QEST Performance Monitor

Quick Start Guide

Document Control

Version	Author	Date	Comment
1.0	Krzysztof Kot	21/05/07	Original Document
1.1	Krzysztof Kot	19/09/07	Modifications for user interface changes
1.2	Krzysztof Kot	18/10/07	Modifications for predictions and interface changes. Added section regarding running of assessments.

1 Introduction

The QEST Performance Monitor is a software package which allows the user to keep track of changes in the performance of concrete mixes easily.

The software allows the user to specify mixes which should be analysed on a regular basis. Mixes are grouped into "Families" which are discussed in more detail in the families section. Concrete mixes can be analysed individually, by simply adding a single mix to a family, or in a group of mixes sharing similar characteristics.

For each family the user can set a number of parameters which will determine how stringent each check of mix performance is as well as what values are expected.

If mixes are found to not be performing as desired the software creates a record reflecting this. A recommended course of action may also be generated.

The analysis performed consists of statistical calculations carried out on test data for the relevant mixes. The statistics obtained as well as the data from which they were calculated are stored alongside the generated recommendations. This allows the user to review all the data relevant to a recommendation should this be desired.

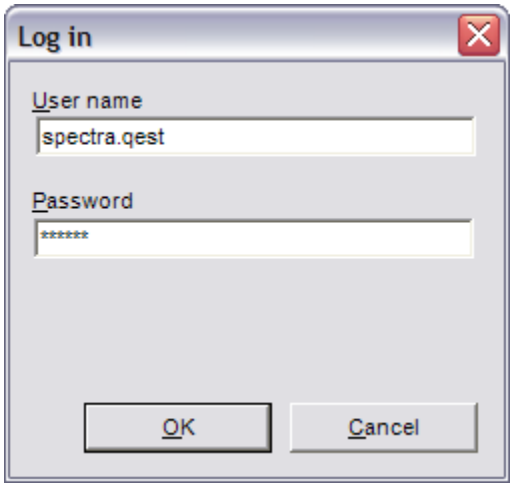
The system will be automated and analyses run nightly on all existing mix families. This should give new data daily regarding the performance of mixes allowing for earlier intervention should an undesirable change occur.

1.1 Logging On

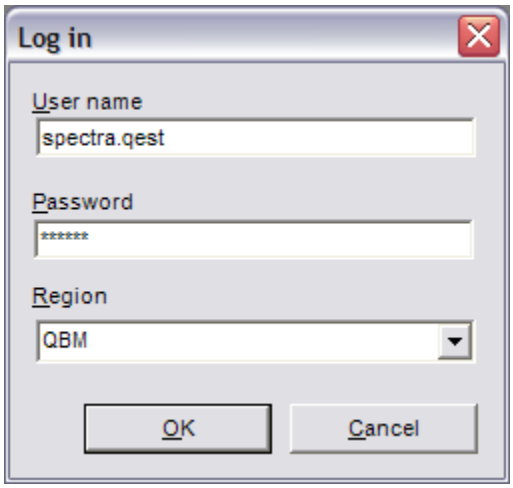
1.1.1 Logging in to the QEST Performance Monitor

Step 1. The QEST Performance Monitor (QPM) Software is currently installed on the Boral R&D system. It should be started in much the same way as QESTLab or QESTMix.

Step 2. When QPM has loaded the QPM log in screen will appear. Use your QESTMix login name and password to gain access.



Step 3. Once the user name and password have been verified, the user will be prompted to choose a region from those available in the drop down box. Users will have access to the same regions as those in QESTMix.



1.1.2 Logging out

1.1.2.1 Logout and change user

It is possible to log a different user in to QPM without shutting down the client and restarting.

Step 1. With QPM running click the **Security** menu then click **Logout**.

Step 2. To login another user, click the **Security** menu then click **Login**.

The new user can then enter their username, password and select a region as normal.

1.1.2.2 Close the QEST Performance Monitor

To close QPM down on your computer click the **File** menu then click **Exit**, or click on the **X** button in the top right corner of the QPM window.

1.2 Navigation

1.2.1 Navigating the QEST Performance Monitor

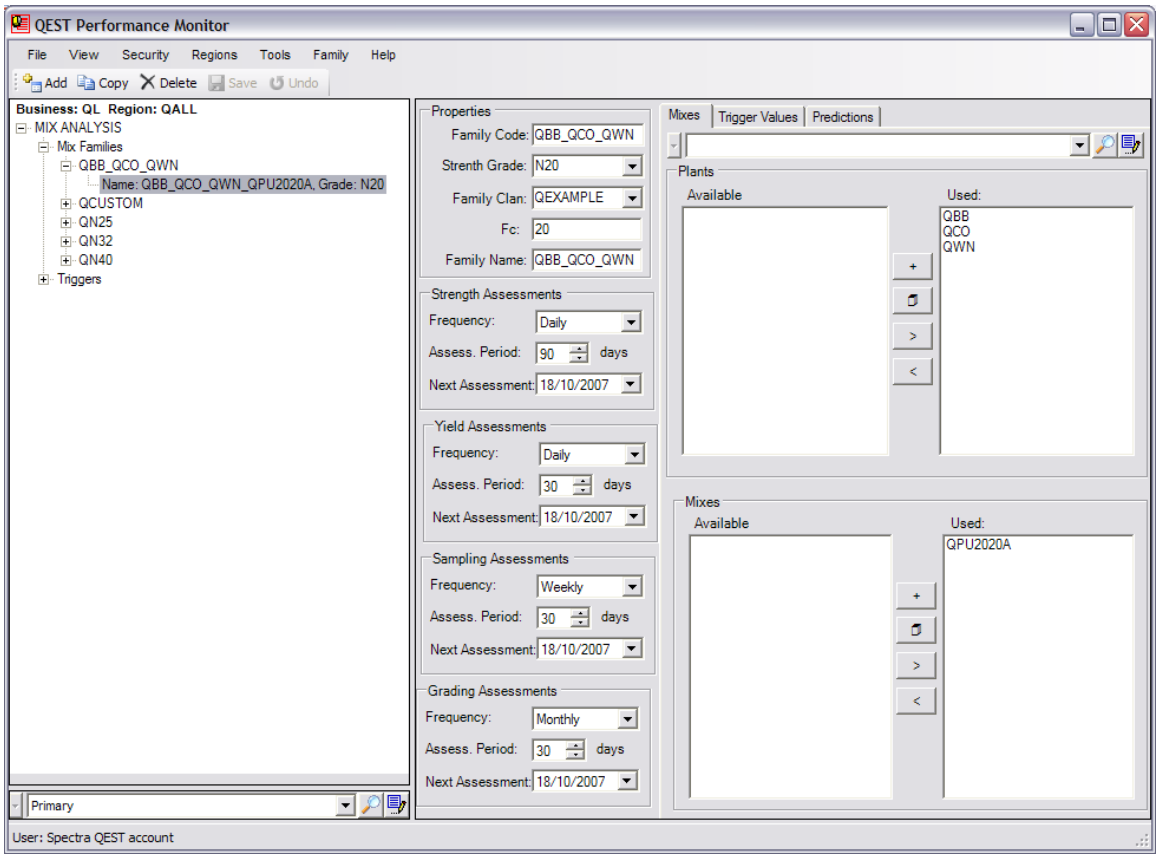
Navigating the QEST Performance Monitor interface is very similar to that of QESTLab and QESTMix. There is a tree on the left hand side which allows the user to manage different areas of the software.

The right hand side of the window will display and allow the user to modify information related to the selection made on the tree.

1.2.1.1 The QEST Performance Monitor Tree

Currently the tree is very simple and allows the user to set up analyses of current mixes. The tree may look slightly different to different users. If a user does not have rights to a specific area then that node of the tree will simply not be displayed. Notice that the current business and region that the user is logged into is shown above the tree. A brief summary of the tree structure follows.

Name		Description
MIX ANALYSIS		The root node for the mix analysis area of the software. Clicking here will not have any effect. Expand this node.
	Mix Families	The items under this node will allow the user to create, modify and delete mix families.
	Triggers	The items under this node will allow the user to create templates for trigger parameter values.



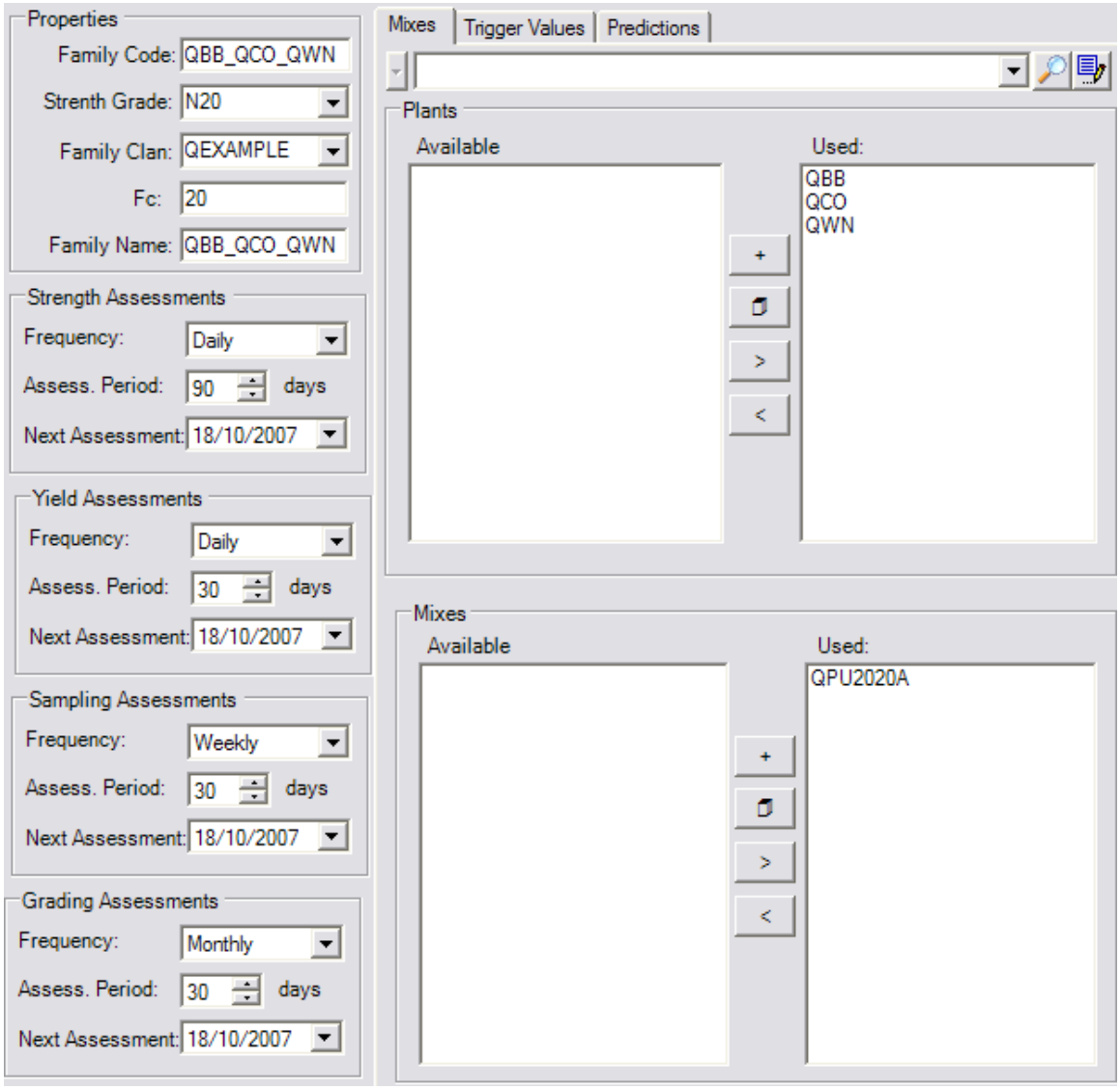
2 Families

2.1 Purpose

A family of mixes is defined as several mixes from one or multiple plants which can be assessed together and have the same target strength.

In other words, families are used to group mixes of a similar nature together. The only restriction currently imposed by the system is that all mixes in a single family must be of the same grade.

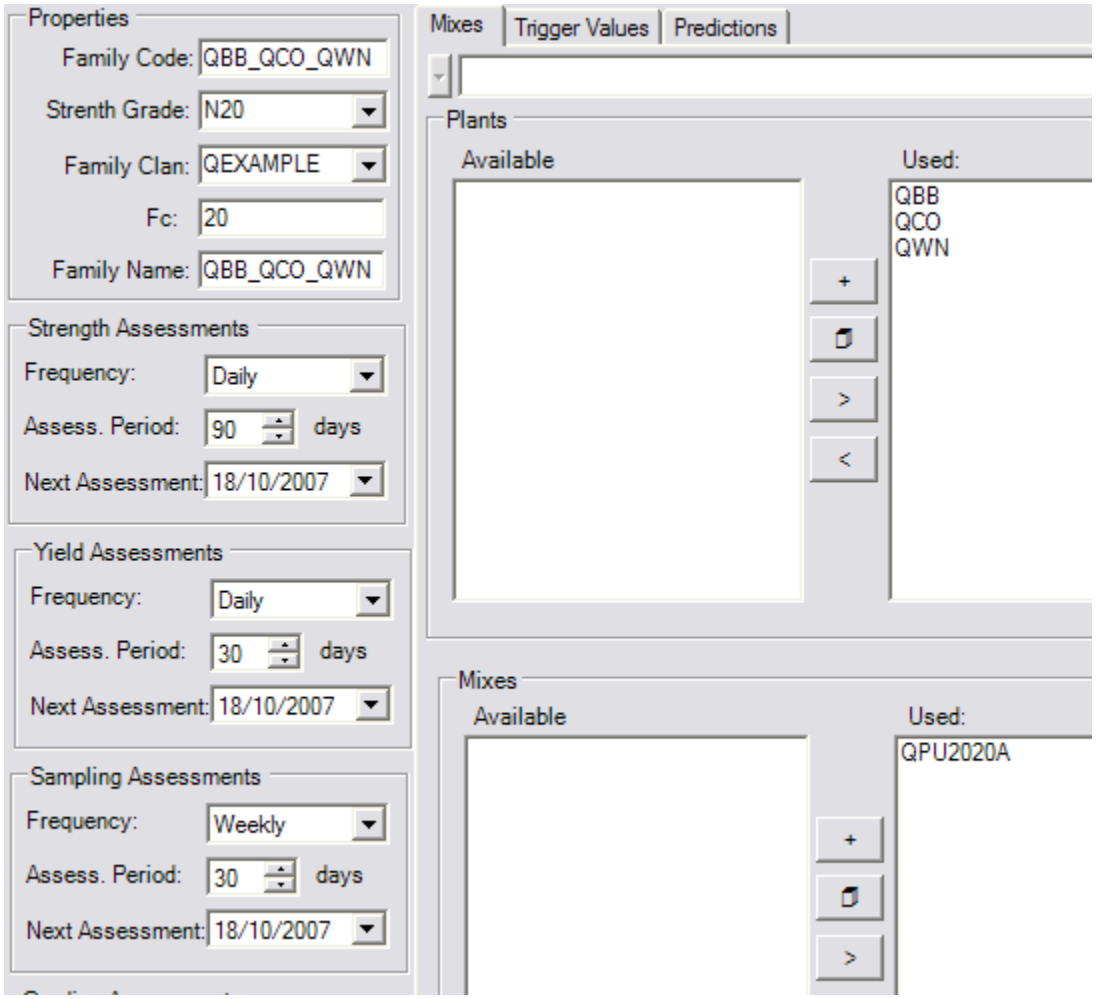
When an analysis is run on a particular family then test data is retrieved which corresponds to a combination of any mix and plant present in the family.



Analysis for the family above will seek out data for the mix 'QPU2020A' from the plants 'QBO', 'QCO' or 'QWN'. This gives three possible valid combinations. If another mix were to be added to this family then the number of valid combinations doubles to six.

2.2 Properties

Each family has a number of properties associated with it which are editable by the user.



The image above shows the family screen within the QEST Performance Monitor. Each element present is described in the associated section below.

The most important aspect of this screen is that this is where the user selects mixes which should be assessed together.

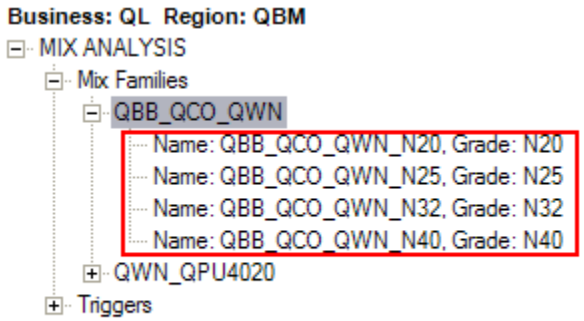
Note that only families from the region that the user is currently logged into will be shown in the tree.

2.2.1 Organisation

2.2.1.1 Code

The family code is used to group families together in the QEST Performance Monitor tree. It should be used to group families which should appear under the same node. It could, for example, be used to group families of the same grade together in the tree. The grouping is entirely up to the user since the code is set upon family creation. Some thought should be given to this grouping and it should be kept consistent to avoid confusion.

The codes will automatically be preceded by the business prefix of the region the user is currently logged into and may be up to twelve characters in length.



In the screenshot above the highlighted families have the code, 'QBB_QCO_QWN'. They have been grouped by the plants present in the families.

It is recommended that group codes take the following format: [Business Prefix][Grade].

2.2.1.2 Grade

The grade of the family is initially used to determine its' F'c value. This Fc value is used when determining target strength for a particular family.

The grade may be up to twelve characters in length.

2.2.1.3 Clan

Each family may belong to a clan which is yet another way of grouping families.

There are no limits regarding which families may belong to a clan. A families clan membership may be changed at any time using the available drop down.

The clan may be up to twenty characters in length.

2.2.1.4 Name

The name of a family is used to identify it within a region. Two families may have the same name but this is not recommended unless their grades differ. The family name and grade is displayed in the QEST Performance Monitor tree. The name of a family can be modified at any time and may be up to fifty characters in length.

It is currently recommended that users stick to one of the following conventions when deciding on a name for a new family:

1) [Business Prefix (enforced)][Grade][Cementitious Materials]
2) [Business Prefix (enforced)][Plant][Mix Code]

For example, QFNQN20GP would be used for a family consisting of N20 mixes using non-blended cement from far North Queensland under convention 1).

Convention 2) should be used for families consisting of single mixes and plants. It is also recommended that the elements in these codes be separated either with spaces or underscores. So, the example name given above could be "QFNQ N20 GP" or "QFNQ_N20_GP" etc.

More recommendations relating to setting up families can be found in the document titled "QEST Performance Monitor - Configuring Families".

2.2.2 Data

2.2.2.1 Mixes

The mixes present in the family will be assessed together when an assessment is run.

For instance, if a sample is found with 28 day strength results it will only be used if the mix which was used for the sample is present in the family.

Mixes can be added or removed at any time.

2.2.2.2 Plants

Data for the mixes present in the family will only be used if the mix is found to come from one of these plants.

For instance, if a sample is found with 28 day strength results it will only be used if the plant from which the sample originated is present in the family.

Plants may be added or removed at any time.

2.2.3 Assessments

This section only deals with assessments in a very brief fashion, for a more thorough discussion please see the assessments section.

2.2.3.1 Assessment Frequencies

The assessments which are carried out by the software will run at pre-configured intervals. The frequencies of assessments can be set up on a per-family basis on the family screen.

The frequencies are set to default values when a family is first created but can be modified as desired.

If an assessment is run on the 1st of January 2007 and the assessment frequency is set to "Monthly" then the date on which the next assessment should be run will be set to the 1st of February 2007.

Note that it is possible to overwrite this value, which is automatically updated whenever assessments run. By doing so the user can set assessments to run more or less often for a given family as desired.

2.2.3.2 Assessment Periods

The assessment period refers to how far back the related assessment will search for data when being run. For instance, a strength assessment will, by default, search for data from the last ninety days.

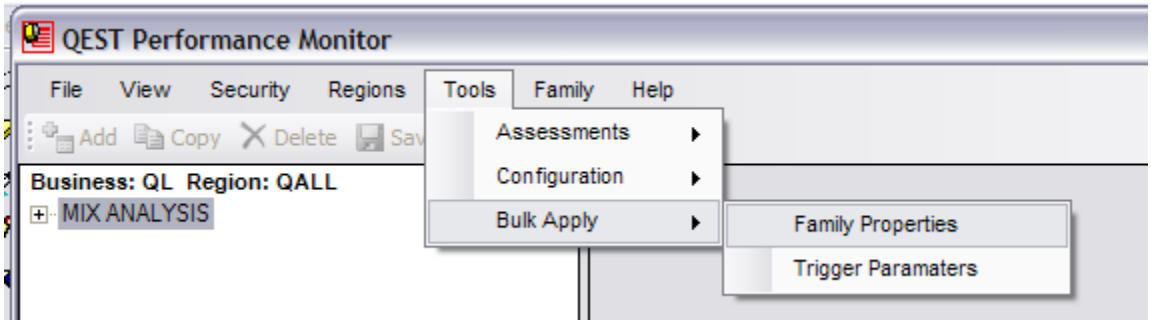
2.2.3.3 Assessment Dates

The dates shown on the family screen against each assessment indicate when that assessment is next due to be run for this particular family.

2.2.4 Predictions

There exists a "Predictions" tab on the family screen. This is used to set up the type of predictions which will take place when running the QEST Performance Monitor. For more information please see "QEST Performance Monitor – Predictions".

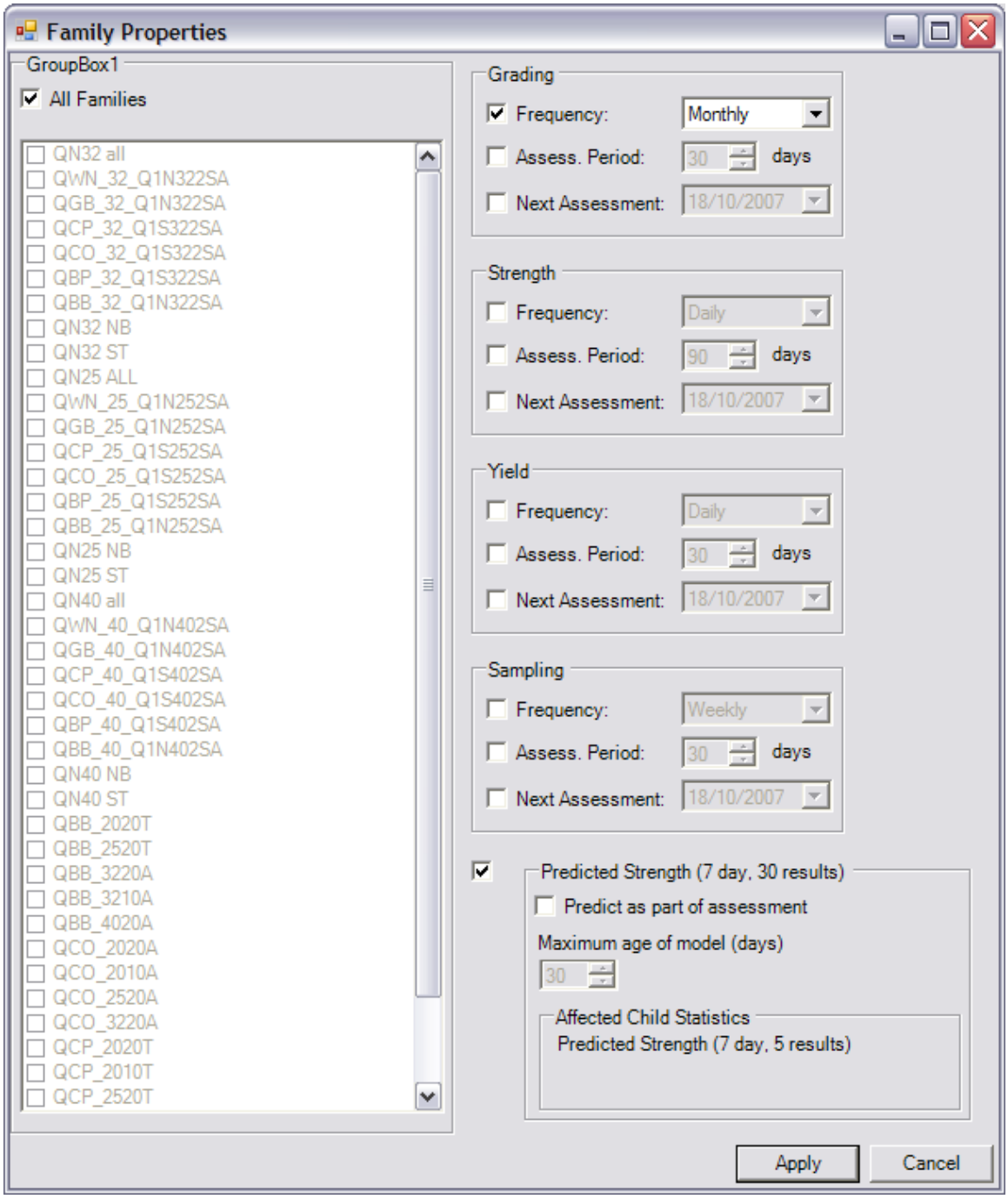
2.2.5 Bulk Apply



It is possible to bulk apply family properties to a number of families at once. This functionality is accessed through the "Tools->Bulk Apply->Family Properties" menu item. Clicking here will present the user with the dialog pictured below.

The user can select the families to which the properties should be applied on the left hand side of the dialog. Ticking any of the properties on the right hand side will cause the selected families to be modified such that their properties reflect the choices made on this dialog.

In the image below, for instance, once the user hits the OK button all the families will have the grading frequency set to "Monthly" and the predictions from seven day strength will not be performed on the fly by the system.

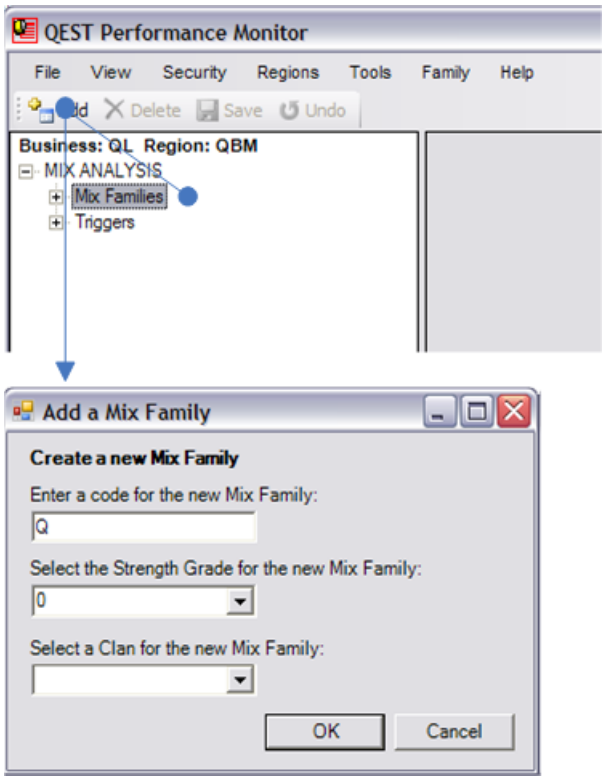


2.3 Adding a Family

2.3.1 Adding a Family

In order to add a family the user must select the 'Mix Families' node on the QEST Performance Monitor tree or a child node thereof. Once a valid node has been selected the 'Add' button in the top right hand corner of the screen will become active. Pressing the 'Add' button will bring up a dialog box requesting family information from the user.

This sequence of actions is pictured below.



At this point the user must decide on which family code this family will belong to and enter this code in the first text box.

The user must then select the grade of mixes which will be allowed in the family. The drop down box will list all available grades which the user can select from. Alternatively the user can type a grade in by hand.

The family code and grade must be entered for each family which is created and the user will be unable to continue until both of these fields are completed.

The third drop down box will allow the user to add this family to an existing clan or create a new clan by typing the desired clan name in this box.

For more information on the purpose of the family code, grade and clan see the Families Properties section.

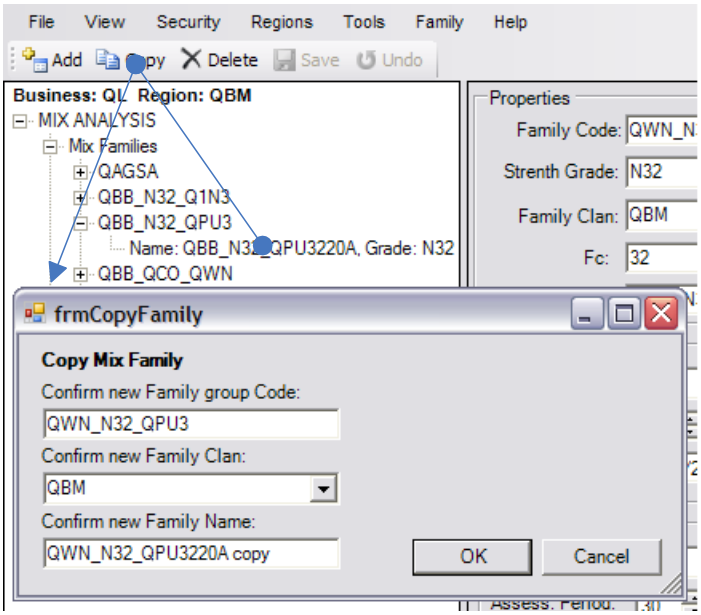
2.3.2 Deleting a Family

In order to delete a family the user must have selected the family which is to be deleted in the tree. At this point the 'Delete' button should become enabled. Clicking on the 'Delete' button will bring up a dialog box asking the user to confirm the action. If the user confirms the deletion by clicking 'Yes' the family will be deleted.

2.3.3 Copying a Family

Families can be copied by using the "Copy" button on the toolstrip menu in the QEST Performance Monitor client. The user should select the desired family then click "Copy" as pictured below.

This will bring up the "Add a Mix Family" dialogue as discussed above. Simply filling the dialogue in with the desired information and clicking the "OK" button will cause a copy of the selected family to be created.



2.4 Adding Plants

In order to add plants to a family the user must first select the desired family from the tree on the left hand side of the screen. At this point the right hand side of the screen should change to allow the user to modify the family as required.

Note that any changes made such as adding or removing items from a family will not be completed until the user saves the changes. This can be achieved by hitting the 'Save' button on the QEST Performance Monitor toolbar or confirming the changes when moving off the document.

2.4.1 Adding a Plant

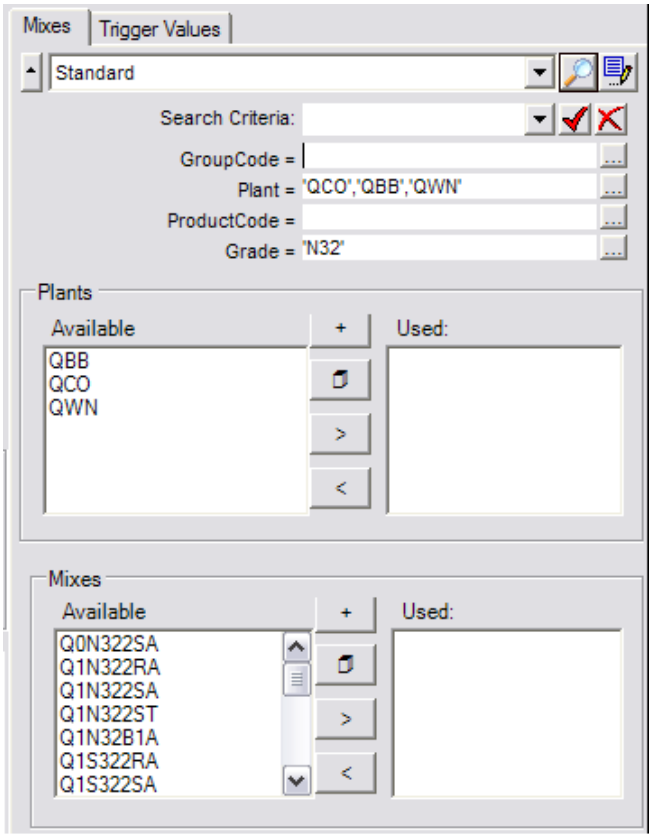
2.4.1.1 Searching

The first step in adding plants to a family is to retrieve a list of viable plants by using the filter present in the family screen.

Upon entering the family screen the user should choose the filter to use, the 'Standard' filter should suffice for most situations.

Once the required filter is selected the user should see the search criteria fields appear. Entering search criteria and refreshing the filter (clicking on the magnifying glass icon) will

cause the 'Available' list boxes under 'Plants' and 'Mixes' to become filled with potential entries which can be used for the current family.



2.4.1.2 Adding

Selecting the desired plant or plants in the 'Available' list box and clicking on the '>' button next to the list box should cause the plant to move into the 'Used' list box.

The plant will now be included in the family.

The button above '>', highlighted below, will automatically shift **all** the entries from the 'Available' list box into the 'Used' list box.

2.4.2 Removing a Plant

The user does not need to perform a search in order to remove a plant from a family. Simply selecting a plant in the 'Used' text box and clicking on the '<' button will remove the plant from the family.

2.5 Adding Mixes

In order to add mixes to a family the user must first select the desired family from the tree on the left hand side of the screen. At this point the right hand side of the screen should change to allow the user to modify the family as required.

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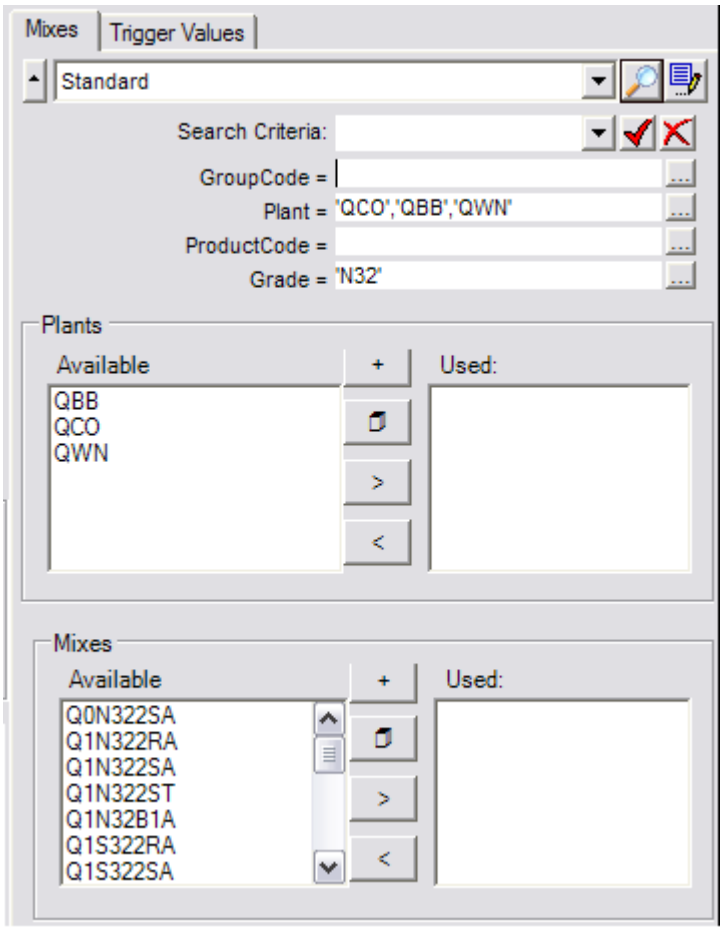

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Selecting the desired mix or mixes in the 'Available' list box and clicking on the '>' button next to the list box should cause the mix to move into the 'Used' list box.

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The button above '>', highlighted below, will automatically shift **all** the entries from the 'Available' list box into the 'Used' list box.

2.5.2 Removing a Mix

The user does not need to perform a search in order to remove a mix from a family. Simply selecting a plant in the 'Used' text box and clicking on the '<' button will remove the plant from the family.

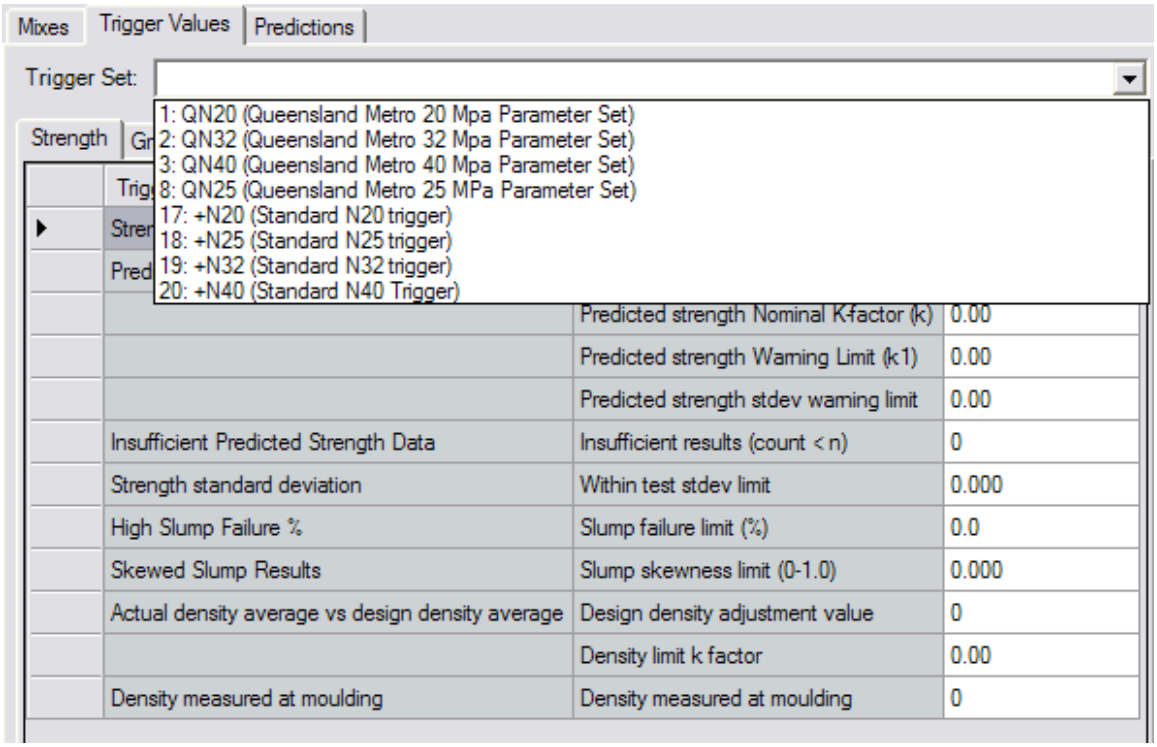
2.6 Triggers

When an assessment is run on a family the parameters required for triggers will be retrieved on a per-family basis. The family screen, therefore, allows the user to set these parameters.

In order to modify the trigger parameters for a family the user must first select the desired family from the tree on the left hand side of the screen. At this point the right hand side of the screen should change to allow the user to modify the family as required.

2.6.1 Modifying Parameters

Clicking on the 'Trigger Values' tab on the family screen will cause the parameters screen to appear. This is pictured below.



The 'Trigger Set' drop down allows the user to choose from any pre-made parameter sets as discussed in the "Trigger Templates" section. Choosing a template will fill all of the trigger parameter values for this family with those defined in the template.

Alternatively, the user is free to set the parameters by simply clicking into the text box next to the desired parameter and typing the desired value.

This screen is color coded with parameters belonging to the same trigger having the same shade next to one another. The parameters for the triggers have been ordered on this screen in the following manner.

- Strength
- Sampling
- Yield

- Grading

A more thorough discussion on trigger parameters is available in the "Trigger Parameters" section.

2.7 Accumulation Tool

2.7.1 Purpose

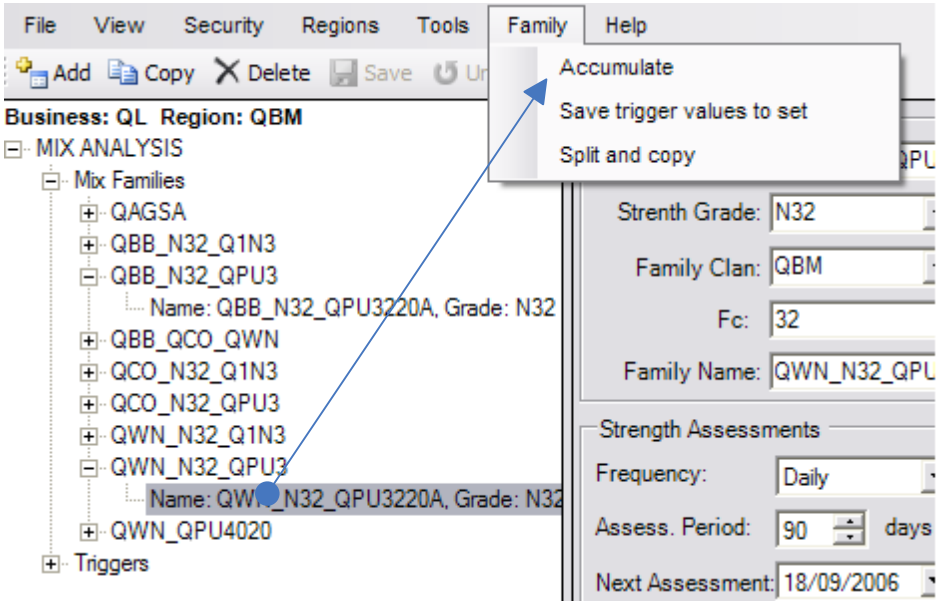
The accumulation tool allows the user to import mixes and plants from families which are in the same clan and of the same grade as the current family. This tool is intended to allow the user to quickly and easily merge families which contain a small number of mixes each into a larger family.

The tool will be most useful when creating new families.

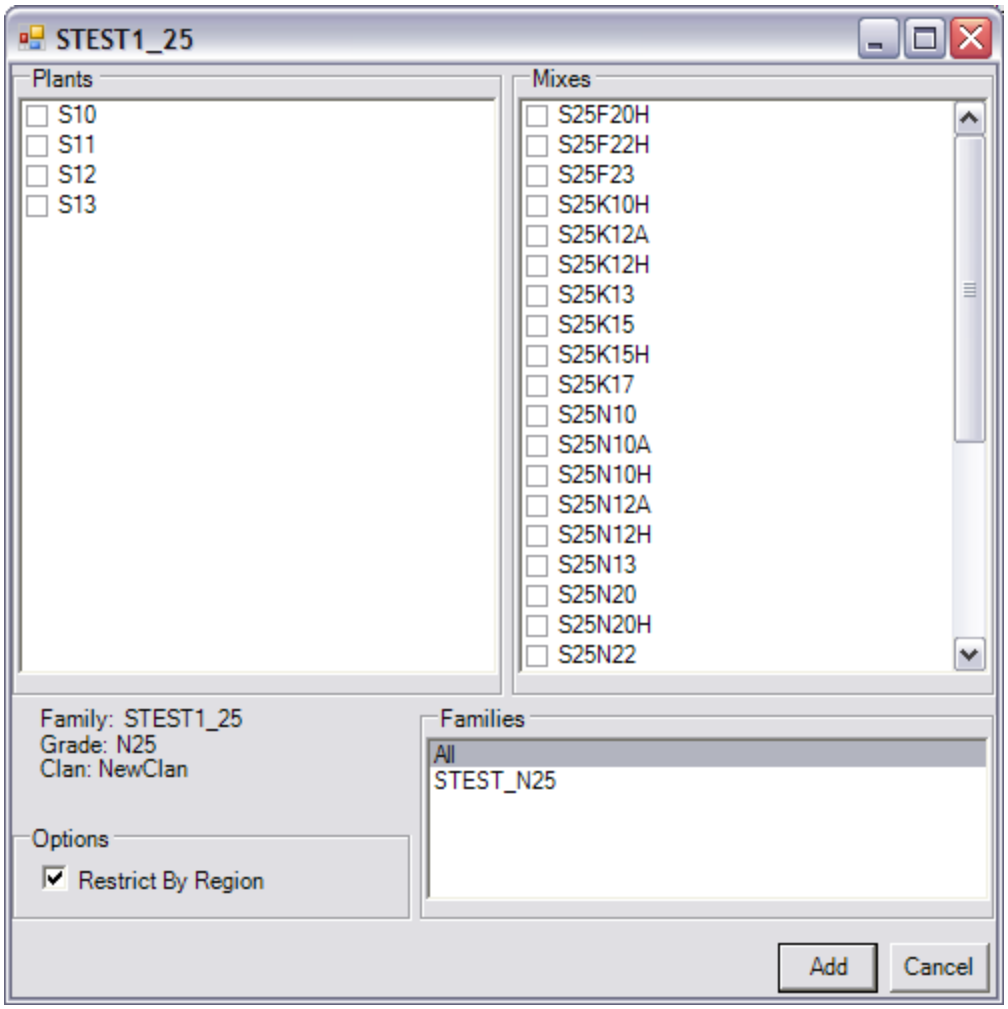
2.7.2 Use

In order to use the accumulation tool with a family the user must first select the desired family from the tree on the left hand side of the screen. At this point the right hand side of the screen should change to allow the user to modify the family as required.

Once a family has been selected the accumulation tool is available from the 'Family' menu as pictured below.



Clicking this menu item will bring up the family accumulation tool screen, pictured below.



This screen shows plants and mixes in families of the same grade and in the same clan as the current family. The plants and mixes shown are only those which do not currently exist in the current family.

The user may restrict the plants and mixes shown to an individual family or show mixes and plants from all matching families, which is the default behaviour.

The list of plants and mixes shown can also be widened to other regions, though this is not recommended.

Ticking the desired plants and mixes and hitting 'Add' will add the selected items to the current family.

2.8 Split and Copy Functionality

2.8.1 Purpose

Functionality has been provided to enable the user to create families containing one plant and one mix from families consisting of a large number of mixes and plants.

It can be thought of as an inverse operation to that undertaken by the accumulation tool described above. The user may create one large family and create subsets of it easily using this functionality.

For instance a family with the following mixes and plants below would be split into six separate families.

Original Family (Grade N32):
Plants

- Plant 1
- Plant 2
- Plant 3

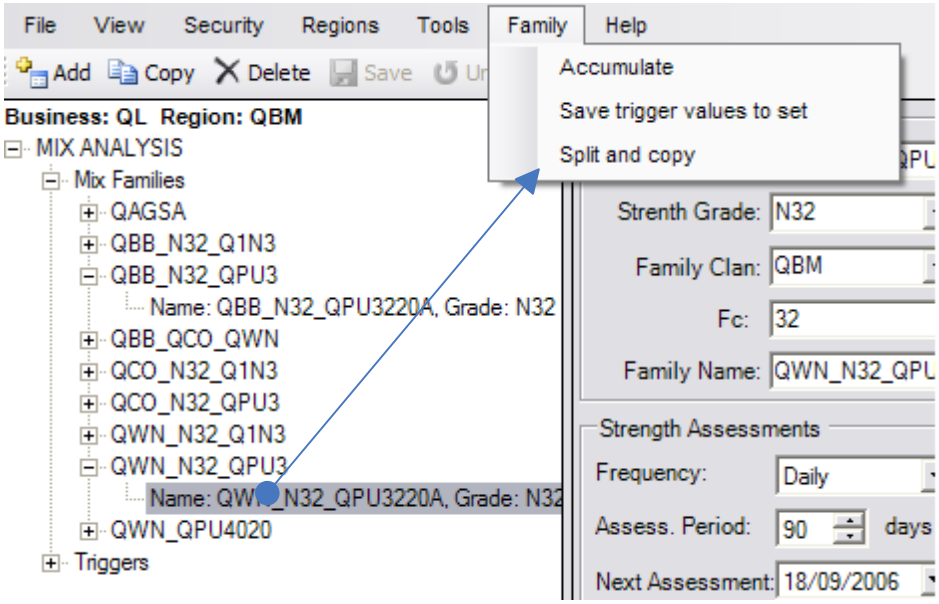
Mixes

- Mix 1
- Mix 2

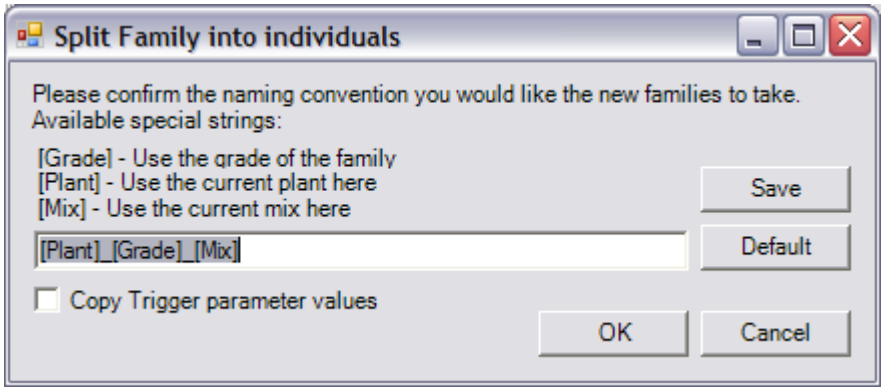
The first created family will contain Plant1 and Mix1 only. The next will contain Plant1 and Mix2. The last created family will contain Plant3 and Mix2.

2.8.2 Use

To use the split and copy functionality the user should select the family of interest and click on "Split and copy" in the "Family" menu as pictured below.



This will bring up the following dialog.



This tool will split a family containing more than one plant and/or mix into smaller families containing exactly one plant and one mix.

The text box on the dialog box above is used to set how the new families are named. The user is able to enter any text in here to determine the naming convention used. There are three special strings that can be used such for substitutions. These are as follows

- [Grade] – The system will substitute the grade of the family here
- [Plant] – The system will substitute the name of the plant here
- [Mix] – The system will substitute the mix code here

For example entering the text "Q[Grade] [Plant] [Mix]" here for the example family mentioned earlier in this section will create the first family with the name "QN32 Plant1 Mix1".

Ticking the "Copy Trigger parameter values" will copy the trigger parameter values of the original family into the new ones.

2.9 Deciding on Mixes to Assess

This document deals with the technical aspects of using the QEST Performance Monitor rather than the suggested decision making process regarding which mixes should be assessed and how the families should necessarily be structured. For information on these topics please refer to the document entitled "QEST Performance Monitor – Configuring Families"

3 Assessments

3.1 Purpose

Assessments are defined as the gathering and checking of statistical data within the QEST Performance Monitor.

There are four different overall assessment types, each of which is run for each family. These are strength, yield, grading and sampling. Each of these is discussed in further detail in the relevant section.

While assessments are one of the most crucial parts of the software they occur, for the most part, behind the scenes. The user has control over assessments from the family screen which allows them to set when the assessments will be run and how often. The user is also able to set how sensitive triggers for each assessment are on a per family basis.

3.2 Properties

Assessments possess properties which dictate when they are run, how far back they search for data and how often they are to be run. These properties are set per assessment type and per family. Thus a strength assessment for one family can have differing properties to a strength assessment for a different family. Furthermore, the properties for strength and yield assessments may differ in the same family.

Setting these properties is done on a per family basis. For more information please refer to section 2.2.3.

3.3 Strength

The strength assessment calculates statistics on data related to concrete strength. By default this assessment searches for data from the past ninety days. This can be modified on the family setup screen however. The following Statistics are calculated on the following values.

Name	**Arithmetic Mean**	**Standard Deviation**	**Slope**	**Median**	**Geometric Mean**	**Sum**
Predicted Strength (7 day, 30 results)	*	*	*			
Predicted Strength (7 day, 5 results)	*	*	*			
Actual Strength (28 day, 30 results)	*	*				
Actual Strength (28 day, 5 results)	*	*	*			
Within Test Variation (28 day, 30 results)	*					
Actual Slump (30 results)	*	*	*	*	*	
Actual Slump (5 results)	*	*	*	*	*	
Slump Failures						*
Actual Density	*	*				
Design Density	*	*				

These statistics are then used by triggers to check whether the mixes conform to performance characteristics as set out by the trigger parameters.

3.4 Yield

The yield assessment calculates statistics on data related to yield. By default this assessment searches for data from the past thirty days. This can be modified on the family setup screen however. The following Statistics are calculated on the following values.

Name	Arithmetic Mean	Standard Deviation	Slope	Median	Geometric Mean	Sum
Actual Yield (30 results)	*	*				
Design Yield (30 Results)	*	*				

These statistics are then used by triggers to check whether the mixes conform to performance characteristics as set out by the trigger parameters.

3.5 Grading

The grading assessment calculates statistics on data related to grading information. By default this assessment searches for data from the past thirty days. This can be modified on the family setup screen however.

Since more than one mix may be considered at a time it would be incorrect to simply calculate statistics on the percentage passing each sieve. It is possible that the mixes have different target gradings. This situation would lead to incorrectly large standard deviations and unexpected mean values even if the actual gradings are close to the desired values. As a result the statistics for gradings are calculated on *the difference of the actual grading from the target for each sieve*. The arithmetic mean and standard deviation of these differences is calculated for each sieve size, as shown in the table below.

Sieve Size	Arithmetic Mean	Standard Deviation	Slope	Median	Geometric Mean	Sum
26.5 mm	*	*				
19.0 mm	*	*				
9.5 mm	*	*				
4.75 mm	*	*				
2.36 mm	*	*				
1.18 mm	*	*				
0.600 mm	*	*				
0.300 mm	*	*				
0.150 mm	*	*				
0.075 mm	*	*				

These statistics are then used by triggers to check whether the mixes conform to performance characteristics as set out by the trigger parameters.

3.6 Sampling

The sampling assessment is a special case insofar as no actual statistics are calculated. The system simply checks the total batched quantity and number of samples of the relevant mixes in the given period. The following two values are then calculated.

Let:

- N = Total number of samples in the assessment period for the relevant mixes.
- T = Total batched quantity of the relevant mixes in the assessment period.

Name	**Formula**
Sampling Frequency	T/N
Number of Samples	N

These values are then used by triggers to check whether the mixes conform to performance characteristics as set out by the trigger parameters.

4 Triggers

4.1 Purpose

'Trigger' is a general name in the QEST Performance Monitor given to an action which performs a check on raw data or the values calculated by assessments.

There are different types of triggers. Some are run while the module is gathering data for assessments while most are run after statistics have been calculated.

Triggers which run while the data is being gathered ensure that the data is consistent or meets minimal criteria.

Triggers which run after statistical values have been calculated check the gathered test data against certain tolerances. In order to perform these kinds of checks the triggers need to be provided with parameters by the user. Parameters are set on a per-trigger, per-family basis.

A more thorough discussion on the types of triggers present within the QEST Performance Module is available in the section 4.6.

4.2 Parameters

Trigger parameters are used to make the tolerances before a warning or recommendation is made to the user more or less sensitive. Each trigger has one or more parameters and these are specific to the action carried out by the trigger itself.

A summary of trigger types and their parameters is presented in the "Trigger Types" section. This section also outlines the recommendations generated by each trigger and under what conditions this occurs.

Trigger parameter values can be set for each family which exists in the system allowing for greater control of when a recommendation might be generated.

4.3 Recommendations

Whenever the data being checked by a trigger reaches a pre-defined level a recommendation is generated. This can range from a simple warning about ignored data through to a suggested course of action due to certain changes in test results.

There are a number of exceptions to this rule in that a few triggers are used simply to ensure gathered data is valid and will not generate a recommendation at all.

A summary of trigger types and the recommendations generated by each is presented in the "Trigger Types" section.

4.4 Templates

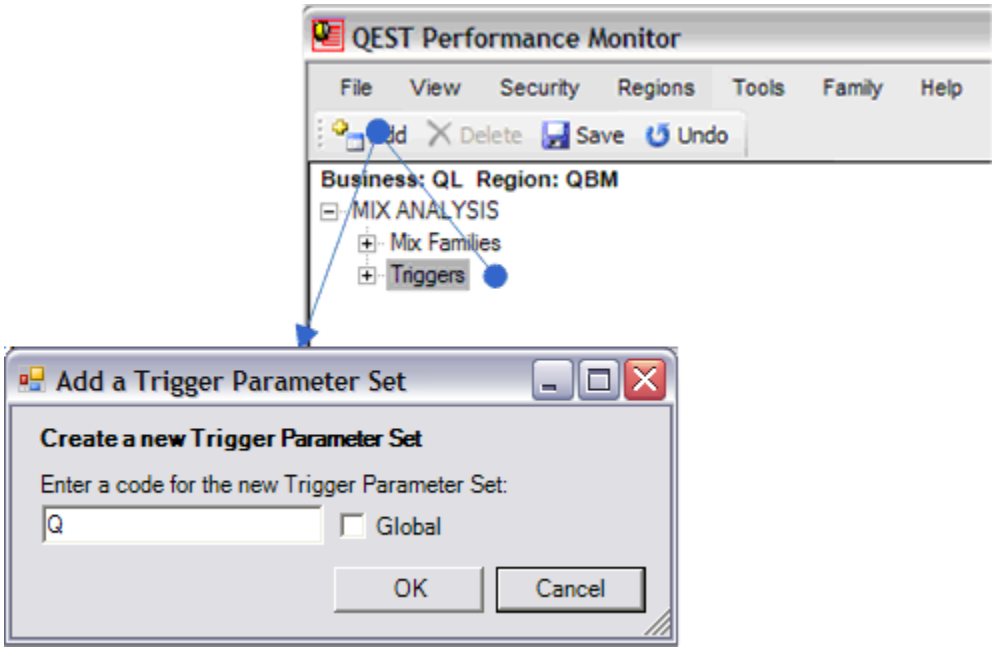
4.4.1 Purpose

It is possible to create templates for trigger parameters. These templates can then be applied to a family by simply selecting one on the trigger values section of the family screen.

This feature saves the user having to define parameters for every single family by hand if the parameter values to be used are the same or similar across a number of families.

4.4.2 Adding a Template

Adding a trigger template is very similar to adding a family. In order to add a template the user must select the 'Triggers' node on the QEST Performance Monitor tree or a child node thereof. Once a valid node has been selected the 'Add' button in the top right hand corner of the screen will become active. Pressing the 'Add' button will bring up a dialog box requesting trigger template information from the user.



The only thing the user must enter at this point is a code with which to identify the new trigger parameter set. Note that the code will automatically be prefixed with the business prefix of the region the user is currently logged into. Entering a code and clicking OK will add the new template making it appear in the tree.

If the “Global” box is checked the new parameter set template will be globally available for use and modification.

4.4.3 Properties

Apart from the parameter values themselves the trigger parameter sets, or templates, have two properties that are set by the user. These are discussed below.

4.4.3.1 Code

The code of a trigger parameter set is decided upon when the set is created. It cannot be modified after the set has been created. This code will appear next to the parameter set in the QEST Performance Monitor tree making it easily identifiable.

The code identifying a trigger parameter set may be up to twelve characters in length.

4.4.3.2 Name

The name of the trigger parameter set may be modified at any time after the set has been created. It appears in parentheses in the QEST Performance Monitor tree next to the code making it easily identifiable.

The name of a parameter set may be up to fifty characters in length.

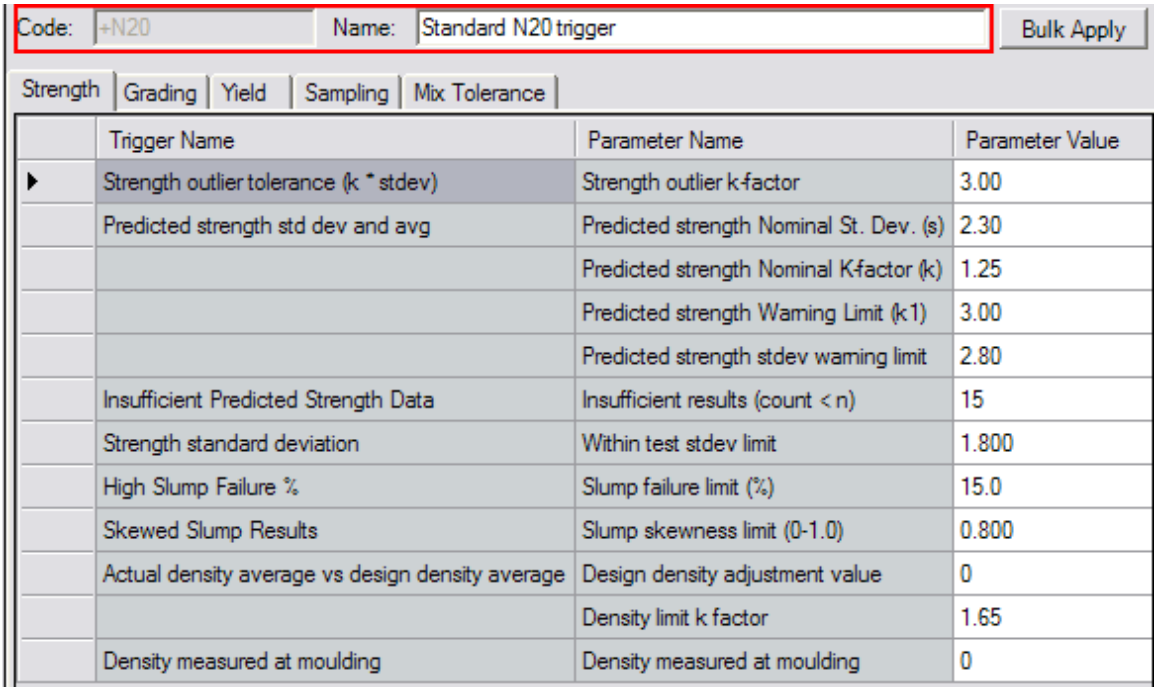
4.4.4 Using a Template

4.4.4.1 Setting up a Template

Selecting the template from the tree on the left hand side of the tree will cause the right hand side of the window to show the trigger setup screen as shown in the screenshot below.

Note that the this screen looks very similar to that shown in section 2.6.1. However, rather than containing a drop-down box in the highlighted area this screen contains text boxes. These allow the user to give an appropriate name to the trigger parameter set.

From here the user may also enter the desired parameter values for each trigger. More information on the parameter values and their effects can be found in the trigger types section.



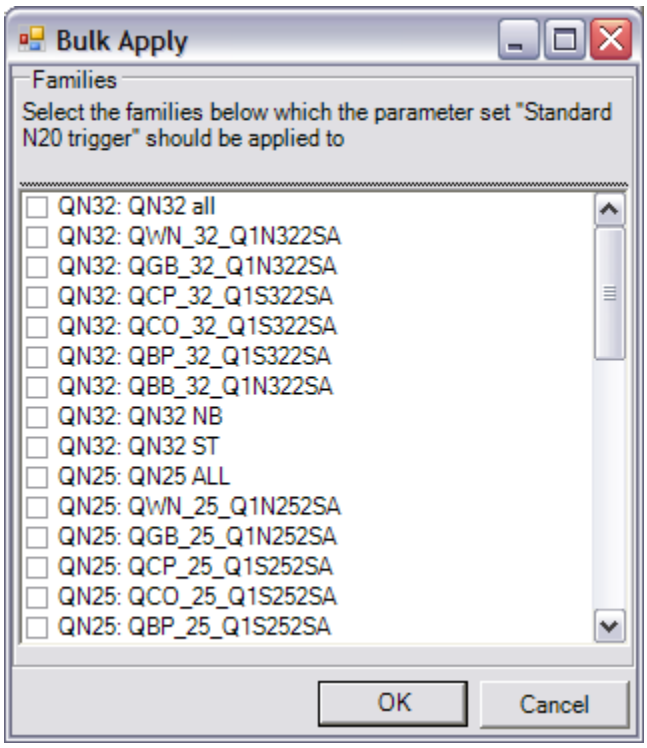
Trigger Name	Parameter Name	Parameter Value
Strength outlier tolerance (k * stdev)	Strength outlier k-factor	3.00
Predicted strength std dev and avg	Predicted strength Nominal St. Dev. (s)	2.30
	Predicted strength Nominal K-factor (k)	1.25
	Predicted strength Warning Limit (k1)	3.00
	Predicted strength stdev warning limit	2.80
Insufficient Predicted Strength Data	Insufficient results (count < n)	15
Strength standard deviation	Within test stdev limit	1.800
High Slump Failure %	Slump failure limit (%)	15.0
Skewed Slump Results	Slump skewness limit (0-1.0)	0.800
Actual density average vs design density average	Design density adjustment value	0
	Density limit k factor	1.65
Density measured at moulding	Density measured at moulding	0

4.4.4.2 Using a Template for a Family

Once a template has been set up it is possible to transfer the defined values to be used on a family. As discussed in the families section the user can choose which template to use from the drop down box in the 'Trigger Values' section of the family screen.

This will copy all the values from the parameter set to the family in question. Note that once the values are copied any changes made to the parameter values in the template will not be reflected in the family and vice versa. The copy operation is a once-off process.

It is also possible to bulk apply an entire template to a number of families at once. This functionality is available from the "Bulk Apply" button on the screen shown above. This action will bring up the dialog shown below. Ticking the desired families and hitting okay will cause the system to apply the parameter set to all the selected families.



4.4.5 Deleting a Template

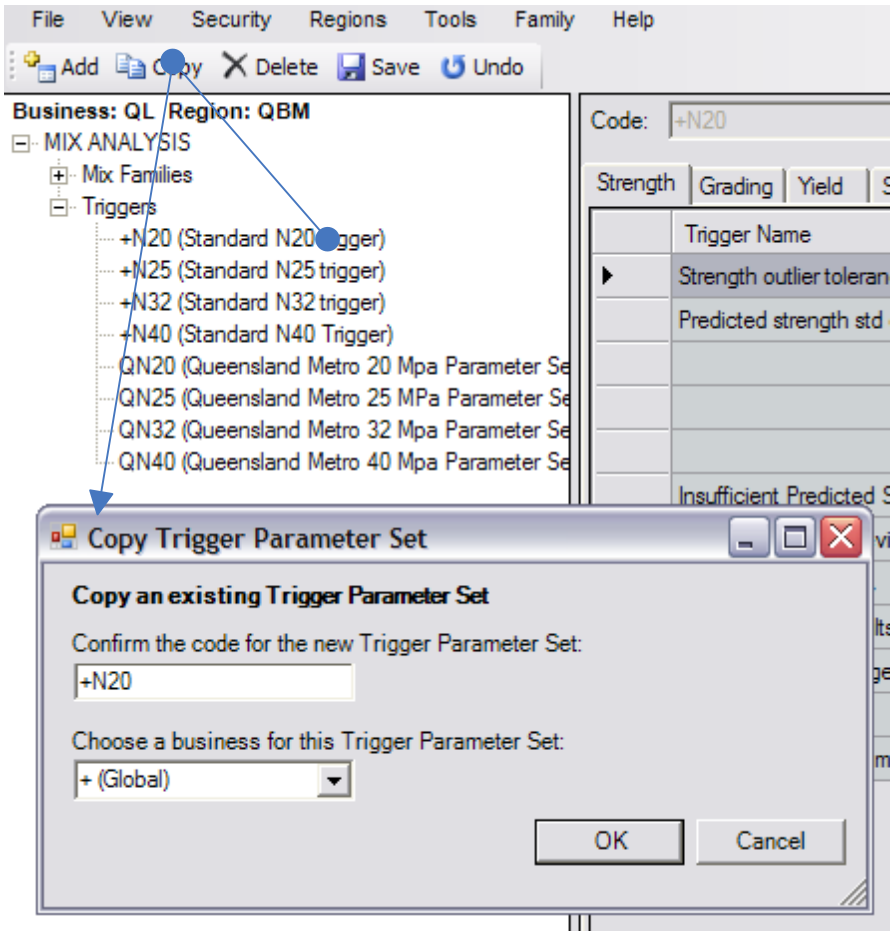
Deleting a parameter set works in much the same way as deleting a family.

In order to delete a trigger parameter set the user must selected the set which is to be deleted in the tree. At this point the 'Delete' button should become enabled. Clicking on the 'Delete' button will bring up a dialog box asking the user to confirm the action. If the user confirms the deletion by clicking 'Yes' the trigger parameter set will be deleted.

4.4.6 Copying a Template

Templates can be copied by using the "Copy" button on the toolstrip menu in the QEST Performance Monitor client. The user should select the desired template then click "Copy" as pictured below.

This will bring up the "Copy Trigger Parameter Set" dialogue. Simply filling the dialogue in with the desired information and clicking the "OK" button will cause a copy of the selected template to be created.



4.4.7 Global Templates

It is possible to create templates which are global. That is, they will be available for use and modification within any region. Since these are available everywhere care should be taken when creating or modifying these parameter sets.

Any parameter set with the + prefix will be treated as global by the system.

4.5 Per Family

As discussed in the family triggers section, trigger parameters are set on a per-family basis. These are the values used when running assessments. Note that no default values are assumed such that if a value is set to zero (as all are when a family is created) then zero will simply be used for the parameter.

It is important, therefore, that parameter values be set once a family is created to something appropriate. This can be done by applying a pre-made template or filling in the values by hand.

Note that it is possible to apply a template and then simply modify the values which should differ for this particular family without affecting the template used.

4.6 Types

4.6.1 Introduction

There are a number of types of triggers. Some relate to data collection while others are specific to an assessment type.

4.6.2 Data

There are two triggers which run as the data is being collected.

Trigger	Parameter	Explanation	Generated Recommendation	Field0	Field1	Field2	Field3	Field4	Field5	Field6
Mix Change	None	This trigger is run on the data prior to calculating any statistics and ensures that mixes are consistent in the period the assessment is run for.	Mix Changed: Using only the newest version of mix in assessment period							
Outlier tolerance (k * stdev)	outlier k-factor	The k factor used in determining outliers for the associated assessment	Outlying Data: Outlying data found, check raw data.	Value	Lower Limit	Upper Limit	SampleID	Docket	Statistic	Sample UID

4.6.2.1 Mix Changes

The first of these triggers ensures that data is collected only for points which contain consistent mixes.

If the design of a mix is found to have changed between two points purportedly having the same mix then data is re-gathered. Constraints are placed on the search such that the module will only gather points which have a batch date greater or equal to that of the newest version last seen.

4.6.2.2 Outlying Data

The second of these triggers checks the data for outlying values. Once an arithmetic mean, x, and standard deviation, s, has been determined for a set of data points, the value of each is checked. If the point falls outside of $x \pm k*s$ then it is eliminated and the recommendation above is generated.

The value of k can be set per assessment type.

4.6.3 Strength

A summary of the triggers related to strength is shown below.

Trigger	Parameter	Explanation	Generated Recommendation	Field0	Field1	Field2	Field3	Field4	Field5	Field6
Predicted strength standard deviation	Predicted strength stdev warning limit	If the standard deviation of the predicted strength values > this limit then a warning is generated.	High pred strength var: Check raw data	Standard Deviation	Limit					
Predicted strength avg	Predicted strength Nominal St.	The standard deviation value used to determine the target for a particular set of								

	Dev. (s)	predicted strength statistics. The calculation is target = Fc + k*s								
	Predicted strength Nominal K-factor (k)	The k-factor used to determine the target for a particular set of predicted strength statistics. The calculation is target = Fc + k*s								
	Predicted strength Warning Limit (k1)	The k-factor used to determine the warning limits for strength values. The calculation used is trigger = k1*std(strength)/sqrt(n). If the strength is then > target + trigger or < target - trigger a warning is generated. The text of the warning depends on whether or not the standard deviation trigger fired.	If standard dev > limit (i.e. above trigger fires) Then this trigger generates the following warnings: Low predicted strength: Check raw data, variation is high if strength < target - trigger High predicted strength: Check raw data, variation is high if strength >targer + trigger If standard dev is okay then Low predicted strength: Increase cement content, variation is high if strength < target - trigger High predicted strength: Decrease cement content, variation is high if strength > targer + trigger	strength	target	trigger				
Predicted Strength insufficient results	Insufficient results (count < n)	If there are less than this number of results in a predicted strength assessment then a warning will be generated	Insufficient Data: Increase data set. Include additional mixes or increase strength assessment date range.	count	required					
Strength outlier tolerance (k * stdev)	Strength outlier k-factor	The k-factor used for determining outliers in any strength evaluation. This includes the following: Slump Predicted Strength Actual Strength Within Test Variation Density	Outlying Data: Outlying data found, check raw data.	Value	Lower Limit	Upper Limit	SampleID	Docket	Statistic	Sample UID
Strength standard deviation	Within test stdev limit	If the standard deviation of the within test statistics divided by 1.35 is greater than this value a warning will be generated.	High within test strength variation: Check raw data	limit	std dev (already divided by 1.35)					
High Slump Failure %	Slump failure limit (%)	The percentage of samples in the data set which are allowed to have slump failure flags set before a warning is generated	High Slump Failure: Check slump of relevant mixes	Failed	Total	Failed (%)				
Slump Skew	Slump skewness limit (0-1.0)	The maximum skew allowed for slump values in an assessment before a warning is generated	Skewed Slump Results: Check slump and strength data.	Skewness	Limit	GeoMean	Median	StDev		
Actual density average vs design density average	Correction	Design density adjustment value. Any time design density is used in calculation, this correction is made to it.								
	k factor	The k factor used for the actual density and design density check. The target values are calculated as the mean of the design densities ± k * trigger Where the value k above is this parameter. trigger = stdev(actual density) / count(actual density)	High/Low Actual Density: Recheck Design	Actual Density Avg	Limit	Target	Trigger			
Density measured at moulding	Density measured at moulding	This takes a value of 0 or 1 (False and True respectively). If the density measurements are all taken on moulding day								

		this should be set to 1. If true all density values from a specimen are considered. Otherwise only those values of age seven days or less are considered.								

4.6.4 Sampling

A summary of the triggers related to sampling is shown below.

Trigger	Parameter	Explanation	Generated Recommendation	Field0	Field1	Field2	Field3	Field4	Field5	Field6
Low Sampling Frequency	Sampling frequency warning limit	The highest value that sampling frequency can take for an assessment period before a warning is generated.	Low Sampling: Increase Sampling Frequency	Samp freq	Max allowed					
Low Number of Samples	Low number of samples warning limit	The lowest number of samples allowed in an assessment period before a warning is generated.	Low Sampling: Increase number of samples per assessment period	Samples	Min Required					

4.6.5 Yield

A summary of the triggers related to yield is shown below.

Trigger	Parameter	Explanation	Generated Recommendation	Field0	Field1	Field2	Field3	Field4	Field5	Field6
Yield average	Yield alert value (m)	Currently the amount that the mean of the actual yield values and the mean of the design yield values may differ before a warning is generated	If mean(actual yield) - mean(design yield) < limit then Low average yield: Increase yield. If mean(actual yield) - mean(design yield) > limit then High average yield: Decrease yield	target (design yield mean)	limit	yield (actual yield mean)				
Yield min load	Yield min load size	Minimum load size required on a docket before it will be considered in any yield statistical calculation	None, the data is simply not used							
Yield outlier tolerance (k * stdev)	Yield outlier k-factor	The k factor used in determining outliers for any yield assessment	Outlying Data: Outlying data found, check raw data.	Value	Lower Limit	Upper Limit	SampleID	Docket	Statistic	Sample UID
	Yield low Std limit	The standard deviation used in determining outliers for yield if the actual standard deviation falls below this value	No warnings generated by this, it is a part of the outlier check							
Yield running average	low running average limit (m)	The lower limit yield running average is allowed to take	Low yield running average: Increase Yield	low_count	limit	last_run_avg_3	last_sample_id	last_date_cast		
Yield standard deviation	Yield stdev warning limit	The highest standard deviation that the yield values will be allowed to have before a warning is generated.	High yield variation: Check raw data	stdev	limit					

4.6.6 Grading

A summary of the triggers related to aggregate gradings is shown below.

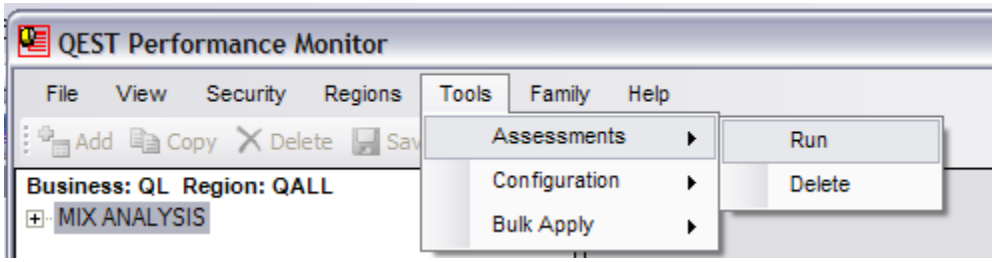
Trigger	Parameter	Explanation	Generated Recommendation	Field0	Field1	Field2	Field3	Field4	Field5	Field6
Grading min load	Grading min load size	Minimum load size required on a docket before it will be considered in any grading statistical calculation	None, the data is simply not used							
Grading outlier tolerance (k * stdev)	Grading outlier k-factor	k factor used for determining limits for outliers when considering data for a grading assessment. Limits calculated as mean(values) ± k*std	Outlying Data: Outlying data found, check raw data.	Value	Lower Limit	Upper Limit	SampleID	Docket	Statistic	Sample UID
Low/High grading		Grading stats are calculated on the values which are differences between the amount of material passing on a sieve and the target grading value. So in reality the statistics are calculated on values where value = (passing - target). Statistics are calculated for each sieve in this way. The mean of these values is then considered. If the mean falls above or below the limits specified in the parameters listed below a warning is triggered.		Value (This is currently mislabeled as % passing(Sieve size), should be simply 'value'. Remember that value is actually (% passing - target))	Low Limit	High Limit				
	Lower 26.5mm sieve limit (-%)	If mean(value) < limit for 26.5mm sieve generate warning	Low Grading: Low % passing on 26.5mm sieve. Recombine materials	As above	As above	As above				
	Upper 26.5mm sieve limit (+%)	If mean(value) > limit for 26.5mm sieve generate warning	High Grading: High % passing on 26.5mm sieve. Recombine materials	As above	As above	As above				
	Lower 19.0mm sieve limit (-%)	If mean(value) < limit for 19.0mm sieve generate warning	Low Grading: Low % passing on 19.0mm sieve. Recombine materials	As above	As above	As above				
	Upper 19.0mm sieve limit (+%)	If mean(value) > limit for 19.0mm sieve generate warning	High Grading: High % passing on 19.0mm sieve. Recombine materials	As above	As above	As above				
	Lower 9.5mm sieve limit (-%)	If mean(value) < limit for 9.5mm sieve generate warning	Low Grading: Low % passing on 9.5mm sieve. Recombine materials	As above	As above	As above				
	Upper 9.5mm sieve limit (+%)	If mean(value) > limit for 9.5mm sieve generate warning	High Grading: High % passing on 9.5mm sieve. Recombine materials	As above	As above	As above				
	Lower 4.75mm sieve limit (-%)	If mean(value) < limit for 4.75mm sieve generate warning	Low Grading: Low % passing on 4.75mm sieve. Recombine materials	As above	As above	As above				
	Upper 4.75mm sieve limit (+%)	If mean(value) > limit for 4.75mm sieve generate warning	High Grading: High % passing on 4.75mm sieve. Recombine materials	As above	As above	As above				
	Lower 2.36mm sieve limit (-%)	If mean(value) < limit for 2.36mm sieve generate warning	Low Grading: Low % passing on 2.36mm sieve. Recombine materials	As above	As above	As above				
	Upper 2.36mm sieve limit (+%)	If mean(value) > limit for 2.36mm sieve generate warning	High Grading: High % passing on 2.36mm sieve. Recombine materials	As above	As above	As above				
	Lower 1.18mm sieve limit (-%)	If mean(value) < limit for 1.18mm sieve generate warning	Low Grading: Low % passing on 1.18mm sieve. Recombine materials	As above	As above	As above				
	Upper 1.18mm sieve limit	If mean(value) > limit for 1.18mm sieve generate warning	High Grading: High % passing on 1.18mm sieve.	As above	As above	As above				

	(+%)		Recombine materials							
	Lower 0.600mm sieve limit (-%)	If mean(value) < limit for 0.6mm sieve generate warning	Low Grading: Low % passing on 0.6mm sieve. Recombine materials	As above	As above	As above				
	Upper 0.600mm sieve limit (+%)	If mean(value) > limit for 0.6mm sieve generate warning	High Grading: High % passing on 0.6mm sieve. Recombine materials	As above	As above	As above				
	Lower 0.300mm sieve limit (-%)	If mean(value) < limit for 0.3mm sieve generate warning	Low Grading: Low % passing on 0.3mm sieve. Recombine materials	As above	As above	As above				
	Upper 0.300mm sieve limit (+%)	If mean(value) > limit for 0.3mm sieve generate warning	High Grading: High % passing on 0.3mm sieve. Recombine materials	As above	As above	As above				
	Lower 0.150mm sieve limit (-%)	If mean(value) < limit for 0.15mm sieve generate warning	Low Grading: Low % passing on 0.15mm sieve. Recombine materials	As above	As above	As above				
	Upper 0.150mm sieve limit (+%)	If mean(value) > limit for 0.15mm sieve generate warning	High Grading: High % passing on 0.15mm sieve. Recombine materials	As above	As above	As above				
	Lower 0.075mm sieve limit (-%)	If mean(value) < limit for 0.075mm sieve generate warning	Low Grading: Low % passing on 0.075mm sieve. Recombine materials	As above	As above	As above				
	Upper 0.075mm sieve limit (+%)	If mean(value) > limit for 0.075mm sieve generate warning	High Grading: High % passing on 0.075mm sieve. Recombine materials	As above	As above	As above				

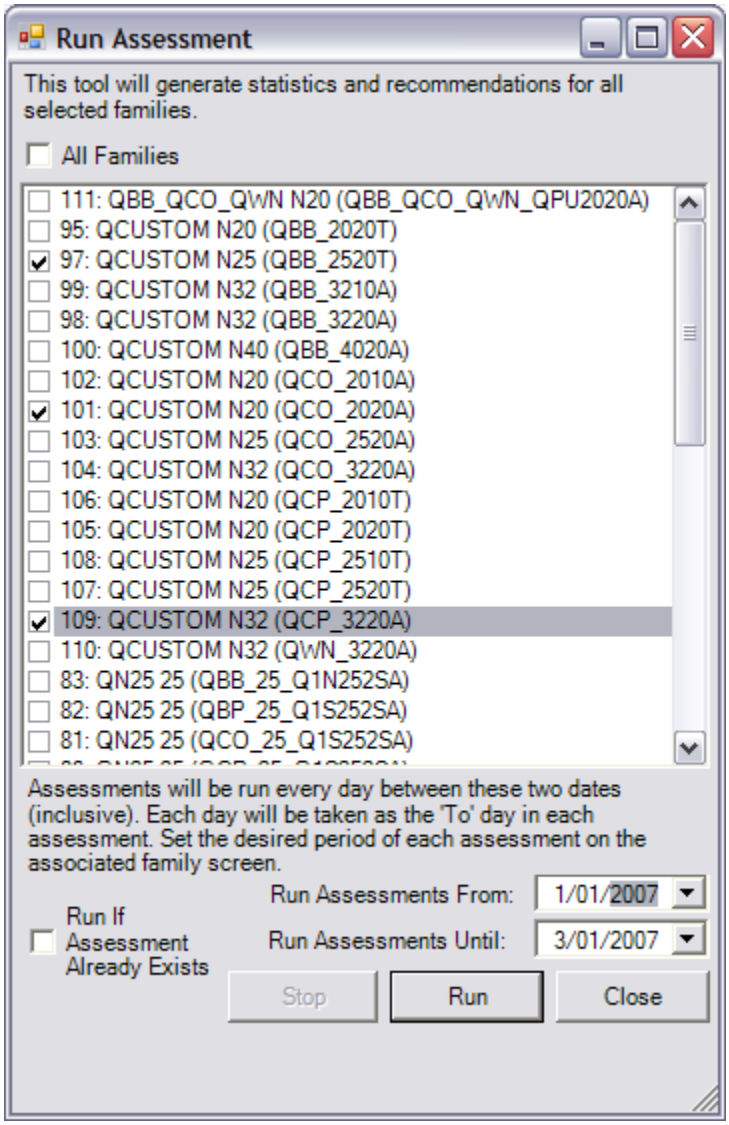
5 Running Assessments

5.1 Historical

The user can manually run analyses on historical data whenever required. This functionality is available through the "Tools->Assessments->Run" menu item as pictured below.



Clicking this menu item will bring up the following dialog.



The user may select the families on which analyses should be run as well as specify the dates for which they would like the analysis to run.

In the image above the three selected families will be assessed on the first through to the third of January. As an example consider the family QBB_2520T above. The first analysis will run to the first of January and, as such, will seek data from 01/01/2007 date minus the "Assessment Period" as set up in the family screen until 01/01/2007.

If the period is set for sixty days, for example, the first analysis will be run on data from 02/11/2006 until 01/01/2007. Once this analysis is complete the "Next Assessment Date" for the assessment type in the family will be updated according to its' "Assessment Frequency" property. The system will then attempt to run assessments for 02/01/2007. If the "Next Assessment Date" for the particular assessment on the family has been set past this date in the preceding step it will be skipped.

This form, in effect simulates the analyses being run every night between the two dates selected above.

It is also possible for the user to stop assessments while they are running. Pressing the “Stop” button on the dialog above while a number of assessments are running will cause the system to complete the assessments for the current day on the current family then stop.

5.2 Automatic

It is intended that the QEST Performance Monitor will run nightly with the assessment date being set to the current date. This functionality has not yet been enabled.

6 Data Analysis

Once statistics and recommendations have been generated the user should analyse the resulting data. For more information please refer to the document “QEST Performance Monitor - Data Analysis”.