­­ **Change History**

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| Version | Date | Reason | Author | Approved |
| 1.0 | 2nd Aug 2010 | Initial Version | Dell Topel Chih Hsiang Tang Jane Harrison Justin Mancinelli Wei Yeap Cheng Xing-Shu Liu |  |
| 1.1 | 31st Aug 2010 | Update of style according to specification in Project Plan document | Justin |  |
| 1.2 | 1st October 2010 | Removed a couple of erroneous tests. Corrected spelling mistakes | Jane |  |

Tiffany Gold Mine Environmental Management Reporting System Test Plan

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# Introduction

## Purpose

The purpose of this document is to describe the testing processes which are to be performed for the entire TiGERS software system. It describes the types of testing to be performed and lists the actual tests which will be performed with data to be input and expected results.

## Intended Audience

The document is aimed primarily at the project developers, and indeed, the test cases have been written by them, to enable them to have a full understanding of the functionality of the system and to ensure that a quality product is delivered to the end user. It also serves a secondary purpose as reassurance for the project sponsor that quality assurance is of the utmost importance and something the project team members take seriously.

## Test Plan Structure

Section 2 of the document describes the testing strategy adopted for the project. It describes the type of testing to be performed, areas where testing will be focussed, areas which will not be tested and reasons why, and justifications for these decisions.

Section 3 lists assumptions that have been made in the preparation of this test plan. Any constraints affecting the test plan are also documented here.

Section 4 lists the test cases which have been developed in order to test the system. The unit test cases have been derived directly from the use cases described in the System Requirements Specification document.

## Definitions, Terms and Acronyms

This section provides the definition of all terms required to properly interpret this document. It contains some terms that have a special meaning in this project.

|  |  |
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| Term | Definition |
| TiGERS | Tiffany Gold Mine Environmental Management Reporting System |
| Map | A visual representation of the mine site in form of an aerial photo. |
| Sampler | A generic term for an observation station that is set up at a specific sampling location to allow samples to be taken. |

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| Sampling location | A geographical position at the Tiffany Gold Mine defined by a latitude/longitude pair and represented by a marker on a map at which a water sample is taken at a prescribed frequency. Samples can be taken above ground (creek, domestic water tank) and below ground (bore). |
| (Environmental) parameter | A numerical description of an observed property of the environment such as pH or EC. |
| (Screening) frequency | The period of time between sampling events which may vary from sampler to sampler and from parameter to parameter. Frequencies are divided into *screening frequency* (only some parameters are analysed) and *comprehensive screening frequency* (all parameters are analysed). The latter always occurs less often. |
| Screening program | An activity in which many pre-defined sampling locations are visited to retrieve samples that have to be analysed for a set of parameters at that time. |
| Sampling date | Date at which a water sample is taken for later analysis in a laboratory. |
| EC | Electrical conductivity measured in micro Siemens per centimetre (μS/cm), one of the many environmental parameters measured in a water sample indicative of salinity. |
| .kml | KML is a file format used to display geographic data in an Earth browser such as Google Earth, Google Maps |
| User Experience | Another term for Usability. Test of how easy or difficult it is for a user to use a system in order to achieve a particular goal. |
| DBA | Database Administrator. Person responsible for database setup and maintenance. |
| Unit testing | Testing for the behaviour of components of a product to ensure their correct behaviour. |
| Functionality testing | Validating an application conforms to its specifications and correctly performs all its required functions. |
| Requirements testing | Testing based on objectives derived from requirements for a software component. |
| Black-box testing | Testing without knowledge of the internal workings of the item being tested. |
| Performance testing | Performance testing is the process of determining the speed or effectiveness of a computer, network, software program or device. |
| Regression testing | Regression testing allows a consistent, repeatable validation of each new release of a product. |

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| --- | --- |
| Stress testing | Testing conducted to evaluate a system or component at or beyond the limits of its specified requirements. |
| Recovery testing | Testing aimed at verifying the system's ability to recover from varying degrees of failure. |

## References and Applicable Documents

Dell Topel et al. System Requirements Specification. 19th May 2010. Print.

# Testing Strategy

## Type of Testing to be Performed

We will perform unit tests, functionality tests, and requirements tests to ensure that TiGERS behaves as the users and stakeholders expect. We will also perform user experience testing to ensure the application is easy for users to navigate and use as well as contribute positively to productivity.

Automated testing will cover the unit tests and much of the functionality tests. The testing paradigm which we will use extensively for automated tests is black-box testing. Manual testing will be more appropriate for some functionality tests and most requirements tests and all user experience tests because we can better simulate how users will interact with the application.

## Areas of Testing to be Focused

The tests will have a strong focus on data manipulation (add, update, delete) and data retrieval for all users of TiGERS. Data manipulation will be tested against various constraints related to the type of data being processed and the security policy associated with that data. Data retrieval will be tested against expected results both in terms of correctness of the data and appropriate organization of the data. We will perform brief manual tests for data manipulation and extensive automated tests.

There will also be a strong focus on functional areas of the application such as security and workflow. Security tests will be performed both manually and automatically while workflow testing will be done manually.

We will also test the email, map, and report generation components but the tests for these components will not be comprehensive because, although they are important to TiGERS, they are not essential (it is possible to perform the same functions through more traditional means such as phones, physical maps and other report software). Email, map and report system tests will be performed manually.

User experience tests will mainly focus on the user’s ability to quickly and accurately navigate the various pages associated with their authenticated role. There will also be testing focused on appropriate design which will allow users to be more productive by mitigating eye stress, keeping the users engaged through interactive elements, and limiting the number of actions necessary to perform a given task. User experience tests must be done manually to better simulate how users will interact with the application. We will pay close attention to visual, logical, and navigational design considerations.

## Areas which will not be Tested

We will not perform regression, stress, or performance tests due to strict financial and time constraints. The risks associated with these tests are very low since the set of users contains employees of Tiffany Gold Mine and a select few external contracting organizations and their laboratories (each of which has only one employee interacting with the application).

We also will not perform recovery testing as it has been agreed with stakeholders that system recovery is not a requirement of the software.

## Justification of Testing Types and Areas Chosen

Unit tests have been chosen to ensure the correctness of code as it has been envisioned by the developer. It is especially important to unit test all classes and methods which manipulate data to minimize the possibility of data corruption and increase data integrity in the application and database layers. The reason we must give this area high importance is because the risk associated with incorrect data is very high—without proper testing of data integrity, the integrity of Tiffany Gold Mine may come under scrutiny in civil and/or criminal action.

Functionality tests ensure that logically related sections of code perform correctly as indicated by the Software Requirements Specification. After unit tests have passed, we must be confident that each unit can work with the others to provide a well-functioning system. This includes security of the system and a well-designed workflow for users of the system. Security testing is just as important as data manipulation testing (as mentioned above) but because of the high risk associated with malicious or unintentional corruption of data by users of the application as opposed to incorrect software design. Workflow testing is essential in allowing users to access any and all sections of the application which they are entitled to—the risk of poor workflow is poor performance leading to a poor ROI.

Requirements tests ensure that the application as a whole behaves correctly as indicated by the Software Requirements Specification and further meetings with stakeholders. If stakeholders do not agree that the application meets their requirements, they will not accept the version as-is and will expect development to continue lowering their ROI and increasing the time before release.

User experience testing ensures that the interface between users and the system optimizes productivity and minimizes user rejection. If users reject the software because of inadequate experiences, they will turn to more familiar tools which they believe are better to work with and only use TiGERS when absolutely necessary. This will decrease productivity and lower the ROI for the stakeholders.

# Assumptions and Constraints

## Assumptions

All testing will be carried out internally by members of the TiGERS project team.

## Constraints

Time is the biggest constraint affecting this project. Deadlines are fixed and consequently, testing will not be as comprehensive as it ought to be. That said, however, testing has been targeted so that a high quality end product will still be achieved.

The team has been told that there is no further access to the project sponsor. Therefore user acceptance testing cannot be performed and so no test cases have been developed for this.

Database security is handled by granting the correct privileges to the TiGERS application and to the system DBA. Tables will not be accessed directly by anybody other than the DBA.

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# Test Cases

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test #** | **Test Description** | **Inputs** | **Expected Output / Resulting Action** | **Pass / Fail** |
| *1* | *Login with correct username and password* | *enter "admin" and "admin" into username and password text fields respectively* | *direct to welcome page for role admin* |  |
| *2* | *Cannot login with incorrect username and password* | *enter "admin" and "abcdefg" into username and password text fields respectively* | *shows error message on the same page* |  |
| *3* | *Cannot login with no username or password* | *enter only "admin" into password fields* | *shows error message on the same page* |  |
| *4* | *Retest case 3 for different combinations* | *enter only one of the two fields with correct information* | *shows error message on the same page* |  |
| *5* | *Direct to correct page after login* | *enter "officer" and "officer" into username and password text fields respectively* | *direct to welcome page for role environmental officer* |  |
| *6* | *Retest case 5 for all roles* | *enter correct username and password for different roles* | *direct to welcome page for different roles* |  |
| *7* | *Upload sample data with correct file format* | *upload sample data file with .csv format* | *display "upload successfully" message* |  |
| *8* | *Cannot upload sample data with incorrect file format* | *upload sample data file with .xml format* | *display "incorrect file format" message* |  |
| *9* | *Sample data correctly uploaded into database with sepcified number* | *upload sample data file with .csv format and correct sample data* | *database has a new record with the specified information* |  |
| *10* | *Validate correct sample data* | *upload sample data file with .csv format and correct sample data* | *display "upload successfully" message* |  |
| *11* | *Validate incorrect sample data* | *upload sample data file with .csv format and "100" for PH* | *display "incorrect sample data" message and indicate all incorrect fields* |  |
| *12* | *Retest case 11 for all data fields* | *upload sample data file with .csv format and incorrect sample data* | *display "incorrect sample data" message and indicate all incorrect fields* |  |
| *13* | *Validate missing sample data* | *upload sample data file with .csv format and no data for ph* | *display "missing sample data" message and indicate all incorrect fields* |  |
| *14* | *Retest case 13 for all data fields* | *upload sample data file with .csv format and no data for different fields* | *display "missing sample data" message and indicate all incorrect fields* |  |
| *15* | *Modify sample data with correct numbers* | *change ph to 14* | *display "update successfully" message* |  |
| *16* | *Retest case 15 for all data fields* | *change data value to another correct value* | *display "update successfully" message* |  |
| *17* | *Modify sample data with incorrect numbers* | *change ph to 100* | *display "incorrect sample data" message and indicate all incorrect fields* |  |
| *18* | *Retest case 12 for all data fields* | *change data value to an incorrect value* | *display "incorrect sample data" message and indicate all incorrect fields* |  |
| *19* | *List all contractor with some important details* | *no input required* | *List all contractor with their full name and email address* |  |
| *20* | *View the selected contractor detail* | *select a contractor from a list* | *display all the information of the contracotr* |  |
| *21* | *Search existing contractors by username* | *enter "contractor1" into username text field* | *list the contract who has the username "contractor1"* |  |
| *22* | *Search non-existing contractors by username* | *enter "nothiscontractor" into username text field* | *display "no contractor found" message and no contractor is displayed* |  |
| *23* | *Search existing contractors by first name* | *enter "sean" into first name text field* | *list the contract who has the first name "sean"* |  |
| *24* | *Search non-existing contractors by first name* | *enter "nothisfirstname" into first name text field* | *display "no contractor found" message and no contractor is displayed* |  |
| *25* | *Search a existing contractor by last name* | *enter "tang" into last name text field* | *list the contract who has the last name "tang"* |  |
| *26* | *Search non-existing contractors by last name* | *enter "nothislastname" into last name text field* | *display "no contractor found" message and no contractor is displayed* |  |
| *27* | *Search existing contractors by full name* | *enter "sean" and "tang" into first name and last name text fields respectively* | *list the contract who has the first name "sean" and the last name "tang"* |  |
| *28* | *Search non-existing contractors by full name* | *enter "abc" and "efg" into first name and last name text fields respectively* | *display "no contractor found" message and no contractor is displayed* |  |
| *29* | *Add a new laboratory with correct detail* | *enter "user1", "james", "bond", "user1@hotmail.com" for username, firstname, lastname and email respectively and select "laboratory" for role combobox* | *display "new laboratory added" message* |  |
| *30* | *Add a new laboratory with incorrect detail* | *enter "user1", "james", "bond", "abcdefg" for username, firstname, lastname and email respectively and select "laboratory" for role combobox* | *display "incorrect email" message and no laboratory is added* |  |
| *31* | *Retest case 30 for different fields* | *enter incorrect data into other fields and select "laboratory" for role combobox* | *display "incorrect data" message and indicate which fields are incorrect* |  |
| *32* | *Add a new laboratory with no detail* | *enter "james", "bond", "abcdefg" for firstname, lastname and email respectively and select "laboratory" for role combobox* | *display "missing username" message and no laboratory is added* |  |
| *33* | *Retest case 32 for different fields* | *not enter data into other fields and select "laboratory" for role combobox* | *display missing data" message and indicate which fields are missing. no laboratory is added* |  |
| *34* | *Add a new user account with correct detail* | *enter "user2", "james2", "bond2", "user2@hotmail.com" for username, firstname, lastname and email respectively and select "user" for role combobox* | *display "new user added" message* |  |
| *35* | *Add a new user account with incorrect detail* | *enter "user2", "james2", "bond2", "abcdefg" for username, firstname, lastname and email respectively and select "user" for role combobox* | *display "incorrect email" message and no user is added* |  |
| *36* | *Retest case 33 for different fields* | *enter incorrect data into other fields and select "user" for role combobox* | *display "incorrect data" message and indicate which fields are incorrect. No data been updated* |  |
| *37* | *Add a new user account with no detail* | *enter "james2", "bond2", "abcdefg" for firstname, lastname and email respectively and select "user for role combobox* | *display "missing username" message and no user is added* |  |
| *38* | *Retest case 37 for different fields* | *not enter data into other fields and select "user" for role combobox* | *display "missing data" message and indicate which fields are missing. no user is added* |  |
| *39* | *List all sample location that have not been assigned with a laboratory* | *no input required* | *list all sample location that have not been assigned with a laboratory* |  |
| *40* | *Assign a sample location to laboratory by selecting a laboratory* | *select a laboratory form a combobox* | *display "laboratory is assigned" message* |  |
| *41* | *Update laboratory with correct detail* | *change first name to "michael"* | *display "update successfully" message* |  |
| *42* | *Update laboratory with incorrect detail* | *change email to "abcdefg"* | *display "incorrect email" message and no data been updated* |  |
| *43* | *Retest case 42 for different fields* | *change other fields to incorrect values* | *display "incorrect data" message and indicate which fields are incorrect. No data been updated* |  |
| *44* | *Update laboratory with no detail* | *change username to ""* | *display "missing username" message and no data is updated* |  |
| *45* | *Retest case 44 for different fields* | *change other fields to empty strings* | *display "missing data" message and indicate which fields are missing. no data been updated.* |  |
| *46* | *Upload sampler media file with correct file format (jpg)* | *upload a media file with .jpg format* | *display "upload successfully" message. File been uploaded.* |  |
| *47* | *Upload sampler media file with correct file format (wmv)* | *upload a media file with .wmv format* | *display "upload successfully" message. File been uploaded.* |  |
| *48* | *Upload sampler media file with incorrect file format* | *upload a media file with .java format* | *display "invalid file format" message. No file been uploaded.* |  |
| *49* | *Cannot access to web pages without login* | *enter "http://www.tigers.com/admin/users.html" into the url field without login* | *Redirect to login page* |  |
| *50* | *Retest case 49 for all pages* | *enter a proper url into the url field without login* | *Redirect to login page* |  |
| *51* | *Access to web pages after login* | *click the "view all users" menu on the menu bar after login as an admin* | *Redirect to userList page* |  |
| *52* | *Retest case 51 for all pages on the menu bar* | *click one item on the menu bar after login as an admin* | *Redirect to the corresponding page* |  |
| *53* | *Retest case 52 by using url* | *enter the page's url into url field after login as an admin* | *Redirect to the corresponding page* |  |
| *54* | *Retest case 52 for different roles* | *click one item on the menu bar after login as a certain role* | *Redirect to the corresponding page* |  |
| *55* | *Retest case 52 using url for different roles* | *enter the page's url into url field after login as a certain role* | *Redirect to the corresponding page* |  |
| *56* | *Cannot access to other roles' web page* | *enter "http://www.tigers.com/admin/users.html" into the url field after login as a contractor* | *display "access deny" message* |  |
| *57* | *Retest case 56 for different pages* | *enter a proper url (other roles' pages) into the url field after login as a contractor* | *display "access deny" message* |  |
| *58* | *Retest case 56 for different roles* | *enter a proper url (other roles' pages) into the url field after login as a certain role* | *display "access deny" message* |  |
| *59* | *Add/edit exceedance value without all required inputs* | *Any, as long as one or more required fields are left blank* | *Error: ask user to enter missing field* | *Passed* |
| *60* | *Min value is > max value (add/edit)* | *Any set of inputs as long as one or more parameters have a min value > its max value* | *Error: minimum value cannot exceed maximum for field* | *Passed* |
| *61* | *Invalid input values (add/edit)* | *Any set of inputs as long as one or more parameters are considered invalid for its type (eg pH of 20)* | *Error: invalid value specified for field* | *Passed* |
| *62* | *Add exceedance value with correct inputs* | *Any set of inputs not classified in the above* | *Exceedance value should be successfully added, and should be present in the back-end database; all parameters entered should appear in the corresponding fields in the database* | *Passed* |
| *63* | *Modify exceedance value with correct inputs* | *As above, but for modify screen* | *Exceedance value should be successfully changed, and changes should be apparent appropriate fields in the database* | *Passed* |
| *66* | *Contractor and Environmental Officer can view "set sampling location from map" and "set sampling location from list" screens* | *Contractor or EO try to add/edit a sampling location* | *These users are allowed to view both screens, and the current sampling location should be marked if already set (modifying a location)* |  |
| *67* | *Laboratory users can see "set sampling location from list" screen* | *Laboratory users trying to add/edit a sampling location assigned to the lab* | *These users are allowed to view the screen displaying the sampling locations assigned to them by contractors/EOs, and the current sampling location should be marked if already set (modifying a location)* |  |
| *68* | *Laboratory users cannot access the "set sampling location from map" screen* | *Laboratory user tries to access "set sampling location from map" screen* | *These users shouldn't be able to access the screen, with no link to the page, and cannot access it If URL is directly entered* |  |
| *69* | *User tries to submit with no sampling location entered* | *No sampling location set* | *Error: need to specify sampling location* |  |
| *70* | *Submission with sampling location entered* | *Select valid sampling location from map/list* | *Sampling location is added (or modified) to the system* |  |
| *71* | *EO can access "screening program" screens* | *EO is logged in and chooses to start or modify a screening program* | *System allows the action* | *Passed* |
| *72* | *Other users cannot access "screening program" screens* | *Other users are logged in, or no user is logged in, and tries to add/modify a screening program* | *Error: access denied* |  |
| *73* | *New screening program submitted with missing or invalid input* | *Required fields missing (e.g. no water body set)* | *Error: ask user to fill in missing input* | *Passed* |
| *74* | *New screening program submitted with valid inputs* | *All fields have been entered* | *Add screening program and send email* | *Passed* |
| *75* | *EO can view schedule of sampling frequencies* | *User chooses a view options and water body* | *System displays list of screening frequencies for selected water body, with the various view options applied to the output* | *Passed* |
| *76* | *Other users cannot view sampling frequencies* | *User tries to view sampling frequencies* | *Error: access denied* |  |
| *77* | *EO can view all types of environmental audit reports* | *EO tries to view sample data, exceedance data or graphs* | *System allows the action* |  |
| *78* | *Other users cannot view environmental audit reports* | *User tries to view environmental audit reports* | *Error: access denied* |  |
| *79* | *Show exceedance graph* | *EO selects water body and parameters* | *System displays exceedance graph for the water body and selected parameters* |  |
| *80* | *EO can view exceedance reports* | *EO is logged in and chooses to view exceedance report for a specified sampling location* | *System generates report showing exceedance values for the sampling location* |  |
| *81* | *EO can get detailed information on exceedance* | *EO selects exceedance line* | *System shows information relating to the exceedance, including the parameter whose threshold was exceeded* |  |
| *82* | *Graphs and tables meet specifications* | *Back-end database should contain sample data which cause exceedances, some which don't cause exceedances, from multiple water bodies and across various parameters* | *The displayed report should match the specifications laid out in the SRS/sample reports and display exceedances correctly as specified* |  |
| *83* | *Sampling location not set* | *User tries to generate report without selecting a sampling location* | *Error: need to select sampling location* |  |
| *84* | *Non-EO users try to view exceedance reports* | *Non-EO users are logged in, or no user is logged in, and tries to view an exceedance report* | *Error: access denied* |  |
| *85* | *Report tables meet specifications* | *Database should contain sample data which cause exceedances from varying dates, samplers and parameters and the same for data which doesn't cause exceedances* | *System should generate reports which match the specifications laid out in the SRS* |  |
| *86* | *Only system administrator can add a new contractor/EO* | *User tries to add a contractor/EO to the system* | *Allow access if current user is system administrator, deny access otherwise* |  |
| *87* | *Missing or invalid fields for new user* | *Admin leaves required fields blank (e.g. not supplying a username) or enters invalid details for the new user (e.g. entering letters for the phone no.)* | *Error: fill out missing required fields and/or enter valid information into fields* |  |
| *88* | *Valid user details entered* | *All required details filled out for new user, and all fields are valid* | *System asks user to confirm details, and if confirmed, will insert new user with details specified into database; if not confirmed, return user back to previous screen instead* |  |
| *89* | *Only system administrator can modify user accounts* | *User tries to modify a user account* | *Allow access if current user is system administrator, deny access otherwise* |  |
| *90* | *Missing or invalid fields for user* | *Admin removes data from required fields or makes one or more fields contain invalid data* | *Error: fill out missing required fields and/or enter valid information into fields* |  |
| *91* | *Valid user details entered* | *All required details filled out for new user, and all fields are valid* | *System asks for confirmation on the update; if confirmed, system updates user with new information, otherwise it returns the admin to the previous screen* |  |
| *92* | *Remove user account* | *Admin chooses to remove a specific user account* | *Confirm deletion action. If confirmed, remove the account entirely if it contains no activity, otherwise mark the account as deleted but do not remove it from the system* |  |
| *93* | *Reset user password* | *Admin chooses to reset the password of a specific user account* | *Confirm action - if confirmed, generate a random password and set this random password to the account. Notify admin of this password.* |  |
| *94* | *Only system administrator can view system utilisation reports* | *User tries to view system utilisation reports* | *Allow access if current user is system administrator, deny access otherwise* |  |
| *95* | *Reports match specifications* | *User chooses to view system utilisation report* | *Generated report matches specifications outlined in the SRS* |  |
| *96* | *Upload valid amount of media files to sampler* | *Upload less than 11 media files to sampler* | *Display "Upload successfully" message* |  |
| *97* | *Upload invalid amount of media files to sampler* | *Upload more than 10 media files to sampler* | *Displaying "Maximum 10 media files" message* |  |
| *98* | *Retest case 2 with 0 media file upload* | *Upload 0 media files to sampler* | *shows error message on the same page* |  |
| *99* | *Modify sampler media file* | *Delete a media file or edit text caption* | *Update confirm, Display "Update successfully" message* |  |
| *100* | *Retest case 4 with no update* | *No changes made* | *Update confirm, Display "Update successfully" message* |  |
| *101* | *Add sampler with valid data* | *Enter a unique alphanumeric ID, location, select the water body, enter frequencies to be taken* | *Add confirm, Display "Add sampler successfully" message* | *Passed* |
| *102* | *Retest case 6 with invalid data* | *Enter an invalid data in any field.* | *Display error message* | *Failed doesn’t enforce entry of depth to collar screening frequency, transfers to invalid page*  *Fixed errors, passed* |
| *103* | *Modify sampler with valid data* | *Amend information* | *Display "Updated successfully" message* | *Passed* |
| *104* | *Retest case 8 with invalid data* | *Enter an invalid data in any field.* | *Display error message* | *Passed* |
| *105* | *Add water body* | *Enter a unique name and specify its surface water.* | *Add confirm, Display "Add water body successfully" message* | *Passed* |
| *106* | *Retest case 10 with invalid data* | *Enter an invalid data in any field.* | *Display error message* | *Passed* |
| *107* | *Modify water body with valid data* | *Amend information* | *Display "Updated successfully" message* | *Passed* |
| *108* | *Retest case 12 with invalid data* | *Enter an invalid data in any field.* | *Display error message* | *Passed* |
| *109* | *Modify Contractor Information* | *Amend names, telephone number and email address* | *Modify confirm, Display "Updated successfully" message* |  |
| *110* | *Retest case 14 with invalid data* | *Enter an invalid data in any field.* | *Display error message* |  |
| *111* | *Assigning sampler to contractor* | *Selecting new sampling location and assign to contractor* | *Display "Assigned successfully" message* |  |
| *112* | *Retest case 17 with previously assigned sampling* | *Selecting old sampling location and reassign to new contractor* | *Display "Assigned successfully" message* |  |
| *113* | *Entering sampling frequencies* | *Select parameters and enter frequency* | *Display "Update successfully" message* | *Passed* |