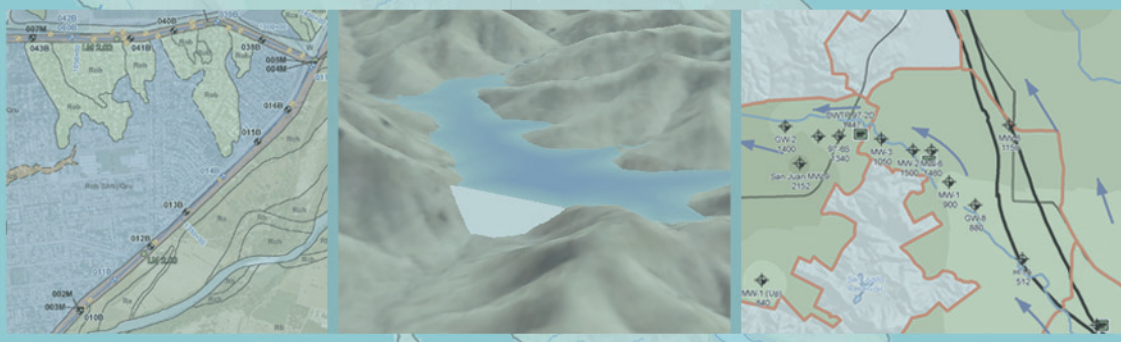
floodER
Department of Water Resources
Flood Emergency Response Program

FloodSAFE GIS Standards

California Department of Water Resources

September 2009



FloodSAFE CALIFORNIA DEPARTMENT OF WATER RESOURCES

FloodSAFE GIS Standards

California Department of Water Resources
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Abbreviations and Acronyms

CDEC	California Data Exchange Center
CLD	California Levee Database
CSDGM	Content Standard for Digital Geospatial Metadata
DEM	Digital Elevation Model
DTM	Digital Terrain Model
DWR	Calfornia Department of Water Resources
ERD	Entity Relationship Diagram
FGDC	Federal Geographic Data Committee
FOCIS	Flood Operations Center Information System
GER	Geotechnical Evaluation Report
NAD	North American Datum
QA/QC	Quality Assurance/Quality Control
UTM	Universal Transverse Mercator

FloodSAFE GIS Standards

The California Department of Water Resources (DWR) is making a significant investment in flood-related data collection and mapping to support a wide range of efforts within the FloodSAFE Program. DWR established a Flood System Data/GIS Technical Team (Technical Team) to address the issues associated with the Flood System Data Management to ensure the FloodSAFE California program's flood information are properly managed and that the investment to the FloodSAFE mapping program is preserved. The Technical Team included staff from various FloodSAFE Programs with an understanding of database management and program needs. The Technical Team prepared a two-phased approach that included:

- Phase I – Data Needs Identification and Evaluation. This phase also included developing GIS standards as well as establishing protocols and priorities to improve the overall information and data management system.

- Phase II – Program Implementation. This phase includes implementing the Phase I recommendations to the information management systems that support the FloodSAFE Program including the integration of the FloodSAFE georeferenced database, California Data Exchange Center (CDEC) database, and Flood Operations Center Information System (FOCIS).

This document (Draft FloodSAFE GIS Standards) was completed in response to Phase I of the Flood System Data/GIS Management effort.

Introduction

Digital mapping is a key element for the FloodSAFE program. Accurately digitized data helps to preserve legacy paper documents and produce a high-quality digital document, communicate georeferenced data clearly and easily to different users, and reduce cost and repetition of work by sharing data.

Because these GIS data are currently being produced by various DWR staff and contractors for various FloodSAFE Programs, they are not uniformly standardized. The lack of GIS standards impedes data collection, management, and sharing since the data are not in a single set of GIS standards. Compliance with the GIS standards will facilitate data sharing, integration, and compatibility among users from different areas. The data must have a single set of standards so that different data sets can be used together and be easily shared and used by users in many locations. GIS standards greatly improve the efficiency of map creation, data access, and data management and allow FloodSAFE to integrate the information from different sources.

The purpose of this document is to develop a single set of standards for GIS data produced and used in FloodSAFE and managed and stored in the CDEC. The GIS standards were primarily compiled from two sources, the DWR California Levee Database (CLD) GIS Standards developed by PBS&J for levee GIS data and the GEI GIS Standards developed by

GEI for Flood Emergency Response (FloodER) program GIS data. Both CLD and FloodER projects have already generated significant amounts of GIS data. The technical team sent a draft version of this document to DWR GIS users and contactors for technical review and comments. Inputs from reviewers in DWR and consultants were incorporated in this document. Comments and suggestions from reviewers were summarized and presented in a separated document.

DWR has department-wide enterprise ESRI ArcMap licenses and ESRI ArcMap software is widely used for both DWR staff and FloodSAFE program consultants. As a result, this document primarily focuses on GIS data in ESRI format. GIS data created by other GIS vendors such as MapInfo and Intergraph should be converted into ESRI format.

Although this document primarily focuses on vector data, raster data should also follow the standards wherever it is applicable, e.g. naming convention and deliverable standards.

Once the standards are finalized and approved, this document and its attached files will be available on the CDEC and FloodSAFE websites. These attached files include map document templates, metadata style sheet file, symbology file, abbreviation list, projection file, and a QA/QC sheet, which will be retained for updates and to bear a version number.

Geodatabases for specific projects under FloodSAFE will be created according to standards defined in this document. It is recognized that individual geodatabases may vary significantly with respect to type and the number of feature classes, feature datasets, tables, attributes, and geospatial or tabular relationships. Geodatabases under one project under FloodSAFE should be consistent with respect to creating metadata, establishing accuracy, defining projections, or maintaining any other geospatial or database functionality.

Objective

The objective of this document is to provide standard recommendations and guidelines for collection, analysis, management, and maintenance of GIS data. The implementation of the GIS standards will help make GIS data, maps, and reports produced by DWR GIS staff and its contractors more complete, consistent, and accurate, regardless of GIS software and data models used during the creation.

In this document, seven standards are identified for inclusion in the GIS Standards:

1. Projection and Coordinate System
2. Metadata Standards
3. Cartographic Standards
4. Abbreviation Standards and Naming Conventions
5. QA/QC Standards
6. Spatial Topology Standards
7. Deliverable/Media Standards

1. Projection and Coordinate System

The projection and coordinate system is the most important standard to be defined in any GIS standardization. It is the foundation of any GIS data. A single projection and coordinate

system avoids data re-projection, which is time consuming and wastes storage space due to multiple copies of data in multiple systems especially for large raster data sets. Furthermore, multiple projections and coordinate systems are not allowed within a single geodatabase dataset. Although multiple systems would not have many issues for ESRI desktop application, it requires extra effort to develop customized GIS applications, especially for web-based GIS applications.

Several projections and coordinate systems are commonly used in California. It is difficult to choose one single system for all of California because some systems require multiple zones. The system in CLD is NAD_1983_California_Teale_Albers and has one zone for all of California. Universal Transverse Mercator (UTM) projection is more accurate and is widely used but it needs two zones to cover the whole of California: Zone 10N for Northern California and Zone 11N for Southern California.

Geographically, the majority of flood data in California is within Northern California and the Central Valley, i.e., UTM Zone 10N. For example, 95 percent of project levees and 80 percent of overall levees are in this area. About 85 percent of FloodSAFE funding goes to this area (http://www.water.ca.gov/floodsafe/docs/FloodSAFE_Overview_Fact_Sheet.pdf). NAD 1983 UTM Zone 10N was chosen as the projection and coordinate system in Central Valley Flood Mapping Project, which will generate huge amount of imagery data sets and Digital Elevation Model data sets. These raster data are in the native projection of NAD 1983 UTM Zone 10N. As a result, NAD 1983 UTM 10N is chosen as the default projection and coordinate system. Following is the detail for this system.

Projection: Transverse_Mercator
- False_Easting: 1640416.666667
- False_Northing: 0.000000
- Central_Meridian: -123.000000
- Scale_Factor: 0.999600
- Latitude_Of_Origin: 0.000000
- Linear Unit: Foot_US (0.304801)

Geographic Coordinate System: GCS_North_American_1983
- Angular Unit: Degree (0.017453292519943295)
- Prime Meridian: Greenwich (0.000000000000000000)
- Datum: D_North_American_1983
  - Spheroid: GRS_1980
  - Semimajor Axis: 6378137.000000000000000000
  - Semiminor Axis: 6356752.314140356100000000
  - Inverse Flattening: 298.257222101000020000

Vertical Coordinate System: NAVD88
- Linear Units: Foot_US
- Direction: positive up
- Vertical Shift: 0.000000
- Vertical Datum: North_American_Vertical_Datum_1988

NAD_1983_UTM_Zone_11N and NAD_1983_California_Teale_Albers are chosen as the secondary projections. The detail of NAD_1983_UTM_Zone_11N is similar to 10N. The detail of NAD_1983_California_Teale_Albers is listed as the following:

Projection: Albers
- Spheroid: GRS 80
- False_Easting: 0.000000
- False_Northing: -4000000.000000
- Central_Meridian: -120.000000
- Standard_Parallel_1: 34.000000
- Standard_Parallel_2: 40.500000
- Latitude_Of_Origin: 0.000000
- Linear Unit: Meter (1.000000)

Geographic Coordinate System: GCS_North_American_1983
- Angular Unit: Degree (0.017453292519943299)
- Prime Meridian: Greenwich (0.000000000000000000)
- Datum: D_North_American_1983
  - Spheroid: GRS_1980
  - Semimajor Axis: 6378137.000000000000000000
  - Semiminor Axis: 6356752.314140356100000000
  - Inverse Flattening: 298.257222101000020000

Vertical Coordinate System: NAVD88
- Linear Units: Meter
- Direction: positive up
- Vertical Shift: 0.000000
- Vertical Datum: North_American_Vertical_Datum_1988

Sample projection files for NAD_1983_UTM_Zone_10N and NAD_1983_California_Teale_Albers are listed in Appendix A.

2. Metadata Standards

Metadata is “data about data.” It documents information about data, such as content, quality, source, vintage, accuracy, condition, projection, responsible party, contact phone number, method of collection, and other characteristics or descriptions. It helps a user to locate and understand the data and provides a common set of terminology and definitions for the documentation of GIS data. Metadata standards need to be established to describe, organize, and access GIS data. The Content Standard for Digital Geospatial Metadata (CSDGM) developed by the Federal Geographic Data Committee (FGDC) is recommended as a standard for metadata. The FGDC coordinates the development of the National Spatial Data Infrastructure to operatively produce and share geographic data.

A fully CSDGM-compliant metadata is recommended for FloodSAFE GIS data. To develop fully FGDC-compliant metadata, all of the “mandatory” and “mandatory if applicable” sections of the CSDGM have to be completed. It consists of ten sections:

- Identification Information (Section 1)

- Data Quality Information (Section 2)
- Spatial Data Organization Information (Section 3)
- Spatial Reference Information (Section 4)
- Entity and Attribute Information (Section 5)
- Distribution Information (Section 6)
- Metadata Reference Information (Section 7)
- Citation Information (Section 8)
- Time Period Information (Section 9)
- Contact Information (Section 10)

Wherever possible, the fully CSDGM-compliant metadata should be used to prepare metadata. It is required if the data have to comply with federal metadata standards. See http://www.fgdc.gov/metadata/geospatial-metadata-standards for details.

Minimum Accepted Metadata – FloodSAFE Required Metadata

In some instances resources may be limited such that documentation describing the fully FGDC-compliant metadata is not possible. In such cases, a Minimum Accepted Metadata should be implemented. Although the Minimum Accepted Metadata only includes part of the sections in the full list, it does meet the minimum requirements for the FGDC Content Standard for Digital Geospatial Metadata. The sections of the FGDC standard included in the Minimum Accepted Metadata are:

- Identification Information (Section 1). Contact information and citation information must be provided.
- Data Quality Information (Section 2), which must include source of data information, development process information (method of capture) and accuracy. For example, feature class was digitized on screen using 1:245 USGS DOQs at the scale between 1:3600 and 1:6000.
- Spatial Data Organization Information (Section 3)
- Spatial Reference Information (Section 4)
- Distribution Information (Section 6)

The details for the sections included in the Minimum Accepted Metadata are included in Appendix B.

For shapefile data source, the metadata should be XML or HTML format and shall be attached with the data it describes. XML format is preferred. Users can use ArcCatalog metadata editor or other XML editor to create and maintain metadata. A sample of metadata exported from California Levee Database, version 2.1 released in early February 2009 is listed in the Appendix C.

In addition to the metadata file, if the data source is geodatabase, a data dictionary or Entity Relationship Diagram (ERD) which lists classes, attributes, information about the attributes, subtypes/domains need to be included, and information about any relational tables to the spatial datasets is required for deliverable. Please refer to http://www.crwr.utexas.edu/gis/gishydro01/support/dictionary.pdf for a sample data dictionary and refer to California Levee Database ERD for a sample ERD.

3. Cartographic Standards

The use of cartographic standards in mapping facilitates faster and more consistent interpretation of mapping products. As there are so many different scenarios in real world, it is impossible to list all templates for each program/project. The standards are hence are only for guideline purpose. For example, there may not have enough room for some elements for paper size A and users need their judgment to reorganize these elements.

GIS cartographic standards should follow the National Geospatial Program Standards for mapping/GIS products. National Geospatial Program Standards are referenced at http://ncgmp.usgs.gov/ncgmpstandards/.

It is recommended to use consistent map templates containing predetermined background layers and symbology for a program/project. Templates reinforce consistency and can speed up the production of finished maps. Make sure that the scale bar is at a fixed scale (example: one inch equals .5 miles) and avoid arbitrary scales (example: one inch equals 0.389 miles).

Create maps that best serve the purposes of those who will be using the map. Be aware that some users may be color blind and may need feature colors modified to interpret the data properly. Aim to have map features that are clearly defined. Try to use labels only where it may help to clarify a map feature. Use a labeling engine (e.g., Maplex) to alleviate problems encountered with maps that have complex labeling. If the labeling engine proves unsatisfactory, convert the labels to Geodatabase annotation or map annotation and manually place the labels. Details about the map templates and elements on the maps are included in Appendix D.

Any map should clearly communicate the intended message. All map products should follow these standards where applicable. In some cases, maps may be produced as a special request and there may be no standard to follow, but the following elements should be included:

- DWR Logo
- FloodSAFE Program Logo for FloodSAFE program. Do not include it for non-FloodSAFE program or replace with other program logo for other flood program.
- Project Name
- Title
- Statement of Scale
- North Arrow
- Neatline (map border)
- Legend
- Author's Name
- Date of Publication—the gathered date and time information should be written near the author's name on the map
- Data citation/data source
- Plot Stamp - text indicating last modified date, name and location of the .mxd file. Example: S:\HAFOO\FPIIB\LMAAS\data\GIS Database\projects\Project_Design_Capacities.mxd 01/16/2009 10:12 AM

Map products should also adhere to the following:

- Symbology standards (See Appendix E)
- Use of standardized colors for maps printed in color (refer to USGS Digital Raster Graphic standards), for example, blue for water, green for vegetation, and so forth.

Standard map symbols are required to avoid ambiguous map interpretation. Implementation of symbol standards improves efficiency, consistency, and readability. A set of standard map symbols is listed in Appendix E. If a symbol is not listed in the standards, the following criteria are to be used for the customized symbol:

- Symbol size must be in proportion to the size of the other symbols and the map. Symbology that works for large scale maps does not necessarily work for small scale maps or vice versa.
- Symbol must be easily and quickly identifiable when displayed in color and black and white
- Symbol must be clearly distinguishable between other symbols when displayed in color and in black and white

4. Abbreviation Standards and Naming Conventions

The abbreviation standards and naming conventions are intended to provide a consistent naming system for file, layer and attribute that is repeatable, clear, and enables consistent archiving of GIS data.

Although not all the names of features, objects, relationships, and attributes need to be fully spelled out, they should be properly abbreviated by using the Standard Abbreviations in Appendix F. Some examples are Fld for Field, FC for Flood Control, and Num for Number. See Appendix F for details.

In addition to the abbreviation standards, some guidelines are recommended for naming file, directory, layer, geographic class, attribute item, and field. Together with abbreviation standards, naming conventions provide a common set of terminology for the name of digital documentation and geospatial data.

File, Directory, Layer and Geographic Class Naming

File naming standards ensure names are valid when data is converted between different data formats. In general, names should have physical meanings and reflect their contents.

- File names shall contain only alphanumeric characters (i.e., letters and numbers) and underscore.
- File names shall start with a letter.
- No spaces, dashes, or special characters (except underscores) in file names or directory names (file paths). Even though recent versions of GIS software are more tolerant of these than in the past, some tasks will still fail with no explanation if spaces or special characters are used.
- File names will be 50 characters or less. 100 or less for Map document files.
- Common abbreviations should be used where applicable.

If the "list" of items in the file name is too long, separate into multiple files or generalize the name of the file (as long as the name is still relevant to the file contents). Capital letters separate different words of the same part of a file name while underscores separate different parts of a file name. The geographic region is generally the first part of a file name (when such information is necessary) while the content of the file is the second part. Examples: "SanJoaquinSystem_LeveeSegments," or "SacramentoSystem_LeveeMiles," or "SanJoaquinSystem_AssuranceAgreements."

The following is an example of a useful file name: RD1601_1997_GER_01.pdf. This example is 18 characters long and is derived from the year that the document was created (1997, add month and day if needed), the document type (GER), the location (RD1601), and an incremental number (01). The file can then easily be interpreted as a Geotechnical Evaluation Report (GER) document created in 1997 located in Reclamation District 1601. All of the abbreviations should follow the Abbreviation Standards.

Each directory should contain one kind of file and the name should represent its content, for example: shapefiles, tables, exports, and documents. Each file should contain one kind of data (file name examples: DWR_Channel_Reports, CVFPB_Project_FactSheets).

Attribute Item and Field Naming and Guideline

Attribute item and field naming standards enable data conversion between different data formats without truncation or conflicts. Below are the guidelines for naming attribute item and field:

- Item names shall contain only alphanumeric characters (letters and numbers) and underscores.
- Item names must start with a letter.
- No spaces, dashes, or special characters (except underscores) will be used.
- Use underscores to separate words.
- Common abbreviations should be used where applicable.
- No 'system reserved words' like 'DATE', NUMBER, TEXT, TO, FROM, or GRANT to name columns or fields.
- The maximum length for field name shall be 20 characters if the data source is geodatabase and 10 characters for shapefile data source. For these with abbreviated names, add an alias in the field property or add definitions for the attribute data in the metadata.
- If an attribute or column title uses acronyms, these should be capitalized.

For the data type of attribute, use whichever is suitable to the feature being attributed. For data value, use full text names whenever appropriate, avoid abbreviations that might confuse another person accessing the data, or use numeric fields where necessary, such as manual numbers, unique identifiers, etc. In general, attributes only containing numbers should be defined as numeric data type; especially if they are used in calculations. However, if they need to keep "0" at the beginning (e.g. 0651 instead of 651) or have other characters such as "-", they shall be a text string or varchar datatype. Date is recommended as yyyy-mm-dd (numeric). All date fields created in coverage, shapefile, or geodatabase (personal or enterprise) format shall be created as a date field type. Always include an ID index field (in

addition to the OBJECTID field), a “Comment” field (255 characters) when creating data from historical documents, and a “Source” field (255 characters) to provide additional citation (above and beyond metadata).

Imagery and scanned digital files should also follow the above naming conventions. Digital file names should have information about the document type, geographic location, and document creation date. For scanned digital files:

- Name all digital files with the above naming conventions.
- Separate a scanned file that contains multiple documents by document and name them appropriately.
- Ensure that there are no spaces in the document name.

In map document (.mxd) files, data source should use relative pathname for local data files to enhance the ability to share and distribute the layouts. In general, map document file should have the name identical with map title. Use an abbreviation if the map title is too long. Additional information such as data period, paper size, and serial number could be used to differentiate files. Example: Project_Design_Capacities_42x60_Sheet2.mxd.

5. QA/QC Standards

Quality Assurance/Quality Control (QA/QC) is the key to GIS data accuracy and quality of the GIS data. With a well designed QA plan and QC procedures, data developers can maintain accuracy and quality of data, improve efficiency, and avoid redoing poorly completed work.

Before assigning staff and starting the GIS work, go through the QA steps. A thorough examination of methods and policies could help to find ways of improving the overall techniques for data production.

After completing the work for each milestone, it is important to conduct a thorough QC review. It is critical to catch errors early and quickly before the data are imported into the database. Check for the following concerns during Quality Control Review:

- All required features are included.
- Duplicated data in the same format/type do not exist.
- Topology is correct.
- Attribute information is accurate.

Several iterations of the QA/QC process may be required for more complicated multi-step projects. Everyone working on the GIS database should use QA/QC techniques on their own work before having someone else check it. When people take responsibility for their work the quality of the overall project significantly increases.

Following are some important steps for the QA/QC processes:

- Reviewers are familiar with the quality of the source data.
- Format and standards are checked.
- Layer has appropriate file format.

- Data/layer name follow naming conventions.
- System is set in the correct coordinate system and horizontal and vertical datum(s) and proper units of measure.
- Table column names are meaningful and have no spelling errors.
- Map follows cartographic standards.
- Data are checked.
- Unique occurrence of fields.
- Meaningful attributes.
- Source data are compared with the processed final data.
- Spatial topology is correct.
- Metadata and maintenance process document are complete.
- Corrections are noted and corrections to the noted deficiencies are instructed.
- Data is rechecked once corrections have been made.
- Number of rechecks needed is rechecked and the QC compliance form is signed.

Details about the QA/QC Standards are listed in Appendix G and were compiled from QA/QC documents developed by PBS&J and GEI Consultants, Inc. A completed QA/QC document, which includes a log of standard QC or Problem/Action, should be attached with data as a deliverable and be available for DWR staff to review.

6. Spatial Topology Standards

Spatial topology is a set of rules that define the geometric relationship between points, lines, and polygons. It is used to identify errors in the vector fabric of the database. Creating a topologically correct dataset is a significant step toward establishing the accuracy and spatial integrity of a GIS database.

Spatial data submitted for inclusion in a geodatabase should be topologically clean and free of errors. Data should not have any spatial errors such as slivers, overshoots, undershoots, overlapping polygons, non-closed polygons, unresolved line segment intersections, duplication, break at overpasses and underpasses, over 500 vertices per arc, or other topological errors unless necessary to accurately describe the specific map data (see http://www.esri.com/news/arcuser/0401/topo.html for more detail). All points, lines, polygons, and regions will have a single global unique identification number. Checking and documenting the data's spatial topology with ESRI's topology tools and resolving spatial errors is required. Additional QA/QC is needed to check whether the tool was used correctly.

All data provided as a geodatabase shall have topology based on the criteria outlined in the ArcGIS help system instructions (refer specifically to 'Topology Validation' topic). Detailed definitions of the assigned topology rules must be submitted as well. Refer ESRI White Paper http://downloads.esri.com/support/whitepapers/ao_/geodatabasetopology.pdf for more information about geodatabase topology.

The precision of coordinates and attributes should be adequate to accurately represent the location and values of the data. Double Precision is recommended for coordinates. The tolerance and precision should be consistent among a dataset. Resolution values should be in the same units as the coordinate system and a resolution value should be at least 10 times smaller than the tolerance value. GIS data layers derived directly from base data should be of

the same spatial accuracy as the source data. The following tolerances and resolution values are required for FloodSAFE GIS:

XY Tolerance 0.001 meters (or 0.003281 feet)
Z Tolerance 0.001
Resolution 0.0001 meters (or 0.0003281 feet)
Fuzzy Tolerance 0.001
Dangle Tolerance 0.0
Tic_Match 0.0
Edit 0.5
NodeSnap 0.001
Weed 0.5
Grain 0.5
Snap 0.5

7. Deliverable/Media Standards

All data should be written to CD-ROM/DVD, external hard drive, USB drive, or FTP and documentation describing the files contained on these media should be included. A cover for CD-ROM/DVD is included in Appendix H.

For data in flat file format (shapefile, coverage, map document, raster/imagery file), all files should follow standards in Standard 4. For personal or file geodatabase, submit original database files (mdb file or folder of file geodatabase) or its XML file. For SDE geodatabase, submit either file geodatabase or its XML file.

For files in georeferenced aerial photography and imagery formats, check the information and completeness of the following files:

MrSID - Images must be Version MG2
Image Catalogs – Submitted as .DBF or as an Embedded Raster Catalog
JPEG – Must be accompanied by World File (JFW)
TIFF 4.0 – Must be accompanied by World File (TFW)

For digital elevation models (DEM) or digital terrain models (DTM), e00, GRID, or TIN must be accompanied by all ASCII source files. All elevation points submitted shall be delivered in a single, comma delimited ASCII file.

References

[1] Federal Geographic Data Committee (1998): Content Standard for Digital Geospatial Metadata (version 2.0), FGDC-STD-001-1998. Online at http://www.fgdc.gov/standards/projects/FGDC-standards-projects/metadata/base-metadata/v2_0698.pdf

[2] FEMA Guidelines and Specifications for Flood Hazard Mapping Partners http://www.fema.gov/plan/prevent/fhm/gs_main.shtm

[3] USGS Topographic Map Symbols. http://egsc.usgs.gov/isb/pubs/booklets/symbols/

[4] USGS Geologic Mapping Standards. http://ncgmp.usgs.gov/ncgmpstandards/

[5] FGDC Digital Cartographic Standard for Geologic Map Symbolization. http://ngmdb.usgs.gov/fgdc_gds/geolsymstd/download.php

[6]Ten most common metadata errors: http://www.fgdc.gov/metadata/documents/top10metadataerrors.pdf

[7] USGS Digital Raster Graphic Standards http://rockyweb.cr.usgs.gov/nmpstds/drgstds.html

[8] ESRI QA/QC for GIS Data: Creating a Quality Assurance Plan for GIS Data. http://www.esri.com/news/podcasts/transcripts/qa_qcforgisdata_creatingaqualityassuranceplan.pdf

APPENDIX A

Sample Projection File

(Exported from California Levee Database, version 2.1 released in early February 2009)

Project file for NAD_1983_UTM_Zone_10N

PROJCS["NAD_1983_UTM_Zone_10N",GEOGCS["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Transverse_Mercator"],PARAMETER["False_Easting",1640416.666666667],PARAMETER["False_Northing",0.0],PARAMETER["Central_Meridian",-123.0],PARAMETER["Scale_Factor",0.9996],PARAMETER["Latitude_Of_Origin",0.0],UNIT["Foot_US",0.3048006096012192]],VERTCS["NAVD_1988",VDATUM["North_American_Vertical_Datum_1988"],PARAMETER["Vertical_Shift",0.0],PARAMETER["Direction",1.0],UNIT["Foot_US",0.3048006096012192]]

Project file for NAD_1983_California_Teale_Albers

PROJCS["NAD_1983_California_Teale_Albers",GEOGCS["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Albers"],PARAMETER["False_Easting",0.0],PARAMETER["False_Northing",-4000000.0],PARAMETER["Central_Meridian",-120.0],PARAMETER["Standard_Parallel_1",34.0],PARAMETER["Standard_Parallel_2",40.5],PARAMETER["Latitude_Of_Origin",0.0],UNIT["Meter",1.0]],VERTCS["NAVD_1988",VDATUM["North_American_Vertical_Datum_1988"],PARAMETER["Vertical_Shift",0.0],PARAMETER["Direction",1.0],UNIT["Meter",1.0]]

APPENDIX B

Minimum Accepted Metadata

Section 1: Identification Information

Basic information about the dataset and its identity
Originator
Publication Date
Title
Supplemental Information
Access Constraints
Use Constraints
Point of Contact
Native Dataset Environment

Section 2: Data Quality Information

A general assessment of the quality of the dataset
Attribute Accuracy Report
Logical Consistency Report
Completeness Report
Horizontal Positional Accuracy Report
Vertical Positional Accuracy Report
Process Description

Section 3: Spatial Data Organization Information

The mechanism used to represent spatial information in the dataset
Direct Spatial Reference Method

Section 4: Spatial Reference Information

The description of the reference frame for, and the means to encode, coordinates in the dataset
Horizontal Coordinate System Definition
Geodetic Datum
Bathymetric Datum

Section 6: Distribution Information

Information about the data format
Format Name
Format Information Content
Technical Prerequisites

APPENDIX C

Metadata Sample

(This is provided for reference purpose. It does not have to be printed out as hardcopy for deliverable. Exported from California Levee Database, version 2.1 released in early February 2009)

Levee_Centerline

Metadata:

1. Identification_Information
2. Data_Quality_Information
3. Spatial_Data_Organization_Information
4. Spatial_Reference_Information
5. Entity_and_Attribute_Information
6. Distribution_Information
7. Metadata_Reference_Information

Identification_Information:

Citation:
Citation_Information:
Originator:
State of California, Department of Water Resources - Division of Flood Management - Floodplain Management Branch
Publication_Date: Unknown
Title: Levee_Centerline
Geospatial_Data_Presentation_Form: vector digital data
Online_Linkage:
\\SACSRV2\GIS\GIS\Projects\087756_DWR_Flood_Mgmt\080432\Shapefiles_GDB\Levee_Centerline.shp
Description:
Abstract:
This feature class contains data about the centerline of an embankment for controlling the waters of the sea, river, or other water bodies. This dataset has been developed to establish a levee database for all levees and levee systems in the State of California, in support of the Department of Water Resources floodplain mapping program for the State.
Purpose:
The levee database is intended to provide an assembly of pertinent data for use by DWR and other agencies in assessing public safety needs for areas protected by levees or other related facilities.
Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: unknown
Currentness_Reference: publication date
Status:
Progress: In work
Maintenance_and_Update_Frequency: Continually
Spatial_Domain:

Bounding_Coordinates:
West_Bounding_Coordinate: -124.410828
East_Bounding_Coordinate: -113.705503
North_Bounding_Coordinate: 42.016387
South_Bounding_Coordinate: 32.439947
Keywords:
Theme:
Theme_Keyword_Thesaurus:
REQUIRED: Reference to a formally registered thesaurus or a similar authoritative source of theme keywords.
Theme_Keyword: Levee
Theme_Keyword: Flood Control
Place:
Place_Keyword: California
Access_Constraints:
The data being provided are intended to comply with the California Public Records Act. User shall not license, re-license, sub-license, assign, release, publish, transfer, sell, or otherwise make available any portion of the data to a third party without the prior permission of DWR. Portions of these data have been derived from the USACE's National Levee Database (NLD) and may be considered Critical Infrastructure Information (CII) as defined by the Department of Homeland Security (DHS), and thus merit restricted distribution.
Use_Constraints:
DWR makes no warranties, representations, or guarantees, either expressed or implied, as to the completeness, accuracy, or correctness of the data, nor accepts or assumes any liability arising from or for any incorrect, incomplete, or misleading data provided pursuant to this request.
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization:
CA Data Exchange Center, California Department of Water Resources
Contact_Address:
Address_Type: mailing and physical address
Address: 3310 El Camino Avenue, Suite 200
Address: P.O Box 219000
City: Sacramento
State_or_Province: CA
Postal_Code: 95821-9000
Country: United States
Contact_Voice_Telephone: (916) 574-1777
Contact_Instructions: WebSite: <http://cdec.water.ca.gov>
Native_Data_Set_Environment:
Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 3; ESRI ArcCatalog 9.2.6.1500

Data_Quality_Information:

Lineage:

Process_Step:

Process_Description:

The LEVEE_CENTERLINE feature class was digitized on screen and rectified to 1:24k USGS Digital Orthophoto Quads (DOQ) at a scale no less than 1:3600 and no more than 1:6000. Levee locations were determined by the review of the Levee_Final shapefile originally created by the USACE in conjunction with FEMA and OES. Levee features identified in the Levee_Final shapefile were reviewed for spatial and attribute correctness. 1:24k USGS Topo Quads (DRG) and FEMA FIRM panels were used to locate and identify additional levee features outside of those identified by the Levee_Final shapefile.

Process_Date: Not complete.

Process_Step:

Process_Description: Dataset copied.

Source_Used_Citation_Abbreviation:

Z:\Projects\IS\DWR\CA_Levee_Database\doc\metadata\levee_centerlines

Process_Step:

Process_Description: Metadata imported.

Source_Used_Citation_Abbreviation:

C:\Documents and Settings\16246\Desktop\04_01_2008\geodatabase\levee_centerlines.xml

Process_Step:

Process_Description: Metadata imported.

Source_Used_Citation_Abbreviation:

Z:\Projects\IS\DWR\CA_Levee_Database\doc\metadata\levee_centerline_05282008.xml

Process_Step:

Process_Description: Dataset copied.

Source_Used_Citation_Abbreviation:

Server=encgisdev; Service=7171; User=dwr_admin; Version=SDE.DEFAULT

Process_Step:

Process_Description: Dataset copied.

Source_Used_Citation_Abbreviation:

\\ENCFS01\Encinitas_IS\Projects\IS\DWR\CA_Levee_Database\data\geodatabase\DWR_CALeveeDatabase_v1.31_05June2008.mdb

Process_Step:

Process_Description: Dataset copied.

Source_Used_Citation_Abbreviation:

Server=encgisdev; Service=8181; User=dwrgis_admin; Version=SDE.DEFAULT

Process_Step:

Process_Description: Metadata imported.

Source_Used_Citation_Abbreviation:

Z:\Projects\IS\DWR\CA_Levee_Database\xml\metadata\LEVEE_CENTERLINE.xml

Process_Step:

Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:
Server=encgisdev; Service=8181; User=dwrgis_admin; Version=SDE.DEFAULT
Process_Step:
Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:
\\ENCFS01\Encinitas_IS\Projects\IS\DWR\CA_Levee_Database\data\geodatabase\DWR_CALeveeDatabase_v1.32_08122008.mdb
Process_Step:
Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:
Server=encgisdev; Service=8181; User=dwrgis_admin; Version=SDE.DEFAULT
Process_Step:
Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:
\\CARFS01\ATG\Projects\IS\DWR\CA_Levee_Database\data\geodatabase\DFM_CALeveeDatabase_v1.32_09302008.mdb
Process_Step:
Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:
Server=encgisdev; Service=8181; User=dwrgis_admin; Version=SDE.DEFAULT
Process_Step:
Process_Description: Metadata imported.
Source_Used_Citation_Abbreviation:
N:\GISProjects\049116394_DWR_TO100\Levee_Database\DWR\Metadata\All\LEVEE_CENTERLINE.xml
Process_Date: 20090109
Process_Time: 13502700
Process_Step:
Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:
\\CARFS01\ATG\Projects\IS\DWR\CA_Levee_Database\data\geodatabase\processing\NLDSchemaTransition\gdb\DataLoading\DFM_CALeveeDatabase_v2.1_Rxx_01132009.mdb
Process_Date: 20090114
Process_Time: 12042900
Process_Step:
Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:
Server=encgisdev; Service=8181; User=dwrgis_admin; Version=SDE.DEFAULT
Process_Date: 20090114
Process_Time: 18145700
Process_Step:
Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:

\\FLD-NPEREZ\C$\Documents and Settings\nmperez\My Documents\LeveeDB Project\UpgradeTo9.3\O&MUpdates\DFM_CALeveeDatabase_v2.1_R1_20090219.mdb
Process_Date: 20090304
Process_Time: 15471600
Process_Step:
Process_Description: Dataset copied.
Source_Used_Citation_Abbreviation:
Server=136.200.38.83; Service=5151; Database=esri_dwr_gis; User=dwrgis_viewer; Version=SDE.DEFAULT
Process_Date: 20090312
Process_Time: 11035400

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: String
Point_and_Vector_Object_Count: 9215

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Map_Projection:
Map_Projection_Name: Albers Conical Equal Area
Albers_Conical_Equal_Area:
Standard_Parallel: 34.000000
Standard_Parallel: 40.500000
Longitude_of_Central_Meridian: -120.000000
Latitude_of_Projection_Origin: 0.000000
False_Easting: 0.000000
False_Northing: -4000000.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 0.000000
Ordinate_Resolution: 0.000000
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222
Vertical_Coordinate_System_Definition:
Altitude_System_Definition:
Altitude_Resolution: 0.000000

Altitude_Encoding_Method:
Explicit elevation coordinate included with horizontal coordinates

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Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: Levee_Centerline
Attribute:
Attribute_Label: FID
Attribute_Definition: Internal feature number
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated
Attribute:
Attribute_Label: Shape
Attribute_Definition: Feature geometry
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain: Coordinates defining the features
Attribute:
Attribute_Label: LEVEE_ID
Attribute:
Attribute_Label: FC_SEGMENT
Attribute:
Attribute_Label: SHAPE
Attribute_Definition: Feature geometry
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain: Coordinates defining the features
Attribute:
Attribute_Label: UP_RIVER_M
Attribute:
Attribute_Label: DOWN_RIVER
Attribute:
Attribute_Label: COMMENTS
Attribute_Definition:
A description or other unique information concerning the subject item
Attribute:
Attribute_Label: GAGE_CODE
Attribute_Definition:
The commonly used identification number for the controlling gage
Attribute:
Attribute_Label: GAGE_OWNER
Attribute_Definition: The name of the owner for the controlling gage
Attribute:

Attribute_Label: FEATURE_NA
Attribute:
Attribute_Label: FEATURE_LE
Attribute:
Attribute_Label: SLOPE_LAND
Attribute:
Attribute_Label: SLOPE_WATE
Attribute:
Attribute_Label: BANK_D
Attribute:
Attribute_Label: COORDINATE
Attribute:
Attribute_Label: CUTOFF_TYP
Attribute:
Attribute_Label: LEVEE_TYPE
Attribute:
Attribute_Label: PRIMARY_MA
Attribute:
Attribute_Label: CREST_WIDT
Attribute:
Attribute_Label: CREST_ACCE
Attribute:
Attribute_Label: FLOOD_SOUR
Attribute:
Attribute_Label: RIVER_BASI
Attribute:
Attribute_Label: HORIZ_ACCU
Attribute:
Attribute_Label: VERT_ACCUR
Attribute:
Attribute_Label: PRIMARY_US
Attribute:
Attribute_Label: STRUCTURE_
Attribute:
Attribute_Label: MAINT_AGEN
Attribute:
Attribute_Label: LOCAL_AUTH
Attribute:
Attribute_Label: OWNER_AGEN
Attribute:
Attribute_Label: Levee_ID
Attribute:
Attribute_Label: CONSTR_AGE
Attribute:
Attribute_Label: Bank_d
Attribute:

Attribute_Label: YEAR_CONST
Attribute:
Attribute_Label: LOCATION_D
Attribute:
Attribute_Label: DWR_CATEGO
Attribute:
Attribute_Label: USACE_CATE
Attribute:
Attribute_Label: DATA_SOURC
Attribute:
Attribute_Label: NLD_LEVEE_
Attribute:
Attribute_Label: LEN
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_assembly_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_congress_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_corp_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_county_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_firm_pnl_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_quad_100_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_maint_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_quad_24_Levee_ID
Attribute:
Detailed_Description:

Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_quad_250_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_rec_dist_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_cntr_subbasin_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_ctr_leveedist_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_levee_ctr_sen_dist_Levee_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_ORG_levee_auth_Org_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_ORG_levee_const_Org_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_ORG_levee_maint_Org_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_ORG_levee_owner_Org_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_RI_CAT_levee_cnt_Doc_Cat_ID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_FC_SEGlevee_center_FC_SEGID
Attribute:
Detailed_Description:
Entity_Type:
Entity_Type_Label: DWRGIS_ADMIN.J_MEDIA_levee_center_Media_ID

Attribute:

Distribution_Information:

Resource_Description:
The data being provided are intended to comply with the California Public Records Act. User shall not license, re-license, sub-license, assign, release, publish, transfer, sell, or otherwise make available any portion of the data to a third party without the prior permission of DWR.
Distribution_Liability:
Users should be aware that he data that are the subject of this Agreement, and that is generally referred to as geographic information system or GIS data, are generalized and not survey grade, and have been developed for use in regional planning projects.
DWR makes no warranties, representations, or guarantees, either expressed or implied, as to the completeness, accuracy, or correctness of the data, nor accepts or assumes any liability arising from or for any incorrect, incomplete, or misleading data provided pursuant to this request.
In no event shall DWR become liable to users of these data, or any other party, for any loss or damages, consequential or otherwise, including but not limited to time, money, or goodwill, arising from the use, operation, or modification of the data. In using these data, users further agree to indemnify, defend, and hold harmless DWR for any and all liability of any nature arising out of or resulting from the lack of accuracy or correctness of the data, or the use of the data.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Transfer_Size: 7.977

Metadata_Reference_Information:

Metadata_Date: 20090407
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization:
CA Data Exchange Center, California Department of Water Resources
Contact_Address:
Address_Type: mailing and physical address
Address: 3310 El Camino Avenue, Suite 200
Address: P.O Box 219000
City: Sacramento
State_or_Province: CA
Postal_Code: 95821-9000
Country: United States
Contact_Voice_Telephone: (916) 574-1777
Contact_Instructions: WebSite: <http://cdec.water.ca.gov>

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

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APPENDIX D

MAP TEMPLATE

Templates

Template Naming Convention

Each template has a name that indicates the general configuration. For example: *A_PORT_BOT* or *B_LAND_SIDE*. The name may be broken down into three sections: 1) paper size, 2) page alignment, and 3) title block location.

PAPER SIZE

A: 8.5” x 11” (Letter)
B: 11” x 17” (Tabloid)
C: 17” x 22”
D: 22” x 34”
E: 34” x 44”

(Custom sizes will have the page dimensions indicated in the name.
Ex: *34x60_LAND_BOT*)

PAGE ALIGNMENT

PORT: Portrait mode, Height is greater than width
LAND: Landscape mode, Width is greater than height.

TITLE BLOCK LOCATION

BOT: Title block, legend, and other marginalia are along the bottom edge
SIDE: Title block, legend, etc. are stacked vertically along the right edge
OTH: Title block, legend, etc. are placed throughout the map document

General Structure Requirements:

Each template is restricted to a minimum of 0.7 inches clear margin space around all borders to ensure proper printing.

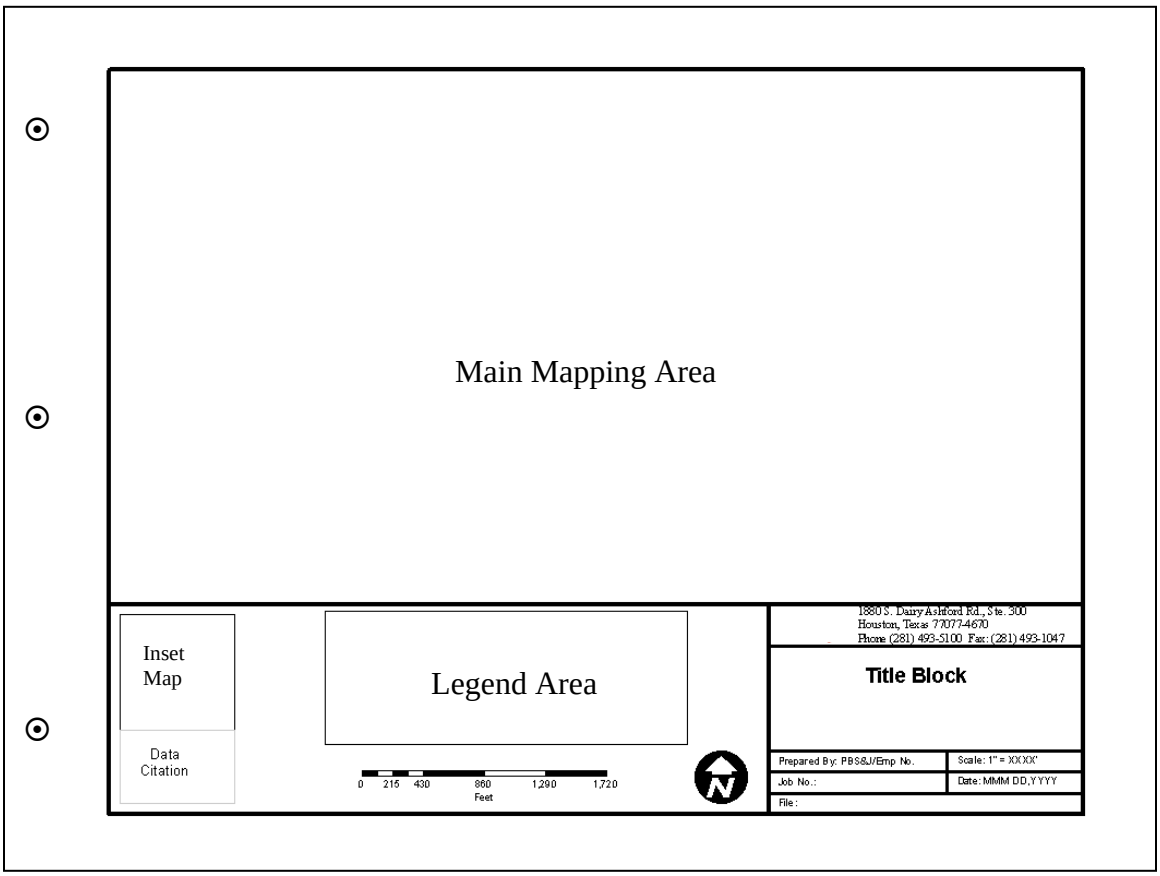
Prints destined to be bound will have a minimum of 1.0 inch clear margin along the bounded edge.

While the placement and format may change with specific projects, each map will contain the following marginalia:

DWR/Program Logs
Project Information
Title Block
Legend
Scale, Scale bar and North Arrow
Date and time generated
Author’s name
Neatline

Generic Map Layout Templates

“A” size (11.0” x 8.5”) Landscape - Generic ArcMap Template



Margins:

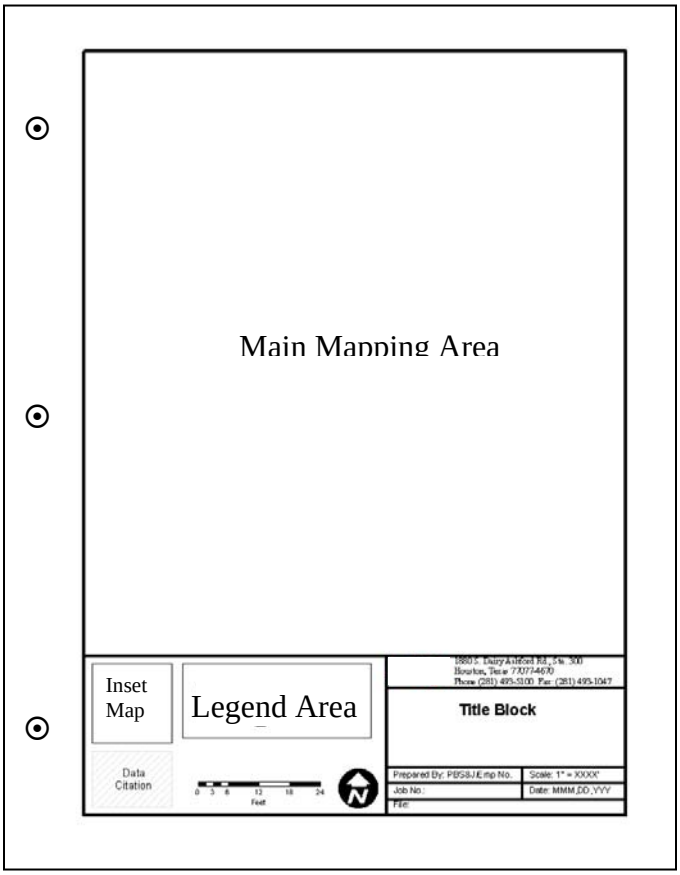
Left edge:	1.0”	(binding edge)
Right edge:	0.7”	
Top edge:	0.7”	
Bottom edge:	0.7”	

Main Mapping dimensions:	9.3 “ x 5.1”	
Inset Mapping dimensions:	1.1” x 1.1”	
Data Citation Area:	1.1” x 0.7”	Font: Arial 6pt
Legend Area:	Variable	
North Arrow:	ESRI North 55 Size: 48	Alternate symbol: ESRI North 3
Scale Bar:	Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide	

Title Block:	3.0” x 2.0”	
Logo Area:	3.0” x 0.4”	PBS&J Logo: PBSJRGB.TIF
Title Area:	3.0” x 1.0”	Main Title font: Arial 14pt Minor: Arial 10pt
Prepared by:	1.7” x 0.2:	Font: Arial 7ptFormat: PBS&J/Emp No (not initials)
Scale	1.3” x 0.2”	Font: Arial 7ptFormat: common scale 1” = xxxx ft
Job No:	1.7” x 0.2”	Font: Arial 7ptFormat: Job# (ex: 461030.00)

Date: 1.3” x 0.2” Font: Arial 7pt Format: Mmm DD, YYYY (ex: Oct 10, 2005)
File: 3.0” x 0.2” Font: Arial 7pt Format: drive\directory\mxd name

“A” size (8.5” x 11.0”) Portrait - Generic ArcMap Template



Margins:

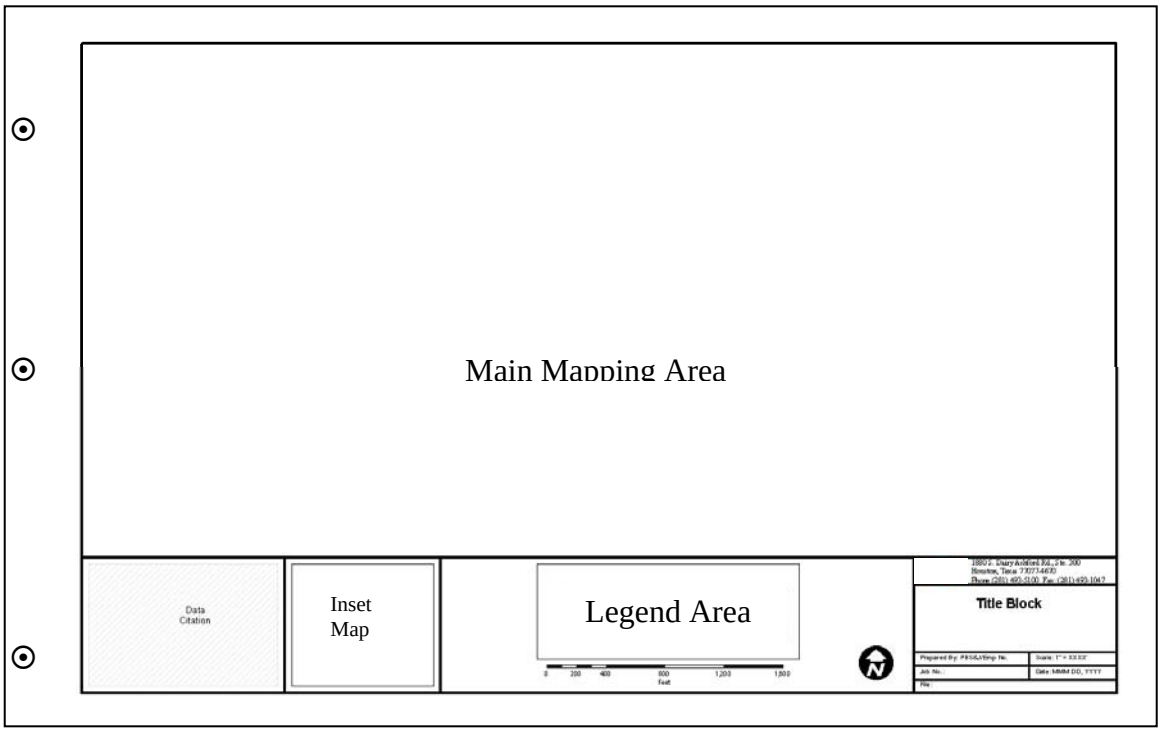
Left edge:	1.0”	(binding edge)
Right edge:	0.7”	
Top edge:	0.7”	
Bottom edge:	0.7”	

Main Mapping dimensions: 6.8” x 7.6”
Inset Mapping dimensions: 1.1” x 1.1”
Data Citation Area: 1.1” x 0.7” Font: Arial 6pt
Legend Area: Variable
North Arrow: ESRI North 55 Size: 48 Alternate symbol: ESRI North 3
Scale Bar: Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide

Title Block: 3.0” x 2.0”
Logo Area: 3.0” x 0.4” PBS&J Logo: PBSJRGB.TIF
Title Area: 3.0” x 1.0” Main Title font: Arial 14pt Minor: Arial 10pt
Prepared by: 1.7” x 0.2: Font: Arial 7pt Format: PBS&J/Emp No (not initials)
Scale 1.3” x 0.2” Font: Arial 7pt Format: common scale 1” = xxxx ft

Job No:	1.7” x 0.2”	Font: Arial 7ptFormat: Job# (ex: 461030.00)
Date:	1.3” x 0.2”	Font: Arial 7ptFormat: Mmm DD, YYYY (ex: Oct 10, 2005)
File:	3.0” x 0.2”	Font: Arial 7pt Format: drive\directory\mxd name

“B” size (17.0” x 11.0”) Landscape Bottom - Generic ArcMap Template



Margins:

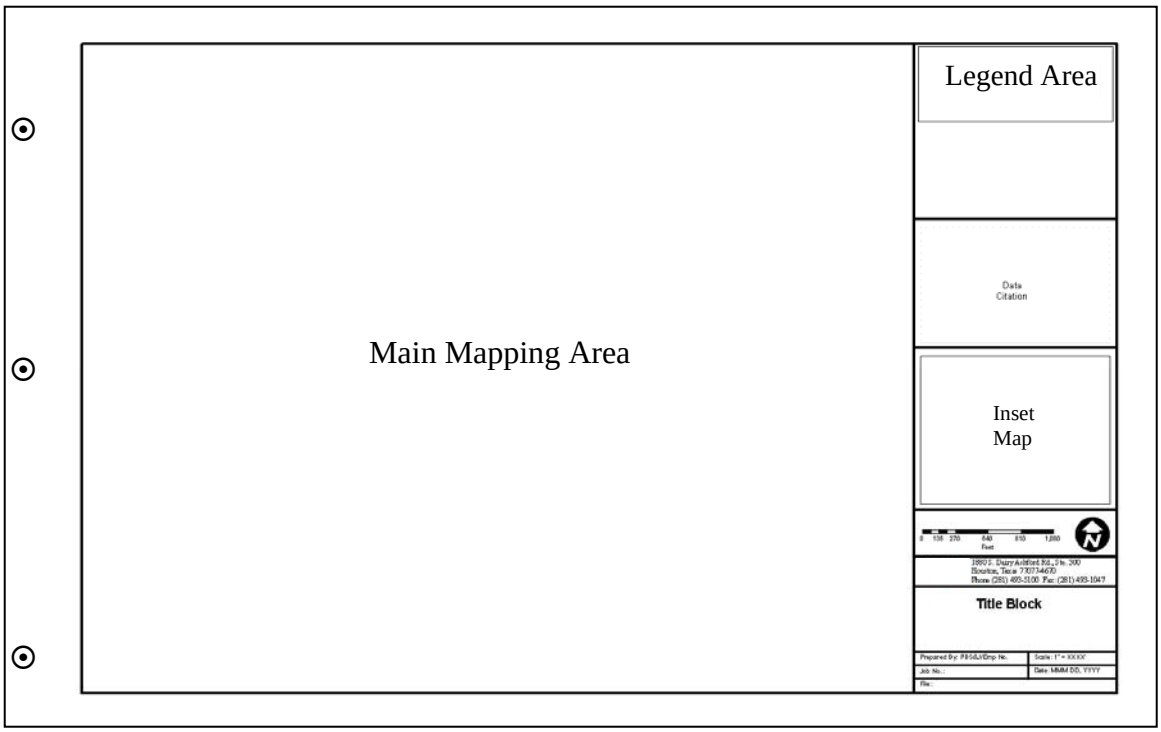
Left edge:	1.0” (binding edge)
Right edge:	0.7”
Top edge:	0.7”
Bottom edge:	0.7”

Main Mapping dimensions:	15.3 “ x 7.6”
Inset Mapping dimensions:	2.2” x 2.0”
Data Citation Area:	3.0” x 2.0” Font: Arial 6pt(Allows for Survey Seal)
Legend Area:	Variable
North Arrow:	ESRI North 55 Size: 48 Alternate symbol: ESRI North 3
Scale Bar:	Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide

Title Block:	3.0” x 2.0”	
Logo Area:	3.0” x 0.4”	PBS&J Logo: PBSJRGB.TIF
Title Area:	3.0” x 1.0”	Main Title font: Arial 14pt Minor: Arial 10pt
Prepared by:	1.7” x 0.2:	Font: Arial 7ptFormat: PBS&J/Emp No (not initials)
Scale	1.3” x 0.2”	Font: Arial 7ptFormat: common scale 1” = xxxx ft
Job No:	1.7” x 0.2”	Font: Arial 7ptFormat: Job# (ex: 461030.00)
Date:	1.3” x 0.2”	Font: Arial 7ptFormat: Mmm DD, YYYY (ex: Oct 10, 2005)

File: 3.0” x 0.2” Font: Arial 7pt Format: drive\directory\mxd name

“B” size (17.0” x 11.0”) Landscape Side - Generic ArcMap Template



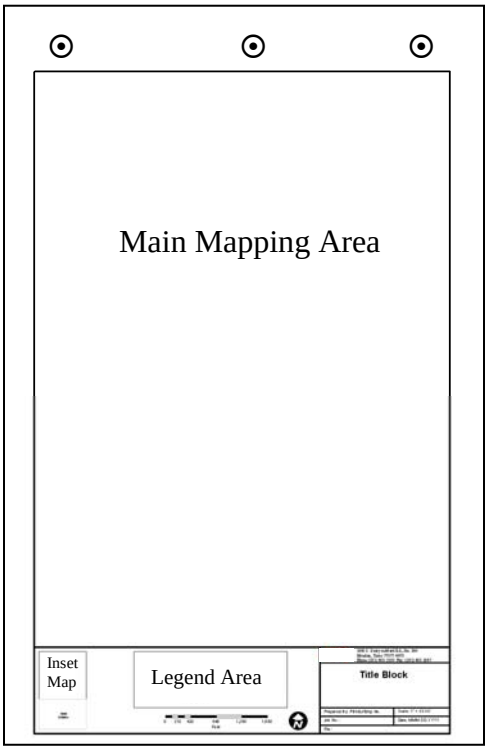
Margins:

Left edge:	1.0”	(binding edge)
Right edge:	0.7”	
Top edge:	0.7”	
Bottom edge:	0.7”	

Main Mapping dimensions: 12.3 “ x 9.6”
Inset Mapping dimensions: 3.0” x 2.4”
Data Citation Area: 3.0” x 2.0” Font: Arial 6pt(Allows for Survey Seal)
Legend Area: Variable
North Arrow: ESRI North 55 Size: 48 Alternate symbol: ESRI North 3
Scale Bar: Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide

Title Block:	3.0” x 2.0”	
Logo Area:	3.0” x 0.4”	PBS&J Logo: PBSJRGB.TIF
Title Area:	3.0” x 1.0”	Main Title font: Arial 14pt Minor: Arial 10pt
Prepared by:	1.7” x 0.2:	Font: Arial 7ptFormat: PBS&J/Emp No (not initials)
Scale	1.3” x 0.2”	Font: Arial 7ptFormat: common scale 1” = xxxx ft
Job No:	1.7” x 0.2”	Font: Arial 7ptFormat: Job# (ex: 461030.00)
Date:	1.3” x 0.2”	Font: Arial 7ptFormat: Mmm DD, YYYY (ex: Oct 10, 2005)
File:	3.0” x 0.2”	Font: Arial 7pt Format: drive\directory\mxd name

“B” size (11.0” x 17.0”) Portrait Bottom - Generic ArcMap Template



Margins:

Left edge:	0.7”
Right edge:	0.7”
Top edge:	1.0” (Binding Edge)
Bottom edge:	0.7”

Main Mapping dimensions:	12.3” x 9.6”	
Inset Mapping dimensions:	1.1” x 1.1”	
Data Citation Area:	1.1” x 0.7”	Font: Arial 6pt
Legend Area:	Variable	
North Arrow:	ESRI North 55 Size: 48	Alternate symbol: ESRI North 3
Scale Bar:	Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide	

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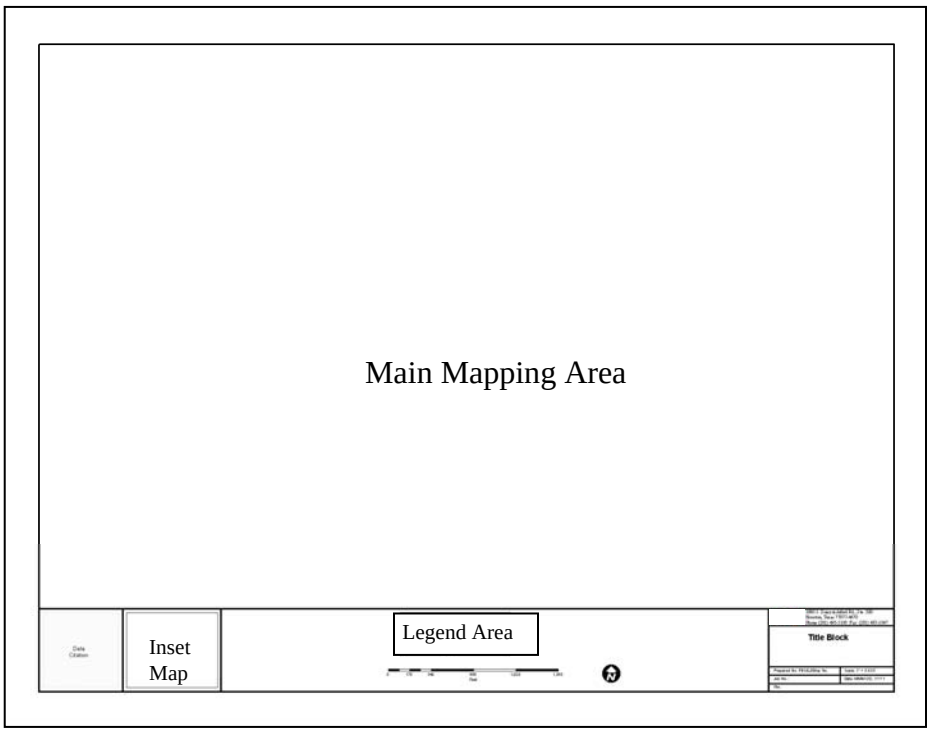
File:	3.0” x 0.2”	Font: Arial 7pt	Format: drive\directory\mxd name

NOTE: Adjust top margin to 0.7” if binding not necessary.

“C” size (22.0” x 17.0”) Landscape Bottom - Generic ArcMap Template



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Scale Bar:	Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide	

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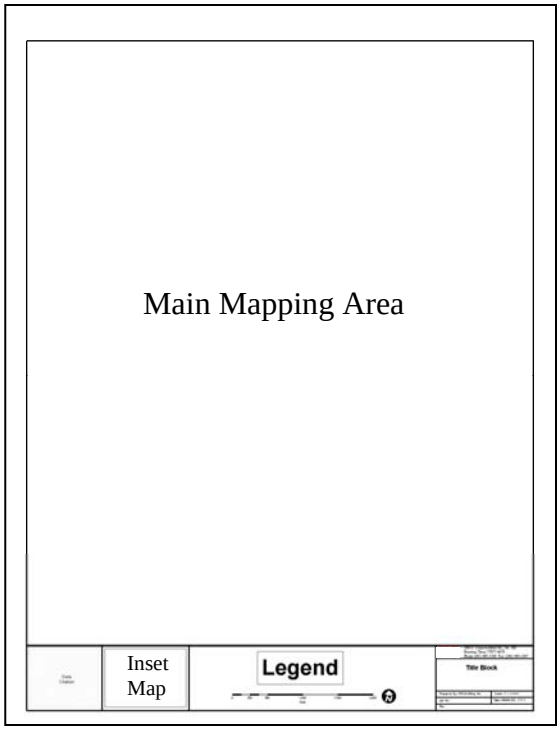
“C” size (17.0” x 22.0”) Portrait Bottom - Generic ArcMap Template



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Bottom edge:	0.7”

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Legend Area:	Variable	
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Scale Bar:	Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide	

Title Block:	3.0” x 2.0”		
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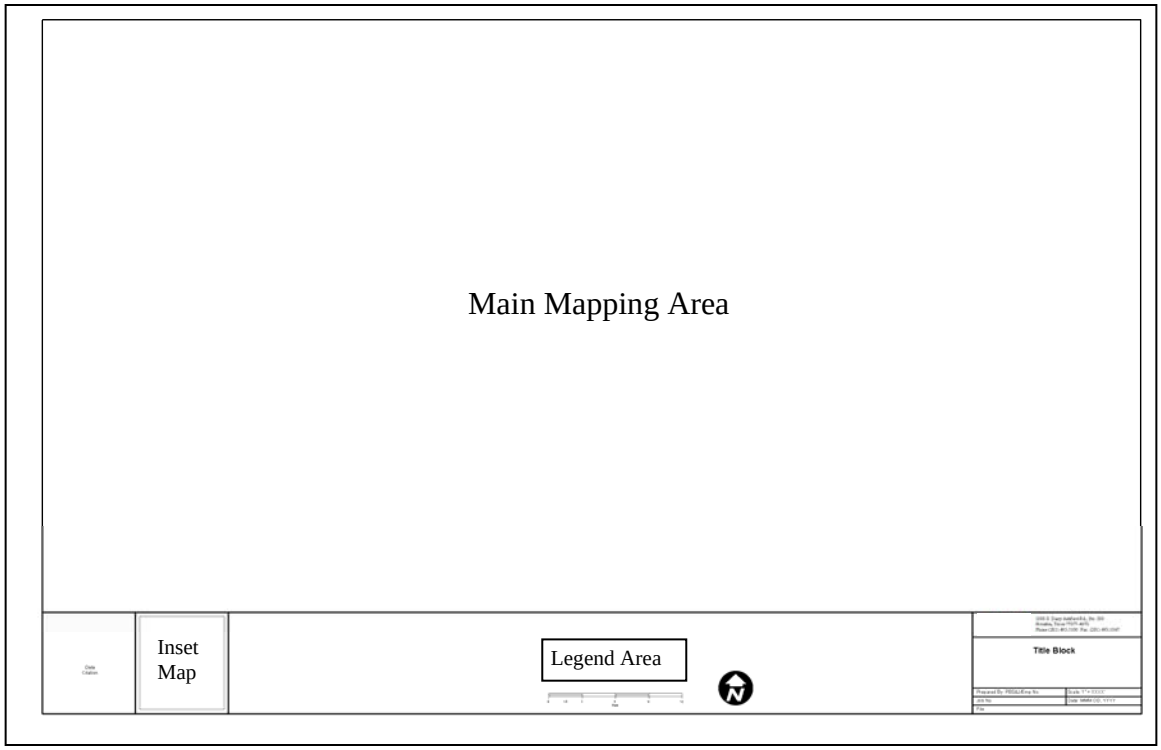
“D” size (34.0” x 22.0”) Landscape Bottom - Generic ArcMap Template



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Scale Bar:	Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide		

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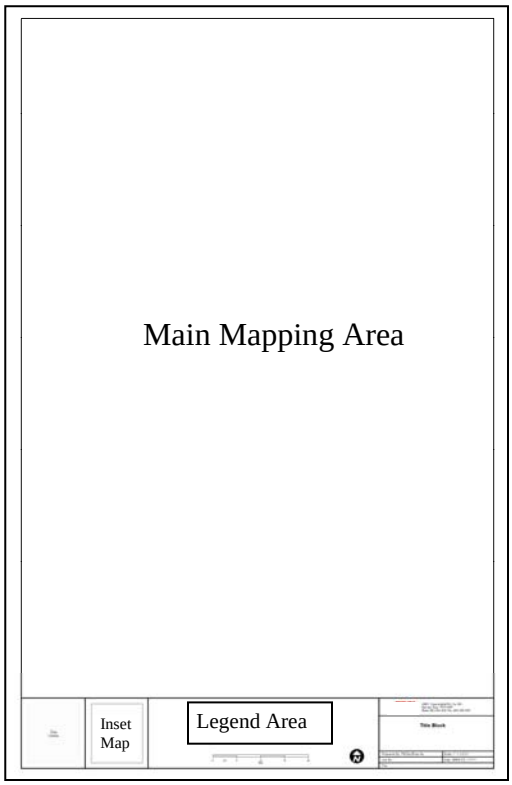

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Scale Bar:	Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide		

Title Block:	5.0” x 3.0”		
Logo Area:	5.0” x 0.5”	PBS&J Logo: PBSJRGB.TIF	
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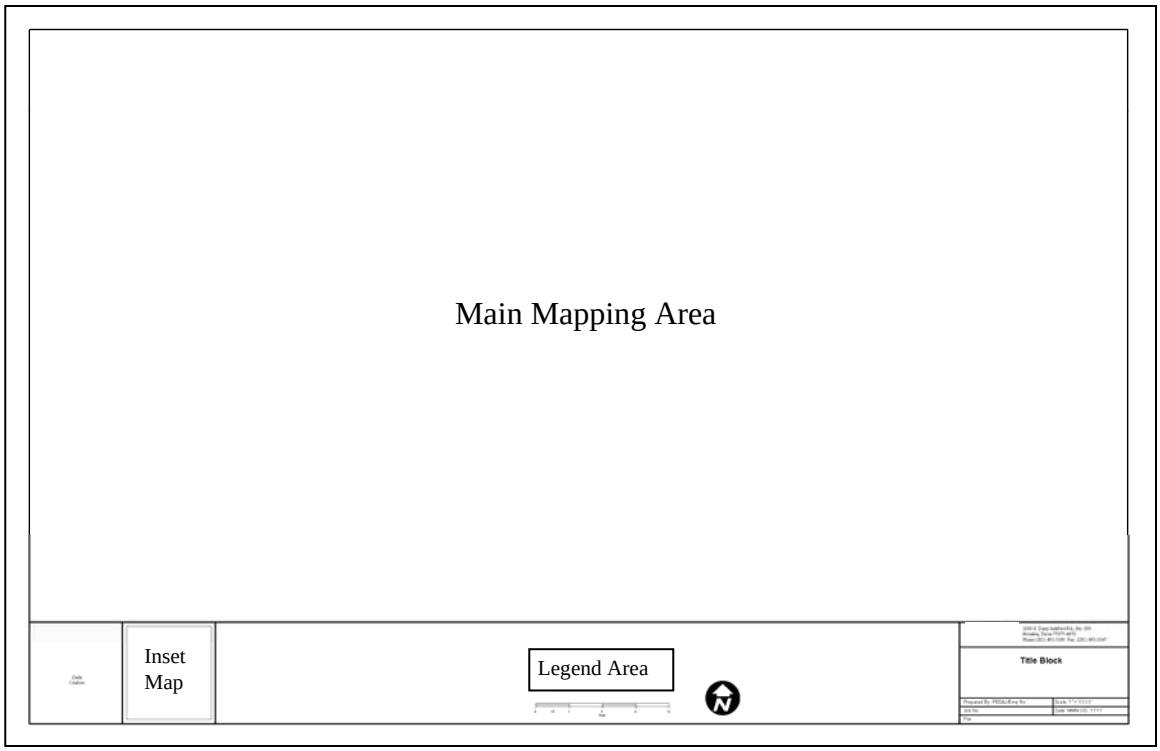

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Scale Bar: Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide

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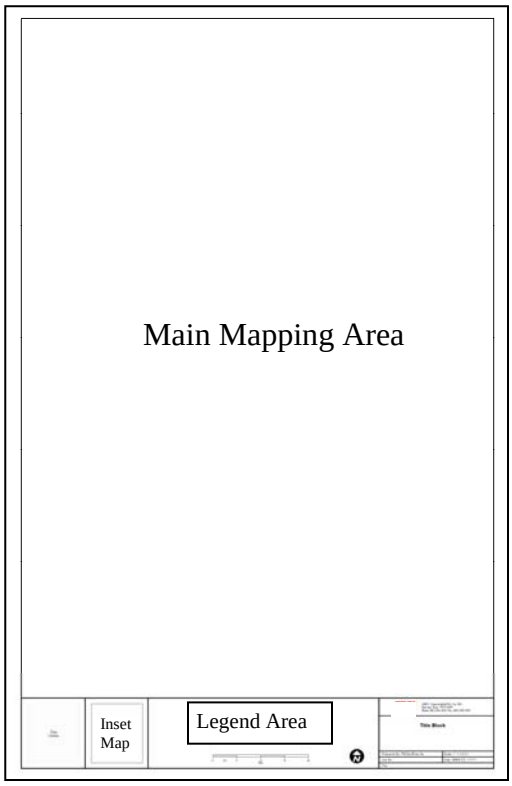
“E” size (34.0” x 44.0”) Portrait Bottom - Generic ArcMap Template



Margins:

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Top edge:	0.7”
Bottom edge:	0.7”

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Legend Area:	Variable		
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Scale Bar:	Alternating Scale Bar 2. Label “Feet” or “Miles” center bottom, 2.0” wide		

Title Block:	5.0” x 3.0”		
Logo Area:	5.0” x 0.5”	PBS&J Logo: PBSJRGB.TIF	
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APPENDIX E

A SET OF STANDARD MAP SYMBOLS

GEI Marker Styles - All Categories

- Arrowhead
- City
- Gages
- Gate
- Hydro Power Station
- Intake
- Landfill
- PumpStation
- Regulating Reservoir
- well
- Well Water Level
- WTP

GEI Line Styles - All Categories

- Boundary, County
- City Boundary 2
- Cross Section
- Fault, Concealed
- fence
- othercanal
- Pipeline
- Proposed Pipeline
- proposed transfer route
- River, Creek, etc.

GEI Fill Styles - All Categories

- Dune Sand
- GWBasins
- upland new
- upland temp

GEI Color Ramp Styles - All Categories

- Suitability

GEI Text Styles - All Categories

- AaBbYyZz City Labels
- AABBYYZZ County Labels CAPS
- AABBYYZZ Line Leader, Bar CAPS
- AaBbYyZz Line Leader, Bar Clc
- AABBYYZZ Line Leader, CAPS
- AaBbYyZz Line Leader, Clc
- AABBYYZZ Line Leader, Simple CAPS
- AaBbYyZz Line Leader, Simple Clc
- AaBbYyZz Stationing
- AaBbYyZz Water Features

URS Marker Styles - All Categories

- Pothole
- Historical Exploration
- Boring
- CPT
- Piezometer
- Proposed Piezometer
- Proposed Boring
- Proposed CPT
- Proposed CPT (Seismic)
- Test Pit
- Proposed Exploration, USACE
- CPT (Seismic)
- River Mile
- Levee Mile
- Monitoring Well
- Irrigation Well, pump, or other structure
- Levee Penetration Outfall
- Relief Well
- River Gage
- Boil
- Levee Distress Point (Meyersohn)
- Sinkhole
- Slide

URS Marker Styles - All Categories

- Cracking
- Seepage
- Erosion
- Burrow

URS Line Styles - All Categories

- Reach
- Urban Project Levee
- Ditch (Concrete-lined)
- Ditch (Unlined)
- Levee Penetration
- Gate
- Non-Urban Project Levee
- HEM
- Ground Resistivity
- Seepage
- Erosion
- Slope Instability
- Area of Concern
- Boils
- Slides
- Sinkholes/Seepage
- Overtopping
- Breach, Levee Failure
- Cracking
- Subsidence
- Water Line
- Levee Crest
- Levee Toe
- Water Line 200 Yr
- Water Line 100 Yr

URS Line Styles - All Categories

- Profile Interpolations
- Grid
- Water Line (1957)
- CPT - green (Fr)
- CPT - red (Qt1)
- Wall
- Grid Border
- Waterside Levee Toe
- Berm
- Berm (Gravel)
- Berm Alteration (Explanation)
- Berm (Raised Grade Area)
- Toe Drain
- Riprap (Full Height)
- Riprap (Partial Height)
- Sheet Pile
- Buried Concrete Wall
- Seepage Analysis Section
- Slurry Cutoff Wall
- Cross Section (Other)
- Cross Section
- Slurry Wall Gap Closure-Complete
- Slurry Wall Gap -Remaining
- Chimney/Blanket Drain
- Seepage Cutoff Trench

URS Fill Styles - All Categories

- Reclamation/Water District Boundary
- Levee District Boundary

URS Fill Styles - All Categories

- Maintenance Area Boundary
- Reclamation District Boundary 4

URS Text Styles - All Categories

- AaBbYyZz Area of Concern
- AaBbYyZz Boil
- AaBbYyZz Boring
- AaBbYyZz CPT
- AaBbYyZz CPT (Seismic)
- AaBbYyZz Creaking/Subsidence
- AaBbYyZz Erosion
- AaBbYyZz Historical Boring
- Interstate
- AaBbYyZz Levee Mile
- AaBbYyZz Levee Station
- AaBbYyZz Piezometer
- AaBbYyZz Proposed Boring
- AaBbYyZz Proposed CPT
- AaBbYyZz Proposed Piezometer
- AaBbYyZz Riprap
- AaBbYyZz River Mile
- AaBbYyZz Seepage
- AaBbYyZz Slides/Seepage
- AaBbYyZz Slope Instability
- State Route
- US Route
- AaBbYyZz Water Features

APPENDIX F

STANDARD ABBREVIATIONS

Standard Abbreviations and Acronyms

(This list will be kept updated – Last Modified Date: 07/30/2009)

Abbreviation	
AB (#)	Assembly Bill (numbered #)
ACWA	Association of California Water Agencies
AEC(s)	Architect/Engineer Contractor(s)
AEP	Annual Exceedance Probability
ANSI/PMI	American National Standards Institute/Project Management Institute
AR	Army Regulation
ASCE	American Society of Civil Engineers
ASFPM	Association of State Floodplain Managers
AWMP	Agricultural Water Management Plan
BCA	Benefit Cost Analysis
BCR	Benefit Cost Ratio
BLM	Bureau of Land Management
BMOs	Basin Management Objectives
BMPs	Best Management Practices
BOs	Biological Opinions
CA	California
Cal Boating	California Department of Boating and Waterways
CalEMA	California Emergency Management Agency
Cal Fire	California Department of Forestry and Fire Protection
CA-OES	California Office of Emergency Services (now named CalEMA)
CCR	California Code of Regulations
CD	Conservation District
CDAA	California Disaster Assistance Act
CDC	California Debris Commission
CDEC	California Data Exchange Center
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CEI	Continuing Eligibility Inspection
CEQA	California Environmental Quality Act
CFP	California Flood Plan
CFR	Code of Federal Regulations
CLD	California Levee Database
CNRFC	California Nevada River Forecast Center (of the NWS)
CO	County, Completely Obstructing (levee encroachments)
COA	Coordinated Operations Agreement
COLA	Center for Ocean-Land-Atmosphere Studies
Corps	United States Army Corps of Engineers
CPC	Climate Prediction Center (of the NWS)
CR	Crown (of a levee)
CREW	Center for Research on Environment and Water
CRS	FEMA's Community Rating System
CSRC	California Spatial Reference Center
CSV	Comma Separated Values
CVFED	Central Valley Floodplain Evaluation and Delineation program
CVFMP	Central Valley Flood Management Planning program

CVFPB	Central Valley Flood Protection Board (formerly Reclamation Board)
CVFPP	Central Valley Flood Protection Plan
CVMP	Central Valley Management Plan for the CVFED Program
CVP	Central Valley Project
CVPFC	Central Valley Plan of Flood Control
CWA	Clean Water Act
CWC	California Water Code
DBW	California Department of Boating and Waterways
DEIR	Draft Environmental Impact Report
DFG	Department of Fish and Game
DFIRM	Digital Flood Insurance Rate Maps
DFM	Division of Flood Management
DHS	California Department of Health Services
DPLA	Division of Planning and Local Assistance
DRMS	Delta Risk Management Strategy
DSOD	Division of Safety of Dams
DWR	California Department of Water Resources
EAD	Expected Annual Damage
EBMUD	East Bay Municipal Utilities District
EIP	Early Implementation Program
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EM	Engineer Manual, Emergency Manager, Emergency Management
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EP	Engineer Pamphlet
EPA	United States Environmental Protection Agency
EPRP	Emergency Preparedness and Response Plan
ER	Emergency Response, Engineer Regulation
ERPP	Ecosystem Restoration Program Plan
ET	Evapotranspiration
ETL	Engineering Technical Letter
EWA	Environmental Water Account
EWMPs	Efficient Water Management Practices
EWP	Emergency Watershed Protection program
EWRI	Environmental Water Resources Insitute
FC	Flood Control
FCCE	Flood Control and Coastal Emergencies
FCD	Flood Control District
FC-O	Forecast-Coordinated Operations
FCSA	Feasibility Cost Sharing Agreement
FCSSA	Flood Control System Status Report
FCW	Flood Control Work
FEAT	Flood Emergency Action Team
FEIR	Final Environmental Impact Report
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FGDC	Federal Geographic Data Committee
FHWA	Federal Highway Administration
FIA	Federal Insurance Administration

FIRM	Flood Insurance Rate Maps
FloodER	Flood Emergency Response Program
FMA	Floodplain Management Association
FOC	Flood Operations Center
FOCIS	Flood Operations Center Information System
FPCP	Flood Protection Corridor Program
FPIIB	Flood Project Integrity and Inspection Branch (a branch of DWR)
FPM	Floodplain Management
FWS	United States Fish and Wildlife Services
FY	Fiscal Year
GAMA	Groundwater Ambient Monitoring Assessment
GIS	Geographical Information System
GMP	Groundwater Management Plan
GRR	General Reevaluation Report
HAFOO	DWR Hydrology And Flood Operations Office
HAS	Hydrometeorological Analysis and Support
H&H	Hydrologic and Hydraulic
H_H	Hydrologic and Hydraulic
HEC	Hydrologic Engineering Center (of USACE)
HM	Hazard Mitigation
HMP	Hazard Mitigation Proposal
ICM(s)	Intermediate Coordination Meeting
ICS	Incident Control System
ID	Irrigation District
ICW	Inspection of Completed Works
IEI	Initial Eligibility Inspection
IFM	Integrated Flood Management
IGES	Institute of Global Environment and Society
IR	Inundation Reduction
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
ISO	International Standards Organization, California Independent System Operator
IWR	USACE Institute for Water Resources
JOC	Joint Operations Center
LAMP	Land Acquisition and Management Plan
LB	Left Bank (of a river, facing downstream)
LERRDs	Lands, Easements, Rights-of-way, Relocations, and borrow and Dredged or excavated materials disposal area.
LFPZ	Levee Flood Protection Zone
LIDAR	Light Detection and Ranging
LLR	Limited Reevaluation Report
LLUR	Local Levee Urgent Repair grant program
LMA	Levee Maintenance Area
LOA	Letter of Agreement
LOLE	Local Levee Evaluation Program grant program
LOMA	FEMA Letter of Map Amendment
LOMR	FEMA Letter of Map Revision
LS	Land Side (of a levee)
MMMS	Map Modernization Management Support program
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding

MSC	Management Support Contractor
N/A	Not Available, Not Applicable
NAFSMA	National Association of Flood and Stormwater Management Agencies
NASA	National Aeronautics and Space Administration
NCDC	National Climatic Data Center
NEPA	National Environmental Policy Act
NESDIS	National Environmental Satellite, Data and Information Service
NFIP	National Flood Insurance Program
NGS	National Geodetic Survey
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
NRCS	National Resources Conservation Services
NSAP	Nonstructural Alternative Project
NSRS	National Spatial Reference System
NWS	National Weather Service
OASIS	Operational Area Satellite Information System, Open Access Same-time Information System
O&M	Operation and Maintenance
O_M	Operation and Maintenance
OES	Office of Emergency Services (now named CalEMA)
OMB	Office of management and Budget
OMRR&R	Operations, Maintenance, Repair, Replacement, and Rehabilitation
Ops	Operations
PCA	Project Cooperation Agreement
PG&E	Pacific Gas and Electric Company
PIR	Project Information Report, Problem Identification Report
PL	Public Law
PMF	Probably Maximum Flood
PMP	Project Management Plan
PO	Partly Obstructing (levee encroachments)
PSP	Proposal Solicitation Package
PW	Project Worksheet
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan (USACE term)
QM	Quality Management
QPF	Quantitative Precipitation Forecast
QR	Quality Review (FEMA term)
RAM	Responsibility Assignment Matrix
RB	Right Bank (of a river, facing downstream)
RCC	Roller Compacted Concrete
RCD	Resource Conservation District
RCP	Reinforced Concrete Pipe
RD	Reclamation District
RFMP	Regional Flood Management/Mitigation Program/ Plan
RIMS	Response Information Management System
RIP	Rehabilitation and Inspection Program
RM	River Mile
ROD	Record of Decision

RWMS	Regional Watershed Management System
RWQCB	Regional Water Quality Control Board
SAC	Sacramento, Sacramento River
SAFCA	Sacramento Area Flood Control Agency
SB (#)	California Senate Bill (numbered #)
SEMS	Standard Emergency Management System
SHEF	Standard Hydrologic Exchange Format
SHMP	State of California Multi-Hazard Mitigation Plan
SJ	San Joaquin, San Joaquin River
SJAFCA	San Joaquin Area Flood Control Agency
SJR	San Joaquin, San Joaquin River
SMARA	Surface Mining and Reclamation Act (of 1975, revised 2007)
SMUD	Sacramento Municipal Utility District
SPFC	State Plan for Flood Control
SPFCCV	State Plan of Flood Control for the Central Valley
SRA	State Recreation Area, Shaded Riverine Aquatic habitat
SRFCP	Sacramento River Flood Control Project
SWAMP	Surface Water Ambient Monitoring Program
SWP	State Water Project
SWRCB	State Water Resources Control Board
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WBS	Work Breakdown Structure
WRDA	Water Resources Development Act
WS	Water Side (of a levee)

GIS Abbreviations and Acronyms

ArcIMS	Arc Internet Map Server
CLD	California Levee Database
Co	County
Crk	Creek
Fld	Field
GDB	Geodatabase
GIS	Geographic Information Systems
Num	Number
SHP	Shapefile

See Also: http://www.cio.ca.gov/wiki/terms.ashx?Code=1
See Also: http://www.lib.berkeley.edu/EART/abbrev.html

Units of Measurement

acre-ft	acre-feet
af	acre-feet
cfs	cubic feet per second
ft	feet
gpm	gallons per minute
in	inches
kaf	thousand acre-feet
kWh	kilowatt-hour
mi	mile
MWh	megawatt-hours
mgd	million gallons per day
psi	pounds per square inch
PST	Pacific Standard Time
sq mi	square miles
taf	thousand acre feet

See Also: http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-2216/BAE-1501web.pdf

APPENDIX G

QA/QC – MAPPING AND METADATA

Quality Assurance and Quality Control Process

Conscientious adherence to the standards created in this document will ensure quality work products. Quality management practices in the following practice areas will assist in the achievement of this goal:

- Metadata Standards
- Cartographic Standards

It is important to understand the difference between Quality Control (QC) and Quality Assurance (QA). QC is a review of work to ensure the products meet professional standards as well as the project and client standards. A QC review should be performed at the end of each task. QA is a monitoring and evaluation procedure to determine that quality control is being or has been performed effectively and appropriately.

All individuals working on a project are responsible for quality control of that project.

The following roles are defined in the QA/QC process:

- *Lead Technical Professional (LTP)* – a GIS Analyst, Information Solutions Developer, Technical Coordinator, Program Assistant, or other qualified professional with primary technical responsibility for the production of a task or work element on a project.

- *QC Reviewer (QCR)* – a designated project team member responsible for performing quality control review associated with a task in accordance with the QC checklist for the project; the QC reviewer has the technical knowledge and qualifications necessary to serve as the LTP for the work products being reviewed.

- *GIS Project Manager (GPM)* is responsible for quality assurance on his or her project.

- *GIS Program Managers* are responsible for the application of the quality assurance and control process within the program.

QC Review Process

While each milestone of the project is being completed the lead technical professional is required to perform a series of QC checks to ensure the completeness, consistency, and accuracy of all products (hard copy and digital). To ensure these checks are complete a checklist for each milestone should be completed. The hardcopies of the completed checklists should be included in the documentation given to the QA Reviewer. The following are QC checklists:

- Cartographic QA/QC Checklist
- Metadata and Digital Data QA/QC Checklist

QA Review Process

Each project should have a QA review process defined before the GIS work starts. Project Managers define QA/QC requirements for the project that fit the specific project and client needs.

QA and QC Minimum Procedures

All QA/QC requirements shall have the following minimum procedures completed after each milestone:

1. Lead Technical Professional (LTP) prepares necessary documentation for review and makes data available to QC Reviewer (QCR).
2. LTP should start to fill in the Quality Control Tracking Stamp. LTP should complete the following items:
   - Project Name
   - Milestone
   - Project Location
   - Initial and date the "Ready for QC"
3. QCR conducts QC review using documentation provided by LTP. Data verified as correct is marked in yellow. Data found to be in possible error is marked in red. The QCR initials and dates the "QC Review" task block, circles Y or N to indicate if comments are included, and writes any comments to the LTP.*
4. QCR provides necessary review documentation back to LTP for concurrence review. LTP places a red check next to data if there is concurrence of data being in error. The LTP initials and dates the "Concurrence" task block.
5. LTP changes or conducts the change of data in error and marks corrected data in error in yellow over the red marks using the documentation for review. The LTP initials and dates the "Changes Made" task block.
6. LTP provides documentation for review to QCR so that changes can be verified. QCR will mark changes that have been made correctly in green and will circle in green any data that remain in error; additional comments should be included. Any data found to remain in error will be reported to the project manager. The QCR initials and dates the "Changes Verified" task block.

The Quality Control Tracking Stamp is required to be completed with each QA review. If a paper product will not be the final product of the project, a digital copy of the stamp should be used. The digital copy of the stamp should be stored in the project folder. All stamps that are completed digitally should also be printed so that a hard copy can be stored the project file.

After the completion of each milestone the QA Reviewer should complete the appropriate portion of the QA Review Log.

* The QA Reviewer may use shorthand when checking each milestone Cartographic QC Assurance Plan Short Hand calls will allow the QA Reviewer to concentrate on their QA review, not writing long comments.

Cartographic QA/QC Checklist

Upon completing a map, check each of the following before providing the map to the QA/QC Reviewer. Please see the symbology standards contained in the Cartographic Standards section of the FloodER GIS Standards.

Project Number _____

Figures Reviewed _____

_____

Date _____

Description	Checked by Map Analyst	Confirmed by QA/QC Analyst
Date		
Template/Title Block		
Standard GEI or project-specific template has been applied		
North arrow present for each data frame		
Scale bar at an even interval (round numbers) and fixed logical scale		
Text Orientated correctly		
Date current in title block		
Data centered on mask (all four edges visible)		
Arrow leaders pointing, direction and origin consistently and at $0^o/90^o$		
Tagline updated with current date, file location, and Analyst's initials		
Legend is present (or ALL features are labeled, rendering a legend unnecessary)		
Title is included, spelled correctly and meaningful		
Basedata		
Hillshade/Aerial/USGS Quad at appropriate saturation/transparency		
Highway/Road lines at appropriate thickness and color		
Highway shields/Road labels at appropriate size		
County boundaries using standard symbology		
County labels: Either two line text at centroid or single line text on either side of boundary "County" is present, and font is standard symbology		
City points labeled in standard symbology at appropriate size		
Rivers/streams/etc. labeled in standard symbology at appropriate size, parallel to features (not splined)		
Lakes/Reservoirs labeled in standard symbology at appropriate size		
Additional base data, as appropriate, using standard symbology		
Project Features		
Layers order corrected and symbolized correctly		
Main focus of the map is most prominent feature		
Project-specific data are clear and more prominent than base data		
Labels correct size/font, not overlap Project Features or other labels unintentionally		
Map Series/Map Book (are the following features consistent between maps in the same series or book)		
Scale		
Symbology (base and project data)		
Legend (location and items)		
Inset map (location and symbology)		
North arrow (location and symbology)		
Metadata (metadata checklist has been completed)		
Data (digital data review checklist has been completed, where appropriate)		

Metadata and Digital Data QA/QC Checklist

Upon completing a dataset, check each of the following before requesting another person look at it for QA/QC. Please see separate documentation on standard file structure, topology, data normalization, and acceptable variations thereof.

Project Number _____

Files Reviewed _____

_____

Date _____

Description	Checked by Map Analyst	Confirmed by QA/QC Analyst
Date		
Metadata		
Metadata template has been applied		
Abstract has been added		
Purpose been added		
Keywords have been added		
Currentness Reference and Calendar Date have been added (Time Period tab)		
Other relevant (project or file specific) fields have been updated		
Digital Data		
Spatial Reference is defined and appropriate for project (shapefiles/geodatabases/images)		
Topology has been validated (where applicable)		
Data has been normalized		
• All necessary attributes have been included		
• Attributes spelled correctly		
• Fields named reasonably, with alias where applicable		
• Attributes/attribute formats are consistent within a field		
• Fields contain appropriate attributes (not combinations of 2 or 3 attributes)		
File names are reasonable and descriptive of features		
Files are properly organized (in the correct directory/geodatabase structure)		
Duplicates/working copies have been removed (shapefiles, geodatabases, and exports)		

QA Review Log

Milestone	Milestone Completion Date	LTP	QA Reviewer	Project Manager (Optional)	Program Manager (Optional)	Date QA Completed

QC Tracking Stamp

PROJECT NAME:_____

MILESTONE: _____

PROJECT LOCATION:_____

QUALITY CONTROL TRACKING STAMP				
ACTIVITY		TASK OR DISCIPLINE		
			Comments (Circle Y or N)	
READY FOR QC	LTP:			
	DATE:			
QC REVIEW (YELLOW = OK) (RED = CORRECTION)	QCR:		Y	N
	DATE:			
CONCURRENCE	LTP:			
	DATE:			
CHANGES MADE (YELLOW OVER RED)	LTP:			
	DATE:			
CHANGES VERIFIED (GREEN CHECK = OK) (GREEN CIRCLE = FIX)	QCR:		Y	N
	DATE:			
POST, BUCKLEY, SCHUH & JERNIGAN			**JAN 2006**	

Comments(QC Riewer):

_____
_____
_____
_____
_____
_____
_____

Comment(QC Reviewer):

_____
_____
_____
_____
_____
_____

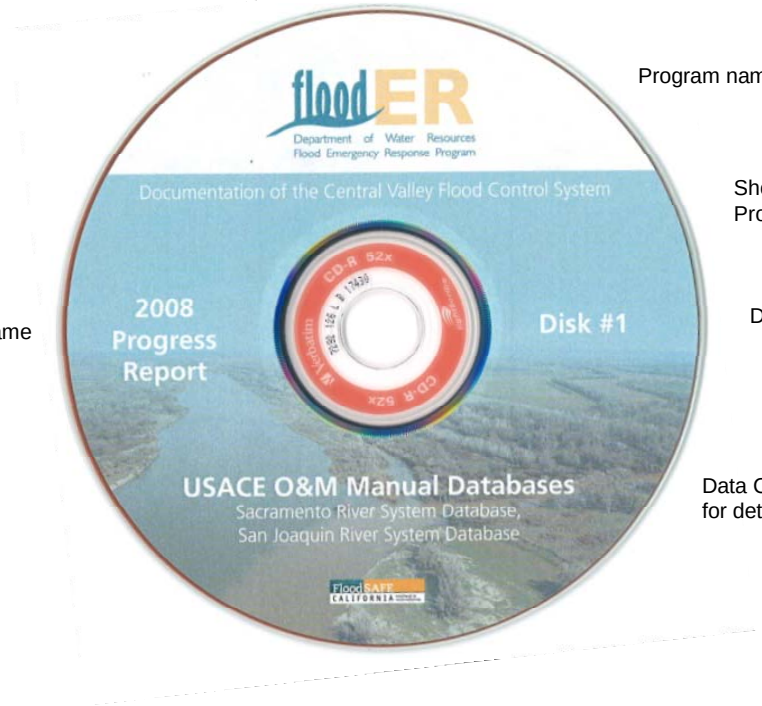
Cartographic QC Assurance Plan Short Hand

D	**DELETE**	AD	**ADJUST**
A	**ADD**	M	**MOVE**
L	**LABEL**	C	**CONNECT**
OP	**AVOID OVERPRINT**	P	**COPY & PASTE**
AT	**ATTRIBUTE**	SP	**SPELLING**
EX	**EXTEND**		

STET	**IGNORE CALL**
s/b	**SHOULD BE**

APPENDIX H

CD-ROM/DVD Cover



Program name

Short Name of Project/Task

Document Name

Disk Serial Number

Data Content (More lines for detail Information)

Summary on Comments of FloodSAFE GIS Standards

There are over 100 comments/suggestions from twelve reviewers from DWR and Contractors. The summary of comments and their responses are listed in the following table.

Most of the comments were incorporated into the new version of standards. Some comments and suggestions regarding projection standards, cartographic standards, file structure, and QA/QC standards require further discussion. As such, detailed comments on template and file structures have not been addressed yet. Comments on implementation of the standards for CVFED programs such as CVFED geodatabase schema, file structures, and symbology should be addressed by the CVFED GIS team.

We suggest developing a standards utility tool for ease of implementation of the standards. The utility tool will facilitate distribution of the standards and the attached files of map document templates, metadata style sheet file, symbology, abbreviation list, projection, and QA/QC sheet. The utility will always keep these attached files up to date and users can download these files through the utility. It will also help data developers to easily apply the standards. The utility tool will include a metadata editor developed specially for the metadata standards, a metadata QC tool to check that Minimum Accepted Metadata is included, as well as a cartographic standards tool to ensure no elements are missing in the map document. The utility tool will also check that the projection and coordinate systems follow the projection standards.

Summary of Comments on GIS Standards		
Comments	**Commented by**	**GEI Response**
General (Introduction and Objective)		
Scope of this document, Flood ER or FloodSAFE; Logo should represent scope of document	Yiguo Liang, DWR	Incorporated
Are these standards compatible with FEMA?	Jim R Ham, DWR ND	Yes
Who is on the Flood System Data/GIS Technical Team?	Jim R Ham, DWR ND	Will provide
Has anyone consulted with the other members (agencies) of the Emergency Response Program on these standards?	Jim R Ham, DWR ND	Not yet.
Will this document address the concept of using non-DWR or non-contractor generated data sets? e.g., hydro data from the ESRI StreetMaps or the National Hydrography data sets.	Jim R Ham, DWR ND	Yes. Data from other sources sould follow the standards
Standards should be set to the degree that there is room for varying situations. Stricter on metadata, QA/QC, and Topology. Flexibility to cartography	Julia Delphia, DWR ND	Incorporated
Text change	Melody Baldwin, DWR	Incorporated
How to merge FOC GIS Standards and make it one standard	Melody Baldwin, DWR	Further discussion is needed
Consider a standard Geodatabase structure for GIS files that can be used by all AECs and then combined into a single one as a deliverable to the client.	Pratibha Basrao, HDR	Related to implementation of the standards
Are there any Raster/Ortho imagery standards	Pratibha Basrao, HDR	Include deliverable requirement
Perhaps note that all deliverables are ESRI GIS vector data formats? (not MapInfo, irdrisi, GRASS, CAD, microstation, smallworld, intergraph,…	SROUTH, RBF	Addressed
Does the standards include final deliverable formats and media?	SROUTH, RBF	Addressed
No discussion of raster data or LiDAR or imagery. Focused on only vector GIS data.	SROUTH, RBF	Addressed
Does not discuss draft versus final submittals and distinguishing them (or if they are allowed) and how should be differentiated.	SROUTH, RBF	Both for final/draft deliverable
Some items in appendix differ from items in document.	SROUTH, RBF	Resolved
ESRI product focused, but not clearly called out that ESRI format is expected. MapInfo is a valid GIS format, but is not listed, so standards really should state ESRI bias clearly.	SROUTH, RBF	Addressed
Are there any national data models that can be incorporated for any of the layers? Stream network for example?	SROUTH, RBF	Not incorporated
Was there a report prepared for Phase I? Can the AEC's be provided with the Phase I report and/or technical memorandum?	Baker, CH2M	Will provide

Is DWR GIS Standard different from FloodSAFE GIS Standard?	Shahid Anwar, DWR	Yes. This document primarily focus on FloodSAFE GIS data
Is there any central storage (server) to store final products so that other groups have the access?	Shahid Anwar, DWR	Yes. It will be stored in CDEC
Are the consultants working on FloodSAFE program able to use the FloodSAFE GIS Standard?	Shahid Anwar, DWR	Yes. They are going to follow the standards
Add a table of contents section	Bill Fox, CH2M	Incorporated
DWR should consider establishing a clearing house for the example files and templates	Bill Fox, CH2M	Yes. Will be set up in CDEC.
Creating a project Geodatabase for CVFED	Wood Rodgers sent through Dan Henderson	Incorporated
Projection and Coordinate System Standards		
Justify use of the selected projection. What's the advantage of the selected projection	Michael Koller, DWR	Addressed
Is it OK to have other projection to save conversion run time for raster data?	Michael Koller, DWR	Addressed
There are many different projections in different agencies. Should we limit to one projection?	Melody Baldwin, DWR	Addressed
Why is the suggested projection Albers and not UTM?	Jim R Ham, DWR ND	Resolved. Projection system issue
The standard projection of Albers Meters is different from the CVFED standard projection of UTM Zone 10 US Feet	Sheng Tan, WoodRodgers	Resolved. Projection system issue
GIS Standards document calls out the Teale Albers projection which isn't the CVFED coordinate system being used	Bill Fox, CH2M	Resolved. Projection system issue
The coordinate system defined is GCS_Noth_American_1983. But can the Coordinate system on the Maps be UTM?	Pratibha Basrao, HDR	Resolved. Projection system issue
a memo stating that the projection is to be UTM Zone 10 Survey Feet	Reviewer1, RBF	Resolved. Projection system issue
No vertical datum is specified.	SROUTH, RBF	Incorporated
The data doesn't contain the vertical datum requirement.	Baker, CH2M	Incorporated
The proposed projection is not the coordinate system required, and in use, for the CVFED Project.	Baker, CH2M	Resolved. Projection system issue
Is projection file mandatory for any project or shape file or dbf file?	Shahid Anwar, DWR	Yes
Why two units? Meter in NAD 1983 California Teale Albers and foot in NAD 1983 UTM?	Shahid Anwar, DWR	May change to one unit.
A typo mistake in Page 4	Shahid Anwar, DWR	Addressed
Should have multiple systems in stead of limiting to have only three systems	Greg Smith, DWR	Projection system issue
Recommend two seperated standards for vector and imagery data	Greg Smith, DWR	Projection system issue
Metadata Standards		
Make sure data source, development process, and contact information are included as they are most important information	Michael Koller, DWR	Incorporated

DWR GIS Planning Committee is developing a standard. How to coordinate?	Melody Baldwin, DWR	Further discussion
DWR GIS Planning Committee is developing a metadata tool. How to coordinate?	Melody Baldwin, DWR	Further discussion
Contact Section has been left off from the Metadata Recommendations	Jim R Ham, DWR ND	It is Point of Contact under identification information. Need to data developer info.
Liked the idea of the two tier approach	Jim R Ham, DWR ND	Remove two tiers. Replace with minimum requirement
How do we determine what data should use Tier two? Or in reality should all metadata be Tier one?	Reviewer1, RBF	Resolved. Remove two tiers. Replace with minimum requirement
Is there a metadata tool for metadata	Reviewer1, RBF	Suggest to develop a utility tool to implement this standards
If there is no metadata tool, is there any template file	Reviewer1, RBF	Suggest to develop a utility tool to implement this standards
What validation (QAQC) procedures / tools are to be developed to check that the metadata is compliant?	Reviewer1, RBF	Suggest to develop a utility tool to implement this standards
Recommend that all FGDC metadata pass USGS's independent metadata validation services: http://geo-nsdi.er.usgs.gov/validation/	SROUTH, RBF	Will incorporate in the utility tool
Will you be supplying a configuration file? FGDC compliant items listed is not the default.	SROUTH, RBF	Yes. Will be avialble in CDEC website or with the tool
Use of ArcCatalog: sometimes it is much faster to type by hand in a template with XML editor or use another program.	SROUTH, RBF	Addressed
What sort of data is envisioned for the Tier Two metadata	Baker, CH2M	Resolved. Remove two tiers. Replace with minimum requirement
How will the providers ability be judged and what will the trigger be to require Tier 1 versus Tier 2?	Baker, CH2M	Resolved. Remove two tiers. Replace with minimum requirement
What determines when the data is required to comply with federal metadata standards?	Baker, CH2M	Resolved. Remove two tiers. Replace with minimum requirement
Geodatabase can handle various databases such as MS Access, Oracle etc. Is there any specific Database used for FloodSAFE program?	Shahid Anwar, DWR	The database in CDEC is Oracle. But users can use personal geodatabase (MS Access) or file geodatabase
It would be great to get a template ESRI geodatabase that included the the contents of Appendix C.	Bill Fox, CH2M	Yes. Will be avialble in CDEC website or with a tool
Required and optional metadata fields identified by DWR GIS Data Subcommittee and color coded	Greg Smith, DWR	Will consider during the implementation of the standards
Cartographic Standards		
Add Data sources and Plot Stamp to map	Michael Koller, DWR	Will add in the future template
Make the map layout more readable. Use 8.5X11 as example	Michael Koller, DWR	Will add in the future template

Should FloodSAFE logo apply on FOC GIS non-FloodSAFE Map?	Melody Baldwin, DWR	will have DWR logo only
On map, include other agency's logo?	Melody Baldwin, DWR	Add it as reference
Red color only used for event area. But red is usually used for highway.	Melody Baldwin, DWR	Used FEMA/FGDC standards
Using map document annotation, why not geodatabase annotation?	Jim R Ham, DWR ND	Will incorporate in the future template
The Cartographic Standards might be a little too restrictive. Particularly the layout templates. Make sure they are presented as guidelines	Jim R Ham, DWR ND	Incorporated. Will modify in the template
In some cases, no room for tile and legend in A size and looks different in B size for these two.	Julia Delphia, DWR ND	Incorporated
FloodSAFE Program Logo (or other appropriate logo) if not FloodSAFE program	Julia Delphia, DWR ND	Incorporated
symbology that works for large scale maps doesn't necessarily work for small scale maps	Julia Delphia, DWR ND	Incorporated
Will the style sheets and logos made available to the AECs to help comply with the standard?	Sheng Tan, WoodRodgers	Related to implementation of the standards
Predetermined background layers (page 3) determined yet? Picked one of 4 AEC's or develop one so the others can use that as a sample	Pratibha Basrao, HDR	Not yet. Related to implementation of the standards
For easy selection and standardization, will a standard Flood ER Styles (style-sheet) be created for lines, points and polygon symbology?	Reviewer1, RBF	Noted in the suggestion
What information is required on the Day/Plot stamp?	Reviewer1, RBF	Incorporated
Will MXT of the layouts be provided to each vendor or will each vendor need to create it from the specs?	Reviewer1, RBF	Yes
Is there a standard disclaimer that needs to be added to all products regarding content or distribution?	SROUTH, RBF	Will develop
The standards more focus on Levee/Inspection not include/consider wider flood program. Some symbology not consistent with FEMA	Baker, CH2M	Will resolve
assume the Data Citation area on the map template can be used for an engineer's stamp	Baker, CH2M	Yes
The 'D' size template at the end of the templates section seems like an error.	Baker, CH2M	Resolved
These standards in page 4 are for raster/imagery data. Is the user to correlate these to vector data?	Baker, CH2M	Yes
These logos specified in page 4 need to be provided as part of the GIS digital templates.	Baker, CH2M	Related to implementation of the standards
Recommend that the digital GIS format FloodSAFE templates with the predetermined background layers be provided with these GIS Standards (.mxt .style) files should be provided	Baker, CH2M	Related to implementation of the standards
This is FloodSAFE GIS Standard. Why do we need to insert FloodSAFE program logo? It will take more space.	Shahid Anwar, DWR	For sharing map/data with other non-FloodSAFE users
Include Data citation or Data Source should be optional	Shahid Anwar, DWR	Not adopted
It would be good to provide sample map templates (mxt files) that have the required elements.	Bill Fox, CH2M	Will be available in CDEC website or with the tool
Abbreviation and Naming Conventions Standards		

Set map file name the same as map title, use additional text in the file name if needed	Michael Koller, DWR	Incorporated
CalEMA(OES) is applied in FOC GIS. Incorporate it?	Melody Baldwin, DWR	Will be Incorporated if consistent with FEMA/FGDC
The doc gave FLD, FC and NUM as examples of abbreviations but they are not listed in Appendix E	Jim R Ham, DWR ND	Resolved
What is proper in page 6?	Jon, DWR ND	Resolved
Each directory should contain one kind of file …". This can lead to some confusion as to how many directories to create as there will be many different types of file formats	Sheng Tan, WoodRodgers	Resolved
attribute or column name the maximum length shall be 20 characters. This will not work in a shapefile	Sheng Tan, WoodRodgers	Resolved
Should there be an underscore instead of an ampersand? O_M or H_H?	Reviewer1, RBF	Addressed
Shapefiles have a limitation of 8 for a field column name. How to handle If a field name is over 8 characters in a GDB?	Reviewer1, RBF	Addressed
Is there to be a standard file directory structure for all vendors to follow?	Reviewer1, RBF	Not developed yet. Next version will include
Relative Pathing – requirements for relative pathing in the MXD GIS files to enhance the ability to share and distribute the layouts	Reviewer1, RBF	Incorporated
Page 5 should be file names or content names?	SROUTH, RBF	Resolved
Is it safe to say to say all field names must be ISO9000 compliant.	SROUTH, RBF	No. Not completely checked.
Use a tree graphic for file structure	SROUTH, RBF	Incorporated
Capitalization is not always maintained in shapefiles from different systems. Field names should not be case sensitive.	SROUTH, RBF	Not developed yet. Next version will include
Can you provide a more extensive list of reserved names in an Appendix?	SROUTH, RBF	A longer list is attached
Not good that all numeric attribute fields that will not be used in calculations shall be stored as text strings or varchar data types	Bill Fox, CH2M	Incorporated
O&M and H&H is special characters not consistent with standards	Greg Smith, DWR	The naming standard only applys for file and field name, not for value in a cell.
Add date in the file name	Greg Smith, DWR	Incorporated. But only if needed
Mandatory fields needed to all tables	Greg Smith, DWR	Partially incorportated. Because some of them is already in the metadata
QA/QC Standards		
GIS Planning Committee is developing a standard. How to coordinate?	Melody Baldwin, DWR	Further discussion is needed. They do not have any standards yet
Double check on QA/QC	Melody Baldwin, DWR	Incorporated. Have QA/QC check log
Are completed QA/QC documents available for DWR staff review?	Jim R Ham, DWR ND	Incorporated. Related to implementation of the standards

Will there be a data dictionary created, so that all vendors know what fields, domains need to be created and what the relationships are?	Reviewer1, RBF	Optional. Maybe required for CVFED
Should there be a recommendation or a requirement for a standard QC or Problem/Action log?	Reviewer1, RBF	Incorporated.
Is NULL ever an acceptable option? Is it considered complete if there are NULLs?	SROUTH, RBF	Yes it is completed. Text changed
Are these standards in appendix to be used as the standard for the FloodSAFE Program projects?	Baker, CH2M	Yes they are.
QA/QC primarily focuses on cartographic.	Greg Smith, DWR	Not incorporated
Spatial Topology Standards		
Need QA/QC to check if topology tools used correctly	Michael Koller, DWR	Incorporated
"All data provided as a geodatabase should have topology…"., requires ArcGIS ArcInfo/ArcEditor license. But not everybody will have access to that license level	Sheng Tan, WoodRodgers	DWR has enterprised ArcInfo license
Should there be a report to document what topology rules were used?	Reviewer1, RBF	Incorporated
Double precision for coordinates is not good enough if location is very critical. Coordinate with 4 digits after the decimal point is needed in some cases.	Shahid Anwar, DWR	Double precision has 8 digits after point not 2 digits.
Spatial Topology Standards - The parameters presented seem to be out of date?	Bill Fox, CH2M	Addressed
No specifications are given for the enterprise geodatabase spatial reference parameters of tolerance and resolution.	Bill Fox, CH2M	Incorporated
Not inculded accuracy and precision tolerances	Greg Smith, DWR	Incorporated
Deliverable/Media Standards		
The addition of USB drives as an acceptable media type should be included	Bill Fox, CH2M	Incorporated
Include external hard disk or ftp	Greg Smith, DWR	Incorporated
Appendix		
Remove empty attribute in relationship tables	Michael Koller, DWR	Incorporated
8.5X11 scale bar set in whole hundreds of feet	Michael Koller, DWR	Incorporated
No need to have other page size. Use 8.5X11 and print it out to any page size	Melody Baldwin, DWR	Comment is not used
The "Distribution Information" section (Section 6 of Appendix B - 2nd to last page of Appendix B) could be strengthened	Reviewer1, RBF	Incorporated
Project specific map template (.mxt) and style (.style) files should be provided with these standards.	Baker, CH2M	Resolved
Are these to be the standard symbology for FloodSAFE and the CVFED project going forward?	Baker, CH2M	Yes
Symbology will need to be expanded for missing features and for different output scales.	Baker, CH2M	Longer symbology will be developed
Add the abbreviations on the map symbols sheet to the abbreviations appendix	Baker, CH2M	Incorporated

STANDARD ABBREVIATIONS probably should be a living/growing document with revision dates, for a period of time to add most of the abbreviations to be used by FloodSAFE and the CVFED Project.	Baker, CH2M	Incorporated
Add the Data Development Standards as its own section similar to Metadata and Cartographic Standards, or as an appendix.	Baker, CH2M	Data Development Standards is not in the scope
PM may be confusing to some users since the title Project Manager is a title used by both DWR and the AECs.	Baker, CH2M	Resolved
Program Manager may be confusing to some users since the title is used by both DWR and the AECs. Are these Program Managers for the FloodSAFE Program?	Baker, CH2M	Resolved
Based on the numbered bullets below, it's not clear who provides what to the QA Reviewer?	Baker, CH2M	Resolved
Are you really sure about exporting the Lineage data processing steps from ArcCatalog?	SROUTH, RBF	The metadata only for example. Not required in hardcopy deliverable
This list for MAP TEMPLATE is different than in the main document. Where are the logo requirements,…	SROUTH, RBF	Resolved
Does FloodSAFE have a standard N Arrow to use?	SROUTH, RBF	Yes
Something wrong with image for size D	SROUTH, RBF	Resolved
Something wrong with image for size E	SROUTH, RBF	Resolved
Where do we download these style sets for STANDARD MAP SYMBOLS?	SROUTH, RBF	CDEC or floodSAFE website
The projection is different than in the main document. Are you forcing NAVD88?	SROUTH, RBF	Resolved
We should use the DWR logo instead of PBS&J logo in ArcMap Template because this template is developed by DWR	Shahid Anwar, DWR	PBS&J logo removed
Title block dimension is not big enough.	Shahid Anwar, DWR	Users have flexibility to adjust the size
Can we move the legend into the main mapping area?	Shahid Anwar, DWR	Users have flexibility to move the legend if it is too big

GIS Standards used:

FGDC Digital Cartographic Standard for Geologic Map Symbolization

FEMA Guidelines and Specifications for Flood Hazard Mapping Partners

USGS Geologic Mapping Standards and Topographic Map Symbols

Other potential GIS Standards to consider:

CalEMA(OES) GIS Document

DWR GIS Planning Committee GIS Standards (under development)

DWR FOC GIS Standards

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The California Department of Water Resources
Naser Bateni, Program Manager (PE 36128)