.

Milestone	**Responsible PDs**	**Estimated Start (month/year)**	**Duration**
a) one-off conversion of existing data	PlanD	April 2004	1 month
b1) data dissemination facility (Interim Solution)	PlanD	April 2004	1 month
b2) data dissemination facility (Ultimate Solution)	PlanD	June 2004	2 months
c) system revamping	LandsD[1]	April 2004	2 months
d) Commissioning	PlanD	June 2004	-

Table 14: Implementation Schedule of TPU/SB CSU

Note 1: Only LandsD is required to carry out system revamping. This would not deter the commissioning of the CSU.

Appendix J Data Dissemination of Building, Lot and Road

1 Data Dissemination Option

1.1 Implementation Options

1.1.1 There are five CSUs in DAM 1 and the respective Data Agents are:

	Data Agent
Slope	CED
Building	LandsD
Lot	
Road Centreline	
TPU/SB	PlanD

Table 15 CSU and Data Agent

1.1.2 Data Agent of each CSU needs to provide data dissemination facilities to an agreed level of service such that Data Owners and Data Users are allowed to store/retrieve the CSU data following the mechanisms and procedures for maintenance of the CSU. There could be different implementation options for this data dissemination purpose.

1.1.3 Four architectures for the data dissemination system were evaluated. And in view of the latest environment description, option A is recommended. A comparison between options A, B, C and D is summarised in the Table 16.

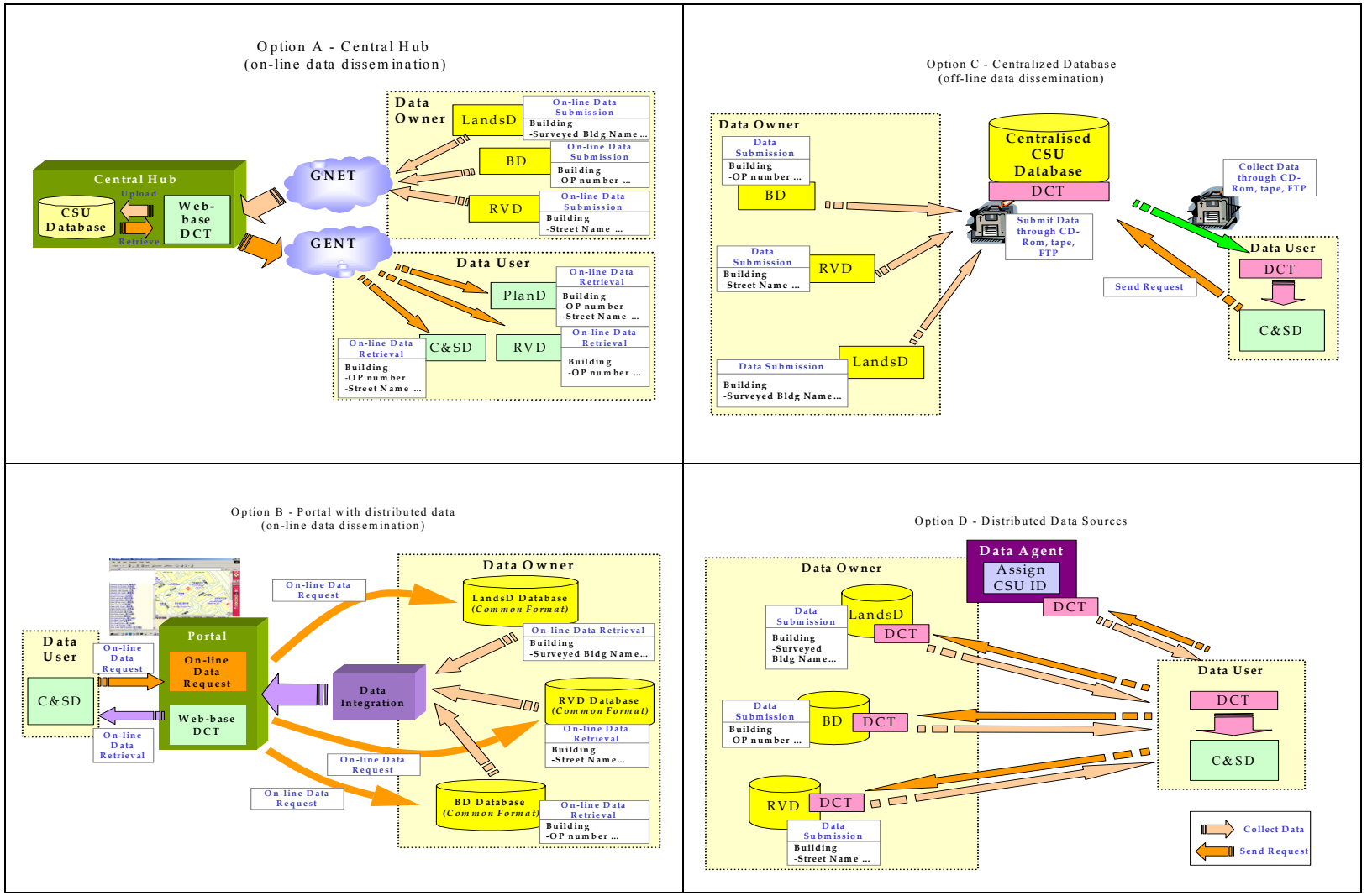

Figure 6 Implementation Options

Comparison between Options A, B, C and D

									Flexibility for the participation of future data providers
A. Central Hub	High	High	Heavy	Medium	Up-to-date info	High	High	Low	Medium to high
B. Portal with distributed system	High	High	Heavy	High. Even if the administration cost is leveraged among the data providers, the total administration cost is high.	Most up-to-date info	High	Medium to High. Depends on the automation level of the portal in ensuring the data consistency across data providers.	Low	Medium to high
C. Centralized Database	Medium	Medium	Medium	Medium	Less up-to-date info	Medium	High	Low	Medium
D. Distributed data sources	Low	Low	Low	Low	Less up-to-date info	Low	Low. Different data subset may not be synchronized.	High	High

Table 16 Comparison between Options A, B, C and D

1.2 Latest environment description update

Initiatives of LandsD

1.2.1 LandsD has recently completed a Feasibility Study (FS) on a Data Dissemination System (DDS). The objectives of the proposed system are described as follows:

(a) To set up a multi-format digital map and land record database and a data communication infrastructure such as Wide Area Network (WAN) for the dissemination of the required digital map and land record data in the appropriate data format to the computer system of the client departments, the private sector and the general public;

(b) To shorten the queuing and processing time for the data conversion and delivery of digital map and land record data in the user required data format;

(c) To optimize the staff resources required to carry out the data format conversion and

(d) To reduce the operation and administration cost of disseminating digital map and land record data.

1.2.2 Among the different business options considered in the FS, it was recommended in the FS Report that DDS should be implemented with data conversion and dissemination. Given what was recommended in the FS Report, there is one common similarity between the DDS of LandsD and the above discussed options: they both serve similar data dissemination purpose. Besides, the DDS of LandsD will also provide more facilities than those of Option C discussed in section 1.1.

1.2.3 LandsD has another hub prototype initiative. They had arranged a session to introduce the rather automatic downloading approach and demonstrated some geospatial information search and retrieval functions using their hub prototype. PDs, e.g. LandsD, RVD and BD were impressed by the hub prototype and indicated that a hub would be a viable solution to improve the level of services.

1.2.4 The difference between the functionalities of LandsD's DDS and the hub prototype is summarised below:

	Functionalities		
	Data Dissemination	User Query	Analysis
LandsD's DDS	Included	Little	Not required
LandsD's hub prototyype	Included	Included	Included
Remarks(1)	Data dissemination is mandatory for	Not required for DAM 1, but PDs	Not required for DAM 1, but PDs

	DAM 1	would see there is a potential need outside the scope of DAM	would see there is a potential need outside the scope of DAM
Remarks (2)	Provided by Option A, B, C and D	Only provided in Option A and B	Only provided in Option A and B

Table 17 Difference between the functionalities of LandsD's DDS and the hub prototype

1.2.5 In view of the need from the DAM and the potential needs from the PDs, Option A will give a better salvage value on its migration from DAM to DAF. Also the investment could be leveraged for LandsD's DDS purpose.

1.2.6 Assuming LandsD's DDS would be used for DAM 1 purpose, a comparison between Option A and LandsD's DDS is shown below:

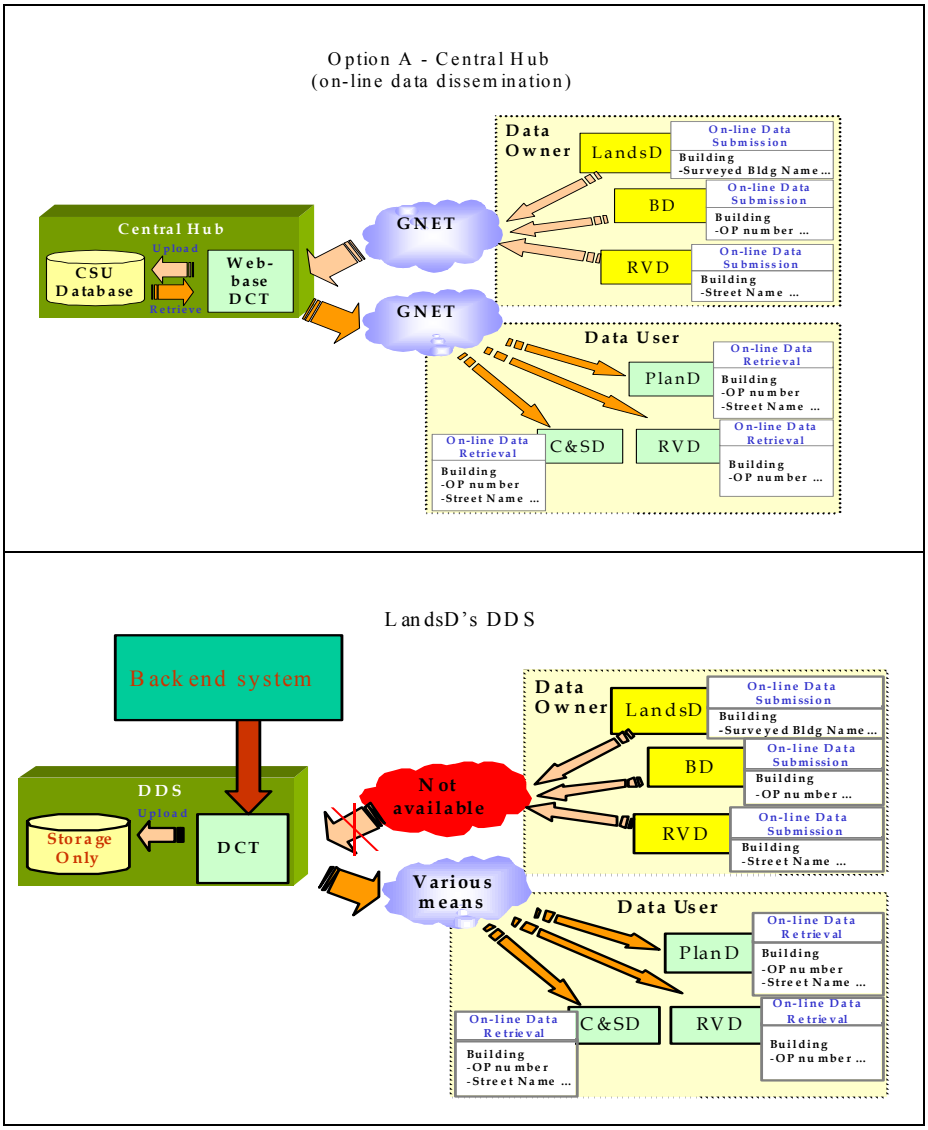

Figure 7 – LandsD's DDS and Option A

1.2.7 Although data transfer from Data Owners to the centralized database is not included in the original scope of the FS Study of the LandsD's DDS, the infrastructure set up in the DDS should be able to serve this purpose without significant technical difficulties.

1.2.8 Given the implementation schedule of DAM 1 and LandsD's DDS, it is recommended Option A should be implemented in stages:

(a) Stage 1 – develop the central database, data upload facilities, data import programmes, data conversion tools and facilities to allow data download by Data Users for DAM 1 purpose (Web-based user interface may be considered for data upload and download facilities).

(b) Remaining stages – set up a hub to provide query and analytical functions (not a mandatory requirement for DAM 1, but these functions could improve level of services), which are subject to detailed user requirements collected upon system implementation.

1.2.9 It is considered that the one off investment on Option A – Stage 1 could be leveraged on LandsD's DDS (see 1.3.8 below for details on the proposed funding arrangement). Since it is very likely that Option A – Stage 1 would take more than 12 months prior to its implementation, it might not meet the original planned schedule for DAM. It is recommended that this 12-months constraints should be lifted since Option A – Stage 1 could be more cost effective given the latest current environment. These benefits include:

(a) LandsD is now recommended to be the Data Agent of Building CSU, Lot CSU and Road Centreline CSU. These CSUs could be grouped and share the same infrastructure for Option A –Stage 1. If with consent from CED and LandsD, Slope CSU could also be grouped into this Option A – Stage 1 to be hosted by LandsD. No separate central database and DCT are required to be maintained for individual CSU (Option C). This could be an advantage over Option C.

(b) There would be benefit from economy of scale if Option A- Stage 1 and LandsD's DDS are implemented together

(c) Some investment on DAM could be leveraged on LandsD's DDS.

(d) Option A – Stage 1 would provide a better level of service to PDs and manual post processing effort would be very much reduced.

(e) Option A – Stage 1 will provide the data dissemination service through which PDs could exchange CSU data conforming to the CSU specification and data format standard.

1.2.10 Although LandsD's prototype hub provides spatial queries and analysis functions, it would not be a mandatory requirement for DAM to include these value added functions within the timeframe of DAM. These could be included in the remaining stages of Option A which can be carried out outside the scope of the DAM project.

1.2.11 As explained in previous sections, more benefit could spin off from Option A - Stage 1 since it provides a good IT infrastructure where value added services can be retrofitted at a later stage, e.g. searching and query functions of the spatial information. One perceived benefit is that these value added services could be shared and B/Ds need not purchase a number of GIS software licenses for use by general users, while at the same time, they could benefit from the services provided by the GIS facilities which are commonly accessible by PDs and/or public. e.g. the information hub hosted by Town Planning Board (http://www.ozp.tpb.gov.hk) offers a Web service which shows the base map and allow zoning plan searched by Building Name, Street Name, Town Planning Board District and Lot No.; another example is the "HKSAR Geospatial Information Hub" developed by LandsD; it is a very resourceful central hub which has nicely integrated very useful geospatial information from different sources; it provides even more powerful search and some analysis capability which can readily be expanded to support the decision making and operational need for bureaux and many PDs within the Government.

Initiatives of ITSD

1.2.12 SCOPES (Shared Common Platform for Electronic Services) is an initiative of ITSD due to be launched soon. SCOPES is to provide an IT infrastructure based on SOAP to facilitate the application integration and enhance interoperability in the development of customer-centric projects that cut across the service boundaries of B/Ds. SOAP v1.1 is a standard Intra-government remote service delivery protocol (for simple functional integration in a heterogeneous environment) recommended in the HKSAR Interoperability Framework (IF) v1.0.

1.2.13 SCOPES is suitable for the systems which have the following functional characteristics:

(a) Need for application-to-application integration

(b) Need to handle ebXML messages

(c) Need for Certificate Revocation List (CRL) checking

1.2.14 Given the known requirement at this stage, the data dissemination option of DAM 1 is not required to handle ebXML message and there is no need for CRL checking. The need for application-to-application integration has to be reviewed according to the options chosen for data dissemination and the architecture to be used.

(a) Among the options discussed in section 1.1.3, Option C and Option D does not require application-to-application integration. There is no obvious benefit to adopt SCOPES for these two options.

(b) Both option A and option B can also provide additional query and analytical functionality (note: these functionalities are not mandatory for data dissemination for DAM 1) in addition to the data dissemination for DAM 1 purpose. Data dissemination only requires file transfer functionality. There is no need for application-to-application integration. Therefore, there is no obvious benefit to adopt SCOPES solely for data dissemination purpose. Strictly speaking, data dissemination of DAM does not fall into the scope of SCOPES.

(c) In both option A and option B, the query and analytical functionality can be provided in two different ways:

(i) User query - a Web interface is provided for users (from PDs) to perform query or analysis on GIS data and to obtain the results on completion of query/analysis.

(ii) Application integration – Web services can be deployed for applications of PDs to perform query or analysis and return the result to the applications. The merit of this solution approach needs to be evaluated by its need and cost/benefit justification.

(d) In option A, the user query functionality is to be carried out in a central hub and will therefore not require application-to-application integration. There is no obvious benefit to adopt SCOPES for user query, but application integration can be a candidate for SCOPES since it might require application-to application-integration.

(e) In option B, application-to-application could be a viable option for both user query and application integration. The query and analysis requests from the originating application can be redirected to individual applications of each PDs. Each individual application can provide Web services for integration with other applications. This application-to-application integration could allow many-to-many "exchange" of messages. It can be a good candidate to adopt SCOPES. The merit of this solution approach needs to be evaluated by its need and cost/benefit justification.

1.2.15 One characteristics of the data exchange in DAM 1 is that they are the spatial data exchanged in high volume and they are available in different formats. The spatial data are stored in different formats in different systems. These different formats might not be totally compatible with each other. This may lead to the result that the client applications may not be able to interpret the data returned by the Web

services. In order to solve this problem, the server application has to convert the data into a format which can be directly supported by the client application before passing back the result. Given the existing environment of the PDs, there is a mix of systems including GIS systems which are designed for sophisticated non-text based applications. Resources, including staff, finance and time resources, required to overcome the technical challenge would be a key concern to the PDs.

1.2.16 Business requirements of PDs should also be duly considered. If one PD (e.g. Data Agent) has set to offer application to application web services, but other PDs (e.g. Data Users and Data Owners) choose to run the analysis using their own means (e.g. have the analysis carried out on the existing client side), it would defeat the purpose of web services.

1.2.17 In option B, since the data are distributed in different applications, all the applications has to provide Web services in order to provide the query and analytical functions. This will be a more appropriate solution for DAF.

1.2.18 Despite the fact the SCOPES will provide a common infrastructure good for future application integration in option A and for option B which is a more appropriate solution for DAF, the application integration needs to be complemented with compatible GIS technology supporting products compatibility and data quality assurance.

1.3 Way forward

Data dissemination option

1.3.1 The main objective of DAM is to provide short-term solution (within a period of 12 months) to overcome the problems in the exchange of PLW data.

1.3.2 The constraints imposed by this 12-months time frame should be lifted when justified with perceived benefit to the common interest of PDs and non PDs. Although Option A – Stage 1 will take longer than 12 months prior to its implementation, the benefit and the to-be spinned off benefit are to the interests of PDs and non PDs. If this constraint is lifted, Option A –Stage 1 is recommended to be the data dissemination option for DAM purpose.

SCOPES

1.3.3 Option C and option D can fulfill the main objective of DAM and there is there is no obvious benefit to use SCOPES in these cases. Therefore, it is recommended not to use SCOPES for these two options.

1.3.4 In option B, the data can be disseminated without using SCOPES. Option B can provide additional facilities by providing user query and analytical functions using Web services and SCOPES. It is a more appropriate solution for DAF

implementation. Nevertheless, the issues highlighted in 1.2.15 and 1.2.16 needed to be carefully considered.

1.3.5 In option A, data dissemination can also be implemented without using SCOPES. Since LandsD is also prepared to implement their own data dissemination system, the data dissemination part of option A is recommended as a viable option for DAM purpose since both DAM and LandsD DDS could share the same infrastructure.

1.3.6 In option A, user query can also be implemented without SCOPES. If application integration is required for analysis functionality and if the issues highlighted in 1.2.14, 1.2.15 and 1.2.16 are addressed, Web services and SCOPES could be viable option. Taking into account the time frame and main objective of DAM, it is recommended that the application integration using Web services and SCOPES can be implemented outside the scope of DAM project.

Advance task to be carried out by LandsD

1.3.7 Since LandsD already finished their FS on DDS, the study formed a good base for Option A – Stage 1 reference purpose. It could be time effective if a separate supplementary study is carried out to finalise feasibility study of option A – Stage 1 of DAM 1. The FS of LandsD's DDS took more than 12 months to complete, and given the scope of Option A-Stage 1, 6 to 8 months should be allowed before a clear cost figure (both non recurrent and recurrent) could be derived. The supplementary FS would cover a number of tasks which could fall under the jurisdiction of Bureau and LandsD. Main scope of this supplementary study includes:

(a) Study the database management of CSUs (under jurisdiction of LandsD).

(b) Study the requirements on the import programme, data transfer from Data Owners to the central database, data conversion, metadata production and data transfer from the central database to Data Users (under jurisdiction of LandsD).

(c) From now to the implementation of Option A – Stage 1, different PDs might be separately planning to develop their own GIS systems or information portals for access by B/Ds or public. To some extents, there are duplication of efforts and duplication of financial expenditure within the Government. These investments should be better coordinated and leveraged for the benefit of the government. The supplementary study could also study how the hub facilities now available with PDs (or planned to be in place) could be better leveraged for DAM purpose. This item is optional since it is outside the scope of DAM (under jurisdiction of HPLB or CITB).

(d) Check if the retrofitted functions of LandsD DDS or the Option A (remaining stages) could use the same common technical architecture (under jurisdiction of LandsD).

(e) Conduct a brief study on whether SCOPES is suitable for data dissemination purpose of DAM 1 (under jurisdiction of HPLB).

1.3.8 The funding arrangement of Option A – Stage 1 and LandsD's DDS is shown below:

	Functions							
	Option A – Stage 1 (for DAM purpose)					**Other non-DAM functions (for LandsD's DDS and hub purpose)**		
	CSU database	**Metadata**	**Data Dissemination**					
	CSU database	Metadata production	Interface – between DDS and Data Owners	Data conversion	Interface – between DDS and Data Users	Interface – between Option A and BMS	e-ordering and e-payment	Query functions
Funding source (one off and recurrent)	DAM		DAM			DDS	LandsD's DDS	LandsD's DDS
Requirements	Conforming to CSU DAM specification	Conforming to DAM5 and DAM6 requirements	Subject to user requirements DAM	Conforming to DAM 2 and DAM 3 requirements DAM	Subject to user requirements LandsD's	LandsD's DDS	LandsD's DDS	LandsD's DDS
Remarks	Could be leveraged on LandsD's DDS		Could be leveraged on LandsD's DDS	Could be leveraged on LandsD's DDS	Could be leveraged on LandsD's DDS			

Table 18 – Proposed funding arrangement

Appendix K Cost Benchmark

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
Building	ArchSD01-A	ArchSD	LandsD	ArchSD	Base map	DAM2	DGN	O-Y-1	300	1	1	0	2	0	3,374
Lot	ArchSD10	ArchSD	LandsD	ArchSD	Land status	DAM1	Hardcopy	O-M-5	4.8	60	0	0	0	0	0
Slope	ArchSD11	ArchSD	CED	ArchSD	Slope data	DAM1	Soft copy	-	-	0	0	0	0	0	0
Building	BD02	BD	RVD	BD	Building Address	DAM1	Soft copy	O-Y-1	-	0	0	0	0	0	0
Building	BLD-26	BD	RVD	BD	Incoming Textual Building data	DAM3	Oracle 8i	O-D-1	-	365	0	0	0	0	0
Lot	BD07	BD	LandsD	BD	Land Status and Cadastral Information	DAM1	Softcopy	Several per day	-	1000	0	0	0	0	0
Lot	BD08	BD	LandsD	BD	Lot outline or polygon	DAM1	Hardcopy	O-Y-6	-	6	1	0	4	0	6,748
Slope	BD01	BD	CED	BD	Slope Information	DAM1	Hard copy	-	-	0	0	0	0	0	0
Building	C&SD01-A	C&SD	LandsD	C&SD	Base Map	DAM1	Arc/Info	O-Q-1	5,000	4	29	0	116	0	194,849
Building	C&SD05-A	C&SD	BD	C&SD	OP documents	DAM1	Hard copy	O-Y-80	-	80	0	0	36	0	60,732
Building	C&SD08-A	C&SD	BD	C&SD	BD MD	DAM1	Hard copy	O-M-1	-	12	3	0	36	0	60,732
Building	BLD-15	C&SD	LandsD	C&SD	Incoming Spatial	DAM3	Arc/Info Coverage	O-Q-1	-	4	10	0	39	0	64,950

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
					Building data		8.1								
Lot	C&SD03-A	C&SD	LandsD	C&SD	Cadastral map include land lot polygons	DAM1	Arc/Info	O-Q-1	640	4	2	0	8	0	12,653
Lot	LOT-07	C&SD	LandsD	C&SD	Incoming Spatial Lot data	DAM3	Arc/Info Coverage 8.1	O-Q-1	-	4	1	0	3	0	4,218
Road Centreline	RCL-04	C&SD	LandsD	C&SD	Incoming Spatial Road Centreline data	DAM3	Arc/Info Coverage 8.1	O-Q-1	-	4	1	0	4	0	6,748
TPU	C&SD04-A	C&SD	PlanD	C&SD	TPU / SB boundaries	DAM1	Arc/Info	O-Y-1	31	1	1	0	1	0	1,265
TPU	TPU-07	C&SD	PlanD	C&SD	Incoming Spatial TPU data	DAM3	Arc/Info Coverage 8.1	A-Y-1	-	1	0	0	0	0	422
Building	BLD-20	CED	LandsD	CED	Incoming Spatial Building data	DAM3	SHAPEFILE	O-Q-1	-	4	1	0	4	0	6,748
Lot	CED18	CED	LandsD	CED	Land Lot layout plans	DAM1	Hard copy	-	-	0	0	0	0	0	0
Lot	LOT-11	CED	LandsD	CED	Incoming Spatial Lot data	DAM3	ArcView SHAPEFILE 3.2a	O-Q-1	-	4	1	0	2	0	3,374
Lot	LOT-14	CED	LandsD	CED	Incoming Textual Lot	DAM3	ArcView SHAPEFILE	O-Q-1	-	4	1	0	2	0	3,374

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
					data		3.2a								
Slope	SLP-10	CED	CED	All PDs	Outgoing Spatial Slope data	DAM3	DGN	O-M-1	-	12	0	0	0	0	0
Slope	SLP-11	CED	CED	All PDs	Outgoing Textual Slope data	DAM3	DBF	O-M-1	-	12	1	0	6	0	10,122
Slope	SLP-12.1	CED	BD	CED	Incoming Spatial Slope data	DAM3	DGN	A-Y-500	-	500	0	0	40	0	67,480
Slope	SLP-12.2	CED	HyD	CED	Incoming Spatial Slope data	DAM3	DGN	A-Y-500	-	500	0	0	40	0	67,480
Slope	SLP-12.3	CED	WSD	CED	Incoming Spatial Slope data	DAM3	DGN	A-Y-500	-	500	0	0	40	0	67,480
Slope	SLP-13	CED	LandsD	CED	Incoming Spatial Slope data	DAM3	DGN	O-M-1	-	12	0	0	0	0	0
Slope	SLP-14.1	CED	LandsD	CED	Incoming Textual Slope data	DAM3	Oracle 8.1.2	A-Y-500	-	500	0	0	25	0	42,175
Slope	SLP-14.2	CED	HD	CED	Incoming Textual Slope data	DAM3	Oracle 8.1.2	A-Y-500	-	500	0	0	25	0	42,175
Slope	SLP-14.3	CED	HyD	CED	Incoming Textual	DAM3	Oracle 8.1.2	A-Y-500	-	500	0	0	25	0	42,175

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
					Slope data										
Slope	SLP-14.4	CED	TDD	CED	Incoming Textual Slope data	DAM3	Oracle 8.1.2	A-Y-500	-	500	0	0	25	0	42,175
Slope	SLP-14.5	CED	WSD	CED	Incoming Textual Slope data	DAM3	Oracle 8.1.2	A-Y-500	-	500	0	0	25	0	42,175
Building	DSD02-A	DSD	Various Works Depts.	DSD	As-built drawings	DAM2	DGN, Hard copy	O-Y-90	5	90	1	0	90	11	211,388
Lot	LOT-09	DSD	LandsD	DSD	Incoming Spatial Lot data	DAM3	DGN SE	A-Y-1	-	1	20	0	20	0	33,740
Slope	SLP-07	DSD	CED	DSD	Incoming Spatial Slope data	DAM3	DGN SE	A-Y-1	-	1	0	0	0	0	0
TPU	TPU-09	DSD	PlanD	DSD	Incoming Spatial TPU data	DAM3	DGN SE	A-Y-1	-	1	2	0	2	0	3,374
TPU	TPU-10	DSD	PlanD	DSD	Incoming Textual TPU data	DAM3	Excel	A-Y-1	-	1	0	0	0	0	0
Other	EMSD01-A	EMSD	CED	EMSD	Project layout	DAM2	DGN	O-Y-30	0.5	30	1	0	30	0	50,610
Building	BLD-16	HyD	LandsD	HyD	Incoming Spatial Building data	DAM3	ArcSDE 8.1.2	O-Q-1	-	4	1	0	4	1	10,983

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
Building	BLD-17	HyD	LandsD	HyD	Incoming Spatial Building data	DAM3	Mif	O-Y-2	-	2	1	0	2	0	5,492
Building	BLD-25	HyD	LandsD	HyD	Incoming Textual Building data	DAM3	ArcSDE 8.1.2	O-Y-2	-	2	1	0	2	0	3,374
Lot	HyD11	HyD	LandsD	HyD	Lot boundaries	DAM1	Arc/Info	O-H-1	4000	2	3	0	6	0	12,240
Lot	LOT-08	HyD	LandsD	HyD	Incoming Spatial Lot data	DAM3	ArcSDE 8.1.2	O-Y-2	-	2	4	1	8	2	21,966
Road Centreline	HyD04-A	HyD	LandsD	HyD	Base map (DGN)	DAM2	DGN	O-Q-1	3000	4	3	1	12	2	30,832
Road Centreline	HyD06-A	HyD	All Works Departments	HyD	As-built drawings	DAM2	DGN, Hard copy	O-Y-140	14	140	0	0	18	7	66,581
Road Centreline	RCL-05	HyD	LandsD	HyD	Incoming Spatial Road Centreline data	DAM3	Arc/Info Coverage (Merged as 1 layer)	O-Y-2	-	2	8	0	16	0	27,667
Slope	HyD13	HyD	LandsD	HyD	SMRIS data	DAM1	Arc/Info	O-H-1	224	2	2	0	4	0	8,866
Slope	SLP-04	HyD	CED	HyD	Incoming Spatial Slope data	DAM3	ArcSDE 8.1.2	A-Y-2	-	2	2	0	4	0	8,866
Slope	SLP-05	HyD	LandsD	LandsD	Incoming Spatial Slope data	DAM3	ArcSDE 8.1.2	O-Y-2	-	2	2	0	4	0	8,866

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
TPU	TPU-05	HyD	PlanD	HyD	Incoming Spatial TPU data	DAM3	ArcView SHAPEFILE	O-Y-2	-	2	0	0	1	0	1,350
Building	LandsD06	LandsD	BD	LandsD	BD Monthly Building Digest	DAM1	Hard copy	-	-	0	0	0	0	0	0
Building	LandsD07	LandsD	BD	LandsD	OP	DAM1	Hard copy	O-Y-100	-	100	0	0	5	0	8,435
Building	BLD-01	LandsD	LandsD	See note 1	Outgoing Spatial Building data	DAM3	E00	O-M-1	-	12	3	0	33	1	60,965
Building	BLD-02	LandsD	LandsD	See note 1	Outgoing Spatial Building data	DAM3	DWG	O-M-1	-	12	3	0	34	1	62,652
Building	BLD-03	LandsD	LandsD	See note 1	Outgoing Spatial Building data	DAM3	DXF	O-M-1	-	12	3	0	34	1	62,652
Building	BLD-04	LandsD	LandsD	See note 1	Outgoing Spatial Building data	DAM3	DGN	O-M-1	-	12	4	0	49	1	87,957
Building	BLD-07	LandsD	LandsD	See note 1	Outgoing Textual Building data	DAM3	ASCII	O-M-1	-	12	1	0	13	1	27,225
Building	BLD-18	LandsD	All Works Departments	LandsD	Incoming Spatial Building	DAM3	Arc/Info Coverage 6.x	A-Y-1	-	1	121	5	121	5	232,377

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
					data		6.x								
Building	BLD-19	LandsD	All Works Departments	LandsD	Incoming Spatial Building data	DAM3	Arc/Info Coverage 6.x	A-Y-1	-	1	181	8	181	8	348,566
Lot	LOT-01	LandsD	LandsD	See note 1	Outgoing Spatial Lot data	DAM3	EOO	O-M-1	-	12	3	0	31	1	57,591
Lot	LOT-02	LandsD	LandsD	See note 1	Outgoing Spatial Lot data	DAM3	DGN	O-M-1	-	12	4	0	49	1	87,957
Lot	LOT-03	LandsD	LandsD	See note 1	Outgoing Spatial Lot data	DAM3	DWG	O-M-1	-	12	2	0	27	1	50,843
Lot	LOT-04	LandsD	LandsD	See note 1	Outgoing Spatial Lot data	DAM3	DXF	O-M-1	-	12	2	0	27	1	50,843
Other	LandsD02-A	LandsD	All Works Departments	LandsD	As-built drawings	DAM2	DWG, hard copy	O-Y-30	3.5	30	1	0	21	0	35,427
Road Centreline	RCL-01	LandsD	LandsD	See note 1	Outgoing Spatial Road Centreline data	DAM3	E00	O-M-1	-	12	3	0	34	2	67,946
Road Centreline	RCL-02	LandsD	LandsD	See note 1	Outgoing Textual Road Centreline data	DAM3	ASCII	O-M-1	-	12	1	0	10	1	22,164

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
Slope	LandsD01-A	LandsD	CED	LandsD	Slope boundary	DAM2	DGN	O-M-1	0.18	12	1	1	6	6	41,886
Slope	SLP-01	LandsD	LandsD	CED	Outgoing Spatial Slope data	DAM3	DGN	O-M-1	-	12	0	0	4	1	10,351
Slope	SLP-02	LandsD	LandsD	see note 2 + WSD + SMIRS	Outgoing Textual Slope data	DAM3	ASCII	O-M-2	-	24	0	0	5	1	11,562
Slope	SLP-03	LandsD	LandsD	see note 2 + WSD + SMIRS	Outgoing Textual Slope data	DAM3	Excel	O-M-2	-	24	0	0	7	1	15,358
Slope	SLP-06	LandsD	CED	LandsD	Incoming Spatial Slope data	DAM3	Arc/Info Coverage pre7.0	O-M-1	-	12	0	0	5	1	11,403
TPU	TPU-06	LandsD	PlanD	LandsD	Incoming Spatial TPU data	DAM3	Arc/Info Coverage 6.x	A-Y-1	-	1	10	0	10	0	16,870
Building	LR01	LR	RVD	LR	Monthly Return of Building Numbers Allocated/ Cancelled	DAM1	Hard copy	O-M-1	NA	12	9	0	108	0	182,196
Building	LR02	LR	BD	LR	Statutory Orders and Occupation Permit, etc.	DAM1	Hard copy	O-Y-26,643	NA	26643	0	0	426	0	719,148
Building	BLD-05	LR	LR	PlanD	Outgoing Textual Building	DAM3	ASCII	O-Y-1	-	1	0	0	0	0	0

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
					data										
Building	BLD-06	LR	LR	LandsD, RVD	Outgoing Textual Building data	DAM3	ASCII	O-D-1	-	365	0	0	0	0	0
Lot	LR03	LR	LandsD	LR	Land grant document	DAM1	Hard copy	O-Y-420	NA	420	0	0	74	0	124,703
Lot	LR04	LR	LandsD	LR	Resumption Notices, Consent etc.	DAM1	Hard copy	O-Y-1,859	NA	1859	0	0	30	0	50,178
Building	PlanD04	PlanD	BD	PlanD	OP information in BD MD	DAM1	Microsoft Excel	O-M-1	0.2	12	2	0	24	0	40,488
Building	PlanD05	PlanD	BD	PlanD	Committed sites for development in BD MD	DAM1	Microsoft Excel	O-M-1	Included in Plan D04	12	3	0	36	0	60,732
Building	BLD-14	PlanD	LandsD	PlanD	Incoming Spatial Building data	DAM3	ArcView SHAPEFILE	O-Q-1	-	4	1	0	4	0	6,748
Building	BLD-22	PlanD	LandsD	PlanD	Incoming Textual Building data	DAM3	ArcView SHAPEFILE 3.2a	O-Y-1	-	1	0	0	0	0	0
Building	BLD-23	PlanD	BD	PlanD	Incoming Textual Building data	DAM3	FoxPro	A-Y-1	-	1	24	0	24	0	40,488

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
Building	BLD-24	PlanD	HD	PlanD	Incoming Textual Building data	DAM3	FoxPro	A-Y-1	-	1	2	0	2	0	3,374
Lot	LOT-05	PlanD	LandsD	PlanD	Incoming Spatial Lot data	DAM3	SHAPEFILE 3.2a	O-Q-1	-	4	1	0	4	0	6,748
Lot	LOT-06	PlanD	LandsD	PlanD	Incoming Spatial Lot data	DAM3	DGN 7.0	O-Q-1	-	4	1	0	2	0	3,374
Lot	LOT-12	PlanD	LandsD	PlanD	Incoming Textual Lot data	DAM3	ArcView SHAPEFILE 3.2a	A-Y-1	-	1	0	0	0	0	0
Lot	PlanD06	PlanD	LR	PlanD	Land owner records	DAM1	Formatted text file	A-Y-1	306	1	80	0	80	0	134,960
Lot	PlanD07	PlanD	LandsD	PlanD	Information on land sales	DAM1	Arc/Info	O-Y-1	0.1	1	6	0	6	0	10,122
Other	PlanD08-A	PlanD	LandsD	PlanD	BMS and CIS data	DAM2	Arc/Info	O-Q-1	-	4	0	0	0	0	0
Road Centreline	RCL-03	PlanD	LandsD	PlanD	Incoming Spatial Road Centreline data	DAM3	ArvView SHAPEFILE	O-Y-2	-	2	1	0	2	0	3,374
Slope	SLP-09	PlanD	LandsD	PlanD	Incoming Textual Slope data	DAM3	ArvView SHAPEFILE	A-Y-1	-	1	0	0	0	0	0
TPU	PlanD01	PlanD	C&SD	PlanD	Register of Living	DAM1	Textual	O-Y-1	39	1	23	0	23	0	38,801

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
					Quarters										
TPU	TPU-01	PlanD	PlanD	CED, HyD, BD, WSD, RVD	Outgoing Spatial TPU data	DAM3	DGN	O-Y-2	-	2	0	0	1	0	844
TPU	TPU-02	PlanD	PlanD	CED, HyD, BD, WSD, RVD	Outgoing Spatial TPU data	DAM3	E00	O-Y-2	-	2	0	0	1	0	844
TPU	TPU-03	PlanD	PlanD	CED, HyD, BD, WSD, RVD	Outgoing Spatial TPU data	DAM3	Arc/Info Coverage	O-Y-2	-	2	0	0	0	0	0
TPU	TPU-04	PlanD	PlanD	CED, HyD, BD, WSD, RVD	Outgoing Spatial TPU data	DAM3	ArcView SHAPEFILE	O-Y-2	-	2	0	0	1	0	844
Building	RVD02-A	RVD	BD	RVD	OPs, certificates and consents	DAM1	Hard copy	O-W-5	-	260	0	0	60	0	101,220
Building	BLD-13	RVD	RVD	BD, LandsD, PlanD, HD	Outgoing Spatial Building data	DAM3	ASCII	A-Y-1	-	1	27	0	27	0	45,549
Building	BLD-21	RVD	LandsD	RVD	Incoming Spatial Building data	DAM3	ArcSDE 8.2	O-W-1	-	52	0	0	0	0	0
Building	BLD-27	RVD	BD	RVD	Incoming Textual Building data	DAM3	Oracle 8i	O-W-5	-	260	20	0	20		33,740

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
Building	BLD-28	RVD	BD	RVD	Incoming Textual Building data	DAM3	Oracle 8i	O-Y-30	-	30	20	0	20		33,740
Building	BLD-29	RVD	LandsD	RVD	Incoming Textual Building data	DAM3	Oracle 8i	O-W-5	-	260	20	0	20		33,740
Lot	LOT-10	RVD	LandsD	RVD	Incoming Spatial Lot data	DAM3	ArcSDE 8.2	O-W-1	-	52	0	0	0	0	0
Lot	RVD09	RVD	LandsD	RVD	Land grant document	DAM1	Hard copy	O-W-5	-	260	0	0	60	0	101,220
TPU	RVD06-A	RVD	PlanD	RVD	TPU boundaries Plan	DAM1	Hard copy	O-Y-1	-	60	0	0	0	0	0
TPU	TPU-08	RVD	PlanD	RVD	Incoming Spatial TPU data	DAM3	ArchSDE	A-Y-1	-	1	0	0	0	0	337
	RVD01	RVD	LR	RVD	MDB	DAM1	Textual	O-D-1	1.5	30	2	0	60	0	101,220
Building	BLD-30	TDD	LandsD	TDD	Incoming Spatial Building data	DAM3	DGN (v7J)	O-Q-1	-	4	1	0	2	0	3,374
Building	BLD-31	TDD	LandsD	TDD	Incoming Textual Building data	DAM3	NA	O-Q-1	-	4	1	0	2	0	3,374

		Subject PD				Related DAM Strategy	Format		Size (Mega Bytes)		Tech. Effort (Manday /process)	Prof. Effort (Manday /process)	Tech. Effort (Manday/Yr)		Total Annual Efforts (HKD/Yr)
Road Centreline	RCL-07	TDD	LandsD	TDD	Incoming Spatial Road Centreline data	DAM3	DGN (V7J)	O-Y-2	-	2	4	0	7	0	11,809
Road Centreline	RCL-08	TDD	LandsD	TDD	Incoming Textual Road Centreline data	DAM3	DBF	O-Y-2	-	2	4	0	7	0	11,809
Building	WSD01-A	WSD	LandsD	WSD	Base map	DAM2	Arc/Info	A-Y-5	1500	4	1	0	4	0	7,807
Building	WSD04-A	WSD	All Works Departments	WSD	As-built drawings	DAM2	DGN, DWG, Hard copy	A-Y-25	6	25	2	0	38	1	69,880
Road Centreline	RCL-06	WSD	LandsD	WSD	Incoming Textual Road Centreline data	DAM3	DBF	O-Y-1	-	1	8	0	8	0	13,496
Road Centreline	WSD03	WSD	LandsD	WSD	GIRS data	DAM1	Formatted text file	O-H-1	200	2	1	0	2	0	4,433
Slope	SLP-08	WSD	CED	WSD	Incoming Spatial Slope data	DAM3	ArcView SHAPEFILE 3.2a	O-M-1	-	12	5	0	60	0	101,220
TPU	WSD02	WSD	C&SD	WSD	Demographic data	DAM1	Hard copy	A-Y-5	500	5	6	2	30	8	90,315
TPU	WSD10	WSD	PlanD	WSD	TPU / SB boundaries	DAM1	Arc/Info	O-Y-1	60	1	1	0	1	0	2,216

Remarks:

Tech Staff Rate (per day): 1,687

Prof Staff Rate (per day): 5,294

Note 1: ArchSD; BD; C&SD; CED; DSD; EMSD; HyD; LandsD; PlanD; RVD; TDD and WSD

Note 2: AFCD, ArchSD, AMS, Broadcasting Department, CAD, Civil Aid Service, CSD, Customs & Excise Dept, EMB, EMSD, EPD, EHD, FSD, GPA, HK Observatory, HD, HAD, ICAC, Immigration Dept, Judiciary, LCSD, Marine Department, OFTA, HKPF, Post Office, SWD, TD, HWFB, HWB, ETWB, CED, DSD, HD, HYD, TDD, WSD, Housing Authority, LandsD(SMS)

Appendix L Cost Estimates – System Revamping and One-Off Data Conversion

CSU	Department	System name / Nature of effort	REVAMPING/ SYSTEM ENHANCEMENT COSTS								DATA CONVERSIONS					TOTAL COST ESTIMATES (HKD)	Remarks
			Procurement Costs (HKD)	SYSTEM ENHANCEMENT			CONTRACT MANAGEMENT			TOTAL Enhancement Costs (HKD)	Procurement Costs (HKD)	IN-HOUSE		Outsourced Effort (HKD)	TOTAL Data Conversion Cost (HKD)		
				Technical Effort (Manday)	Professional Effort (Manday)	Outsourced Effort (HKD)	Technical Effort (Manday)	Professional Effort (Manday)	Outsourced Effort (HKD)			Technical Effort (Manday)	Professional Effort (Manday)				
Building	ArchSD	Nature of effort	1,600,000	0	0	980,000	0	0	0	$0	0	0	0	0	$0	$0	
Building	BD	BD-GIS (Phase 2)	225,000	0	0	240,000	0	0	0	$465,000	0	0	0	0	$0	$465,000	
Building	C&SD	Digital Mapping Sub-system & Data Conversion	0	44	0	359,900	0	11	0	$492,362	0	0	0	0	$0	$492,362	
Building	LandsD	Data Conversion	-	-	-	-	-	-	-	$0	0	494	29	0	$986,904	$986,904	
Building	LandsD	CLIS (SMO)	0	284	65	0	0	0	0	$823,218						$823,218	
Building	LandsD	Customized Data Conversion Tools	0	41	4	0	0	0	0	$90,343						$90,343	
Building	LandsD	DAM_OUT and DAM_IN (SMO)	1,498,420	172	11	0	0	0	0	$1,846,818						$1,846,818	Recurrent= HKD 2,65m
Building	LandsD	GIRS & GIH (SMO)	0	40	2		0	0	0	$78,068						$78,068	
Building	LandsD	LGIS (LAO)	13,000	0	0	40,000	0	0	4,000	$57,000						$57,000	
Building	LandsD	New web-based system (LAO)	324,000	0	0	176,000	0	0	27,000	$527,000						$527,000	
Building	PlanD	Arc\iew custom programmes	0	0	0	8,000	0	0	0	$8,000	0	0	0	0	$0	$8,000	
Building	PlanD	BDRIS	0	0	0	240,000	0	0	25,000	$265,000						$265,000	
Building	PlanD	GIS Portal	0	0	0	50,000	0	0	15,000	$65,000						$65,000	
Building	PlanD	REDPOT	0	0	0	15,000	0	0	0	$15,000						$15,000	
Building	RVD	Data Conversion	-	-	-	-	-	-	-	$0	1,454,200	0	0	4,337,300	$5,791,500	$5,791,500	
Building	RVD	PMS	69,300	0	0	116,600	0	0	0	$185,900						$185,900	
Lot	BD	BD-GIS	0	0	0	0	0	0	0	$0	0	0	0	0	$0	$0	Shares with Building
Lot	DSD	CAD	100,000	0	0	100,000	0	0	0	$200,000	0	0	0	0	$0	$200,000	
Lot	LandsD	Data Conversion	-	-	-	-	-	-	-	$0	0	80	7	0	$172,018	$172,018	Recurrent= HKD 1,6m
Lot	LandsD	CIS	0	300	17	0	0	0	0	$596,098						$596,098	
Lot	LandsD	DAM_CIS	399,084	90	5	0	0	0	0	$577,384						$577,384	
Lot	LandsD	GIH	0	20	1	0	0	0	0	$39,034						$39,034	
Lot	LandsD	GIRS&GIH (SMO)	0	20	1	0	0	0	0	$39,034						$39,034	
Lot	LandsD	LPBRD	0	5	0.5	0	0	0	0	$11,082						$11,082	
Lot	LandsD	Map Sales Conversion Programs	0	72	0	0	0	0	0	$121,464						$121,464	
Lot	LandsD	QMS	0	0	20	0	0	0	0	$105,880						$105,880	
Lot	LandsD	SMRIS	0	5	0.5	0	0	0	0	$11,082						$11,082	
Lot	RVD	PMS	0	0	0	0	0	0	0	$0	-	-	-	-	$0	$0	Shares with Building

CSU	Department	System name / Nature of effort	REVAMPING/ SYSTEM ENHANCEMENT COSTS								DATA CONVERSIONS					TOTAL COST ESTIMATES (HKD)	Remarks
			Procurement Costs (HKD)	SYSTEM ENHANCEMENT			CONTRACT MANAGEMENT			TOTAL Enhancement Costs (HKD)	Procurement Costs (HKD)	IN-HOUSE		Outsourced Effort (HKD)	TOTAL Data Conversion Cost (HKD)		
				Technical Effort (Manday)	Professional Effort (Manday)	Outsourced Effort (HKD)	Technical Effort (Manday)	Professional Effort (Manday)	Outsourced Effort (HKD)			Technical Effort (Manday)	Professional Effort (Manday)				
Road Centr	HyD	RDMS	0	0	0	0	0	0	0	$0	-	-	-	-	$0	$0	
Road Centr	LandsD	Data Conversion	-	-	-	-	-	-	-	$0	0	40	2	0	$78,068	$78,068	
Road Centr	LandsD	DAM_RDEXPORT	0	30	2	0	0	0	0	$61,198						$61,198	Recurrent= HKD79k
Road Centr	LandsD	GIRS	0	159	9	0	0	0	0	$315,879						$315,879	
Road Centr	LandsD	Map Sales Conversion Programs	0	36	0	0	0	0	0	$60,732						$60,732	
Road Centr	LandsD	QMS	0	0	6	0	0	0	0	$31,764						$31,764	
Slope	ArchSD	unnamed system	500,000	0	0	200,000	0	0	0	$700,000	-	-	-	-	$0	$700,000	
Slope	CED	Data Conversion	-	-	-	-	-	-	-	$0	-	-	-	-	$0		
Slope	CED	CSRLP	30,000	286	0	250,000	79.2	26.4	0	$1,035,854	0	0	0	0	$0	$1,035,854	
Slope	CED	SIS	140,000	0	0	0	0	0	0	$140,000						$140,000	
Slope	DSD	Automated Mapping System/ Slope Inventory Management	250,000	0	0	250,000	0	0	0	$500,000	-	-	-	-	$0	$500,000	
Slope	HyD	RDMS	30,000	6	1	0	0	0	1,700,000	$1,745,416	-	-	-	-	$0	$1,745,416	
Slope	LandsD	Data Conversion	-	-	-	-	-	-	-	$0	0	0	0	0	$0		
Slope	LandsD	CLIS (SMO)	0	30	2	0	0	0	0	$61,198						$61,198	
Slope	LandsD	SMRIS	0	2	0.5	174,616	0	0	0	$180,637						$180,637	
Slope	WSD	WSDSMS	300,000	0	0	200,000	0	44	0	$732,936	-	-	-	-	$0	$732,936	
TPU/SB	LandsD	CLIS (SMO)	0	10	3	0	0	0	0	$32,752	-	-	-	-	$0	$32,752	
TPU/SB	PlanD	GIS Portal	0	0	0	50,000	0	0	0	$50,000	-	-	-	-	$0	$50,000	
																$19,296,623	

Notes:

1. The same rates adopted in the previous PLW Study are adopted for Technical and Professional rates as follows:

   - Technical HK$1,687
   - Professional HK$5,294

2. ArchSD is not going to proceed with the implementation of a new GIS system for Building CSU, the quotation obtained from the vendor is included for reference only – it is not included as part of the system revamping effort.

3. The data conversion cost in C&SD is already included in the system revamping cost quoted.

4. There is no separate revamping cost for Lot CSU in BD and RVD as they are already catered for in the Building CSU.

Appendix M Revisit Data Exchange Process

M.1 Processes to be addressed by CAD Standard for Works Projects (CSWP)

			Data Type		Format	Annual Tech. Effort	Annual Prof. Effort
ArchSD03	DSD	Drainage records	Geospatial Data	DF	Hard copy	25	0
ArchSD04	WSD	Water mains records	Geospatial Data	DF	Hard copy	25	0
DSD02	Various Works Department	As-built drawings	Geospatial Data	DF, CF, TT	DGN, Hardcopy	90	12.25
EMSD01	CED	Project layout	Geospatial Data	CF	DGN	30	0
EMSD02	DSD	Project layout	Geospatial Data	CF	DGN	5	0
HyD06	All Works Department	As-built drawings	Geospatial Data	DF, CF	DGN, Hard copy	17.5	7
HyD07	DSD	Details of proposed drainage works	Geospatial Data / Other Data	DF, CF	Hard copy, CSV format	30	0
HyD09	WSD	Details of proposed waterworks installation	Ditto	DF, CF	ditto	30	0
Lands D02	All Works Dept.	As-built drawings	Geospatial Data	DF, CF	DWG, hard copy	21	0
Plan D09	TDD	Engineering site drawings	Geospatial Data	DF	Hard copy	0	0
WSD04	All Works Departments	As-built drawings	Geospatial Data	CF	DGN, DWG, Hard copy	37.5	1.25

Table 19 Processes to be addressed by CSWP

M.2 Processes relate to exchange of Non-CSU Data and are not covered by CSWP

				Problem Type		Annual Tech. Effort	Annual Prof. Effort
ArchSD01	Lands D	Base map	Geospatial	CF	DGN	2	0

				Problem Type		Annual Tech. Effort	Annual Prof. Effort
			Data				
C&SD07	LandsD	Records of tenements	Other Data	DD, DF	Hardcopy	0	0
CED01	LandsD	Base map	Geospatial Data	NA	DGN	4	0
DSD01	Lands D	Base map	Geospatial Data	CF	DGN	108	4
HyD04	Lands D	Base map	Geospatial Data	CF	DGN	12	2
HyD12	Lands D	Base map	Geospatial Data	NA	Arc/Info	6	0.4
HyD15	Lands D	Expressway boundaries	Geospatial Data	DF	Hard copy	1	0.2
Plan D08	Lands D	BMS and CIS data	Geospatial Data / Attribute	CF, DQ, TT	Arc/Info	0	0
Plan D10	Lands D	Land disposal site drawings	Geospatial Data	DF	Hard copy	0	0
RVD07	Lands D	Survey sheet	Geospatial Data	DF	Hard copy	0.4	0.1
TDD01	LandsD	Base map	Geospatial Data	NA	DGN	4	0
TDD03	LandsD	GIRS	Geospatial Data / Attribute	NA	DGN, Formatted text file.	14	0
WSD01	Lands D	Base map	Geospatial Data / Attribute	CF	Arc/Info	4	0.2

Table 20 Processes relate to exchange of Non-CSU Data and are not covered by CSWP

M.3 Processes that relate to exchange of CSU Data

		Data Exchanged				Annual Tech. Effort	Annual Prof. Effort
ArchSD09	Lands D	Land Lot layout plans	Geospatial Data	DF	Hard copy	25	0

		Data Exchanged				Annual Tech. Effort	Annual Prof. Effort
C&SD01	LandsD	Base map	Geospatial Data	DD	Arc/Info	38.5	0
C&SD03	LandsD	Cadastral map include land lot polygon	Geospatial Data	DD	Arc/Info	2.5	0
C&SD04	PlanD	TPU/SB Boundary	Geospatial Data / Attribute	N/A	Arc/Info	0.25	0
C&SD05	BD	OP documents	Other Data	DF	Hard copy	12	0
C&SD08	BD	BD MD	Other Data	DF	Hard copy	12	0
CED04[8]	Arch SD	As-constructed drawings for works projects and engineering inspection results	Geospatial Data / Other Data	DF	Hard copy, Text file, JPEG, GIF	4	0
CED05[8]	DSD	ditto	Ditto	DF	ditto	4	0
CED07[8]	HyD	ditto	Ditto	DF	ditto	12	0
CED09[8]	TDD	ditto	Ditto	DF	ditto	4	0
CED10[8]	WSD	ditto	Ditto	DF	ditto	8	0
CED08	Lands D	SMRIS data	Geospatial Data / Other Data	DF	Hard copy Text file	8	0
DSD07	Lands D	Land Lot layout plans	Geospatial Data	DF	Hard copy	108	54
DSD12	Plan D	TPU / SB boundaries	Geospatial Data	DF	Hard copy	180	90
HyD01	CED	Slope boundary	Geospatial Data	CF	DGN	4	0.4

[8] In processes CED04, CED05, CED07,CED09 and CED10, CED receives as-constructed drawings and engineering inspection results submitted by ArchSD, DSD, HyD, TDD and WSD. These processes will be retained and they form part of the Slope CSU data submission processes on implementation of Slope CSU. Currently, on verification of these submitted data, CED will update the slope information in SIS. Hence, these processes are considered as CSU Data Exchange Processes.

		Data Exchanged				Annual Tech. Effort	Annual Prof. Effort
HyD05	LandsD	GRIS Data	Geospatial Data	DD, DQ	Arc/Info	14	0.4
Lands D01	CED	Slope boundary	Geospatial Data	CF	DGN	6	6
RVD02	BD	OPs, certificates and consents	Other Data	DF	Hard copy	13	3.25
RVD06	Plan D	TPU boundaries Plan	Geospatial Data	DF	Hard copy	45	15

Table 21 Processes relate to exchange of CSU Data and are not covered by CSWP

Appendix N Supporting Information (Evaluation of File Formats Standard)

N.1 A summary of file formats currently used by PDs are summarized (from DAM3 Inventory of Data Exchange Processes):-

N.1.1 GeoSpatial Information

					DGN + Attribute
ArchSD					
BD[9]					
C&SD		✓			
CED		✓	✓		✓
DSD					✓
EMSD		✓			✓
HyD		✓	✓		✓
LR[9]					
LandsD		✓		✓	✓
PlanD		✓	✓		✓
RVD		✓			
TDD					✓
WSD		✓	✓		✓
Percentages of Adoption	**0%**	**73%**	**36%**	**9%**	**73%**

Table 22 File formats of Geospatial information currently used by PDs.

N.1.2 Attributes

			MDB
ArchSD	✓		N/A. MDB is not mentioned in the DAM3 Inventory of Data Exchange Processes
BD			
C&SD		✓	
CED	✓	✓	
DSD	✓		
EMSD		✓	

[9] BD and LR do not request geospatial data as in the current practices.

			MDB
HyD	✓	✓	
LandsD	✓	✓	
LR		✓	
PlanD		✓	
RVD		✓	
TDD		✓	
WSD	✓	✓	
Percentages of Adoption	**46%**	**77%**	

Table 23 File formats of attributes currently used by PDs.

N.2 Inventory of PDs' GIS / CAD Software

		Software	Version	OS
ArchSD	CAD	AutoCAD	2000	Windows 2000 / NT
C&SD	Digital Mapping System	Arc/Info	8.1	Windows NT 4
		Oracle	8	Windows NT 4
CED	Slope Information System	MicroStation	J	Windows NT 4
		Oracle	8i	Windows 2000
	Geological Modelling System	ArcGIS	8.x	Windows NT 40
	Computerized Slope Register and Location Plan System	MicroStation	J	Windows NT 4
		Geographics	7.2	Windows NT 4/ Windows 2000
		ArcView	3.2a	Windows NT 4
DSD	AM/FM	Framme	4	Windows NT 4
EMSD	Pilot GIS	ArcView	3.2a	Windows 98
HyD	Road Data Maintenance System	Arc/Info and ArcSDE	8.1.2	Window 2000 (SP2)
		Oracle	8	Windows 2000
	Utility Management System	MapInfo	4.1	Windows NT (SP5)
LandsD	Computerised Land Information System (CLIS)	AutoCAD	2000I	Windows NT 4
		MicroStation	J	Windows NT 4
		Oracle	7	Windows NT 4

		Software	Version	OS
	SMRIS	Arc/Info	6.x	Solaris 2.6
		Arc/Info	8.x	Windows NT 4
PlanD	Town Planning Information System	Arc/Info	7.1.2	Solaris 2.6
		ArcMap	8.1	Windows NT 4
		Visual FoxPro	6	Windows NT 4
RVD	Property Master System (PMS) and Interim Valuation System (IVS)	Oracle	8i	UNIX
		SAS	8.2	UNIX
		Arc/Info and ArcSDE	8.2	UNIX
TDD	CAD	MicroStation	J	Windows 2000
WSD	Digital Mapping System	Arc/Info	8	SGI Unix 6.5
		SDE	3.2	SGI Unix 6.5
		ArcView 3.2a	3.2a	Windows NT 4

Table 24 Inventory of PDs' GIS / CAD Software

Appendix O Evaluation of File Formats Standard

O.1 File Formats for Geospatial Information

O.1.1 GML

		Compliance[10]
Minimum impacts to PDs' Software System	Supported by most PDs: Currently, there is no PD using GML. Openness: As an open standard, openness of GML is considered as high. Widely adopted and mature: GML is a relatively new standard in the GIS industry. Ordinance Survey of UK is the only organization that disseminates geospatial information using GML in the production environment. OpenGIS released the latest version of GML (v3.0) in February 2003. It is expected that major GIS vendors would support the GML v3 in the future versions of their GIS Software. GML v2.0 which is supported by the latest version of some GIS software would be obsolete shortly. GML v3.0 does not support by GIS Software currently, whilst GML v2.0 would be obsolete. Hence, adoption of GML as the File Formats Standard would be considered as immature during the transition period. Proven DCT: Through the DCT evaluation, the project team evaluated the capability of the DCT to convert GML to / from commonly used proprietary formats by PDs. Although the some minor errors are founded in converted GML, the errors could be fixed by simple settings in the DCT and this was concluded that proven DCT converting to / from GML (v2.0) is available in the market.	Low Compliance
Minimum additional resource required by PD	Minimum additional cost: Very few (if not none) software currently used by the PDs provide built-in functions to support GML with on additional costs (Refers to Appendix A5). DCT would be required for all PDs including Data Owners, Data Agents and Data Owners to exchange data via GML. Hence, additional cost for PDs to adopt GML would be high. Moreover, PDs invented and developed customized	Non Compliance

[10] Full Compliance; High Compliance; Low Compliance and Non Compliance

		Compliance[10]
	program to cope with the current data exchange processes, the additional costs to revamp the programs would be significant. Data Conversion Effort: All PDs would be required to convert information native to their GIS software To / From GML. Data conversion efforts would be considerable. Moreover, exchanges using GML is a new procedure to PDs, huge post conversion efforts such as data cleaning and error checking are expected. Flexibility to cope with CSU change: GML (v2.0) supports only "OGC defined simple features" including Point, Line String, Linear Ring, Surface, Polygon, and Geometry Collection. The supported feature types are relatively less than other file formats, such as Arc/Info Coverage, and makes GML less flexible to cope with future changes.	
Align with industrial / International	Widely adopted and mature: Excepting the cases of UK, dissimulation or exchange of geospatial data using GML is not popular locally and internationally. Align with International Standard: GML, as a specification recommended by OGC, is an internationally recognized open standard.	High Compliance
Support geospatial characteristics	Support Annotation: GML (v2.0) does not support annotations. Contain Feature Type Requested by PDs: GML (v2.0) supports the "OGC defined simple feature" which accomplish the requirement of the five CSUs for time being. Topological information: GML (v2.0) does not support topology. Integrity rules: Integrity rules could be embedded in the schema of GML as the validation rules.	Low Compliance
Data quality and completeness	Topological information: GML (v2.0) does not support topology. Integrity rules: Integrity rules could be embedded in the schema of GML as the validation rules.	High Compliance

Table 25 Evaluation of GML

O.1.2 E00 (exported from Arc/Info Coverage)

		Compliance

		Compliance
Minimum impacts to PDs' Software System	Supported by most PDs: All the GIS-using PDs, excepting CED, support E00 (Refers to Appendix A1). Openness: Openness of E00, as a proprietary format, is considered as low. Widely adopted and mature: All GIS-Using PDs use E00 (or Arc/Info Coverage) currently (Refers to Appendix A1), the format is the most commonly used formats among and is considered as widely adopted among PDs and mature. Proven DCT: Through the DCT evaluation, this was identified that proven DCT converting to / from E00 is available in the market.	High Compliance
Minimum additional resource required by PD	Minimum additional cost: All GIS-using PDs, excepting CED, could support E00 without additional cost. Whilst the GIS Software used by CED (i.e. MicroStation) could import E00 with minimal additional cost (if any). However, CED required a DCT to export data in DGN to E00. For CAD-using PDs such as DSD and ArchSD, a DCT must be available to CAD using PDs to receive / provide information in E00. Data Conversion Effort: While all GIS using PDs support E00, the efforts required for data conversion would be minimal. Only CED requires conversion. Flexibility to cope with CSU change: E00 supports a wide range of spatial feature types such as multiple polygon, donut polygon, annotation, and linear network to cope with any changes in CSU. In the other words, E00 could be able to cope with CSU changes flexibly.	Full Compliance
Align with industrial / International / Local Standard	Widely adopted and mature: E00 is widely used by the PDs, by the local industry and by many other countries. Align with International Standard: E00 does not align with any International Standard.	High Compliance
Support geospatial characteristics	Support Annotation: Annotations (including location, curve, ordination, size and font) are supported in E00. Contain Feature Type Requested by PDs: E00 support all feature types required by PDs. Topological information: Topological information is embedded in E00.	High Compliance

		Compliance
	Integrity rules: Integrity rules are supported in the latest ArcGIS 8.3 Data Model. Nevertheless, the integrity rules are embedded with the backend geodatabase instead of the E00 file being exchanged.	
Data quality and completeness	Topological information: Topological information is embedded in E00 Integrity rules: Integrity rules are supported in the latest ArcGIS 8.3 Data Model. Nevertheless, the integrity rules are embedded with the backend geodatabase instead of the E00 file being exchanged.	High Compliance

Table 26 Evaluation of E00

O.1.3 ArcView SHAPEFILE

		Compliance
Minimum impacts to PDs' Software System	Supported by most PDs: ArcView SHAPEFILE is current used by four PDs for data exchanges. Openness: Although ArcView is controlled by a single vendor, data structure of ArcView SHAPEFILE is published, its openness is relatively higher than other proprietary formats such as Arc/Info Coverage. Widely adopted and mature: ArcView SHAPEFILE is a widely used file formats for geospatial data exchange. Moreover, the file format is supported by all major GIS software. Proven DCT: Most GIS softwares provide built-in tools to read / write ArcView SHAPEFILE. Moreover, through the DCT evaluation, this was identified that proven DCT converting to / from the file format is available in the market.	High Compliance
Minimum additional resource required by PD	Minimum additional cost: ArcView SHAPEFILE could be import to and export from most (if not all) PD's current GIS software without significant additional cost. Moreover, CED has existing tools converting DGN to ArcView SHAPEFILE. A DCT is required for CAD-using PDs such as DSD and CED. Data Conversion Effort: While most PDs using GIS software of same product families, data conversion effort is required but the effort is consider as insignificant. However, for the CAD using PD, a DCT is required. On the other hand, ArcView SHAPEFILE does not support annotation, huge efforts might be required for	Low Compliance

		Compliance
	the receiving PD to reproduce the annotation. Flexibility to cope with CSU change: ArcView might not flexible to cope with future changes in CSU definition. ArcView SHAPEFILE supports only Point, Line and Polygons features. It would be difficult for ArcView to cater for other requirement such as Annotation, Linear Network, Surface, and Dynamic Segmentation. Nevertheless, Polygon features in SHAPEFILE can contain one or more parts. Overlapping and Mulitpart feature can be represented.	
Align with industrial / International / Local Standard	Widely adopted and mature: ArcView SHAPEFILE is not frequently used by PDs. Whereas, the format is widely used by the local industry and by many other countries. Align with Industrial /International Standard: ArcView SHAPEFILE is in wide use in both commercial and public governmental settings.	High Compliance
Support geospatial characteristics	Support Annotation: Annotation is not supported in ArcView SHAPEFILE. Contain Feature Type Requested by PDs: Arc/Info support all feature types required by PDs. Topological information: ArcView SHAPEFILE does not explicitly store topological relationships. Nevertheless, polygons in SHAPEFILE must be constituted as closed and clean (no self-intersection; inside polygon should be on the correct side of the outer polygons) rings. Integrity rules: Integrity rule is not embedded with the ArcView SHAPEFILE.	Low Compliance
Data quality and completeness	Topological information: Although ArcView SHAPEFILE does not maintain topological relationship explicitly, the data structure all polygons in a SHAPEFILE are closed and clean. Moreover, number of polygons in SHAPEFILE should match the number of record in DBF. Integrity rules: Integrity rule is not embedded with the ArcView SHAPEFILE.	High Compliance

Table 27 Evaluation of ArcView SHAPEFILE

O.1.4 DXF

		Compliance

		Compliance
Minimum impacts to PDs' Software System	Supported by most PDs: DXF is current used and supported by one PD (i.e. LandsD) for data exchanges. Openness: Although DXF is controlled by a single vendor, the data structure is published and well-known. Its openness is relatively higher than other proprietary formats such as Arc/Info Coverage. Widely adopted and mature: DXF is a widely used file format for exchanging CAD drawings and geospatial information. Moreover, the file format is supported by all major CAD/ GIS software. Proven DCT: Most GIS software offer built-in tools to read / write DXF. Moreover, through the DCT evaluation, this was identified that proven DCT converting to / from DXF is available in the market.	Low Compliance
Minimum additional resource required by PD	Minimum additional cost: DXF could be import to and export from most (if not all) PD's current GIS / CAD software. However, additional cost would be significant in order to cater the linkage the graphical and attributes. Data Conversion Effort: For GIS-using PDs, the data conversion efforts would be significant. For CAD-using PDs, exchanging information via DXF is the de facto standard and the conversion effort is considered as insignificant. Flexibility to cope with CSU change: DXF, as a CAD format, supports features mainly for map-display purpose such as annotation, point, lines, curves, circle, and polygons etc. There are little restrictions on the spatial feature such as non-overlapping or self-closed polygons, DXF would be flexible to cope with future changes. Nevertheless, DXF would be inefficient to cope with other requirements such as Linear Network, Surface etc.	Low Compliance
Align with industrial / International / Local Standard	Widely adopted and mature: DXF is not frequently using for exchange geospatial information amongst PDs. Whereas, the format is the de facto standard for exchanging CAD as well as geospatial information. Align with International Standard: DXF does not align with any international Standard.	Low Compliance
Support geospatial characteristics	Support Annotation: Annotation is supported in DXF.	Low Compliance

		Compliance
	Contain Feature Type Requested by PDs: DXF supports all feature types required by PDs for the five CSUs. Topological information: DXF, as a CAD format, contains no topological information. Integrity rules: Integrity rule is not embedded with the DXF.	
Data quality and completeness	Topological information: DXF, as a CAD format, contains no topological information. Integrity rules: Integrity rule is not embedded with the DXF.	Low Compliance

Table 28 Evaluation of DXF

O.1.5 DGN

		Compliance
Minimum impacts to PDs' Software System	Supported by most PDs: DGN is currently used by most CAD-user PDs for data exchanges. Openness: DGN is proprietary and its openness is considered as low. Widely adopted and mature: DGN is a widely used file format among PDs for exchanging CAD drawings and geospatial information. Moreover, major GIS Data Owners, such as LandsD, CED and PlanD supplies data in DGN format. Proven DCT: Some GIS software offer built-in tools to read / write DGN. Moreover, through the DCT evaluation, it was identified that proven DCT converting to / from DGN is available in the market.	High Compliance
Minimum additional resource required by PD	Minimum additional cost: DGN could be import to and export from some PD's current GIS software. Moreover, additional cost would be significant to cater the linkage between graphical and attributes. Data Conversion Effort: For GIS-using PDs, the data conversion efforts would be significant. For CAD-using PDs, DGN could be used by mainly CAD software such AutoCAD and MicroStation. Flexibility to cope with CSU change: DGN, as a CAD format, supports features mainly for map-display purposes. There would be little restrictions to cope with future CSU changes. However, it would be difficult for DGN to cater for other requirements such as, Linear Network,	High Compliance

		Compliance
	Surface, and Dynamic Segmentation.	
Align with industrial / International / Local Standard	Widely adopted and mature: DGN is widely adopted and supported by PDs. Align with International Standard: DGN does not align with any international Standard.	Low Compliance
Support geospatial characteristics	Support Annotation: Annotation is supported in DGN. Contain Feature Type Requested by PDs: DGN supports all feature types required by PDs for the five CSUs. Topological information: DGN, as a CAD format, contains no topological information. Integrity rules: Integrity rule is not embedded with the DGN.	Low Compliance
Data quality and completeness	Topological information: DGN, as a CAD format, contains no topological information. Integrity rules: Integrity rule is not embedded with the DGN.	Low Compliance

Table 29 Evaluation of DGN

O.2 File Formats Standard for Attributes Associating with CAD Files

O.2.1 DBase IV (DBF)

		Compliance[11]
Minimum impacts to PDs' Software System	Supported by most PDs: DBF could be used by other PDs' software such as Oracle, Excel, MS Access, INFO, and FoxPro etc. Moreover, Both AutoCAD and MicroStation could connect to DBF with their built-in tools. Openness: As a proprietary format, openness of DBF is considered as low. Widely adopted and mature: DBF is widely used to associate attributes with CAD drawings.	Full compliance
Minimum additional resource required by PD	Minimum additional cost: AutoCAD and MicroStation support direct database connection to DBF. The additional cost would be minimal. Data Conversion Effort: DBF could be imported directly by AutoCAD and MicroStation without conversion. Moreover, data structure such as number of fields, field names, and field type are	Full Compliance

[11] Full Compliance; High Compliance; Low Compliance and Non Compliance

		Compliance[11]
	well defined within the DBF. DBF could be easily imported into most DBMS with automatic functions. Flexibility to cope with CSU change: The customized program should be changed to cope with the changes of CSU.	
Align with industrial / International	Widely adopted and mature: DBF is the industrial de facto format to exchange textual information. Align with International Standard: DBF does not align with any international standard.	Low Compliance
Data quality and completeness	Integrity rules: Information of the DBF such as number of records in file, field type, field length are embedded within the DBF. Such information could be used for quality checking.	High Compliance

Table 30 Evaluation of DBase IV (DBF)

O.2.2 ASCII (i.e. CSV)

		Compliance
Minimum impacts to PDs' Software System	Supported by most PDs: CSV are supported by DBMS software such as Oracle, Excel, MS Access, INFO, and FoxPro etc. However, neither AutoCAD nor MicroStation could connect to CSV directly. Openness: CSV, as a file format of ASCII plain text, could be used by various system platforms, software and application. Widely adopted and mature: CSV is widely adopted to exchange textual information among PDs, however, it is not common for PDs to attached attributes with CAD drawing using CSV.	Low Compliance
Minimum additional resource required by PD	Minimum additional cost: CSV could be easily converted into other formats that are directly supported by AutoCAD and MicroStation with minimum additional resources. Data Conversion Effort: CSV contains no information on the data structure. Hence, data should be interpreted manually. Moreover, to use CSV with AutoCAD and MicroStation, CSV should be converted into OBDC format. Otherwise, the file should be converted into other formats such as DBF or MDB. Flexibility to cope with CSU change: The customized program should be changed	Low Compliance

		Compliance
	extensively to cope with the changes of CSU.	
Align with industrial / International	Widely adopted and mature: CSV is widely adopted in exchanging plain text information. Align with International Standard: CSV does not align with any International Standard.	Low Compliance
Data quality and completeness	Integrity rules: CSV does not contain information for quality checking purposes. There is no guarantee on the data quality.	Non- Compliance

Table 31 Evaluation of DBase IV (DBF)

O.2.3 MDB of MS Access 97

		Compliance
Minimum impacts to PDs' Software System	Supported by most PDs: As an integral component of the MS Office Family, most PDs have licenses for MS Access. Openness: MDB is a proprietary format. Nevertheless, most CAD / DBMS software could connect to MDB via ODBC. Widely adopted and mature: MDB is neither mentioned in the DAM3 Inventory of Data Exchange Process nor the Current Environment Description. Nevertheless, it is understood that some internal systems of PDs (e.g. ArchSD and HyD) are built on MS Access.	High Compliance
Minimum additional resource required by PD	Minimum additional cost: MDB is be supported by AutoCAD and MicroStation with ODBC connection. Data Conversion Effort: Export data from some older version of GIS Software (e.g. Arc/Info Version 6.x) could be a considerable issue. Flexibility to cope with CSU change: The customized program should be changed extensively to cope with the changes of CSU.	Low Compliance
Align with industrial / International	Widely adopted and mature: MDB is neither mentioned in the DAM3 Inventory of Data Exchange Process nor the Current Environment Description. It is understood that some internal systems of PDs (e.g. CED, ArchSD and HyD) are built on MS Access. Align with International Standard: MDB does not align with any International Standard.	Low Compliance
Data quality and completeness	Integrity rules: MDB wraps all database tables as well as the associations into one single file. Data integrity could be persevered during data	Full - Compliance

		Compliance
	exchange	

Table 32 Evaluation of MDB of MS Access 97