

EXTRACTING VALUE from existing geotechnical data, through GOOD DATA MANAGEMENT for OPTIMAL DATA EXTRACTION

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Presentation Overview

- Background
- Data Confidence Process
 - *Data Standard*
 - *Data Migration*
- Data Evaluation by Geotech Methods
- Deliverables
- Conclusions



BACKGROUND

Feasibility Study for the Geotechnical Mine Investigation required data confidence

QA/QC checks had been included in the:

- Field practice for logging and sampling
- Data Management Practice had to produce a reliable, auditable database to deliver useable results and information

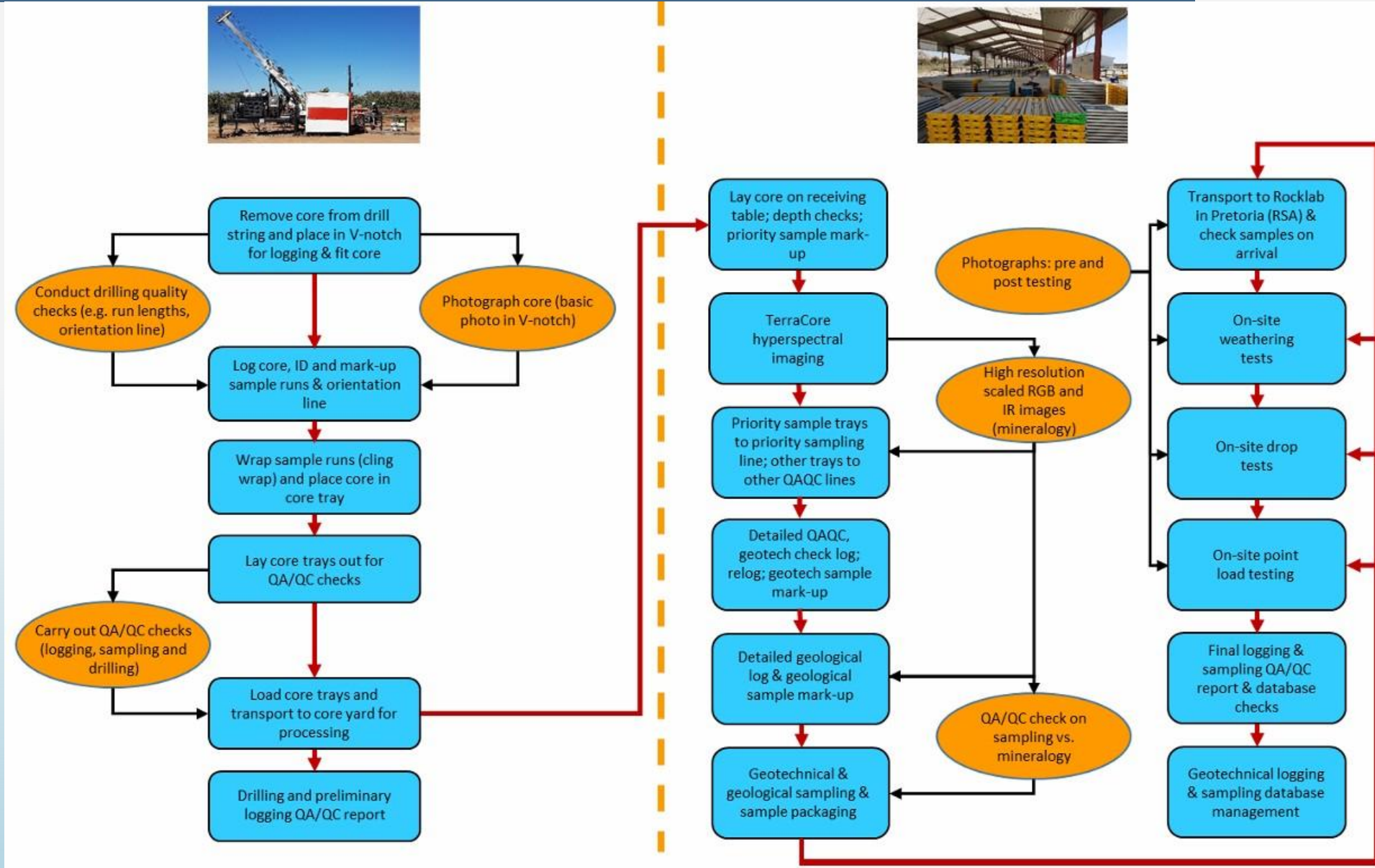


Purpose of the investigation was to:

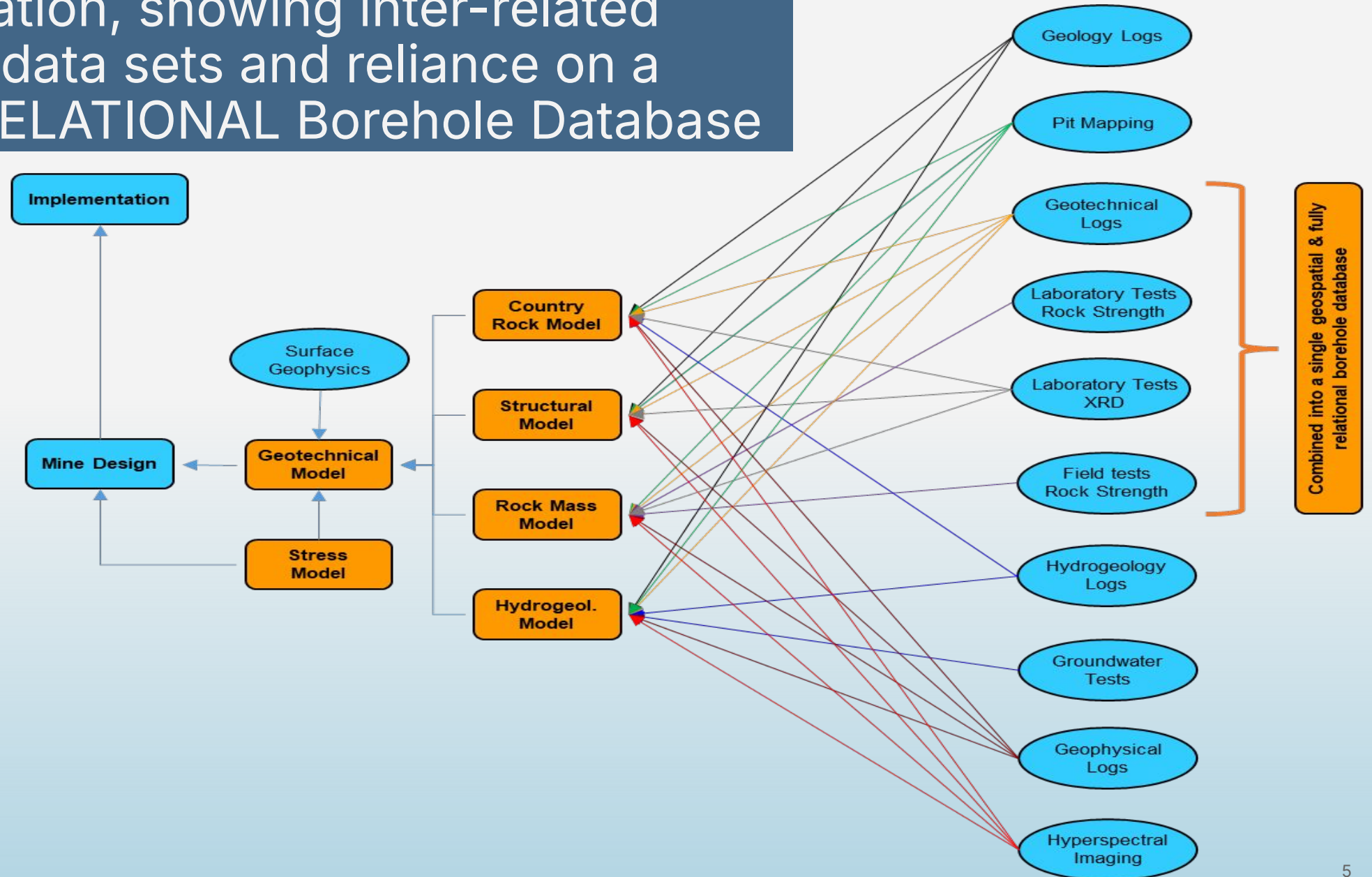
- Verify and improve the mine design
- Generate a geotechnical model by combining the
 - Country rock model
 - Structural model
 - Rock mass model
 - Hydrogeological model



Geotechnical Field Logging and Sampling QA&QC Procedures



Field data sets produced in geotechnical investigation, showing inter-related primary data sets and reliance on a geospatial RELATIONAL Borehole Database



DATA CONFIDENCE PROCESS



DATA INTEGRITY: Requirement for Feasibility Study

Primary field observations and measurements already recorded

Varied field data sets :

- Digital data sets not available
- Relevant handwritten paper logs were collected
- Data had to be captured to spreadsheets and
 - verified against core photos and
 - field QAQC audits already logged systematically

Spreadsheets:

- Transparency and auditability governed data transfer
- Only spelling mistakes, incorrect UOM, column swaps adjusted
- Challenges
 - Duplicated data: most legible, consistent version used
 - Maintaining consistent column headers between capturers to control data migration

Geotechnical Logging Sheet: A3

Joint Orientation Input Sheet: A4

DATA CONFIDENCE PROCESS #2

DATA STANDARD: Requirement for Data Integrity

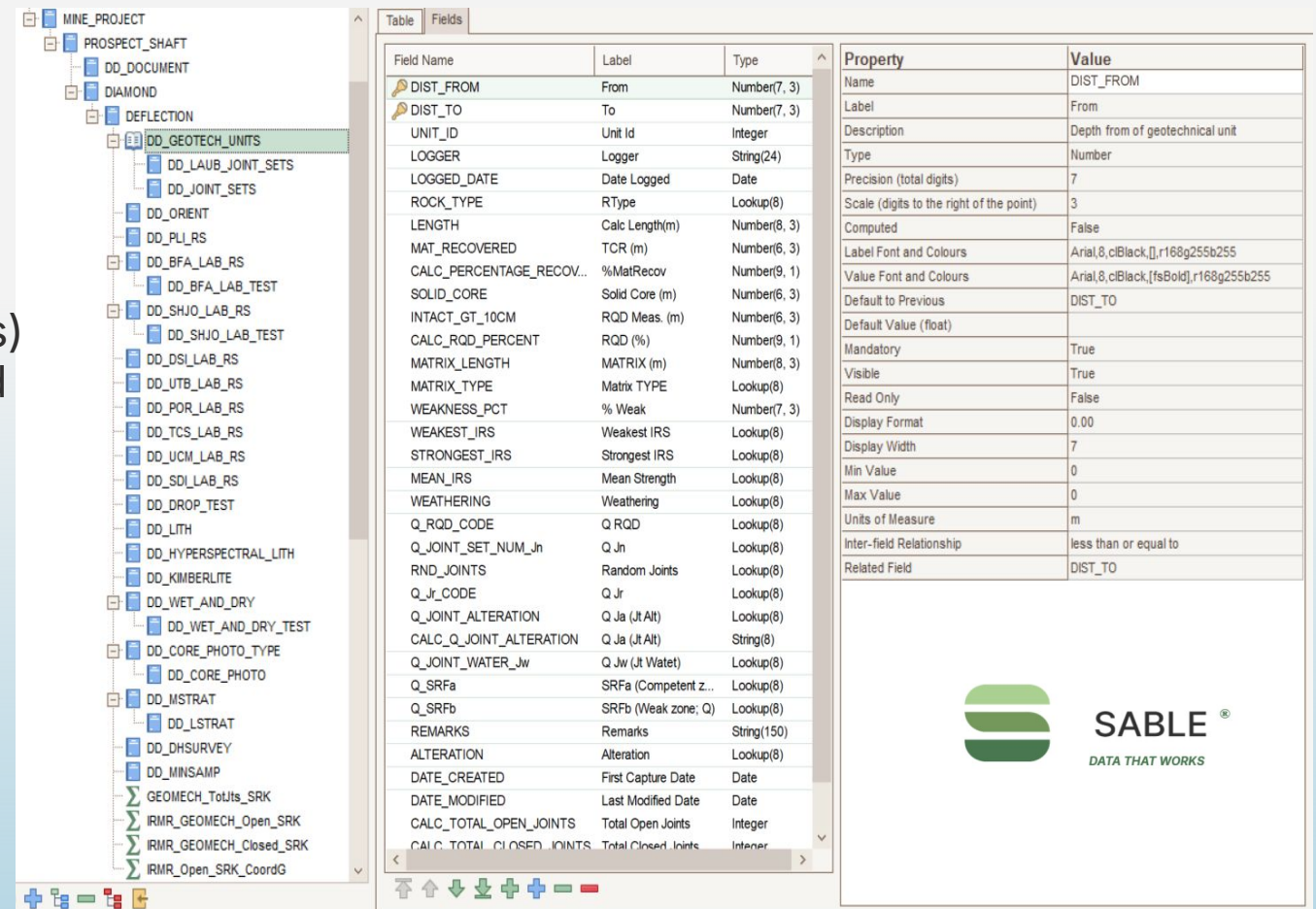
First working database PROTOTYPE was designed to preserve the raw data as collected for auditability

It was then augmented with missing parameters as project progressed

- for each parameter recorded, define
 - Data FIELD TYPE
 - Data CONVENTIONS (meaning of values)
 - VALIDATION (checks and logic executed in real time)
 - RELATIONSHIPS to other data entities

- Create database tables to hold initial migrated data using the first working **Data Standard**

... to be able to see the data !



The screenshot displays a database management interface. On the left, a tree view shows the hierarchy of data entities under 'MINE_PROJECT', including 'PROSPECT_SHAFT', 'DD_DOCUMENT', 'DIAMOND', and 'DEFLECTION'. The 'DEFLECTION' entity is expanded, showing various sub-entities like 'DD_GEOTECH_UNITS', 'DD_LAUB_JOINT_SETS', and 'DD_JOINT_SETS'. On the right, a 'Fields' table provides detailed definitions for the selected field.

Field Name	Label	Type
DIST_FROM	From	Number(7, 3)
DIST_TO	To	Number(7, 3)
UNIT_ID	Unit Id	Integer
LOGGER	Logger	String(24)
LOGGED_DATE	Date Logged	Date
ROCK_TYPE	RType	Lookup(8)
LENGTH	Calc Length(m)	Number(8, 3)
MAT_RECOVERED	TCR (m)	Number(6, 3)
CALC_PERCENTAGE_RECOV...	%MatRecov	Number(9, 1)
SOLID_CORE	Solid Core (m)	Number(6, 3)
INTACT_GT_10CM	RQD Meas. (m)	Number(6, 3)
CALC_RQD_PERCENT	RQD (%)	Number(9, 1)
MATRIX_LENGTH	MATRIX (m)	Number(8, 3)
MATRIX_TYPE	Matrix TYPE	Lookup(8)
WEAKNESS_PCT	% Weak	Number(7, 3)
WEAKEST_IRS	Weakest IRS	Lookup(8)
STRONGEST_IRS	Strongest IRS	Lookup(8)
MEAN_IRS	Mean Strength	Lookup(8)
WEATHERING	Weathering	Lookup(8)
Q_RQD_CODE	Q RQD	Lookup(8)
Q_JOINT_SET_NUM_Jn	Q Jn	Lookup(8)
RND_JOINTS	Random Joints	Lookup(8)
Q_Jr_CODE	Q Jr	Lookup(8)
Q_JOINT_ALTERATION	Q Ja (Jt Alt)	Lookup(8)
CALC_Q_JOINT_ALTERATION	Q Ja (Jt Alt)	String(8)
Q_JOINT_WATER_Jw	Q Jw (Jt Watet)	Lookup(8)
Q_SRFa	SRFa (Competent z...	Lookup(8)
Q_SRFb	SRFb (Weak zone; Q)	Lookup(8)
REMARKS	Remarks	String(150)
ALTERATION	Alteration	Lookup(8)
DATE_CREATED	First Capture Date	Date
DATE_MODIFIED	Last Modified Date	Date
CALC_TOTAL_OPEN_JOINTS	Total Open Joints	Integer
CALC_TOTAL_CLOSED_JOINTS	Total Closed Joints	Integer

Below the table, a 'Property' section lists various attributes for the field, such as Name, Label, Description, Type, Precision, Scale, Computed, Label Font and Colours, Value Font and Colours, Default to Previous, Default Value (float), Mandatory, Visible, Read Only, Display Format, Display Width, Min Value, Max Value, Units of Measure, Inter-field Relationship, and Related Field.



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DATA THAT WORKS

DATA CONFIDENCE PROCESS #3

DATA MIGRATION: CONFORM extracted data

CONFORM extracted data to
first working Data Standard

Migrate data as collected
and translate to required
standards

- For each parameter recorded, MOVE DATA into the
 - Interim FIELD TYPE
 - according to the defined Data CONVENTIONS (meaning of values),
 - Populate **DICTIONARIES** (if applicable)

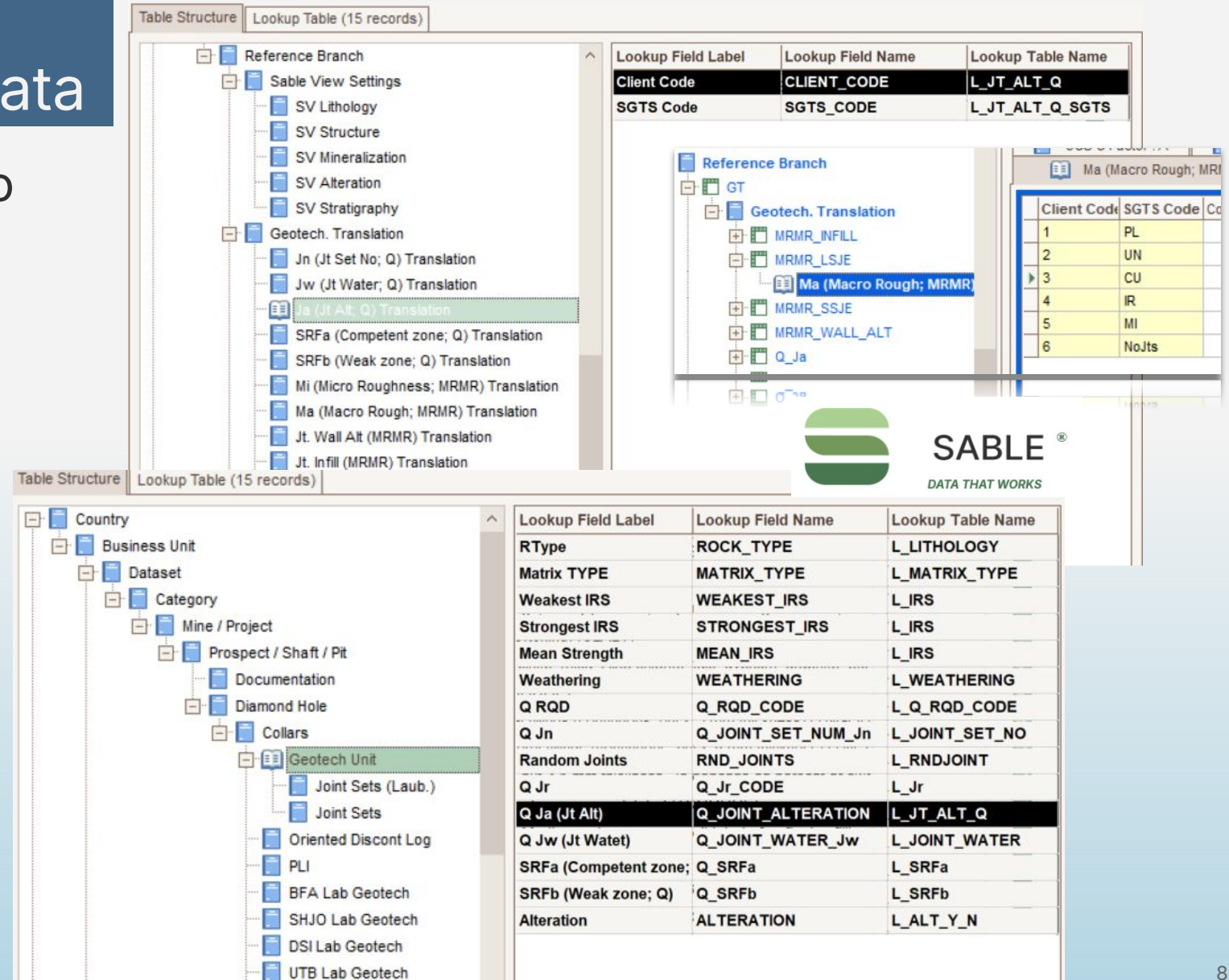


Table Structure Lookup Table (15 records)

Lookup Field Label	Lookup Field Name	Lookup Table Name
Client Code	CLIENT_CODE	L_JT_ALT_Q
SGTS Code	SGTS_CODE	L_JT_ALT_Q_SGTS

Table Structure Lookup Table (15 records)

Lookup Field Label	Lookup Field Name	Lookup Table Name
RType	ROCK_TYPE	L_LITHOLOGY
Matrix TYPE	MATRIX_TYPE	L_MATRIX_TYPE
Weakest IRS	WEAKEST_IRS	L_IRS
Strongest IRS	STRONGEST_IRS	L_IRS
Mean Strength	MEAN_IRS	L_IRS
Weathering	WEATHERING	L_WEATHERING
Q RQD	Q_RQD_CODE	L_Q_RQD_CODE
Q Jn	Q_JOINT_SET_NUM_Jn	L_JOINT_SET_NO
Random Joints	RND_JOINTS	L_RNDJOINT
Q Jr	Q_Jr_CODE	L_Jr
Q Ja (Jt Alt)	Q_JOINT_ALTERATION	L_JT_ALT_Q
Q Jw (Jt Watet)	Q_JOINT_WATER_Jw	L_JOINT_WATER
SRFa (Competent zone; Q)	Q_SRFa	L_SRFa
SRFb (Weak zone; Q)	Q_SRFb	L_SRFb
Alteration	ALTERATION	L_ALT_Y_N

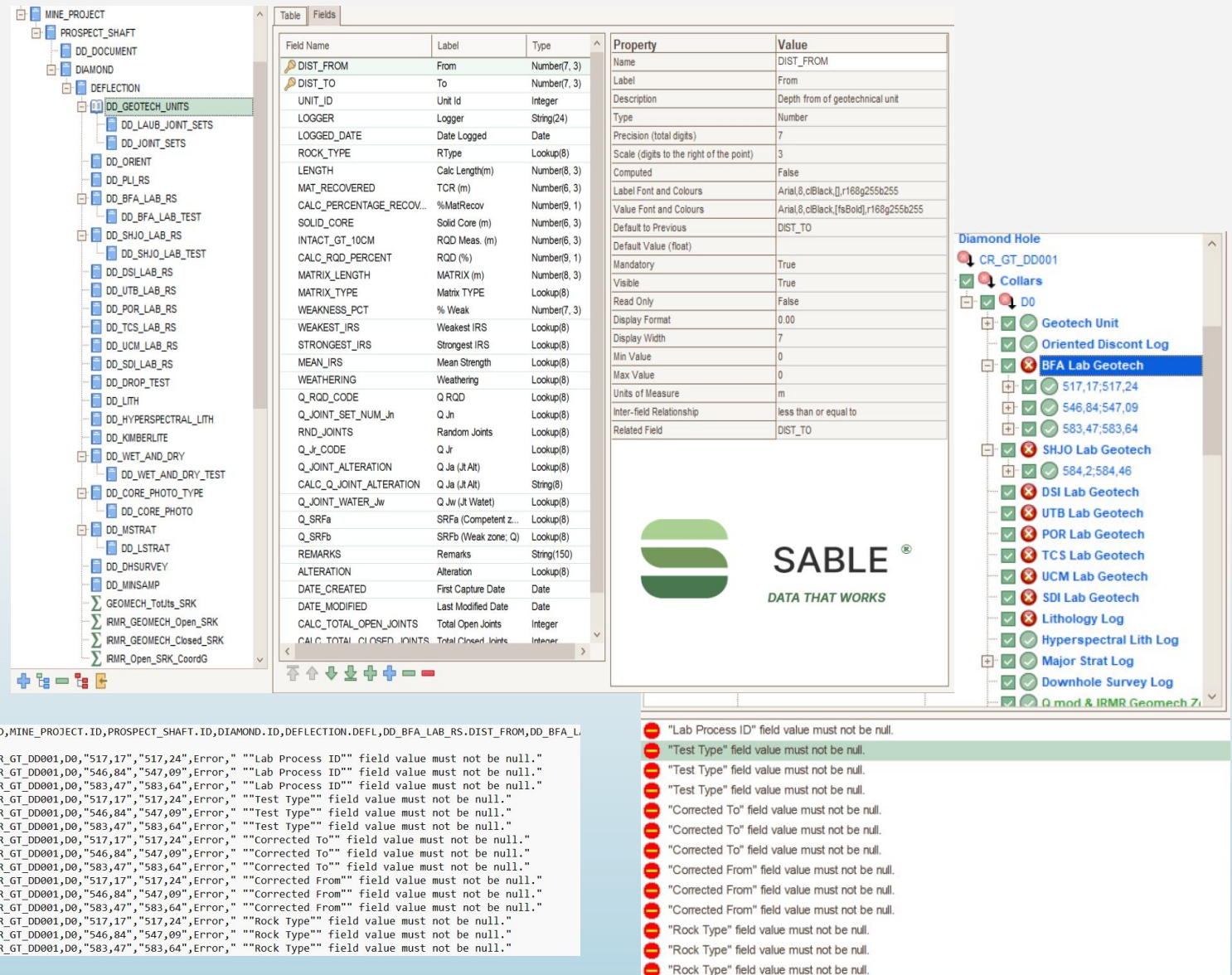
SABLE®
DATA THAT WORKS

DATA CONFIDENCE PROCESS #4

DATA MIGRATION: Prepare Useable Data

Set up PRIMARY data
TABLES in working database
Define the *DATA STANDARD* for
PRIMARY data

- For each PRIMARY parameter required for evaluation, define
 - Final FIELD TYPE
 - Final data **CONVENTIONS** (meaning of values),
 - **VALIDATIONS** to produce USEABLE data (checks and logic running in real time)



The screenshot displays the Datamine software interface during a data migration process. On the left, a project tree shows the hierarchy: MINE_PROJECT > PROSPECT_SHAFT > DD_DOCUMENT > DIAMOND > DEFLECTION > DD_GEOTECH_UNITS. The main window is divided into three panes. The top pane shows a 'Table' view with fields like DIST_FROM, DIST_TO, UNIT_ID, and LOGGED_DATE. The middle pane shows a 'Property' view with fields like Name, Label, Description, Type, Precision, Scale, and Computed. The bottom pane shows a 'Validation' log with a list of errors, including 'Lab Process ID' field value must not be null, 'Test Type' field value must not be null, and 'Corrected To' field value must not be null. The SABLE logo is visible in the bottom right corner.

Field Name	Label	Type
DIST_FROM	From	Number(7, 3)
DIST_TO	To	Number(7, 3)
UNIT_ID	Unit Id	Integer
LOGGER	Logger	String(24)
LOGGED_DATE	Date Logged	Date
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MAT_RECOVERED	TCR (m)	Number(6, 3)
CALC_PERCENTAGE_RECOV...	%MatRecov	Number(9, 1)
SOLID_CORE	Solid Core (m)	Number(6, 3)
INTACT_GT_10CM	RQD Meas. (m)	Number(6, 3)
CALC_RQD_PERCENT	RQD (%)	Number(9, 1)
MATRIX_LENGTH	MATRIX (m)	Number(8, 3)
MATRIX_TYPE	Matrix TYPE	Lookup(8)
WEAKNESS_PCT	% Weak	Number(7, 3)
WEAKEST_IRS	Weakest IRS	Lookup(8)
STRONGEST_IRS	Strongest IRS	Lookup(8)
MEAN_IRS	Mean Strength	Lookup(8)
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Q_RQD_CODE	Q RQD	Lookup(8)
Q_JOINT_SET_NUM_in	Q Jn	Lookup(8)
RND_JOINTS	Random Joints	Lookup(8)
Q_Jr_CODE	Q Jr	Lookup(8)
Q_JOINT_ALTERATION	Q Ja (Jt Alt)	Lookup(8)
CALC_Q_JOINT_ALTERATION	Q Ja (Jt Alt)	String(8)
Q_JOINT_WATER_Jw	Q Jw (Jt Watet)	Lookup(8)
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REMARKS	Remarks	String(150)
ALTERATION	Alteration	Lookup(8)
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DATE_MODIFIED	Last Modified Date	Date
CALC_TOTAL_OPEN_JOINTS	Total Open Joints	Integer
CALC_TOTAL_CLOSED_JOINTS	Total Closed Joints	Integer

Property	Value
Name	DIST_FROM
Label	From
Description	Depth from of geotechnical unit
Type	Number
Precision (total digits)	7
Scale (digits to the right of the point)	3
Computed	False
Label Font and Colours	Arial, 8, cBlack, [r168g255b255]
Value Font and Colours	Arial, 8, cBlack, [fsBold], r168g255b255
Default to Previous	DIST_TO
Default Value (Float)	
Mandatory	True
Visible	True
Read Only	False
Display Format	0.00
Display Width	7
Min Value	0
Max Value	0
Units of Measure	m
Inter-field Relationship	less than or equal to
Related Field	DIST_TO

Validation Log:

- CR_GT_DD001, D0, "517,17", "517,24", Error, " "Lab Process ID" field value must not be null."
- CR_GT_DD001, D0, "546,84", "547,09", Error, " "Lab Process ID" field value must not be null."
- CR_GT_DD001, D0, "583,47", "583,64", Error, " "Lab Process ID" field value must not be null."
- CR_GT_DD001, D0, "517,17", "517,24", Error, " "Test Type" field value must not be null."
- CR_GT_DD001, D0, "546,84", "547,09", Error, " "Test Type" field value must not be null."
- CR_GT_DD001, D0, "583,47", "583,64", Error, " "Test Type" field value must not be null."
- CR_GT_DD001, D0, "517,17", "517,24", Error, " "Corrected To" field value must not be null."
- CR_GT_DD001, D0, "546,84", "547,09", Error, " "Corrected To" field value must not be null."
- CR_GT_DD001, D0, "583,47", "583,64", Error, " "Corrected To" field value must not be null."
- CR_GT_DD001, D0, "517,17", "517,24", Error, " "Corrected From" field value must not be null."
- CR_GT_DD001, D0, "546,84", "547,09", Error, " "Corrected From" field value must not be null."
- CR_GT_DD001, D0, "583,47", "583,64", Error, " "Corrected From" field value must not be null."
- CR_GT_DD001, D0, "517,17", "517,24", Error, " "Rock Type" field value must not be null."
- CR_GT_DD001, D0, "546,84", "547,09", Error, " "Rock Type" field value must not be null."
- CR_GT_DD001, D0, "583,47", "583,64", Error, " "Rock Type" field value must not be null."

DATA CONFIDENCE PROCESS

DATA MIGRATION: Prepare Useable Data

#5

Finalise PRIMARY data

Audit data against the *DATA STANDARD*

- For each PRIMARY parameter required for evaluation, run
 - VALIDATIONS** to produce USEABLE data (checks and logic running in real time)
 - Correct DICTIONARIES
 - MISSING data checks

Validation Report

Database: SDWh73 [REDACTED]
User: sablesa
Date: 2025/07/17 22:13:13

 **SABLE**
DATA THAT WORKS

[BFA Lab Geotech] From / To:

517,17; 517,24	ERROR: "Lab Process ID" field value must not be null.
548,84; 547,09	ERROR: "Lab Process ID" field value must not be null.
583,47; 583,64	ERROR: "Lab Process ID" field value must not be null.
517,17; 517,24	ERROR: "Test Type" field value must not be null.
548,84; 547,09	ERROR: "Test Type" field value must not be null.
583,47; 583,64	ERROR: "Test Type" field value must not be null.
517,17; 517,24	ERROR: "Corrected To" field value must not be null.
548,84; 547,09	ERROR: "Corrected To" field value must not be null.
583,47; 583,64	ERROR: "Corrected To" field value must not be null.
517,17; 517,24	ERROR: "Corrected From" field value must not be null.
548,84; 547,09	ERROR: "Corrected From" field value must not be null.
583,47; 583,64	ERROR: "Corrected From" field value must not be null.
517,17; 517,24	ERROR: "Rock Type" field value must not be null.

Version | Data Structure | Lookups | **Validations** | Script | Advanced Scripts | Modules | System Info

Depth_Parameter1=Depth_Parameter2

204a INVALID QC Sample Depth Difference Check QC DEW

Field Aliases

- Depth_Parameter1
- Depth_Parameter2
- Primary_Sample_ID
- QC_Sample_ID

Checks

Depth_Parameter1=Depth_Parameter2

204b INVALID Field Dup Sample Depth Difference Check QC

Field Aliases

- Depth_From
- Depth_To
- Field_Dup_Sample_Type_Parameter
- Primary_Sample_Type_Parameter
- Sample_ID
- Sample_Type

Checks

MatchInterval

Field Aliases

- Depth_Parameter1
- Depth_Parameter2
- ID

Match Interval

Name: MatchInterval

Description: Field Duplicates must match depth interval of Primary Sample

Error Message: For <AliasField_Dup_Sample_Type_ParameterValue> <A ...

Action when run

N / A	Warning	Error
☐	☐	☒

Data Entry:

Validate Data:			
☐	☐	☐	☒

Sort order:

☒ Default

☐ Defined here

For records conforming to the condition

Sample_Type = Field_Dup_Sample_Type_Parameter

there must be at least one record with the same interval, which conforms to the condition

Sample_Type = Primary_Sample_Type_Parameter

Distance "From" field Alias: Depth_From

Distance "To" field Alias: Depth_To

Configure Validations

Active Validations

UTB Lab Geotech : 7 | POR Lab Geotech : 8 | TCS Lab Geotech : 9 | UCM Lab Geotech : A | SDI Lab Geotech : B | Drop TestS : C

Lithology Log : D | Hyperspectral Lith Log : E | Kimberlite Log : F | Wet and Dry Observation : G | Core Photo Type : H

Major Strat Log : I | Downhole Survey Log : J | Q mod_IRMR Geomech Zone Total Jts with FACTORS for SRK : L

IRMR Geomech Zone Open Jts SRK : M | IRMR Geomech Closed Jts SRK : N | IRMR Open SRK (CoordGEN) : O

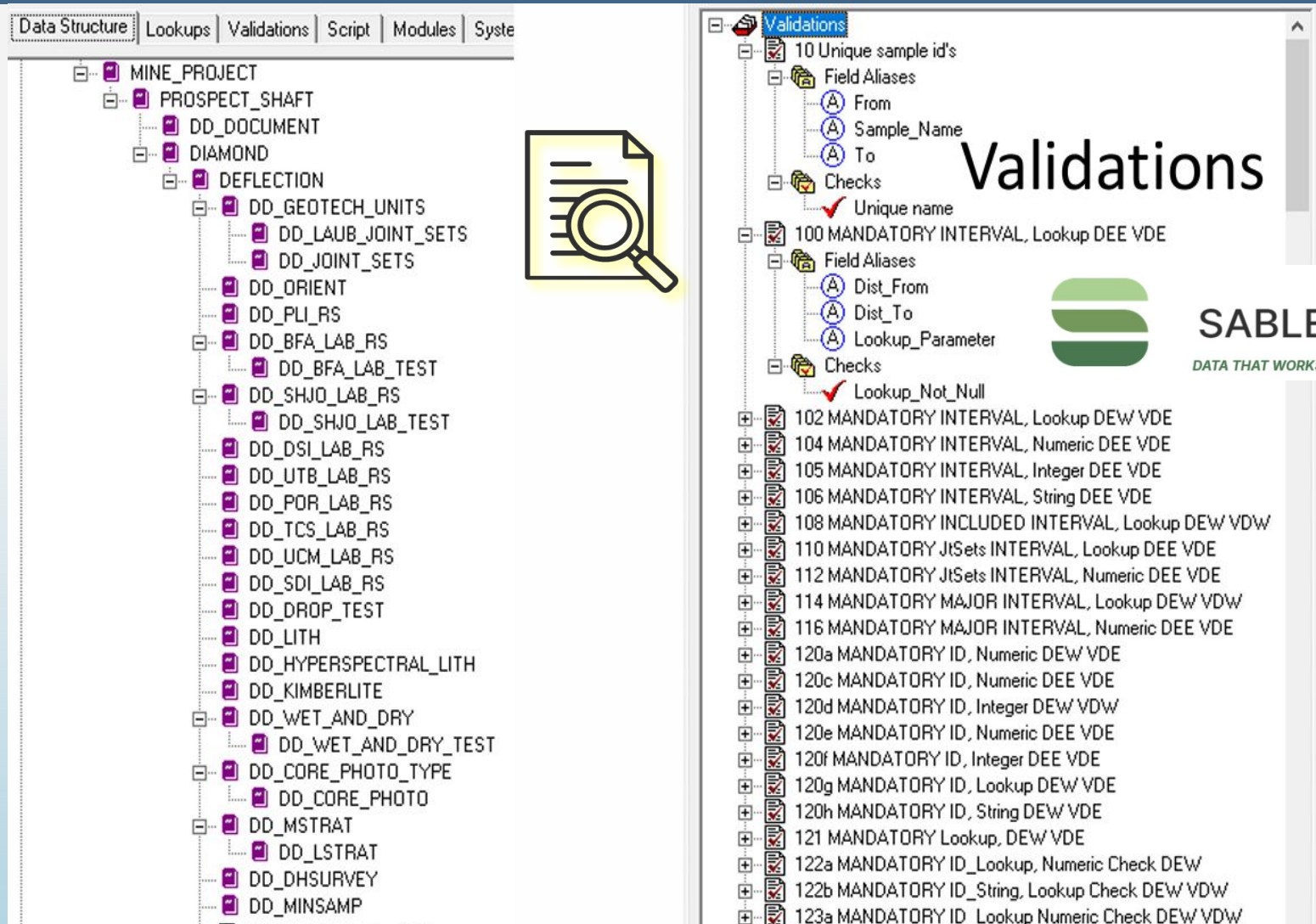
Geotech Unit : 1 | Oriented Discont Log : 2 | PLI : 3 | BFA Lab Geotech : 4 | SHJO Lab Geotech : 5 | DSI Lab Geotech : 6

From	To	Unit Id	Logger	D	RType	Calc Length(m)	TCR (m)	%MatRecov	Solid Core (m)	RQD Meas. (m)	RQD (%)	MATRIX (m)	Matrix TYF
0,00	0,60	1	MR		SAND	0,60	0,60	100	0,00	0,00	0	0,00	M0
0,60	2,10	2	MR		SAND	1,50	0,70	46,7	0,00	0,00	0	0,00	M0
2,10	3,60	3	MR		CALC	1,50	1,50	100	1,01	0,20	13,3	0,14	M6
3,60	5,10	4	MR		CALC	1,50	1,10	73,3	0,45	0,41	27,3	0,38	M6
5,10	6,60	5	MR		CALC	1,50	1,22	81,3	0,69	0,48	32	0,19	M6
6,60	6,85	6	HA & MNP		CALC	0,25	0,25	100	0,09	0,00	0	0,16	M7
6,85	8,10	7	HA & MNP		SILC	1,25	1,25	100	1,25	1,25	100	0,00	M0
8,10	8,71	8	MR		SILC	0,61	0,57	93,4	0,37	0,27	44,3	0,19	M1
8,71	9,60	9	MR		SILC	0,89	0,69	77,5	0,69	0,69	77,5	0,00	M0
9,60	9,90	10	NGO		CALC	0,30	0,27	90	0,27	0,27	90	0,00	M0
9,90	11,40	11	NGO		CALC	1,50	1,20	80	1,05	1,05	70	0,15	M5
11,40	12,00	12	NGO		SILC	0,60	0,46	76,7	0,40	0,40	66,7	0,06	M7
12,00	12,90	13	NGO		CALC	0,90	0,89	98,9	0,89	0,89	98,9	0,00	M0
12,90	14,40	14	IS		CALC	1,50	1,40	93,3	1,40	1,36	90,7	0,00	M0

Validation was successfully completed.

DATA CONFIDENCE PROCESS #6

DATA MIGRATION: Validations within primary data groupings



Validations

10 Unique sample id's

Field Aliases

From

Sample_Name

To

Checks

Unique name

100 MANDATORY INTERVAL, Lookup DEE VDE

Field Aliases

Dist_From

Dist_To

Lookup_Parameter

Checks

Lookup_Not_Null

102 MANDATORY INTERVAL, Lookup DEW VDE

104 MANDATORY INTERVAL, Numeric DEE VDE

105 MANDATORY INTERVAL, Integer DEE VDE

106 MANDATORY INTERVAL, String DEE VDE

108 MANDATORY INCLUDED INTERVAL, Lookup DEW VDW

110 MANDATORY JtSets INTERVAL, Lookup DEE VDE

112 MANDATORY JtSets INTERVAL, Numeric DEE VDE

114 MANDATORY MAJOR INTERVAL, Lookup DEW VDW

116 MANDATORY MAJOR INTERVAL, Numeric DEE VDE

120a MANDATORY ID, Numeric DEW VDE

120c MANDATORY ID, Numeric DEE VDE

120d MANDATORY ID, Integer DEW VDW

120e MANDATORY ID, Numeric DEE VDE

120f MANDATORY ID, Integer DEE VDE

120g MANDATORY ID, Lookup DEW VDE

120h MANDATORY ID, String DEW VDE

121 MANDATORY Lookup, DEW VDE

122a MANDATORY ID_Lookup, Numeric Check DEW

122b MANDATORY ID_String, Lookup Check DEW VDW

123a MANDATORY ID_Lookup Numeric Check DEW VDW

Perform DATA QUALITY checks using PREDEFINED RULES defined in metadata



VALIDATION REPORTS for correction and verification per data set and section of database



DATA CONFIDENCE PROCESS #7

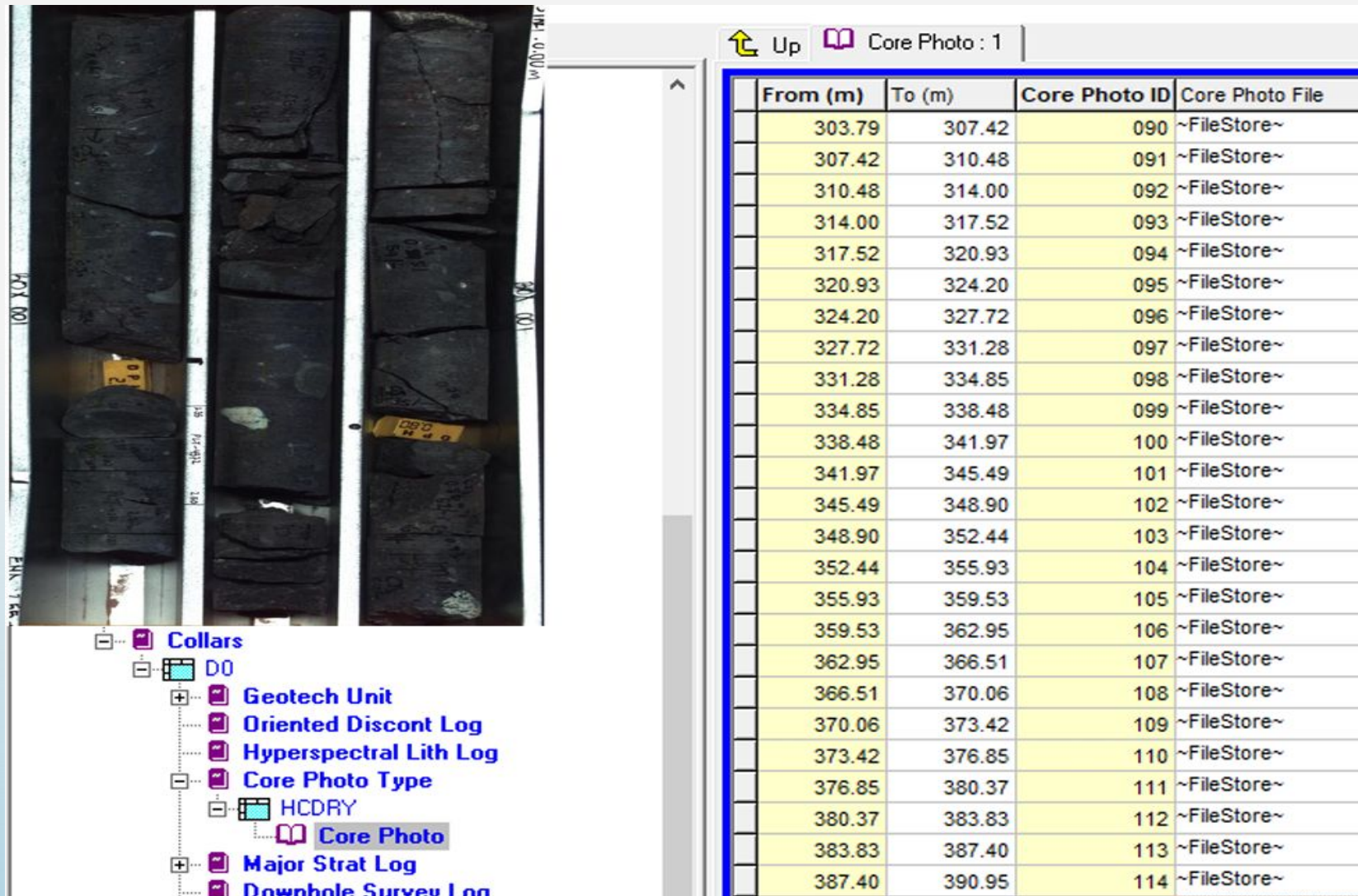
DATA MIGRATION: Load photos and digital images



Load drill
CORE PHOTOGRAPHS
to primary data branches
for easy REFERENCE and
AUDITABILITY



Perform
QUALITATIVE CHECKS
for depths, structures,
angles etc



Up Core Photo : 1

From (m)	To (m)	Core Photo ID	Core Photo File
303.79	307.42	090	~FileStore~
307.42	310.48	091	~FileStore~
310.48	314.00	092	~FileStore~
314.00	317.52	093	~FileStore~
317.52	320.93	094	~FileStore~
320.93	324.20	095	~FileStore~
324.20	327.72	096	~FileStore~
327.72	331.28	097	~FileStore~
331.28	334.85	098	~FileStore~
334.85	338.48	099	~FileStore~
338.48	341.97	100	~FileStore~
341.97	345.49	101	~FileStore~
345.49	348.90	102	~FileStore~
348.90	352.44	103	~FileStore~
352.44	355.93	104	~FileStore~
355.93	359.53	105	~FileStore~
359.53	362.95	106	~FileStore~
362.95	366.51	107	~FileStore~
366.51	370.06	108	~FileStore~
370.06	373.42	109	~FileStore~
373.42	376.85	110	~FileStore~
376.85	380.37	111	~FileStore~
380.37	383.83	112	~FileStore~
383.83	387.40	113	~FileStore~
387.40	390.95	114	~FileStore~

Collars

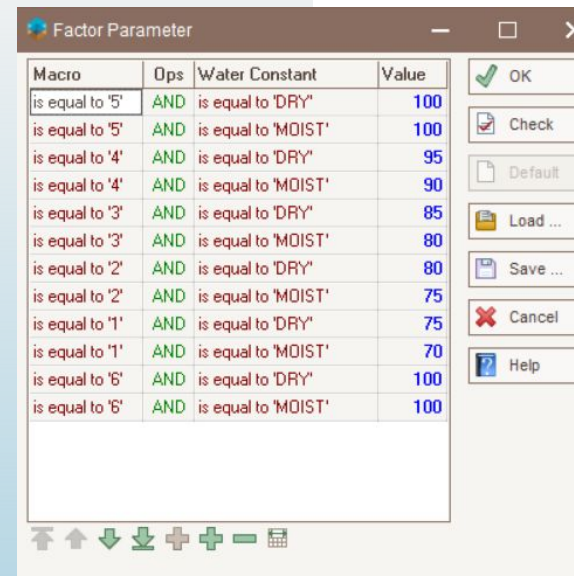
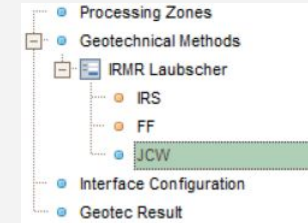
- D0
 - Geotech Unit
 - Oriented Discont Log
 - Hyperspectral Lith Log
 - Core Photo Type
 - HCDRY
 - Core Photo
 - Major Strat Log
 - Downhole Survey Log

DATA EVALUATION PROCESS #1

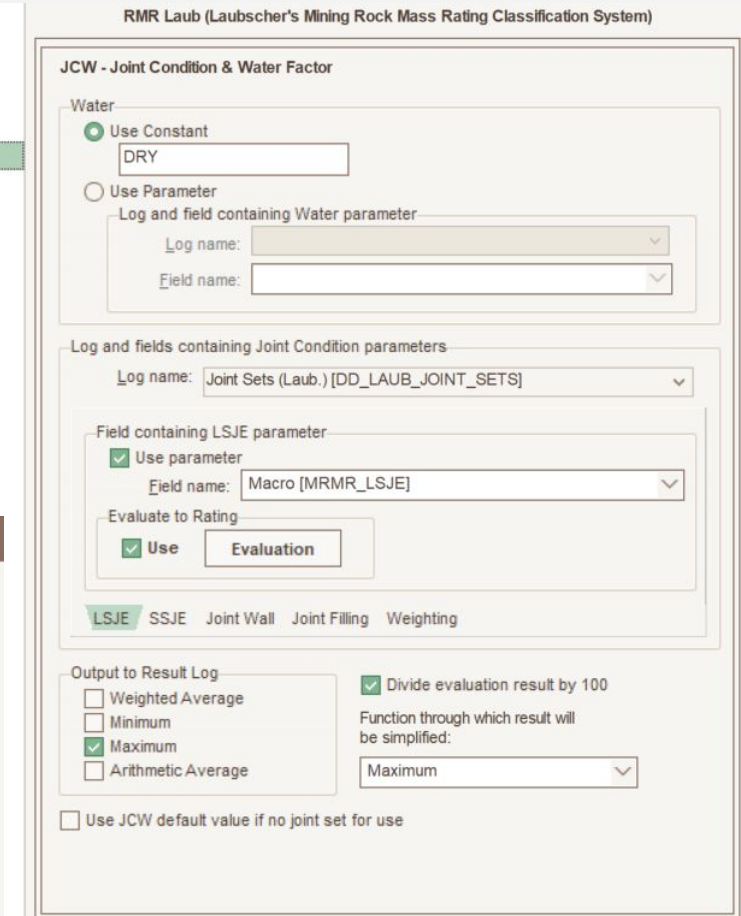
By GEOTECHNICAL METHOD: Configure Factors and Evaluations

For each geotechnical method required, there is a configuration process

- Data fields from separate tables are
 - Mapped as arguments to be evaluated
 - to recognised rock mass and rock quality factors
 - for the evaluation of the SELECTED Geotechnical METHODS
 - Surveyed co-ordinates must be included for spatial model
- The same geotechnical method can be configured to apply to more than one data set e.g. open joints, closed joints and total joints can be processed as separate runs.



Macro	Ops	Water Constant	Value
is equal to '5'	AND	is equal to 'DRY'	100
is equal to '5'	AND	is equal to 'MOIST'	100
is equal to '4'	AND	is equal to 'DRY'	95
is equal to '4'	AND	is equal to 'MOIST'	90
is equal to '3'	AND	is equal to 'DRY'	85
is equal to '3'	AND	is equal to 'MOIST'	80
is equal to '2'	AND	is equal to 'DRY'	80
is equal to '2'	AND	is equal to 'MOIST'	75
is equal to '1'	AND	is equal to 'DRY'	75
is equal to '1'	AND	is equal to 'MOIST'	70
is equal to '6'	AND	is equal to 'DRY'	100
is equal to '6'	AND	is equal to 'MOIST'	100



RMR Laub (Laubscher's Mining Rock Mass Rating Classification System)

JCW - Joint Condition & Water Factor

Water:

☒ Use Constant
DRY

☐ Use Parameter
Log and field containing Water parameter
Log name:
Field name:

Log and fields containing Joint Condition parameters
Log name: Joint Sets (Laub.) [DD_LAUB_JOINT_SETS]

Field containing LSJE parameter:
☒ Use parameter
Field name: Macro [MRMR_LSJE]

Evaluate to Rating:
☒ Use

LSJE SSJE Joint Wall Joint Filling Weighting

Output to Result Log:
☐ Weighted Average
☐ Minimum
☒ Maximum
☐ Arithmetic Average

☒ Divide evaluation result by 100
Function through which result will be simplified: Maximum

☐ Use JCW default value if no joint set for use

DATA EVALUATION PROCESS #2

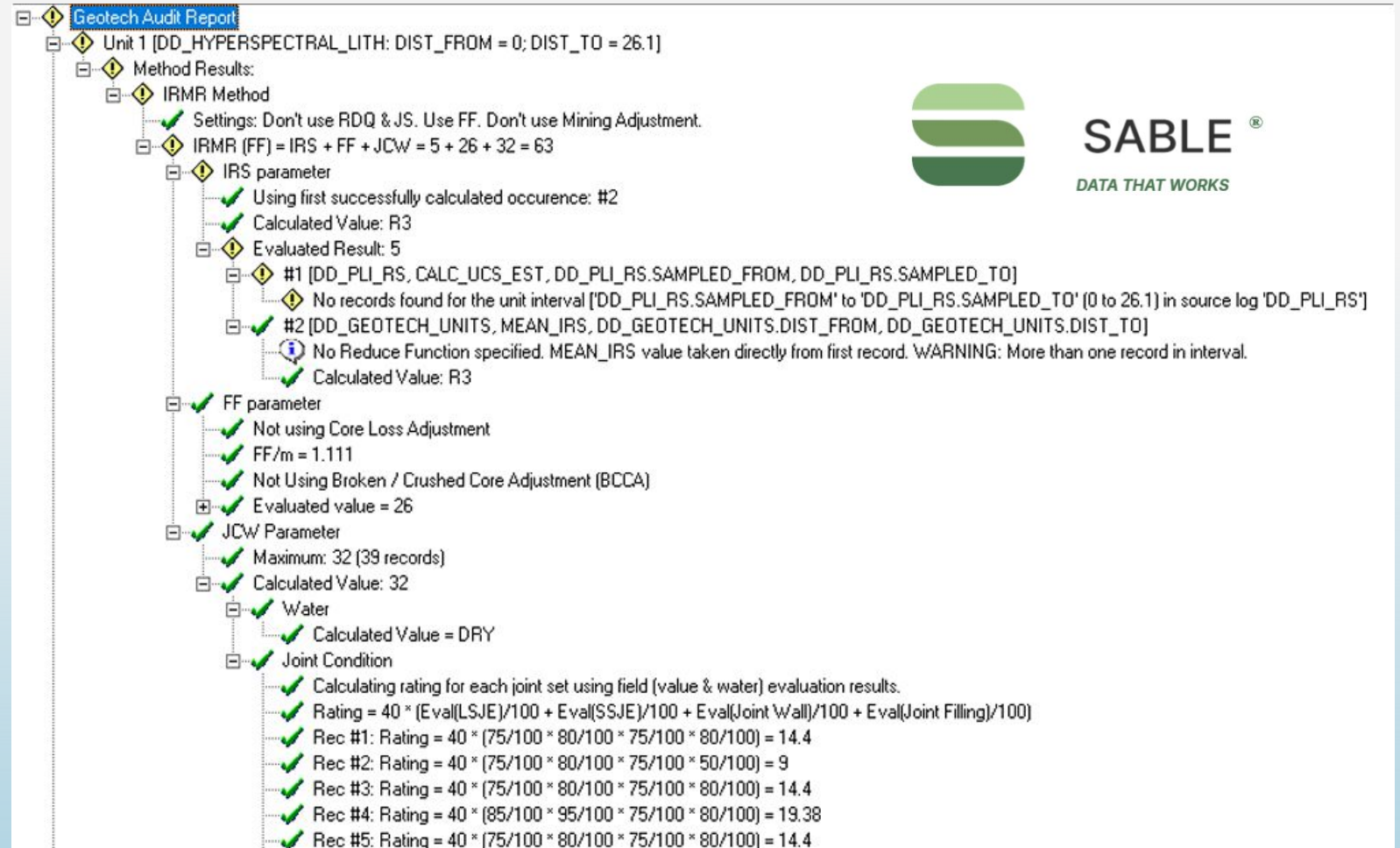
By GEOTECHNICAL METHOD: Produce RESULTS with Audit Trail

Per geotechnical UNIT or geomechanical ZONE:

- *determine validity and sensitivities within data sets*

The AUDIT trail logs the actual VALUES used, DECISIONS made and FORMULAE applied during the evaluation of the selected geotechnical methods

- to calculated outcomes per UNIT or ZONE



Geotech Audit Report

- Unit 1 [DD_HYPERSPECTRAL_LITH: DIST_FROM = 0; DIST_TO = 26.1]
 - Method Results:
 - IRMR Method
 - Settings: Don't use RDQ & JS. Use FF. Don't use Mining Adjustment.
 - IRMR (FF) = IRS + FF + JCW = 5 + 26 + 32 = 63
 - IRS parameter
 - Using first successfully calculated occurrence: #2
 - Calculated Value: R3
 - Evaluated Result: 5
 - #1 [DD_PLI_RS, CALC_UCS_EST, DD_PLI_RS.SAMPLED_FROM, DD_PLI_RS.SAMPLED_TO]
 - No records found for the unit interval [DD_PLI_RS.SAMPLED_FROM' to 'DD_PLI_RS.SAMPLED_TO' (0 to 26.1) in source log 'DD_PLI_RS']
 - #2 [DD_GEOTECH_UNITS, MEAN_IRS, DD_GEOTECH_UNITS.DIST_FROM, DD_GEOTECH_UNITS.DIST_TO]
 - No Reduce Function specified. MEAN_IRS value taken directly from first record. WARNING: More than one record in interval.
 - Calculated Value: R3
 - FF parameter
 - Not using Core Loss Adjustment
 - FF/m = 1.111
 - Not Using Broken / Crushed Core Adjustment (BCCA)
 - Evaluated value = 26
 - JCW Parameter
 - Maximum: 32 (39 records)
 - Calculated Value: 32
 - Water
 - Calculated Value = DRY
 - Joint Condition
 - Calculating rating for each joint set using field (value & water) evaluation results.
 - Rating = $40 \times (\text{Eval}(\text{LSJE})/100 + \text{Eval}(\text{SSJE})/100 + \text{Eval}(\text{Joint Wall})/100 + \text{Eval}(\text{Joint Filling})/100)$
 - Rec #1: Rating = $40 \times (75/100 \times 80/100 \times 75/100 \times 80/100) = 14.4$
 - Rec #2: Rating = $40 \times (75/100 \times 80/100 \times 75/100 \times 50/100) = 9$
 - Rec #3: Rating = $40 \times (75/100 \times 80/100 \times 75/100 \times 80/100) = 14.4$
 - Rec #4: Rating = $40 \times (85/100 \times 95/100 \times 75/100 \times 80/100) = 19.38$
 - Rec #5: Rating = $40 \times (75/100 \times 80/100 \times 75/100 \times 80/100) = 14.4$

DATA EVALUATION PROCESS #3



By GEOTECHNICAL METHOD: Produce calculated RESULT SETS

Primary data processed through evaluations and settings to produce factors

Table Tree

Data Tree

SDI Lab Geotech

Drop TestS

Lithology Log

Hyperspectral Lith Log

Kimberlite Log

Wet and Dry Observation

Wet and Dry Results

Core Photo Type

Core Photo

Major Strat Log

Local Strat Log

Downhole Survey Log

Q mod & IRMR Geomech Zone Total Jts w

IRMR Geomech Zone Open Jts SRK

IRMR Geomech Closed Jts SRK

IRMR Open SRK (CoordGEN)

Field Label	Name	Description
From (m)	DIST_FROM	Distance from beginning of profile
To (m)	DIST_TO	Distance from beginning of profile
Lithology1	LITH1	Lithology1.
Lith1 Strat	LITH1_STRAT	stratigraphic division.

DD_MINSAMP

GEOMECH_TotJts_SRK

IRMR_GEOMECH_Open_SRK

IRMR_GEOMECH_Closed_SRK

IRMR_Open_SRK_CoordG

MRMR_FF_PRE_EV

RMR_A1_P_CHOSEN_P...

RMR_A1_P_CHOSEN

RMR_CJS

AUDIT_XML

MRMR FF Pre Ev

RMR A1 Chosen Pre Ev

RMR A1 Chosen

RMR CJS

Audit Log XML

Real

String(16)

String(20)

String(20)

Memo

Up

Geotech Unit : 1

Oriented Discont Log : 2

PLI : 3

BFA Lab Geotech : 4

SHJO Lab Geotech : 5

DSI Lab Geotech : 6

UTB Lab Geotech : 7

POR Lab Geotech : 8

TCS Lab Geotech : 9

UCM Lab Geotech : A

SDI Lab Geotech : B

Drop TestS : C

Lithology Log : D

Hyperspectral Lith Log : E

Kimberlite Log : F

Wet and Dry Observation : G

Core Photo Type : H

Major Strat Log : I

IRMR Geomech Zone Open Jts SRK : M

IRMR Geomech Closed Jts SRK : N

IRMR Open SRK (CoordGEN) : O

Downhole Survey Log : J

Q mod_IRMR Geomech Zone Total Jts with FACTORS for SRK : L

To (m)	Lithology1	Lith1	I	F	I	F	Q Modified	Q RQD F	Q Jn Fe	Q Jr F	Q Ja Fa	Q Jr/Ja	IRMR witt	IRMR IRS	IRMR FF	IRMR FF/m	IRMR JCW	RM	MRMR FF Pr	F
1,75	SAND	KAL					5,333	1	1	4	0,75	5,333	41	1	40	0	0		0	
6,80	CALC	KAL					5,333	1	1	4	0,75	5,333	54	1	21	1,98	32		1,98	
11,76	SILC	KAL					5,333	1	1	4	0,75	5,333	55	5	18	2,621	32		2,621	
18,25	CBAS	STO					355,733	66,7	1	4	0,75	5,333	63	5	26	0,924	32		0,924	
49,01	WBAS	STO					533,333	100	1	4	0,75	5,333	45	8	5	20,026	32		20,026	
167,17	BAS	STO					496,533	93,1	1	4	0,75	5,333	72	8	26	1,185	38		1,185	
170,08	WBAS	STO					252	94,5	2	4	0,75	5,333	46,76	19	6	17,526	21,76		17,526	
170,77	QUARTZIT	NTA					162,311	91,3	3	4	0,75	5,333	38,48	19		52,174	20,48		52,174	
245,90	SST	NTA					575,467	107,9	1	4	0,75	5,333	82	19	31	0,492	32		0,492	
258,07	SST	MOS					285,333	107	2	4	0,75	5,333	49	5	12	6,163	32		6,163	
258,32	RMST	MOS					266,667	100	2	4	0,75	5,333	28,5	5	4	32	19,5		32	
264,15	SST	MOS					509,333	95,5	1	4	0,75	5,333	41,6	8	8	12,521	25,6		12,521	
264,42	MST	MOS					540,267	101,3	1	4	0,75	5,333	18	5	13	11,111	0		11,111	
271,41	SST	MOS					540,267	101,3	1	4	0,75	5,333	58,2	5	26	1,001	27,2		1,001	
271,68	RMST	MOS					553,6	103,8	1	4	0,75	5,333	57,2	8	22	3,704	27,2		3,704	
275,99	SST	MOS					553,6	103,8	1	4	0,75	5,333	76	8	36	0,232	32		0,232	

SABLE[®]
DATA THAT WORKS

DATA EVALUATION PROCESS #5

CO-ORDINATE RESULTS of verified, stored rock mass rating and rock quality calculations for use in GEOSPATIAL applications

Table Tree

Data Tree

Local Strat Log

Downhole Survey Log

Q mod & IRMR Geomech Zone Total Jts w

IRMR Geomech Zone Open Jts SRK

IRMR Geomech Closed Jts SRK

IRMR Open SRK (CoordGEN)

Reference Branch

Field Label	Name	Description
From	DIST_FROM	Depth from of geotechnical unit
To (m)	DIST_TO	Distance from beginning of profile
Lithology1	LITH1	Lithology1.
Lithology1 Stratigraphy	LITH1_STRAT	stratigraphic division.
IRMR with FF	IRMR_with_FF	IRMR Laubscher with FF (no adjus
IRMR IRS Factor	IRMR_IRS	IRMR IRS Factor Value
IRMR FF Factor	IRMR_FF	IRMR FF Factor Value
IRMR FF/m	IRMR_FF_div...	IRMR FF/m Value
IRMR JCW Factor	IRMR_JCW	IRMR JCW Factor Value
XTop	XTop	X coordinate
YTop	YTop	Y coordinate
ZTop	ZTop	Z coordinate
CalcMsgTop	CalcMsgTop	Calculate Message
XMiddle	XMiddle	X coordinate
YMiddle	YMiddle	Y coordinate
ZMiddle	ZMiddle	Z coordinate
CalcMsgMiddle	CalcMsgMiddle	Calculate Message
XBottom	XBottom	X coordinate
YBottom	YBottom	Y coordinate
ZBottom	ZBottom	Z coordinate

Up

Geotech Unit : 1

Oriented Discont Log : 2

PLI : 3

BFA Lab Geotech : 4

SHJO Lab Geotech : 5

DSI Lab Geotech : 6

UTB Lab Geotech : 7

POR Lab Geotech : 8

TCS Lab Geotech : 9

UCM Lab Geotech : A

SDI Lab Geotech : B

Drop TestS : C

Lithology Log : D

Hyperspectral Lith Log : E

Kimberlite Log : F

Wet and Dry Observation : G

Core Photo Type : H

Major Strat Log : I

Downhole Survey Log : J

Q mod IRMR Geomech Zone Total Jts with FACTORS for SRK : L

IRMR Geomech Zone Open Jts SRK : M

IRMR Geomech Closed Jts SRK : N

IRMR Open SRK (CoordGEN) : O

From	To (m)	Lithology1	Lithology1 Stratigraphy	IRMR with FF	IRMR IRS F	IRMR FF Fe	IRMR FF/r	IRMR JCW F	XTop	YTop	ZTop	CalcMsgTop
0,00	1,75	SAND	KALAHARI	41	1	40	0	0	221266,48	7541935,76	980,02	Two points
1,75	6,80	CALC	KALAHARI	59	1	26	0,99	32	221267,49	7541935,49	978,62	Two points
11,76	18,25	CBAS	STORMBERG GROUP	71	5	34	0,308	32	221273,37	7541934,97	970,55	Two points
167,17	170,08	WBAS	STORMBERG GROUP	67	19	16	3,093	32	221364,12	7541918,43	846,70	Two points

Options

Result

Source

Initial Coordinate Table

Conventions

Deflection table

Direction Generation

Deviation Survey Table

Conventions

Primary Table

Output

Initial Coordinate Table

Collar positioning information

Table name: Diamond Hole [DIAMOND]

X Coordinate Field: Surveyed Easting (m) [SURVEYED_EASTING]

Y Coordinate Field: Surveyed Northing (m) [SURVEYED_NORTHING]

Z Coordinate Field: Surveyed Elevation (mamsl) [SURVEYED_ELEVATION]

Coordination system at collar

LQ

World

+ Y

- Y

+ X

- Y

Initial Direction

Bearing Field: True Azimuth (deg) [TRUE_AZIMUTH]

Inclination Field: Inclination (deg) [INCLINATION]

Bearing and inclination priority at start of hole:

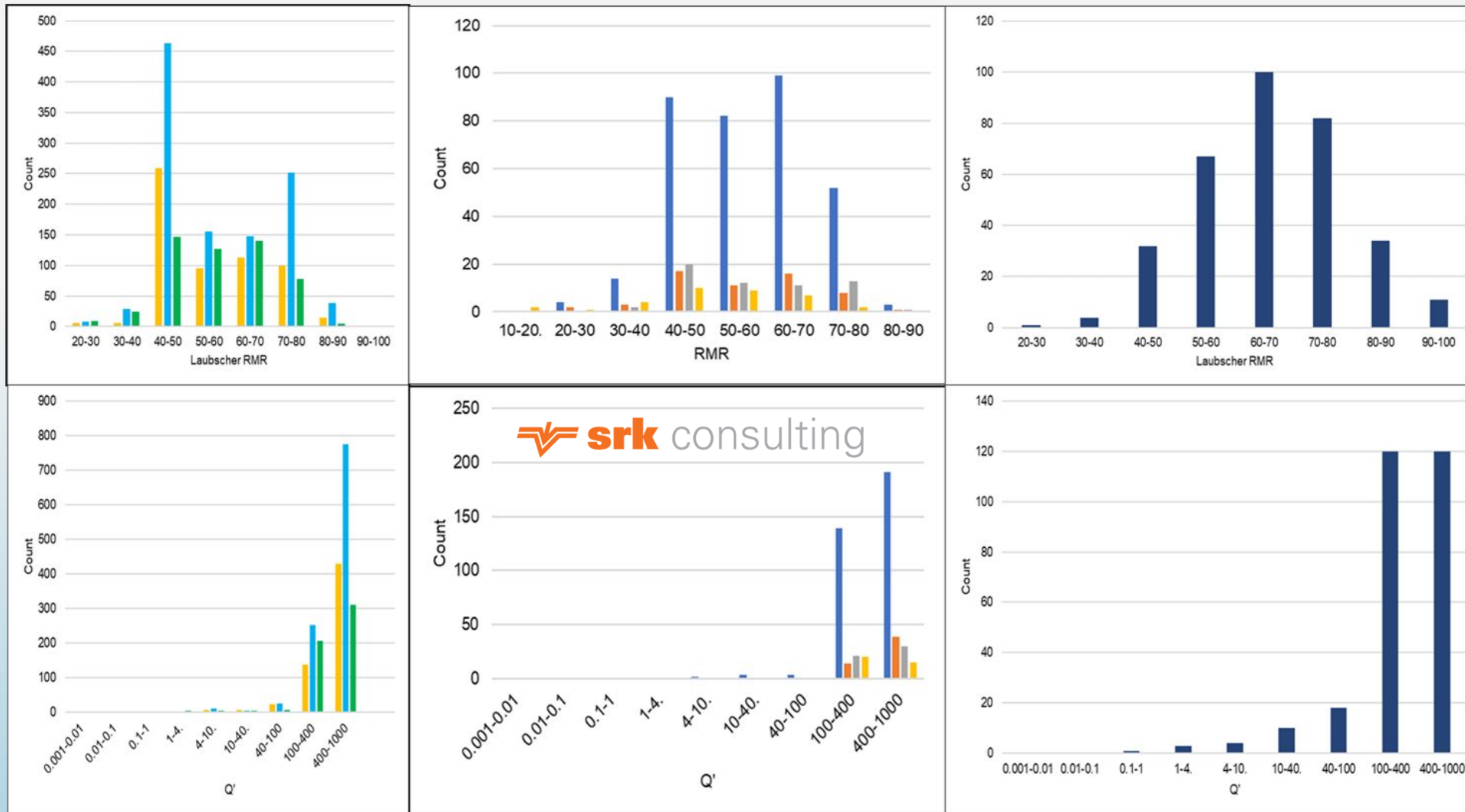
Initial bearing and inclination, if undefined then Survey data

Survey data, if undefined then "Initial" bearing and inclination

 **SABLE**
DATA THAT WORKS

DATA EVALUATION PROCESS^{#7}

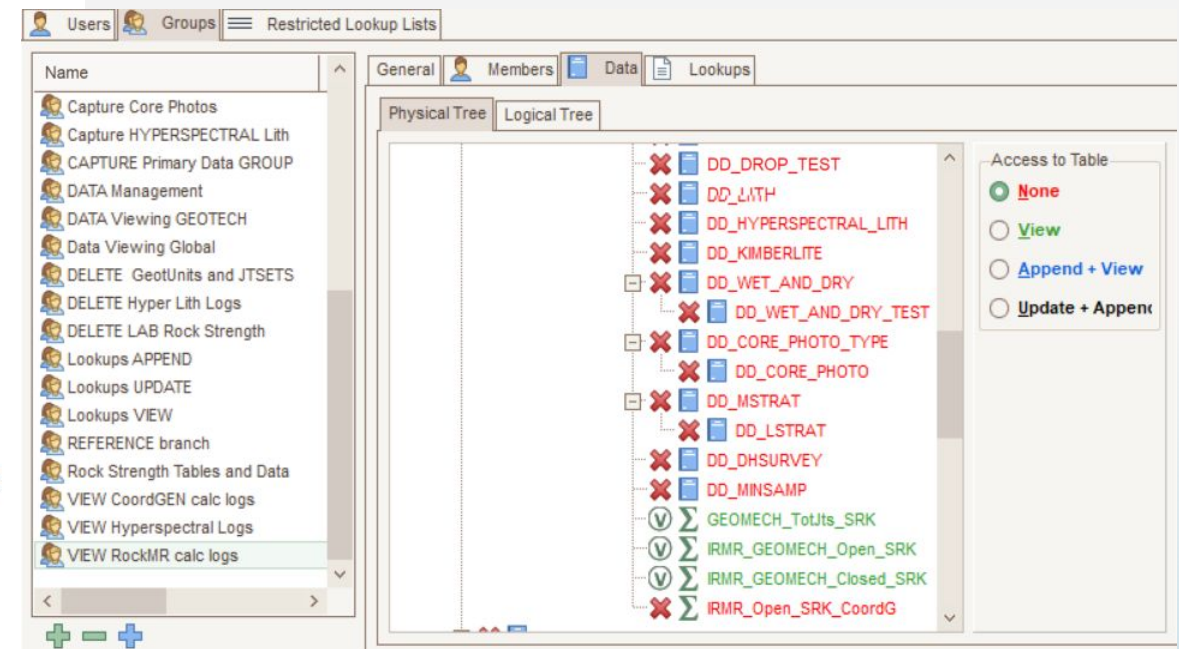
STATISTICAL ANALYSIS of verified, stored rock mass rating and rock quality calculations through 3rd party applications



OPEN RELATIONAL DATABASE with User Security

After SABLE® was implemented

- Structure log contains 38,941 entries
- Geotechnical units log sheet 13, 659 entries
- Laubscher joint set log sheet 40, 969 entries
- Hyperspectral log sheet 4, 650 entries
- **Core photos (per box)** **4, 584 entries**
- Geomechanical zones for Laubscher & Q: 4, 650 entries
- The combined Q and Laubscher Total joints sets 13, 429 entries
- The IRMR Open Joints: 10, 909 entries
- The IRMR Closed Joints: 13, 140 entries
- The IRMR Total Joints: 24,049 entries



DATAMINE

VERIFY

- Satisfies at least 2 geotechnical methods
- Creates confidence in the data collected
- Allows verification of results between methods (Q' , RMR, MRMR, GSI)
- Is PRACTICAL and PROVEN in the field

