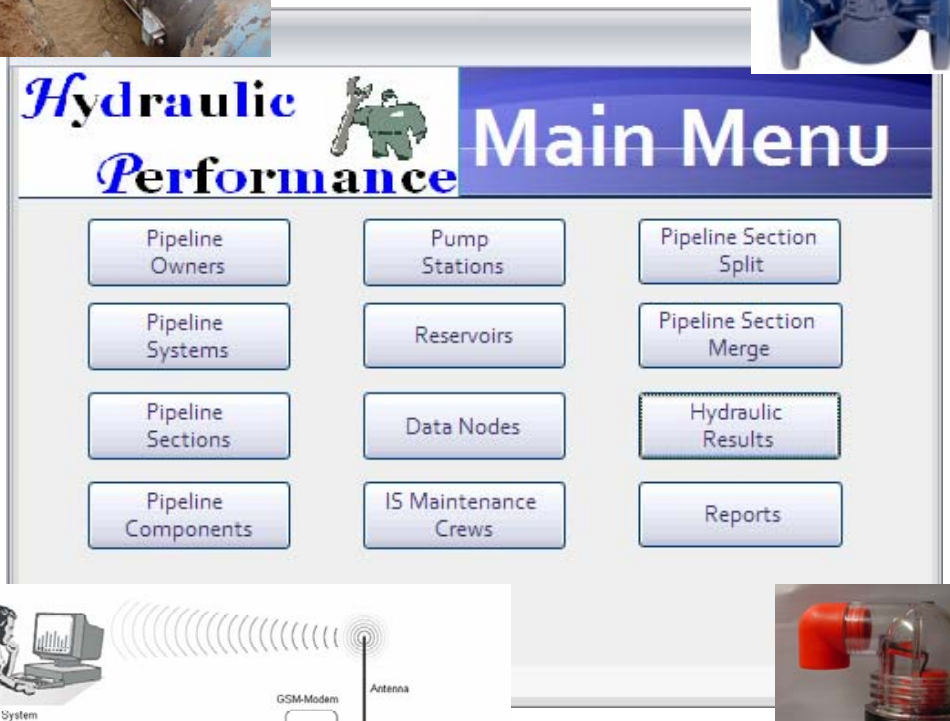
Hydraulic Performance

DB v. 1

User Manual

(Version 1.0)



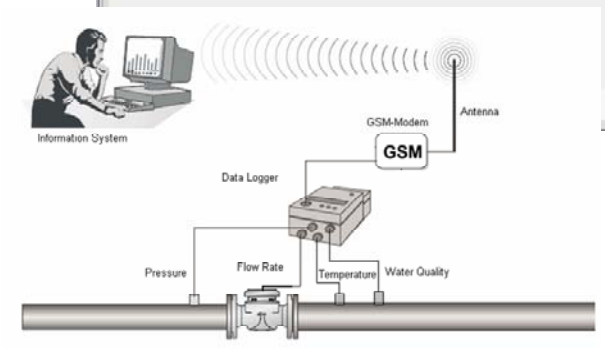


Table of Contents

1. Introduction

The following user manual explains how the hydraulic performance information system operates. Even though this is just a prototype the fundamental functioning is conveyed to the user and limitations and constraints for the different sections are mentioned.

2. Database Access

The database has been encrypted with a password to protect it from unauthorized personnel entering the system. This is the first level of security, whereby authorized users will login via a password screen (figure 1). The password has been set as **"hydraulic"** for the prototype.

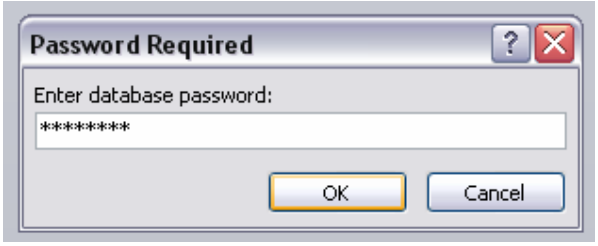


Figure 1: First Level Security

The user is then requested to activate the content of the database as Microsoft deactivated this for security purposes (figure 2).

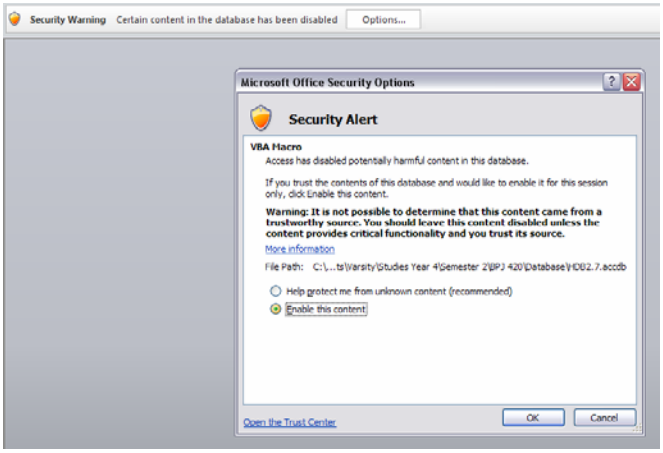


Figure 2: Enable Content

3. User Login

The system user is then requested to login with a username and password (figure 3). This security feature allows for three types of users to access the database namely; Administrator, Full Access and Read-Only. The login screen validated the user's password and displays an error message if the wrong password is entered.

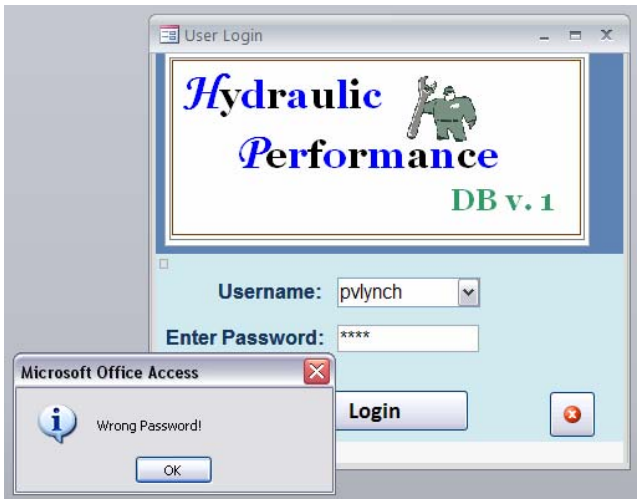


Figure 3: User Login Screen and Validation

Depending on the user clearance, the login screen will then take the user to one of the three main menus namely; Administration Main Menu (figure 4), Read-Only Main Menu (figure 6) and the Hydraulic Main Menu (figure 7). As a default setting, if no password is entered the Read-Only Main Menu appears. Table 1 contains the usernames and passwords for login.

Table 1: Usernames and Passwords

User	Password	Opens
pvlynch	qwerty	Administrator Main Menu
mvdijk	pipe	Hydraulic Main Menu
ddewet	asdf	Read-Only Main Menu

4. Administration

This is the highest clearance level for a user which will allow them to perform administrational duties for the information system. The user also has full access to the information system via the hydraulic main menu button.

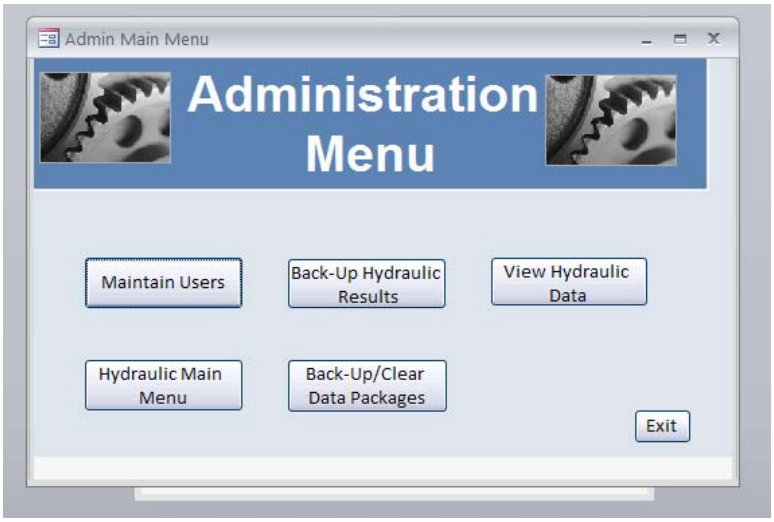


Figure 4: Administration Main Menu

The Administration Main Menu allows the following actions:

- Maintain Users – Add, change and delete system users and their security capacity (figure 5).
- Hydraulic Main Menu – Go to the actual system main menu (figure 7).
- Back-Up Hydraulic Results – Archive the hydraulic results in a separate database for back-up purposes. This is an append query.
- Back-Up and Clear Data Packages – Archive the hydraulic data in a separate database and delete the old data in the current database. This consists of an append and delete query.
- View Hydraulic Data – Allows the administrator to view the hydraulic data which rest of users will not be allowed to perform.

4.1 Maintain System Users

The user can add, change and delete system users. The user clearance is also set via the user role combo box. The screen has a password validation rule that checks if the password is typed in correctly, i.e. retype password feature.

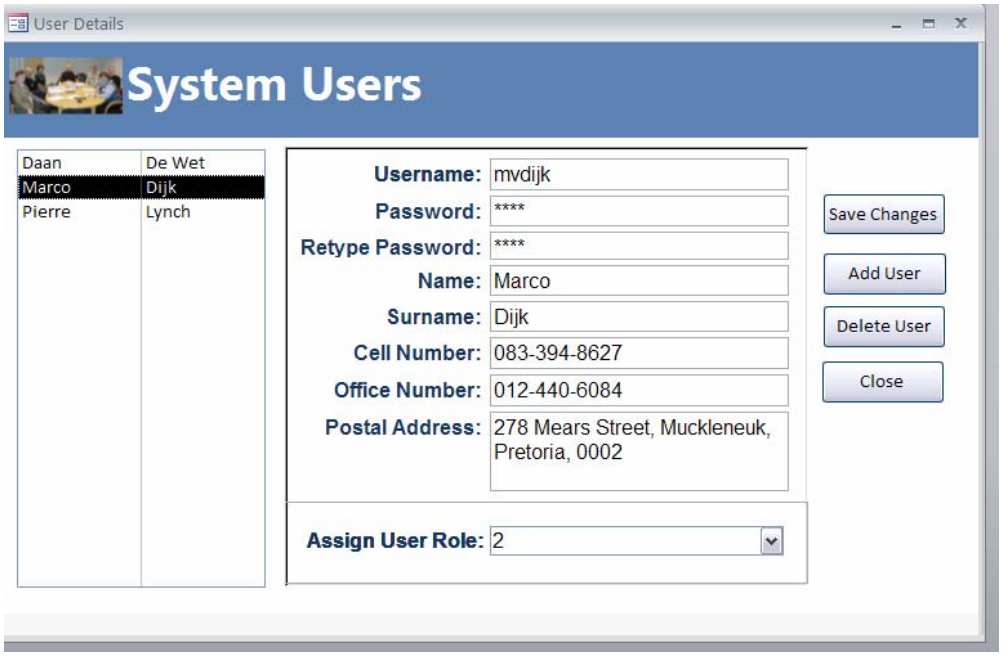


Figure 5: System Users

5. Read-Only View

Users will the lowest clearance level will only be able to view the database without being able to make any changes to current records, deleting records or adding new records. For the prototype's demonstration purposes it was only necessary to complete some of the read only menus.

Figure 6: Read-Only Main Menu

6. Hydraulic Main Menu

The Hydraulic Performance Information System allows users the following options:

- Maintain Pipeline Owners – Add, change or delete pipeline owners. Owners can also be assigned to pipelines.
- Maintain Pipeline Systems – Add, change or delete pipeline systems.
- Maintain Pipeline Sections - Add, change or delete pipeline sections on a pipeline system.
- Maintain Pipeline Components – Add, change or delete pipeline components on a pipeline section.
- Maintain Pump Stations – Add, change or delete pump stations on pipeline systems.
- Maintain Reservoirs – Add, change or delete reservoirs on a pipeline system.
- Maintain Data Nodes – Add, change or delete data nodes (data loggers and instruments) along the pipeline systems.
- Maintain Information System Maintenance Crews – Add, change or delete maintenance crews that will service the data loggers and data recorders on the various pipeline systems.
- Maintain Pipeline Splits – View and add pipeline sections which break up into more sections.
- Maintain Pipeline Mergers – View and add pipeline sections which merge into a pipeline section.
- View Hydraulic Results – Access the output results of pipeline sections' pipe roughness values and accompanying graphs and reports.
- Reports – View and print reports regarding the information system.

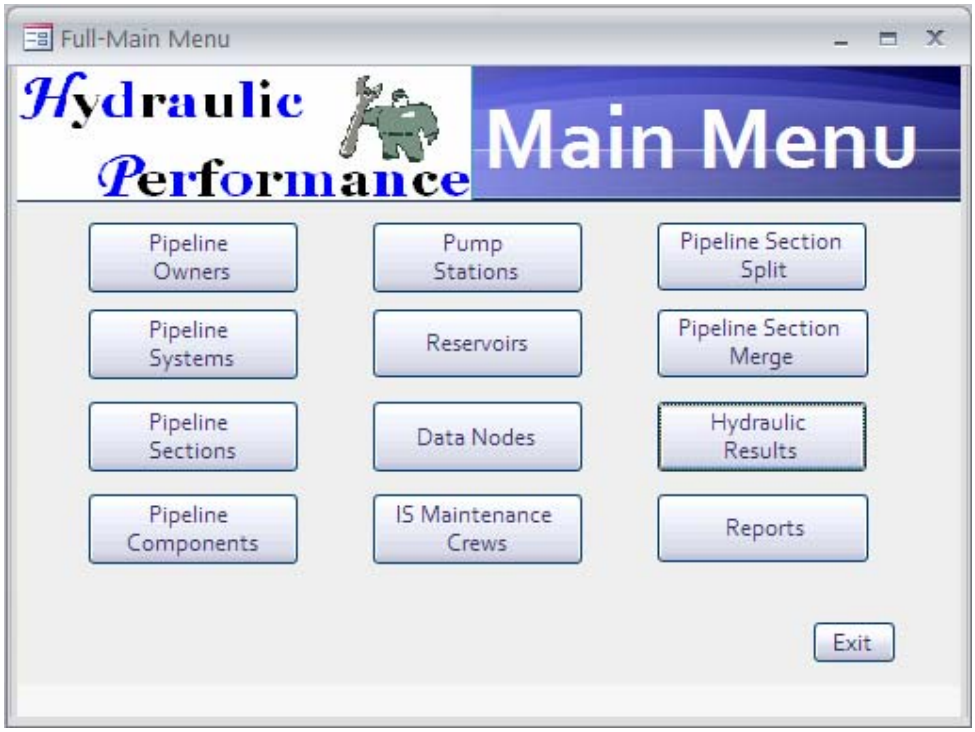


Figure 7: Hydraulic Performance Main Menu

7. Pipeline Owners

The pipeline owner screen (figure 8) allows a user to enter pipeline owner details. The screen displays a list of current pipeline owners and by selecting an owner the details are displayed on the right-hand side of the screen. Typical buttons such as add, save and delete are present.

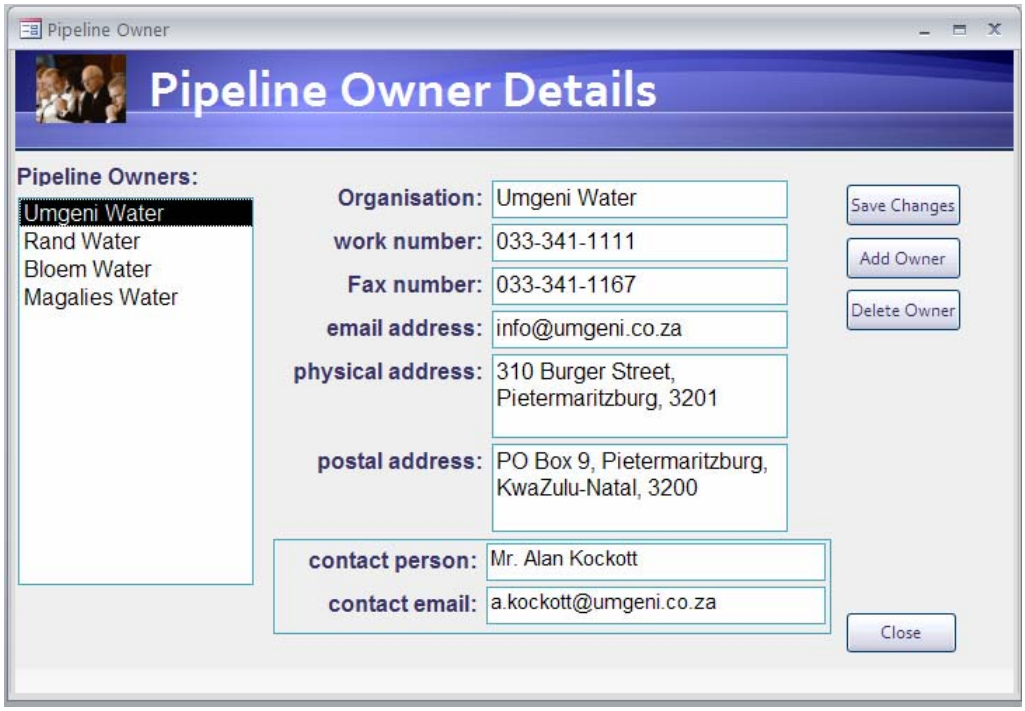


Figure 8: Pipeline Owners

8. Pipeline Systems

The pipeline system screen (figure 9) displays a lit of current pipeline systems in the database. Attachments of photos and drawing of the pipeline systems can be added. Add, save and delete buttons are present to simplify record maintenance. There is a field called short name which is a three letter abbreviation of the pipeline system. This short name is used to name pipeline sections. There is a link to the GIS in order to see where the pipeline lies and the surrounding area (this link is currently not active as the GIS must be installed on the computer). The “Operating Life” field contains a formula which calculates the age of the pipeline based on the commission date.

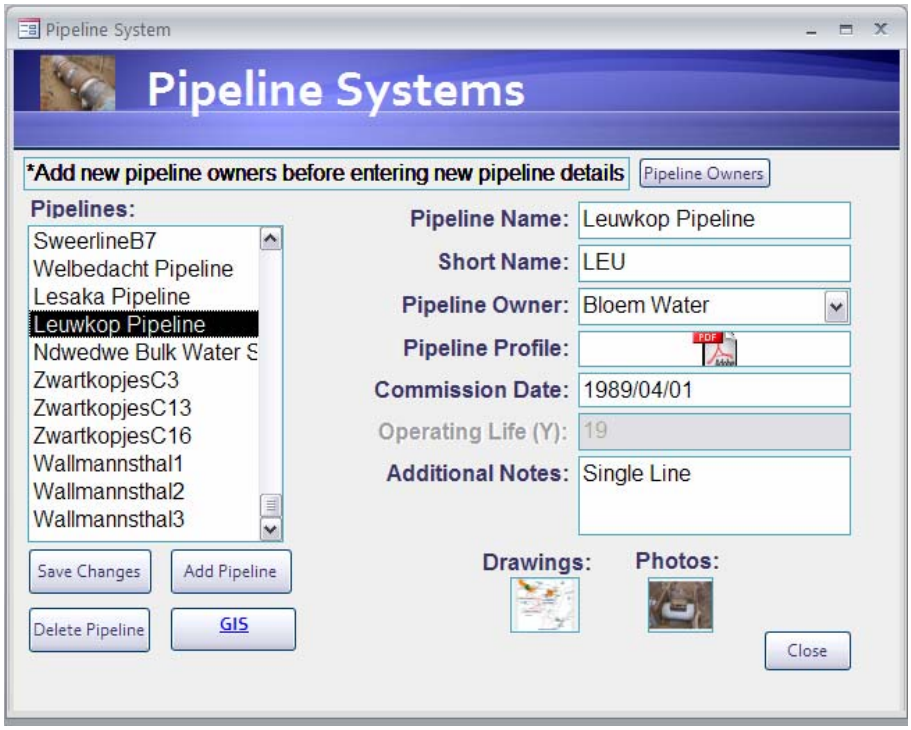


Figure 9: Pipeline Systems

Recommendation

- The GIS must be activated on the final system and by clicking on the button, must open the exact position of the pipeline using the X, Y and Z Coordinates.

9. Pipeline Sections

The pipeline section main menu (figure 10) gives the user the following options; new pipeline section and view existing pipeline sections.

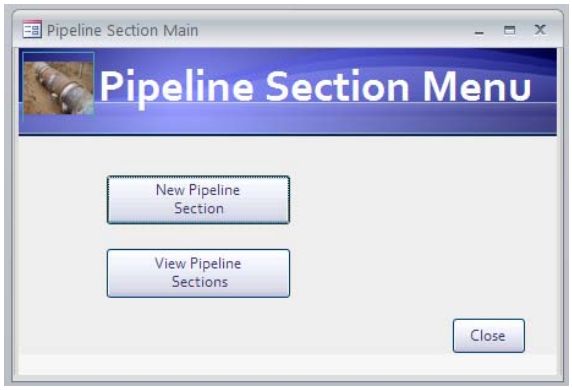


Figure 10: Pipeline Section Main Menu

9.1 New Pipeline Section

The new pipeline section screen (figure 11) allows the user to enter a new pipeline section on an existing pipeline system. This is needed as the entire pipeline will not necessarily be monitored or the pipeline might have variations along its length which could to be monitored individually.

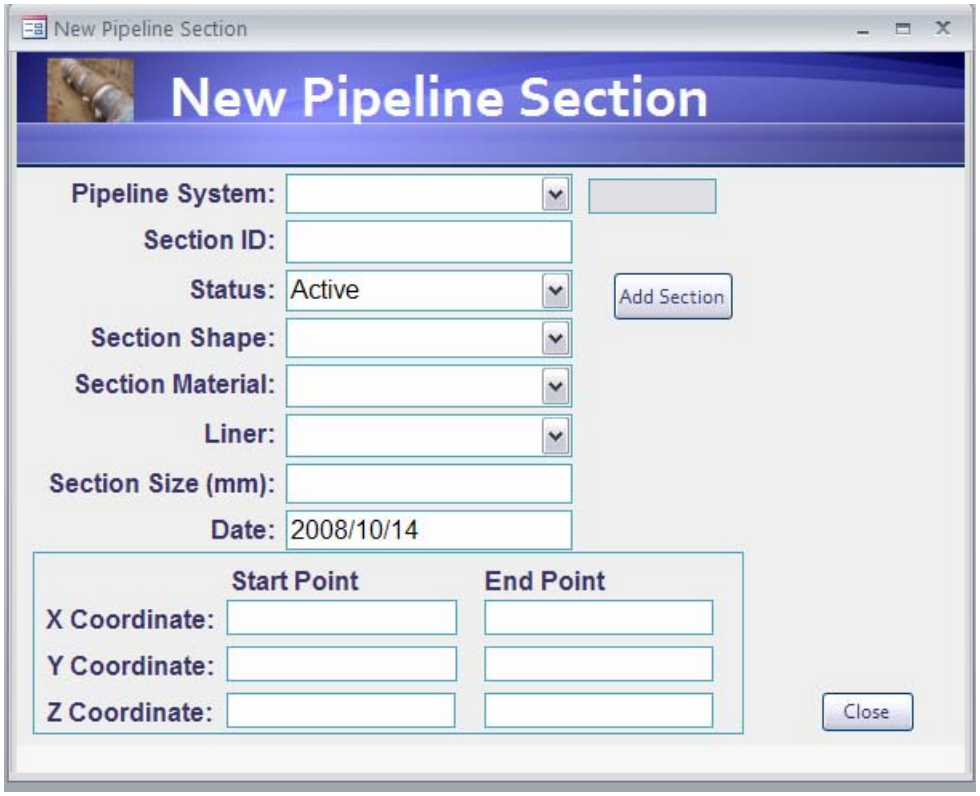


Figure 11: New Pipeline Section

The screen makes use of the current date as a default value for the monitoring date. Drop-down boxes are used to enter details, making the system user-friendly. The section ID is entered using the short name of the pipeline and three numbers (e.g. ORG and 004). This allows the user to see which pipeline system the section belongs to.

Recommendations:

- The final system must make use of the short name, but must be an auto-number feature.

9.2 View Pipeline Sections

The pipeline sections screen (figure 12) lists the current pipeline systems. By selecting a pipeline system all the pipeline sections are displayed. The pipeline section can then be entered in the textbox below to view its history records (Figure 13).

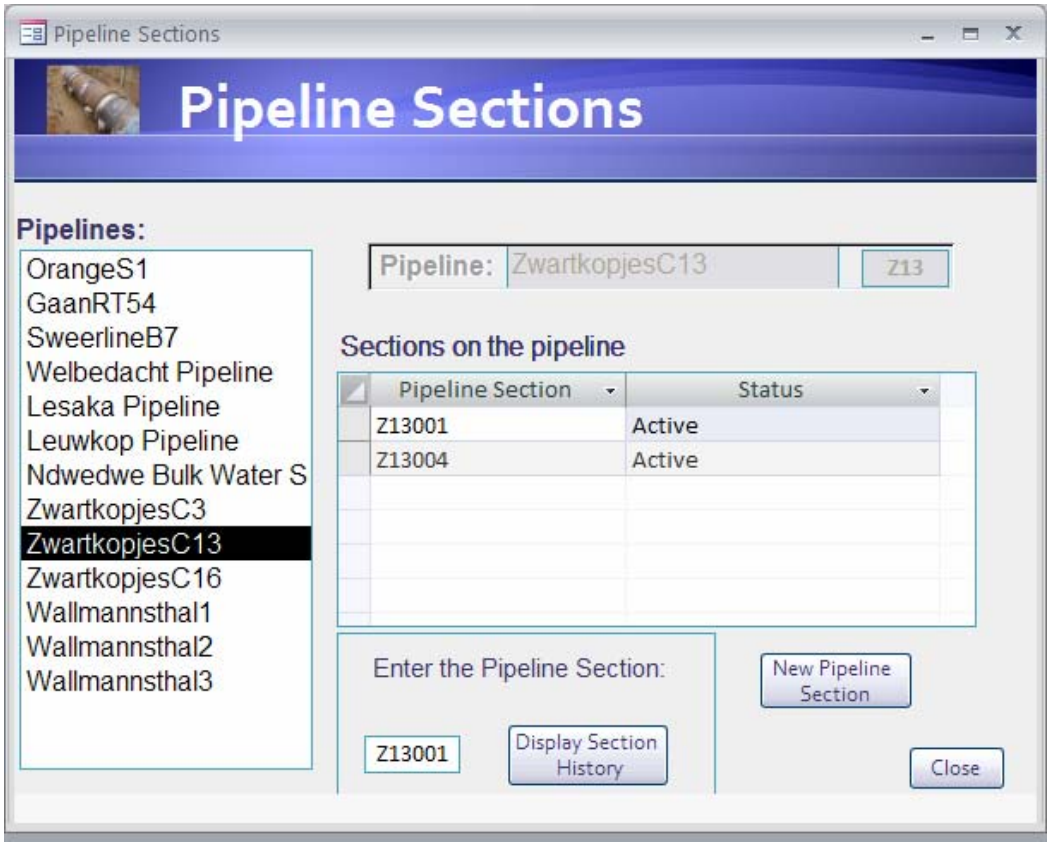


Figure 12: View Pipeline Sections

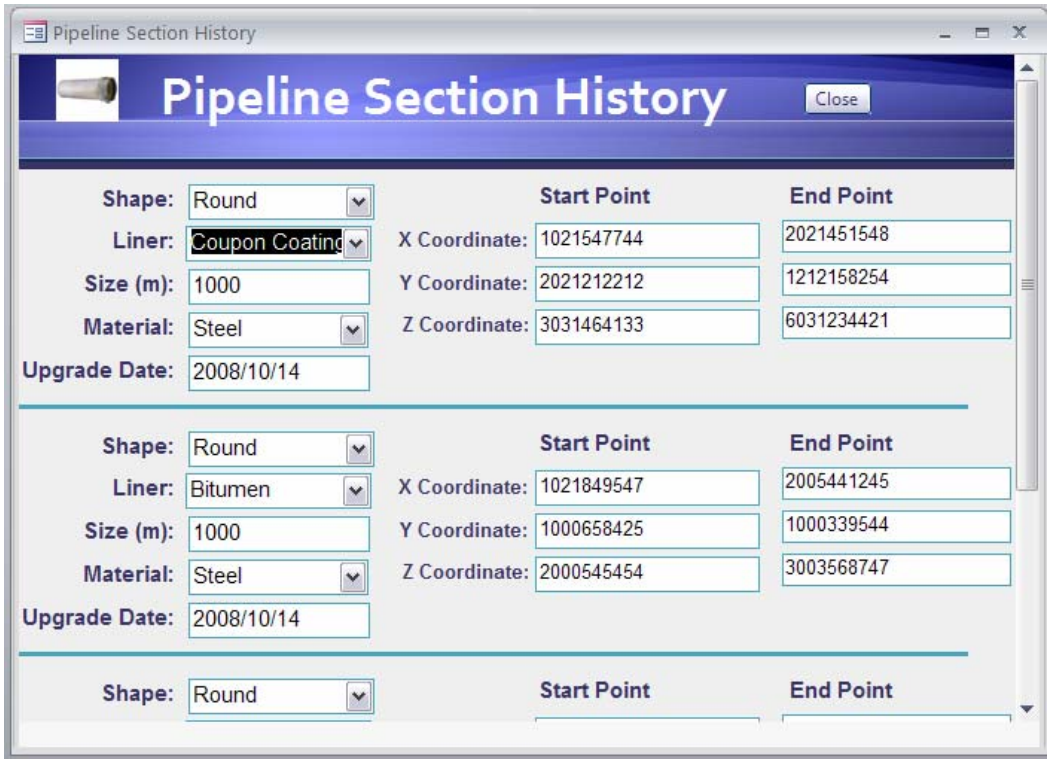


Figure 13: Pipeline Section History

Recommendations:

- The adding of a new pipeline section and viewing of current pipeline sections should be in a tab structure, but due to limitations of MS Access this was not possible (the list box feature becomes inactive).
- The display of a pipeline section's history should be done automatically without first having to enter it in the textbox. This was a design limitation regarding MS Access.

10. Pipeline Components

The pipeline components main menu (figure 14) allows the user to add new components to a pipeline section or view the components on a specific pipeline section.

Figure 14: Pipeline Components Main Menu

10.1 New Pipeline Components

The new pipeline components screen (figure 15) allows the user to enter a new pipeline section component. Drop-down boxes as well as the current date function 'date()' makes the process of entering a new component user-friendly.

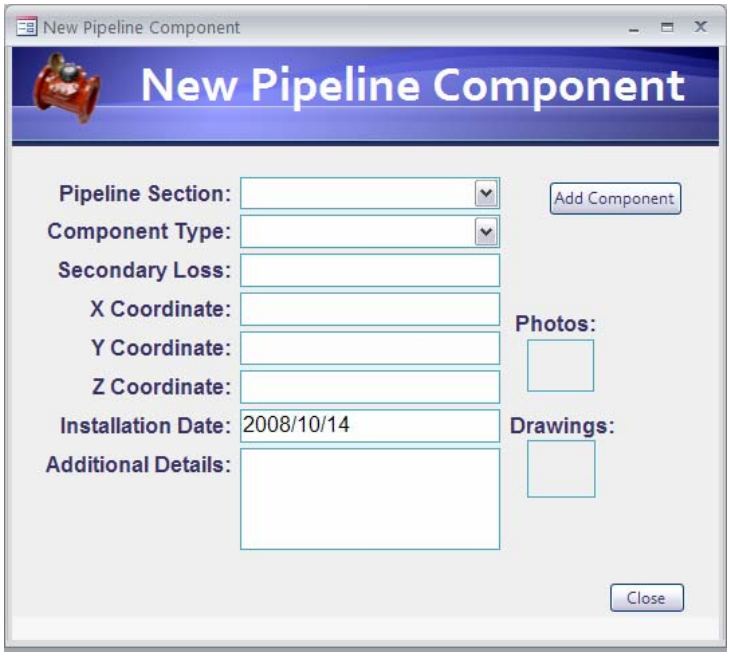


Figure 15: New Pipeline Component

10.2 View Pipeline Section Components

The pipeline section components screen (figure 16) displays the current pipeline sections. Selecting a pipeline section from the list displays the components on that section of pipe. Entering the component ID in the textbox will display the components history details (figure 17).

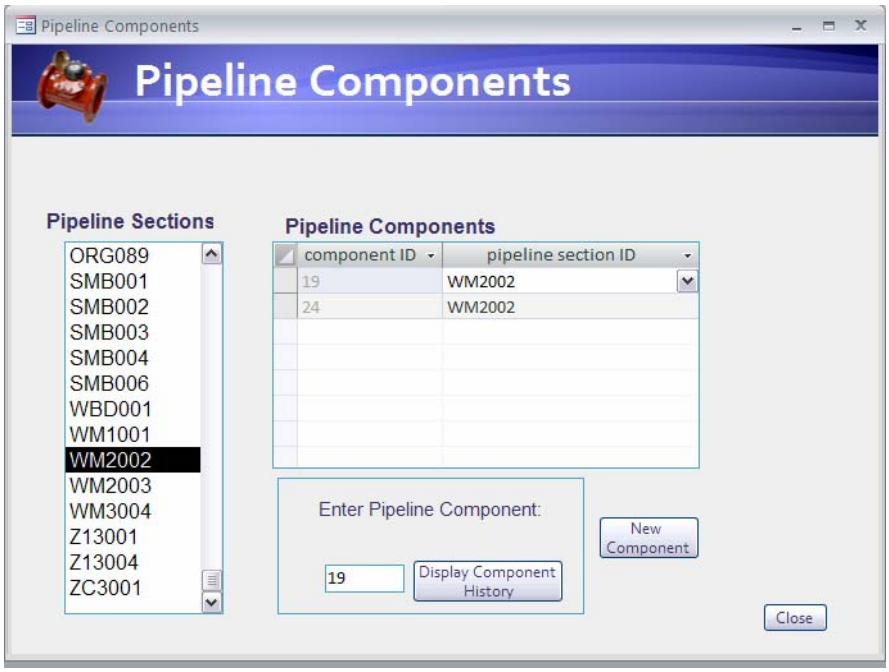


Figure 16: View Pipeline Components

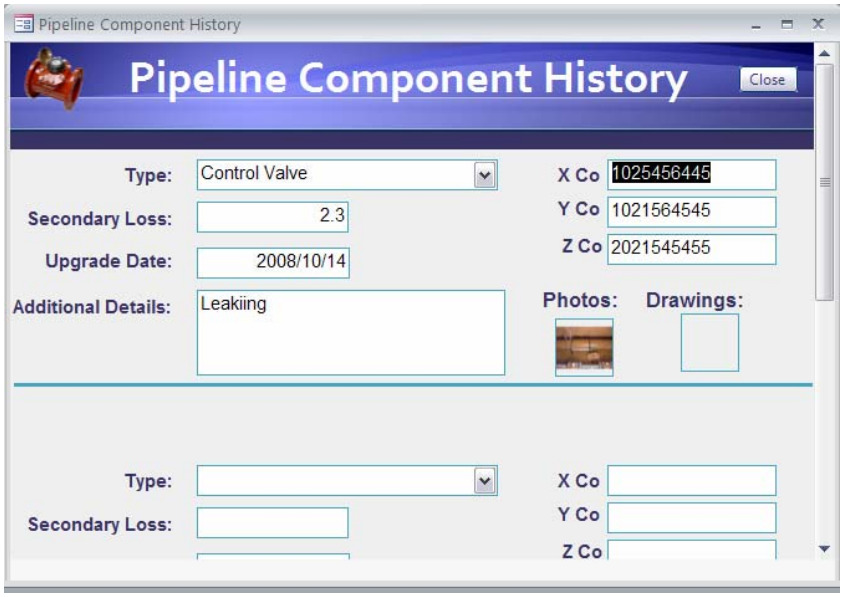


Figure 17: Pipeline Component History

Recommendations

- The adding of a new pipeline component and viewing of current pipeline component should be in a tab structure, but due to limitations of MS Access this was not possible (the list box feature becomes inactive).
- The display of a pipeline component's history should be done automatically without first having to enter it in the textbox. This was a design limitation regarding MS Access.
- It would be desirable to first have a list of pipeline systems and by selecting a system; the pipeline sections are then displayed. This will avoid a long list of all pipeline sections being displayed when one just want to look at specific sections of a pipeline system and its accompanying components.

11. Pump Stations

The pump station main menu (figure 18) allows the user to add new pump station, view current pump stations and assign pump stations to pipeline systems.

Figure 18: Pump Station Main Menu

11.1 New Pump Station

The new pump station screen (figure 19) makes use of the current date feature and drop-down boxes to make it user friendly. Attachments of a pump station drawings and photos can be added to records.

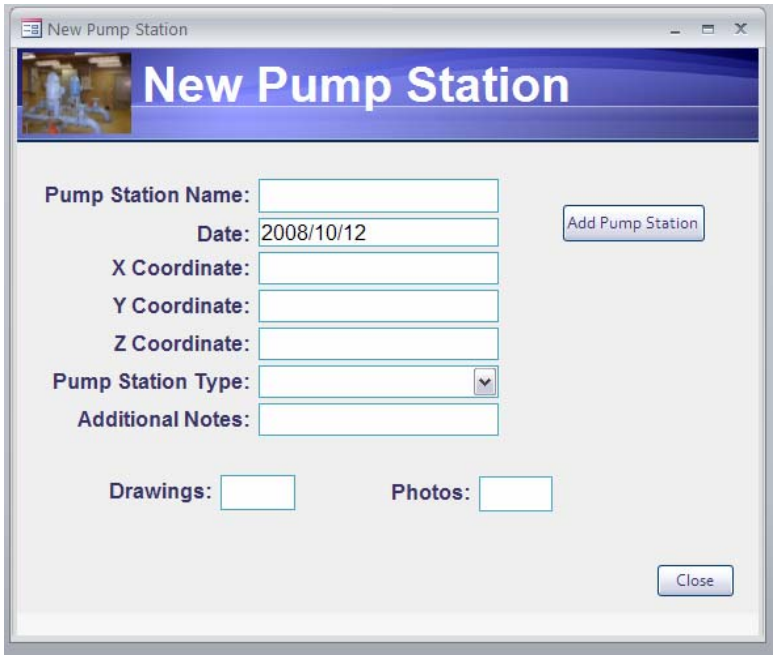


Figure 19: New Pump Station

11.2 View Pump Stations

The pump station screen (figure 20) allows the user to view a list of current pump station. By selecting a pump station, details are displayed. The screen has a link to the GIS in order to view the location of the pump station and the details of the surrounding area.

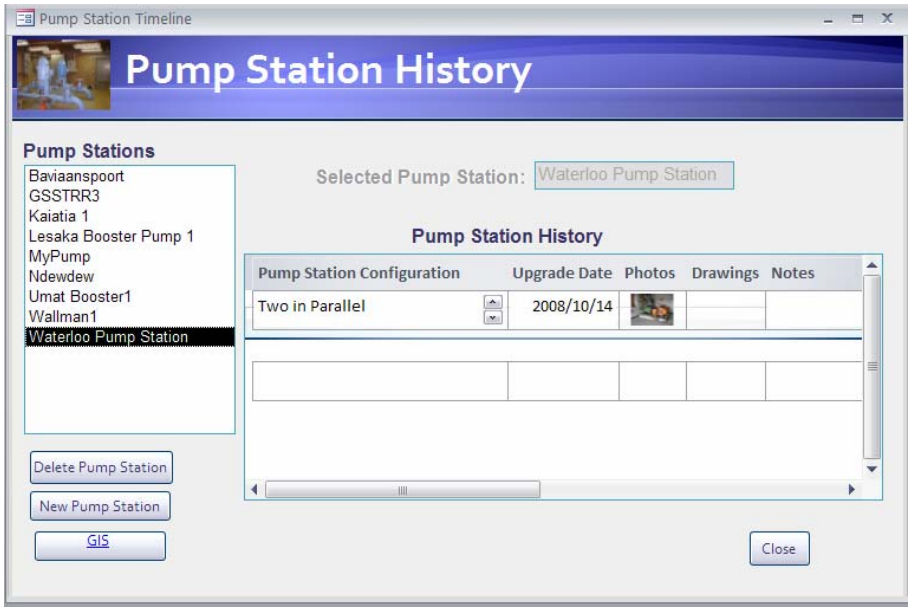


Figure 20: Pump Station History

11.3 Assign Pump Stations

The pump station assignment screen (figure 21) allows the user to assign pump stations to pipeline systems.

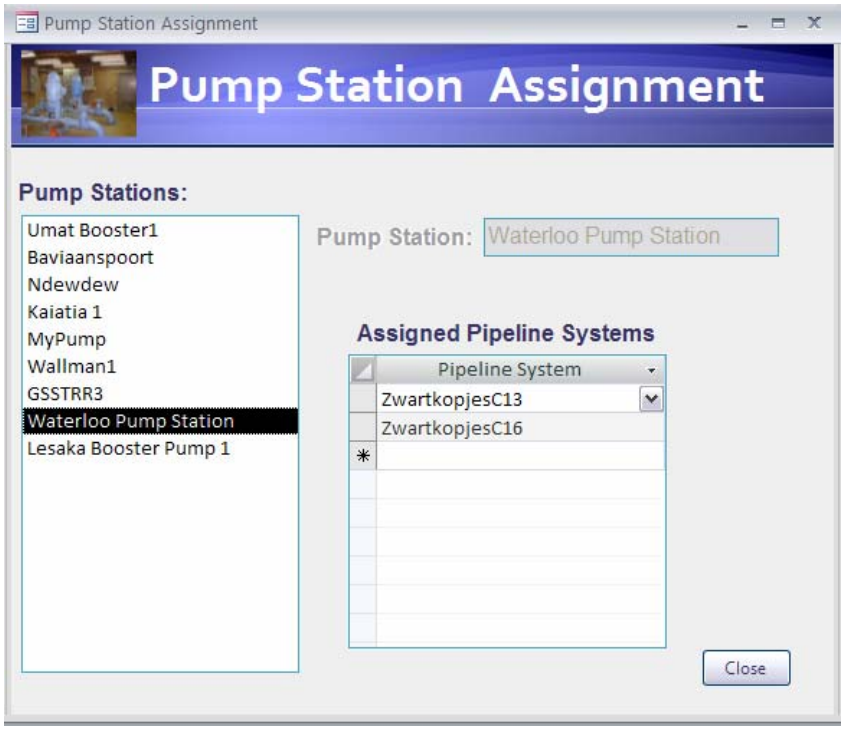


Figure 21: Pump Station Assignment

Recommendations

- The GIS must be active on the final system and by clicking on the button must open the exact position of the pump station.
- A tab structure should be used to display the display the three screens mentioned above, but due to MS Access limitations this was not possible (list boxes became inactive).

12. Reservoirs

The reservoir main menu (figure 22) allows the user to add new reservoirs, view current reservoirs and assign reservoirs to pipeline systems.

Figure 22: Reservoir Main Menu

12.1 New Reservoirs

The new reservoirs screen (figure 23) makes use of the current date feature and drop-down boxes to make it user-friendly to complete the reservoir details. Attachments of the reservoir's drawings and photos can be added.

Figure 23: New Reservoir

12.2 View Reservoirs

The reservoirs screen (figure 24) allows the user to view a list of current reservoirs. By selecting a specific reservoir, details are displayed. The screen has a link to the GIS in order to view the location of the reservoir and the details of the surrounding area.

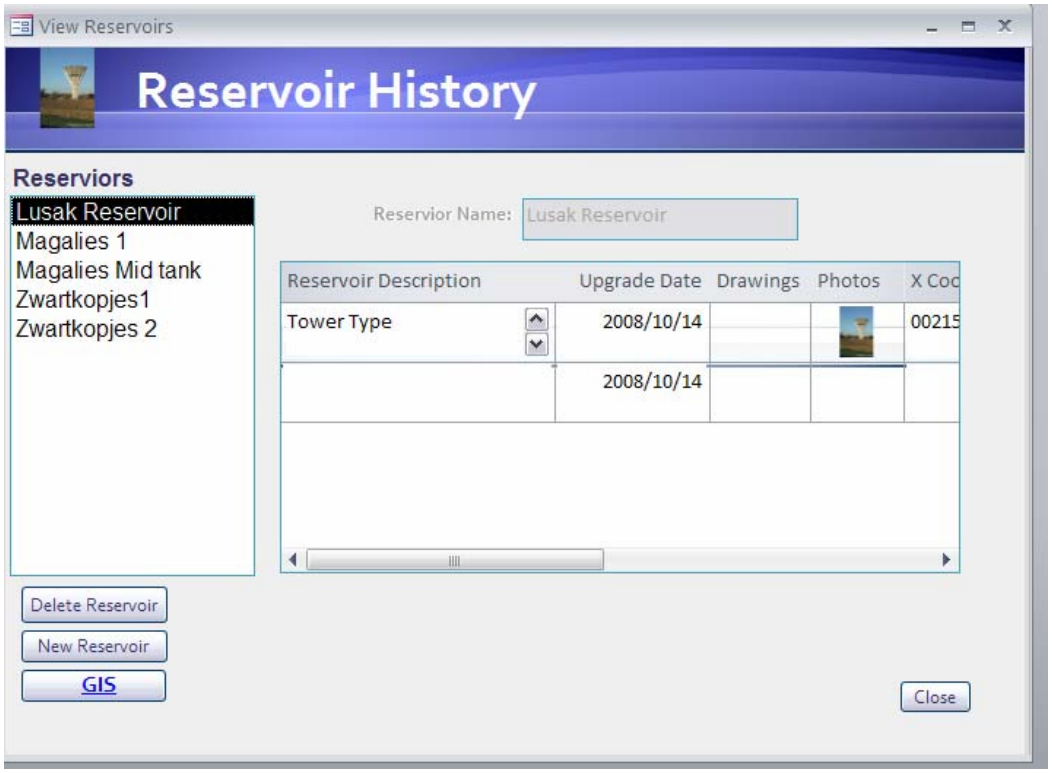


Figure 24: Reservoir History

12.3 Assign Reservoirs

The reservoir assignment screen (figure 25) allows the user to assign reservoirs to pipeline systems.

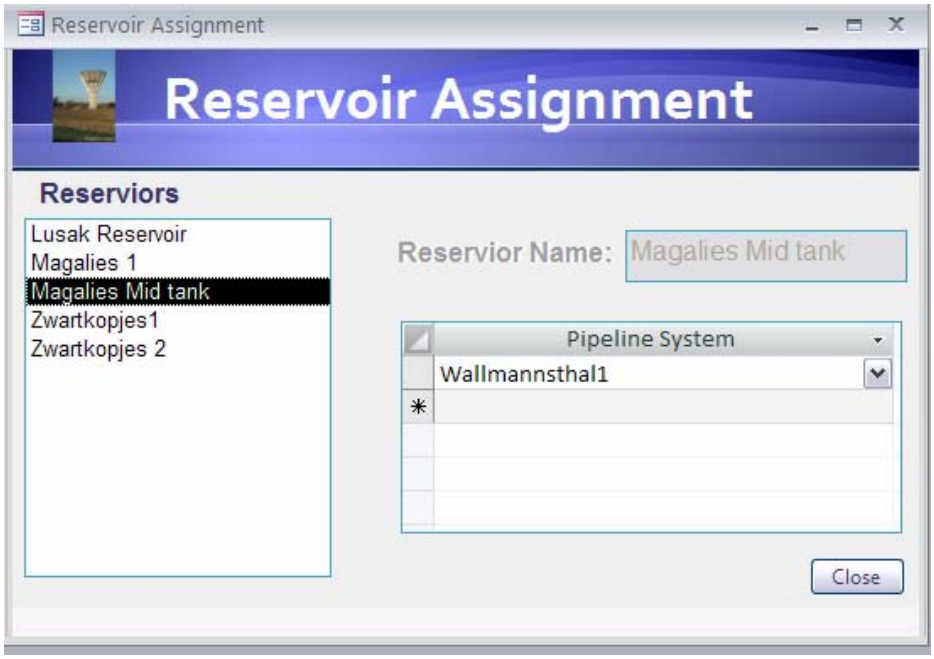


Figure 25: Reservoir Assignment

Recommendations

- The GIS must be active on the final system and by clicking on the button must open the exact position of the pump station.
- A tab structure should be used to display the display the three screens mentioned above, but due to MS Access limitations this was not possible. List boxes became inactive.

13. Data Nodes

The data node main menu (figure 26) allows the user to add new data nodes on a existing pipeline section as well as viewing current data nodes.

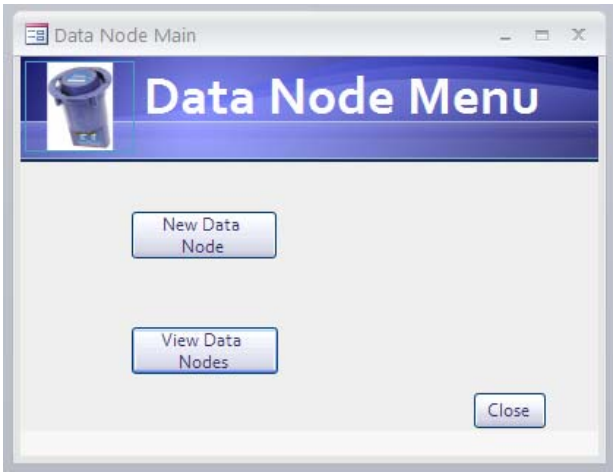


Figure 26: Data Node Main Menu

13.1 New Data Node

The new data node screen (figure 27) makes use of drop-down boxes and current date feature to make the data entering process user friendly.

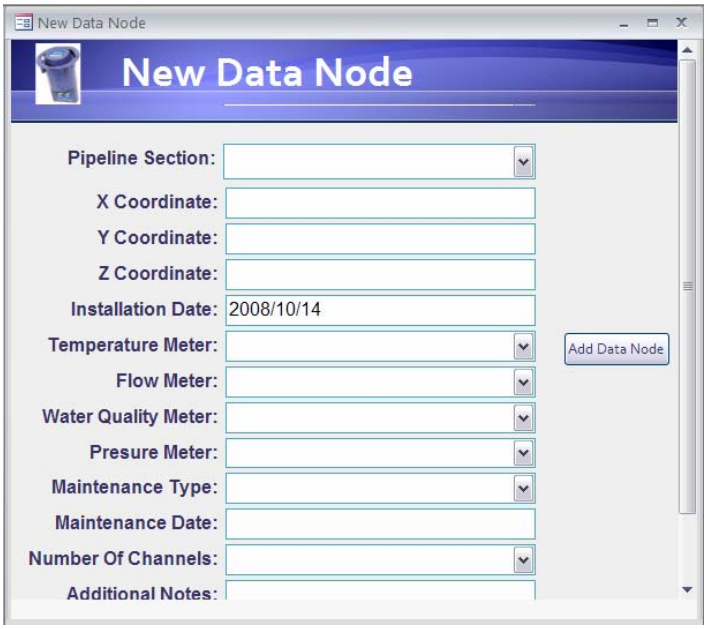


Figure 27: New Data Node

13.2 View Data Nodes

The data node screen (figure 28) displays a list of pipeline sections. By selecting a section, all the data nodes on the section are displayed. The user can then enter a node ID in the text box to display the nodes history records of all the changes that the node has undergone (figure 29).

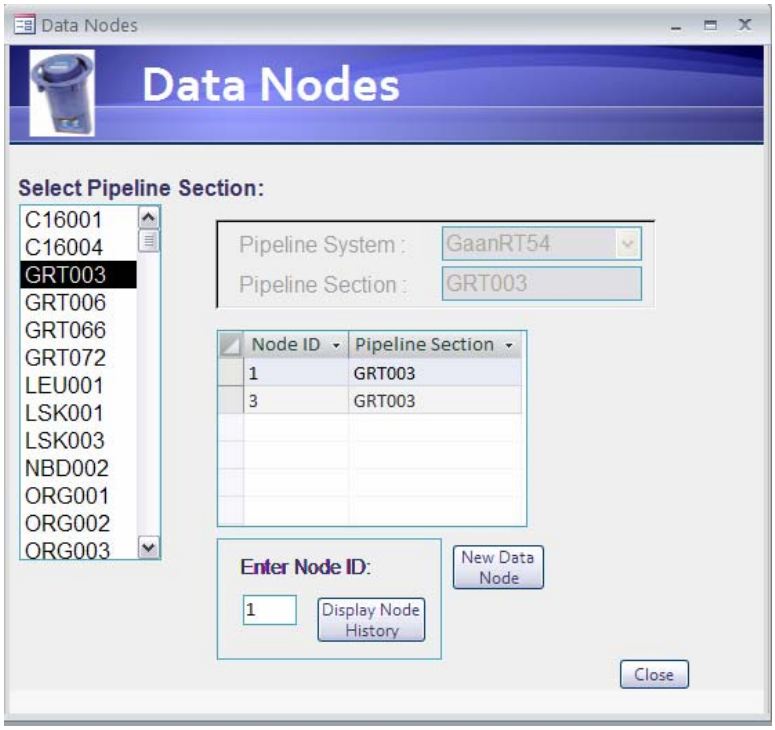


Figure 28: View Data Nodes

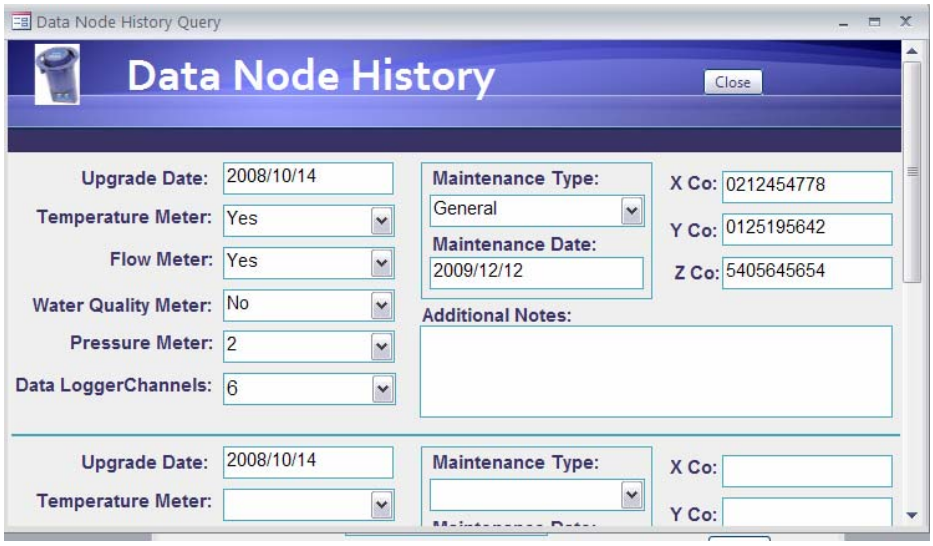


Figure 29: Data Node History

Recommendations:

- The adding of a new data nodes and viewing of current nodes should be in a tab structure, but due to limitations of MS Access this was not possible (the list box feature becomes inactive).
- The display of a data node's history should be done automatically without first having to enter it in the textbox. This was a design limitation regarding MS Access.

14. Maintenance Crew

The maintenance crew screen (figure 30 and figure 31) allows the system user to enter maintenance crew details and assign the crews to pipeline systems via a tab structure. Drop-down boxes we used to make the data entering process user friendly.

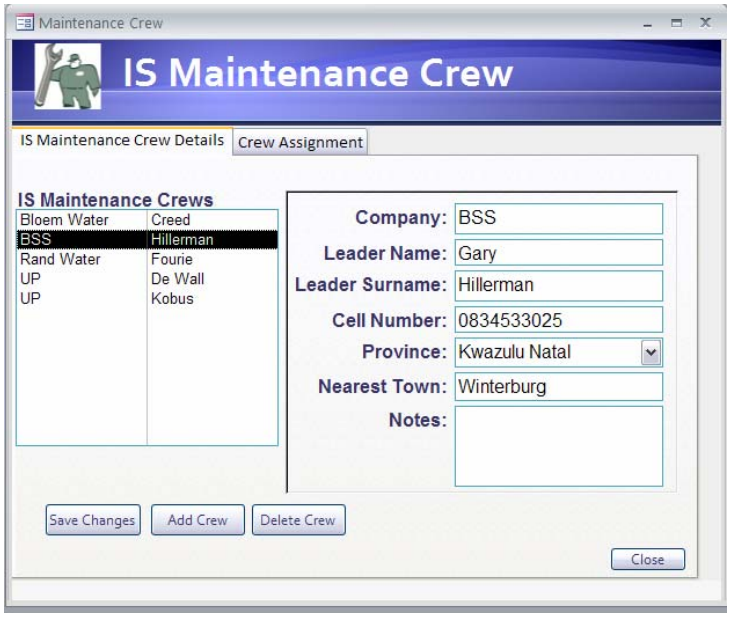


Figure 30: IS Maintenance Crew Details

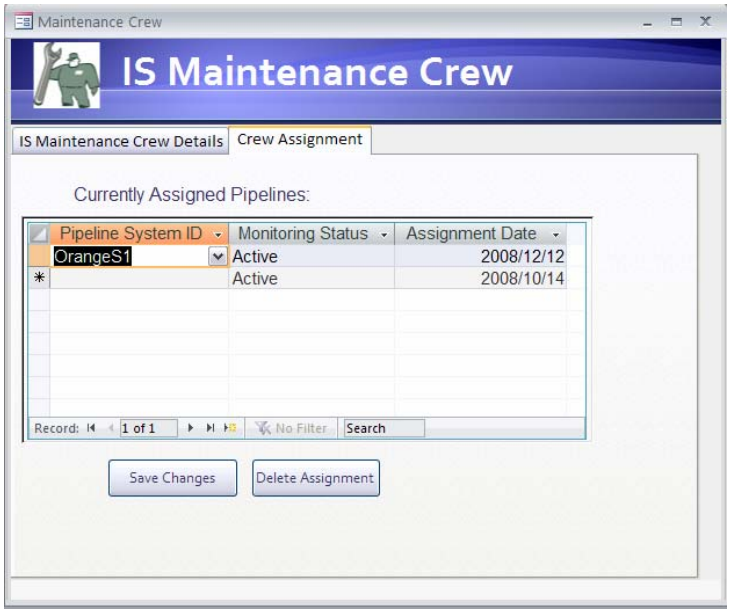


Figure 31: IS Maintenance Crew Assignment

15. Hydraulic Results

The hydraulic results screen (figure 32) displays a list of pipeline sections and by selecting a section the hydraulic results are displayed. These records include the pipe roughness values as well as accompanying graphs and reports.

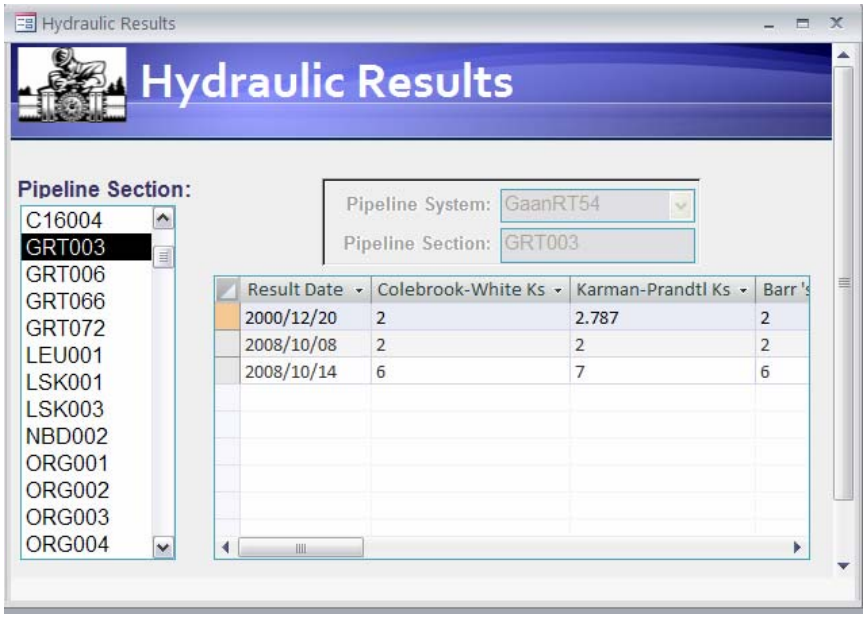


Figure 33: Hydraulic Results

Recommendations:

- A list of pipeline systems must first be displayed. By selecting a specific system all the sections must be displayed. The section can then be selected to display its timeline of hydraulic results.

16. Pipeline Section Split

The pipeline section split menu (figure 34) allows the user to enter a new section split or view all the pipeline sections that hare currently split.

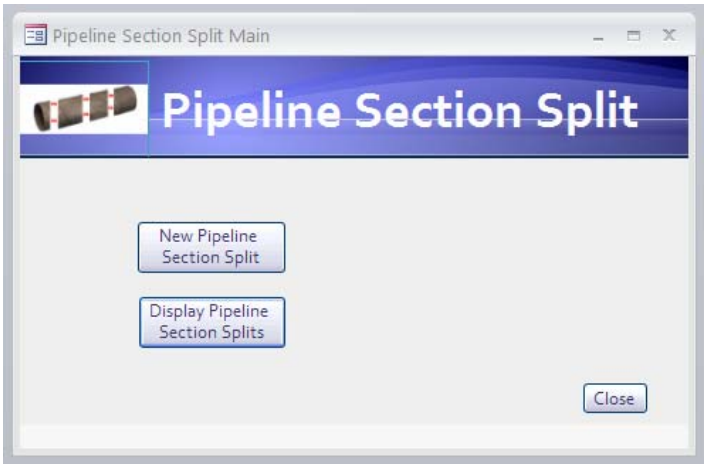


Figure 34: Pipeline Section Split Main Menu

16.1 New Pipeline Section Split

The new pipeline section split screen (figure 35) allows the user to take an existing pipeline section and sub-divided it into smaller sections. This allows the existing information to be kept about the section before the split as well as saving information about the “new” split pipeline sections.

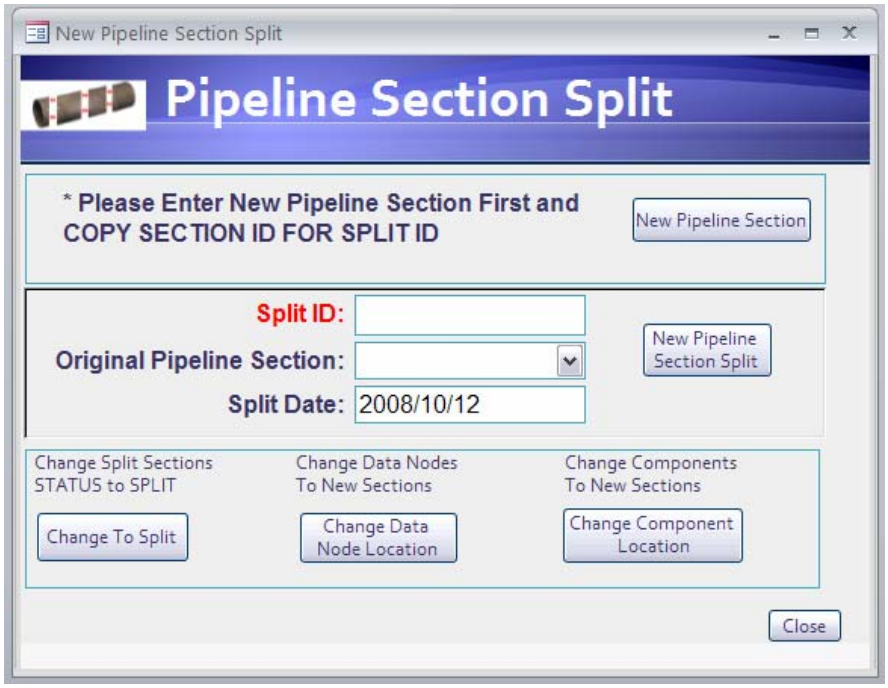


Figure 35: New Pipeline Section Split

Due to the complex nature of splitting a pipeline section and all the changes that have to be made, the process could not be completed automatically by queries as problems arise (e.g. which new section does the data node and components lie on?). Thus the layout of the screen follows a logical sequence in order to make the changes. Pipeline section splits do not occur often so it is not such a great concern that the process takes time.

Recommendations:

- The screen must be redesigned to make it more user-friendly and automated.

16.2 View Pipeline Section Splits

The pipeline section split screen (figure 36) displays a list of all the pipeline sections that have been split. By selecting a section the right-hand side displays the “new” sections that have originated from the split.

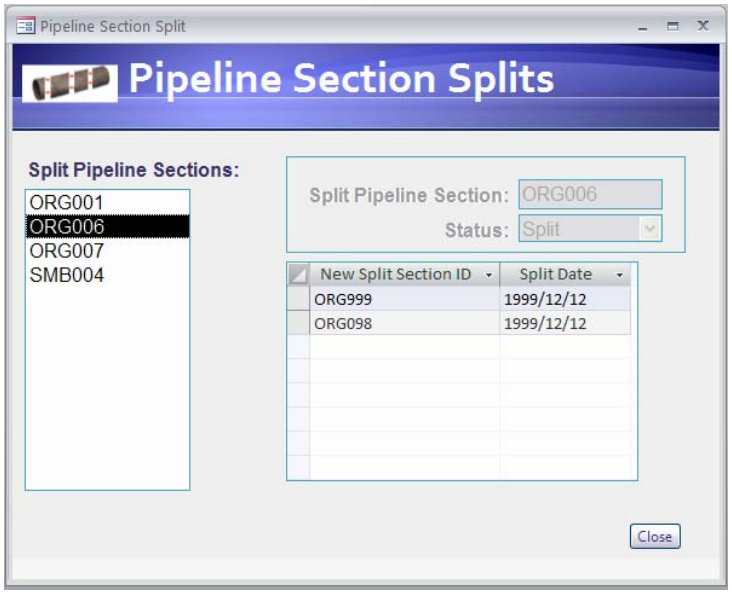


Figure 36: Pipeline Section Splits

17. Pipeline Section Merger

The pipeline section merger main menu (figure 37) allows the user to add new pipeline section mergers as well as view merged pipeline sections.

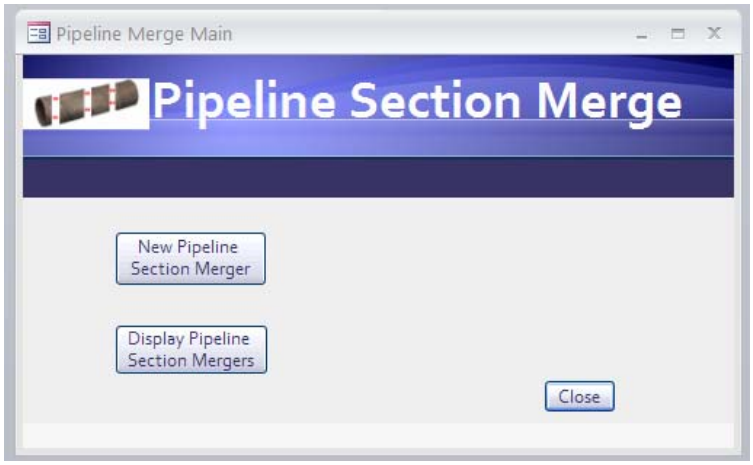


Figure 37: Pipeline Section Mergers Main Menu

17.1 New Pipeline Section Merger

The new pipeline section merger screen (figure 38) allows the user to take existing pipeline sections and combine then into larger sections. This allows the existing information to be kept about the sections before the merger as well as saving information about the "new" merged pipeline section.

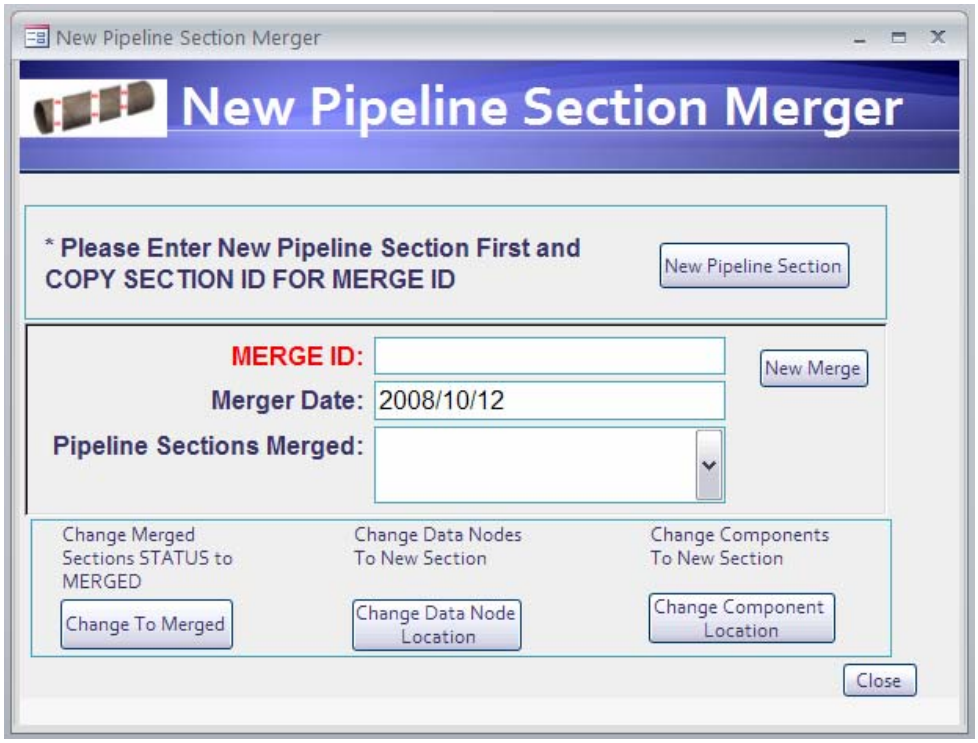


Figure 38: New Pipeline Section Merger

Due to the complex nature of merging pipeline sections and all the changes that have to be made, the process could not be completed automatically by queries (e.g. multi-valued fields were used which cannot be used in queries). The layout of the screen follows a logical sequence in order to make the changes. Pipeline section mergers do not occur often so it is not such a great concern that the process takes time.

Recommendations:

- The screen must be redesigned to make it more user-friendly and automated.

17.2 View Merged Pipeline Sections

The merged pipeline section screen (figure 39) displays a list of all the “new” pipeline sections that have been merged from existing sections. By selecting a section the right-hand side of the screen displays the details of which sections were merged to form the “new” section.

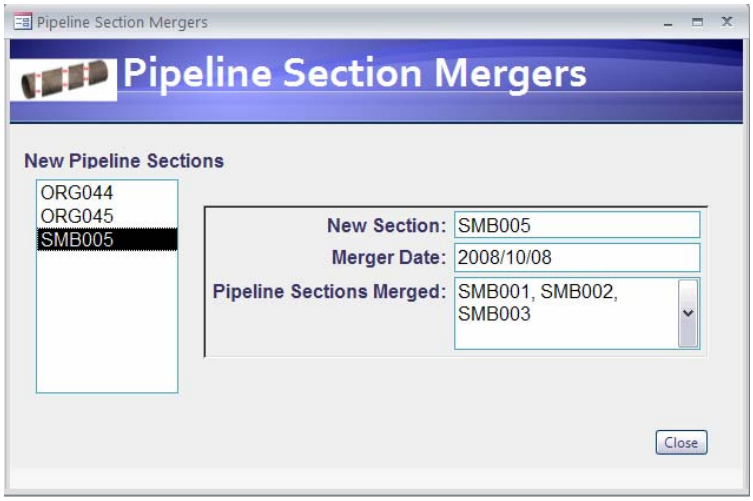


Figure 39: Pipeline Section Mergers

18. Reports

The reports main menu (figure 40) allows the user to select which type of report they would like to display namely; Data Node Maintenance, Hydraulic Results, Pipeline Owners, Split Pipeline Sections and Merged Pipeline Sections.

Figure 40: Reports Main Menu

18.1 Data Node Maintenance Report

The data maintenance report (figure 41) displays all the upcoming data nodes that require service. The date and description of the service is given. It displays on which pipeline section the node lies.

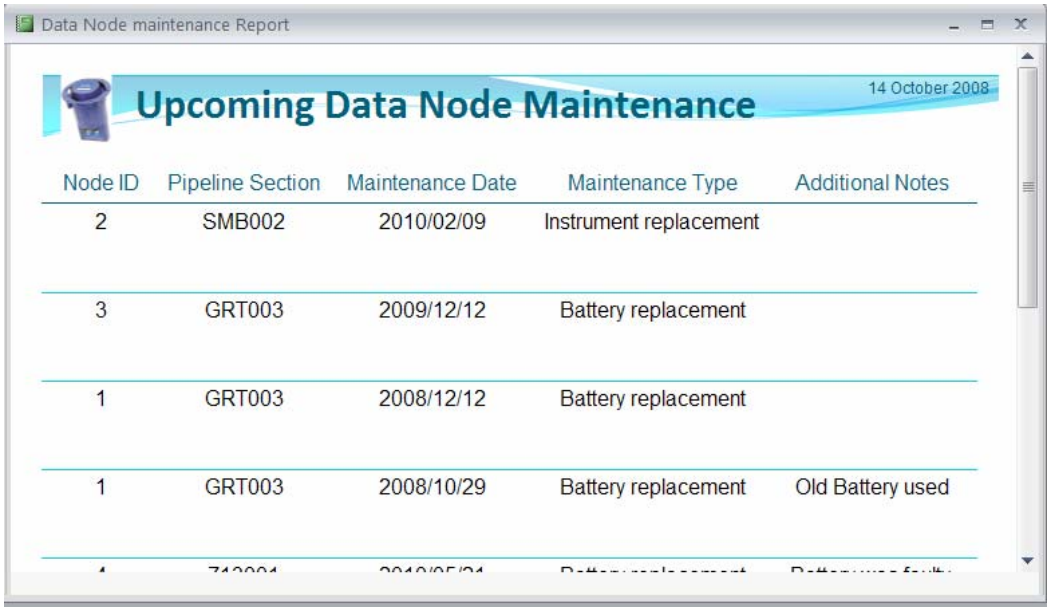


Figure 41: Upcoming Data Node Maintenance Report

18.2 Hydraulic Results Report

The input screen (figure 42) allows the user to input the pipeline section for which the hydraulic report must be displayed.

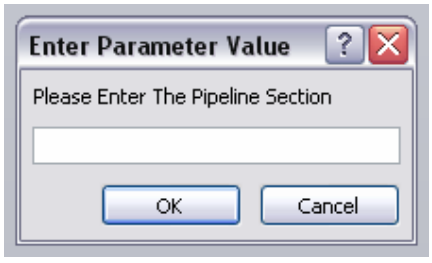


Figure 42: Enter Pipeline Section Screen

The hydraulic report (figure 43) displays the pipe roughness calculated by five different methods and the accompanying graphs for a specific pipeline section.

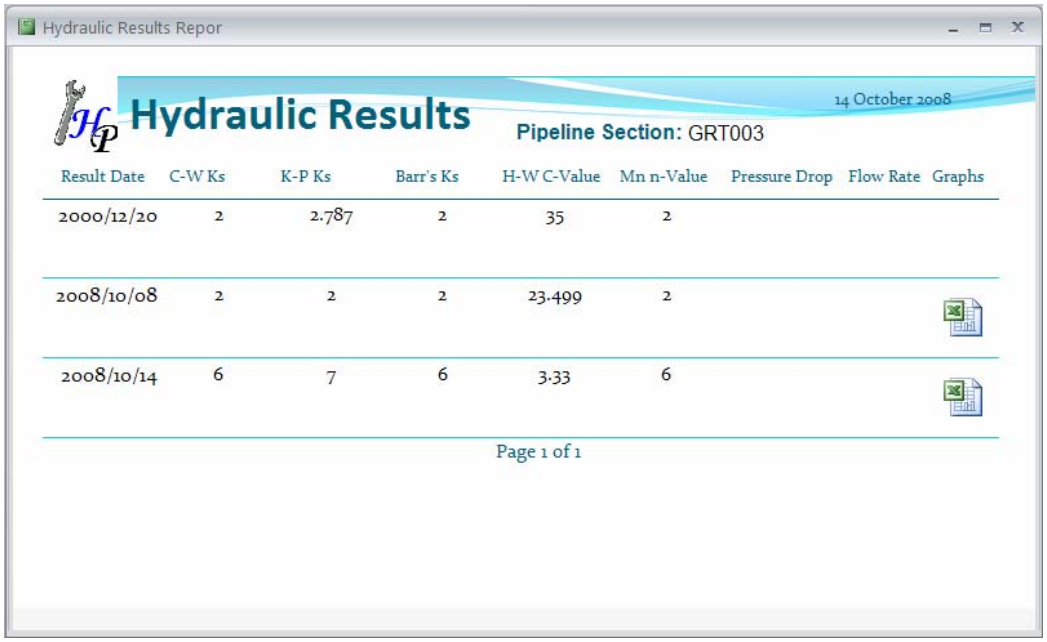


Figure 43: Hydraulic Results Report

18.3 Pipeline Owners Report

The pipeline owner report (figure 44) displays all the pipeline owners and their essential contact details. The project team uses these details to keep in contact with the owners.

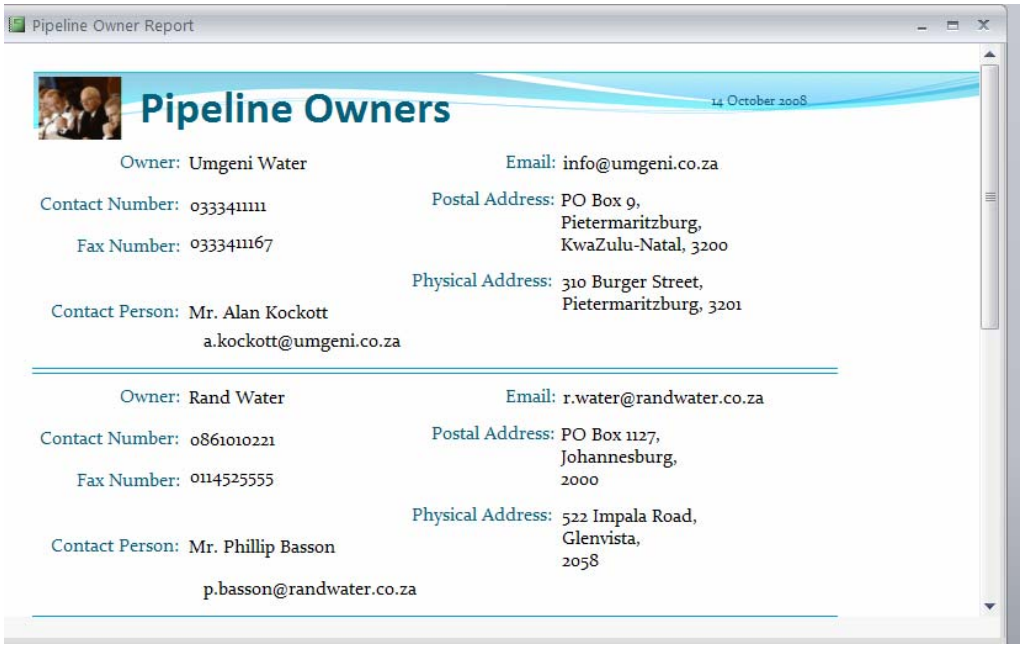


Figure 44: Pipeline Owners Report

18.4 Split Pipeline Sections Report

The split pipeline sections report (figure 45) displays all the “new” pipeline sections that have been split from existing pipeline sections.

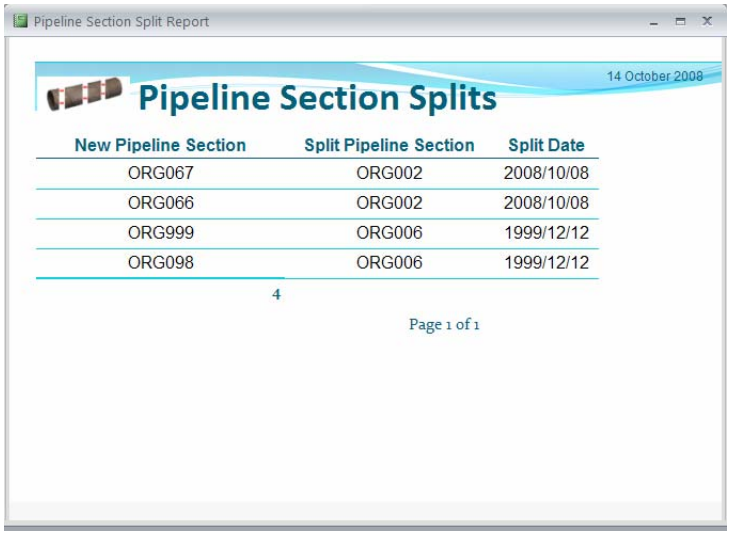


Figure 45: Pipeline Section Splits Report

18.5 Merged Pipeline Sections Report

The merged pipeline sections report (figure 46) displays all the “new” pipeline sections that have originated from merged pipeline sections.

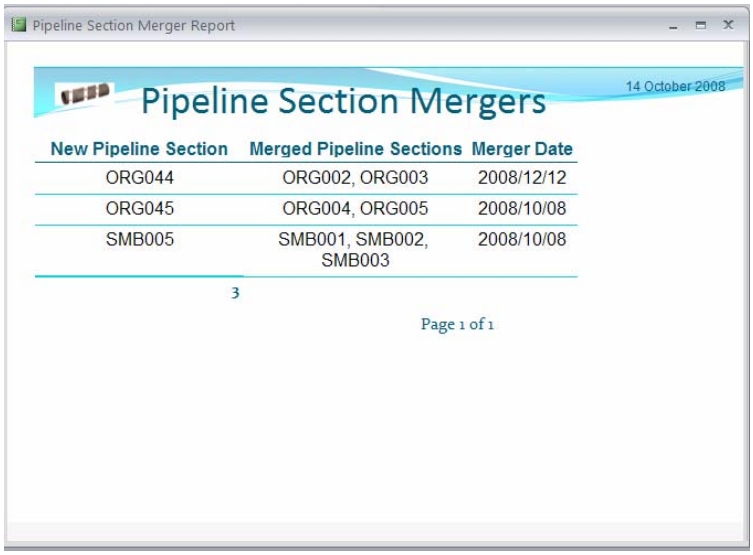


Figure 46: Pipeline Section Mergers Report