

***Watershed Monitoring
Data Management Protocols, version 6***

**Division of Environmental Assessment and Restoration
Florida Department of Environmental Protection
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Introduction

The Watershed Monitoring Section (WMS) of the Florida Department of Environmental Protection (DEP) oversees data flow through the use of several platforms, including an Oracle® database, internet applications, Microsoft® (MS) Access applications, and standard data transfer formats in dBASE and MS Excel. Collectively, these platforms are referred to as the Oracle Generalized Water Information System (OGWIS).

This document outlines the normal data management protocols to be used for any project scheduled by the WMS. The protocols follow the progress of the project to its conclusion, marked by the final release of data to the general public. These protocols are, for the most part, managed by Internet applications known as ADM (Automated Data Management), and GWIS Database Utilities, which allow contractors/staff to edit, update, and export data generated by the WMS.

ADM, developed by WMS staff, is an Oracle forms application used to retrieve and update data within the WMS' Oracle database. ADM may be used to track the progress of individual projects (from preparation through release of the data), to review data, and to generate reports from the data. A Users' Manual for ADM is found

at <http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-ADMMManual.pdf>.

GWIS Database Utilities is an online Active Server Page (ASP) application, which interacts with the WMS' Oracle database. It is used to enter site reconnaissance (recon) information and for updating station information. A Users' Manual for the Database Utilities is found

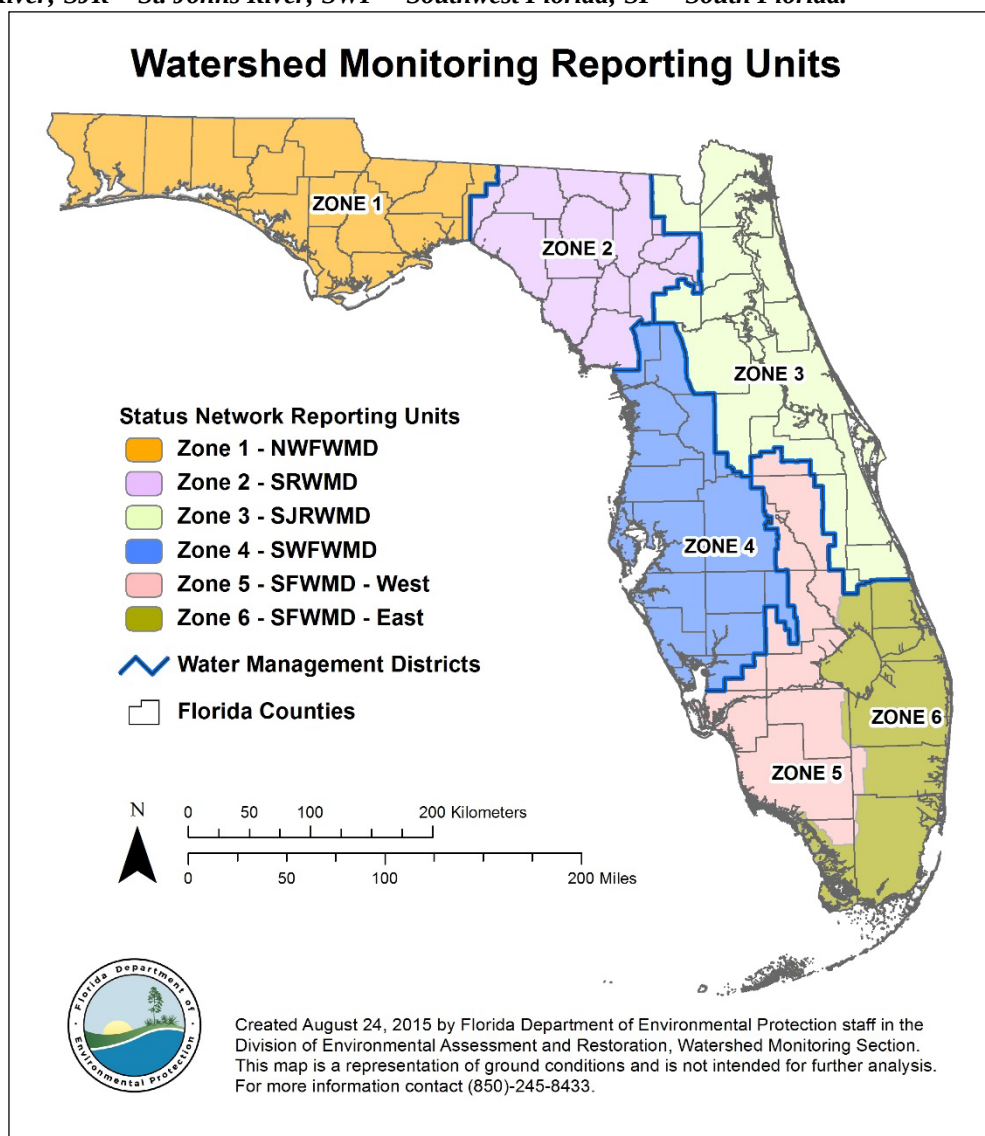
at <http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-GWISManual.pdf>.

Project Preparation

Definition of Project

Projects are the basic unit of WMS sampling. Project names consist of three acronyms: Region/Zone (see Figure 1), project type (see *Current Project Types* below), and date in YYMM format (e.g., Z2GT0901 is Zone 2 Ground Water Trend sampling conducted in January 2009; Z2CA0901 is Zone 2 Confined Aquifer Status sampling conducted in January 2009).

Figure 1. WMS zones (reporting units). The zones are equivalent to the state's five Water Management Districts (WMDs), with South Florida WMD divided into eastern and western zones. NWF = Northwest Florida; SR = Suwannee River; SJR = St. Johns River; SWF = Southwest Florida; SF = South Florida.



Current Project Types

GT - Ground Water Trend
ST - Surface Water Trend
UA - Status Unconfined Aquifer
CA - Status Confined Aquifer
CN - Status Canals
SS - Status Streams
LR - Status Rivers
SL - Status Small Lakes
LL - Status Large Lakes
SP - Special Projects

Historic Project Types

B - Background
M - Ground Water Temporal Variability, Monthly/Quarterly
T - Surface Water Temporal Variability, Monthly
V - VISA (Very Intense Study Areas for ground water protection)
LS - Status Low Order Stream
HS - Status High Order Stream

LIMS Scheduling

For each project, the samplers estimate the number of samples to be collected during each week of the sampling period. This information is given to the WMS Project Managers (PMs) and Quality Assurance Officer (QAO). The QAO schedules the sampling on the DEP Laboratory Information Management System (LIMS). The WMS Data Manager (DM) then enters the Lab Requisition (RQ) numbers and ancillary data into the table T_RQ_LIST in the Oracle database. This information is used to create RQ labels for the custody sheets.

List of Stations

Periodically, the stations and blanks to be sampled per project are loaded into the table T_PENDING in the Oracle Database. This information is used to create the bar code labels for the sample containers and custody sheets.

Project Paperwork

Two weeks prior to a project begin date, either a PM or the DM will generate the necessary project paperwork. Please refer to the WMS Sampling Manual

(<http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-SamplingManual.pdf>) for further details on project paperwork.

Site Reconnaissance and Stations Maintenance

The site and stations tables reside on the department's Oracle server as part of the section's Oracle database. The database is normally accessed via Internet Explorer (version 6.0 or greater). The URL for the GWIS Database Utilities Internet application is <https://fldep.dep.state.fl.us/gwis>.

Please refer to the User's Manual

(<http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-GWISManual.pdf>) for instructions concerning site reconnaissance and station maintenance.

Site Reconnaissance

The sampling agency, PMs, and/or other DEP staff perform all site reconnaissance activities (see <http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-ReconManual.pdf> for a detailed Reconnaissance Manual). After field/office reconnaissance has been performed, reconnaissance information is stored in Oracle, using the Recon Tracking Utility in GWIS Database Utilities.

Site/Station Data Maintenance

Responsibility for site/station data maintenance, such as updates to owner information, is addressed by the appropriate PM. Typically, individual updates and additions are done by the PM or sampling staff via GWIS Database Utilities. The DM initiates batch additions and updates at the request of the PM. The DM or PMs add all new stations to the database.

Status Network Stations

1. The WMS Data Analyst (DA) works with the US Environmental Protection Agency (EPA) to generate all new Status Network random site selections for surface water (SW) and ground water (GW) resources (for further details, see the WMS Monitoring Design Document, <http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-MonitoringDesignDocument.pdf>).
2. The site locations are assigned site identifiers by the DA. The DM adds project-specific data elements.

3. The SW site data are then loaded into the table T_RANDOM_SAMPLE_LOCATION, and the GW site data are loaded into the table T_WELL_LISTFRAME in the GWIS schema of the Production Oracle database.
4. All Status Network SW sites are considered potential new stations. These sites are used to create new stations in the T_STATION table if they are sampled and locational data received. Each site in T_RANDOM_SAMPLE_LOCATION which is sampled is updated with the primary identifier found in T_STATION for the station which relates to the site.
5. Occasionally, a site must be resampled due to issues with the samples being received in a timely manner in the laboratory or issues with the laboratory analyses after the samples are received. In these cases, the data will be stored as different samples.
 - a. If the original site and resample site have a different latitude and longitude, two different stations with unique PK_STATION numbers will be created and associated with the two sets of data. The original site's STATION_NAME and FK_RANDOM_SAMPLE_LOCATION (if applicable) will be appended with the letter "B". The resample site will have the same STATION_NAME and FK_RANDOM_SAMPLE_LOCATION (if applicable) as the original site but without the appended letter "B".
 - b. If the original site and resample site have the same latitude and longitude, only one station will be created for the two sets of data.
6. Once GW wells are sampled for a project their site and physical well information is used to either 1) update an existing well in T_STATION, if the well/station is currently in T_STATION, or 2) create a new well/station record if the well/station does not exist in T_STATION. A package on the database, GWIS_ADMIN.pkg_process_status_station, is run to accomplish this. This procedure also updates the Random_Sample_Location identifier in T_STATION, and the station's primary identifier in T_WELL_LISTFRAME.
7. Note: the PM or sampling staff must check/enter the minimum data required whenever a new station is added to the Station table.

Minimum Data Requirements for Stations

- **For a GW well** to be included into the database the following information is required, as defined in the current GWIS Database Data Dictionary (found at [\\FLDEP1\SOL Z:\datamgmt\Manuals, Instructions\GWIS DATABASE DATA](Z:\datamgmt\Manuals, Instructions\GWIS DATABASE DATA))

[DICTIONARY 1.5.pdf](#)): STATION NAME, WATERBODY NAME, WATER RESOURCE, LATITUDE, LONGITUDE, LOCATION METHOD, LOCATIONAL DATUM, CASING DIAMETER, CASING MATERIAL, CASING DEPTH, TOTAL DEPTH, CONTACT INFORMATION, and DATA SOURCE. A statement describing why the well was selected for inclusion should be supplied with the electronic data in the comment column for the well(s).

- **For a SW station** to be included into the database the following information is required, as defined in the current GWIS Database Data Dictionary (found at [\\FLDEP1\SOL_Z\datamgmt\Manuals, Instructions\GWIS DATABASE DATA DICTIONARY 1.5.pdf](#)): STATION NAME, USGS HYDROLOGIC UNIT, WATERBODY TYPE, WATERBODY NAME, WATER RESOURCE, LATITUDE, LONGITUDE, LOCATION METHOD, LOCATIONAL DATUM, CONTACT INFORMATION, and DATA SOURCE. A statement describing why the station was selected for inclusion should be supplied with the electronic data in the comment column for the station(s).
- **In addition** to the above mentioned data elements, the samplers and/or PMs should make every effort to fill in as much information for the station as appropriate and possible via GWIS Database Utilities (see below for station updates).

Updating Existing Station Data

Periodically, some of the data for a station (either GW or SW site) may change (e.g., ownership of a well may change). Updates to reflect these changes should be made in a timely manner by either the WMS PM or the contracted sampling staff. Existing station data can be updated in the following manner.

1. Select **Existing Station** from the main menu of GWIS Database Utilities.
2. Retrieve the station by entering the station name or typing in the first few characters of the name, and then clicking **Submit**.
3. From the list of retrieved stations, locate the station of interest, and click on the hyperlinked station ID.
4. Using the tabs, locate the form page that contains the data element in need of updating.
5. Make updates as necessary, and click **Save**.

Batch Station Updates to Existing Data

Requests for large-scale updates to T_STATION should be made to the DM.

Data Transfer

Status Network Field Data Transfer

Status Network field data transfer is made via a field data entry program installed on the samplers' Trimble® Global Positioning System (GPS) data loggers. The resultant files are then forwarded to the WMS PM via Internet, diskette, or other mutually acceptable electronic media. Details of the management of these data are found in the "Status Monitoring Network GPS Data Management Procedures" Appendix in the [Design Document](#).

Trend Field Data Transfer

Trend Network field data transfer is made via an online data entry page, or in a standardized format that has been approved by the DM. To use the online application:

1. Open Internet Explorer 6.0 or higher (do not use Google Chrome), and go to <https://fldeplc.dep.state.fl.us/ambient/field>.
2. Click **Surface Water**, **Springs**, or **Ground Water**, depending on the type of data to be entered.
3. Then, select the **zone**/agency you are entering data for from the table provided. This will take you to the actual field data entry form.
4. Select a Trend station from the **Station** dropdown list.
5. Select the month and year of the sampling project from the **Trend Project** dropdown lists.
6. Enter the date on which samples were taken using the **Sample Date** dropdown lists.
7. Select the **Sample Time** in the boxes provided (note that Primary and Bottom samples coming from the same station must have different sample times, and that the time is in 24-hour format).
8. Select a **Sample Type** (Primary(Surface) or Bottom) from the dropdown list
9. Enter the name of the person(s) collecting samples in the **Sampler's Name(s)** box. Do not use initials. Names should be spelled out. There is a 50-character limit.
10. **Enter Your Name** into the box provided. You must enter a name, or else submission of the form will be rejected. Do not use initials. Your name should be spelled out.
11. Enter the field data in the appropriate fields of the form:

- a. Starting at the top of the **Parameter** list, type in the **Value** measured in the field. If no measurement was made, leave the Value null, add an 'O' in the **Value Qualifier** field and make the appropriate **Comments**.
 - b. Select any pertinent **Value Qualifiers** associated with each measurement. A list of acceptable value qualifiers is available by clicking on the provided link.
 - c. Type in any comments pertaining to that particular measurement into the **Comment** box. There is an 80-character limit.
 - d. Follow this procedure until all of the field measurements are entered.
12. Any comment pertinent to the station as a whole may be entered into the **Comments** field at the bottom of the form. Again, there is an 80-character limit.
13. If data entry is complete, review the entries on the screen for accuracy, and click **Submit**.
14. To clear the form and start over, click **Reset**.
15. Once you click **Submit**, you will get a confirmation screen. To enter data for another station click the "Return to Form" link, and follow the preceding steps for the next station.
16. When you have completed entering all the data, be sure to e-mail a notification back to DEP WMS to let us know the data are waiting. An e-mail link, which is already addressed, is provided via the application.

Within 30 days of receipt, DEP will download the submitted data from the web server. These data are then loaded into the table T_FIELD_DATA in OGWIS, and the column DATE_FIELD_DATA in T_PROJECT is updated.

For sampling staff who do not have Internet access, Trend Network field data transfer shall be via one of the two standard file formats described on page 12 in the section, *Acceptable Transfer Formats for Trend Field Data*. The file will be forwarded to the WMS PM via Internet, diskette, or other mutually acceptable electronic media.

Required Field Measurements - Ground Water

This is a three-column table. Column 1 lists the measurement, column 2 lists the unit, and column 3 lists the parameter code.

Note: °C = degrees Celsius; umhos/cm = micromhos per centimeter; mg/L = milligrams per liter; NTU = Nephelometric Turbidity Unit; NGVD = National Geodetic Vertical Datum; N/A = not applicable

MEASUREMENT ¹	UNITS	PARAMETER CODE
Water Temperature, field	°C	00010
Specific Conductance at 25° C, field	umho/cm at 25°C	00094
Dissolved Oxygen, field	mg/L	00299
Dissolved Oxygen Percent Saturation, field	Percent	00301
pH, field	standard units	00406
Depth to Water from Measuring Point	feet	72109
Turbidity, field ²	NTU	82078
Elevation of Measuring Pt., above or below NGVD	feet	82514
Microlanduse ³	N/A	84147

¹ = Measurements that were required, but were not taken, should be listed as null (empty) values along with an 'O' value qualifier and a comment indicating why the measurement was not performed.

² = Required by DEP SOP as of 8/06/2002, however this is subject to change.

³ = Once per year at Trend sites, and at each Status Site.

Required Field Measurements – Surface Water

This is a three-column table. Column 1 lists the measurement, column 2 lists the unit, and column 3 lists the parameter code.

Note: °C = degrees Celsius; umhos/cm = micromhos per centimeter; mg/L = milligrams per liter; NTU = Nephelometric Turbidity Unit; NGVD = National Geodetic Vertical Datum; N/A = not applicable

MEASUREMENT ¹	UNITS	PARAMETER CODE
Water Temperature, field	°C	00010
Specific Conductance at 25° C, field	umhos/cm at 25°C	00094
Dissolved Oxygen, field	mg/L	00299
Dissolved Oxygen Percent Saturation, field	Percent	00301
pH, field	standard units	00406
Secchi Depth (transparency) ²	meters	00078
Total Depth at Sampling Site ³	meters	82903
Stream Stage ⁴	feet	00065
Sample Depth	meters	90068

¹ = Measurements that were required, but were not taken, should be listed as null (empty) values along with an 'O' value qualifier and a comment indicating why the measurement was not performed.

² = If disc is visible on bottom of water body, the 'S' value qualifier must be used.

³ = If sampling done from a fixed point.

⁴ = Surface Water Trend sites only, where available.

Acceptable Transfer Formats for Trend Field Data

DBF (dBASE® File) Format:

This is a four-column table. Column 1 lists the parameter name, column 2 lists the parameter type, column 3 lists the total number of characters or digits, and column 4 lists the number of decimal digits.

NAME	TYPE	TOTAL CHARACTERS OR DIGITS	DECIMAL DIGITS
STATION	CHARACTER	25	N/A
PARAM_CODE	NUMERIC	5	0
PARAM_NAME	CHARACTER	40	N/A
TEXT_VALUE	CHARACTER	11	N/A
VAL_QUAL	CHARACTER	5	N/A
SAMP_DATE	CHARACTER	8	N/A
SAMP_TIME	CHARACTER	4	N/A
SAMP_SEQ	CHARACTER	2	N/A
SAMP_TYPE	CHARACTER	1	N/A
PROJECT	CHARACTER	30	N/A
COMMENT	CHARACTER	80	N/A
SAMPLER	CHARACTER	50	N/A

Microsoft® Excel Format:

This is a four-column table. Column 1 lists the parameter name, column 2 lists the parameter type, column 3 lists the total number of characters or digits, and column 4 lists the number of decimal digits.

NAME	TYPE	TOTAL CHARACTERS OR DIGITS	DECIMAL DIGITS
STATION	TEXT*	25	N/A
PARAM_CODE	NUMERIC	5	0
PARAM_NAME	TEXT	40	N/A
TEXT_VALUE	TEXT	11	N/A
VAL_QUAL	TEXT	5	N/A
SAMP_DATE	TEXT	8	N/A
SAMP_TIME	TEXT	4	N/A
SAMP_SEQ	TEXT	2	N/A
PROJECT	TEXT	30	N/A
COMMENT	TEXT	80	N/A
SAMPLER	TEXT	50	N/A

* = All text columns to be left justified

Please refer to the WMS' Field Database Data Dictionary Version 2.6

at \\FLDEP1\SOL_Z\datamgmt\Manuals, Instructions\FIELD_V2.6.doc for data element definitions.

Field Data Submittal Deadlines

Deadline for Trend and Status field data submittal is 30 days from project end date (the day that the last sample was collected for the project).

Field Data Paperwork (Status and Trend)

Copies of all relevant paperwork for the project, including sample custody records and the list of stations actually sampled, should be mailed to the WMS PM within 30 days from the project end date.

Lab Data Submittal

Once all analyses for a project are completed, the DEP lab transfers the receipt, result, and QA/QC records to AMBIENT holding tables on its Oracle database in the schema VGSM. Then these data are transferred directly to the WMS Oracle database via PL/SQL procedures that are scheduled to run weekly every Monday night at 7pm.

Project Processing

1. Once all lab and field data for a project are loaded into the WMS Oracle database, the DM runs a series of PL/SQL procedures to normalize the data. During this process, each sample is spot checked for missing analytes. Furthermore, the DM checks for missing stations. The resultant data are held in temporary tables in the WMS Oracle database (T_PROVIS_SAMPLE and T_PROVIS_RESULT).
2. Once all of the data have been accounted for and any necessary edits made, they are transferred to the tables T_SAMPLE and T_RESULT, and the column DATE_PROVISIONAL in T_PROJECT is updated.

Provisional Data Review

After the DM has normalized the files, the appropriate staff are notified that the data are ready for review using ADM. Detailed instructions are given below.

1. Open ADM, enter the project of interest and click **←-Search** to load the project data. Select the **Review** tab. If the data for the project have been normalized, there should be a date listed beside 'Provisional'. If this is the case, the operator may run the Database Checks by clicking **Run Checks**.

2. A PDF file will be created and opened in the internet browser. The document contains the name of the project, the date the checks were run, a count of the stations sampled and blanks collected, the number of analytes per station and sample type, missing analytes per station, detections coming from associated blanks, measurement range checks, measurements reporting negative values, and samples with excessive turbidity.
3. The purpose of this file (commonly referred to as the project's documentation file or metadata file) is to document the life history of the project's data. Comments documenting any changes made to the data, or referring to any unusual results, should be included in the Comments section of the file using the text entry box under Project Comments.
4. **Run Checks** must be performed before project data can be released (see below).

Once the documentation file is created and reviewed by the WMS PM, it may be forwarded to the sampling contractor and/or sampler for review. MS Excel exports of the project data and the project's blank data should be submitted for review at the same time. These exports are created within ADM by navigating to the **Reports** tab, and selecting **Result Data** and **Blank Data** from the Open Data View window. These files are opened in the internet browser, where they are saved as text (.txt) files and then converted to MS Excel files by the WMS PM. The PM also has the option to retrieve project data in one of two pivot formats. **Pivot Table Value (Number)** retrieves T_RESULT.VALUE whereas **Pivot Table Value (Text)** retrieves T_RESULT.VALUE_TEXT. In order to review results that are only stored as text (e.g. Water Sample Collection Device), the PM should use **Pivot Table Value (Text)**. The **Metadata** button will open an existing documentation file for the selected project if the **Run Checks** button on the **Review** tab has been used (discussed in *Provisional Data Review* above). Data exports from ADM do not include all data associated with the project from T_SAMPLE and T_STATION.

The data exports from ADM mentioned above are not for permanent storage and they should not be re-used to fill data requests. If a data request is made, the PM should generate a new spreadsheet to send at that time. The procedure for regenerating spreadsheets does not vary from the initial creation procedure. In addition, corrections by PMs or samplers should not be made to these spreadsheets, as they will never make it to the database (see *Data Correction* below).

Data Correction

Updates and additions to the Stations table are made through the GWIS Database Utilities application as described in the *Site/Station Data Maintenance* section above. PMs are granted access, and changes/additions are made at their discretion.

Sample data corrections are made through a form review process. PMs send requests for sample data correction to the WMS DM for review and update of the appropriate Oracle tables. Data reviewers at contracted sampling agencies can also submit requests for data correction through their PM.

Requested data corrections are submitted on a copy of the Sample Data Correction Request Form at \\Fldep1\sol_z\datamgmt\GWIS Sample Data Corrections. More extensive, systematic changes can be requested by e-mail, as long as all pertinent data are included. Correction requests are dated upon receipt, annotated with action taken and date action taken, copied, and the original returned to the PM.

Any editing changes made to a database are documented in the project's documentation file (see project's documentation file, under the section *Provisional Data Review* above). Furthermore, the DM updates the comment columns of the sample and/or results table to reflect any editing changes made to either of these two tables.

Project Data Release

Certification of Data for Release

1. Certification for public release can come only after the review of the project data and the metadata file (see *Provisional Data Review* above), and after any needed editing has been completed and reviewed.
2. The WMS Project Manager and, if applicable, the contracted sampling agency's data reviewer must approve the data before it is certified for release. The only exception occurs if the data review time period (see *Data Management Deadlines* below) has expired, and DEP deems it necessary to release the data so that data analysis may proceed.
3. Project status is upgraded to Release in ADM, via the **Review** tab's **Release** button. A note adding the date the data were deemed released and who approved the data for release

should be added to the project's documentation file (refer to 'project's documentation file', under the section *Provisional Data Review* above).

4. In rare instances data may be unreleased via the **Review** tab's **Revert Release** button. This should only occur when egregious errors are noted in released data. If data are 'unreleased' any noted errors causing this action must be corrected and the data must be reviewed again before they are released. The PM should obtain approval from the DM and, if applicable, the contracted sampling agency's Project Manager before unreleasing any data.

A report that contains target dates for each project and whether or not they have been met can be generated using the **Project Status Report** button in the ADM **Review** tab. This report is generated as a PDF file in the web browser.

General Release Databases

1. Once provisional data have been reviewed, edited, and certified as being ready for general release, exports of the data can be distributed for general use. It is important to use ADM to create a current export of the data directly from the Oracle Database for each request, because any changes made to the data will be reflected in the current export. There is no guarantee that prior exports will be up to date with edits/changes that may have been made to the database.
2. Newly released data will also be loaded to the Florida STORET database on a monthly basis.

Deletion of Data from Release Database

To be physically deleted from the database, data must meet at least one of the following criteria: data were collected in obvious violation of sampling agreement with station owner; data were not collected for a WMS Monitoring Network.

Data Notifications

Letters, data reports, and notifications for exceedances of water quality thresholds will be created and forwarded to other programs within DEP, the Florida Department of Health, and property owners, as referenced in the WMS Project Manager Manual

(<http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS->

[ProjectManagerManual.pdf](#)). When all required letters for each project have been sent, Project Managers use the **Record Date** button in the ADM **Reports** tab to document that the notifications are complete.

The **Reports** tab in ADM also contains information about each project's notification status (**Notification Status Report** button). This button generates a file in the web browser listing which contacts/owners have requested letters and displays the date that the project's letters are sent.

Data Security

Oracle Database

The database is located on the department's depdbprod.dep.state.fl.us server.

Once loaded to the WMS Oracle Database, each sample data record is locked and changes are solely permitted by the WMS DM. However, updates to the Comment column of the Project Table will be made available to the PMs and contractors via the ADM Application. Updates to the STATIONS tables will be allowed via GWIS Database Utilities, <https://fldep.dep.state.fl.us/gwis>, as indicated in the [GWIS Database Utilities User's Manual](#).

The Agency for State Technology (AST) is responsible for data backups. Full Recovery Manager (RMAN) is used to perform backups of the database, along with transaction logs, every Monday through Saturday night. This allows for point in time recovery of the database. Oracle Export backups are performed at the same time.

DEP Database Administrators (DBA's) are responsible for performing Oracle schema exports. These exports are available only for short term retention.

Data Management Deadlines

Note: due dates are from project end date, the day on which the final sample for the project was taken.

<u>Item</u>	<u>Due Date</u>
Field Data Receipt	30 days
Lab Data Receipt	90 days
Provisional DBF Creation	120 days
Project Review/Data Release	240 days
Letter to Owner/contact Person	360 days
Dept. of Health Notification	360 days

Data Availability

Data are available from the DEP upon request; for availability and access please refer to <http://www.dep.state.fl.us/water/monitoring/data.htm>.