

Curraghinalt Water Quality Discharge Limits

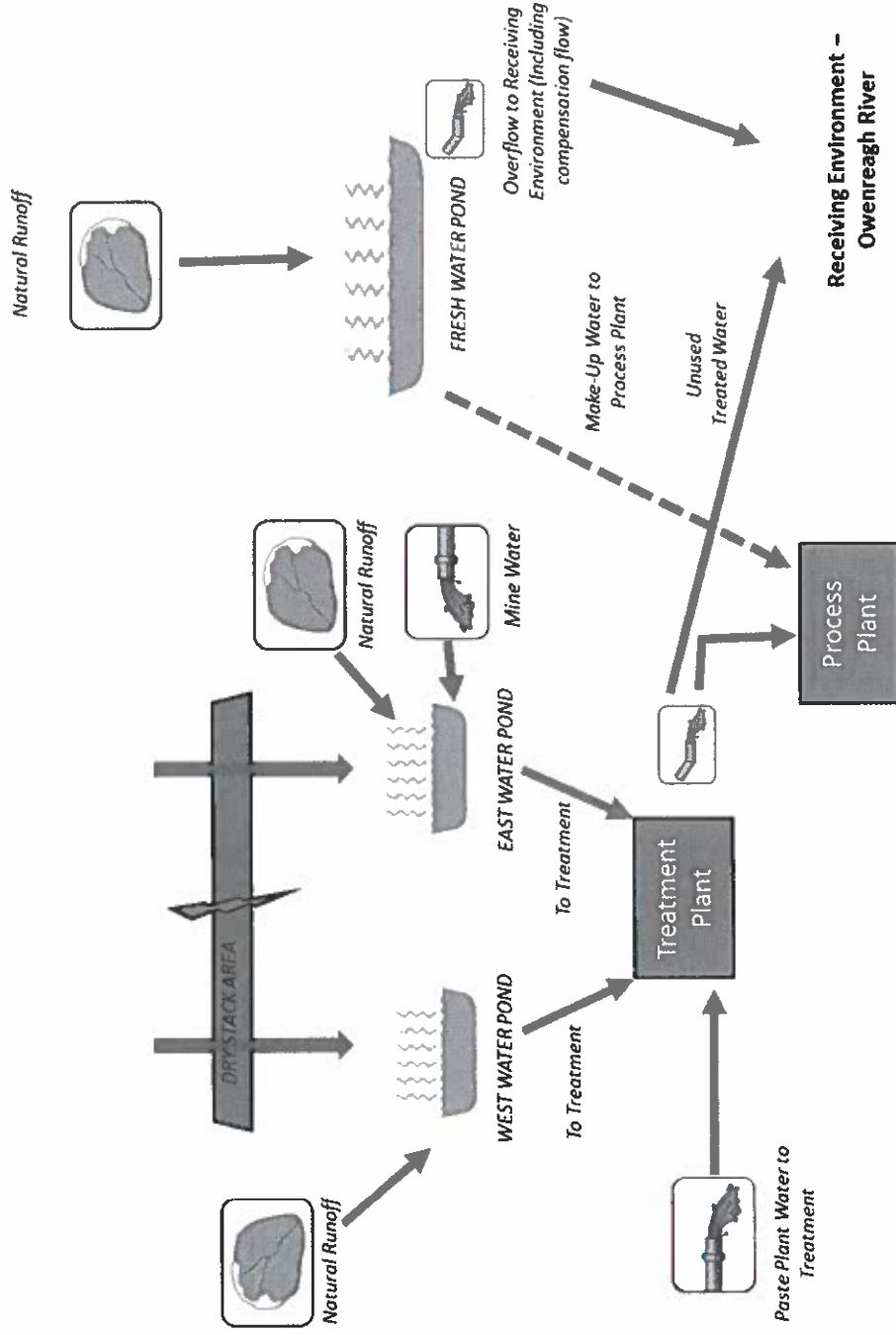
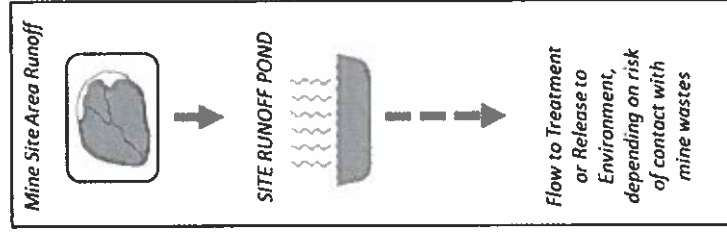
- Purpose of discussion is to provide update on progress of water balance and water quality assessment
- Review of available water quality standards and current water license for tunnel extension
- Discussion of methodology for water quality impact assessment
- Two consented discharges will be required
 - Extension of current consent for existing infrastructure area, including mine water contribution during construction phase
 - New consent for mine site area; including construction work and treated discharges from mine site
- Presentation focusses on new consent. However, methodology for both consents will follow same approach taken for Tunnel Extension Water License Application

Water Balance Update

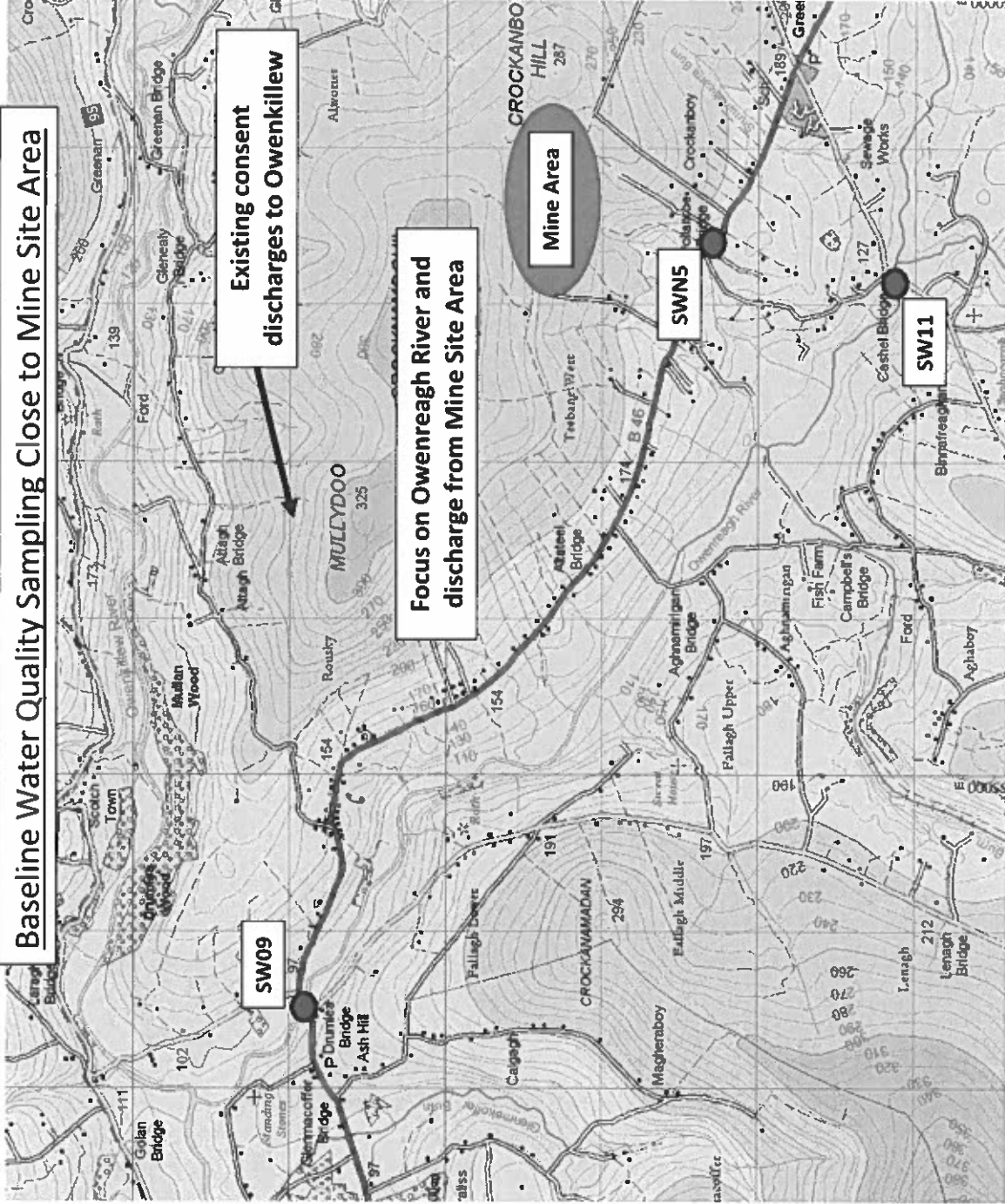
Water Balance model of site and water management infrastructure has been created and used to develop initial site water balance

- Monthly time step
- Includes all mine site components

Currently being used to refine site water management plan, optimise sizing of water storage ponds and water treatment plant

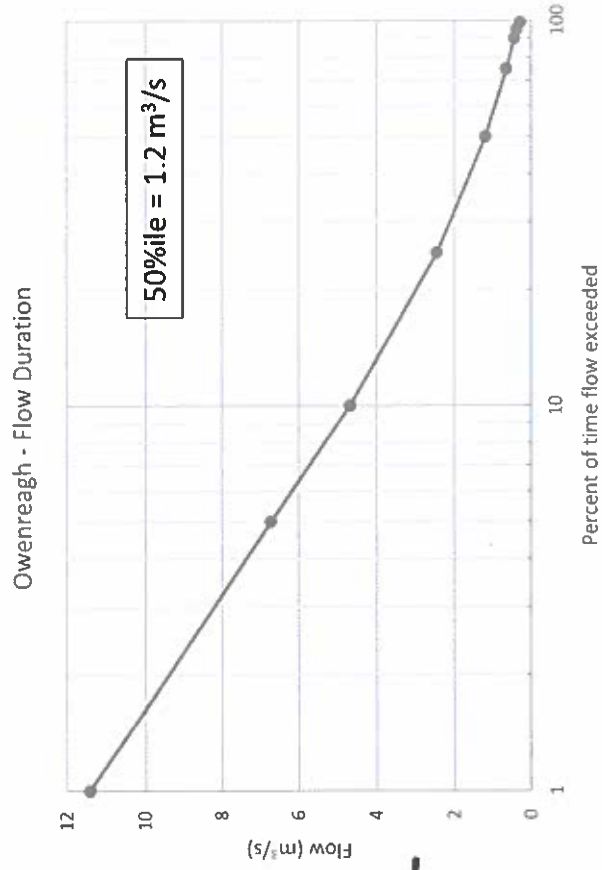
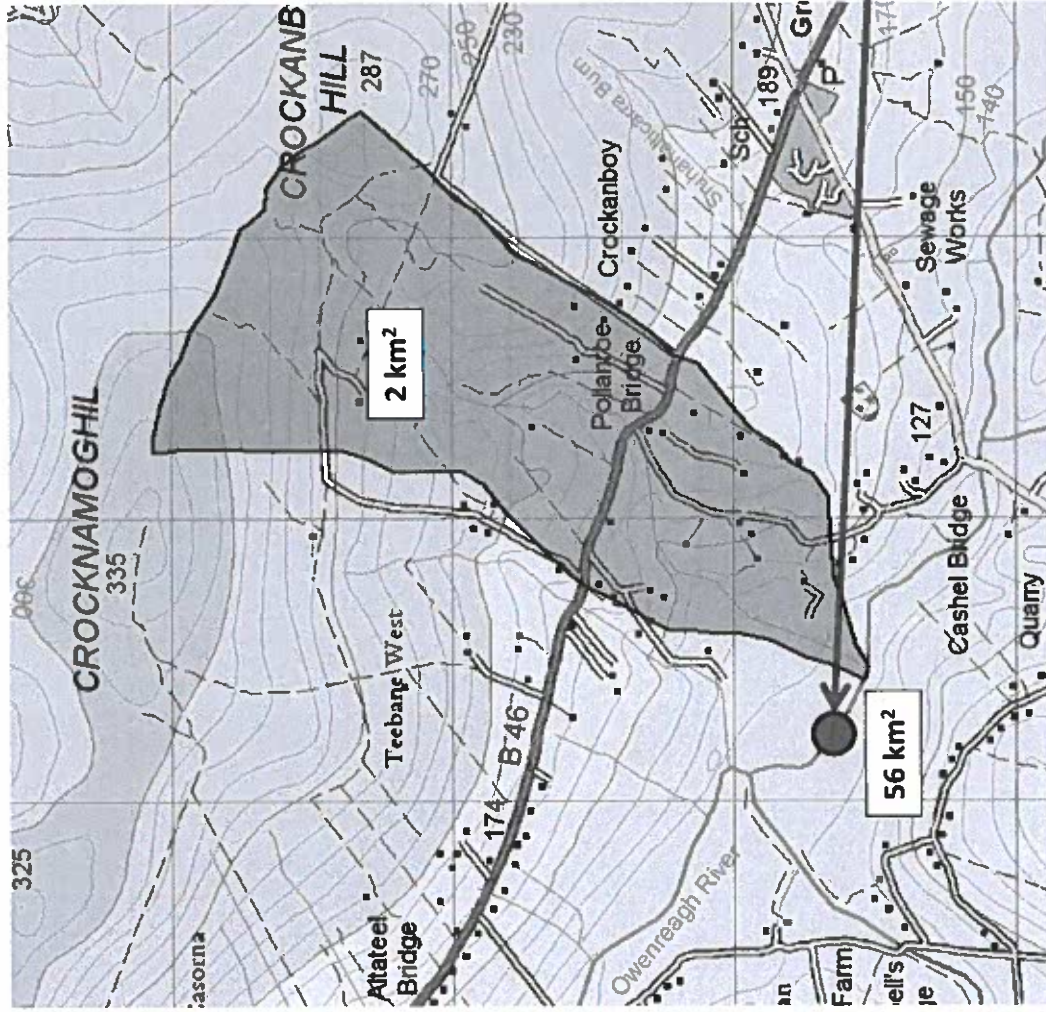


Baseline Water Quality Sampling Close to Mine Site Area



Hydrological Catchments for Receiving Environment
 Owenreagh River – 56 km² downstream of mine site
 Unnamed Watercourse draining mine site – 2 km²

Proposed receiving environment is Owenreagh River



Dilution Calculations to be Undertaken to Assess Post-development Concentrations in Receiving Environment

Same methods as for Tunnel Extension Water License - Assumption of total mixing across river width

Calculations to be Undertaken for Average Flow Conditions for Owenreagh River

Assessment requires initial predictions of water treatment plant effluent

$$\left(\text{Conc. River} \left(\frac{\text{mg}}{\text{L}} \right) * \text{River Flow} \left(\frac{\text{m}^3}{\text{s}} \right) \right) + \left(\text{Conc. Outfall} \left(\frac{\text{mg}}{\text{L}} \right) * \text{Discharge Rate} \left(\frac{\text{m}^3}{\text{s}} \right) \right)$$

$$\text{River Flow} \left(\frac{\text{m}^3}{\text{s}} \right) + \text{Discharge Rate} \left(\frac{\text{m}^3}{\text{s}} \right)$$

Discharge to Receiving Environment from Treatment Plant

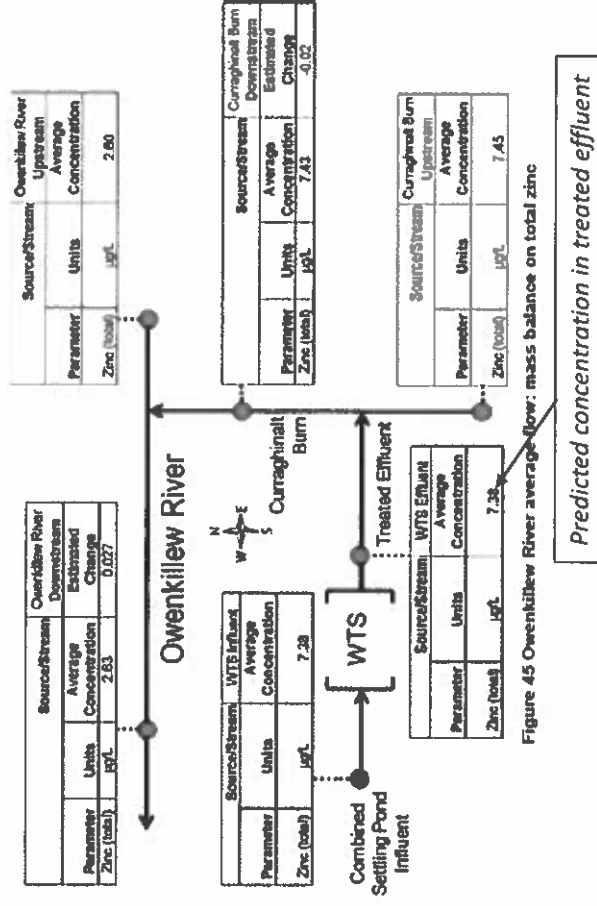
Average in Year 6 = 20.5 m³/hour = 6 L/s

Maximum in Year 6 ~ 150 m³/hour = 42 L/s

Median River Flow = 1.2 m³/s (1,200 L/s)

Max. Treatment Plant = 3.5% of river flow; Average Treatment Plant = 0.5% river flow

Example Calculation for Tunnel Extension



Potential Parameter of Concern	Tunnel Extension Discharge Consent (mg/L)	Possible EQS (SR 2015/351 unless otherwise stated) (mg/L)	SW09		SW11	
			Median (mg/L)	Maximum (mg/L)	Median (mg/L)	Maximum (mg/L)
Ammonia as NH4		0.2	0.045	0.08	0.05	0.08
Nitrate as N	-	50 (Nitrates Directive)	0.3	3.19	0.11	1.8
BOD	10	3	1.1	11	1.5	4
Hardness	for reference					
Cyanide		0.001	0.0015	0.003	0.001	0.003
Arsenic	0.05	0.05	0.00064	0.00302	0.00045	0.0021
Cadmium	0.0007	0.00008	0.00005	0.00015	0.000015	0.00016
Chromium (III + VI)	0.0081		0.00075	0.0029	0.0001	0.0025
Chromium III	-	0.0047	0.001	0.001	0.001	0.0075
Chromium VI	-	0.0034	0.0025	0.02	0.001	0.01
Copper	0.0162	0.001	0.0015	0.00178	0.0015	0.0075
Iron	3.9	1	0.49	1.1	0.76	1
Lead	0.0072	0.0072	0.0002	0.0029	0.0002	0.0005
Mercury	0.0017	0.00007	0.000005	0.0005	0.000005	0.00001
Manganese	-	0.123	0.036	0.11	0.059	0.11
Nickel	0.02	0.02	0.00067	0.0021	0.0001	0.0006
Silver	-	0.0005	0.0025	0.0025	0.0025	0.0025
Zinc (Total)	0.0338	0.0109 + Ambient background	0.0021	0.024	0.0031	0.0072
TSS	50	10 (Sub-basin management plan)	5	17	5	15

Other Potential Parameters of Concern
Chloride, sulphate, uranium, vanadium
No agreed standards

Way Forward

- Site Water Balance to be finalised in next few weeks
- Once Water Treatment Plant effluent concentrations are obtained, dilution calculations based on water balance and baseline hydrology will be undertaken
- Initial set of Discharge Criteria will be provided for discussion
- Prior to this we would look for;
 - Confirmation of list of Parameters of Concern
 - Confirmation of EQS values for receiving environment
 - Confirmation of methodology for calculations supporting application

