

# Applying the MS 1759 GIS Standard to Urban Planning Department Geospatial Dataset

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**Abstract** — The implementation and development of Geographic Information System (GIS) as a tool for decision making by government agencies and local authority has grown up rapidly. Government agencies and local authority have developed GIS by using their own specification and standard for the purpose of planning and development. Thus, geospatial data repository that has been located at each agency can not be shared easily. To enable the sharing of geospatial data, geospatial data standards are crucial. The introduce of MS 1759 standard as a GIS standard for geospatial data in Malaysia is a good step in order to enable data sharing process among government agencies. However, the acceptance of this standard by certain government agencies are still beyond the desired level. This happen because this standard does not meet the needs or requirements of this agencies especially when the agency already have their own GIS standard such as Department of Town and Country Planning (JPBD). Therefore, the research need to be done in order to improve MS 1759 standard so that the can be accepted by all government agencies in Malaysia. This research was conducted by using geospatial dataset from Urban Planning Department in Kulai Municipal Council (MPKu) as a case study. To get the best and correct result, JPBD standard document and MS 1759 standard document has to be reviewed. The result of this research is a Urban Planning Department geospatial dataset that have applied MS 1759 standard and also the improvement that have been made to the MS 1759 standard.

**Keywords** – Geographic Information System (GIS); GIS standard; MS 1759 GIS standard

## 1. INTRODUCTION

Nowadays, the use of GIS by government agencies and local authority as decision making tool are growing in Malaysia. The problem is these organizations have developed their GIS based on their specifications, standards, and also their own planning and development [1]. Geospatial data repository that exists in those agencies cannot be benefited by others optimally because there is no mechanism or infrastructure to share the data easily between data provider agencies and users. According to [2], geospatial data sharing is essential to fully realize the capability and benefits of GIS and GIS technology. In order to make data sharing is possible, GIS standards for geospatial data will become a crucial factor [3]. Even in any information system implementation, data standards can be a central to the success of the implementation.

Awareness of the importance of geospatial data sharing has make government establish Malaysian Centre for Geospatial Data Infrastructure (MaCGDI) as a centralized agency that specialized in GIS infrastructure in Malaysia. One of the MaCGDI responsibilities is to promote the development and implementation of Malaysian Geospatial Data Infrastructure (MyGDI) as the Malaysian National Spatial Data Infrastructure (NSDI). MyGDI is an initiative by the government to enhance the awareness about data availability and improve access to geospatial information by facilitating data sharing among participating agencies. MyGDI provides a basis spatial data exploration, evaluation and application for users and data providers, within all levels of government, commercial, and non-profit sectors, academia and the public.

One of the strategies implemented by MaCGDI to encourage all government agencies to share the data is by introducing a GIS standard for geospatial data. This standard called Geographic Information/Geomatics – Features and Attributes Code MS 1759:2004 or more recognize as MS 1759. Although this standard is intended to be a GIS standard for Malaysia, the acceptance of this standard still doesn't reach the desired level. This is because, MS 1759 standard doesn't meet the needs or requirements of the certain government agency. Another factor that causes this problem is some agencies such as JPBD already have their own GIS standard that definitely suit with their needs and requirements. Thus, research need to be done to improve the MS 1759 standard so that this standard can suit with JPBD needs and requirements. In order to do this research, geospatial dataset from Urban Planning Department in Kulai Municipal Council (MPKu) has been used by author as a case study.

In this journal, the review about MS 1759 standard is introduced in Section 2. MPKu Urban Planning Department Geospatial Dataset is introduced in Section 3. The procedure to apply the MS 1759 standard to MPKu Urban Planning Department geospatial dataset is shown in Section 4. Finally, the journal ends with conclusions and recommendations of this research in Section 5.

## 2. GEOGRAPHIC INFORMATION/GEOMATICS – FEATURES AND ATTRIBUTES CODE MS 1759:2004

This standard was developed by Technical Committee on Geographic Information/Geomatics under the authority of the Information Technology, Telecommunication and Multimedia Industry Standards Committee based on the working draft prepared by the Technical Standards Committee of the MyGDI. The develop standard is intended for use by all businesses that produce, distribute or utilize geospatial data, either alone or in conjunction with non-geospatial data [4]. This standard specifies the method for encoding of geospatial data and provides the discretion of the feature and their associates attributes for the exchange of digital geographic information. In this standard, every feature is identified by a unique six-character code. The first character of the code will have an alphabetic value from A to Z and this character is corresponds to the feature category. The feature is divided in twelve (12) categories and each category will be divided again into sub-categories (Table 1). The sub-categories are identified by the second character of the unique six-character code.

TABLE 1: Categories and Sub-categories of MS 1759 Standard

CATEGORIES CODE	CATEGORIES	SUB-CATEGORIES CODE	SUB-CATEGORIES
A	Aeronautical	AA	Air Space
		AB	Aerodrome
B	Built Environment	BA	Residential
		BB	Commercial
		BC	Industrial
		BD	Institutional
		BE	Educational
		BF	Religious
		BG	Recreational
		BH	Cemetery
		BJ	Built-up
D	Demarcation	DA	Topographic
		DB	Maritime
		DC	Cadastral
G	Geology	GA	Geolithology
		GB	Mineral
		GC	Fossils
		GD	Mining
		GE	Exploration
		GF	Geological Features
		GG	Geoscience
H	Hydrography	HA	Coastal Hydrography
		HB	Shoreline Structures
		HC	Fishing Facilities
		HD	Ports and Harbours
		HE	Navigation Aids
		HF	Danger and Hazard
		HG	Depth Information
		HH	Inland Water
		HJ	River Structure
		HK	Offshore
		HL	Miscellaneous
R	Hypsography	RA	Relief Portrayal
S	Soil	SA	Histosols
		SB	Spodosols
		SC	Andisols
		SD	Oxisols
		SE	Vertisols
		SF	Ultisols
		SG	Mollisols
		SH	Alfisols
		SJ	Inceptisols

CATEGORIES CODE	CATEGORIES	SUB-CATEGORIES CODE	SUB-CATEGORIES
	Soil	SK	Entisols
T	Transportation	TA TB	Land Transportation Water Transportation
U	Utility	UA UB UC UD UE UF UG UH	Electricity Telecommunication Water Supply Oil and Gas Broadcasting Sewerage Waste Management Meteorological
V	Vegetation	VA VB VC VD VE VF	Cropland (Perennials) Cropland (Annuals) Cropland (Cash-Crops) Natural Vegetation (Dryland) Natural Vegetation (Wetland) Natural Vegetation (Miscellaneous)
X	Special Use (Dataset Specific)	XA XB	Terrain Analysis Dataset Meteorological Dataset
Z	General	ZA	Control Points

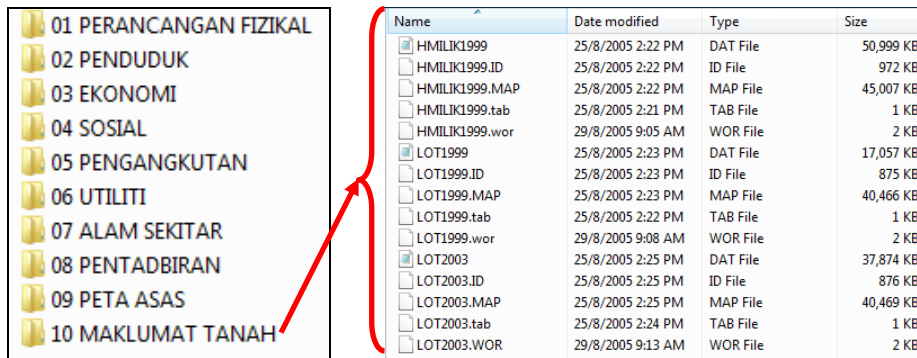
After second character of the unique six-character feature code (third, fourth, fifth and sixth), the characters are a numeric value starting from 0000 through 9999. This value provides distinctive feature identification within categories yet allows flexibility. All features will be identified by all this unique six alphanumeric characters (for example, the feature “Road” is represented by TA0060). The block of feature code values from 8000 through 8999 has been reserved for special usage (e.g. usage within a particular agency or a group of users).

This standard also includes the code for attributes. Each attribute is describes by using the attribute codes to represent the category of information [5]. Each attribute is recognized by a distinctive three character alphanumeric code. For example, the attribute “Road Service Area” has the code RDS and the attribute “Bridge Construction Material Type” has the code BMT. There are two types of attribute values in this standard which are coded and actual. Coded values have a range from 0 through 999 and each of the value has its own meaning. Actual values are typically real measurements like height, width, date, etc. The units of measurement associated with an attribute are abbreviated according to the units of measurement codes [5].

The one example of attribute that have coded value is RDS2 where RDS mean Road Service Area and 2 means the coded value of the RDS attribute which are Rural Road. Even the objective of this standard is to optimize the benefit of the geospatial data by data transfer and sharing among data providers and users, it is definitely far from perfection. This standard still needs to be upgraded and researched by adding other features that is not exist in the standard yet.

### 3. MPKu URBAN PLANNING DEPARTMENT GEOSPATIAL DATASET

Urban Planning Department is one of the departments in MPKu that is actively using GIS as a tool to complete their daily task. Urban Planning Department will use GIS when there are complaints issued by citizens to MPKu about the possibility of company or personal has been violating the law of planning permission. Staff in this department will search or make a query to get information about the area that the complainant give in complaint form by using land parcel number and ‘mukim’ of the area. If there was a breach of laws, the enforcer will go to the area and warn the offenders and force them to request for temporary planning permission, license and pay compound penalty to the MPKu for certain period. This department also used GIS for customer services application. Sometimes, the developers or citizen will come to this department to get information about certain land parcel that they want to buy and develop. So, they will request the staff in this department to give them information about zoning, landuse and also others extra information such as river for land parcel that they want to develop.



Name	Date modified	Type	Size
<input checked="" type="checkbox"/> HMLIK1999	25/8/2005 2:22 PM	DAT File	50,999 KB
<input type="checkbox"/> HMLIK1999.ID	25/8/2005 2:22 PM	ID File	972 KB
<input type="checkbox"/> HMLIK1999.MAP	25/8/2005 2:22 PM	MAP File	45,007 KB
<input type="checkbox"/> HMLIK1999.tab	25/8/2005 2:21 PM	TAB File	1 KB
<input type="checkbox"/> HMLIK1999.wor	29/8/2005 9:05 AM	WOR File	2 KB
<input checked="" type="checkbox"/> LOT1999	25/8/2005 2:23 PM	DAT File	17,057 KB
<input type="checkbox"/> LOT1999.ID	25/8/2005 2:23 PM	ID File	875 KB
<input type="checkbox"/> LOT1999.MAP	25/8/2005 2:23 PM	MAP File	40,466 KB
<input type="checkbox"/> LOT1999.tab	25/8/2005 2:22 PM	TAB File	1 KB
<input type="checkbox"/> LOT1999.wor	29/8/2005 9:08 AM	WOR File	2 KB
<input checked="" type="checkbox"/> LOT2003	25/8/2005 2:25 PM	DAT File	37,874 KB
<input type="checkbox"/> LOT2003.ID	25/8/2005 2:25 PM	ID File	876 KB
<input type="checkbox"/> LOT2003.MAP	25/8/2005 2:25 PM	MAP File	40,469 KB
<input type="checkbox"/> LOT2003.tab	25/8/2005 2:24 PM	TAB File	1 KB
<input type="checkbox"/> LOT2003.WOR	29/8/2005 9:13 AM	WOR File	2 KB

FIGURE 1: Urban Planning Department Geospatial Data Stored in 10 Folders.

For geospatial dataset, this department stored their geospatial dataset as a single dataset in different folders (Figure 1). Actually, geospatial dataset in this department is from Town and Country Planning Department (JPBD) headquarters. Every 5 years, JPBD will release a new geospatial data for local plan in certain district or area and give the data to all local authority or government agencies according to their territory area. Because this data is from JPBD headquarters, the geospatial data model design for this department has followed the standard that has been produce by JPBD which is called as Geographic Information System (GIS) Manual for Development Plan Studies. So, it is difficult for this department change their data model design according to MS 1759. However, it is good if they willing to accept the MS 1759 standard because State Geospatial Data Centre (SGDC) from MaCGDI requires all geospatial data to follow MS 1759 standard.

Based on JPBD GIS standard for Local Planning (RT), MPKu Urban Planning Department geospatial dataset format have 10 folder structure (Figure 2). This geospatial dataset format has followed the format that produce by National Land Use Information Division (BMGN) [6]. Each of the folders represent the category of the data belongs to it. The example of the data in each folder is shown in Table 2.

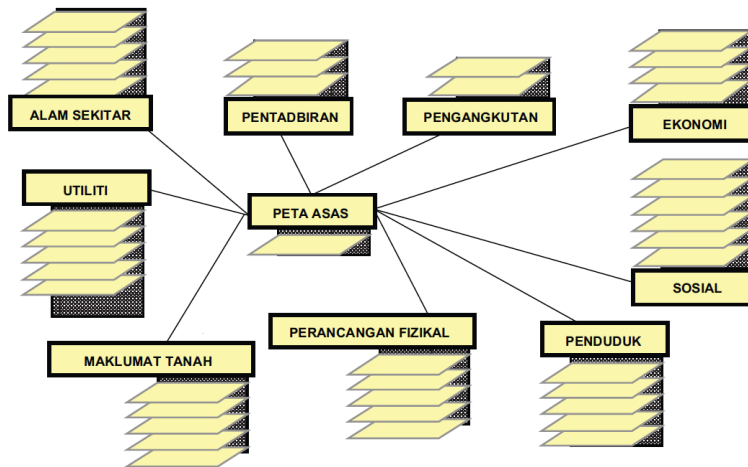


FIGURE 2: Geospatial Dataset Format for RT

TABLE 2: Example of the Data in Each Folder

FOLDER		DATA	DESCRIPTION
Perancangan Fizikal	<i>Physical Planning</i>	GTNSMS1 2010	Existing landuse information for certain land
		ZONING	Planning zone for certain land
Penduduk	<i>Residential</i>	PDDK	Population information in certain area
Ekonomi	<i>Economy</i>	INDUSTRI	Information about industrial area in certain area
		PLANCONG1	Place that attract the tourist to come
Sosial	<i>Social</i>	CRIME HOTSPOT	Place that have been considered as crime hotspot
		POKOK	Information about the location of the preserve tree
		REKREASI	Recreational place information
		LANDSKAP1	Information about landscape project that has been

FOLDER		DATA	DESCRIPTION
			done by MPKu
		PERUMAHAN	Residential area information in MPKu
Pengangkutan	<i>Transportation</i>	JALAN	Road network information
		REL	Railways information
		KSOKONG	Transportation hub information
		PLINTAS1	Information about traffic management
		BETUNG1	Information about sewerage in certain place
Utiliti	<i>Utility</i>	BETUNG2	Information about sewerage in certain place
		BKLAIR2	Information about water supply in certain place
		ELEKTRIK1	Information about electric facility in certain area
		SPEPEJAL1	Solid waste collection routes information in MPKu
		SPEPEJAL3	Solid waste dispose area information in MPKu
		BISING	Noise pollution information
Alam Sekitar	<i>Natural Environment</i>	SUNGAI	River network in Kulaijaya area
		KSAS	Environment sensitive area information
		TANIH	Soil class information
		UDARA	Air quality information
		ADUN	State election area
Pentadbiran	<i>Administration</i>	PARLIMEN	Parliamentary election area
		DAERAH	District area information
		MUKIM	Mukim area information
		BLOK	Planning block information
		Peta Asas	<i>Base Map</i>
Maklumat Tanah	<i>Land Information</i>	LOTTANAH	Land parcel information

#### 4. APPLYING MS 1759 GIS STANDARD TO THE GEOSPATIAL DATASET

In order to apply the MS 1759 standard to the geospatial dataset, the feature name in the MPKu Urban Planning Department geospatial dataset has to follow the feature name that has been provided in MS 1759 standard. However, it is not an easy or straight forward task. JPBD standard document and MS 1759 standard document need to be reviewed in order to find the best and correct feature name.

##### A. Change the Feature Name According to MS 1759 Standard

To change the current feature name to MS 1759 standard feature name, lot of changes has to be done. Several features can be change easily because these features have a same meaning with the MS 1759 standard feature name. The example of this change has been listed in Table 3 below:

TABLE 3: Change the Feature Name from JPBD Standard to MS 1759 Standard

JPBD Standard Feature Name	MS 1759 Standard Feature Name	MS 1759 Standard Category	MS 1759 Standard Sub-Category
LOTTANAH	Land Parcel	Demarcation	Cadastral
PDDK	Census Enumeration Block	Demarcation	Topographic
ADUN	State Electoral Area	Demarcation	Topographic
PARLIMEN	Parliamentary Electoral Area	Demarcation	Topographic
DAERAH	District Coverage Administrative	Demarcation	Topographic
MUKIM	Mukim Coverage Administrative	Demarcation	Topographic
PERUMAHAN	Housing Estate	Demarcation	Topographic
INDUSTRI	Industrial Landuse Area	Demarcation	Topographic
JALAN	Road	Transportation	Land Transportation
REL	Rail Line	Transportation	Land Transportation
SUNGAI	River	Hydrography	Inland Water
BETUNG1	Sewerage Pipe	Utility	Sewerage

ELEKTRIK1	Power Line	Utility	Electricity
SPEPEJAL1	Transportation Route	Utility	Waste Management
SPEPEJAL3	Secured Landfill	Utility	Waste Management

There are features have to be separated into several feature in order to follow MS 1759 standard feature name. This task has to be made because several features in geospatial dataset or JPBD standard use number at the end of the feature name (e.g BETUNG1, BETUNG2) to differentiate the feature representation line, polygon or point. That means, all the same and related data is combining together in one feature or layer according to its data representation. The example of this separating task is shown in Table 4.

TABLE 4: Separating Feature to Follow MS 1759 Standard Feature Name

JPBD Standard Feature Name	MS 1759 Standard Feature Name	MS 1759 Standard Category	MS 1759 Standard Sub-Category
BETUNG2	<ul style="list-style-type: none"> <li>Sewerage Manhole</li> <li>Sewerage Treatment Plant</li> </ul>	Utility	Sewerage
BKLAIR2	<ul style="list-style-type: none"> <li>Sunction Tank</li> <li>Water Treatment Plant</li> </ul>	Utility	Water Supply
PLINTAS1	<ul style="list-style-type: none"> <li>Road Junction</li> <li>Interchange</li> </ul>	Transportation	Land Transportation
REKREASI	<ul style="list-style-type: none"> <li>Golf Course</li> <li>Theme Park</li> <li>Zoo</li> </ul>	Built Environment	Recreational

There are also several features in existing geospatial dataset in MPKU Urban Planning Department has to be merge in order to follow the MS 1759 standard. Example of the features that has to be merge is shown is Table 5 below.

TABLE 5: Merging Feature to Follow MS 1759 Standard Feature Name

Current Features	Features Name According to the MS 1759	MS 1759 Standard Category	MS 1759 Standard Sub-Category
<ul style="list-style-type: none"> <li>Fire Station</li> <li>Police Station</li> <li>Hospital</li> <li>Post Office</li> <li>Detention Centre</li> <li>Rail Station</li> <li>Airport</li> <li>Bus Terminal</li> <li>Museum</li> <li>Clinic</li> <li>Telekom Building</li> <li>MPKu Building</li> <li>Hall</li> </ul>	Institutional Building	Built Environment	Institutional
<ul style="list-style-type: none"> <li>Petrol Station</li> <li>Hotel</li> <li>Shopping Complex</li> <li>Public Market</li> <li>Stall</li> </ul>	Commercial Building	Built Environment	Commercial
<ul style="list-style-type: none"> <li>School</li> <li>Kindergarten</li> </ul>	Educational Building	Built Environment	Educational
<ul style="list-style-type: none"> <li>Church</li> <li>Hindu Temple</li> <li>Chinese Temple</li> <li>Surau</li> <li>Mosque</li> </ul>	Building of Worship	Built Environment	Religious



### B. Adding New Features to MS 1759 GIS Standard

The most difficult task is to name the feature in JPBD standard that is not existed in MS 1759 standard. In order to do this task, MS 1759 document has provided a rule to documenting new features and attributes. These rules are [5]:

- Feature and attribute names should be precise and unambiguous.
- Attribute values should be self-describing.
- A feature and attribute should not have same name.
- A feature or attribute can have multiple names but only one definition.
- A feature or attribute name should not be used in the description of the feature or attributes.
- A feature name or definition should not specify if the feature is an area, point or line feature.
- A feature should be relatively permanent.
- A feature should not be duplicated between categories.
- All attribute values are positive unless otherwise stated.
- A boundary is just a spatial object or information that be considered a line feature and not a perimeter or solid surface of an area or spatial feature.
- The systematic structure of the coding schema should be permanent.

Table 6 below showed the features that are not exist in MS 1759 standard and also proposed new features that have to be made in order to satisfy the requirement of MPKu Urban Planning Department. This new features have been proposed by referring the rules above.

TABLE 6: The New Proposed Features for MS 1759 Standard

Features That Not Exist in MS 1759 Standard	The New Proposed Feature Name	
	Category/Subcategory	Feature Name
CRIME HOTSPOT	General	Crime Hotspot
LANDSKAP	General	Landscape Project
POKOK	General	Preserved Tree
KSOKONG	Transportation/Land Transportation	Transportation Hub
UDARA	Utility/Meteorological	Air Quality Station
BISING	Utility/Meteorological	Noise Monitoring Station
REKREASI	Built Environment/Recreational	1) National Park 2) Resort
KSAS	Demarcation/Topographic	Environment Sensitive Area
BLOK	Demarcation/Topographic	Planning Block
TTANIH	Demarcation/Topographic	Soil Class
GTNSMS1_2010	Demarcation/Topographic	Existing Landuse
ZONING	Demarcation/Topographic	Zoning Landuse

## 5. CONCLUSIONS AND RECOMENDATIONS

GIS is a special type of information system that use geographical data or always been referred as geospatial data. To get optimum benefit from the GIS technology, geospatial data need to be shared among GIS stakeholder in Malaysia. For better implementation of GIS in Malaysia, sharing of geospatial data among these GIS stakeholders is encouraged. In order to ensure the better GIS implementation, geospatial data standard is essential. The development and introduce of MS 1759 as a Malaysia standard by MaCGDI is a good step to realize the geospatial data sharing in Malaysia. However, the acceptance of MS 1759 standard by government agencies in Malaysia also tends to make a huge impact for geospatial data sharing process. Thus, research need to be done to improve the MS 1759 standard so that this standard can suit with all government agencies needs and requirements. This research has shown the step that has been done to improve the MS 1759 by using MPKu Urban Planning Department geospatial dataset as a case study. Hopefully this journal can give a basic idea to improve the MS 1759 by adding the new features such as from marine and oceanography agencies.

**ACKNOWLEDGMENT**

The author would like to thanks Dr. Halina binti Mohamed Dahlan for her guide and support in this research.

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