Shropshire Council

Whitchurch Library & Civic Centre

Feasibility of RAAC Remediation & Rebuild Options*

Cabinet Report
November 2024

Introduction

- Brief Overview of RAAC & affected areas
- Committee Recommendation Outline Options
- Outline brief SPOG feasibility options
- Option 1 – Remediation / RAAC Roof Replacement & Associated elemental items
- Option 2 – Demolition & Rebuild to provide current Civic amenities
- Risk Analysis & SWOT considerations

What is RAAC?

- Reinforced Autoclaved Aerated Concrete (RAAC), created in Sweden 1920's
- Largely introduced in the UK in the 1950's* to mid 1990's
- Standing Committee on Structural Safety (SCOSS) 12th report confirmed a design life span of 30-years**
- Lightweight form, created through hydrogen gas reaction, heat cured (without aggregate) with different reinforcement bar than traditional concrete
- DfE & LGA escalated guidance August 2023 for responsible bodies to check their public buildings.

Fig 1 – RAAC example

General Risk Factors of RAAC

- Incorrectly detailed or calculated at manufacture
- Low compressive strength
- Reinforcement: inadequate coverage/placement, corrosion and anchorage (texture)
- Highly permeable: corrosion of reinforcement, spalling concrete, reduced compressive strength, increased weight
- Modifications: reduced performance at transverse ends/general/formed openings (bearing)
- End Bearing tolerance <75mm and shear failure
- Elasticity/creep: Inferior to traditional concrete resulting in deflection – cracking/spalling

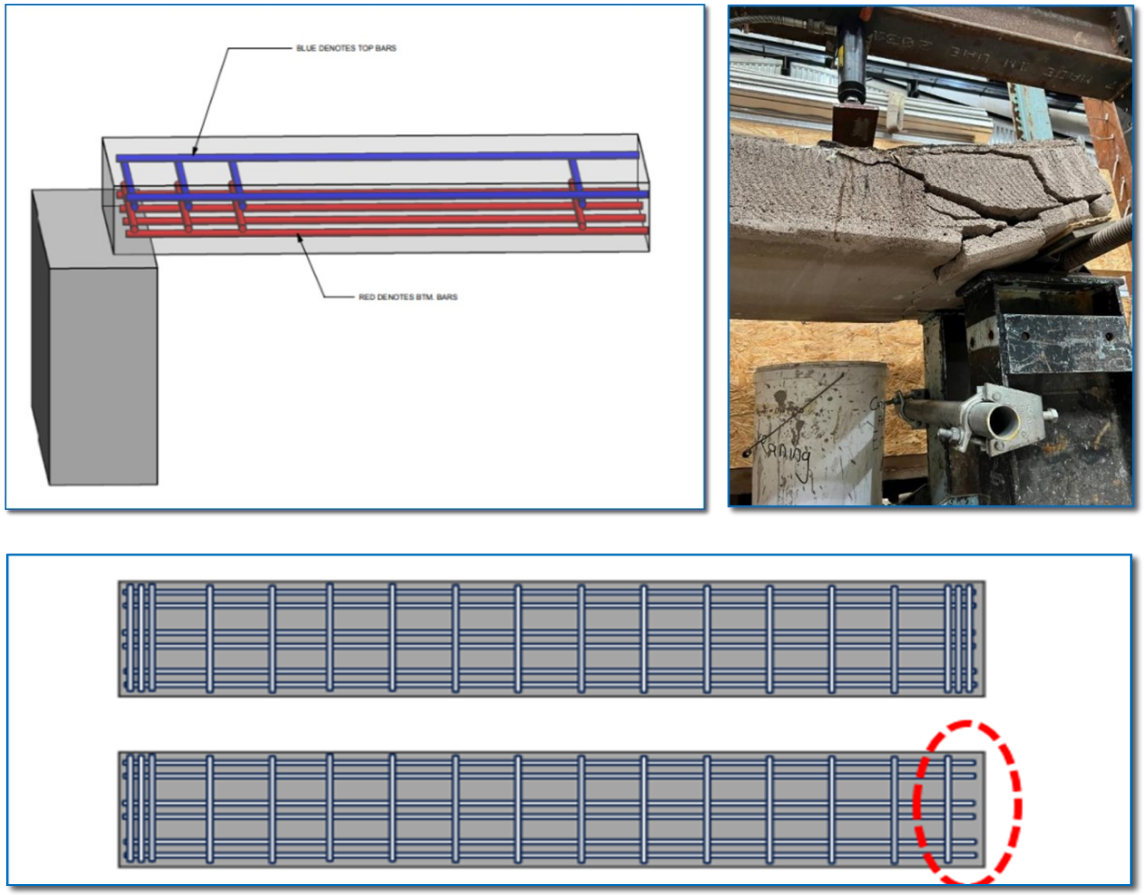

Fig 2 – RAAC Reinforcement / compressive strength

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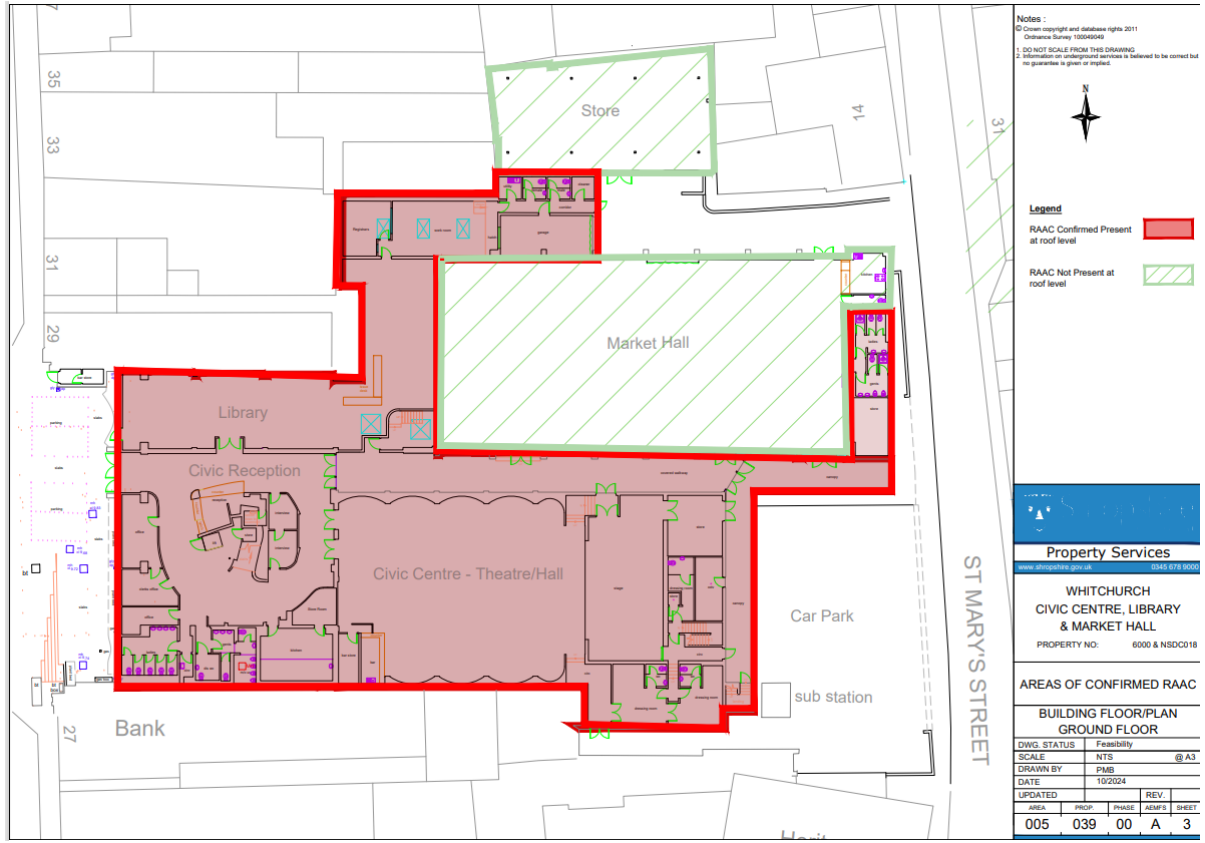
Overview of Structural Assessment



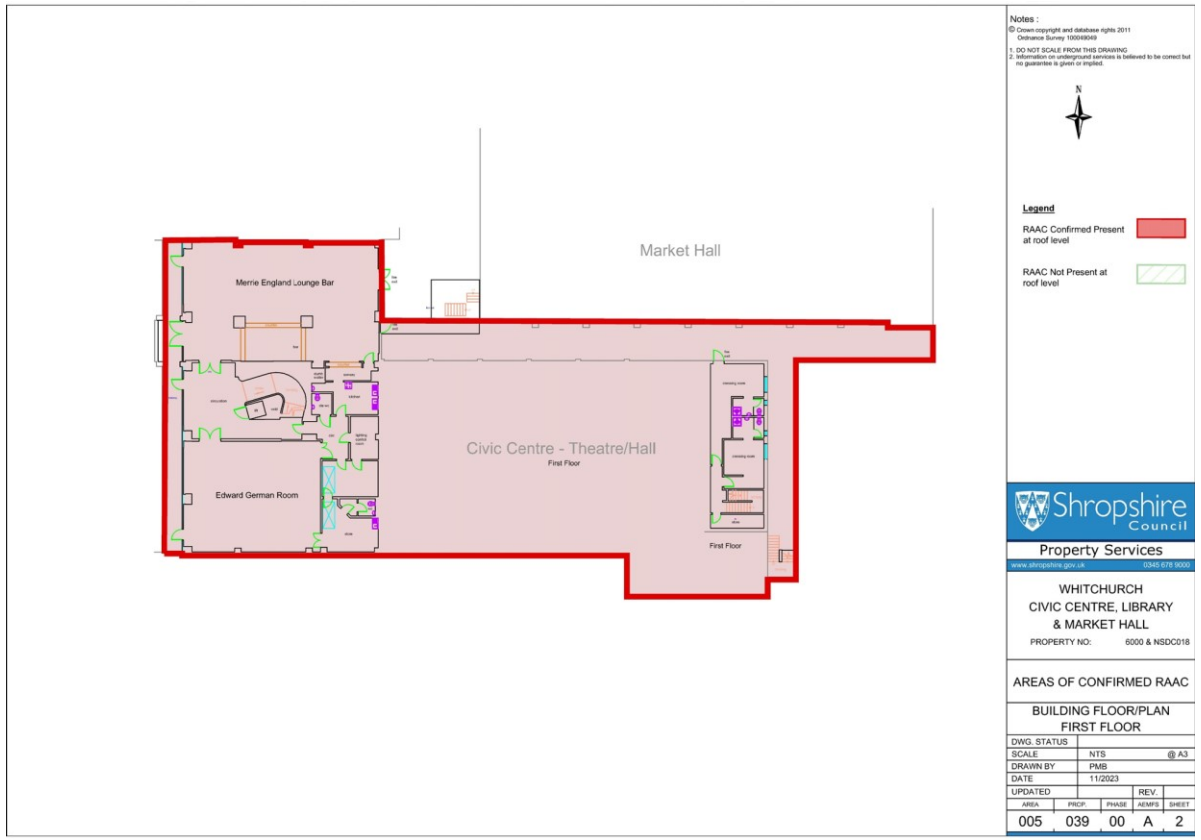


Fig 3 – Whitchurch Library & Civic Centre – Confirmed areas of RAAC (updated October 2024)

Whitchurch Library & Civic Centre
Overview of Structural Assessment

- Unsupported or inadequately supported planks affecting suitable loading under current structural safety parameters.
- Adaptions of RAAC planks to the detriment of stability.
- End bearings in assessed areas are <75mm.
- Reinforcement and transverse reinforcement being compromised in areas due to modification.
- Deformation/displacement of RAAC planks in areas indicated by deflection.
- Historic penetrations/fixings and moisture ingress to areas of RAAC impacting condition of planks.
- Red – Critical Risk category (IStructE)

Assessment category	Risk category	
Red	Critical risk	Requires urgent remedial works which may include taking out of use or temporary propping to allow the safe ongoing use of a building. Depending on the extent, this may be part or all of the building. Combined with awareness campaign for occupants including exclusion zones.
	High risk	Requires remedial action as soon as possible. Combined with awareness campaign for occupants, which may include exclusion zones, signage, loading restrictions and the need to report changes of condition, eg, water leaks, debris, change in loading, etc.
Amber	Medium risk	Requires inspection and assessment on a regular basis, eg, annually. Combined with awareness campaign for occupants, which may include signage, loading restrictions and the need to report changes of condition, eg, water leaks, debris, etc.
Green	Low risk	Requires inspection and assessment occasionally, say three year period depending on condition. Combined with awareness campaign for occupants, which may include signage, loading restrictions and the need to report changes of condition, eg, water leaks, debris, etc.

Fig 4 – Institute of Structural Engineers – RAAC Risk Assessment Categorisation

Whitchurch Library & Civic Centre

Cabinet Paper Agenda Item 12

Outline Options Appraisal (High Level Estimate)

Option	Option Description	High Level Estimate £	Considerations
Option 1	Do the minimum and close the building permanently	£60,000 - £100,000	Liability concerns and responsibilities. Risk of roof structure collapse. Ongoing inspection and contractor costs. Additional propping to first and ground floor front locations
Option 2	RAAC to remain in place and mitigated through internal structural framework, repairs to spalled concrete and full replacement of roof membranes	Unknown	RAAC exceeded design life and mitigation could not be guaranteed. Replacement ceilings to allow for regular inspection/surveys Ongoing revenue cost burden for regular inspections. Lack of confidence in use of building. Dependent on further structural calculations if viable.
Option 3	Replacement of structural roof and associated essential items	£2,360,000 to £2,450,000	Replacement to current Building Regulations. Cost consideration to include replacement suspended ceilings, services i.e. lighting/fire alarm. Minor internal decoration/flooring of essential and affected areas only.
Option 4	Demolition and clearing of site	£510,000 - £600,000	Conservation Area. Party Walls of neighbouring properties.
Option 5	Demolition and Rebuild as existing facilities provision.	*£6,035,000 - £7,635,00	Demolition budget outline estimate provided in Option 4 and rebuild based on the existing like for like provision* Any change variance of requirement would need an outline scope and feasibility of redevelopment requirement be established to inform outline budget cost.
Option 6	Demolition and Redevelopment of the site	£1,250,000	Initial work on a development appraisal suggest a viability gap of approx. £1.24=5m to bring forward a mixed-use development scheme incorporating community uses and residential and under a new masterplan for the site

Fig 5 – Outline Options Appraisal High Level Estimate costs

(Public Pack)Agenda Document for Cabinet, 17/01/2024 10:30 (shropshire.gov.uk) p 317-383

Whitchurch Library & Civic Centre
Working Group Consolidation of Options

Option 1

Progress a feasibility study to assess the potential for comprehensive repairs/replacement to the roof structure and other elements of the centre to address the inherent defects associated with RAAC and the ultimate findings of the Structural Survey.

This will encompass a technical review of the required interventions, rectification and replacement elements required to address the condition items which currently prevent safe use of the asset together with any ancillary remediation associated with the major works. The feasibility will cover cost, value for money, deliverability and potential timescale/programme. The cost estimate will be an estimate and include all appropriate preliminary items, professional fees, approvals and temporary works.

Option 2

Undertake a feasibility study encompassing the potential to demolish and re-provide civic amenities in line with the current provision encompassed in the existing building together with any other civic or community uses within the building (please refer to list of existing uses and uses identified within the consultation summary response July 2024.)

*The concept design can consider more efficient and modern interpretation of the spaces and requirements together with any additional civic or community uses. Provide a masterplan and concept design feasibility for a scheme together with an estimate of cost to **RIBA stage 2**.*

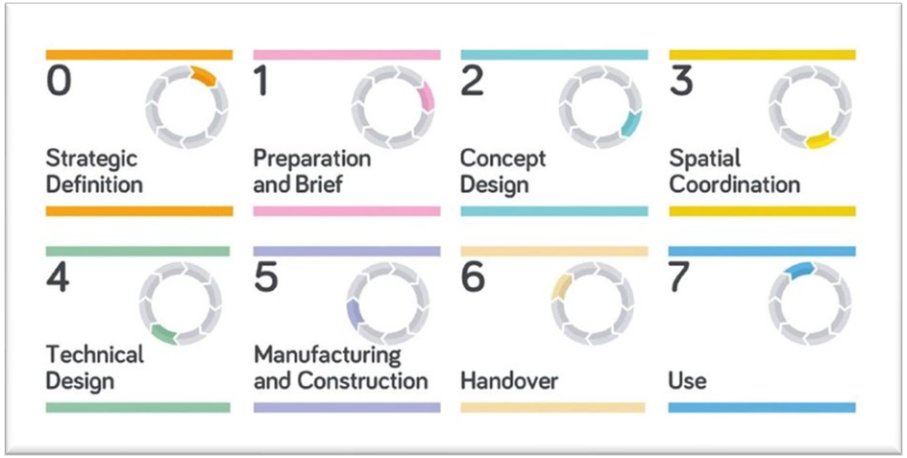


Fig 6 – RIBA Plan of Work Stages

Whitchurch Library & Civic Centre
Option 1 – RAAC Roof Repair/Replacement

Fig 7 – West Aerial View

Insitu repair/skeletal framework of RAAC ***discounted*** due to:
Red Critical Rating of overall condition,
Expired 30-year life span,
Ongoing OpEx revenue inspection costs
Reputation and user confidence
Limited Professional Indemnity.

Therefore, assessment of complete replacement of the RAAC structural roofs to effected areas:

Feasibility included:

- Structural assessment of the existing structural suitability and proposed roof replacement
- Building Condition Survey including Fabric, M&E, updated site plans, including drone survey
- Fire Compartmentation & Fire Door survey
- Gas System Test & Inspection
- Technical Feasibility of RAAC Replacement options

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Option 1 – RAAC Roof Replacement

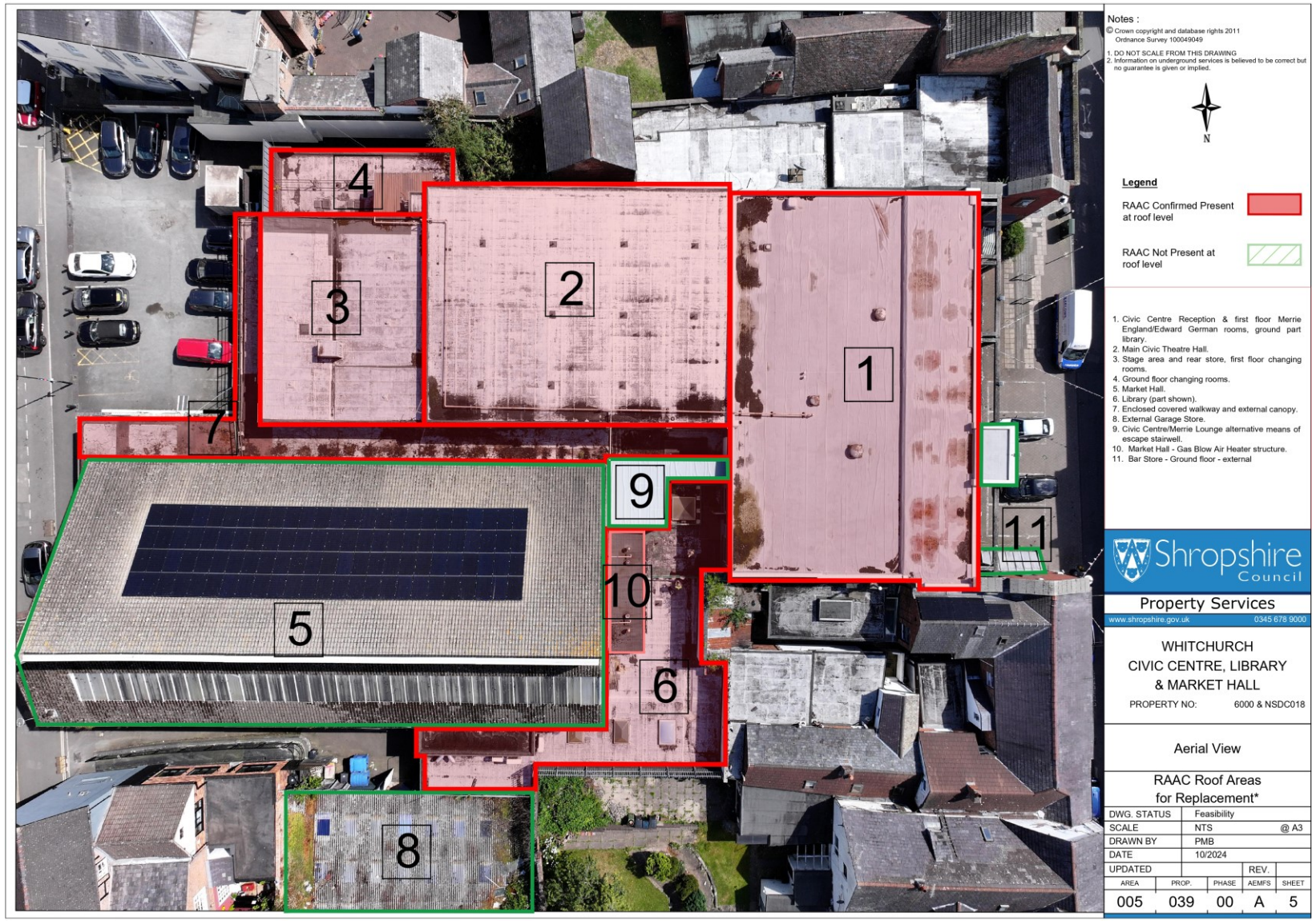

Fig 7 – Roof zoning plan

1. Civic Centre Reception & first floor Merrie England/Edward German room, ground part library/stairwell.
2. Main Civic Theatre Hall.
3. Stage area and rear store, first floor changing rooms.
4. Ground floor changing rooms.
5. Market Hall.
6. Library (part shown).
7. Enclosed covered walkway and external canopy.
8. External Garage Store.
9. Civic Centre/Merrie Lounge alternative means of escape stairwell.
10. Market Hall Gas Blow Air Heater structure.
11. Bar Store - Ground floor - external

Whitchurch Library & Civic Centre Option 1 – Repair/Replacement

Proposed Re-roof of all RAAC roofs and associated works:

Based on initial structural assessment most of the existing RAAC parts of the structure **would be able to support a new lightweight system**
(in a no worsening situation).

However further project consequential considerations:

- Internal walkway roof/canopy to be replaced in its full entirety including associated Market Hall store/male & female toilets (structure/function)
- Library roof RAAC form's a section of floor to the alternative means of escape from the social bar room and will need to be replaced
- Gas Pipework on various roofs to be removed and reinstated
- Removal of existing encapsulated Asbestos Containing Material
- Market Hall gas blow air heater structure & heaters, located on Library roof, to be removed and replaced in new location serving the existing system
- Replacement of suspended ceilings, ceiling lighting, emergency lighting, stage lighting etc, fire alarm/intruder alarm, mechanical services
- Protection of internal surfaces i.e. floor finishes, decoration.
- Removal and temporary storage of contents

Fig 8 – South and North aerial photos with gas service highlighted

Whitchurch Library & Civic Centre
Option 1 – Repair/Replacement

Proposed Lightweight Warm Roof Construction

- Lightweight metal profile structural deck.
- Composite Mineral Felt Built Up System - polyester and fibreglass reinforcement with Single-Point Guarantee / BBA Certified
- Safe 2 Torch Product
- The existing wight of RAAC, plus roof membranes, suspended services allowance approx. 150 kg/m2
- Siporex RAAC own weight approx. 96 kg/m2.
- Proposed lightweight system approx. 50-60 kg/m2 (including standard services/ceilings etc) so well within existing superstructure loading limits
- Consideration of brief if Photovoltaic Panels are to be included as an additional provision, though would need to be considered further on weight assessment upfront. Though potential design weight tolerance depending on proposal.

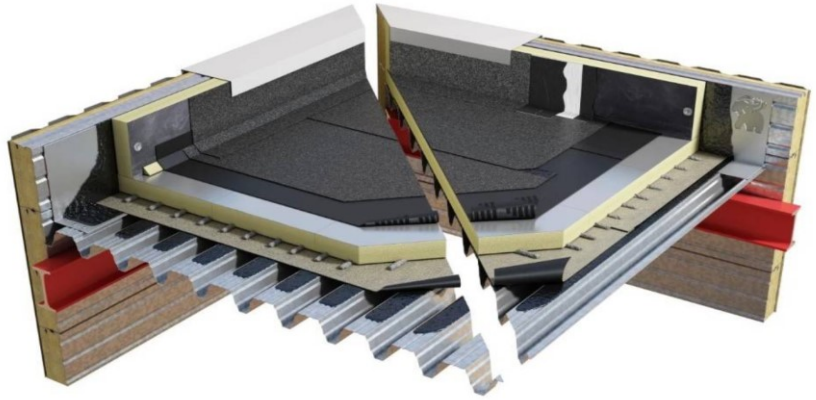

Fig 8 – Section of typical light weigh metal deck warm roof construction

Fig 9 – Example of mineral felt roof with Photovoltaic panels and edge protection

Whitchurch Library & Civic Centre
Option 1 – RAAC Roof Replacement

- Proposed Re-roof by deconstruction method.
- Internal crash deck for working platform/fall arrest.
- External scaffold and weather protection.
- Empty & store contents.
- Protect internal floors/surfaces
- Break up and remove RAAC, reboard/re-roof
- Work backwards with deconstruction/reinstatement being slight inefficient than traditional build. Use of high reach telehandler – rather than crane (air space)
- Car park to front and rear being compound in use
- Risks:
  - Party Wall Act (1996),
  - Conservation Area (Planning),
  - Building Regulations
  - Weather and work damage to internal surfaces
  - Hall sprung floor and weight of crash deck
  - Impact on remaining operational areas of the site

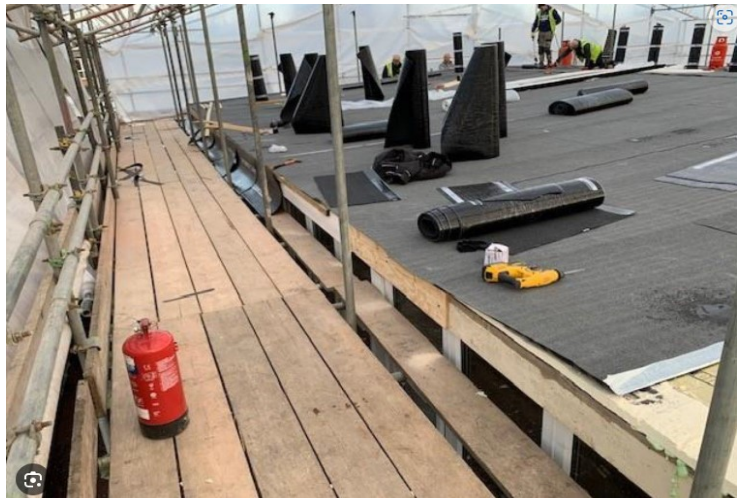

Fig 10 – Example of external scaffold protection and temporary crash deck construction

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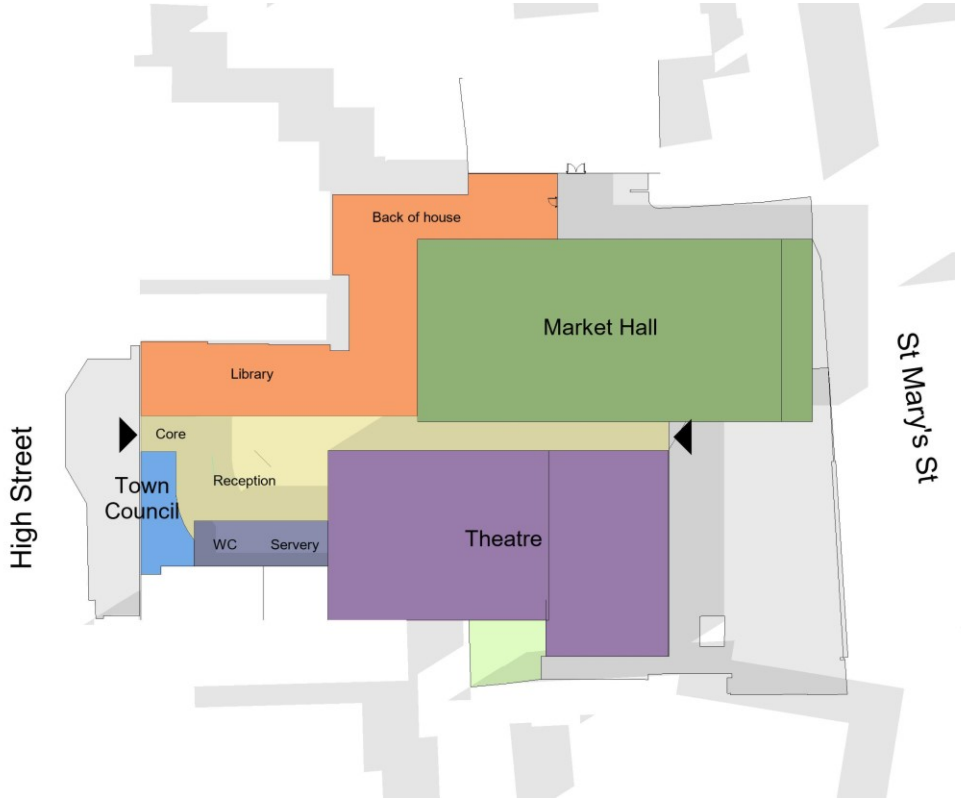
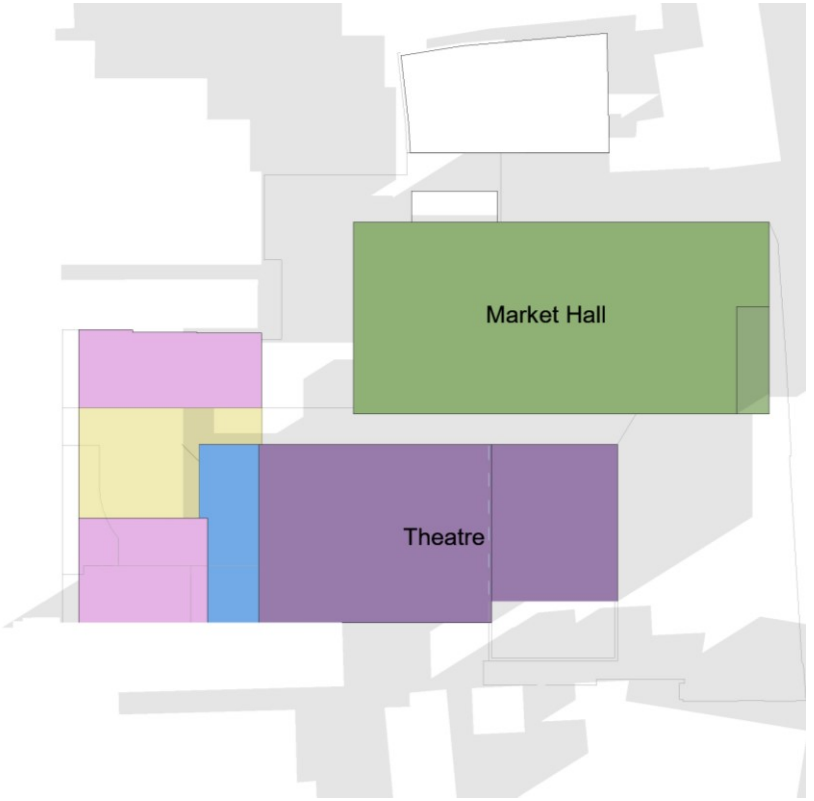
Option 1 – Existing Re-roof



Option 1A Ground Floor



Option 1A First Floor

Strengths

- Minimises loss of embodied carbon in using existing structure.
- Lowest CapEx

Weaknesses

- Will not address any major issues with the layout
- Operating costs won't be significantly reduced
- Construction phasing may be difficult
- Carries the greatest construction risk

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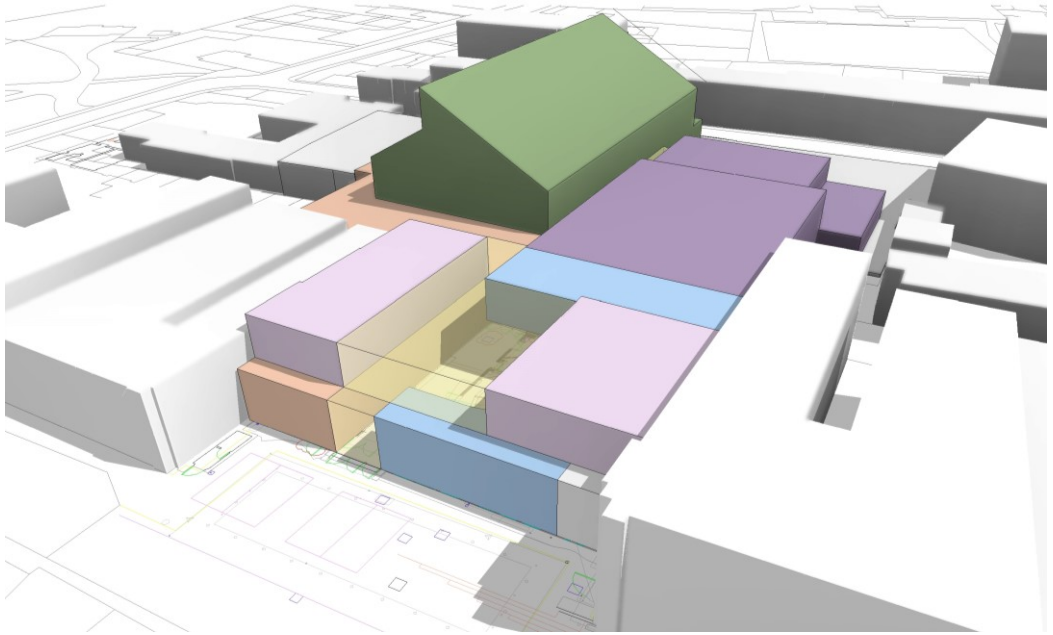
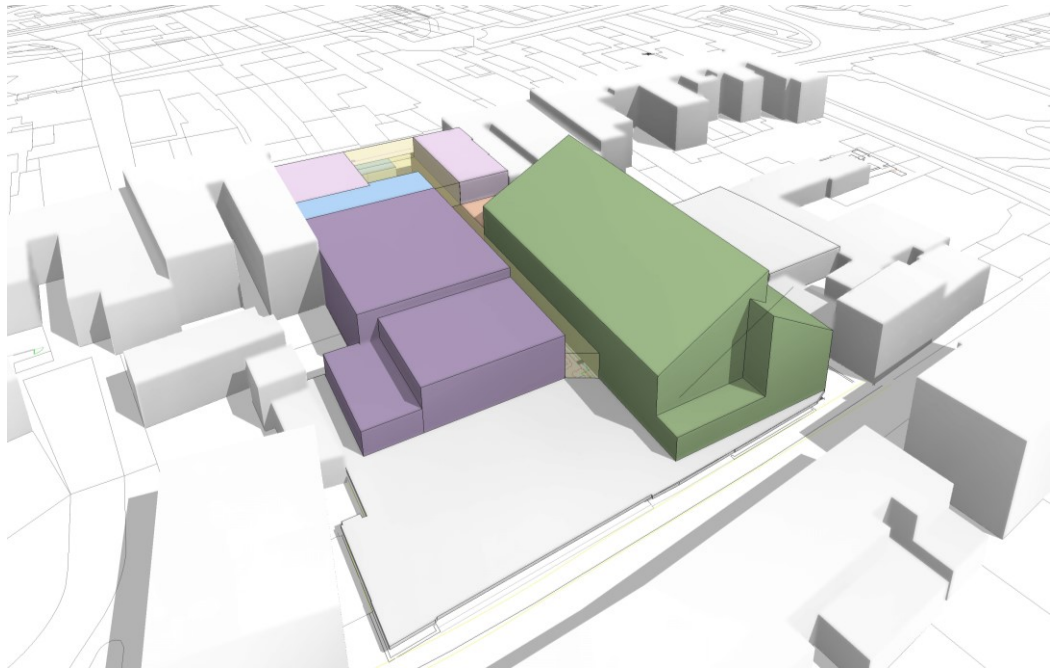
Option 1 – Existing Re-roof





Opportunities

- Could reopen the soonest out of all options
- Potential of upgrade of elements
- Potential provision of Photovoltaic Panels to reduce carbon footprint and energy usage

Threats

- Real risk of scope creep during re-roofing
- Planning permission to be considered
- Building Regulations
- Party Wall disputes

Whitchurch Library & Civic Centre
Option 1 – RAAC Roof Replacement

In addition to the cost of the RAAC roof replacement project are approx. ***£750,000*** *estimated costs for condition-based remedial works/improvements to be considered.*

These have been rated using the Condition Survey scoring system methodology as in ***Figure 11.*** *The proposed are based on the escalation of the condition priority:*

- *D-1 & D2 Bad/Urgent & Essential 1 – 2 years - Total Est £200,000*
- *C-2 Poor/essential within 2 years - Total Est Costs £183,000*
- *C-3 Desirable 3-5 years - Total Est Costs £232,000*
- *B3 & B4 Satisfactory >5 years and long term -Total Est Costs £135,000*

Examples of inclusion/concerns:

- *External Garage Store – Replace leaking Asbestos Chrysotile Roof*
- *Gas Blow Air Heaters & Gas boiler remedials*
- *Fire compartmentation/fire damper and fire door concerns*
- *Replacement of single glazed/timber external window & doors. Some not operational, poor condition & would improve OpEx energy efficiency*
- *Cracked render to Theatre lintels & Market Hall*
- *Replacement box gutter/fascia to Market Hall*
- *Floor coverings to areas*
- *Ventilation*

Definition of Condition Ratings based on existing condition

Condition Rating	Definition
Condition A - GOOD	Performing as intended and operating efficiently
Condition B - SATISFACTORY	Performing as intended but exhibiting minor deterioration.
Condition C - POOR	Exhibiting major defects and/or not operating as intended.
Condition D - BAD	Life expired and/or serious risk of imminent failure. Requires immediate attention.

Definition of Priority Ratings based on existing condition

Ref	Priority	Definition
001	**Urgent**	Work that will prevent immediate closure of premises and/or address an immediate high risk to health and safety of occupants and/or remedy a serious breach of legislation. Work which is likely to lead to total or partial loss of service.
002	**Essential**	Work required within two years that will prevent serious deterioration of fabric or services and/or address a medium risk to the health and safety of occupants and/or remedy a less serious breach of legislation.
003	**Desirable**	Work required within three to five years that will prevent serious deterioration of fabric or services and/or address a low risk to the health and safety of occupants and/or remedy a minor breach of legislation
004	**Long Term**	Work required outside the five year planning period that will prevent deterioration of the fabric or services or to ensure compliance with legislation.

Fig 11 – Condition Rating & Priority Score

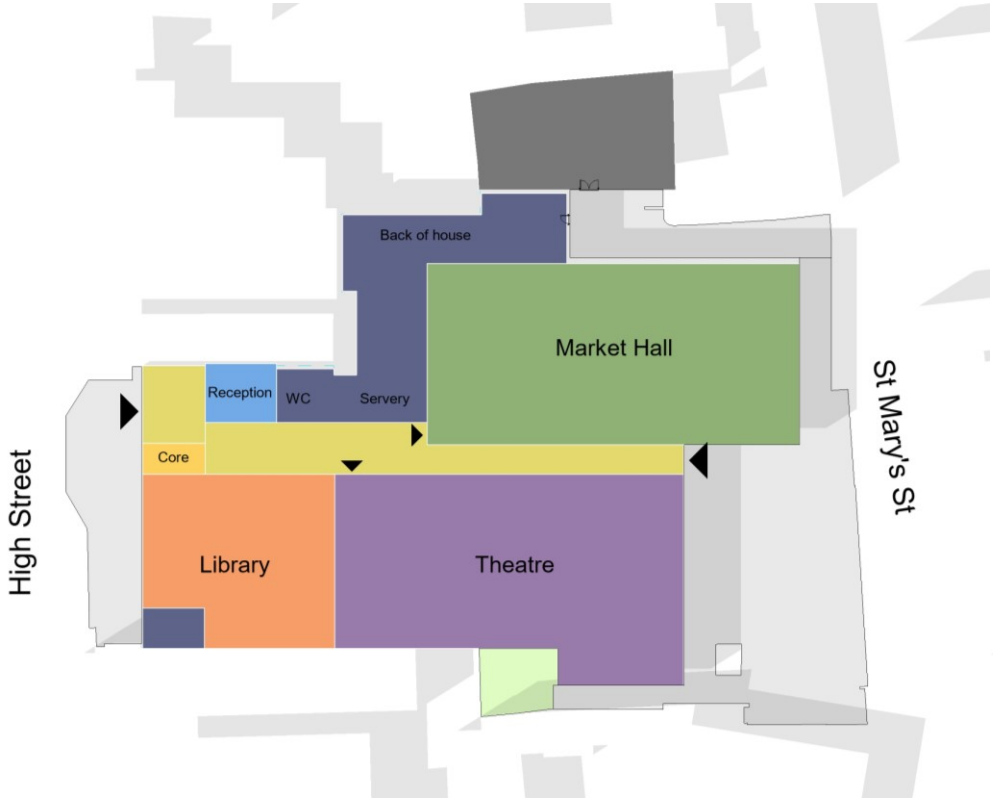
Whitchurch Library & Civic Centre
Option 1 – RAAC Roof replacement

WHITCHURCH CIVIC CENTRE																																						
Option 1a RAAC Reroof & Condition items Draft timeline	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Description	Comment																																			
Working Group Decision on prefeered option																																				
Busines Case and Committee Paper																																				
Committee Meeting Outcome	4th December 2024																																			
Stage 3 - Detailed Client Brief																																				
Appoint Design Team																																				
Stage 4 Outline Techincal Design																																				
Legal Preperation and JCT formation																																				
Part Wall Act - notices	2 months notice pending dispute																																			
Cost check																																				
Client approval of Outline																																				
Consultation on Outline Design																																				
Working Group Stakeholders																																				
Public Engagement																																				
Planners/Building Control																																				
Confirm brief for Scheme Design																																				
Planning Application Preperation - Tentative	Conservation (Committee)?																																			
Planning Period	8 weeks																																			
Planning Decision																																				
Stage 4 - Detailed Design																																				
Building Regs Submission	5 Weeks																																			
Procurement (Public Sector Procurement Act)	Formerley OJEU																																			
Tender Appraisal / Recommendation																																				
Appoint Contractor	14 day standstill																																			
Contractor mobilsation																																				
Contract Period																																				
Occupation																																				
Fully open																																				
Defects Period	12 Months																																			
Completion of Defects																																				

Fig 11 – Potential Timeline of Option 1

Whitchurch Library & Civic Centre

Option 2a – Complete Demolition & Rebuild



Option 2A Ground Floor

Option 2A First Floor

Strengths

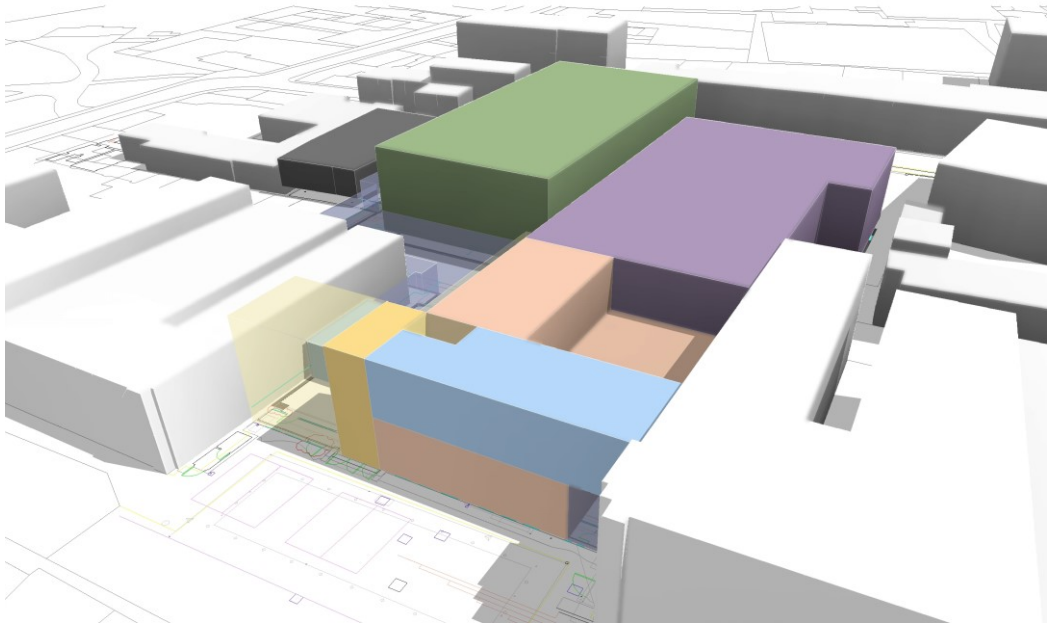
- All functions retained
- New Library and office space will be better suited to current requirements
- Connects the Library to the High Street

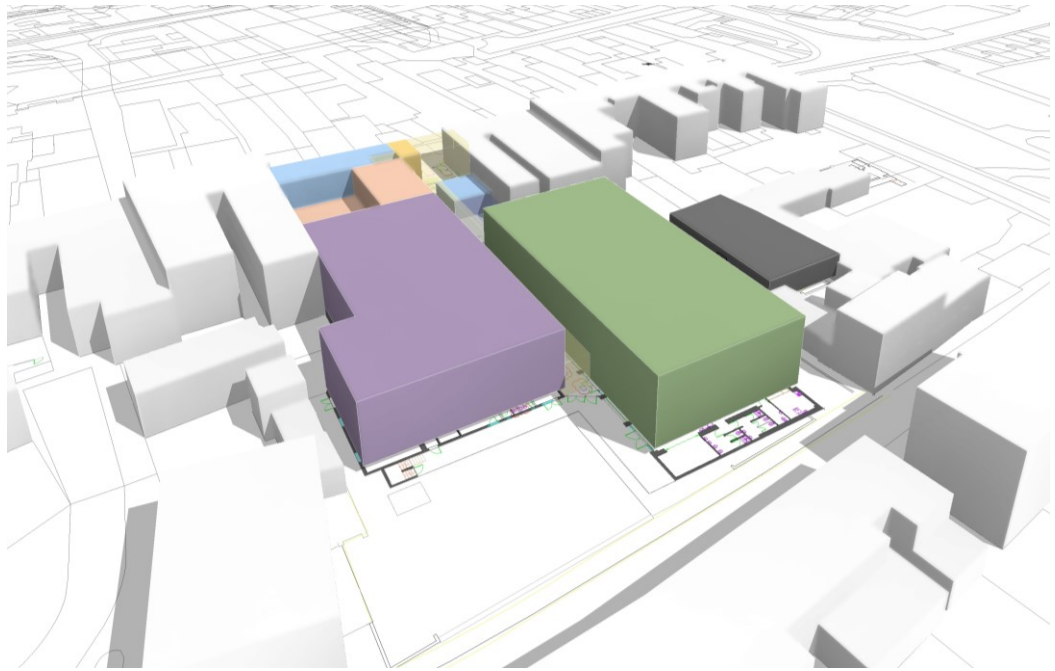
Weaknesses

- Highest CapEx of all options
- Highest embodied carbon
- Library deliveries might be more difficult

Whitchurch Library & Civic Centre

Option 2a – Complete Demolition & Rebuild





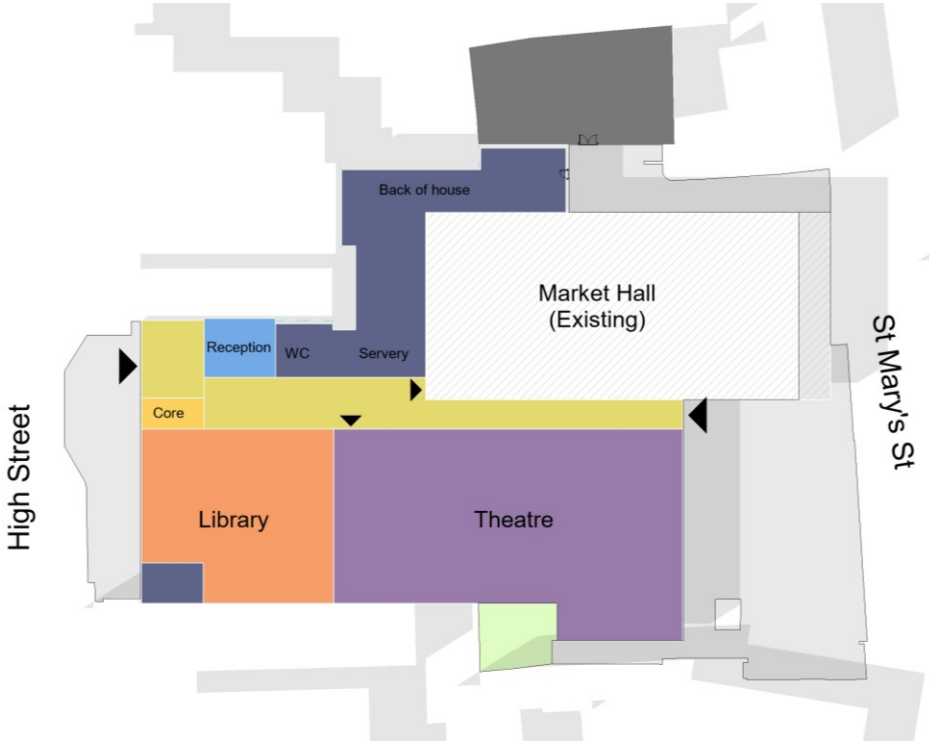
Opportunities

- Improves the internal environment (more natural light)
- New spaces could be made larger / smaller to fit needs

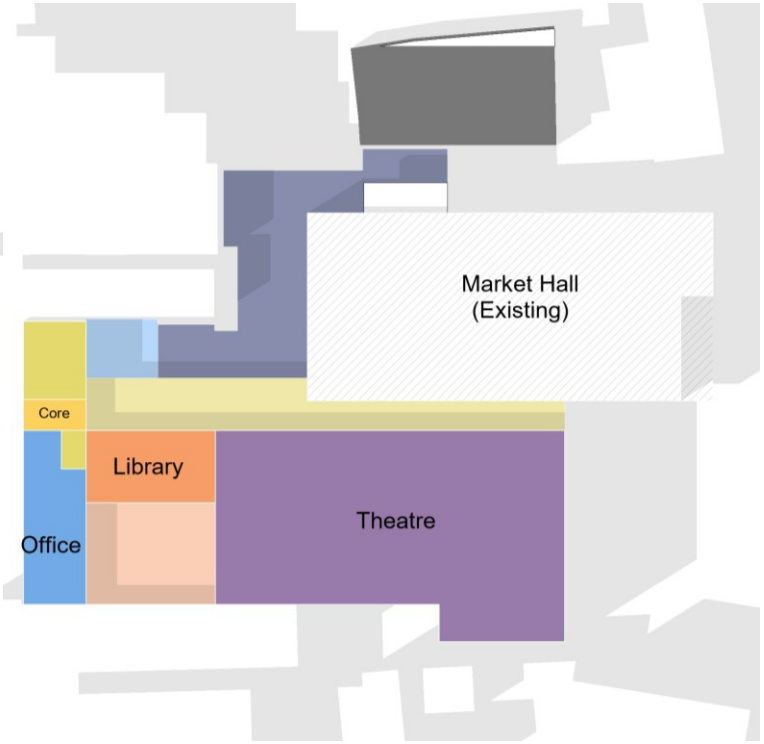
Threats

- Planning permission will be required
- Programme

Whitchurch Library & Civic Centre
Option 2b – Rebuild with Market Hall retention



Option 2B Ground Floor



Option 2B First Floor

Strengths

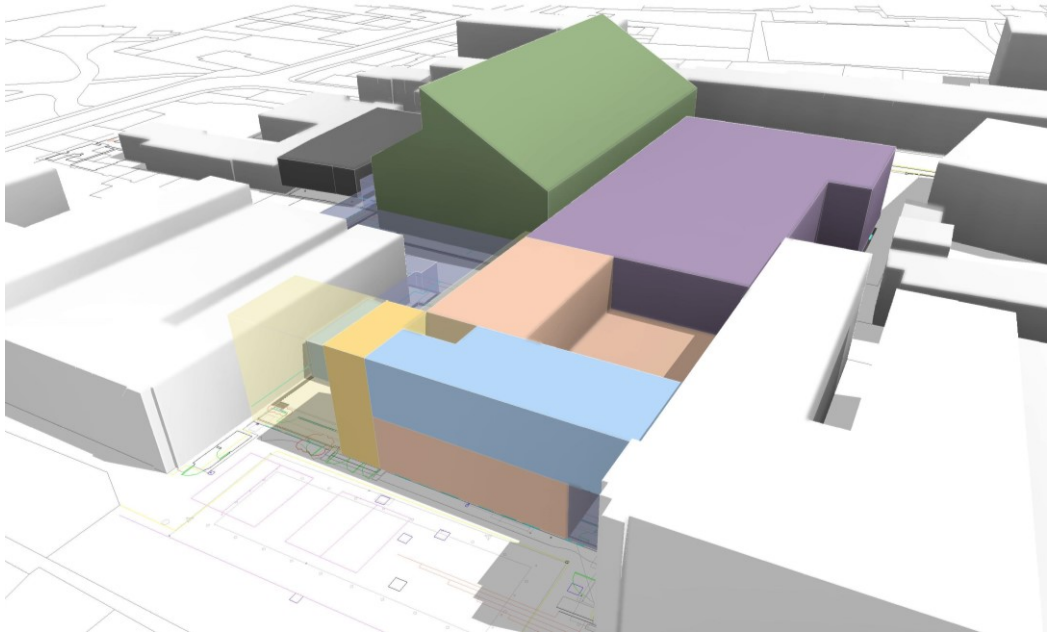
- All functions retained
- New Library and office space will be better suited to current requirements
- Connects the Library to the High Street
- Retention of Market Hall offers CapEx saving

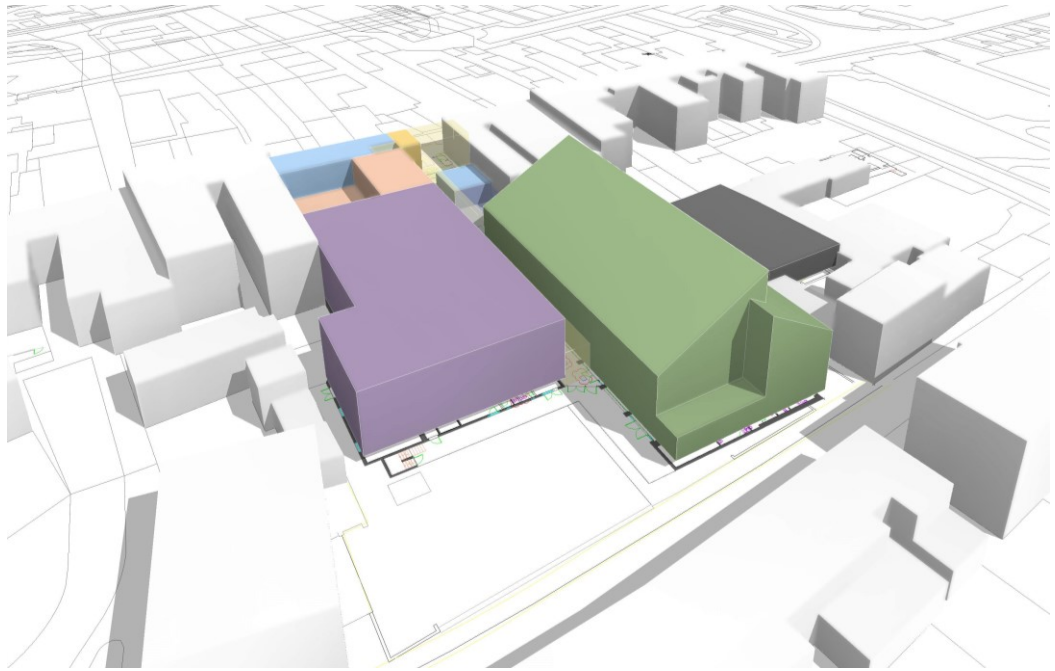
Weaknesses

- CapEx is still much higher than 1A/1B
- Construction phasing may be more difficult than complete new build

Whitchurch Library & Civic Centre

Option 2b – Rebuild with Market Hall retention





Opportunities

- Improves the internal environment (more natural light)
- Creates a better circulation flow
- New spaces could be made larger / smaller to fit needs
- Makes the library more visible

Threats

- Planning permission will be required
- Programme

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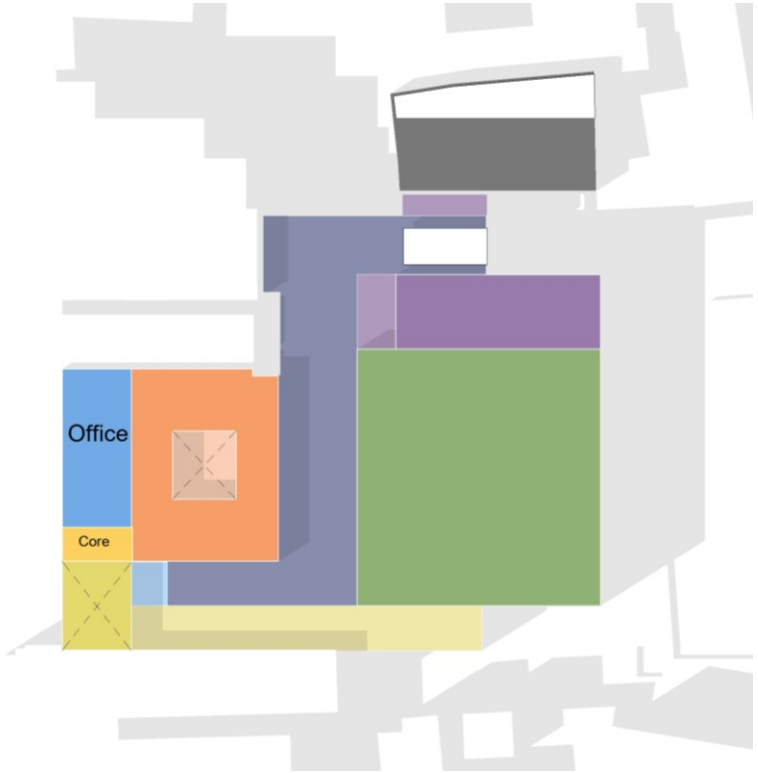
Option 2c – Demolition & Reduced Rebuild

Option 2C Ground Floor



Option 2C First Floor

Strengths

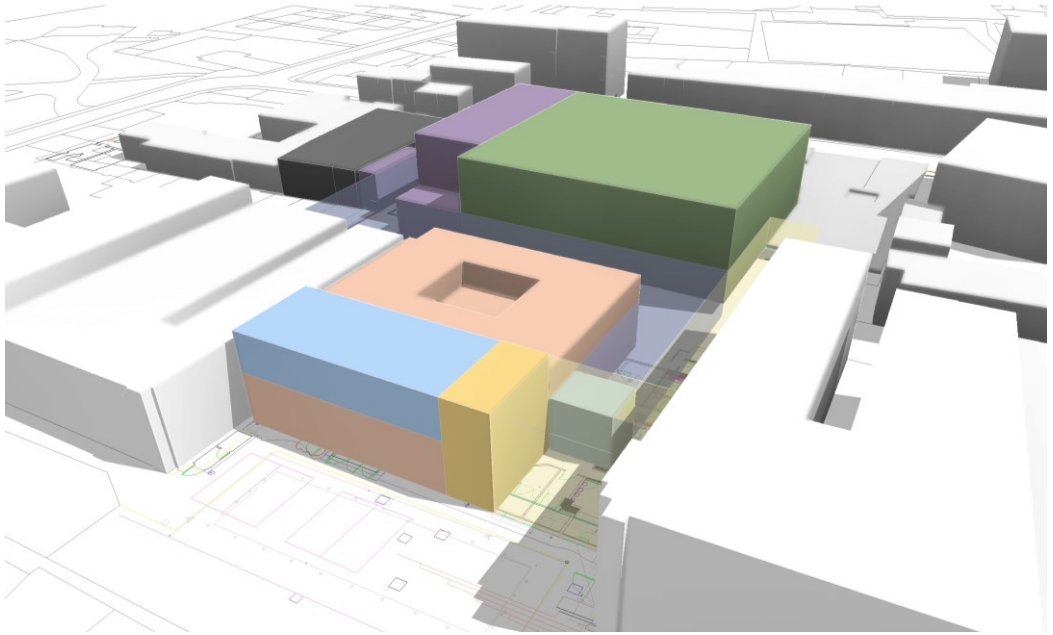
- Reduced OpEX cost through reduction in floor area
- Creates space and opportunities for external market
- Creates additional space for construction/phasing

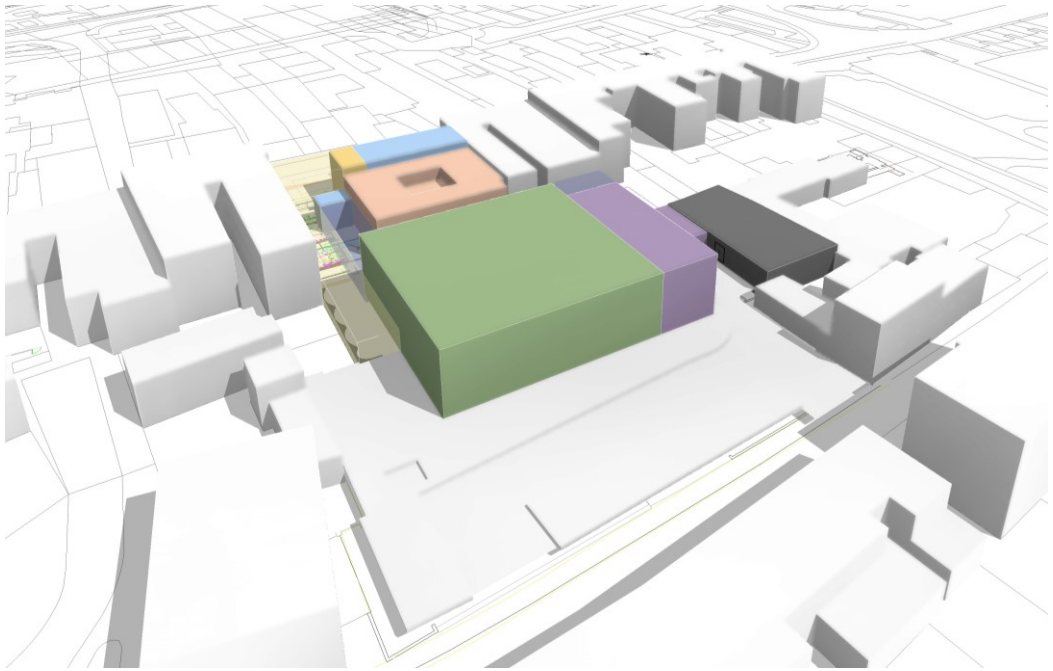
Weaknesses

- Loss of some existing facilities or functions may not be acceptable to stakeholders

Whitchurch Library & Civic Centre

Option 2c – Demolition & Reduced Rebuild





Opportunities

- Improves the internal environment (more natural light)
- New spaces could be made larger / smaller to fit needs
- Different facility types could respond to market demand and utilisation

Threats

- Planning permission will be required
- Programme
- Stakeholder opinion

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Option 2 – Demolition & Rebuild

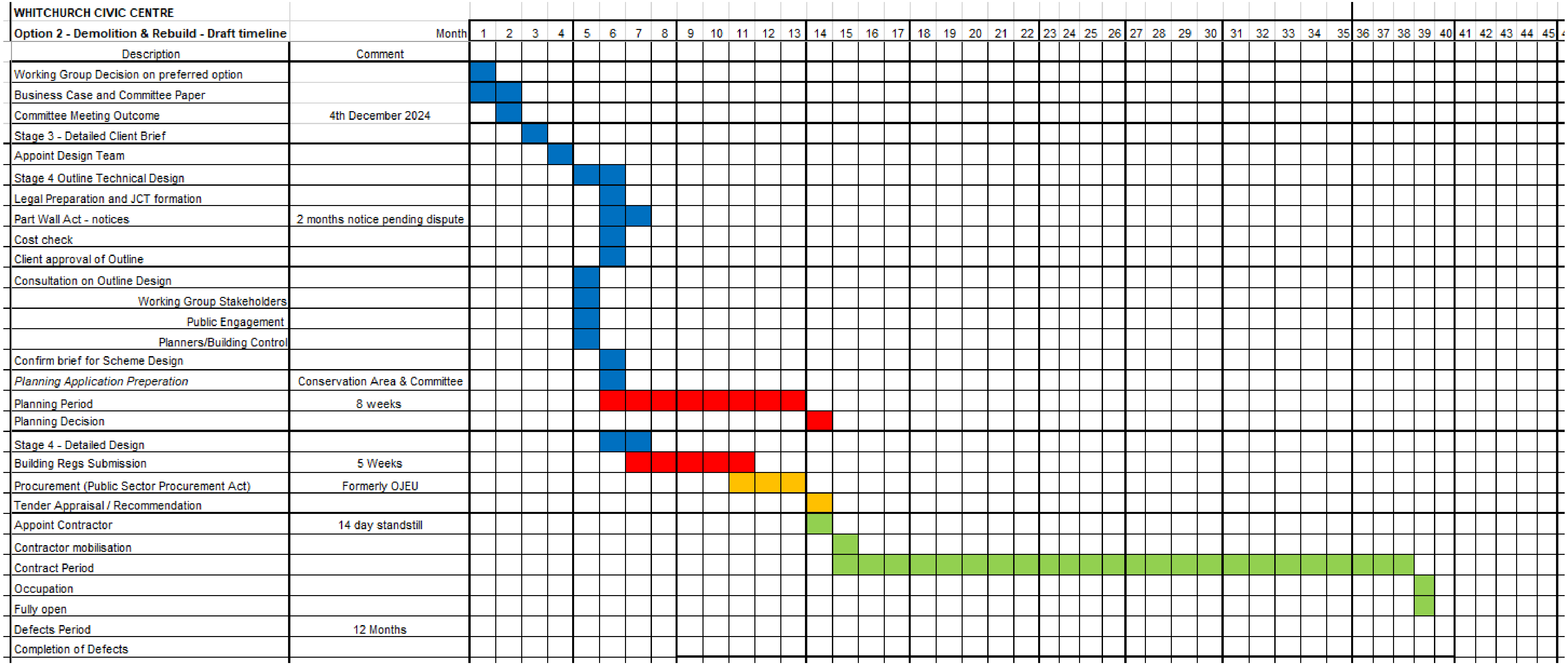

Fig 12 – Potential Timeline of Option 2

Whitchurch Library & Civic Centre

Summary of high-level options and SWOT analysis

Option Name	Summary	Area Comments	Estimated Costs	(Main) Strength	(Main) Weakness	(Main) Opportunities	(Main) Threats
Option 1	Existing re-roof (with consequential works plus essential condition element improvement)	Floor areas, layout remain.	£2.8m - £2.9m Plus, additional condition survey works to be considered circa £750k. Consisting of Condition Priority: D1&D2 - £200k C2 - £183k C3- £232k B3/B4 - £135k Option: Civic Hall roof Photovoltaic Panels, plus permanent edge protection circa additional £50k - £70k	Minimises loss of embodied carbon in using existing structure. Main area's structure suitable for replacement structural roof system	Entrance, office, and library layout doesn't meet service requirements. Will not perform as well as new build. Some spaces underutilised. Property remains at energy efficiency level. Condition based CapEX and OpEX remain for the existing elements of the property	Familiarity of layout to staff and users. Lowest CapEX cost option Large area of flat roof to consider Photovoltaic Panels as part of design (tbc) utilising south facing open areas to reduce OpEx utility costs and lower carbon footprint.	Unknown hidden issues and risk. Constraint on site access and buildability impacting of efficiency of re-roof. Inherent general property defects remain unless addressed though capital condition improvement. Remains high OpEx costs for aging building, plant, and low energy efficiency energy Highest operational cost. Impact of demolition on services removed such as Gas Pipework, Market Hall gas blow air heaters. Party Wall (1996) legal considerations/claims. Inclusion of Photovoltaic requiring cyclical OpEx inspection and fall arrest barrier protection
Option 2A	New build – All existing facilities replaced	Floor area similar as existing, but priced at new build rate	£8.5m - £9m	All function retained. Library and office space better suited to current requirements	Highest CapEx Highest embodied carbon.	Lower OpEx cost. Improved emergency efficiency	Highest CapEx cost
Option 2B	New build but retain existing Market Hall	As 2A, minus the area of existing Market Hall	£6.7m - £7m	Balances new/retained options.	Existing Market hall fixes site layout and uses	Reduced OpEx cost	New facilities to Civic/Library and market Hall OpEx and function remain
Option 2C	New build – consolidated footprint	Smallest footprint of all options	£7.5m - £8m	Frees up more of the site for external functions. Building size more suited to the mean utilisation.	Compromises on provision to reduce cost.	Reduced OpEx cost than other rebuild options	Loss of some functions may not be acceptable

Fig 13 – Summary of high-level options, costs and SWOT

Decisions

Agree next steps, timescale and actions