

ROYAL PINES RESORT
GOLD COAST
11-12 NOVEMBER 2024

Data Preparation for Asset Performance Management (APM)

Vicki Hlinovsky

Sunwater



Data Preparation for Asset Performance Management (APM)

11 November 2024

Vicki Hlinovsky

Business Process Lead (EAM)

Agenda

- Introduction
- Questions for the audience
- Background on APM
- Data ingested from S/4 to APM
- Data requirements for Risk & Criticality in APM
- What data do I already have for Risk & Criticality?
- Data Model (what data is where?)
- What next?

We service more than
5000
customers

700+ people across
33 locations



We operate
365 days
per year to deliver
the **lifeblood** of
regional Queensland



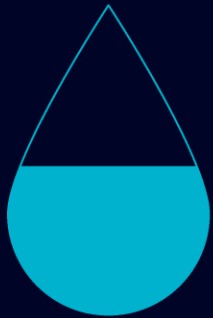
Irrigation



Industrial



Urban



We supply around

40%

of the water
used commercially in Queensland

33%

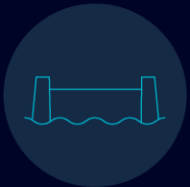
of our people live and
work in regional Queensland



Capacity of

6715 gigalitres

of water storage in dams,
weirs and barrages



19 dams



65 weirs and
barrages



595 kilometres of
water channels



70 major pumping
stations



1951 kilometres
of pipelines



5 water
treatment plants

Questions for the audience

- Do you currently store Criticality against your assets?
- Do you currently Risk Assess your assets using RCM or FMEA?
- Are you thinking about implementing APM?

Background on APM

Legacy ECC Work Management System (WMS) for Long Term Planning

- Implemented S/4HANA in September 2020 including Asset Strategy & Performance Management (ASPM)
- Custom built legacy ECC Work Management System (WMS) replaced with standard S/4 objects:

ECC WMS Object	S/4 Object
Long Term Planning Item	Maintenance Items & Task Lists
Condition Assessments	Measuring Points & Documents
Risk Assessments	Criticality & Risk Assessment in ASPM

Refurbishment and Maintenance Planning

Refurbishment and Maintenance Planning

Display PM Object | First Record | Previous Record | Next Record | Last Record | CAP Form | Planning

Func Loc: AWC-PST-001-PUN-001-PUM

Equipment: 10000052

In Op From: 01.10.2000

Object #: 10000052

✓ View Links

Description: PUMP

User Status: AUSE DOCO

Asset Life: 60

Object Type: PUCENTL

✓ View Orders

General Location:

Replace Cost: 767,535.74

Est Replace Date: 01.10.2060

Cost Centre: CBG

✗ View Archived

Category: P Pump Station - Major

Sort Field: AWOONGA PUMP STATION

Standard Func.Loc: Node

Items | Condition (3) | Risk Assessment (360)

Planning Data

Next Cy...	Freq U...	First Y...	IT...	Description	Cost	PlnOrd/Mit...	ET...	Activity Fund ...	Program	Program Description
2035	15YR	2020 F		Awoonga PSTN - Refurbish - PUN1 - PUMP - Replacement & Refurbishm...	125,000	5240007	E	04-01 ANN	10004	MW Pumpset Refurb & Replac
2060	60YR	2060 R		Awoonga PSTN - Replace - PUN1 - PUMP - Replacement & Refurbishm...	797,385		C	04-01 ANN	10004	MW Pumpset Refurb & Replac

Long Term Planning Items

Refurbishment and Maintenance Planning

Refurbishment and Maintenance Planning

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Standard Func.Loc: Node

Items | Condition (3) | Risk Assessment (360)

Functional Failure: Loss of standby pumping capability

Comments: If duty pump fails pipeline shuts down

Assessor: PHILIP STEVENS

Assessment Date: 30.01.2007

Type: DESK

Probability: 45

Entered By: STEVENSP

Entered On: 30.01.2007

Category	Rank	Consequence	Score	Cat ...	Risk	Comments
WH&S			0	0		
Environment			0	0		
Financial	8 8...	Moderate	360	2	Moderate	
Production/Operations	8 8...	Moderate	360	2	Moderate	
Stakeholder Relations	3 3...	Minor	135	1	Low	

Condition Assessments

Refurbishment and Maintenance Planning

Refurbishment and Maintenance Planning

Display PM Object | First Record | Previous Record | Next Record | Last Record | CAP Form | Planning

Func Loc: AWC-PST-001-PUN-001-PUM

Equipment: 10000052

In Op From: 01.10.2000

Object #: 10000052

✓ View Links

Description: PUMP

User Status: AUSE DOCO

Asset Life: 60

Object Type: PUCENTL

✓ View Orders

General Location:

Replace Cost: 767,535.74

Est Replace Date: 01.10.2060

Cost Centre: CBG

✗ View Archived

Category: P Pump Station - Major

Sort Field: AWOONGA PUMP STATION

Standard Func.Loc: Node

Items | Condition (3) | Risk Assessment (360)

Type: PUMP

Assessor: Glyn Millward

Date: 15.11.2006

Score: 2

Rem. Life: 74

On: 21.11.2006

Notes: good condition

Envr Notes:

WH&S Notes:

Maintenance:

In The	Look For	1	2	3	4	5	6	N/A	Comments
External Coating / Surface / Bolts	Cracking/Flaking/Corrosion as per AS/NZ...	0	0	0	0	0	0	0	VERY MINOR PAINT CHIPPING- INDOORS
Foundation and/or Baseplate	Physical condition	0	0	0	0	0	0	0	LOOKS USED BUT NO PROBLEM
Pump	Vibration (based on AS 2625.1-2003)	0	0	0	0	0	0	0	NO PROBLEMS- FUNCTIONS WELL CHECK V
Flow and Discharge Pressure	Comparison to rated values	0	0	0	0	0	0	0	OK OPERATOR
Casing & Gland	Physical condition	0	0	0	0	0	0	0	LEAKAGE SINCE INSTALLED OF MECH SEA
Pump Unit	Age (% of Refurbishment Life)	0	0	0	0	0	0	0	

Default CAP Asset Type: HEADER GEN Header

Risk Assessments

Standard S/4 Solution for Long Term Planning, Condition & Risk

- Implemented S/4HANA in September 2020
- Attempted to set up ASPM but SAP advised it wouldn't be developed any further and was to be replaced by APM in 2021
- Current S/4 Standard objects to replace Legacy WMS:

ECC WMS Object	S/4 Object	
Long Term Planning Item	Maintenance Items & Task Lists	✓
Condition Assessments	Measuring Points & Documents	✓
Risk Assessments	Criticality & Risk Assessment in ASPM	✗

SAP
Display Maintenance Plan: Strateg...
All
Search

Edit Refresh Additional Functions

Maintenance Plan: AC-20948 Description: AWOONGA CALLIDE PIPELINE Strategy: S99 Scheduling Indicator: Time - key date

Items Planning Data Maintenance Calls Classification

Items
Standard

Item	Item Description	Technical Object	Order Type	Plant	Work Center	Plant ...	Plann...	Business Area	Task List
52457	AC-60Y-LT-RPLC-PUMP-PTNA	ACPS01-PUN-001-PUM	Corrective Maintenance Order	1000	1000AMPN	1000	760		A/21110514/1
52458	AC-15Y-LT-RFRB-PUMP-PTNA	ACPS01-PUN-001-PUM	Corrective Maintenance Order	1000	1000AMPN	1000	760		A/21110514/2

Details for item 52457 - AC-60Y-LT-RPLC-PUMP-PTNA
General Data Object List Location Data

Long Text: Awoonga PSTN - Replace - PUN1 - PUMP - Replacement & Refurbishment Life Strategy (#956033) (Tier 2) _ WMS Maint Key 0000016472

Long Term Planning Items

SAP
Display Measuring Points: MeasPoint List
All
Search

Menu
Details Change <-> Display Update
Graphic Long Text Measuring Point MeasDocuments

Sel.	Measuring point	Functional Location	Equipment	Measurement position	Description of measuring point	Text	Unit	Upper range limit	Lower range limit
<input type="checkbox"/>	80854	ACPS01-PUN-001-PUM		PUMP1	External Coating / Surface / Bolts	Cracking/Flaking/Corro AS/NZS2312:2002	CON	6	1
<input type="checkbox"/>	80855	ACPS01-PUN-001-PUM		PUMP2	Foundation and/or Baseplate	Physical condition	CON	6	1
<input type="checkbox"/>	80856	ACPS01-PUN-001-PUM		PUMP3	Pump	Vibration (based on AS 2625.1-2003)	CON	6	1
<input type="checkbox"/>	80857	ACPS01-PUN-001-PUM		PUMP4	Flow and Discharge Pressure	Comparison to rated values	CON	6	1
<input type="checkbox"/>	80858	ACPS01-PUN-001-PUM		PUMP5	Casing & Gland	Physical condition	CON	6	1
<input type="checkbox"/>	80859	ACPS01-PUN-001-PUM		PUMP6	Pump Unit	Age (% of Refurbishment Life)	CON	6	1

Condition Assessments

SAP
Display Technical Object : 10000052
All
Search

Additional Functions
You can also

Technical Object: 10000052 Technical Object Type: Equipment Description: PUMP Category: I - Infrastructure Equipment Valid From: 01.10.2000 System Status: INST User Status: AUSE DOCO
3 Document(s)

General Data Location Data Organization Data Structure Documents Classes Characteristic Values Permits

Technical Object Address
Name:
Postal Code:
Street:
Region:
Fax No.:
Name 2:
City:
Country/Region:
Telephone No.:

Location Data
Maintenance Plant: 1000 Sunwater Brisbane Location: ACPS01 AWOONGA PUMP STATION
Room: WLCA
Production Work Center:
Plant Section: SIM SUBWATER
ABC Indicator: 1 Negligible

Criticality

ABC Indic.	ABC IndicText
<input type="radio"/> 1	Negligible
<input type="radio"/> 2	Minor
<input type="radio"/> 3	Moderate
<input type="radio"/> 4	Major
<input type="radio"/> 5	Catastrophic
<input type="radio"/> N	Not Assessed

Proof of Concept – Asset Performance Management (APM)

- Kicked off in September 2024
- Proof of Concept in Sandpit
- Limited number of assets (max 5,000)
- Measurable Objectives for PoC include:
 - Data model
 - Fields ingested by APM from Technical Objects
 - Catalog Codes – Mandatory vs Optional
 - Assessment types – Criticality, FMEA, RCM
 - Rules
 - Alerts
 - Data cleansing/creation effort

The screenshot displays the SAP 'Manage RCM Assessments' interface. At the top, the title is 'RCM Assessment for Pump' with ID 'RCM_AS_01'. Below this, technical details are listed: 'Technical Object: Raw water Pump 2(20024005)' and 'Failure Data Profile: Failure Data for Pumps(1S-AD-PUP)'. Key metrics shown are 'Risk Score: 41.0', 'Criticality: O&M Safety critical (A)', and 'Status: In Process'. A 'Change Status' link is in the top right. The interface has two tabs: 'Information' and 'Assessment', with 'Assessment' currently selected. The 'Assessment' tab is divided into a 'Hierarchy' section on the left and a 'Details' section on the right. The 'Hierarchy' section shows a tree structure with nodes like 'Get rid of excess water (01)', 'Total loss of function (01)', 'Breakdown (BRD)', 'Low output (LOO)', 'Pressure Control (02)', and 'Pump (Pump)'. The 'Details' section is titled 'Details: Failure Mode' and contains 'General Details' (Code ID: BRD, Code Short Description: Breakdown, Code Group ID: ZSROPU2, Code Group Short Description: Type 2 Failure mode for Pump), 'Consequence Evaluation' (Type of Consequence: Environmental Risk, Maintenance Policy Recommended: Scheduled Replacement Task Recommended, Consequence Score: E3), and 'Failure Mechanisms (2)'. Buttons for 'Edit Consequence Evaluation', 'Simulate', 'Assign', and 'Remove' are visible.

Data ingested from S/4 to APM

SAP Help Portal – APM Documentation

- [SAP Asset Performance Management | SAP Help Portal](#)

- Feature Scope Design

- Getting Started Guide

- **Application Help**

- Security Guide

- Integration Guide

- Overview of API Services

- Extensibility Guide

- What's New

- **Information overload!!!**

The screenshot shows the SAP Help Portal interface for SAP Asset Performance Management (APM) documentation. The page title is "Application Help - SAP IoT". The left sidebar contains a navigation tree with "Overview: SAP Asset Performance Management" selected. The main content area displays the "Overview" section, which describes SAP APM as a cloud solution for industrial assets. It lists "Business Benefits" (risk-based maintenance processes, move to more condition-based approaches, integration with maintenance management, measurement of efficiency, and streamlined maintenance strategies) and "Features" (ability to view and explore technical objects, and class and characteristics assignments). The right sidebar includes "On this page" links (Overview, Business Benefits, Features, Supported Languages) and a "Was this page helpful?" feedback section with "Yes" and "No" buttons.

Technical Object Fields Visible in APM

Tab	Field
General Data	Category
	Object Type
	Serial Number
	Equipment/Functional Location
	Material
Structure	Superior Functional Location
	Technical Identification Number
	Superordinate Equipment
	Construction Type
Location Data	Maintenance Plant
	Sort Field
Account Assignment	Company Code
	Cost Centre
	Controlling Area

Critical Data Mapping Field

Tab	Field
Manufacturer Data	Manufacturer
	Model Number
	Manufacturer Part Number
	Manufacturer Serial Number
	Construction Month
	Construction Year
Responsibilities	Planner Group
	Maintenance Planning Plant
	Main Work Centre
	Catalog Profile
Administrative Data	Created On
	Changed On
	System ID

Classification & Characteristics Visible in APM

- View the following Class/Characteristic attributes:

Field	Description
Characteristic	Refers to the name that uniquely identifies a characteristic. For example, Torque (TORQUE), Switching Location (CONTROL).
Characteristic Group	The characteristic group is used to group together similar characteristics. For example: "Corrosion, Output, Rating".
Value	Refers to the Unit of Measurement.
Data Type	Refers to the type of data of the characteristic. For example: "Numeric", and "Character".
Value Description	Refers to the characteristic value description from SAP ERP.

- Filter Technical Object based on Class attributes:

Field	Description
Class Name	Refers to the unique name to identify a class within a class type. For example, Transformer, Pump, etc.
Class Description	Refers to the description of the class. For example, "Centrifugal Pump".
Class Group	Refers to the group that a specific class belongs to. For example, "Machinery, Rotating, Stationary".
Class Type	Refers to the unique key, which identifies the class type. The standard class type used for equipment is "002" (equipment class) and for the functional location is "003" (Functional Location class).

Catalog Codes – Catalog Profile

- Stored on FLOC or EQ on Organization Data tab
- All other Catalog Codes are linked to Catalog Profile
- Catalog Codes used on Malfunction Data tab on Notifications for Damage, Object Part, etc

Critical Data Mapping Field

T-code QS49 – Display Code Group Index

Display Code Group Index: Initial Screen

Lower Selection Limit for the Range of Catalog Types (1)

Restrictions

Catalog type(s)

Code group(s)

Code(s)

Language Key

Other languages ☒

Inactive records ☐

Short text for the catalog	Keyword
0 Action Reasons	Action
1 Characteristic Attributes	Attribute
2 Tasks	Task
3 Usage Decisions	Decision
4 Events	Event
5 Causes	Cause
6 Effects	Effect
7 Hold Codes	Hold
8 Activities (QM)	Activity QM
9 Defect Types	Defect Type
A Activities (PM)	Activity PM
B Object Parts	Object Part
C Overview of Damage	Damage
D Coding	Coding
E Defect Locations	Defect Loc.
F Decision - SPM Returns	Dec. SPM
G Defect - SPM Returns	Defect - SPM
H Effort - SPM Returns	Effort - SPM
I Follow-Up Activity - SPM Returns	Activity SPM
J Functions	Function

Change Technical Object : BMPS01-ELH

Read Only Set User Status Additional Functions

Technical Object: BMPS01-ELH Technical Object Type: Functional Location Description: HIGH VOLTAGE SYSTEM Category:

User Status: AUSE 0 Document(s)

General Data Location Data **Organizational Data** Structure Documents Classes Characteristic Values

Responsibilities

Planner Group: 770 Moranbah Planning Plant:

Maintenance Work Center: 7750 Collinsville Work Center Plant:

Catalog Profile: 9400 SWITCHGEAR

Account Assignment

Company Code: 1001 Sunwater Limited Australia Controlling Area:

Business Area: Main Asset Number/Subnumber:

Cost Center: 1410025 Burd Moran Pipe WBS Element:

Settlement Order: Standing Order:


Catalog Prof...	Catalog profile
<input type="radio"/> 1000	CIVIL GENERAL
<input type="radio"/> 1100	CHANNEL STRUCTURES
<input type="radio"/> 1200	FENCING
<input type="radio"/> 1300	CHANNELS
<input type="radio"/> 1400	BUILDINGS/LAND
<input type="radio"/> 1500	DRAINS
<input type="radio"/> 1600	ROADS
<input type="radio"/> 1700	EARTHWORKS
<input type="radio"/> 1800	EMBANKMENTS
<input type="radio"/> 1900	WEIRS AND BARRAGES
<input type="radio"/> 2000	STORAGES(RESERVOIRS,BALANCING)
<input type="radio"/> 2100	TOWNSHIP FACILITIES
<input type="radio"/> 2200	RECREATIONAL FACILITIES
<input type="radio"/> 2300	DAMS
<input type="radio"/> 4000	POWER POLES
<input type="radio"/> 6000	VALVES
<input type="radio"/> 6100	PIPES AND FITTINGS
<input type="radio"/> 6200	MECHANICAL EQUIPMENT
<input type="radio"/> 6300	GATES (FLOOD,REGULATING)
<input type="radio"/> 6400	PUMPS
<input type="radio"/> 6500	LIFTING EQUIPMENT
<input type="radio"/> 6600	MOTORS
<input type="radio"/> 6700	PUMP STATIONS
<input type="radio"/> 6800	BORES
<input type="radio"/> 6900	MOBILE PLANT EQUIPMENT
<input type="radio"/> 7000	CRANE
<input type="radio"/> 7100	TANK
<input type="radio"/> 7200	CATHODIC PROTECTION
<input type="radio"/> 9000	FLOW METERS
<input type="radio"/> 9100	ELECTRICAL EQUIPMENT
<input type="radio"/> 9200	ELECTRICAL CONTROL SYSTEMS
<input type="radio"/> 9300	SUBSTATION
<input type="radio"/> 9400	SWITCHGEAR
<input type="radio"/> 9500	TRANSFORMER
<input type="radio"/> 9600	UPS
<input type="radio"/> 9700	CITECT / SCADA
<input type="radio"/> 9750	INSTRUMENTATION
<input type="radio"/> 9999	SWP GENERAL CATALOG PROFILE

Indicators (Measuring Points) Visible in APM

Critical Data Mapping Field

- The following fields from Measuring Points and Measurement Documents are visible in APM


Field	Description
Characteristic	Characteristic of Measuring Point
Description	Description of Measuring Point
Position	Measurement Position of Measuring Point
Maximum Value	Upper limit of Measuring Point
Minimum Value	Lower limit of Measuring Point
Category	Measuring Point Category
UoM	Unit of Measure for Measuring Point
Indicator Latest value	Last Measurement Document reading value
Number of Decimal places to display	Number of decimal places on Measuring Point
Last Updated	Last Measurement Document date
Data Type	Data type of the characteristics on Measuring Point
Source	Refers the source of indicator - Created locally in SAP Asset Performance Management or originating from SAP S/4HANA Cloud System.


 **Help Portal**

» ☆ Favorite 📄 Download PDF 🔗 Share

Important Notes on Measuring Points Replication

- **The Position, Category and Characteristics combination for the indicators shall be unique** for a given technical object in Asset Performance Management System. We recommend not to have Position, Category, and Characteristics combination repeated in multiple measuring points for a given technical object.
- The Position, Category, and Characteristics combination for the indicators shall be unique for a given technical object in Asset Performance Management System. **We recommend not to Change Position, Category, and Characteristics of measuring points** for a given technical object once it replicated to SAP Asset Performance Management.
- The Position, Category, and Characteristics are mandatory information for the indicators in Asset Performance Management System. **We recommend not to have blank Position in any measuring points for a given technical object.** If blank positions are found those positions will be replaced with a position called "DEFAULT" in SAP Asset Performance Management.
- The **measuring points already replicated to Asset Performance Management System will not be deleted** even if the measuring points are deleted for the corresponding technical object in SAP S/4HANA system.
- The measuring point replication depends on the replication of measuring point category used in the measuring point. We recommend to consume a new measuring point category in the measuring point once the category is replicated to SAP Asset Performance Management.

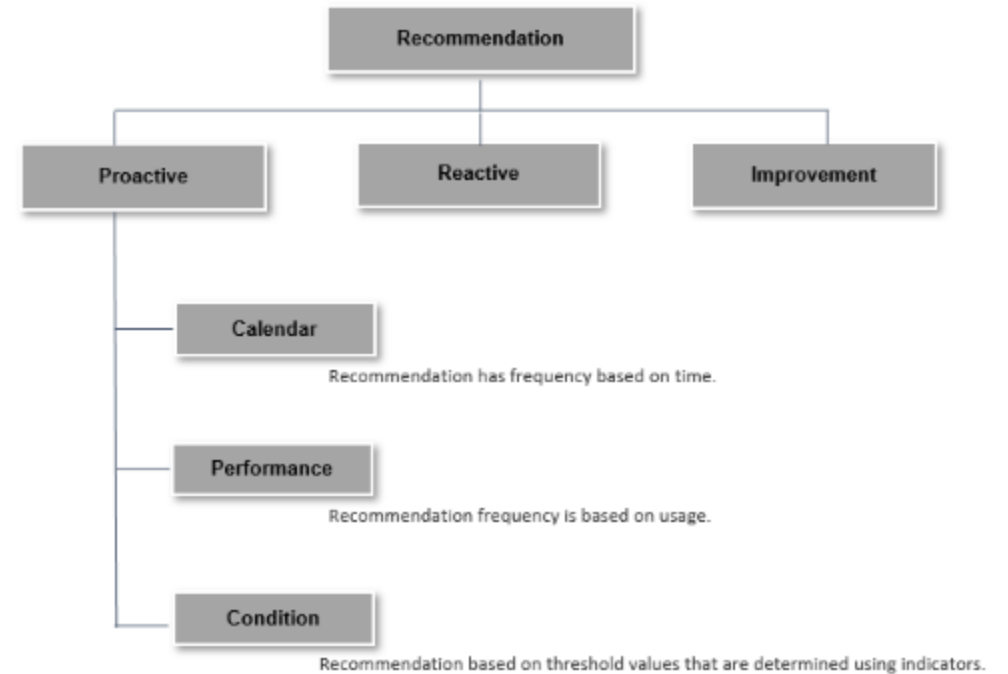
 **Tip**
If the replication of measuring points fails, then edit the measuring point description and save again, so that the measuring point is replicated in the next delta cycle.

 **Remember**
For newly created measuring points, sync from SAP S/4 HANA to SAP Asset Performance Management works only with the following transaction codes in SAP S/4HANA system: IE02 or IL02. Using the S/4HANA public API or transaction code IK01 will not detect the newly created measuring point and will not sync it in SAP Asset Performance Management.

Recommendations

- Used to manage failure mitigating Recommendations
- Maintenance Activity Category:
 - Proactive (Calendar, Performance or Condition)
 - Reactive (Corrective)
- Improvement Activity Category (e.g. design/process change)
- Assigned to Technical Objects (FLOC/EQ)
- Can be linked to Indicators (Measuring Points) on Technical Objects
- Can be linked to Task List and Maintenance Plan

Illustration

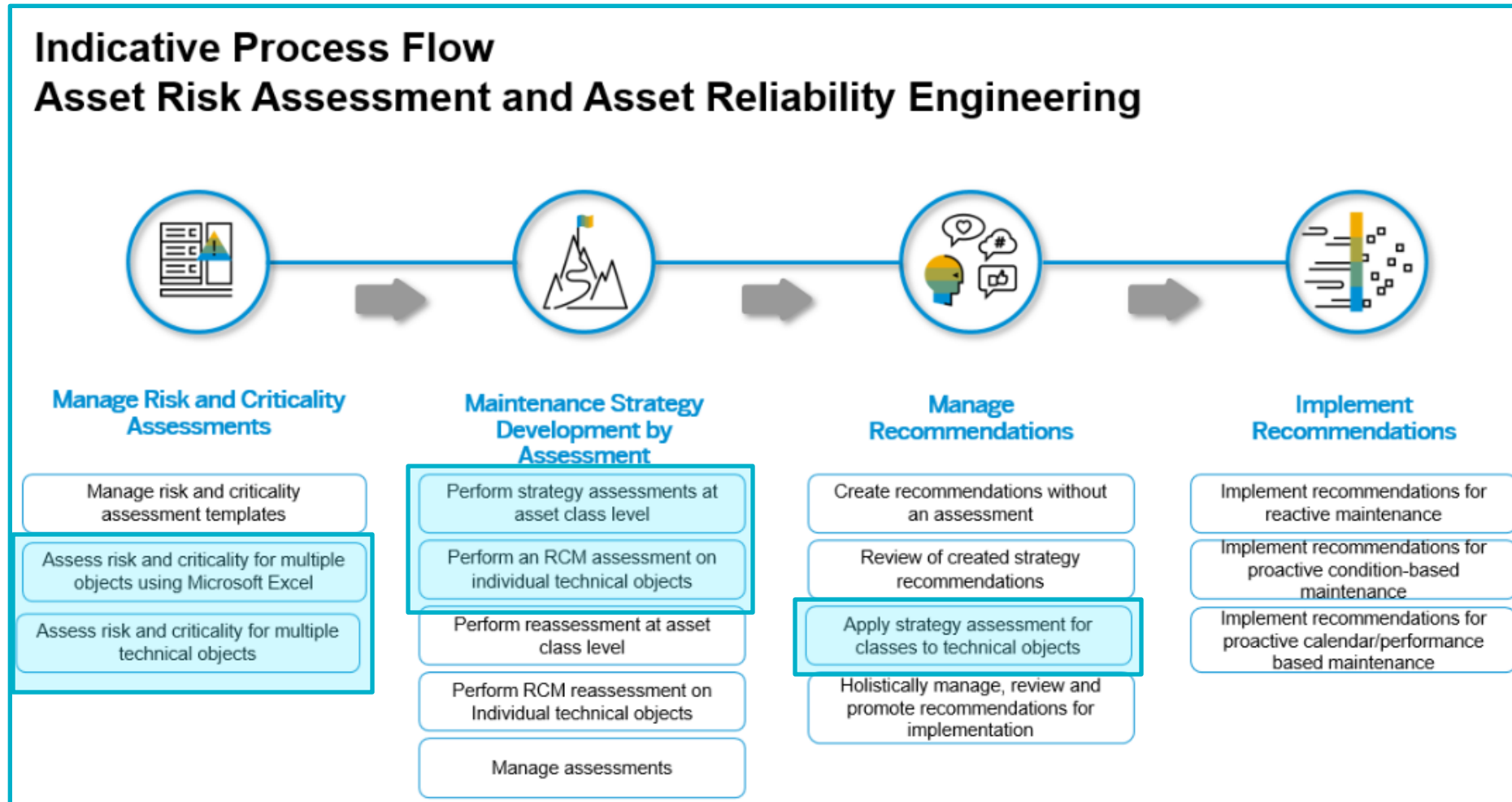


Data Requirements for Criticality & Risk Assessments in APM

Criticality & Risk Assessment Types in APM

- Multiple Assessment Types – which one do I use?

Assessment in APM



Risk & Criticality Assessment

- Risk & Criticality Assessment is used to identify critical assets and determine risk score
- Suggest appropriate risk-based methodologies as defined in template such as:
 - Reliability Centered Maintenance (RCM)
 - Failure Model Effects Analysis (FMEA)
 - Preventive Maintenance Review
 - Run to Fail
 - OEM Guidelines

The screenshot shows the SAP 'Manage Risk & Criticality Assessments' interface. The main header indicates the assessment is for 'ASM Assessment Current Risk' with ID 'RCASML1707447006186819'. The status is 'Released', risk type is 'Current Risk', and currency is 'Indian Rupee (INR)'. The interface is divided into two main sections: 'Assignments (2)' and 'Impacts'.

Assignments (2) Table:

Technical Object	Details	Risk Score
_AUT_A2855M_PopOverRC_4T4EMPLATE		9.00
Top level for char 1112 CHAR		9.00
_AUT_A2855M_PopOverRC_4T4EMPLATE	2 / 2	
AssetHealth-E2E-EQUIP-202402090000 10541924		4.00
_AUT_A2855M_PopOverRC_4T4EMPLATE	2 / 2	

Impacts Table:

Impact	Risk Score	Criticality	Action
_AUT_APM_2P_IMPACT	2.00		1.00 INR
_AUT_APM_5P_IMPACT	9.00		2.00 INR
Overall	9.00		3.00 INR

Risk Matrix for _AUT_APM_2P_DIM1:

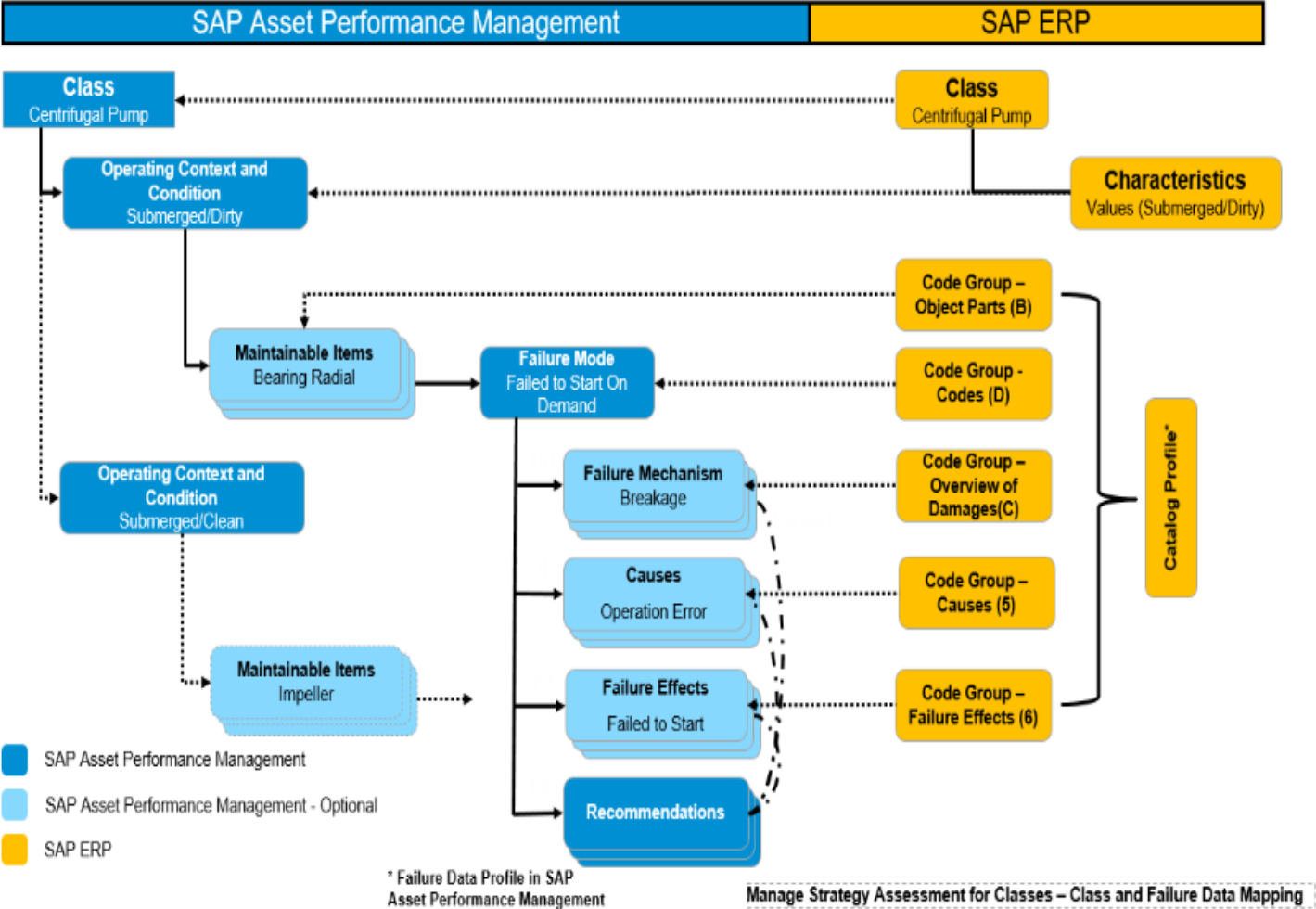
	VERY HIGH	HIGH
MEDIUM	3.00	4.00
HIGH	2.00	3.00

The matrix is labeled with 'VERY HIGH' and 'HIGH' on the x-axis and 'MEDIUM' and 'HIGH' on the y-axis. The overall risk score is 2.00.

Strategy Assessment for Classes

Manage maintenance strategies with mitigation actions at the Class level

Critical Data Mapping Field



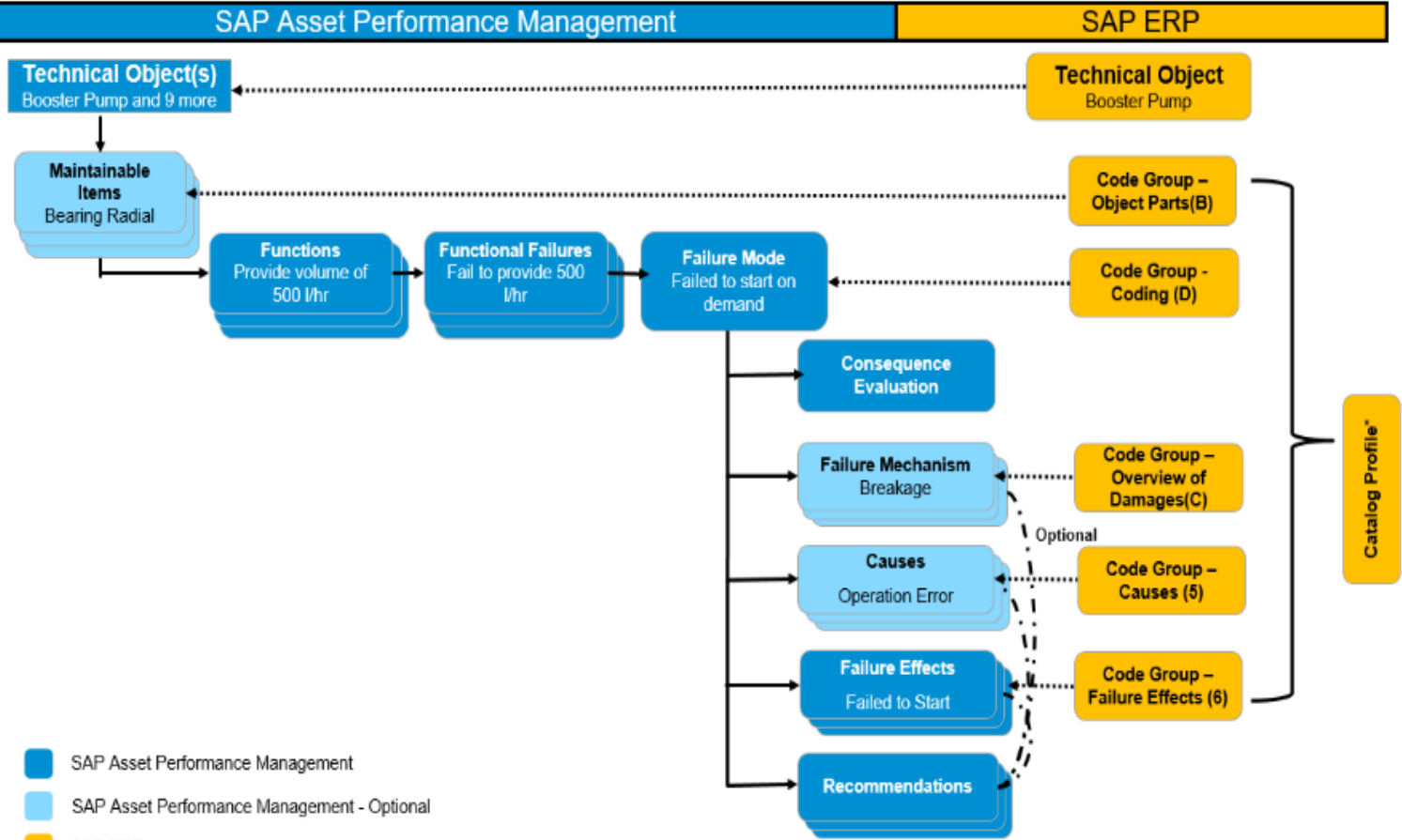
Component	Mandatory / Optional	SAP ERP
Class	Mandatory	Class
Operating Context and Condition	Optional#	Characteristic
Maintainable Items	Optional	Object Parts (B)*
Failure Modes	Mandatory	Coding (D)*
Failure Mechanisms	Optional	Overview of Damage (C)*
Causes	Optional	Causes (5)*
Failure Effects	Optional	Effects (6)*

Mandatory if Operating Context set to "yes"
* Catalog codes defined in SAP ERP & visible in GUI T-code QS49

Reliability Centred Maintenance (RCM) Assessment

- Assess Technical Objects and assign failure data

Critical Data Mapping Field



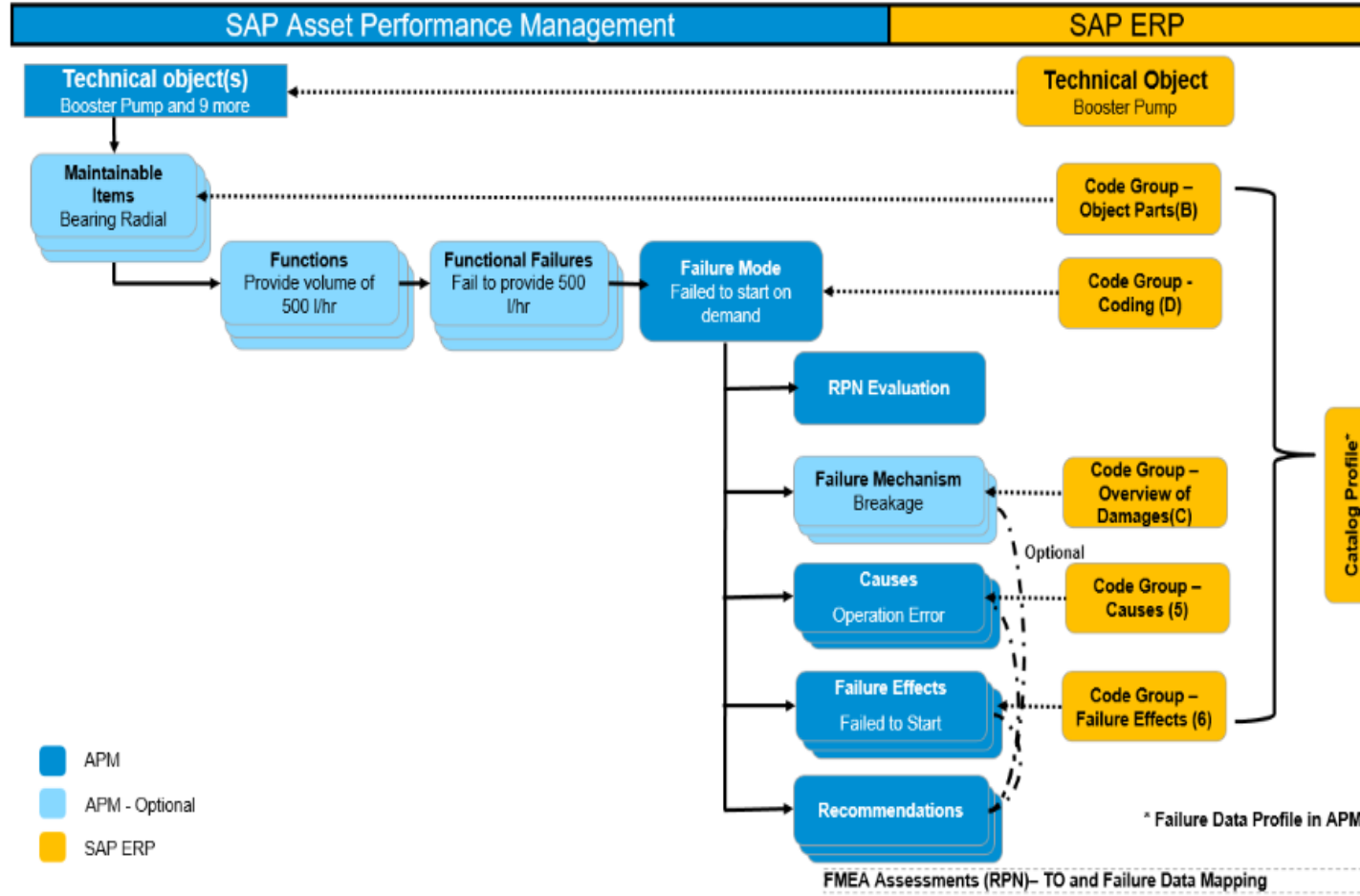
Component	Mandatory / Optional	SAP ERP (Type)
Function #	Mandatory	
Maintainable Item	Optional	Object Parts (B)*
Functional Failure #	Mandatory	
Failure Modes	Mandatory	Coding (D)*
Failure Mechanisms	Optional	Overview of Damage (C)*
Causes	Optional	Causes (5)*
Failure Effects	Mandatory	Effects (6)*

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
Created & maintained in APM

RCM Assessments – Technical Object and Failure Data Mapping

FMEA - Risk Priority Number (RPN) Evaluation

- Identify Failure Modes, their causes and effects on an asset



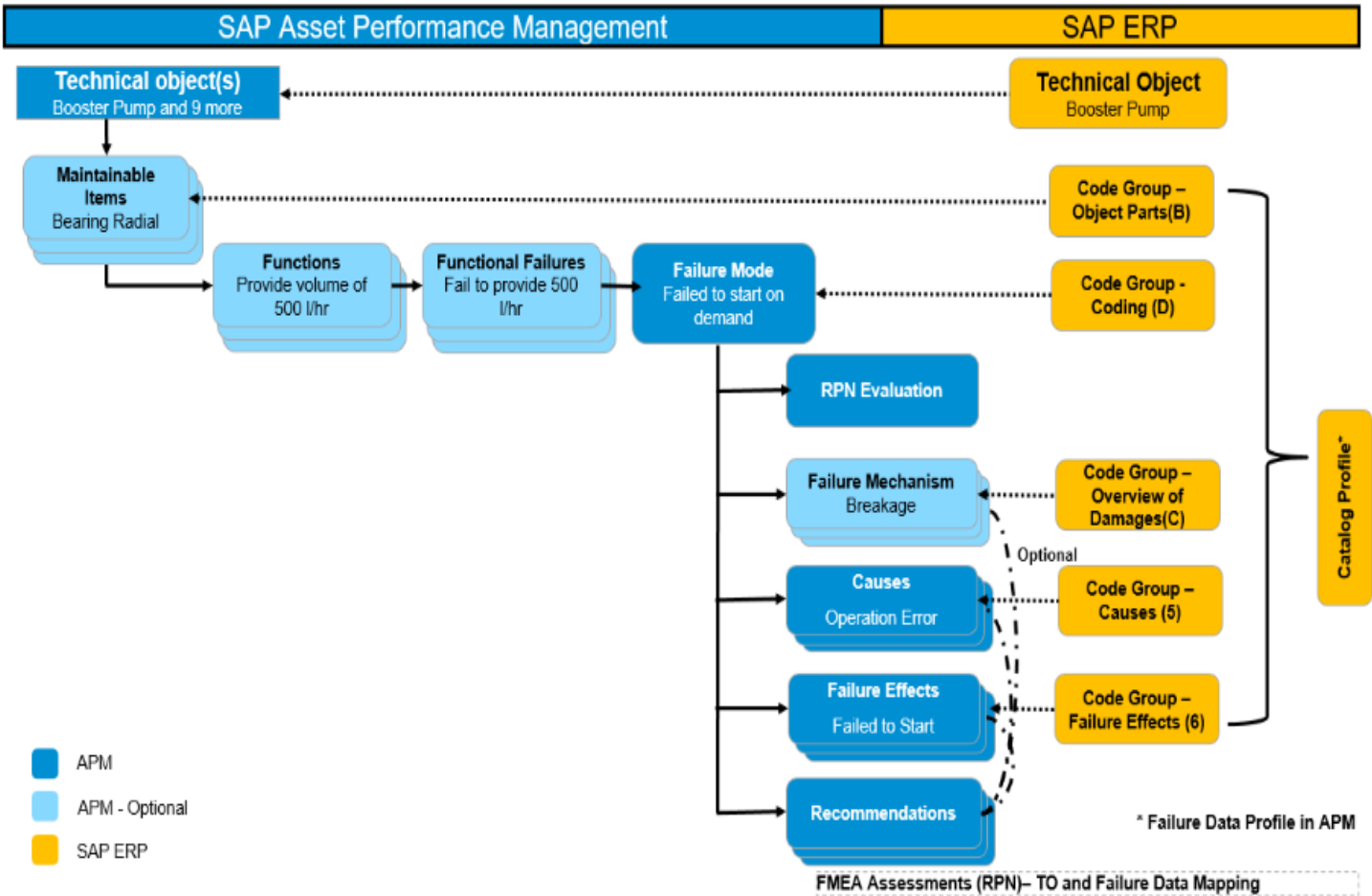
Critical Data Mapping Field

Component	Mandatory / Optional	SAP ERP (Type)
Maintainable Item	Optional	Object Parts (B)*
Functions #	Optional	
Functional Failures #	Optional	
Failure Modes	Mandatory	Coding (D)*
Causes	Mandatory	Causes (5)*
Failure Effects	Mandatory	Effects (6)*
Failure Mechanisms	Optional	Overview of Damage (C)*
RPN Evaluation #	Optional	
Recommendation #	Mandatory	

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
Created & maintained in APM

FMEA – Failure Mode Criticality Score (FMCS)

- Perform Criticality Analysis at the Failure Mode level



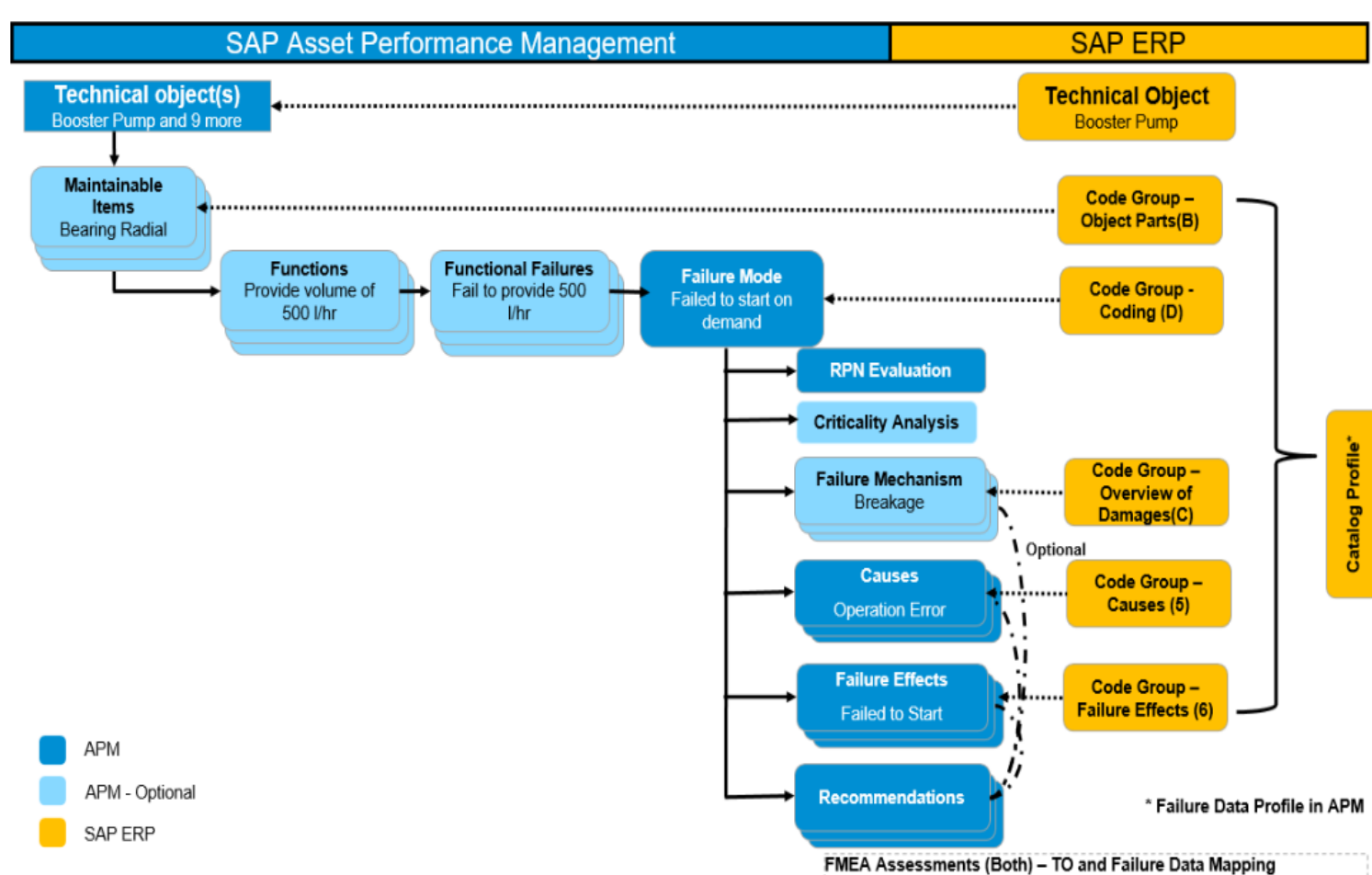
Critical Data Mapping Field

Component	Mandatory / Optional	SAP ERP (Type)
Maintainable Item	Optional	Object Parts (B)*
Functions #	Optional	
Functional Failures #	Optional	
Failure Modes	Mandatory	Coding (D)*
Causes	Optional	Causes (5)*
Failure Effects	Mandatory	Effects (6)*
Failure Mechanisms	Optional	Overview of Damage (C)*
FMCS Evaluation #	Optional	
Recommendation #	Mandatory	

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
Created & maintained in APM

FMEA – Both RPN & FMCS

- Perform Criticality Analysis at the Failure Mode level and Identify Failure Modes, their causes and effects on an asset



Critical Data Mapping Field

Component	Mandatory / Optional	SAP ERP (Type)
Maintainable Item	Optional	Object Parts (B)*
Functions #	Optional	
Functional Failures #	Optional	
Failure Modes	Mandatory	Coding (D)*
Causes	Mandatory	Causes (5)*
Failure Effects	Mandatory	Effects (6)*
Failure Mechanisms	Optional	Overview of Damage (C)*
RPN Evaluation #	Mandatory	
FMCS Evaluation #	Optional	
Recommendation #	Mandatory	

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So... what data do I need to build for Risk & Criticality in APM?

Component	SAP ERP	Strategy Assessment for Classes	Reliability Centered Maintenance (RCM)	FMEA - Risk Priority Number (RPN)	FMEA – Failure Mode Criticality Score (FMCS)	FMEA – Both RPN & FMCS
Class	Class	Mandatory	N/A	N/A	N/A	N/A
Operating Context & Condition	Characteristic	Optional	N/A	N/A	N/A	N/A
Maintainable Item	Object Parts (B)*	Optional	Optional	Optional	Optional	Optional
Functions #		N/A	Mandatory	Optional	Optional	Optional
Functional Failures #		N/A	Mandatory	Optional	Optional	Optional
Failure Modes	Coding (D)*	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
Causes	Causes (5)*	Optional	Optional	Mandatory	Optional	Mandatory
Failure Effects	Effects (6)*	Optional	Mandatory	Mandatory	Mandatory	Mandatory
Failure Mechanisms	Overview of Damage (C)*	Optional	Optional	Optional	Optional	Optional
RPN Evaluation #		N/A	N/A	Mandatory	N/A	Mandatory
FMCS Evaluation #		N/A	N/A	N/A	Optional	Optional
Recommendation #		N/A	N/A	N/A	Mandatory	Mandatory

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Created & maintained in APM

What data do I already have for Risk & Criticality?

Legacy WMS Risk Assessments

- Free text Functional Failures:
 - No list of Failure Modes to select from
 - Not consistent across asset types
 - Not linked to Object Part, Damage, Effect, Cause, etc
- Risk Matrix changed from 6 x 7 in ECC to 5 x 5 in S/4:
 - No way to map scores to new matrix
 - Risk Categories are different
- Inconsistencies in what level in the hierarchy Risk Assessment is done (e.g. Header or lower level)
- Not linked to mitigation strategies
- Data is difficult to mine and has to be dumped from tables
- Maximum Risk Score is not weighted by Category

The screenshot shows the 'Refurbishment and Maintenance Planning' software interface. The top section contains form fields for 'Funct Location' (AWC-PST-003-PUN-001-CWS), 'Description' (COOLING WATER UNIT), 'General Location' (P), 'Category' (Pump Station - Major), 'Standard Func.Loc.' (Cooling System), 'Equipment', 'User Status' (AUSE DOCO), 'In Op From' (31.03.1988), 'Object #' (698), 'Object Type' (ME), 'Replace Cost' (0.00), 'Est Replace Date', 'Cost Centre' (CBG), and 'Sort Field' (BOCOOLIMA PUMP STATION). Below this is a 'Risk Assessment (30)' section with a table of risk categories. A red box highlights the 'Probability' dropdown menu, which is set to '10 - ...'. A red box also highlights the 'Consequence' column in the table, which is set to 'Insignificant'. Arrows point from these red boxes to two separate boxes at the bottom of the slide, which provide detailed descriptions for the '3 - Minor' and '10 - Rare' risk levels.

Category	Rank	Consequence	Score	Cat ...	Risk	Comments
WH&S	3	3	30	1	Low	
Environment	3	3	30	1	Low	
Financial	3	3	30	1	Low	
Production/Operations	3	3	30	1	Low	
Stakeholder Relations	3	3	30	1	Low	

3 3 - Minor

8 8 - Moderate

18 18 - Significant

40 40 - Major

100 100 - Critical

235 235 - Catastrophic

1 - Extremely Rare : The event could occur only in extremely exceptional circumstances

3 - Very Rare : The event could occur only in very exceptional circumstances

10 - Rare : The event may occur only in exceptional circumstances Highly unlikely

20 - Unlikely : The event could occur at some time but is unlikely Occurs about 0

45 - Possible : The event may occur in some circumstances Occurs about once every

100 - Likely : The event may occur in most circumstances Occurs about once a year

235 - Almost Certain : The event is expected to occur in most circumstances Occurs

Criticality Assessment for Critical Spares

- Only looked at water producing assets where holding a spare would reduce risk
- Data stored in Excel on Sharepoint
- Failure Modes concatenated in one cell and not assessed separately
- Max Consequence Score loaded in ABC Indicator field in SAP

Asset Description	Object Type	Parent	Dominant Failure	Consequence	Safety	Environment	Customer Supply	Stakeholder Relations	Financial	Legal, Regulatory	Max	Consequence Description
TRANSFORMER ISOLATOR STAT/SERV	ISOLATOR		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure / Fails to operate due to mechanical damage	Potential electrical injuries/death to personal. Supply disruptions to customers. <\$10k to replace item, <\$200k to replace any damaged equipment	5	1	3	3	1	2	5	Catastrophic
LOW VOLTAGE	ELECTRICAL EQUIPMENT	x	Parent - see below		5	1	4	3	3	1	5	Catastrophic
CABLES	LV CABLE-ABOVE GRND		Insulation failure due to mechanical damage / Short circuit due to loose connections	Crane fails to operate	3	1	2	3	1	1	3	Moderate
SWITCHBOARDS	ELECTRICAL EQUIPMENT	x	Parent - see below		5	1	4	3	3	1	5	Catastrophic
SWITCH BOARD OPERATOR CONSOLE	CONTROL CONSOLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Potential personnel injury - electrical burns. Control gear damage. Loss of customer	3	1	1	2	1	1	3	Moderate
SWITCHBOARD 48V DC TRIP SUPPLY	ELECTRICAL EQUIPMENT		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Potential personnel injury - minor electrical burns	3	1	2	2	1	1	3	Moderate
CABINET, BATTERY CHARGER	CUBICLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Incorrect control. Potential personnel injury - low voltage	3	1	1	1	1	1	3	Moderate
SWITCHBOARD STAT/SERV 415V	ELECTRICAL EQUIPMENT	x	Parent - see below		5	1	4	3	3	1	5	Catastrophic
CUBICLES	ELECTRICAL EQUIPMENT	x	Parent - see below		5	1	4	3	3	1	5	Catastrophic
AUX SUPPLY ISOLATING CUBICLE	CUBICLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Incorrect control. Potential personnel injury - low voltage	3	1	1	1	1	1	3	Moderate
COMPRESSOR NO1 ISOL CUBICLE	CUBICLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Incorrect control. Potential personnel injury - low voltage	3	1	1	1	1	1	3	Moderate
COMPRESSOR NO2 ISOL CUBICLE	CUBICLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Incorrect control. Potential personnel injury - low voltage	3	1	1	1	1	1	3	Moderate

Note that Data Origin defaults to "Inherit from Superior" which is not ideal. Had to load data twice to force ABC Indicator Data Origin to set to "Individually Maintain"

Catalog Codes – Object Part & Damage






Component	SAP ERP	
Class	Class	
Operating Context & Condition	Characteristic	
Maintainable Item	Object Parts (B)*	✓
Functions #		
Functional Failures #		
Failure Modes	Coding (D)*	✗
Causes	Causes (5)*	✗
Failure Effects	Effects (6)*	✗
Failure Mechanisms	Overview of Damage (C)*	✓
RPN Evaluation #		
FMCS Evaluation #		
Recommendation #		

Display Code Group Index: Initial Screen												
Language...	Short text	Keyword	Code Gro...	Language...	Short Text	LT	St	Em...	Code	Language...	Short Text for Code	
B	EN	Object Parts	Object Part	6300	EN	Gate			6352	EN	Lubrication	
									6353	EN	Actuator, Air	
									6354	EN	Actuator, Hydraulic	
									6355	EN	Bearing	
									6356	EN	Bolt	
									6357	EN	Casing	
									6358	EN	Cylinder, Air	
									6359	EN	Cylinder, Hydraulic	
									6360	EN	Door	
									6361	EN	Fitting	
									6362	EN	Gasket	
									6363	EN	Guard	
									6364	EN	Hose	
									6365	EN	Pin	
									6366	EN	Seal	
									6367	EN	Shaft	
			6400		Pump		2		6401	EN	Bearing	
									6402	EN	Casing	
									6403	EN	Cooling system	
									6404	EN	Coupling	
									6405	EN	Control valves	
									6406	EN	Impeller	
									6407	EN	Pipework	
									6408	EN	Performance	
									6409	EN	Seal - Mechanical	
									6410	EN	Seal - Packing	
									6411	EN	Shaft	
									6412	EN	Wear Rings - Casing or Impeller	

Display Code Group Index: Initial Screen												
Language...	Short text	Keywo...	Code Gro...	Language...	Short Text	LT	St	Em...	Code	Language...	Short Text for Code	
C	EN	Overview of Damage	Damage	1000	EN	Mechanical		2				
									1000	EN	General	
									1010	EN	Leakage	
									1020	EN	Vibration	
									1030	EN	Clearance/ alignment failure	
									1040	EN	Deformation	
									1050	EN	Looseness	
									1060	EN	Sticking	
			1100	EN	Material		2					
									1100	EN	General	
									1110	EN	Cavitation	
									1120	EN	Corrosion	
									1125	EN	Scouring	
									1130	EN	Erosion	
									1135	EN	Spalling	
									1140	EN	Wear	
									1150	EN	Breakage	
									1160	EN	Fatigue	
									1170	EN	Overheating	
									1180	EN	Burst	

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
Created & maintained in APM

Catalog Codes – Coding Code

Component	SAP ERP
Class	Class
Operating Context & Condition	Characteristic
Maintainable Item	Object Parts (B)* 
Functions #	
Functional Failures #	
Failure Modes	Coding (D)* 
Causes	Causes (5)* 
Failure Effects	Effects (6)* 
Failure Mechanisms	Overview of Damage (C)* 
RPN Evaluation #	
FMCS Evaluation #	
Recommendation #	

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49

Created & maintained in APM

Already used Coding Code D for Valuation Code on Measuring Points!!

Display Code Group Index: Initial Screen

Save to File

↑	Language...	Short te...	Keywo...	Code Gro...	Language...	Short Text	LT	St	Em...	Code	Language...	Short Text for Code
D	EN	Coding	Coding	10000003	EN	WTP Comment Codes				BWN	EN	Backwash cycle not run
				10000004	EN	Laboratories for Samples		2		BWY	EN	Backwash cycle run
										ALS	EN	ALS
										CAIR	EN	Cairns RCLS
										DES	EN	DESPL
										ECOS	EN	Ecoscope EL
										MACK	EN	Mackay RCLS
										OTHR	EN	Other
										SYMB	EN	Symbio
										TOOW	EN	Toowoomba RCLS
										VERI	EN	BureauVeritas
				10000005		Comment codes SDL Group		2		NINF	EN	No Water/Low Water - No Sample Collected
										NR01	EN	Not Required Seasonal - No Sample
										NREL	EN	No Release - No Sample Collected
										NSNA	EN	Access/Safety Issues - No Sample
										NSXB	EN	Christmas Shutdown - No Sample Collected
										OTOP	EN	Overtopping - No Sample Collected
										SDLI	EN	SDL sensor issue - data not available
				10000006		Comment codes LAB Group		2		NINF	EN	No Water/Low Water - No Sample Collected
										NR01	EN	Not Required Seasonal - No Sample
										NREL	EN	No Release - No Sample Collected
										NSNA	EN	Access/Safety Issues - No Sample
										NSXB	EN	Christmas Shutdown - No Sample Collected
										OTOP	EN	Overtopping - No Sample Collected

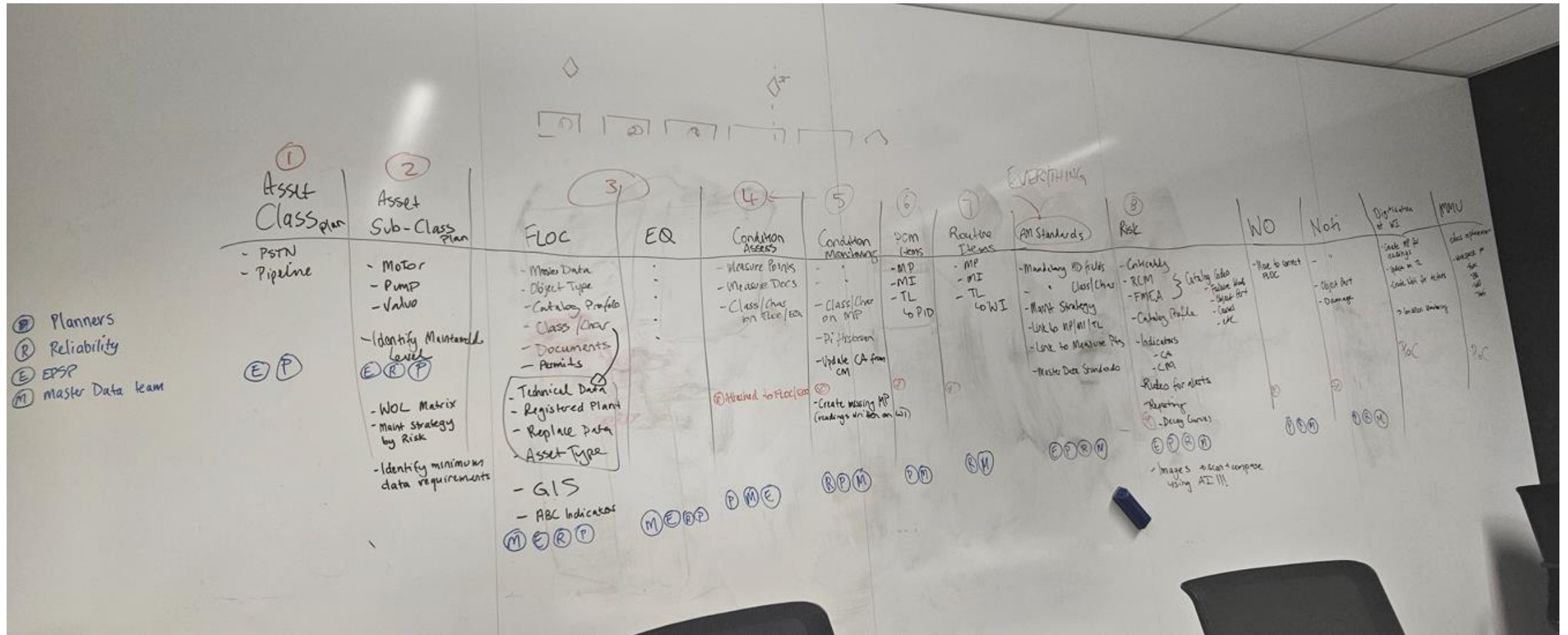
Data Model

(What data is where?)

Asset Data Working Group

- Established Asset Data Working Group with representatives from:
 - Reliability
 - Long Term Planning
 - BAU Master Data team
 - Contractor Master Data Specialists
 - Asset Management Improvement Program team
- Purpose of the group is to have input on:
 - All decisions relating to master data
 - Ensure any cross over with other initiatives are identified and utilized
 - Ensure all documentation is up to date (e.g. Asset Management Plans, Standards, Procedures)
 - Ensure any regulatory or compliance issues are covered

Whiteboard Brain Dump

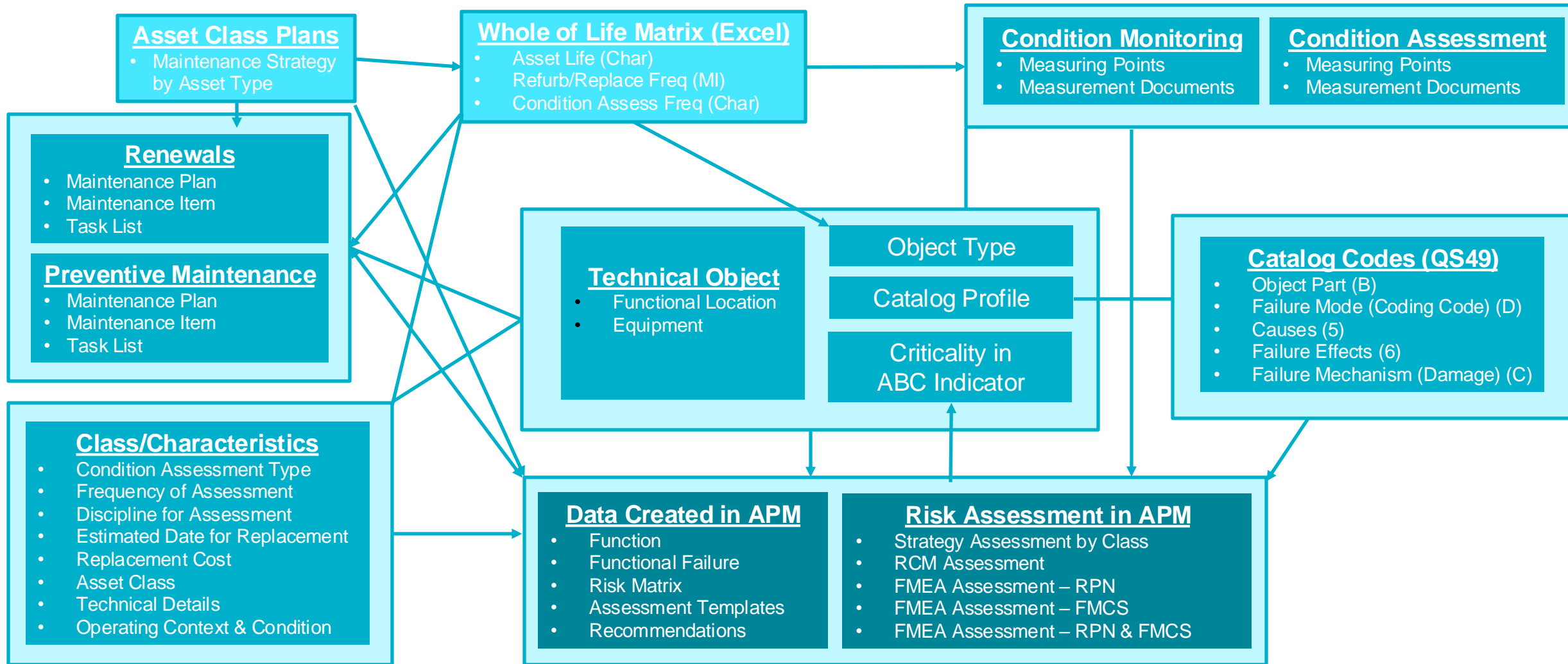


S/4 Data Objects used in APM

SAP S/4

APM

Excel

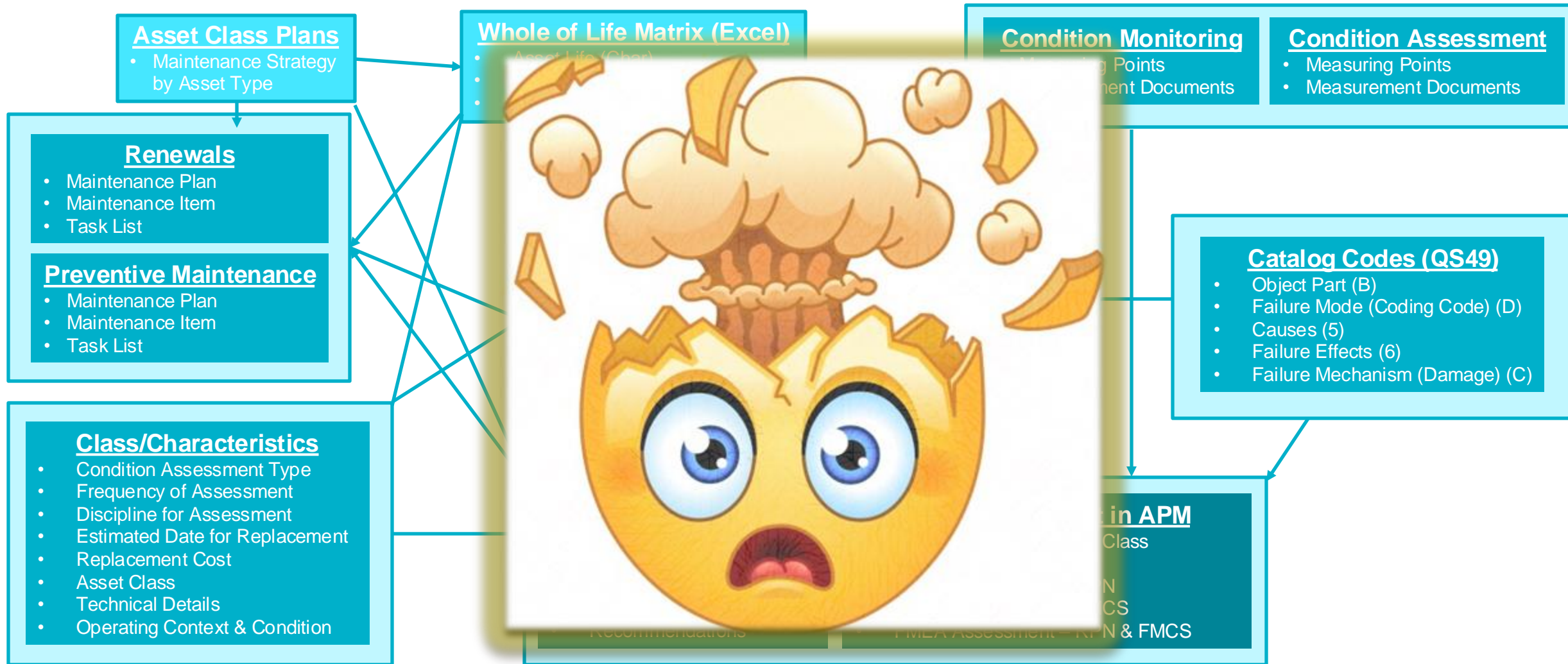


S/4 Data Objects used in APM

SAP S/4

APM

Excel



A High-Level Approach – what data is where?

Need to identify Maintainable Asset in asset hierarchy and ensure all below data objects are on the same level where possible.

- **Technical Objects (Functional Locations & Equipment)**
 - Object Type – linked to asset life, refurb/replace frequency, Condition Assessment frequency
 - Catalog Profile – linked to Catalog Codes for Object Part, Damage, Cause, Effect, etc
- **Maintenance Plans, Items and Task Lists**
 - Renewals (major refurb/replace, major inspections, enhancements, etc.)
 - Preventive Maintenance (minor servicing, minor inspections, etc.)
- **Measuring Points & Measurement Documents**
 - Condition Assessment (physical inspection assessed against up to six criteria on a scale 1-6)
 - Condition Monitoring (manual and/or SCADA readings for temperature, hours run, vibration, etc)
- **Risk Assessments**
 - Criticality Consequence Score in ABC Indicator field (from Criticality Assessment for Critical Spares)
 - Future APM Risk Assessments

Spot the Maintainable Asset – Surge Tanks

Blackwater Pipeline

Object	Object ID	Description
<input checked="" type="radio"/>	BLPIP2-SRG-001	SURGE TANK 4T 4861.56M
<input type="radio"/>	BLPIP2-SRG-001-PIP	PIPE
<input type="radio"/>	BLPIP2-SRG-001-STR	STRUCTURE
<input type="radio"/>	BLPIP2-SRG-001-TKS	TANK
<input type="radio"/>	BLPIP2-SRG-001-VLN	400D REFLUX VALVE



Eungella Eastern Pipeline



Object	Object ID	Description
	EWEEPI-P02-SRG	P2 SURGE TANKS
	EWEEPI-P02-SRG-001	SURGE TANK AT 11545M
	EWEEPI-P02-SRG-001-BYP	BYPASS LINE
	EWEEPI-P02-SRG-001-BYP-PIP	PIPEWORK
	10009892	PIPEWORK
	EWEEPI-P02-SRG-001-BYP-SCT	25MM STRAINER
	EWEEPI-P02-SRG-001-BYP-VLI	ISOLATION VALVE
	EWEEPI-P02-SRG-001-BYP-VLI-001	100MM ISOLATION VALVE (UPSTREAM)
	10009890	VALVE, 100MM SLUICE
	EWEEPI-P02-SRG-001-BYP-VLI-002	100MM ISOLATION VALVE (DOWNSTREAM)
	10009891	VALVE, 100MM SLUICE
	EWEEPI-P02-SRG-001-BYP-VLI-003	25MM ISOLATION VALVE
	EWEEPI-P02-SRG-001-BYP-VLL	100MM ALTITUDE VALVE
	10009893	VALVE, 100MM ALTITUDE VALVE
	EWEEPI-P02-SRG-001-BYP-VLP	25MM PRESSURE REDUCING VALVE
	EWEEPI-P02-SRG-001-CVR	TANK ACCESS HATCH
	EWEEPI-P02-SRG-001-FNC	FENCING AND GATE
	EWEEPI-P02-SRG-001-INN	INSTRUMENTATION
	10009894	LEVEL TRANSMITTER
	10009895	VALVE, 50MM GATE
	EWEEPI-P02-SRG-001-OVF	OVERFLOW PIPE
	EWEEPI-P02-SRG-001-PIP	PIPEWORK
	EWEEPI-P02-SRG-001-SCA	SCADA AT SURGE TANK 11545M
	10009896	240V DISTRIBUTION PANEL
	10010133	CONTROL CUBICLE
	10010134	DATA RADIO
	10010135	RTU
	EWEEPI-P02-SRG-001-SCO	TANK SCOUR OUTLET
	10009897	VALVE, 100MM SLUICE
	EWEEPI-P02-SRG-001-STR	CONCRETE STRUCTURE
	EWEEPI-P02-SRG-001-TKS	TANK 6.2M
	EWEEPI-P02-SRG-001-VLV	VALVE ARRANGEMENT
	EWEEPI-P02-SRG-001-VLV-VLI	300MM ISOLATION VALVE
	10009898	VALVE, 300MM BUTTERFLY
	EWEEPI-P02-SRG-001-VLV-VLN	300MM NON RETURN VALVE
	10009899	VALVE, REFLUX 300MM

Proposed Ideal Data Model for Surge Tank



Data in S/4 matches Ideal Data Model



Data in S/4 does NOT match Ideal Data Model

Technical Object (FLOC/EQ)	Description	Object Type	Catalog Profile	Renewal Maint Items	PM Maint Items	Condition Assessment	Condition Monitoring	Criticality	Risk Assessment
BLPIP2-SRG-001	SURGE TANK 4T 4861.56M	TK03	CIVIL GENERAL	NO	NO	NO	NO	NO	NO
BLPIP2-SRG-001-PIP	PIPE	PI01	PIPES	60Y REPLACE	12M INSPECT	YES	NO	YES	YES
BLPIP2-SRG-001-STR	STRUCTURE	CW01	CIVIL GENERAL	80Y REPLACE	12M INSPECT	YES	NO	YES	YES
BLPIP2-SRG-001-TKS	TANK	MT01	TANK	60Y REPLACE	12M INSPECT	YES	NO	YES	YES
BLPIP2-SRG-001-STR	400D REFLUX VALVE	VL14	VALVES	30Y REPLACE	12M INSPECT	YES	NO	YES	YES

Existing Data for Surge Tank

Technical Object (FLOC/EQ)	Description	Object Type	Catalog Profile	Renewal Maint Items	PM Maint Items	Condition Assessment	Condition Monitoring	Criticality	Risk Assessment
BLPIP2-SRG-001	SURGE TANK 4T 4861.56M	TK03	CIVIL GENERAL	NO	NO	NO	NO	NO	NO
BLPIP2-SRG-001-PIP	PIPE	PI01	PIPES	60Y REPLA	12M INSPEC	YES	NO	YES	YES
BLPIP2-SRG-001-STR	STRUCTURE	CW01	CIVIL GENERAL	80Y REPLA	12M INSPEC	YES	NO	YES	YES
BLPIP2-SRG-001-TKS	TANK	MT01	TANK	60Y REPLA	12M INSPEC	YES	NO	YES	YES
BLPIP2-SRG-001-STR	400D REFLUX VALVE	VL14	VALVES	30Y REPLA	12M INSPEC	YES	NO	YES	YES

Proposed Ideal Data Model for Pump Unit

Technical Object (FLOC/EQ)	Description	Object Type	Catalog Profile	Renewal Maint Items	PM Maint Items	Condition Assessment	Condition Monitoring	Criticality	Risk Assessment
ACPS01-PUN-001	PUMP UNIT 1	PU01	HEADER	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-MOE	MOTOR 1	MO02	MOTORS	15Y REFURB 45Y REPLACE	600HR INSPECT 1800HR INSPECT 12M SERVICE	YES	YES	YES	YES
EQ.10000044	MOTOR, 11KV	MO02	MOTORS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-PUM	PUMP 1	PU03	PUMPS	15Y REFURB 60Y REPLACE	3M INSPECT 6M INSPECT 12M SERVICE	YES	YES	YES	YES
EQ. 10000052	PUMP, TKL	PU03	PUMPS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV	VALVES	VL01	HEADER	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX	SUCTION VALVE & ACTUATOR	VL06	HEADER	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX-ACT	ACTUATOR	EL02	ELEC EQUIP	15Y REPLACE	12M INSPECT	YES	YES	YES	YES
EQ. 10039597	ACTUATOR, ELEC	EL02	ELEC EQUIP	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX-VLX	SUCTION VALVE	VL06	VALVES	15Y REFURB 45Y REPLACE	12M INSPECT	YES	YES	YES	YES
EQ. 10000054	VALVE, 600M BUTF	VL06	VALVES	NO	NO	NO	NO	NO	NO

Example of Existing Data in S/4



Data in S/4 matches Ideal Data Model



Data in S/4 does NOT match Ideal Data Model

Technical Object (FLOC/EQ)	Description	Object Type	Catalog Profile	Renewal Maint Items	PM Maint Items	Condition Assessment	Condition Monitoring	Criticality	Risk Assessment
ACPS01-PUN-001	PUMP UNIT 1	PU01	PUMPS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-MOE	MOTOR 1	MO02	MOTORS	15Y REFUR 45Y REPLAC	600HR INSP 1800HR INS 12M SERVICE	YES	YES	YES	YES
EQ.10000044	MOTOR, 11KV	MO02	MOTORS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-PUM	PUMP 1	PU03	PUMPS	15Y REFUR 60Y REPLAC	3M INSPECT 6M INSPECT 12M SERVICE	YES	YES	YES	YES
EQ. 10000052	PUMP, TKL	PU03	PUMPS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV	VALVES	VL01	VALVES	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX	SUCTION VALVE & ACTUATOR	VL06	VALVES	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX-ACT	ACTUATOR	EL02	ELEC EQUIP	15Y REPLAC	12M INSPEC	YES	YES	YES	YES
EQ. 10039597	ACTUATOR, ELEC	EL02	ELEC EQUIP	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX-VLX	SUCTION VALVE	VL06	VALVES	15Y REFUR 45Y REPLAC	12M INSPEC	YES	YES	YES	YES
EQ. 10000054	VALVE, 600M BUTF	VL06	VALVES	NO	NO	NO	NO	NO	NO

What next?

Preparing Data for APM

- APM Proof of Concept in Sandpit for:
 - Multiple types of facilities (e.g. dam, pump station, pipeline, channel)
 - Asset Types – pumps, motors, valves, pipes, switchboards
- Develop **Asset Class Plans** to define maintenance strategies by Asset Type
- Develop **Asset Data Information Standard** to:
 - Define business rules for maintainable asset
 - Define naming convention, field relationships, etc.
- Develop **Asset Data Strategy & Plan** to:
 - Move S/4 data objects to maintainable asset where possible
 - Create Functions and Functional Failures in APM
 - Review and update existing Catalog Profile, Object Part and Damage codes
 - Create Catalog Codes for Failure Modes, Causes and Failure Effects

Delivering water for prosperity