



Typical Project Scope

- ▶ Above ground decommissioning
- ▶ Full inventory of materials and waste
- ▶ Identify and quantify contamination
- ▶ Requirement to quantify waste for Integrated Waste Strategy



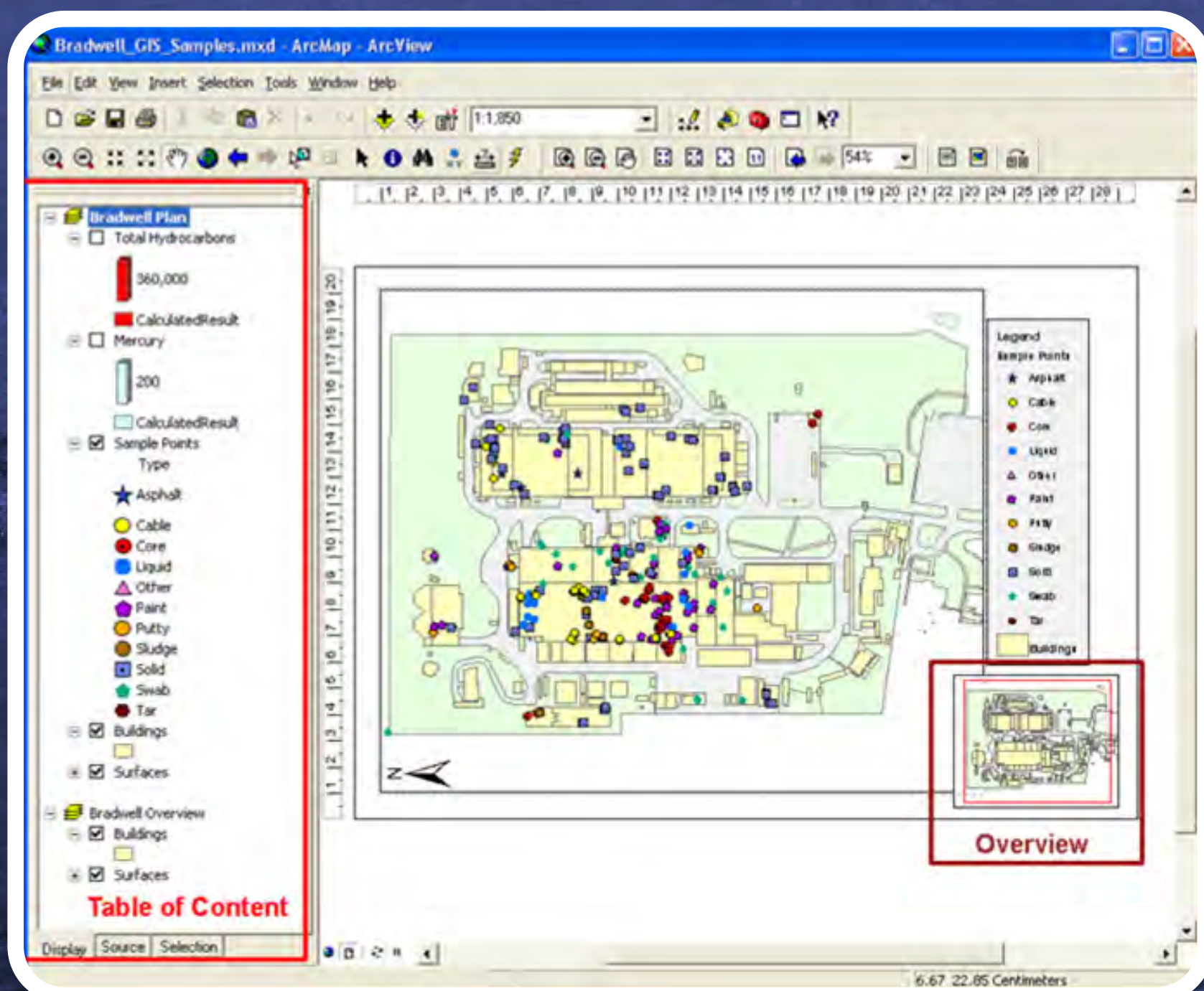
- ▶ Quantify and characterise all waste materials at decommissioning nuclear sites.
- ▶ Develop a database for all these data on a building and waste type basis



Quantify & characterise all materials resulting in more than:

- ▶ 100 buildings
- ▶ 50 different types of materials
- ▶ 350,000 t of materials
- ▶ 42 miles of pipes

Contamination Identifier



Building Packs Automatically Generated

Bradwell Characterisation – General Information			
	Building No	11	
	Building Name	MAIN TURBO-GENERATORS	
	Building Year	1956?	
	Use of Building	Turbine Alternator Plant	
		PROCESS	CIVILS
Description of Building	Steel box girder portal frame, concrete panel roof Walls lower brickwork with aluminium + steel cladding Reinforced concrete lined basement below ground level		
Interrelation of services with other buildings/Sections	* Interaction of high pressure and low pressure systems between various sections within the turbine house. * Electricity cables from around the perimeter of the building appear to service other areas.		



Planning for Sustainable Nuclear Decommissioning

GIS Decommissioning Scheduling Tool



Decommissioning Costs

Waste Categorisation Database - Process Item

Waste Categorisation Database (v5.0) - Process Item Details

Building: [002] Area: [cl_3] Item ID: [39CF_3_BCCP] Material: [Mixed]

Group: [Panel] Belongs To: [Services (Grey)]

Specifications: [Burst Cartridge Control Panel]

Dimensions And Measurements (Initial Values)

Length (m)	Height (m)	Width (m)	Ext. Vol (m3)	Int. Vol (m3)	Material (m3)
21	2.5	1	52.5	52.04488178	0.455118216
Thickness (m)	Ext. Diameter (m)	Int. Diameter (m)	Vol Correction	Density	Mass (t)
0.003			1	6000	2.7307

Assumptions Made: [No] [Yes] [Mass and mass given for main material. Application of mass given for included in total.]

Path To Main Image: [ItemPhotos\Process\035cf_JMGP0065.jpg]

Potential Contaminants

Paints: ☒ yes

Other: ☒ Potential lead-based paint

Internal: ☒ Known

Number of Units: [1]

Volume of All Units (m3): [0.455]

Mass of All Units (t): [2.731]

Rad: [LLW] Assumptions: [Process and plant equipment/materials which were identified as potentially or radiologically contaminated, are assumed as LLW based on contamination results found in boiler circuits 3 and 11. Further survey techniques could change these assumptions based on the dose rates of this material/equipment or further sampling to demonstrate actual levels of contamination. The reactors and spent fuel pool proper, are not included in this inventory as assumed by Bradwell personnel to be LLW.]

Item Removal Information

Recyclable: ☒ No if internal contamination is confirmed

Item State: [Pending Demolition]

Vol. Arising Prelim Packaged Final Packaged Disposal Total Packages Packages Shipped

Waste Quantification and Characterisation Database

Waste Categorisation Database (v5.0) - Waste Master Screen

Data Last Validated: [02/05/2007]

Control Panel

Location Navigation

Location Use: [Gatehouse]

Location Description: [Brick built building with a concrete roof. Currently used as security access gatehouse]

Year Built: [1960]

Demolition State: [Pending Demolition]

Path To Photo: [BuildingPhotos\001_Gatehouse.jpg]

Inventory Date: [13/12/2006] Inventory By: [CSA - Civil] Ext. Time To Demolish: [21] Days [WM Protocol]

Structural Integrity: [Sound]

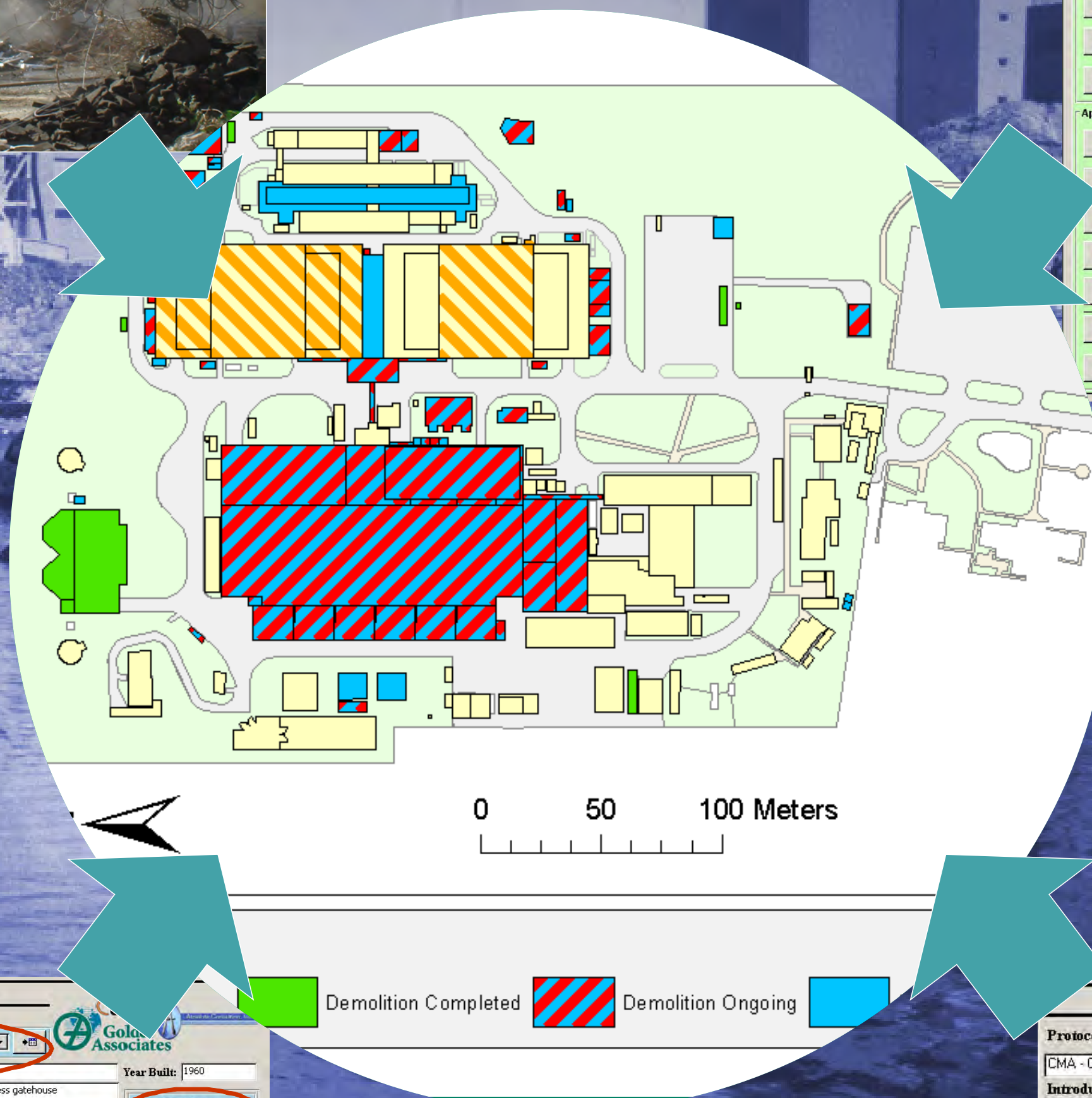
Constraints:

Works Approach: [Demolition to be undertaken by demolition excavator and include time for loading of materials.]

Context: [Demolition to be undertaken by demolition excavator and include time for loading of materials.]

Assumptions: [Refer to Technical Memo 507 - Civil Team Assumptions (in Document Module) for general assumptions.]

Civil Controls	Type of Material	Vol (m3)	Mass (t)	Demolition Statement	Rad	Rec
Concrete	Concrete	93.65	224.8	98		
Glass	Glass	0.2	0.53	98		
Masonry	Masonry	23.39	46.79	95		
Non-Structural Steel	Non-Structural Steel	0.21	1.68	98		
Re-Bar	Re-Bar	0.47	3.76	98		



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Decommissioning Schedule

Waste Categorisation Database (v5.0) - WM Protocol Details

Protocol: [7.01] Click For Disposal Options: [Inert Landfill]

Introduction To Material:

Concrete present in variable sizes, ages and grade strengths. Some concrete structures contain rebar and other reinforcements. To be removed from the Bradwell site to a recycling facility or recycled onsite with the use of a (semi)mobile recycling plant

Treatment Preparation Process:

Crushing and screening. The reinforcement bars from the concrete, approximately 2% of the concrete, is separated during crushing and sold to scrap metal dealers.

Treatment Preparation Process Costs:

To be broken up using either mechanical or hydraulic pulveriser or hydraulic breaker prior to crushing. Reinforcement to be mechanically removed supplemented by manual assistance (using oxy gas cutting equipment) removed following breaking up concrete prior to crushing. £0.5-3 per tonne.

Treatment Preparation Process Timeframe:

40 to 150 tonne per hour

Handling:

Concrete to be broken up before taking off site or crushing. Reinforced concrete needs to be separated from steel reinforcements if the waste is destined for an inert landfill. Testing may not be required for some disposal facilities to demonstrate the leachability of the material. Appropriate hand, eye protection and dust masks should be worn.

Landfill:

Concrete can be placed on an inert waste landfill. However, recycling of the resource is preferred. Leaching tests (in compliance with Waste Acceptance Criteria requirements) may be required for some waste fractions in order to prove that the material does not cause leakage in excess of the threshold values. For information, leaching tests

Landfill Options:

[Inert Landfill]

Waste Management Protocols

Benefits

- Tender Documentation
- Centralised System
- Less time, cost effort
- Transparent & Auditable
- Strong Visualisation of Complex Scenarios
- Streamlined Reporting



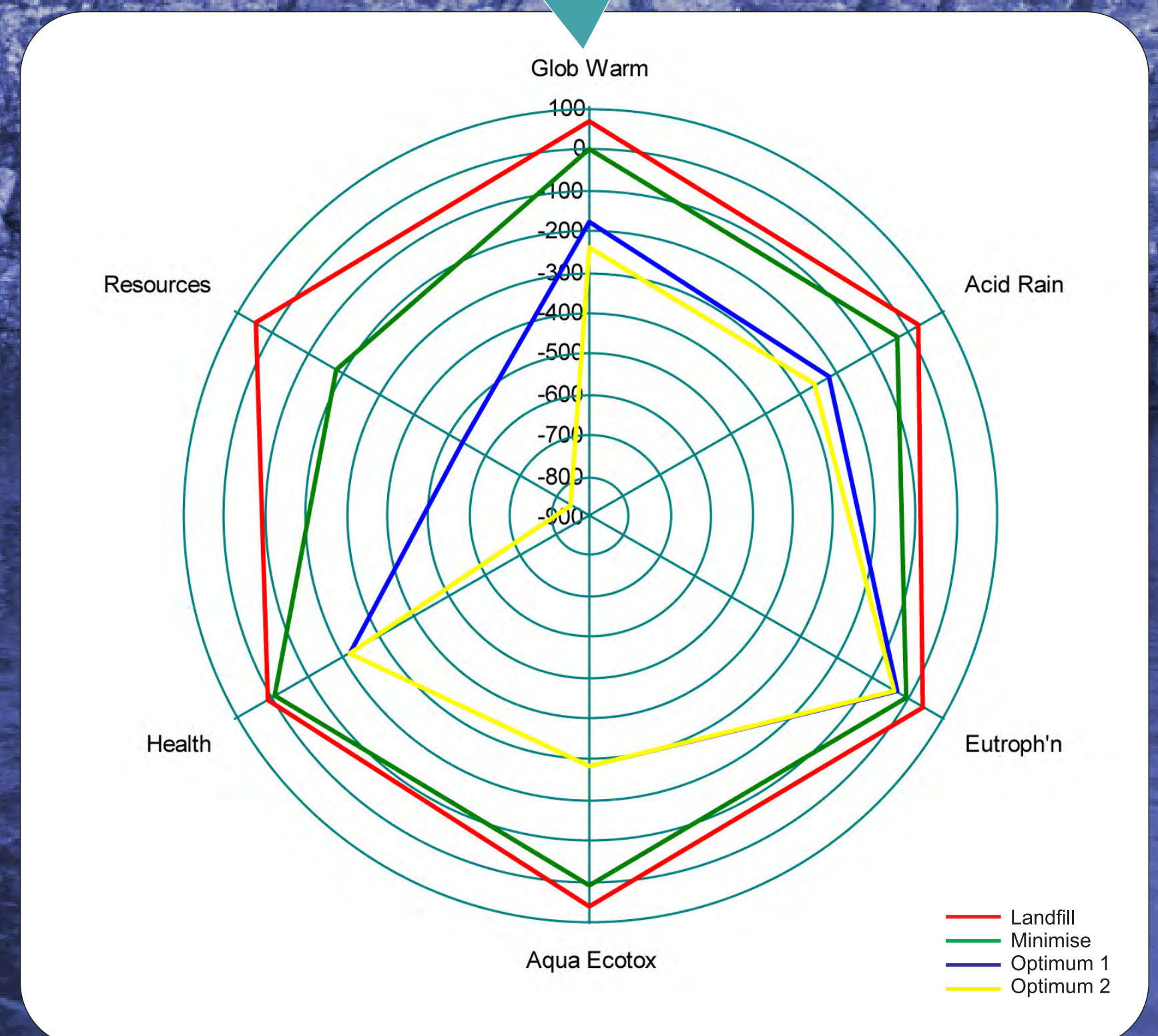
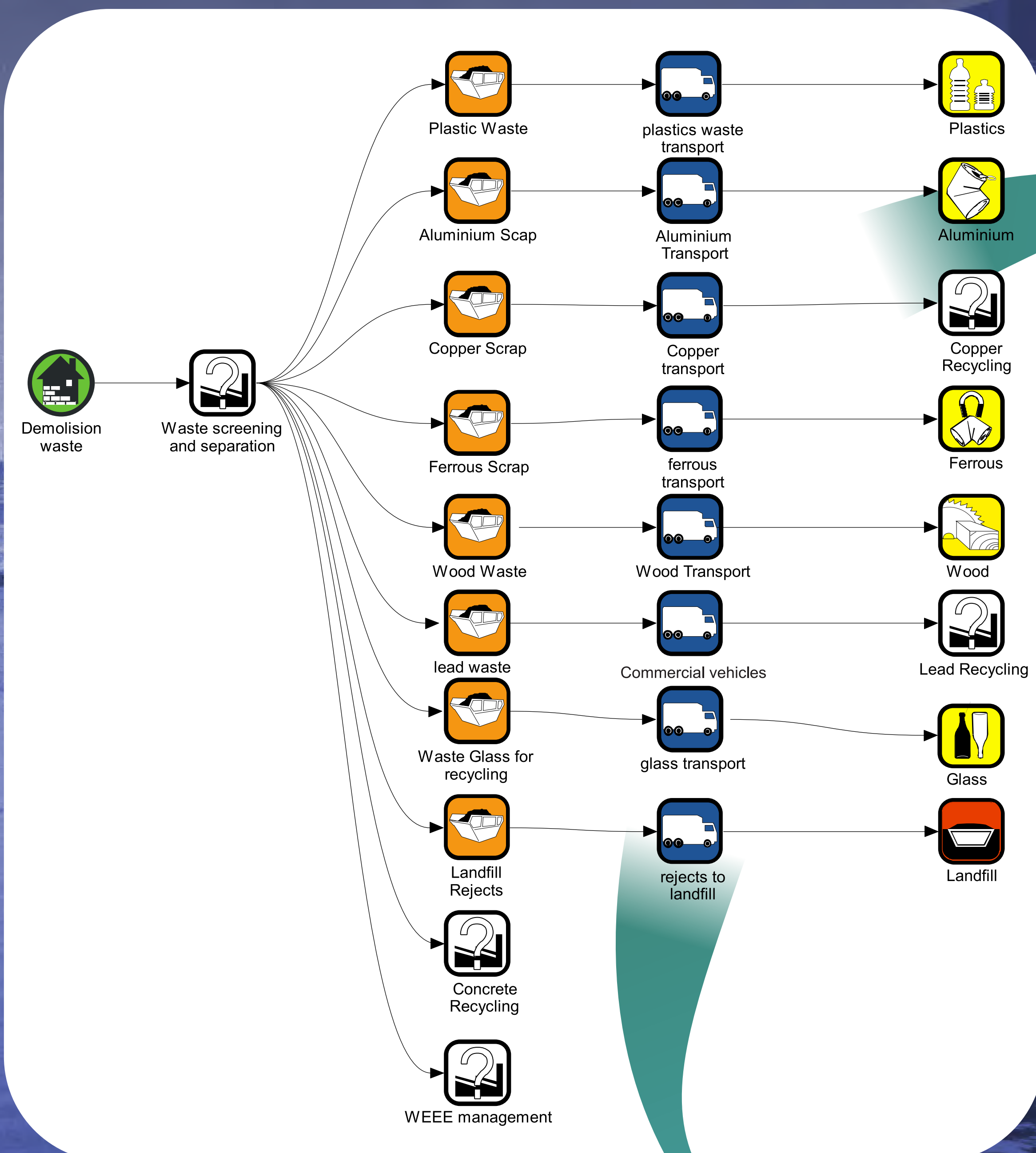
Generate scheduled site activities as required





WRATE: A Life Cycle Assessment Tool for Nuclear Decommissioning?

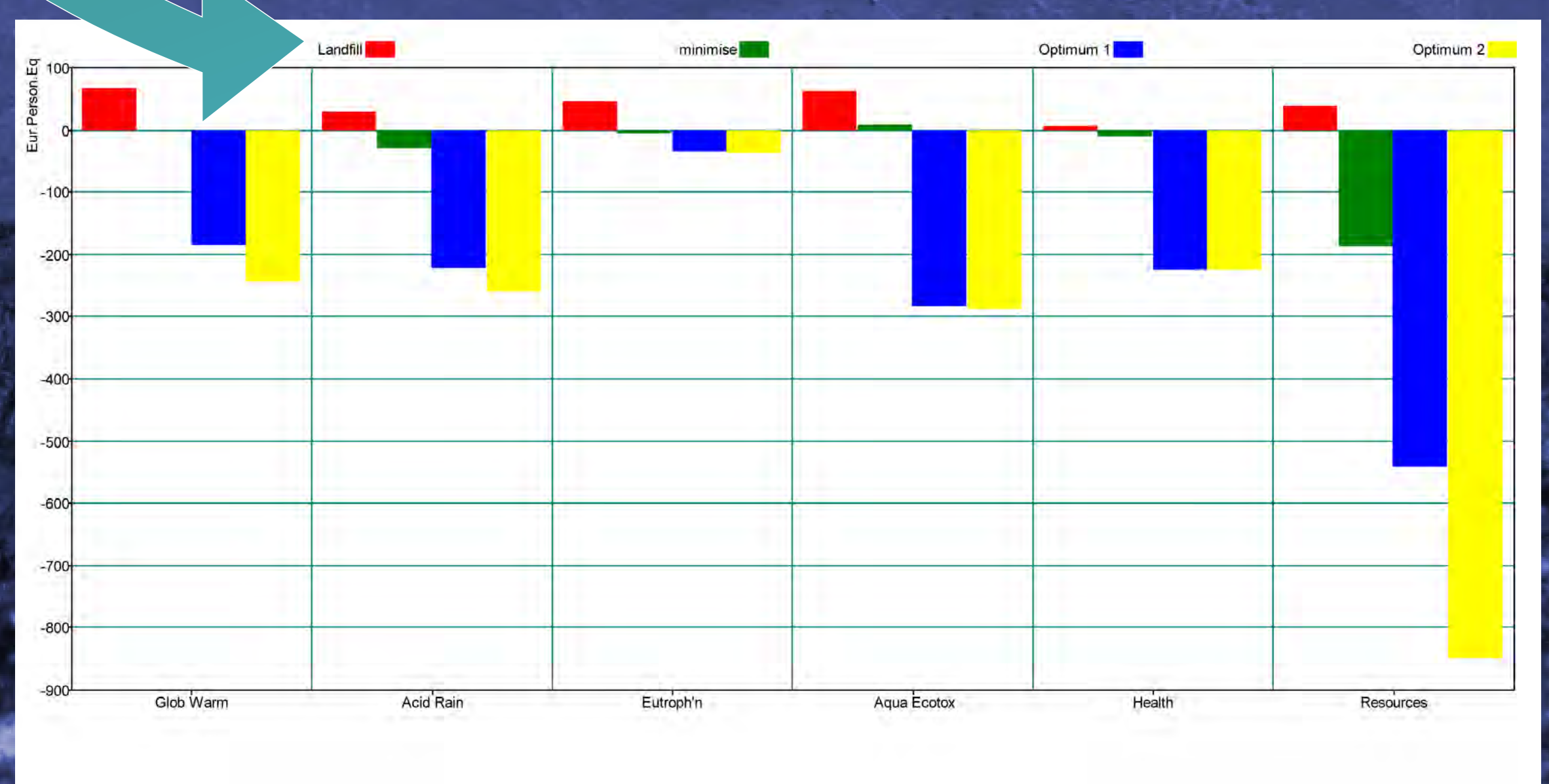
Map the processes involved in handling/treating the waste



Generate Indicator Specific Results for example Carbon Footprint of a decommissioning scenario

Key Attributes and Features of WRATE

- Monitors some 1000 environmental burdens (raw materials, emissions, burdens, off-sets and energy)
- It contains over 300 different Environmental Impact Assessment models (GWP, Ac, Htox, Aqtox, OzDP etc)
- It contains over 500,000 lines of computer code
- It is a 140 Mb install (primarily because of the meta-data that is included to assist in transparency).
- It is **easy** to use at the Standard Level
- It is **as complex** as you want to make it at the Expert Level



Compare scenarios