MASAR
MAINTAINING STRENGTH AND RESILIENCE FOR LOCAL GOVERNMENTS IN LEBANON

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1 BACKGROUND

This Standard Operating Guidance (SOG) document was developed by a team of Geographic Information Systems (GIS) specialists and professionals, GIS Coordinators and Technicians, and subject matter experts. This document strives to serve as a template to standardize and unify the operations of the GIS Technical Units in municipalities and the Union of Municipalities (UoM) on a national level.

This document proposes a set of guidelines for the daily operations of the GIS Technical units and intends to create a shared foundation, encouraging improved communication and collaboration amongst various GIS technical units. This is a living document that provides a starting point to produce guidelines for the organization and management of geospatial data, map creation, and output within Multi GIS Centres in various Areas of Intervention (AoI). It is anticipated that this document will be updated as more and more local agencies adopt GIS operating procedures for municipal work.

Intended as a template, GIS Technical Units are encouraged to modify document content to accommodate local specific details. Modifications may range from referencing local datasets and file locations to adjusting standard map products to better serve local needs. It is recommended that you work with your Head of UoM and Mayors to create a Standard Operating Procedure (SOP) or Standard Operating Guidance (SOG) that meets the unique needs of your GIS Technical Unit within your AoI.

2 PURPOSE

The core GIS SOG was developed to provide guidance and content that serves as a template for a national-level GIS SOP for the operation of municipal GIS systems within the GIS Technical units. It helps with the creation, preparation, coordination, and dissemination of GIS services for the GIS municipal work. This is a living document that provides a starting point to produce guidelines for the organization and management of GIS data, map creation, and output within the UoM GIS Technical Units specifically.

3 OBJECTIVES

The objectives of this SOG are to:

1. Facilitate adoption and creation of a consistent and unified municipal geospatial data
2. Achieve consistency in the staffing of GIS positions with clear communication and job description

3. Provide consistent guidance on key GIS daily municipal operations
4. Drive consistency in data and mapping protocols
5. Determine and document protocols for data and map dissemination
6. Guide data and map sharing practices with external contacts

4 GIS TECHNICAL UNIT ORGANIZATION STRUCTURE

The GIS Technical Unit (GTU) model is recommended to be based on the "Municipal Act," specifically Article 122 of Decree-Law no. 118/1977, which specifies that the UoM's Engineering Body shall be in charge of certain tasks on behalf of the member municipalities. This includes assisting in approving applications for construction permits, preparing required technical studies and consultations, setting specifications for supplies, works, and services, and developing plans. GTU will be responsible for managing, maintaining, updating, and upgrading the geospatial data, in addition to providing strong GIS technical support to the municipalities in spatial-based planning and spatial decision-making. The GTU is also responsible for data stewardship, data acquisition, and data sharing among municipalities. The GTU should establish and maintain a long-term relationship with data providers and various stakeholders to ensure the continuous update of the geospatial data and the long-term sustainability of the GIS.

The recommended organizational structure for the GTU is presented in Figure 1 to allow optimal data coordination and sharing.

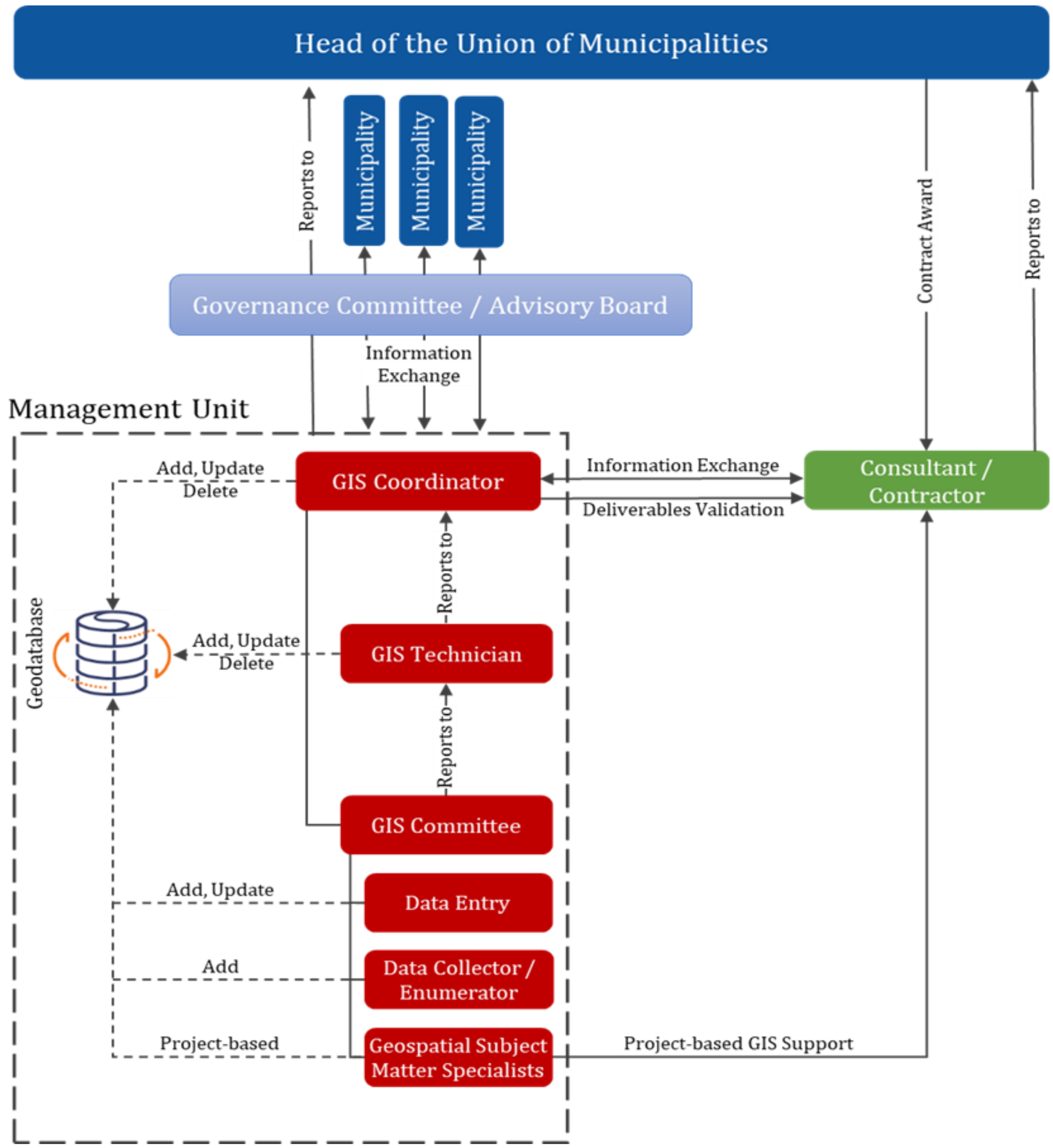

Figure 1- Hybrid Organizational Structure

4.1 Governance Committee/Advisory Board

Changes in the positions of Mayors or Head of UoM due to elections or political tensions can fail a GIS initiative on a local government level. Hence, to protect the GTU from such turbulences, the establishment of a Governance Committee is recommended to sponsor the GIS initiative and create a buffer between the GTU, the Mayors, and the head of the UoM. The Governance Committee establishment is based on the "Municipal Act," specifically Article 53 of Decree-Law no. 118/1977, which specifies that "the Municipal Council shall be entitled to elect committees among its members to study the issues falling within its scope. He may call for the help of other committees that he shall appoint from other than its members".

The role of the Governance Committee is advisory and regulatory to ensure the sustainability of the GTU work. The Governance Committee should consist of local community members with a background in various disciplines who are committed to the success of this initiative in the long run. The Governance Committee will meet on a monthly or quarterly basis to discuss various functional and technological issues related to the GTU. They also must meet with the GIS Coordinator to facilitate the GMU operations. In case of disagreements between mayors or the Head of Union and the GIS Coordinator, the Governance Committee should be entitled to interfere to resolve the issue.

4.2 GIS Volunteers Committee

It is essential to formalize a GIS Volunteers Committee that encompasses the trainees who received a GIS Certificate of Completion or any person who has GIS knowledge and expertise. The volunteers should sign the “Data privacy agreement” and “Code of Ethics”. The role and responsibilities of the GIS Volunteers Committee are to support the development of GIS work within the GTU. They constitute the working force to ensure the sustainability of GIS. The GIS Volunteer Committee should work under the command of the GIS Coordinator and the GIS Technician.

It is vital to involve the GIS Committee in all the GIS work since they will constitute the workforce successors in case any rollout happened. Hence, when needed, the GIS Coordinator or the GIS Technician can be easily replaced with any of the GIS Committee members who are familiar with the GTU's daily operational work.

5 GIS STAFFING

GIS staffs are essential for the operationalization and institutionalization of the GIS Technical unit. Two GIS staff are recommended for the GTU; The GIS Coordinator and the GIS technician. The skills required for each position vary. The GIS Coordinator will be responsible for the external relationships and communication with outside stakeholders in addition to internal GIS work, while the GIS technician is responsible for the day-to-day GIS operations such as base maps development, data collection, analyses, and dissemination. However, both members should work as a team to ensure the full operation of the GTU.

5.1 GIS Positions and Responsibilities

Below is a table outlining the GIS positions, titles, and associated responsibilities. They are developed to be flexible and scalable to allow some flexibility in the daily operation of the GTU. Besides the dedicated staff to the GTU, the volunteer's role in data collection and data entry is also defined. Additionally, supervisors that are involved in data collection on a project basis are also defined, as the line of communications with the GIS Coordinator and GIS Technician is to define.

Table 1- GIS positions, titles, and associated responsibilities

Position Title	Responsibilities	Direct Supervisor	Report to
GIS Coordinator	• Coordinate with external Data Providers/ Municipalities • Design, develop, manage, and update the multi-sectorial projects' geodatabases. • Conduct daily maintenance of GIS database, including but not limited to, editing, querying, and searching. • Check data quality to report errors or discrepancies as needed for proper data analysis. • Manage data processing and ensure that the collected data is reported, and the necessary documents are provided to field teams before and during assessment and analysis. • Print maps from GIS software programs as needed • Perform desk-based data capturing (digitizing and geo-referencing). • Document, monitor, and where necessary, augment the quality of primary and secondary data in terms of accuracy and consistency. • Contribute to the design and development of data collection tools including assessments and digital field surveys. • Manage data manipulation and generate data visualizations using GIS programs, mainly ArcMap. • Consolidate data and provide analysis as required.	Head of UoM	Head of UoM

Position Title	Responsibilities	Direct Supervisor	Report to
	• Analyze proposed and existing GIS applications and databases to determine equipment requirements, disk storage needs, physical location, and structure of databases and applications, and develop recommendations regarding equipment data capacity and availability requirements. • Conduct research and development of new GIS-related products and procedures. • Work closely and flexibly with the Consultants/Contractors in the coordination and liaison with partners and municipalities in meetings related to multi-sectorial projects. • Maintain confidentiality of work-related issues information; adhere to the relevant legal requirements related to data management		
GIS Technician	• Prepare, collect, organize, and input data to maintain and enhance the GIS database including field research, GPS data collection, and processing. • Assist with interpreting as-built drawings, construction plans, engineering plans, recorded maps, legal descriptions, imagery, and related source documents and incorporate them into GIS using various methods including digitizing, and GPS. • Assist in the creation and maintenance of multiple GIS layers including parcels, streets, right-of-way, zoning, other development layers, and water and sewer system layers. • Follow quality assurance (QA) and quality control (QC) processes, and perform routine data management tasks, such as data validation and correction, to ensure data accuracy, integrity, and completeness. • Assist with GIS and data analysis, prepare and execute queries, and produce maps, spreadsheets, graphs, and other analytical products.	GIS Coordinator	GIS Coordinator Head of UoM

Position Title	Responsibilities	Direct Supervisor	Report to
	• Troubleshoot and support the Management Unit and related hardware and software, including printers/plotters, GPS, and other mobile devices • Maintain confidentiality of work-related issues information; adhere to the relevant legal requirements related to data management		
Field Data Collector/ Enumerator (Volunteer)	• Conduct data collection using the provided data collection tools. • Conduct household surveys on households (Localhost, Lebanese, and Syrian Refugees) within the assigned areas. • Document all the findings in the provided data collection tools. • Ensure collected data is accurately recorded. • Capture data using digital data entry technology provided. • Ensure anonymity of respondents and develop a relationship of trust and safe space during data collection exercise with respondents. • Identify and report any challenges faced that could affect the quality of the data. • Handle work equipment responsibly.	GIS Technician	GIS Technician GIS Coordinator
Field Data Entry Technician (Volunteer)	• Accurately enter data into corresponding fields within the various software • Identify and correct data entry errors using appropriate quality control methods • Provide general data entry support across many teams on an ad-hoc basis	GIS Technician	GIS Technician GIS Coordinator
Geospatial Subject Matter Specialist (Project-Based)	• Project-based	GIS Coordinator	GIS Coordinator Head of UoM
Data Collection Supervisor (Project-Based)	• Manage the enumerators • Supervise the daily data collection • Ensure the quality of the collected data • Ensure the smooth operation of the data collection in the field • Distribute the work between enumerators in the field • Resolve disputes in the field	GIS Technician	GIS Coordinator GIS Technician

5.2 GIS Position Role Tables and Communication

In the GIS Position Role Table below, each GIS position and associated required skills are thoroughly defined. An individual's ability to assume each GIS role is determined by the frequency with which that individual conducts certain GIS or GIS-related activities within their daily work routine. These values are idealized and do not need to be exactly duplicated or represented in the person filling the role.

Provided below is an example of one GIS Role and its associated duties, tasks, and frequency levels.

Table 2- GIS Role and its associated duties, tasks, and frequency levels

Duty	Task	Frequency	Responsible
Administering and Operating GIS Application	Use geospatial software to identify, evaluate, and input spatial data.	Often (weekly)	Coordinator Technician
	Use geospatial software to query data.	Often (weekly)	Coordinator Technician
	Convert or import digital data.	Often (weekly)	Coordinator Technician
	Analyze raster data sets with Spatial Analyst/Grid or Imagine	Often (weekly)	Coordinator Technician
	Analyze vector data sets with Geoprocessing	Often (weekly)	Coordinator Technician
	Project spatial data	Often (weekly)	Coordinator Technician
GIS Product Development	Create Metadata	Often (weekly)	Coordinator Technician
	Collect field location data via GPS	Often (weekly)	Technician
	Edit GIS data	Often (weekly)	Coordinator Technician
	Convert data (i.e., geodatabase, shapefile, coverage, DWG, etc.)	Often (weekly)	Coordinator Technician
	Generate statistics	Often (weekly)	Coordinator Technician
	Perform image analysis	Often (weekly)	Coordinator Technician
	Map and Create new GIS data	Often (weekly)	Coordinator Technician
	Maintain existing GIS data (QA/QC)	Often (weekly)	Coordinator
GIS Services to End Users	Create maps	Often (weekly)	Coordinator Technician
	Create reports based on GIS Analysis	Often (weekly)	Coordinator
	Create charts	Often (weekly)	Coordinator Technician
	Create tables	Often (weekly)	Coordinator Technician
	Interpret analysis for client	Often (weekly)	Coordinator

Duty	Task	Frequency	Responsible
	Determining the design format of GIS data layers or databases used with GIS layers	Often (weekly)	Coordinator
	Directly work with clients to meet their GIS needs or further their understanding of GIS	Occasionally (every month)	Coordinator

6 POLICIES

Table 3 - Data Policies

Policy Name	Policy Creator	Standards	Policy Description
Data Standardization	GIS Coordinator, GIS Technician	1. GIS Data Naming 2. GIS Data Schematic	To ensure that all GIS data are modeled, named, and defined consistently, according to standards, across the GU. All GIS data (structured and unstructured) must conform to a common set of standards and schemas across all data sharing parties.
Metadata Standardization	GIS Coordinator, GIS Technician	1. Metadata Standards	To define metadata standards to be used on all GU GIS data for data naming, data modeling, and database design.
Data Quality Assurance / Quality Control	GIS Coordinator, GIS Technician	1. Quality Assurance 2. Quality Control	To ensure and maintain the quality of the GIS data and maps at the GU.
Data Security	GIS Coordinator, GIS Technician	1. Data Security	To safeguard and secure all data in all electronic formats at the GU.
Data Privacy	GIS Coordinator, GIS Technician	1. Data Privacy	To adhere to the data privacy rules at the GU.
Data Backup	GIS Coordinator, GIS Technician	1. Data Backup	To administer and deploy appropriate backups and disaster recovery measures.
Data Accessibility	GIS Coordinator, GIS Technician	1. Data Accessibility	To ensure the accessibility of the GU data, information, and metadata to all, except when determined to be restricted. When restrictions are made, stewards of the data are accountable for defining specific individuals and levels of access privileges that are to be enabled.
Data Sharing	GIS Coordinator, GIS Technician	1. Data Request	To share some of the GU data, information, and metadata on

Policy Name	Policy Creator	Standards	Policy Description
			determined restrictions and data privacy.
Data Update/ Upgrade	GIS Coordinator, GIS Technician	1. Data Update 2. Data Upgrade	To ensure that data must be updated cyclically for its viability and usefulness. Also, data must be upgraded based on municipal needs.
Data Collection	GIS Coordinator, GIS Technician	1. Data Collection	To develop procedures for the Data collection at the GU to ensure its quality.
Map Production	GIS Coordinator, GIS Technician	1. Design Template and Map content	To create a map template for the GU that contains all the map elements.
Data Acquisition	GIS Coordinator, GIS Technician	1. Data Acquisition	To develop a mechanism for data acquisition from external sources.
Data Projections and Coordinate System	GIS Coordinator, GIS Technician	1. Data Projection	To define the coordinate system and projection of the GIS data that is used at the GU.

Table 4 - Employees Policies

Policy Name	Policy Creator	Standards	Policy Description
Job Description	GIS Coordinator, GIS Technician	1. Job Description 2. Scope of Work	To define the job and the tasks of the GIS Coordinator and Technician at the GU.
Contract Renewal	GIS Coordinator, GIS Technician	1. Annual Contract Renewal	To develop the mechanism for the contract renewal of the GIS Coordinator and GIS Technician based on Lebanese laws.
Salary Scale	GIS Coordinator, GIS Technician	1. Salary Range	To define the salary scale of the GIS Coordinator and the GIS Technician within the GU based on the Lebanese municipalities' salary scales.
Days of Work	GIS Coordinator, GIS Technician	1. Monthly Working Days	To define the working days of the GIS Coordinator and the GIS Technician within the GU based on the Lebanese municipalities' working hours.
Disciplinary Actions	GIS Coordinator, GIS Technician	1. Disciplinary Actions	To identifies the disciplinary actions for responding to incidents that would violate Lebanese municipalities' policies.

Policy Name	Policy Creator	Standards	Policy Description
Leaves	GIS Coordinator, GIS Technician	1. Annual Leave 2. Sick Leave 3. Maternity Leave	To define the rules and regulations related to various types of leaves that the GIS Coordinator and the GIS Technician, within the GU, are entitled to take based on Lebanese Laws.
Contract Termination	GIS Coordinator, GIS Technician	1. Resignation 2. Dismissal 3. Arbitrary Termination 4. Legal Notice Period	To define a mechanism on how the GIS Coordinator or the GIS Technician contracts are terminated based on Lebanese laws.
Compensations	GIS Coordinator, GIS Technician	1. Overtime 2. Transportation 3. Bonus	To define the compensations that the GIS Coordinator or the GIS Technician are entitled to based on Lebanese laws.
Second Job on Project Basis	GIS Coordinator, GIS Technician	1. Second Job Terms	To set when the GIS Coordinator and the GIS Technician are entitled to have a second job without written approval and when this might constitute a breach of discipline and may result in disciplinary action.
Remote Work	GIS Coordinator, GIS Technician	1. Remote Work Terms	To set the scope for remote work and in which cases the GIS Coordinator and the GIS Technician can work from locations other than the GU office based on deliverables and a flexible schedule.

Table 5 - Communication and Outreach / Other Policies

Policy Name	Policy Creator	Standards	Policy Description
Internal/ External Communication	GIS Coordinator, GIS Technician	1. Communication within the GU 2. Communication with the Head of UOM/ Mayors 3. Communication with outside	To guide the communication of the GU both internally and externally.

Policy Name	Policy Creator	Standards	Policy Description
		stakeholders (DAG, ...) 4. Communication with the GIS Governance Committee 5. Communication with NGOs 6. Communication with Consultants	
Volunteer Appointment	GIS Coordinator, GIS Technician	1. GIS Volunteer Appointment / Committee 2. Data Collection Volunteers	To define the role and scope of work of volunteers within the GU.
Data Governance Committee	GIS Coordinator, GIS Technician	1. Data Governance Committee Appointment and Scope of Work	To define the role and scope of work of the data governance committee with the GU.
Project Execution for Third Party	GIS Coordinator, GIS Technician	1. Project Execution	To draft a mechanism for the execution of projects to any party. It must include the timescales and the financial return and the mode of payment.
MOU Agreement	GIS Coordinator, GIS Technician	1. MOU Agreement and Terms	To develop a mechanism for signing an MOU between the GU and other parties to cooperatively work together on an agreed-upon project. The MOU details the obligations and commitments of the parties.
Grant	GIS Coordinator, GIS Technician	1. Grant Mechanism	To develop a grant mechanism for the GU while applying for a project.
Visibility	GIS Coordinator, GIS Technician	1. Media Visibility 2. Conference Attendance 3. Events	To develop a broad strategy for enhancing the exposure of the GU.
Procurement	GIS Coordinator, GIS Technician	1. Procurement Process	To establish procedures for the GU for procurement of all goods and services at cost-effective prices, at the required specifications and quality.

7 DATA STANDARDS AND GUIDELINES

Some geospatial standards and guidelines should be adopted and implemented in day-to-day operations. Provided below are some of the key standards and guidelines that all GTUs should review, adopt and implement. This list includes common standards and guidelines but is not an all-inclusive list, nor it is meant to limit an organization to the following:

7.1 Data Standardization

This policy aims to unify all GIS data by creating standards for GIS datasets file naming and folder naming.

7.1.1 GIS Data Naming Convection

Geographic Data Naming Conventions standardize how GTU geospatial data are named to:

- Promote greater accessibility and improve usability for internal and external users of GTU GIS data
- Promote consistency in GIS layer and attribute (variable) naming
- Facilitate GIS integration with other GTUs and municipalities
- Provide a clearer understanding of the information in the layers/data set via the layer name
- Facilitate the identification of GIS data sets between data users.

Hence, the primary objective is to promote a consistent file naming convention for shared, geo-referenced data sets. This guideline proposes clear filename creation methods to minimize confusion, errors, and unnecessary support when GIS data are exchanged between users.

The Standard shall apply to the following:

- GIS data and associated relational databases are managed and stored in the GTU Geodatabase (i.e., parcels, buildings, and street centreline).
- GIS data converted, compiled, or acquired from data providers that will ultimately be stored on the GTU Geodatabase main computer/server.

7.1.1.1 Definitions

Attribute Domain: Attribute domains are rules that describe the legal values of a field type, provide a method for enforcing data integrity, and are used to constrain the values allowed in any particular attribute for a table or feature class.

Feature Class: A Feature Class is a collection of geographic features with the same geometry type (such as point, line, or polygon), the same attributes, and the same spatial reference. Feature classes can be stored in geodatabases, shapefiles, coverages, or other data formats. Feature classes allow homogeneous features to be grouped into a single unit for data storage purposes. For example, highways, primary roads, and secondary roads can be grouped into a line feature class named "roads." In a geodatabase, feature classes can also store annotation and dimensions.

Feature Dataset: A feature dataset is a collection of related feature classes that share a common coordinate system. Feature datasets are used to spatially or thematically integrate related feature classes. Their primary purpose is for organizing related feature classes into a common dataset for building a topology, a network dataset, a terrain dataset, or a geometric network.

Geodatabase: A geodatabase is an ESRI data storage and management framework for ArcGIS. It combines "geo" (spatial data) with "database" (data repository) to create a central data repository for spatial data storage and management to support GIS software applications.

Geospatial Data: Geospatial data, also referred to as GIS data, provides information in a structured format that identifies the geographic location and characteristics of natural or constructed features and boundaries on earth.

Layer Files: An abstraction from one or more feature classes or feature datasets used to present or organize data in a manner so that it may then be more easily analyzed.

Relationship Classes: A Relationship Class is an operation that establishes a temporary connection between records in two Tables using a key common to both. The connection allows information in both tables to be viewed simultaneously while browsing the associated GIS spatial data in a Feature Class or Feature Dataset.

Camel Case: The first letter of each word is capitalized, and spaces and punctuation are removed. Useful for technical situations where spaces are not allowed.

Mixed Case: The first letter of words that run together should be capitalized.

7.1.1.2 Standard

Two competing objectives need to be balanced: the need to make the data set name easily recognizable, and the need that the data file name be as short as possible for use in various software systems (and that data variable names not be truncated during data exchange and format changes, which could unintentionally create non-unique variable names).

The first rule of naming files in ArcGIS is **no spaces** and **no special characters** (except an underscore _).

The second rule of naming files in ArcGIS is no spaces and no special characters (except an underscore). There are three exceptions to this rule:

- File name aliases. You can give your layers "reader-friendly" names for use in legends.
- Folder names: ArcGIS will let you name folders with a space, but it's a good habit to not do so. Some tools will fail with a space in a folder name.
- Final products. PDF, jpg, tiff, etc. map outputs can have spaces. Follow any other protocol in place when it comes to naming final products.

The third rule of file naming do not start file names, field headings, folder names, or MXD names with a number or underscore

- This rule is to prevent any sort of file confusion within the software. The tools and processes behind the scenes are not fans of spaces and underscores as file starters.

Geodatabase Rules:

- Feature class or table name length: 160 characters
- Field name length: 64 characters

Shapefile Rules:

- Shapefile name length: 10 characters

Raster Rules:

- Raster Field name: 13 characters
- Total length for raster and path name: 128 characters

The suggestions described below are good practice generally, these naming conventions should be used for data layers stored internally and exchanged between data stewards.

- In cases where the same theme is created yearly the last two digits of the year will be attached to the theme.

- File and folder names must not contain spaces, special characters, or periods, aside from file extension delimiters.
- The underscore “_” is the only allowable character for delimiting name elements.
- Capital letters may be used to make names easier to understand.
- The format for dates is 8 digits in the year, month, and day order (yyyymmdd)
- The format for time is 4-digits in a 24-hour format (hhmm).

7.1.2 Data Format Conventions

- Acceptable Data Formats include - <<Example: .xls, .dbf, .shp, File Geodatabase>>
- Create GIS tables as .dbf for quick import into ArcGIS
- When working with Excel spreadsheets remember that cell values linked to calculations will not be translated between .xls and .dbf. If there are values of consequence that are linked to a calculation, create a new field for the data values and perform a paste special (Values only) before converting to .dbf. Make sure that there are no spaces in the header row and worksheet tabs.
- Microsoft 2007 does not support saving as a .dbf; however, ArcMap now intakes .xlsx and has always been accepted .csv files.
- Tables posted for consumption of use outside of GIS should be in an MS Excel (.xls) or (.xlsx) format.
- Acceptable Map [Output] Formats include - Example: .jpg, .pdf, .mxd
- When exporting to .jpg or .pdf use a resolution of 300 dpi.
- Use Relative Paths Option when sharing .mxd’s with others - Select the Document Properties option from the File Menu, followed by the Data Sources button in the “Map Title” Properties dialog. Then select “Store relative path names to data sources” and “Make relative paths the default for new map documents I create.”
- When posting zip files, use the same naming convention as the associated data file (refer to the above naming conventions).

7.1.2.1 File Name Tracking

It is essential to create a master table (database) containing the file name and critical information relating to the datasets, which could be maintained and hosted by the GTU. This lookup table would be available for building library documentation and minimizing replicated work between various GTUs. It could contain the following:

- File name
- Brief description of the data
- Scale
- Data Source/Steward
- Date of acquisition and Last update

7.1.2.2 GIS Data Naming

The Geographic Entity Naming Conventions established with this Standard are presented in the following table:

Table 6 - Naming Convention

Type	Description	Naming Convention	Character Limit	Case	Limitations & Conditions
Feature Dataset	The descriptive name of the Feature Dataset. The Feature Dataset Name does not contain underscores.	<FeatureDatasetName>	24	Camel	A. Feature Datasets should only be considered for use under the following conditions: 1. Participation in topology, a terrain dataset, or a geometric network 2. Geometry is shared 3. Special cases for certain history layers B. Feature Classes within the Feature Dataset should follow the Feature Class naming convention
Feature Class	The Feature Class Name should be descriptive of the thematic contents.	<FeatureClassName>	24	Camel	A. Feature class names should not contain dates. The current feature class name shall not have a date as it will be the latest version by default. B. If a Feature Class is to be archived, use only the year to archive, do not include days or months.

Type	Description	Naming Convention	Character Limit	Case	Limitations & Conditions
Relationship Class Tables	Relationship Class Tables should follow the same general naming guidelines as feature class names.	<TableName>	24	Camel	Guidelines are only applicable to Feature Classes that use Relationship Class tables
Attribute Domain Names	Attribute Domain Names should be named with a prefix of “dom” and the name that matches the associated Feature Class or Relationship Class Table.	dom[DomainName]	24	Mixed: Domain prefix "dom" is lowercase. The domain Name is Camel Case.	Care should be taken to avoid potential conflicts that could result from the use of generic Attribute Domain Names. For example, an Attribute Domain Name of domType could be relevant in a single user database but if migrated to a multi-user database, conflicts could arise.
Field Names	Field Names should be short yet descriptive.	FieldName	5-10 characters	Camel	A. Avoid the use of Microsoft SQL reserved keywords for field names. B. Alias names should be used for field names longer than 10 characters. C. Should the 10-character field name limit be exceeded, use the first 10-character spaces for unique identification. If the name is too long truncation will occur should a shapefile be later created. If the name is too short, conflicts and/or confusion may occur during multiple table joins.

7.1.3 GIS File Directory Structure/ Data Schematic

The directory structure is set up at the beginning of GIS development to ensure the proper organization of the data and to facilitate sorting.

7.1.3.1 Major Subfolders Naming Standard

Internal GIS data files are stored in major subfolders using the Framework Themes groupings. The following is an alphabetical listing of the Framework Themes:

- Administrative Boundaries

- Cadastral (Private Ownership and Public Ownership)
- Climate
- Cultural & Demographic
- Elevation
- Hazards
- Hydrography
- Land Cover/Land Use
- Ortho-imagery
- Transportation
- Utilities
- Infrastructure
- Geology

7.1.4 Procedure

The procedure to create a directory structure and GIS files are:

- Create a blank directory template, and change the name based on the Framework Theme Grouping naming conventions.
- Create and name the geodatabase file(s) according to the naming conventions.
- Create Feature Dataset/s according to the naming conventions.
- Import or create the Feature class/es and name them according to the naming conventions.
- Name the first map product (e.g. .mxd) according to the file naming convention and save it to the projects folder.
- Use the "Save a Copy" tool in ArcMap or other GIS software to save backup copies of the master map documents in the \projects\backups folder each operational period or as necessary. The previous backup files can be used as a pattern for the name by clicking on the file and then changing the data and time.
- Base the name of the map product files (exported from the ArcMap.mxd) on the map document (.mxd) name. Complete the names by inserting the appropriate date and time.

- Map a backup copy of the maser geodatabase in the \GIS_data\backups folder each operational period or as necessary.

Example Directory Structure

- <<Folder>> P:\UOMME_GIS\BaseData - This folder contains basemap data.
  - Cadastral – Parcels Boundaries
  - Buildings – Buildings Footprints
  - Streets – Street Centrelines
  - DEMs – Digital Elevation Models
  - Logos – logos and data disclaimers
  - Raster – Hillshade, Aerial Imagery, Satellite Photo
  - Vector – Admin Boundaries, Points of Interest, etc.
- <<Folder>> \GISProject - This is the top tier GIS directory:
  - YYYY_GISProject – This is the top-tier Folder for a unique project (e.g. Solid Waste, LED, Vegetation, etc). A 4-digit year and the name of the Unique Project (e.g. 2021_SolidWaste)
    - Date (YYYYMMDD) date/time stamped project spatial data layers;
      - Project Data – All data stored in this folder are data that are specific to the project and include a date/time stamp. Consideration should be given to breaking 'project data' into sub-groups 1) DEM, 2) Raster, and 3) Vector.
      - Products – GIS analysis and map products produced for the project

7.1.4.1 Responsible

The GIS Coordinator is the one responsible for the naming of the geospatial data and the creation of the folder structure.

The GIS Technician can also create and name geospatial data by following the naming convention. The GIS Coordinator should validate and approve the process.

7.2 Metadata Standardization

The purpose of this standard is to establish the requirement for documenting the GTU geospatial data through the creation and use of Geospatial Metadata (documentation about the data). Metadata plays a fundamental role in successful spatial data management through standardized geospatial data documentation. Metadata is "data about the data" - essential information about the source, date, accuracy, and lineage of the data. Metadata is essential for preserving data investment, instilling accountability for the quality and content, and for facilitating data sharing.

The Geospatial Metadata Standard is intended to:

1. Define the geospatial metadata content standard for the GTU's data.
2. Institutionalize metadata production and maintenance of geospatial data as a required component and best practice for managing the geospatial data investment.
3. Align the geospatial metadata requirements and international metadata standards.
4. Prepare and fortify the geospatial data holding to support data sharing and facilitate data interoperability
5. Expand the use of geospatial data to support processes by providing documentation including content, layout, and timeliness of geospatial data.

This standard applies to all existing geospatial datasets and new geospatial datasets delivered. The standard described herein represents the minimum level of documentation required for all geospatial datasets. Minimum geospatial metadata is required for all geospatial data delivered.

7.2.1 Standard

Official standards organizations define metadata standards. By adhering to common metadata standards, organizations are more able to share data. An important standard in the United States is the FGDC Content Standard for Digital Geospatial Metadata, first published in 1998. The International Organization for Standardization has also created a spatial metadata standard. For both the FGDC and ISO standards, the metadata set of tools are:

- A metadata editor
- Style sheets that present the metadata in various report formats
- A synchronizer that automatically records a dataset's properties in the appropriate metadata elements for that standard

ISO 19139 Metadata Implementation Specifications are based on the ISO 19115 which defines:

- Mandatory and conditional metadata sections, metadata entities, and metadata elements;
- The minimum set of metadata required to serve most metadata applications (data discovery, determining data fitness for use, data access, data transfer, and use of digital data and services);
- Optional metadata elements to allow for a more extensive standard description of resources if required.

The following table represents all the elements of the Metadata with their description. The required Elements are 16 & 17 (Data Originator & Data Point of Contact), and Elements 48 through 58. Elements 44 & 45 (Attribute Definition and Attribute Definition Source) and one of the following (Elements 47.1a and 47.1b, 47.2a and 47.2b, 47.3a and 47.3b or 47.4) are required for all fields in the data attribute table except the identification number field (e.g., OBJECTID) and SHAPE field(s). These elements that are difficult to describe have been noted in the Metadata Standard for possible Exemption based on the dataset format with an asterisk next to the Element Number.

Table 7 - Metadata Elements and Definitions

Element Number	Element Name	Element Definition
1	Title	The name by which the cited resource is known. Data type: Text. From: ISO 19115:2003.
2	Tags	A set of terms that can be used by GIS to search for the resource. Terms should be provided as a comma-separated list. Data type: Text. From: ArcGIS metadata.
3	Summary (Purpose)	A summary of the intentions with which the resource was developed. Data type: Text. From: ISO 19115.
4	Description (Abstract)	A brief narrative summary of the resource’s content. Data type: Text. From: ISO 19115.
5	Credits	Recognition of those who created or contributed to the resource. Data type: Text. From: ISO 19115
6	Use Limitation	Describes limitations affecting the fitness of use of the resource. Data type: Text. From: ISO 19115:2003.
7*	West Bounding Coordinate	Western-most coordinate of the limit of coverage expressed in longitude. Domain: -180.0 <= West Bounding Coordinate < 180.0
8*	East Bounding Coordinate	Eastern-most coordinate of the limit of coverage expressed in longitude. Domain: -180.0 <= East Bounding Coordinate < 180.0

Element Number	Element Name	Element Definition
9*	North Bounding Coordinate	Northern-most coordinate of the limit of coverage expressed in latitude. Domain: -90.0 <= North Bounding Coordinate <= 90.0; North Bounding Coordinate >= South Bounding Coordinate
10*	South Bounding Coordinate	Southern-most coordinate of the limit of coverage expressed in latitude. Domain: -90.0 <= South Bounding Coordinate <= 90.0: South Bounding Coordinate <= North Bounding Coordinate
11	Topic Categories	Identifies the primary themes associated with the resource's content. Data type: Code. From: ISO 19115:2003
12	Theme Keywords	Keywords that associate the resource with a particular subject or topic. Date type: Text. From: ISO 19115:2003.
13	Place Keywords	Keywords that associate the resource with a location. Data type: Text. From: ISO 19115:2003.
14*	Stratum Keywords *Only required for bathymetric data	Keywords that associate the resource with a layer or level, for example in atmospheric, geologic, and oceanographic data. Data type: Text. From: ISO 19115:2003.
15	Dates	The dates when the cited resource was created and published; note if they are different. Data type: Date. From: ISO 19115:2003.
16	Data Originator	The name of the organization or individual that developed the dataset. Data type: Text. From: ISO 19115:2003.
17	Data Point of Contact	The name of the organization or individual that is the current point of contact. Data type: Text. From: ISO 19115:2003.
18*	Metadata Point of Contact	The name of the individual who is the point of contact for the metadata. Data type: Text. From: ISO 19115:2003.
19*	Metadata Update Frequency	The frequency with which the metadata is updated. Data type: Text. From: ISO 19115.2003.
20	Status	The status of the resource. Data type: domain ("Complete" "In Work" "Planned") From: ISO 19115.
21	Credit	Recognition of those who created or contributed to the resource. Data type: Text. From: ISO 19115.
22	Language	The languages of information used within the data. Data type: Code. From: ISO 19115:2003.
23	Data Update Frequency	The frequency with which the resource is updated. Data type: Code. From: ISO 19115.2003.
24*	Next Update *Only required if the Update Frequency is set to a specific time frame.	The scheduled revision date. Data type: Date. From: ISO 19115.2003.
25	Access Constraints	Restrictions and legal prerequisites for using the dataset after access is granted. Data type: Text. From: ISO 19115:2003.
26	Supplemental Information	Information regarding the vertical datum.

Element Number	Element Name	Element Definition
	*Only add if data includes Z information	
27*	State Plane Coordinate System	A plane-rectangular coordinate system was established for each state in the United States by the National Geodetic Survey.
28*	SPCS Zone Identifier	An identifier for the SPCS zone. Domain: Four-digit numeric code for the State Plane Coordinate Systems based on the North American Datum of 1983 are found in Department of Commerce, 1986, Representation of geographic point locations for information interchange
29*	Horizontal Datum Name	The identification is given to the reference system used for defining the coordinates of points. Domain: "North American Datum of 1927" "North American Datum of 1983" free text
30	Completeness Omission Report	Identifies the characteristics of the data whose quality was measured. Domain: free text
31	Attribute Accuracy Report	An explanation of the accuracy of the identification of the entities and assignments of values in the data set and a description of the texts used. Domain: free text
32	Lineage	Information about the events, parameters, source data that constructed the dataset, and information about the responsible parties.
33	Data Source Description	A detailed description of the source. Domain: free text
34	Data Source Citation Title	The name by which the cited resource is known. Domain: free text
35	Data Source Date	The date when the cited resource was created. Domain: date
36	Data Source Contact	The name of a person associated with the resource. Domain: free text
37	Process Step Description	Describes the event, transformation, or process that occurred while maintaining the resource, including any parameters or tolerances that were used. Domain: free text
38	Process Step Date	Identifies the date and time when the process step occurred. Domain: free text
39	Process Step Contact	The name of a person associated with the resource. Domain: free text
40*	Entity Type Label	The name of the entity type. Domain: free text
41	Entity Type Definition	The definition of the entity type. Domain: free text
42	Entity Type Definition Source	The authority that provided the definition. Domain: free text
43*	Attribute Label	The name of the attribute. Domain: free text
44	Attribute Definition	The description of the attribute. Domain: free text

Element Number	Element Name	Element Definition
45	Attribute Definition Source	The authority that provided the definition. Domain: free text
46	Attribute Domain Value	One of the following (47.1a and 47.1b, 47.2a and 47.2b, 47.3a and 47.3b or 47.4) is required for each attribute field.
47.1a	Enumerated Domain Value	A name or label of a member of the set. If this is a published standard codeset, such as USGS Digital Line Graph codes or FIPS codes, use the 'Codeset Domain' instead.
47.1b	Enumerated Domain Value Definition	The description of the value. Domain: free text
47.2a	Range Domain Minimum	The least value that the attribute can be assigned. Domain: free text
47.2b	Range Domain Maximum	The greatest value that the attribute can be assigned. Domain: free text
47.3a	Codeset Domain Name	Any published codeset, such as USGS Digital Line Graph codes or FIPS codes. Domain: free text
47.3b	Codeset Domain Source	Source of published codeset. Domain: free text
47.4	Unrepresentable Domain	Any value that is not or cannot be prescribed. For example, names. Domain: free text
48	Contact Person	The name of the individual to which the contact type applies. Domain: free text
49	Contact Organization	The name of the organization to which the contact type applies. Domain: free text
50	Contact Position	The title of the individual. Domain: free text
51	Contact Address	The address for the organization or individual. Domain: free text
52	Address Type	The information is provided by the address. Domain: "Mailing Address" "Physical Address" "Mailing and Physical Address"
53	City	The city of the address. Domain: free text
54	State or Province	The state or province of the address. Domain: free text
55	Postal Code	The ZIP or other postal code of the address. Domain: free text
56	Contact Telephone	The telephone number by which individuals can speak to the organization or the individual. Domain: free text
57	Contact Fax	The telephone number of a facsimile machine of the organization or individual. Domain: free text
58	Contact Email	The address of the electronic mailbox of the organization or individual. Domain: free text

7.2.2 Procedure

For every acquired or newly created GIS data, the GIS Technician shall enter or update the Metadata as follow:

- Open your ArcGIS file in ArcCatalog
- Set up the program, go to: Customize -> ArcCatalog Options -> Metadata - Ensure that "ISO 19139 Metadata Implementation Specifications" is the appropriate metadata style
- Ensure that Metadata Updates are turned ON by checking the box next to "Automatically update when metadata is viewed" (this updates parameters such as map projection, bounding box, etc.)
- In ArcCatalog, click on the description tab to view metadata
- Click on edit to open the metadata editing window. This is where you should enter all new metadata, and edit existing data from older versions of the program (after importing).
- Press the Save bottom to save the information you entered.

7.2.3 Responsible

The GIS Technician is the one responsible to create and edit the Metadata.

The GIS Coordinator is the one responsible for the validation of the Metadata.

The Metadata should be created or edited when the GIS data file is created or acquired from any institution. The update is done automatically by the system.

7.3 Data Quality Assurance/Quality Control Compliance Procedures

The purpose of this section is to set in place Quality Control & Quality Assurance (QC/QA) processes for the GTU staff to ensure high-quality GIS data. The goals of the plan are to address issues of data accuracy, completeness, and timeliness to provide the unions and the public with high-quality GIS data and to set the unions on course to having the best GIS data of any municipality. To better understand the QC/QA process described later in this document, there are some components and terms that first need to be explained and defined.

7.3.1 Definitions

QA/QC: Quality assurance (QA) and quality control (QC) consist of activities to ensure the quality of geodata. QC and QA are usually used interchangeably but their focus is completely different. Quality Control, by definition, is the process used during the production of a product to ensure its quality. Quality Assurance, by definition, is the process used to verify the quality of a product after its production. As such, quality control is a reactive process that focuses on identifying defects and errors while quality assurance is a proactive approach whose purpose is prevention.

In QC observation methods such as checking, investigating, and discovering are used to find inaccuracies, defects, and areas where requirements for quality are not fulfilled in the outcome. Results from the QC are used to contain, evaluate, adjust and resolve the defects found to enhance the accuracy of the geodata. In QA systematic activities are planned and implemented in the quality system processes to hinder inaccurate and imperfect development of data. Therefore, it can be stated that QC often results in QA, where QC identifies defects and QA remodels the process to eliminate the defects and prevent them from recurring. Furthermore, it can be claimed that one cannot exist without the other if data quality objectives are to be met.

QA is the main pillar in any successful GIS data development and data gathering. If quality is lacking in the data, it has lost its credibility and can therefore be deemed expendable. Planning for QA in geodata is very important. Without planning the work, you are endlessly retracing your steps, performing the same work multiple times and often in an illogical order, having difficulty remembering what to do next, and making decisions in a hurry.

7.3.2 Quality Criteria

Quality control and assessment procedures for the acquisition, creation, editing, and geoprocessing of geospatial data and the construction of maps for any purpose. Six components of data quality are applied to all geospatial data generated, manipulated, or acquired by the GTU:

- Accuracy – positional
- Accuracy – attribute
- Completeness
- Logical consistency
- Precision

- Lineage

In addition to the six components above, all geospatial data generated and acquired are reviewed for:

- Best availability
- Appropriateness
  - Scale
  - Accuracy
  - Resolution
  - Time
  - Format
  - Content
- Topology errors
  - Overlap
  - Gaps
  - Sliver polygons/segments
- Attribute errors
- Geometry errors
  - Empty geometry

7.3.3 Quality Control and Assurance SOP

7.3.3.1 QA/QC SOP for Data Development

Geospatial data and non-geospatial data are reviewed according to the specifications detailed in Section 2 Quality Criteria. Additional data quality control measures include:

- Data are created in a file geodatabase
- Topology rules are enforced, if applicable

7.3.3.2 Digitizing

Where possible, polygons and polylines should share identical geometry and accuracy with existing layers of the GTU, such that:

- The threshold is 0 meters from the authoritative data sets.
- Georeference basemaps using Spline with more than 9 control points

- Heads-up digitizing (data capture) of authoritative datasets is used to generate the feature geometry.

When geospatial data are generated using head's up digitizing techniques, the following is a quality control checklist:

- ☐ Source data is authoritative and appropriate in scale, accuracy, resolution, time, format, and content
- ☐ Source data is projected in the same coordinate system and datum as the dataset being generated
- ☐ Map scale is appropriate for digitizing effort accuracy and precision
- ☐ The following methods are used to existing features from another dataset:
    - Copy and paste
    - Trace tool
    - Replace Sketch
- ☐ Feature templates are used, if applicable
- ☐ Save often
- ☐ Review dataset according to specifications in this Section and Section 2 Quality Criteria

If data fail to meet the criteria, the data are either edited to correct the error or archived, and the process of generating the data is repeated according to a modified methodology to ensure meeting quality assessment criteria.

7.3.3.3 Imagery Geoprocessing

In many cases, the default parameters and environment tools are sufficient for CBP's geoprocessing. However, the processing of imagery requires the implementation of the following standards:

- All raster and vector datasets involved in a process must be in the same coordinate system.
- Snap Raster (Processing Extent in Environment Settings) is set to match the original raster dataset if a new raster dataset or subset of the data is being generated.
- The output coordinate system is the same as the input.
- Raster resampling of cell size is equivalent to or proportional to the original raster dataset
- Raster resampling uses BILINEAR interpolation for digital elevation data

7.3.3.4 Latitude and Longitude Coordinates

Data providers may provide secondary data to GTU as latitude and longitude coordinates of projects for mapping purposes. The GTU depends upon the source data provider to guarantee the accuracy of the data provided. In this case, the following standards are required:

- Five-digit precision

- GTU will assess:
  - If possible, relative positional accuracy through comparative visual inspection using basemaps or auxiliary data
  - Data completeness
    - Number of features
    - Attribute table content

7.3.3.5 QA/QC SOP for existing Data (Data Update and Maintenance)

GTU's datasets are updated as needed by the GIS Team at the request of the GIS Coordinator.

Updates occur when the GIS Coordinator requests an update. Datasets and metadata are updated using the following steps:

1. A new file geodatabase is created.
2. The previous version is copied to the new geodatabase.
3. Geometry or attributes are updated in the new geodatabase.
4. Metadata is updated in the new geodatabase.
5. The previous version is retired to an Archive folder within the same folder.

7.4 Data Security

The purpose of this policy is to protect geospatial data from illegal and unauthorized usage. This policy proposes a security mechanism that should be enforced at geospatial data storage, dissemination, and at data retrieval to protect geospatial data from illicit users. Security is not only important at the storage level but also at the distribution level. It is necessary to incorporate security at geospatial data repositories, geospatial data warehouses, and the distribution and outsourcing of the geospatial data.

7.4.1 Procedure

Depending on the characteristics of geospatial data, various security requirements need to be established to make geospatial data secure on the distribution network. These requirements are:

7.4.1.1 Protection of Geospatial Data regarding privacy

It deals with unauthorized access and misuse of geospatial data. Violation of this requirement results in an illegal copy of data, tampering, and forgery of data, exposure of private information, etc.

7.4.1.2 Ensuring Confidentiality of Nondisclosure Geospatial Data

Some high-precision data is permitted to be used by government agencies only. Access to such data should be prevented from the users that are not authorized to access it. Failing to do it may result in leakage of nondisclosure information, a threat to the safety of residents, illegal copy of data, tampering, and forgery of data, and data error.

7.4.1.3 Ensuring Integrity and Authenticity of Geospatial Data

This requirement deals with the completeness and correctness of geospatial data. Geospatial data should be protected from unauthorized modifications. Also, geospatial data should come from authentic sources. The possible damages are influenced by services that use geospatial data, maltreating tampered digital map as an official document, and trouble or crime caused by tampered geospatial data.

7.4.1.4 Management of the Access Privilege of Geospatial Data

Authorization policy should be enforced to specify “who” can access “what”, “where”, and “how”. If some errors occurred in setting the access privilege of geospatial data, the possible damages are a serious threat to the security of the entire database and disturbance in services that use geospatial data.

7.4.1.5 Prevention from Violation of the Copyright of Geospatial Data

Copyright protection should be applied to geospatial data to provide authentication and origin tracing. Violation of this requirement causes infringing author profits and prosecution of legal liability relevant to the protection of copyright, masquerading of an author or a source, tampering and forgery of data, and illegal copy and distribution of data.

7.4.1.6 Ensuring Availability of Geospatial Data

Ensuring availability means geospatial data should be available as and when required, failing to which causes bad influence on the data service.

7.4.2 Proposed Conceptual Framework

Access control policies regulate data access. The idea is to maintain control over who has access to data via various credentials based on the function and nature of the data. While dealing with geospatial databases, the roles of the users, as well as the hierarchy of spatial data, are of equal importance. The authorization model for access control will include

- Subject – user id or role
- Object – basic component and relationship
- Event – denotes if any event occurs to permit/deny access permission
- Context – Contextual information like time and subject locations are considered for permission grant operation
- Permission – permit/deny
- Operation – a type of operation to be executed on spatial data.
- Spatial window – a specified spatial region of interest

7.5 Data Privacy

The purpose of this policy is to protect the rights and freedoms of individuals and provide clear rules on the use of personal data to facilitate its use.

Data protection and privacy laws around the world are evolving as lawmakers and regulators are moving away from protecting a selected set of personally identifiable information toward regulating the collection, use, and dissemination of information that could directly or indirectly identify an individual. Due to the inherent versatility of geospatial information which allows one data set to be used for a variety of applications, it is difficult to develop laws and regulations that protect the privacy, and the misuse of data while still allowing the collection and use of geospatial information for a wide range of important applications. The challenge will become even greater as the quality of the data (accuracy, precision, timeliness, etc.) increases, and the scope of data (radar, infrared, hyperspectral, etc.) grows.

7.5.1 Procedure

Since no law exists in Lebanon, the General Data Protection Regulation (GDPR) is used as a reference for the SOP. Hence, GIS shall always conform to the following principles.

Lawfulness, fairness, and transparency	Personal data shall be processed lawfully, fairly, and transparently with the data subject.
Purpose limitation	Personal data shall be collected for specified, explicit, and legitimate purposes and not further processed in a manner that is incompatible with those purposes.
Data minimization	Personal data shall be adequate, relevant, and limited to what is necessary for relation to the purposes for which it is processed.
Accuracy	Personal data shall be accurate and, where necessary, kept up to date.
Storage limitation	Personal data shall be kept in a form that permits identification of data subjects for no longer than is necessary for the purposes for which the personal data is processed.
Integrity and confidentiality	Personal data shall be processed in a manner that ensures appropriate security of the personal data, including protection against unauthorized or unlawful processing and accidental loss, destruction, or damage, using appropriate technical or organizational measures.
Accountability	The GIS Technician and the GIS Coordinator shall be responsible for and be able to demonstrate compliance with the GDPR.

7.5.1.1 Consent

Consent must be given by a clear affirmative act, which establishes a freely given, specific, informed, and unambiguous indication of the data subject's agreement to the processing of their data. GIS Technician, Coordinator, or Enumerator shall obtain consent via a written statement or by electronic means.

7.5.1.2 Data privacy by design

GIS Coordinator shall have in place technical and organizational measures which integrate data protection into processing activities. Privacy and data protection are a key consideration in the early stages of any project GIS undertake, for example, when:

1. building new systems for storing or accessing personal data;
2. developing legislation, policy, or strategies that have privacy implications;
3. embarking on a data-sharing initiative;
4. using data for new purposes.

7.5.2 Breach Reporting

In the case of a personal data breach, the GIS Coordinator shall without undue delay, and where practicable, notify the Head of UOM not later than 1 hour after having become aware of the breach.

7.5.3 GIS Privacy Practices Guideline

Data Acquired	Privacy
Any information about the location and shape of, and the relationships among, geographic features, including remotely sensed and map data.	No
Any graphical or digital data depicting natural or manmade physical features, phenomena, or boundaries of the earth and any information related thereto, including surveys (hard copy only), maps, charts, remote sensing data, and images.	No
Data originating from commercial satellite systems, global positioning systems, geographic information systems, and airborne or terrestrial mapping equipment.	No
Collection, storage, retrieval, or aggregation of information about an individual that is publicly available such as legal information found in deeds, property records, and property maps	Yes
Data depicting the physical locations of street addresses, without associated personal information	No
Personal information about an individual's real-time geospatial location	Yes
Personal information that is protected under law such as health and employment information.	Yes

7.6 Data Backup

The purpose of this policy is to provide a consistent framework to apply to the backup process. The policy will provide specific information to ensure backups are available and useful when needed - whether to simply recover a specific file or when a larger-scale recovery effort is needed.

This policy applies to all data stored on the GIS Coordinator and the GIS Technician systems. The policy covers such specifics as the type of data to be backed up, frequency of backups, storage of backups, retention of backups, and restoration procedures. A backup policy is like an insurance policy - it provides the last line of defense against data loss and is sometimes the only way to recover from a hardware failure, data corruption, or a security incident. A backup policy is related closely to a disaster recovery policy.

7.6.1 Procedure

7.6.1.1 Identification of Critical Data

The GIS Coordinator identifies what data is most critical to the GIS unit. This can be done through a formal data classification process or an informal review of information assets. Regardless of the method, critical data should be identified so that it can be given the highest priority during the backup process. Critical data are usually data that are dynamic and change frequently such as survey data collection data.

7.6.1.2 Backup Frequency

Backup frequency is critical to successful data recovery in the event of an incident. The first step is to decide on the Recovery Point Objective (RPO). The RPO, as a policy, is the furthest point back in time that allows a restore. When setting the RPO as one week, for example, the backups will need to be at least as frequent. A one-week RPO is considered the right balance between backup frequency and storage capacity.

7.6.1.3 Backup procedure

- The GIS Coordinator backs up the GIS Data once a week on both the GIS Coordinator Computer Hard Drive (Server) and the GIS Unit Hard Disk.
- The backup content is copied to the D-drive on the GIS Coordinator's Computer.
- The Backup folder is named GIS_Backup_YYYYMMDD
- The folder is overridden with the new backup folder to save disk space.
- The second backup is on the GIS Unit External Hard disk.
- The Backup folder is named GIS_Backup_YYYYMMDD
- The folder is not overridden with the new backup folder to keep historical records.

7.6.1.4 Off-Site Rotation and Storage

Geographic separation from the backups must be maintained, to some degree, to protect from any disaster such as fire, flood, or other regional or large-scale catastrophes. The GIS Unit backup media should be placed outside the Union. The GIS Coordinator can place the backup media at his home while held accountable for any accident that might cause a data breach.

7.6.1.5 Backup Storage

The GIS unit has set the following guidelines for backup storage:

- On-Site: The backup media should be stored in a securely locked drawer while the GIS Coordinator is the only person holding the key.
- Off-Site: The backup media should be reasonably secured from theft or fire at the GIS Coordinator's house.
- Online backups (OneDrive or google drive) are allowable if the service meets the security and privacy criteria specified herein.

7.6.1.6 Backup Retention

The time required for backup retention (number of stored copies of backup-up data is sufficient) is one year to effectively mitigate risk while preserving required data.

7.6.2 Restoration Procedures

The data restoration procedures must be tested and documented. The GIS Coordinator is responsible for the restoration, how it is performed, under what circumstances it is to be performed, and how long it should take from request to restoration. Backup restores must be tested when any change is made that may affect the backup system, as well as once every month.

7.6.2.1 Expiration of Backup Media

Certain types of backup media have a limited functional lifespan. After a certain time in service, the media can no longer be considered dependable. When backup media is put into service the date must be recorded on the media. The media must then be retired from service after its time in use exceeds specifications.

7.6.3 Enforcement

This policy will be enforced by the GIS Coordinator. Violations may result in disciplinary action. Where illegal activities are suspected, the Coordinator /Technician may report such activities to the Head of UoM.

7.7 Data Access

A Data Access Policy is an established control put in place to ensure that data protection requirements are followed if anyone external to the GTU wants to access the GIS data. It ensures that personally identifiable information in data in the GIS database is kept from unauthorized users. The data access control policies adhere to both the data privacy and data security policies requiring that users obtain authorization from the GIS Coordinator and Head of the UoM for accessing controlled data. Data access must be kept minimal not to allow anyone besides the GIS Coordinator/Technician to access the GIS data.

7.7.1 Procedure

- Any external user requesting access to GTU data must request authorization from the GIS Coordinator.
- The GIS Coordinator can approve or disapprove the request. Decisions to grant access should be given to very specific cases and should conform to the data sharing, data security, and data privacy policies.
- If the GIS Coordinator approves the request, he should grant the user access within a specific time interval.

7.8 Data Sharing

The GTU maintains and develops extensive GIS databases to support the UoM and the municipalities within the union. The sharing and distribution of GIS data with municipalities within the union or to external entities, including commercial, educational, not-for-profit, and governmental organizations, is at the prerogative of the Head of the Union. Efficient sharing of geographic information can result in considerable savings by minimizing duplication in digital data capture activities that are capital-intensive undertakings.

7.8.1 Data Sharing Criteria

However, GIS data sharing with external entities shall be based on the following criteria:

- The distribution of data should not incur a threat to data security and data privacy
- Only geographical subset areas will be distributed; not entire data sets especially with municipalities. They are only entitled to access the data within their geographic jurisdiction.
- Most attribute data will be removed before distribution.
- Distribution should be made in the form of images, shapefiles, or geodatabase.
- Only data that is created by the GTU may be shared. Data obtained from other external sources may not be distributed externally such as LU/LC, contour lines, etc as they are not owned by the GTU.
- The authoring/owner of the information shared must be consulted and notified.
- On a limited basis, some special organizations will have access to larger sets of data in database formats. These cases are the following:

- Subcontractors or consultants working for the union, that require the data to complete some work.
- Entities where a data-sharing agreement (Memorandum of understanding) has been established with the GTU.
- Governmental entities where an Intergovernmental Agreement has been reached.

7.8.2 Procedures

7.8.2.1 Data Request Process Received by a municipality within the UoM

When contacted by a municipality within the UoM with a request for GIS data:

- The GIS Coordinator shall request an official letter from the head of the municipality addressed to the Head of the UoM requesting the GIS data related to this specific municipality. The request shall include a detailed list of the requested GIS data.
- Once received, the Head of the Union shall review the request for approval.
- Once approved, the request is sent to the GIS Coordinator to prepare the GIS data.
- The GIS Coordinator shall document and file the GIS data requests into a Request Log to keep records.
- The GIS data is then placed on a CD/DVD or through WeTransfer with a delivery receipt.
- Once delivered to the municipality, the person receiving the GIS data on behalf of the municipality shall sign the delivery receipt and return it to the GTU for documentation.

7.8.2.2 Data Request Process Received by external entities external entities

When contacted by an external entity with a request for GIS data:

- An Information Request Form will be forwarded to the requestor along with the applicable Limited Use Agreement

7.8.2.3 Evaluation of Request:

- Upon receipt, the information Request will be sent to the Head of the UoM for approval.
- The form will be added to the entry in the Request Log.
- The GIS Coordinator shall validate the legitimacy of the organization requesting the data, and the Why and How the data will be used.

- The Head of the UoM and the GIS Manager will review the request based on the criteria defined previously.

7.8.2.4 Response to Request

Approved Request – Basic Data

- The GIS Coordinator will assign the request to the GIS technician.
- The GIS technician will clip the geographical area requested and save the data as a feature class in a newly created geodatabase.
- Other than basic identifier keys, attribute data will be removed.
- These files will be emailed (size permitting) to the original requestor.
- The status of the request will be updated in the log.

Approved Request – Extensive Data

- The GIS Coordinator will forward a Limited Use agreement to the requesting party for signature.
- Upon receipt of the signed use agreement, the GIS technician will extract the data as specified and send it to the requestor.
- Only the requested attributes will be included.
- The status of the request will be updated in the log, including the expected return date, where applicable.

Rejected Request

- The rejection letter will be sent to the requestor

7.8.3 Fees

The GIS Coordinator is entitled to charge fees for requested GIS data if shared with external parties. The fees shall cover the manpower cost, the operational cost, the printing cost, the media cost, and the shipment cost when applicable.

For Digital Data Sharing – The cost per dataset shall be specified depending on the data requested by the GIS coordinator plus the cost of media (i.e., CD, DVD) and shipping. Payment must be received before any GIS data is shipped.

For Hard copy Data Sharing– The cost of media is calculated according to the cost of equipment, ink, and paper plus the cost of shipment. Payment must be received before any product is shipped. The fees are set by the GIS coordinator.

7.9 Data Update

The purpose of this policy is to provide a computational model that makes the maintenance of GIS systems easier. It presents a briefing on the updating and upgrading process. Updating is an essential step in the GIS life cycle. If data are not regularly updated the results and decisions deduced from the spatial analysis are unreliable. However, realizing this step is a very difficult task. Due to the temporal property of the natural or non-natural phenomena they represent, data require regular if not continuous updating.

7.9.1 Procedure

7.9.1.1 Update capture

Update capture is the first step in the chain. This update can have several causes:

- Real-world evolutions: all spatiotemporal evolutions which concern the entities of the real world model in the geographic databases.
- Errors corrections: They correspond to corrections of the former version of the database.

The frequency of the collection, and consequently the frequency of revision of bases, is the first problem at the producers of the geographic information. Some apply processes of revision by lot which consists in revising each part of the base at regular intervals. But the definition of the adequate interval for the revision of the adequate part is itself a subject of discussion. Certain themes of the base (e.g. the road theme) evolve much more quickly than the other themes (e.g. administrative limits). The different update cycles for the various themes, for example, six months for the road theme and two years for the theme of the administrative limits, can engender incoherence in the base. If a road represents the administrative limit of a municipality and the course of the road is modified but not the administrative limits of this municipality then the base becomes inconsistent when a share of geometry is expected. One could think that a continuous and homogeneous revision of all the themes of the base is the solution, which however may turn out to be very expensive and especially useless for certain themes of the base.

7.9.1.2 Update integration

The update integration in a geographic database deals with the modification of all the entities directly or indirectly concerned by the evolution (e.g., splitting off some wood into several parts, which is crossed by a new road through). This task relies on the retrieval of different relationships between objects and on the semantics of entities stored in the database. These relations are often implicit (i.e., not explicitly stored in the database) and must be retrieved on the fly. Several kinds of conflicts may emerge when an update is integrated into a database. These conflicts provoke the inconsistency of the base. In most the approach, removing these conflicts need operator intervention.

7.9.1.3 Update Delivery

Mostly, the updated delivery is made in the form of the whole updated database. To integrate these modifications into a destination database, we have the choice between two alternatives: replace completely the destination database with the delivered one or extract just the modified objects from the delivered database and integrate them into the destination one. The advantage of this method lies in its simplicity of execution: it is enough to transfer all the current bases of the producer. But, to extract the modifications and propagate them in their base constitutes long and boring labor. The delivery by differentials implies that only the modified objects, between two states of the database, are delivered. This approach is very advantageous because it allows to pass on only the data which should be updated, without affecting the other data. Furthermore, it mitigates the problem of the quantity of information to be passed on because this quantity becomes lesser and in that case, the transfer is easier to make. The inconvenience of this method of delivery is that it is heavy and difficult to set up. Another type of delivery is what one calls logs. In this mode, one delivers no object but only the description of the evolutions that objects (tracked down by their reference) underwent. This shape of delivery can concern objects having evolved but also the whole base. The major inconvenience of this solution is that she supposes the reference existence, which is not always acquired.

7.9.2 Design and Updating of Geographic Databases

Although change on the Earth's surface may be slow and difficult to detect, changes will and do occur. This change may be global (climate warming) or local (salinization, erosion), it may be gradual and difficult to observe (loss of soil by wind or water) or dramatic and catastrophic (earthquakes, volcanoes, floods, or landslides). While other databases may seldom need changing, geographic databases must be changed regularly, perhaps as often as several times a day. The need for updating results from the changes of feature locations and/or of feature attributes. In addition, a data dictionary, which consists of metadata and describes the database, might also be updated when the expectations and circumstances are changed. Most database management systems have functions allowing the user to keep the database up to date. Methodologies aiming to update data should not only update the spatial information according to the main principles but also enable the GIS user to store the updating status of the database. The development of a system that can store historical records of updating processes is mandatory to develop any updating methodology. When designing a GIS, care should be given to using efficient and useful methodologies enabling the input of new information into the system and storing the time information of changes. Members of the European Organization for Experimental Photogrammetric Research OEEPE detected the following main problem areas in updating digital complex topographic databases:

- Handling the time/historical dimension
- Development of user-friendly, cost-effective procedures
- Production of software to produce and accept change-only information
- Data compatibility

7.9.2.1 Updating Attribute Data

Attributes are alphanumerical data that are associated with graphical features and stored in attribute tables. The updates required from a change in the value of an attribute can be done by modifying the graphical and topological attribute values. To make new decisions through new analysis, the user might need to add new attributes or remove some of the existing ones. Since the attribute values can be initialized or changed, attributes, which are defined by the fields of database tables, can be created and deleted or their characteristics can be altered. Deleting an attribute value causes it to be changed with zero or nothing can be considered a modification. On the contrary, deleting an attribute means removing the column it belongs to. Therefore, all the graphic elements using the same attribute table will be subjected to this change. Some metadata that might be defined as attributes such as recording and updating dates can be updated automatically using GIS software facilities. Other metadata like the source or accuracy of the data can be updated by the user during the data capture process interactively.

7.9.2.2 Updating the Data Dictionary

Adding, deleting, and modifying records and fields are all common database operations. They are mostly easy to implement. But the data in the data dictionary are dependent not only on each other but also on the data in the geographic database. Hence updating the data dictionary is not as easy as updating spatial data or attribute values. For instance, if someone wants to remove a layer of the geographic data model, he must delete all features within this layer, or move them to other layers. Therefore, the meta-data forming the data dictionary should be updated meticulously. Updating processes of a data dictionary are as follows:

- Adding, deleting, merging, and decomposing layers
- Adding and deleting features, modifying feature definitions
- Changing the feature contents of layers
- Adding and deleting attributes, modifying attribute definitions
- Determination or modification of attribute value domain
- Assigning attributes to features or modification of feature attributes
- Determination or modification of feature attribute value domain

7.9.2.3 Monitoring the Database-Updating Process

The course of updating processes should be stored with their dates so that they can be more significant and queried. In monitoring the history of updates, the worst handicap takes place when a deletion is made. The deletion causes the data to be inaccessible in a computer medium. Access to the deleted data or undoing of deletions can be done by recording backup files. The backup file that is created before deletion should include the information, i.e., date and reason for backup, the user ID recording backup, etc. Backup files enable the users to monitor additions, deletions, and modifications in chronological order. There are two major approaches to monitoring database-updating processes:

- Creation of a class of geographic area objects which will receive all information regarding a specific updating task.
- Recording of historical data of an updating task of each feature individually in its attributes.

The latter can be called a feature-oriented method and handled by adding user attributes carrying time stamps. In this approach, to monitor updating processes dates related to the addition or modification of the feature are stored in its attributes. The modification date of attribute values should also be assigned to the attributes of the feature associated with the attribute. Date tagging can be done by the user interactively, which, of course, is not ideal. To have better results, routines capable of automated date tagging should be developed. To automatically handle historic information of updating processes during data manipulation, user interfaces enabling both manipulation and recording should be developed by using GIS macro language. Deleting or changing of location or shape of a graphical feature results in losing its previous information. Therefore, it is not possible to store information before updating the current database files. Before significant deletion processes, the data file should be saved as another data file that also includes date information. On the other hand, recording backups much frequently results in a waste of disk space. However, recording backups seldom can cause loss of information or access to misleading information. So, the answer to the question of "Under which condition and to what extent a backup should be taken?" can be given according to the expectations and the usage of GIS. Since the backup time is not specific, the user should decide it meticulously. Another way to access deleted data is to create a file for storing the features to be deleted before deletion. By using this file, the user can query and access deleted features. In this approach, after modification or deletion user cannot instantly access the information before these operations. Going through the backup files is necessary to access this information. Creating two additional attributes for each table and three additional attribute fields for each attribute that is being monitored causes extra use of disk space. Although this seems to be a waste of disk space, they enable the user to keep the time dimension in the database and to query regarding time.

As a result, to monitor the database-updating process, undo modifications and deletions, and keep time information of updates, the second approach, which also includes partially the first one, is preferable to be used. If space efficiency is preferred over instant monitoring of database updates, the first approach is to be preferred.

7.10 Data Collection

7.10.1 Procedures

7.10.1.1 Establish study purpose and objectives

The study purpose and objectives establish the need for data and information needed at the GTU. It should be defined as the first step in any data collection activity. Once established, the study's purpose and objectives will help to guide the data collection to successful completion.

7.10.1.2 Survey design

Step 1: Define survey objectives, use of results, and target population

Step 2: Draft survey questions

Step 3: Pilot and re-adjust the questionnaire

Step 4: Select respondents and the data collection method

7.10.1.3 Preparing for data collection

Step 1: Making logistics arrangements

Step 2: Setting up central and local headquarters

Step 3: Contacting local authorities

Step 4: Deciding on the size and composition of field teams

Step 5: Arranging transportation, and security

Step 6: Obtaining and preparing copies of local maps

7.10.1.4 Pretesting the Questionnaire

Step 1: Carry a pre-test in the field

Step 2: Discuss the results of the pretest with experienced colleagues and with the interviewers.

Step 3: Make any changes necessary to the instructions to interviewers.

Step 4: If the pertest reveals that respondents refused to answer the questions in the form in which they are given in the questionnaire, consult an experienced survey worker in the country in which you are working.

7.10.1.5 The Questionnaire Layout

Check that your questionnaire contains sections for:

1. Interview date
2. Interviewer's name (or number)
3. A unique identifying number for the cluster, household, mother, and eligible child
4. An introductory paragraph is written for your survey, explaining the purpose of the survey, asking for permission to do the interview, and stating that the information obtained during the survey is confidential
5. Introductory paragraphs to the different modules

7.10.1.6 Selecting the field workers

Step 1: Recruit a field supervisor

Step 2: Recruit the enumerators equally from both genders

7.10.1.7 Choosing and preparing the equipment

In a digital survey, only a digital notebook or cell phone is enough.

A GNSS/GPS for coordination might be needed in some survey that requires accurate locations.

A name tag is necessary to be given to surveyors to identify them.

7.10.1.8 Training the field workers

It is essential to have high-quality data. This will be possible only if you allow enough time to train the supervisors and interviewers thoroughly. Remember to:

- Plan for the training course
- Prepare interviewer guides
- Make sure adequate space is available
- Provide facilities for drinks and snacks (a good working atmosphere during the training course can help to motivate interviewers to perform well in the field)
- Use audio-visual aids during the training.

Before you train the field workers you should also:

- Translate and pretest the questionnaire, the instructions for filling in the questionnaire, and the field procedures
- Identify typical field locations for practicing household selection and interviews.

7.10.1.9 Carrying out the pilot study

The pilot study is the final rehearsal for the survey. It should be carried out soon after finishing the training period, but at least a few days before beginning the actual fieldwork. This will allow time for correcting any problems detected during the pilot study.

7.10.1.10 Setting up computers for data processing

The GIS Coordinator/Technician must be responsible for the data processing at the GTU office. In digital surveys, the collected surveys must be uploaded in real-time or daily to allow for the quality control and validation of the data.

7.10.1.11 Running the survey

Running the actual survey can start smoothly after the pilot and the feedback. The field supervisor and the data collectors at this stage are well trained and ready to carry the collection as per the pilot. The data collectors' teams are grouped and distributed to their designated islands. The supervisor has to do follow-up and quality control on the collection and must be available to solve any problem and answer any question.

7.10.1.12 Analyzing the results

In this step, all survey responses are summarized and analyzed. The results can be presented in graphs and tables and explain what conclusions can be drawn from the data.

7.11 Map Production

The purpose of the map production policy is to generate a standardized map template to maintain a uniform look and feel for any map produced by the GTU. Additionally, this will enable all GIS Staff to follow the same guidelines listed below when creating map products.

7.11.1 Procedures

7.11.1.1 Map Template

It is recommended that the GIS Coordinator creates a map template and populate all the base data within it. Templates speed up the process of getting map products and standardize the maps of the GTU.

The map templates should include the following map elements:

- Title – Includes Map Name, Map theme, Geographic Extent, time/date stamp of data
- The map itself, including the symbolization of geographic features
- Legend – that explains the geographic symbols
- Scale Bar and map scale
- Logo and data disclaimer to recognize data sources/UoM/GTU
- North Arrow
- Projection – Name of the projection, datum, and units
- Copyright/Data Sources – who, what, where, when, why, and how
- "Time Sensitive Data" Disclaimer Stamp – for all maps that are time-sensitive
- "DRAFT" stamp – if the map is a draft

7.11.1.2 Map Format Conventions

- Share completed map products in jpeg or pdf format.
- For non-web maps export maps with 100 dpi resolution to keep file size down, unless a higher resolution is necessary to see detail (300 dpi is recommended for hard copy print maps). This eases data sharing and load on networks.

7.11.1.3 Map Symbology Guidelines

- Reference the layers that are classified or categorized.
- Ensure that symbols do not overlap.

7.11.1.4 Map Distribution

GIS Coordinator/Technician are not at liberty to distribute maps unless they follow the data sharing policy.

7.12 Data Acquisition

A data acquisition policy is a formal request that provides proper and straightforward communication with other parties to acquire data required for a specific project. The purpose of this policy is to provide a consistent framework to apply to request the kind of data needed for the GTU from governmental bodies, NGOs, academic institutions, or any other external party. The policy will provide specific information to ensure data is acquired properly. It applies to all data needed for the GTU to acquire to operate efficiently and effectively.

7.12.1 Procedure

- The GIS Coordinator prepares a formal letter addressed to the data provider.
- The GIS Coordinator shall enumerate in the letter the exact data requested, the format of the data, and whether a soft or hard copy is needed.
- The letter shall be addressed from the UoM and signed by the Head of the UoM.
- The GIS Coordinator shall document and file the GIS data acquisition request into a Request Log to keep records.
- The letter is then officially sent to the data provider.
- The GIS Coordinator shall follow personally the request for data until they are acquired.

- The acquired data shall be checked by the GIS coordinator for accuracy.
- The GIS Coordinator shall ensure the acquired data is converted to the same coordinate system and projection as the GTU data.
- The GIS Coordinator shall generate the Metadata for the newly acquired data.
- The GIS Coordinator shall convert the newly acquired data to a feature class within the geodatabase following the Data Standardization policies.

7.13 Data Projections and Coordinate System

The objective of this policy is to ensure that all GIS data have the same Coordinate system and Map projections to minimize spatial inaccuracy. Additionally, it intends to minimize the effort required to use data collected from various sources.

7.13.1 Procedures

- Define the coordinate system and map projection for the Geodatabase when you create it.
- Ensure that you use Double-Stereographic Projection
- Import all the GIS data into the Geodatabase
- Carry a Transformation if the GIS data is in a different coordinate system.

7.14 Communication and Outreach Standards and Guidelines

The purpose of the communication policies is to establish uniform methods for conducting internal communications between GTU employees and the Head of the UoM, and for conducting communications between the GTU and its external stakeholders.

7.14.1 Procedural Steps

7.14.1.1 Internal Communications

Effective internal communications are considered crucial to the smooth and effective work at the GTU. These communications serve to encourage the GTU staff to improve performance and motivate them to fulfill their duties. Officially, the GIS Coordinator is the one responsible for the effective communications; however, from a practical perspective, this responsibility is shared by all within the GTU – particularly the

GIS Technician. It should be kept in mind that the Head of the UoM and the GIS Coordinator generally need to be aware of all matters involving the GTU.

Both the GIS Coordinator and the GIS Technician have the right to communicate directly with the Head of the UoM to share important information, resolve urgent matters, and discuss subjects related to the GTU's proper operations.

As a GIS Coordinator, you can expect to be:

- permitted to communicate most issues to your team members yourself;
- briefed on any sensitive or significant issues in advance;
- consulted on proposed GIS projects;

As a GIS Coordinator, you also have the responsibility to:

- communicate with your team about relevant issues;
- treat questions from your team members seriously and respectfully. Respond to all questions (whether immediately or after further investigation) and explain the answer;
- raise any significant problems or issues of concern in your area (which you cannot resolve) with the Head of the UoM;
- be as informed as you can be about the issues relevant to your area and your team members;
- empower your team members by providing them with information to enable them to do their jobs as well as possible;
- hold regular meetings with the Head of the UoM to discuss developments, plans, and performance within the GTU.

As a GIS Technician, you can expect to be:

- provided with relevant information and kept informed of relevant developments promptly;
- consulted on issues relevant to your area of expertise;
- allowed to raise questions or issues of concern relevant to your work to the GIS Coordinator and Head of UoM. Your questions should be treated seriously and respectfully and should be answered either immediately or within a reasonable period.

As a GIS Technician, you should:

- actively participate in internal communication by providing information to the GIS Coordinator and other relevant stakeholders
- raise relevant questions or problems with your GIS Coordinator to the Head of the UoM - your questions should be treated seriously and respectfully;

- attend meetings where requested;
- read relevant GTU correspondence, including emails, notices, etc.

7.14.1.2 External Communications

Effective communications are extremely important in fostering mutually affirming and respectful relationships with external stakeholders. The GIS Coordinator has overall responsibility for coordinating external communications related to the GTU. The GIS Coordinator is expected to:

- Conduct meetings with external stakeholders.
- Maintain working relationships with external stakeholders that may require the frequent exchange of GIS data.
- Inform the Head of the UoM and the GIS Technician about the meetings and discussions carried out with external stakeholders.
- Develop minutes of meetings and share them with the Head of the UoM and the GIS Technician.

7.15 Volunteer Appointment

The purpose of this policy is to indicate the procedures, limitations, benefits, and liabilities of utilizing volunteers at the GTU.

Volunteers are non-employees who engage in work at the GTU without monetary compensation to gain training. The volunteers within the GTU can be any individual from the UoM willing to give time to carry out work for the GTU. The volunteers will allocate time, share experience, and engage in various projects free of charge (or any incentive) under the direct supervision of the GIS coordinator and the GIS Technician.

7.15.1 Procedures

7.15.1.1 Selection of volunteers

- Preference is given to the UoM residents who are wishing to volunteer their time to the GTU
- Anyone under the age of 18 is not eligible for volunteering
- The volunteer should know basic English.
- Have GIS knowledge and expertise
- Have basic knowledge of computers and tablets/cell phones

7.15.1.2 Volunteers responsibilities

The volunteers within the GTU can:

- Work on a specific task assigned to him by the GIS Coordinator or Technician
- Work as an enumerator in the data collection
- Contribute to the supervision of the Data collection, if assigned
- Perform data validation and quality assurance/quality control
- Convert map/data to GIS including digitizing
- Be responsible for data entry
- Assist in any GIS work as deemed necessary by the GIS coordinator

7.15.1.3 Benefits

Often volunteers are graduate or undergraduate students who need a record of experience to fulfill specific educational program requirements. Hence, a training certificate can be provided by the GTU.

7.15.1.4 Accountabilities

Volunteers are held accountable to respect internal policies, security, and privacy as follows:

- Respect internal policies that include conduct, attendance and punctuality, privacy, and data security
- Sign liability form

7.16 MOU Agreement

A Memorandum of Understanding (MoU) is used to confirm the GTU's willingness to undertake a potential range/series of GIS collaborative activities with other stakeholders (Government, NGO, Academic institution, etc). The following outlines the procedures to be adopted for the approval and monitoring of MoUs and applies to MoUs being initiated by the GTU or proposed by another institution.

7.16.1 Procedures

7.16.1.1 Initial approval

An MoU should only be developed when, following initial discussions, there is serious intent and potential to undertake a range of specific collaborative activities between the GTU and other institutions related to

GIS. Hence, the GIS Coordinate is the one in charge of this task and shall prepare an initial document to be approved by the Head of the UoM. The following steps shall be followed:

Step 1: The GIS Coordinator prepares the document for developing an MoU. The document should be made based on the following information:

- Brief information about the collaborating institution.
- Initial intentions behind the desire to develop an MoU.
- Potential benefits to RGU.
- An outline of initially planned actions.
- Details of any agreed delivery timelines, where relevant.
- An indication of the longer-term prospects.
- An assessment of the financial implications (Payment terms, income, etc).

Step 2: The document is sent to the Head of the UoM for review.

Step 3: In case the Head of the UoM approves the document, the GIS Coordinator can start the formal preparation of the MoU and the signing.

7.16.1.2 MOU preparation and signing

Following approval by the Head of the UoM, a specific MoU is developed by the GIS Coordinator.

The MoU should:

- Indicate the initial intent of the collaboration.
- Confirm and state explicitly that all ensuing activities arising from the MoU will be subject to a formal contractual agreement before implementation.
- Specify an initial period of duration of the MoU.
- Include a termination mechanism/clause.
- The Head of the UoM will be the signatory of all MoUs.
- Details of all signed MoUs will be held in a database maintained by the GIS Coordinator.

7.16.1.3 Activities arising from the MoU

Formal agreements will be drawn up in respect of all subsequent specific activity that is proposed to be undertaken following the formal completion of an MoU.

7.16.1.4 Monitoring

The GIS Coordinator will be responsible for monitoring, every week, the activities are undertaken under each approved MoU. This will in turn inform decisions relating to the progress of work and the performance of the GTU. If there is any form of delays, it is the responsibility of the GIS Coordinator to report the delays to the Head of the UoM to take the necessary actions on time.

7.17 Grant

The objective of a grant mechanism is to provide GTU with a process to apply for a Grant from any donor.

7.17.1 Procedures

The Grant mechanism comprises:

1. The GTU staff should write a grant proposal for a specific project.
2. The grant proposal should be submitted to the NGO/donors for evaluation purposes
3. Once the grant proposal has been reviewed and evaluated, the NGO can either reject or approve the grant.
4. In case of approval, the GTU and the funding organization shall agree on the process and details for monitoring the progress of work.

APPENDIX A – GIS Role Tables

The roles are:

- Field Data Entry Technician
- GIS Technician

In the GIS Role tables to follow, each GIS Role is thoroughly defined as are the skills required for an individual to qualify to fill each GIS Role in the manner required to adequately support the county in an emergency event. An individual's ability to assume each GIS role is determined by the frequency with which that individual conducts certain GIS or GIS-related activities within their daily work routine. These values are idealized and do not need to be exactly duplicated or represented in the person filling the role. The specific duties and tasks where specific GIS software is referenced should be updated to reflect the software used by your agency. The role charts provided here serve only as examples and do not set standards for the use of any particular software.

Field Data Entry Technician		
	DUTY/TASK	**FREQUENCY**
	Uses mobile data collection devices	Occasionally (every month)
	Maintains mobile data collection devices	Occasionally (every month)
	Edits geometry of a point, line, or polygon	Occasionally (every month)
	Edits attributes of geospatial data in a GIS	Occasionally (every month)
	Adds data across multiple file formats from different sources into field data collection applications	Occasionally (every month)

GIS Technician		
	DUTY/TASK	**FREQUENCY**
Administering and Operating GIS Applications	Use geospatial software to identify, evaluate, and input spatial data	Occasionally (every month)
	Use geospatial software to query data	Occasionally (every month)
	Convert or import digital data using digitizers, scanners, or GPS.	Often (weekly)
	Analyze raster data sets with Spatial Analyst/Grid or Imagine	Rarely (every 6 mos.)
	Analyze vector data sets with Geoprocessing	Occasionally (every month)
	Project spatial data	Rarely (every 6 mos.)
GIS Product Development	Create FDGC Metadata	Rarely (every 6 mos.)
	Collect field location data via GPS	Often (weekly)

	Edit GIS data	Often (weekly)
	Convert data (i.e., geodatabase, shapefile, coverage, DWG,…etc)	Often (weekly)
	Generate statistics	Rarely (every 6 mos.)
	Geocode data	Often (weekly)
	Map and Create new GIS data	Often (weekly)
	Maintain existing GIS data (QA/QC)	Rarely (every 6 mos.)
GIS Services to End Users	Creating maps	Often (weekly)
	Create reports based on GIS Analysis	Occasionally (every month)
	Create charts	Occasionally (every month)
	Create tables	Occasionally (every month)
	Interpret analysis for client	Occasionally (every month)
	Determining the design format of GIS data layers or databases used with GIS layers	Never (never)
	Directly working with clients to meet their GIS needs or further their understanding of GIS	Never (never)