achieve outstanding client success

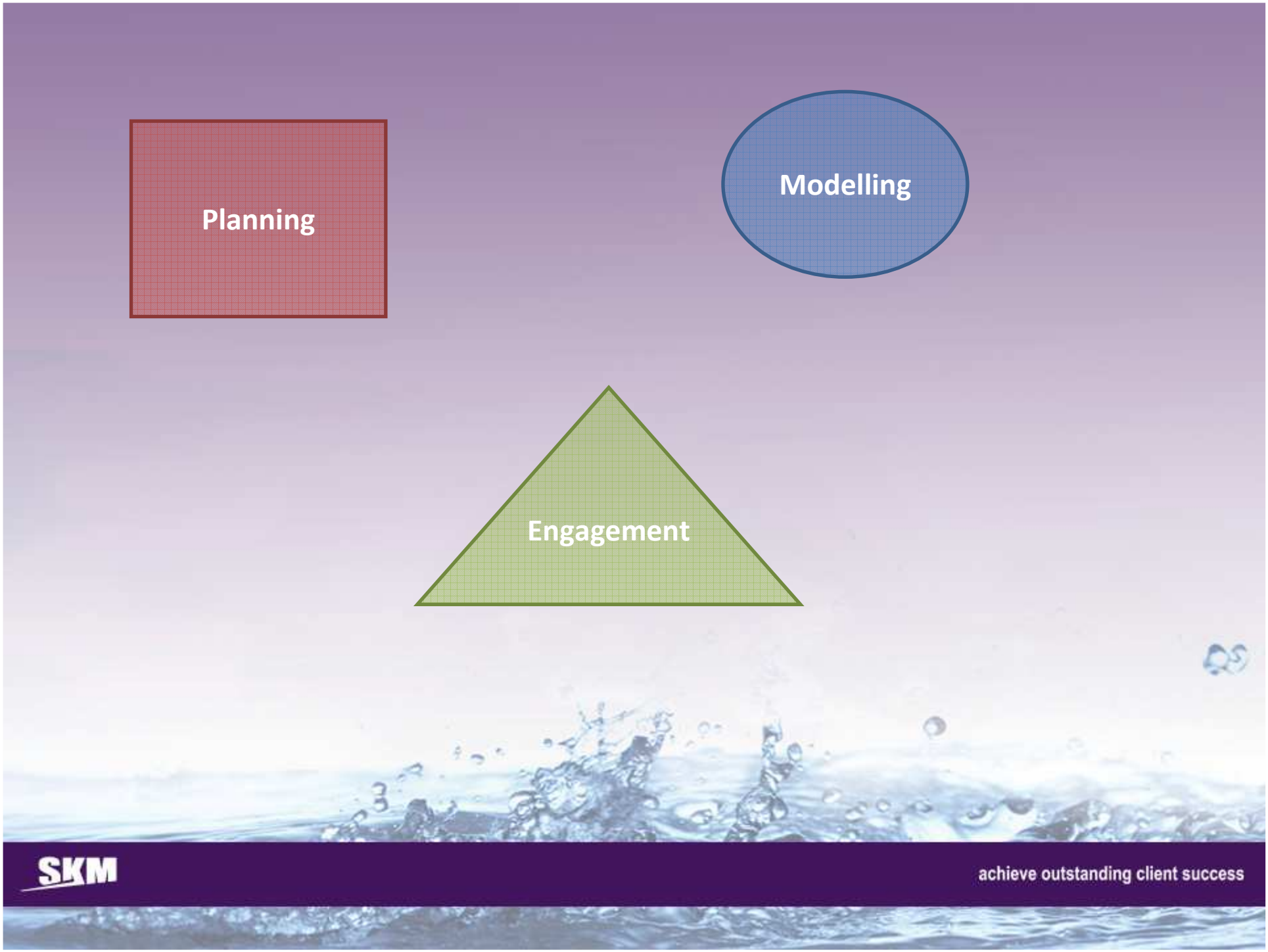
SINCLAIR KNIGHT MERZ
SKM

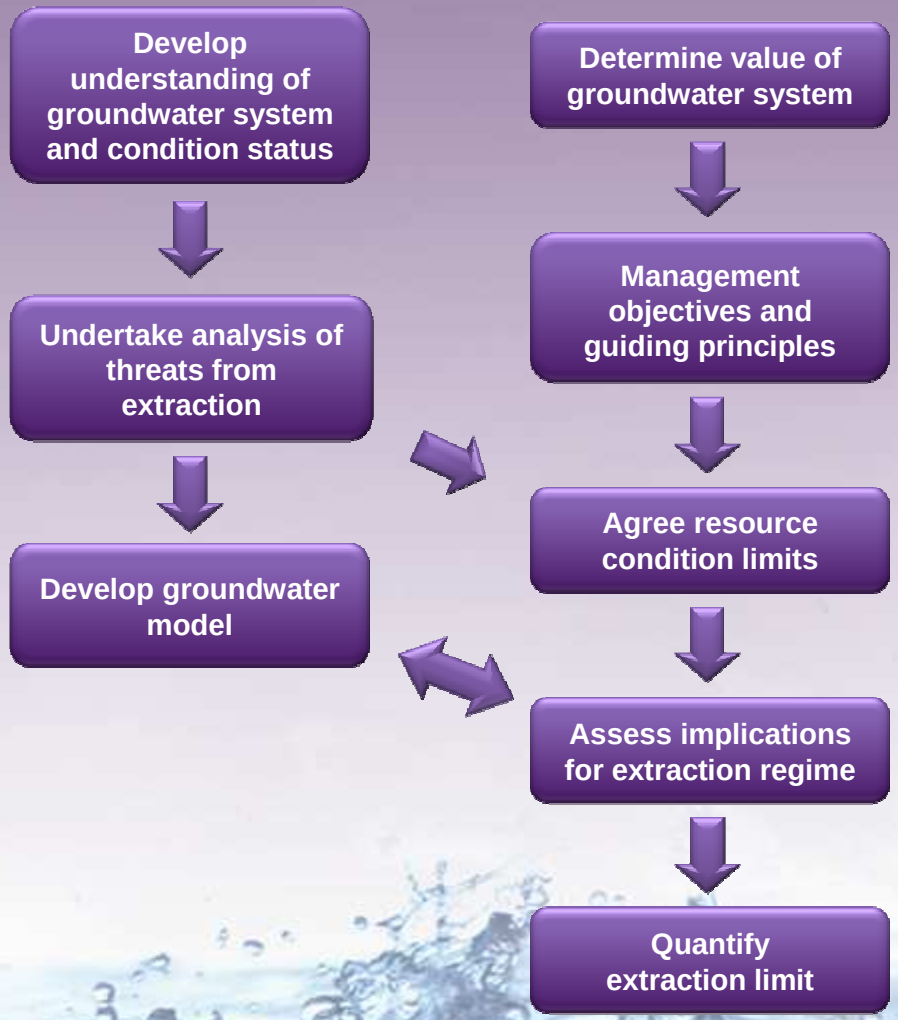
Resource Condition Limits and the setting of Groundwater Extraction Limits – A Stakeholder driven process

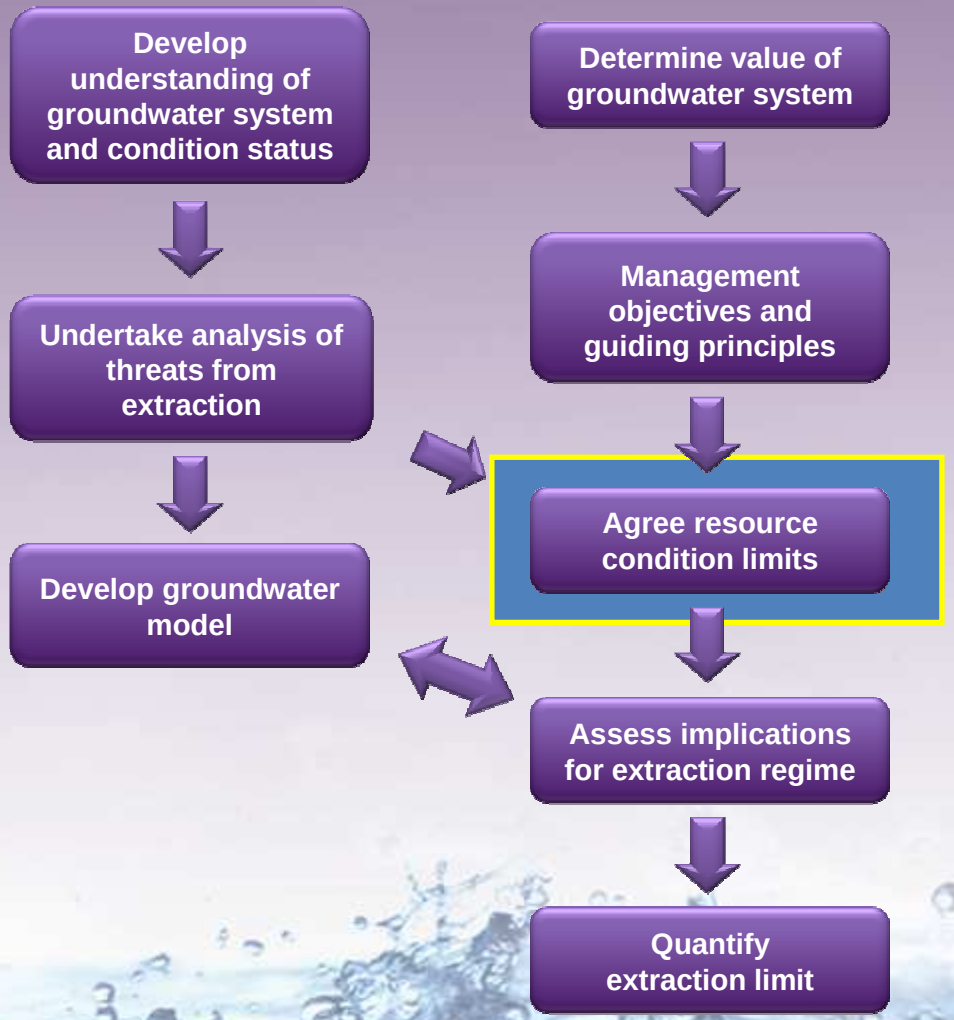
Stuart Richardson

Concepts

- Evolution from Safe Yield to Sustainable Yield
- From Sustainable to Acceptable
- Decide Announce and Defend (DaD) to stakeholder engagement
- Assets based approach
  - » Protecting asset value by achieving acceptable groundwater conditions – risk management
- How do you define acceptable groundwater conditions?


Planning
Modelling
Engagement
SKM
achieve outstanding client success


Develop understanding of groundwater system and condition status
Undertake analysis of threats from extraction
Develop groundwater model
Determine value of groundwater system
Management objectives and guiding principles
Agree resource condition limits
Assess implications for extraction regime
Quantify extraction limit

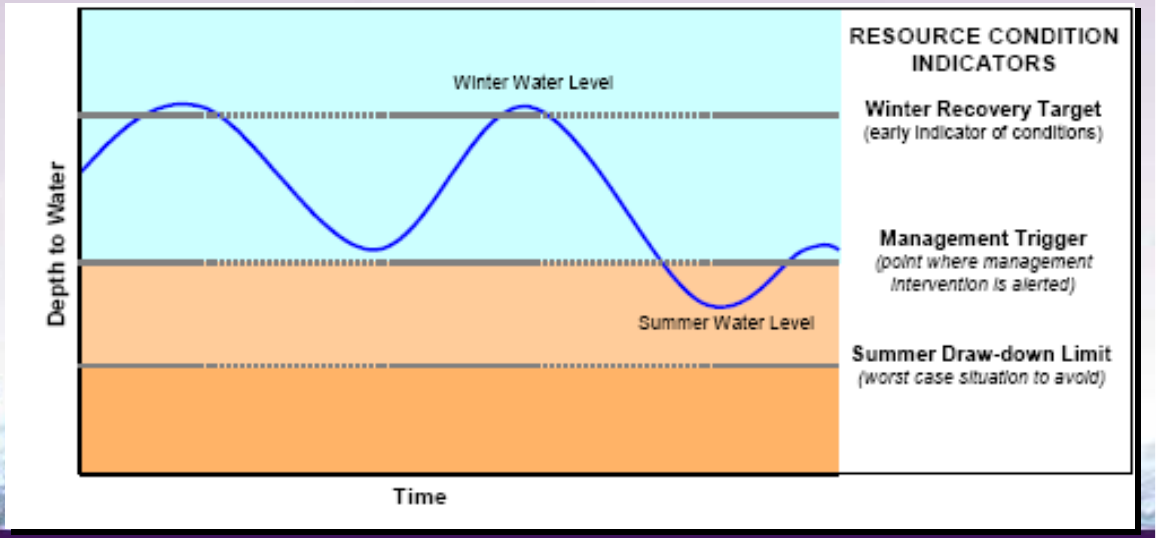

Develop understanding of groundwater system and condition status
Undertake analysis of threats from extraction
Develop groundwater model
Determine value of groundwater system
Management objectives and guiding principles
Agree resource condition limits
Assess implications for extraction regime
Quantify extraction limit

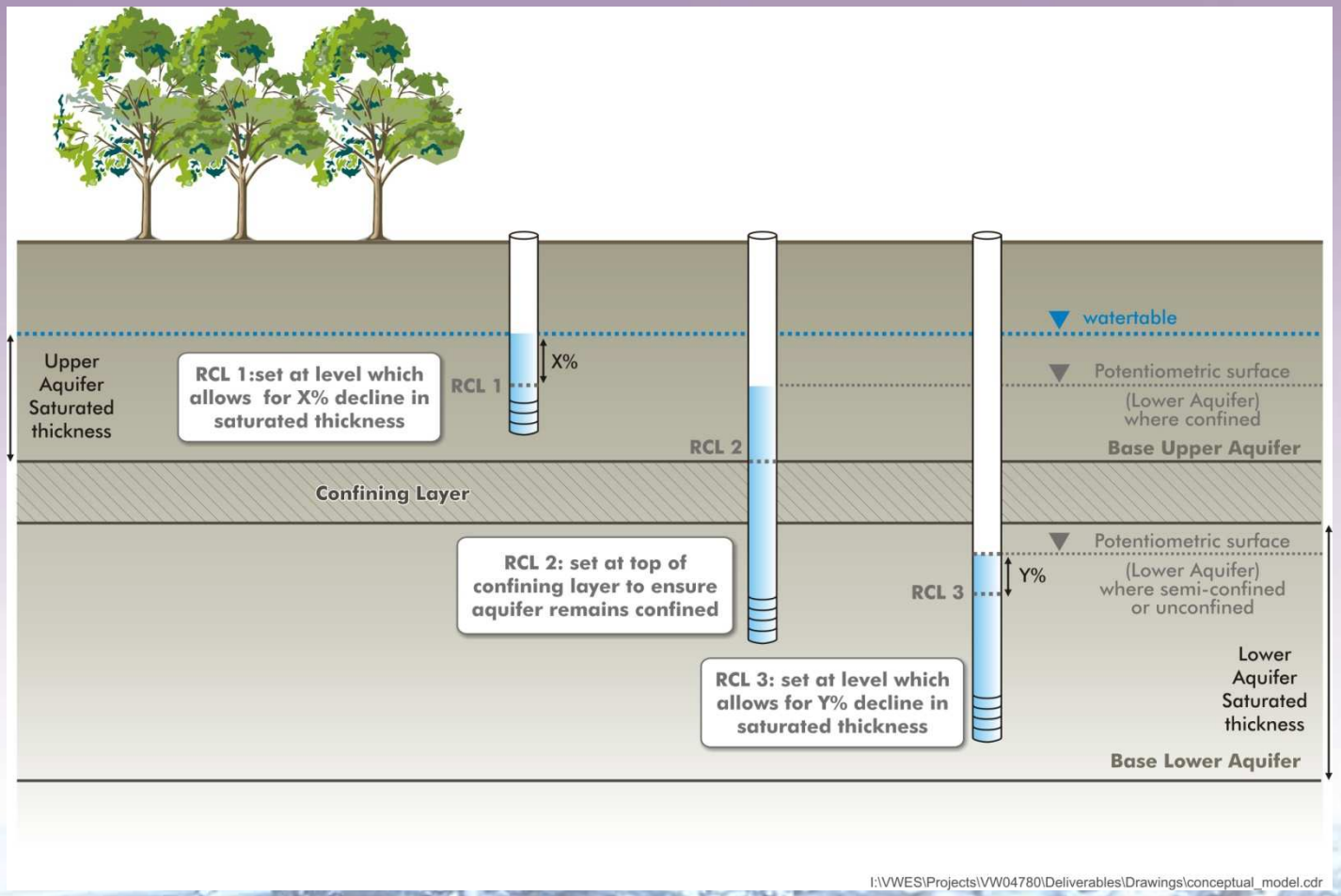
What is a Resource Condition Limit

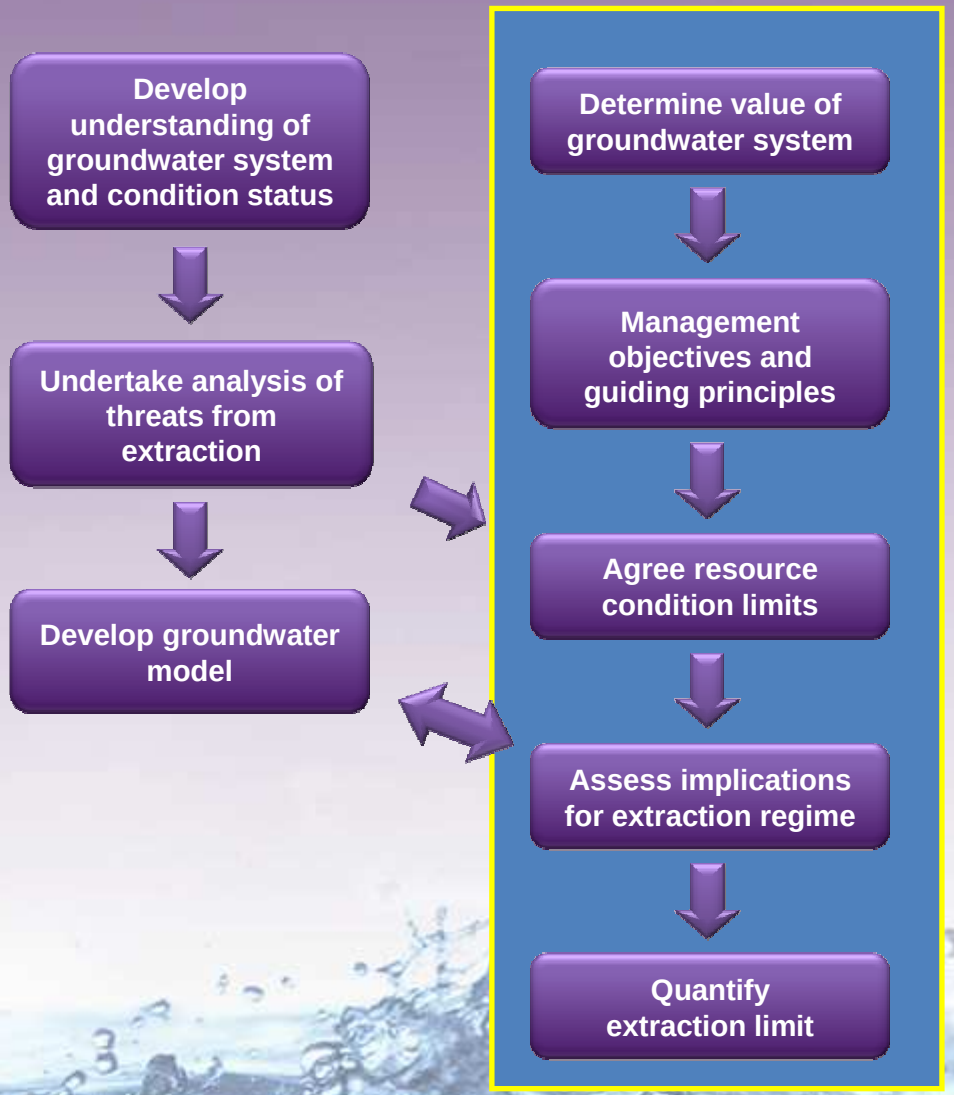
- Resource Condition Indicator
  - » A metric that can be used to assess resource condition
    - Rate of Drawdown
    - Rate of change of groundwater salinity
- Resource Condition Limit
  - » The limit where an indicator should be constrained
    - Top of an aquifer
    - Beneficial use category

What would it look like ?

- No greater decline in groundwater levels than occurred between Dec 2000 and Jun 2008 as measured on the edges of the drawdown cone, and the establishment of stable water level conditions within 5 years at the centre of the drawdown cone
- Water levels recover in winter to levels measured in August 2007 and drawdown levels do not exceed *x* m




Upper
Aquifer
Saturated
thickness
RCL 1:set at level which allows for X% decline in saturated thickness
RCL 1
X%
RCL 2
Confining Layer
RCL 2: set at top of confining layer to ensure aquifer remains confined
RCL 3
Y%
RCL 3: set at level which allows for Y% decline in saturated thickness
watertable
Potentiometric surface
(Lower Aquifer)
where confined
Base Upper Aquifer
Potentiometric surface
(Lower Aquifer)
where semi-confined
or unconfined
Lower
Aquifer
Saturated
thickness
Base Lower Aquifer
I:\VWES\Projects\VW04780\Deliverables\Drawings\conceptual_model.cdr


Develop understanding of groundwater system and condition status
Undertake analysis of threats from extraction
Develop groundwater model
Determine value of groundwater system
Management objectives and guiding principles
Agree resource condition limits
Assess implications for extraction regime
Quantify extraction limit

Planning Environment

- Key to have all stakeholders present
  - » Irrigator groups (maybe different sub-groups)
  - » Regulator
  - » Operator
  - » S&D users
  - » Sleepers and Dozers
  - » Environment

Roles and Responsibilities

- Who is responsible for what, and what is their view of how the groundwater resource in the NAP is performing?
  - » NRM Board
  - » State Government
  - » SA Water
  - » Irrigators
- Who has responsibility for the planning action?

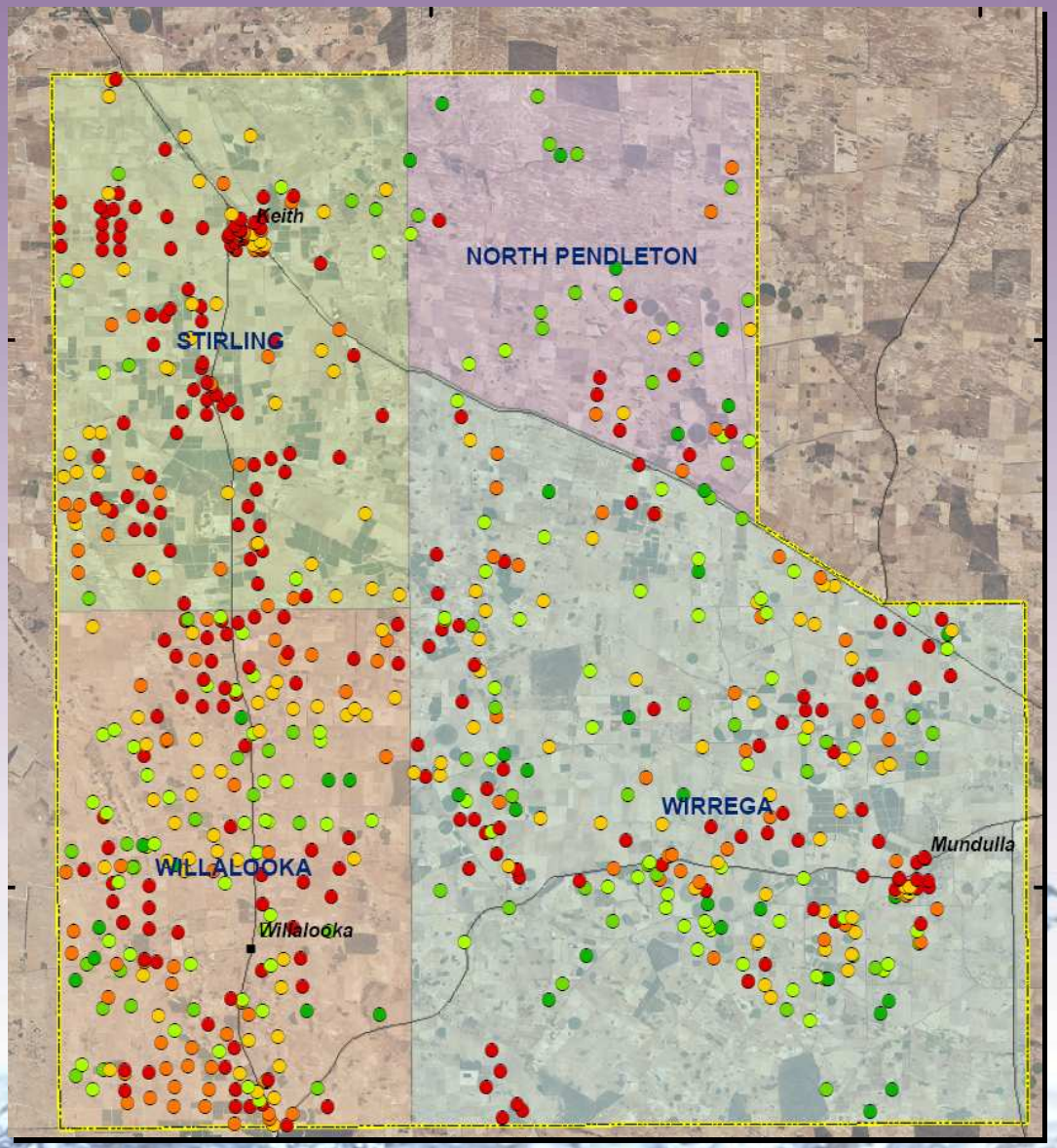
What are the risks to the resource?

- Head decline
- Increasing salinity (e.g. leakage from Q to T1)
- Land subsidence
- Reduction in aquifer recharge

Due to:

- Extraction within and outside the NAP
- Bore interference
- Urbanisation and dam development
- Climate variability
- Uncertainty in technical assessments

Map of Stock and Domestic Wells at risk by 2060



Integrated Water Resource Management in the South East of South Australia - Pilot Trial Zone -

Stock and Domestic Wells at Risk of Drying out by 2060.

Year

2015	2040
2020	2050
2030	2060

Values

- What are the things about the NAP that groups of individuals think are important or revered or respected and worth protecting
  - » Can be economic, social/cultural or environmental

Principles

- What are the core things that will (or should) govern the way the NAP PWA groundwater is used and managed
  - » Equity
    - Equal share of benefits and costs
  - » Sustainably
    - Leave resource in no worse condition than the start
  - » Precautionary
    - Will make a cautious decision if not enough data
  - » Manage for the long term across climate variability
  - » Continuous improvement in knowledge base
  - » Adaptive management
  - » Security

In what state do you want to leave the resource in 5 years time ?

- In 5 years time, groundwater will still be able to be pumped at current rates and will be the same salinity
  - » Pumping costs?

Sustainability condition

- The groundwater resource will be no worse off (and therefore the impacts will be acceptable) if:
  - » The water level in the T1 aquifer is greater than the specified level in Sept each year as measured at agreed bores, and
  - » The water level in the T2 aquifer is greater than the specified level in Sept each year as measured at agreed bores, and
  - » The salinity in all aquifers does not exceed the beneficial use where it is below that level.

What is an acceptable Trigger and Limits for the T1 and T2 aquifers

- Current water levels?
- Average water levels across previous years?
- Water levels maintained 10 m above the top of each aquifer in September each year?
- No more than 1 m reduction in water level measured in observation bores over 2 or more years?

Scenarios to be tested via Groundwater Model

1. Abstraction at 100% of volumetric allocations
2. Abstraction as constant proportion of allocations to satisfy agreed Resource Condition Limits
3. Abstraction as constant proportion of allocations to maintain S-N hydraulic gradient
4. Abstraction as variable proportion (by GMA) of allocations to meet TAR_D values
5. Wet Climate: Recharge at 120%, abstraction at 75% and leach 50% of salt currently stored under vineyards to water table

Do Scenarios meet RCLs?

RCL	Scenario 01 100% Allocations	Scenario 02 45% Allocations	Scenario 03 60% Allocations	Scenario 04 TARd
June 2004 WL	N	Y	Y/N	Y (mainly)
50% Saturation	N	Y	Y/N	Y (mainly)
Maintain N-S flow	N	Y	Y	Y

Allocation versus Extraction
(ML/yr based on Indicative Volumetric Allocations)

Management Area	100% Allocation (Scenario 1)	45% Allocation (Scenario 2)	60% Allocation (Scenario 3)	Allocation = TARD (Scenario 4)	2003/04 Extraction (ML)	2004/05 Extraction (ML)	2005/06 Extraction (ML)
1	39784	17903	23870	27899	20871	14044	21472
2A*	14927	6717	8956	6733	7020	7418	9043
2B*	14377	6470	8626	3651	6406	7151	5214
3	7479	3366	4487	4985	3511	4063	3848
4	2967	1335	1780	6368	1824	839	1163
TOTAL	79534			49636			

League Table

Played	Won	Draw	Loss
5	3	1	1

Northern Adelaide Plains and Padthaway

- Brought together perspectives of government and water users (e.g. issues around cuts to allocation in the Padthaway)
- Provided a basis for quantification of the sustainable groundwater yield that was acceptable to most stakeholders (e.g. agreement that use on 2003/04 in the NAP was considered acceptable)
- Allowed the development of draft water allocation planning policy

South East Pilot

- Identified the key management issues (e.g. maintaining bore yields and limiting impacts to S&D users) and the target technical investigations (modelling)
- Provided a basis for quantification of sustainable groundwater yield.

West Wimmera

- Provided an opportunity for the wide range of stakeholders to appreciate other perspectives
- Provided a basis for quantification of sustainable yield and allocation regime
- Effectiveness of the process was more limited where conflicts between dryland farmers and irrigators existed

Peake

- Process provided the agencies with a basis for water allocation planning process, but no agreement on acceptable levels of extraction due to persistent conflicts between irrigators and S&D users

Summary

- There is a process available that can move beyond the DaD approach
- Builds on the Acceptable Yield concept
- Relies on sound science and good modelling tools
- The main benefits are that stakeholders gain agreement – less conflict and need to defend
- More work to be done to develop tools that more explicitly link groundwater conditions with socio-economic and environmental indicators