Appendix 12

THE STATES OF GUERNSEY
EDUCATION DEPARTMENT AND STATE PROPERTY SERVICE
LA MARE DE CARTERET SCHOOLS

Stage 2 Life Cycle Cost Report

August 2014

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VERSION CONTROL

Figure 1 - Version Control Table

Version Number	Date Issued	Originator	Distribution	Comments
V0.1	19-08-14	Yemi Akinwonmi	Chris Jeffers	Internal QA process
V1.0	26-08-14	Yemi Akinwonmi	Ian Ingram, G&T	Stage 2 LCC Report

DISCLAIMER

1. EXECUTIVE SUMMARY

The tables below provide a summary of the findings of this report:-

1.1 Overall Life Cycle Costs

Figure 2 – Executive Summary – Stage 2 Life Cycle Costs

Design Stage	Summary of Costs Primary School, SEN & Nursery (including Energy Centre & External Works Split)	25 Years	60 Years
		Current	Current
2	**Total Life Cycle Cost**	**£ 16,837,395**	**£ 28,072,327**
	Life Cycle Cost Detail	**25 Years**	**60 Years**
	Non-construction costs	£ -	£ -
	Income	£ -	£ -
	Construction	£ 10,866,785	£ 10,866,785
	Operation	£ 985,366	£ 2,364,878
	Maintenance	£ 2,606,518	£ 6,255,644
	Lifecycle Replacement	£ 2,378,726	£ 8,585,020
	Totals	**£ 16,837,395**	**£ 28,072,327**

Design Stage	Summary of Costs Secondary School & Sports Building (including Energy Centre & External Works Split)	25 Years	60 Years
		Current	Current
2	**Total Whole-Life Cost**	**£ 47,725,860**	**£ 79,635,431**
	Life Cycle Cost Detail	**25 Years**	**60 Years**
	Non-construction costs	£ -	£ -
	Income	£ -	£ -
	Construction	£ 29,852,976	£ 29,852,976
	Operation	£ 3,018,894	£ 7,245,347
	Maintenance	£ 7,985,668	£ 19,165,603
	Lifecycle Replacement	£ 6,868,321	£ 23,371,505
	Totals	**£ 47,725,860**	**£ 79,635,431**

1.2 Total Life Cycle Replacement Costs

The table below shows the summary of the life cycle replacement costs based on the current Stage 2 design over a 25 and 60 year review period, a more detailed breakdown is provided within the main report

Design Stage 2	Primary School, SEN & Nursery (including Energy Centre & External Works Split)			
La Mare De Carteret Schools	2,872m2			
	£/m2@25yrs	£/m2@60yrs	25 Year Cost	60 Year Cost
Life Cycle Costs	£33.13	£49.82	£2,378,726	£8,585,020

Design Stage 2	Secondary School & Sports Building (including Energy Centre & External Works Split)			
La Mare De Carteret Schools	8,798m2			
	£/m2@25yrs	£/m2@60yrs	25 Year Cost	60 Year Cost
Life Cycle Costs	£31.23	£44.27	£6,868,321	£23,371,505

1.3 Total Operation and Maintenance Costs (Facilities Management)

The table below shows the summary of the Facilities Management (FM) costs at Stage 2.

Design Stage 2	Primary School, SEN & Nursery (including Energy Centre & External Works Split)			
LA MARE DE CARTERET SCHOOLS	2,872m^2			
	£/m2	Annual Cost	25 Year Cost	60 Year Cost
FM Costs	£46.99	£143,675	£3,591,884	£8,620,522

Design Stage 2	Secondary School & Sports Building (including Energy Centre & External Works Split)			
LA MARE DE CARTERET SCHOOLS	8,798m^2			
	£/m2	Annual Cost	25 Year Cost	60 Year Cost
FM Costs	£46.99	£440,183	£11,004,563	£26,410,950

2. INTRODUCTION

Gardiner and Theobald Facilities Management Consultancy (GTFM) has completed the Life Cycle Cost analysis and Facilities Management Cost review for the redevelopment of the La Mare De Carteret (LMDC) Schools in Guernsey with study periods of 25 and 60 years.

Our report considers costs associated with delivery of hard and soft facilities services, estimated utilities expenditure and life cycle replacement costs over a 25 and 60 year period and is intended to meet the following objectives:

- To help achieve the financial, sustainability and operational benefits to be derived from following the principles of industry best practice Life Cycle analysis through the design development; and
- To enable the States of Guernsey Education Department to budget for the operational costs of the facility over the next 25 and 60 years.

This report sets out the methodology and subsequent analysis used to satisfy the above objectives.

The figures contained within this report show the final results of the Life Cycle Replacement Costs and FM Cost Analysis based on the design and understanding of operational requirements at Design Stage 2 (formerly RIBA Stage C). It also includes estimated utilities costs provided by Buro Happold.

The life cycle analysis has been based upon the cost information provided, with the allocation of funds and allowances predicated by the level of detail established within the cost plans and the design data provided at the time of the study.

Design Stage	Outputs / Deliverables
1(A/B)	**Feasibility Study Critical Appraisal – Life Cycle** Provision of Life cycle guidance on key building elements to consider for options analysis, with strategic review of lifecycle impacts of each. Summary of Life cycle impact of options considered as part of feasibility study
2(C)	**Project Specific Life Cycle** Analysis and estimation of the following Life cycle Costs: • Construction • Utilities Benchmark • Life cycle Replacement • Maintenance Benchmark (£/m^2)
2(C)	**Report and Cost Summary for Life Cycle Cost Analysis**

The construction industry uses many terms and varying definitions within the realm of life cycle costing. For ease of reference, we have provided a glossary of terms (Appendix B), as they have been applied to this report.

This report sets out the methodology and subsequent analysis used to satisfy the objectives below and the final results of the cost analysis at **Stage 2**.

2.1 Project Overview & Objectives

It is our understanding that The States of Guernsey Education Department and State Property Services aim to achieve the following objectives with regards to the La Mare De Carteret redevelopment;

- Replacement of the existing high school facilities for up to 600 11-16 age pupils;
- Replacement of the existing two-form entry primary school facilities for up to 420 4 -11 age pupils;
- Replacement of the existing co-provisioned nursery unit for approximately 30 children aged 3 - 4;
- Provision of a county/national competition level indoor sports facilities within the schools' new sports facilities;
- Relocation of the Communication and Autism Support Service facilities within the two schools;
- Provision of community facilities for families and the older generation within the schools and sports.

The schools are planned to be operational by no later than 2017 to meet the start of the academic year and they will be designed to provide flexibility to allow for future expansion of the facilities and curriculum and technology changes over the buildings' projected minimum life expectancy of 60 years.

Our analysis is in some way reliant on data and information provided by others, the details of which are summarised in the table below.

Figure 3 – Information / Documentation used

Design Stage	Information / Documentation	Provided By	Dated
1	N/A	N/A	N/A
2	Cost Plan	Gardiner & Theobald London	Aug 14
2	LMDC Stage 2 Report	Design Engine	Jul 14
2	Utilities Information	Buro Happold	Jul 14

We have provided a table below which provides further details of the source of costs that we have included and the assumptions we have made.

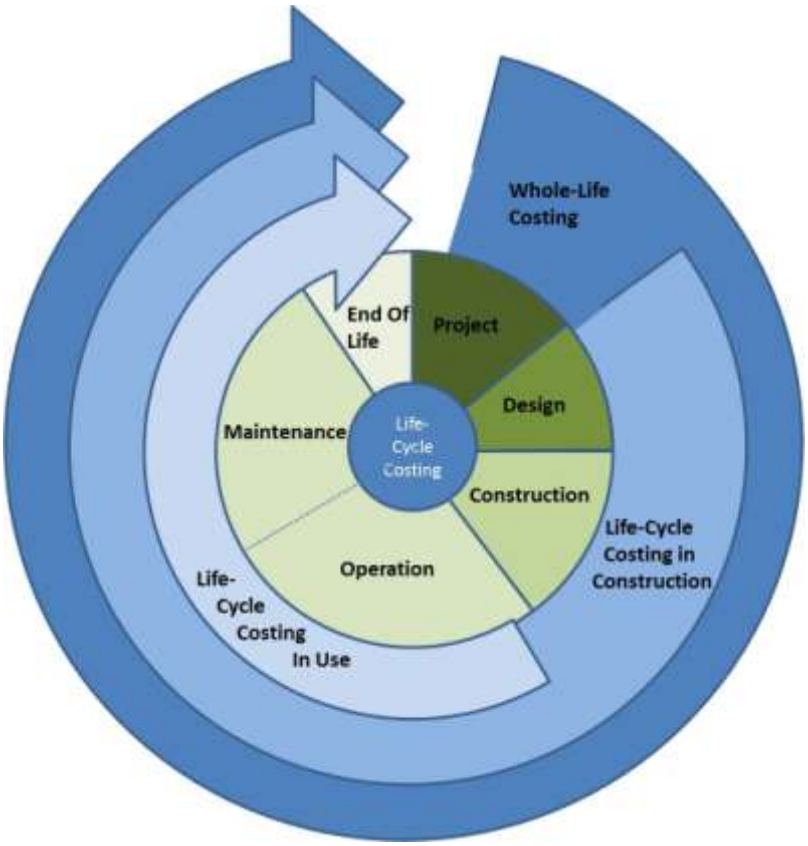
COST TYPE	WHOLE LIFE COST ELEMENT	INCLUDED?	DATA SOURCE
Construction Asset	Construction Cost	Yes	G&T
Life Cycle Costs (LCC)	Replacement of Major Systems	Yes	GTFM
	Redecoration	Yes	GTFM
Facilities Management (FM) Costs	Hard FM Costs	Yes	GTFM Benchmark Data
	Planned Maintenace	Yes	GTFM Benchmark Data
	Reactive Maintenance	Yes	GTFM Benchmark Data
	Grounds Maintenance	Yes	GTFM Benchmark Data
	Soft FM Costs	Yes	GTFM Benchmark Data
	Caretaking	Yes	GTFM Benchmark Data
	Cleaning	Yes	GTFM Benchmark Data
	Waste	Yes	GTFM Benchmark Data
	Pest Control	Yes	GTFM Benchmark Data
	Catering	No	
	Security	No	
	Utilities	Yes	Buro Happold
Other	Third Party Income	No	
	Rents	No	
	Taxes	No	
	Other	No	

3. METHODOLOGY

Our unique approach is to take a 'real world' look at the practicalities of building operation and life cycle replacement to take account of use, maintainability, accessibility, replacement frequencies and sustainability of building components, to identify possible changes to reduce cost, or to improve sustainability or ease of operational efficiency.

3.1 Life Cycle Analysis Cost Elements

Figure 4 – BS ISO 15686 – Analysis at different stage of life cycle[1]



3.2 Design Costs

Design costs are not required for the purposes of life cycle analysis and have not been considered within this report.

3.3 Construction Costs

The total estimated construction cost for stage 2 of the analysis has been provided by Gardiner and Theobald London and is detailed in Section 4.

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[1] Re-created from BS ISO 15686-5:2008

3.4 Operational & Maintenance Costs

For the purposes of this report, we have combined operational and annual maintenance costs into one heading of “Annual Facilities Management Costs”. The methodology used for the development of each of these Facilities Management Costs is outlined below.

3.4.1 Management Costs

In estimating the management costs associated with a facility, we use our expert knowledge of the FM industry and the project specific requirements for managing the FM services included in the analysis to determine the resources required. We then apply our market tested cost data to determine an estimate of the management cost.

3.4.2 Annual Maintenance Costs (Planned & Reactive)

We use our extensive database of market tested maintenance costs to estimate the annual maintenance cost of the facility using £/m2 of the facility. £/m2 is an industry standard approach to maintenance cost estimation.

3.4.3 Cleaning Costs

We use our extensive database of market tested cleaning costs to estimate the annual cleaning cost of the facility using £/m2 of the facility. We use our knowledge of the project (usage / layouts / specific finishes) and our industry knowledge and professional expertise to sensitise the £/m2 rate to ensure that the rate reflects the practicalities on the ground. £/m2 is an industry standard approach to cleaning cost estimation.

3.4.4 Utilities (Gas, Electricity, Water)

For the purpose of estimating annual utilities costs for the facility, ideally we use consumption data provided by others within the design team. In this case, Buro Happold have provided the benchmark utilities rates for this project which we have used to facilitate an overall ‘life cycle’ cost.

3.5 Life Cycle Replacement Costs

All too often, new buildings, whilst maintained and cleaned on a day-to-day basis, do not have the necessary investment made to replace worn out components. Therefore, over time the visual and operational impact of a new facility is eroded. The building starts to look jaded, and the consideration paid by the building users is reduced. Life Cycle Replacement (LCR) can be considered as the entire or substantial replacement of capital components to offset this deterioration. So, for example, replacing windows or floor finishes would be captured within the LCR assessment; programmed redecorations would likewise be included.

Reactive maintenance activities (such as repairing broken glass or damaged wall finishes) and planned preventative maintenance (such as boiler servicing, lift inspections etc.) would not be covered within the LCR costs, and would be considered as maintenance expenditure within the operational FM costs.

GTFM has developed a bespoke life cycle modelling tool, refined over many years of experience, and updated to align with the requirements of ISO 15686.

All our life cycle replacement cost estimates & profiles are based upon an assessment of the expected service life of each asset/component and the likely replacement cost at the end of that service life.

3.5.1 Service Life Expectancies

Service life expectancies are estimated using our own databases, published data such as CIBSE, BMI and BCIS and manufacturers product and warranty data. We also take practical operational considerations into account when determining service life expectancies, in particular ensuring that the use and location of the facility, occupancy patterns and varying intensity of use are taken into account.

3.5.2 Replacement Costs

Replacement costs are estimated using the original capital cost estimate as the base point, which is an industry standard approach. Our approach is to then make an assessment of the % of the original capital cost required to replace each asset/component, taking into consideration potential access restrictions, with the total estimate made up of the following cost elements:

- Strip out & Disposal of existing;
- Replacement;
- Prelims;
- Design Fees;
- Contingencies;
- Contractor overhead (8%) & profit (4%) have been allowed.

Our model makes use of BCIS codes, providing our clients with an industry standard view of the life cycle replacement cost profiles, facilitating useful life cycle replacement cost analysis and management. The model used has been created to be flexible enough to carry out modelling from a strategic level right down to a detailed elemental/component level.

The model uses the latest New Rules of Measurement (NRM).

3.5.3 Cost Basis

Life cycle replacement costs should be considered at the same price date as the construction cost plan, in this case based on Q3 2014 price levels. No allowance for inflation over the 60 year period has been factored into these costs, although the UK government Green Book NPV factor makes some allowance for future inflation.

3.6 Life Cycle Cost Considerations

The list below gives an indication of some of the elements / components of the building which are key contributors to the overall life cycle cost over the 25 and 60 year review periods and it helps to give some guidance on key impact focus areas for the design team from a capital and operational costs perspective:-

- The roofing solution to the main building and external canopies;
- The wall, floor and ceiling finishes to classrooms, general circulation and high traffic / impact areas;
- The heat source type / mechanical ventilation plant and equipment
- The lighting solution / strategy for the building.
- External sports pitches and play areas

4. CONSTRUCTION COSTS

Based on cost plans provided by G&T London, we have used the following cost data:

4.1 Construction Costs Summary

Element	Stage 2
La Mare De Carteret Schools	**11,669m^2**
High School	£18,676,139
Sports Hall	£6,484,145
CAS & Pre-school	£735,886
Primary School	£7,906,647
Energy Centre	Included
External Works & Drainage	£12,159,930
Sub Total	**£45,962,747**
FFE and ICT	£3,007,750
Contingencies / Risk Allowance	£3,677,019
Total (inc. Prelims, OH&P & Contingencies)	**£52,647,516**
TOTAL CONSTRUCTION COSTS	**£52,647,516**

5. ANNUAL FACILITIES MANAGEMENT COSTS

We have utilised annual FM benchmark rates provided by the Estates Team of the States of Guernsey's Education Department which we believe is sensible approach based on the specific location of the LMDC and the likely FM strategy to be adopted throughout its operation. We have compared the benchmark rates provided with similar schools projects we have been involved with and are comfortable that the overall costs are in the range of what we would expect for this type of facility.

5.1.1 Hard FM Costs

The total Hard FM benchmark cost estimate assumes the provision of a professionally managed maintenance service and includes costs for all annual or less frequent statutory tests and inspections, planned maintenance in accordance with SFG20 standards or a similar regime. It also includes for grounds maintenance to all external areas.

We note that the States' Works Department will be maintaining the grass pitches; as a result this is excluded from the cost estimate.

Whilst we believe the overall Hard FM cost estimate should be achievable for a school of this nature, however, the actual costs will depend upon the final FM solution adopted by the LMDC.

5.1.2 Soft FM Costs

The total Soft FM benchmark estimate assumes an allowance for caretaking and the provision of a professionally managed cleaning service, incorporating routine and periodic cleaning, in order to maintain the cleanliness of the school buildings and facilities to acceptable standards. It also includes for pest control, window cleaning, feminine hygiene, waste and consumables. We have not included for any catering provision or out of normal school hours use of the facilities at this stage.

5.1.3 Utilities Costs

For the purpose of estimating annual utilities costs for the schools, we use consumption and tariff data provided by others within the design team. In this case, Buro Happold has provided the benchmark utilities estimates in the Interim Energy Strategy Assessment Report for this project which we have used to build up the costs for this element.

We anticipate that the sustainability and renewables strategies in the LMDC Schools design proposals will assist in lowering utilities costs in conjunction with the use of high insulating materials in the construction, including external cladding and roofing materials as the design progresses. However the use and management of the building by the school will ultimately determine the actual consumption experienced.

For the purposes of this report, we have combined operational costs into one heading of "Annual Facilities Management Costs" and the details are summarised in the table below.

5.2 Facilities Management Cost Estimates

The tables below provide FM cost estimates for the services in scope at design **Stage 2** included within the analysis.

Based our understanding of the requirements of the States of Guernsey's Education department, we have applied the following to the FM cost estimates:

- The costs have been split between two main categories
    - Primary School, Nursery and SEN building
    - Secondary School and Sports Hall
- Costs relating to the energy centre and external works have been distributed in proportion to the size of the buildings in the above main categories based on their GIA.

Overall the FM costs do not indicate any areas of major risk and the current costs are in line with what we would expect for this type facility and based on our previous benchmarks.

However, it is important that the following should be noted which may result in a change in the overall operation and maintenance costs as the design further develops

- The facilities management costs at Stage 2 are based on data provided by The States of Guernsey Education Department's Estate's Team and is therefore not based on the actual strategy for FM services that may be deployed for the new LMDC Schools. Clearly, once the delivery strategy and costs have been further developed and / or FM services procured for the School, these costs could be used in place of this data.
- The utilities estimate at Stage 2 is based on data provided by Buro Happold in the full MEP Stage C Report with amendments issued to us on 30th July 2014 which forms the basis of the utilities costs in this report. It is noted that the estimates provided are based on a high level assessment of the "potential" energy consumption for the school and not the "actual" building energy use, hence we anticipate this will be refined as more detail becomes available.

These estimates may change as the design develops. This may be either due to changes in the GIA of the building, or due to our adjustment of the benchmark £/m2 rates based on an increase in the level of information available which will enable us to refine our estimate.

The table below shows the annual FM cost estimates of LMDC schools at stage 2 of the design.

Figure 5 – Facilities Management Cost Estimates

Design Stage 2	**Primary School, SEN & Nursery** (including Energy Centre & External Works Split)			
LA MARE DE CARTERET SCHOOLS	**2,872m^2**			
Cost Element	**£/m2**	**Annual Cost**	**25 Year Cost**	**60 Year Cost**
FM Administration & Helpdesk	£0.55	£1,579	£39,483	£94,760
Planned & Reactive Maintenance	£11.61	£33,338	£833,453	£2,000,287

Grounds Maintenance*	£0.42	£9,961	£249,017	£597,641
Caretaking	£14.46	£41,522	£1,038,047	£2,491,313
Cleaning , Waste & Pest Control	£6.22	£17,861	£446,518	£1,071,644
Sub total		**£104,261**	**£2,606,518**	**£6,555,644**
Utilities - Electricity	£10.10	£28,993	£724,814	£1,739,554
Utilities – Heating / Gas	£3.17	£9,109	£227,729	£546,551
Utilities - Water	£0.46	£1,313	£32,822	£78,773
Subtotal - Utilities		**£39,415**	**£985,366**	**£2,364,878**
Totals	**£46.99**	**£143,675**	**£3,591,884**	**£8,620,522**

Design Stage 2	**Secondary School & Sports Building** (including Energy Centre & External Works Split)			
LA MARE DE CARTERET SCHOOLS	**8,798m^2**			
Cost Element	**£/m2**	**Annual Cost**	**25 Year Cost**	**60 Year Cost**
FM Administration & Helpdesk	£0.55	£4,839	£120,966	£290,318
Planned & Reactive Maintenance	£11.61	£102,139	£2,553,474	£6,128,339
Grounds Maintenance*	£0.42	£30,517	£249,017	£1,831,009
Caretaking	£14.46	£127,212	£762,921	£7,632,711
Cleaning , Waste & Pest Control	£6.22	£54,720	£3,180,296	£3,283,227
Sub total		**£319,427**	**£7,985,668**	**£19,165,603**
Utilities - Electricity	£10.10	£88,825	£2,220,635	£5,329,524
Utilities – Heating / Gas	£3.17	£27,908	£697,702	£1,674,484
Utilities - Water	£0.46	£4,022	£100,558	£241,339
Subtotal - Utilities		**£120,756**	**£3,018,894**	**£7,245,347**
Totals	**£46.99**	**£440,183**	**£11,004,563**	**£26,410,950**

**Please note that the Grounds Maintenance figures are based on the current rate advised by Guernsey's Department of Education Estates Department and we have applied the "net external" grounds area for the schools to arrive at our estimates.*

6. LIFE CYCLE REPLACEMENT COSTS

The following analysis represents the estimation of life cycle replacement (LCR) costs in chronological order in line with the design development.

We have generated an estimation of the likely life cycle profile required, which will assist in future forecasting, to enable costs to be allocated from a client sinking fund, so that if managed appropriately the facility may remain in the required condition throughout the 60 year review period.

6.1 Life Cycle Replacement Assumptions

- The Total LCR Fund at **Stage 2** of analysis is provided base date **Q3 2014** and is net of Inflation, VAT and any costs associated with managing the fund.
- The methodology adopted when determining the life cycle provisions assumes that the buildings and systems will be subject to a robust maintenance regime during this period and the components of these systems are situated in the environmental conditions specified by the manufacturers.
- We have not included for any technological upgrades of systems, which may be required over the period. The model assumes that all equipment has been fitted in appropriate positions within the building, allowing the required access to complete maintenance and life cycle replacement works.
- The building has been designed to meet the specifications and standards required by the relevant authorities
- Due to the current design level, we have had to make reasonable assumptions over the specification of materials, finishes and equipment
- All costs have been based on current costs as per the costs of the corresponding cost plan at **Stage 2** – **Q3 2014**.
- Based our understanding of the requirements of the States of Guernsey's Education department, The LCR costs have been split between two main categories
    - Primary School, Nursery and SEN building
    - Secondary School and Sports Hall
- Costs relating to the Energy Centre and External Works have been distributed in proportion to the size of the buildings in the above main categories based on their GIA.

6.2 Summary of Life Cycle Replacement Cost Estimates (Real)

The following figure provides details of the life cycle replacement cost estimates in real terms as estimated at **Stage 2** of design development, indicating a £/m2/annum 25 and 60 year cost estimate.

It should be noted that whilst life cycle costs are often expressed in terms of costs per m^2 per annum the actual expenditure varies considerably year on year. In the first few years of operation life cycle expenditure will be very limited, primarily associated with the replacing of finishes and redecorations.

Figure 6 – Summary of Life Cycle Replacement Cost Estimates (Real)

Design Stage 2	Primary School, SEN & Nursery (including Energy Centre & External Works Split)			
La Mare De Carteret Schools'	**2,872m2**			
Cost Element	**£/m2@25**	**£/m2@60**	**25 Year Cost**	**60 Year Cost**
Sub-Structure	£0.00	£0.00	£0.00	£0.00
Superstructure	£5.99	£12.87	£430,311	£2,216,938
Finishes	£8.63	£9.74	£619,585	£1,678,363
Fixtures and Fittings	£2.98	£3.65	£213,884	£629,528
Services	£9.93	£14.23	£713,160	£2,452,223
External Works	£5.60	£39.33	£401,786	£1,607,958
Totals	**£33.13**	**£49.82**	**£2,378,726**	**£8,585,020**

Design Stage 2	Secondary School & Sports Building (including Energy Centre & External Works Split)			
La Mare De Carteret Schools'	**8,798m2**			
Cost Element	**£/m2@25**	**£/m2@60**	**25 Year Cost**	**60 Year Cost**
Sub-Structure	£0.00	£0.00	£0.00	£0.00
Superstructure	£7.02	£12.91	£1,544,562	£6,813,217
Finishes	£7.13	£8.08	£1,568,435	£4,267,532
Fixtures and Fittings	£4.53	£5.30	£996,690	£2,799,899
Services	£9.41	£13.27	£2,070,697	£7,005,097
External Works	£3.13	£4.71	£687,937	£2,485,760
Totals	**£31.23**	**£44.27**	**£6,868,321**	**£23,371,505**

More substantial expenditure however can be anticipated after years 15-20 as major components (particularly in respect of mechanical and electrical installations) come to the end of their useful life. The life cycle model profiles the anticipated expenditure over the 60 year periods.

7. SUMMARY OF FINDINGS

From the analysis undertaken of the Life Cycle Cost (LCC) of the La Mare De Carteret Schools development according to cost plans at **Stage 2** of analysis the costs for the development over 25 and 60 year terms are summarised in the table below.

Design Stage	Summary of Costs Primary School, SEN & Nursery (including Energy Centre & External Works Split)	25 Years Current	60 Years Current
2	**Total Life Cycle Cost**	**£ 16,837,395**	**£ 28,072,327**
	Life Cycle Cost Detail	**25 Years**	**60 Years**
	Non-construction costs	£ -	£ -
	Income	£ -	£ -
	Construction	£ 10,866,785	£ 10,866,785
	Operation	£ 985,366	£ 2,364,878
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Design Stage	Summary of Costs Secondary School & Sports Building (including Energy Centre & External Works Split)	25 Years Current	60 Years Current
2	**Total Whole-Life Cost**	**£ 47,725,860**	**£ 79,635,431**
	Life Cycle Cost Detail	**25 Years**	**60 Years**
	Non-construction costs	£ -	£ -
	Income	£ -	£ -
	Construction	£ 29,852,976	£ 29,852,976
	Operation	£ 3,018,894	£ 7,245,347
	Maintenance	£ 7,985,668	£ 19,165,603
	Lifecycle Replacement	£ 6,868,321	£ 23,371,505
	Totals	**£ 47,725,860**	**£ 79,635,431**

The cost per square metre may reduce in the progression from **Stage 2** to **4**, as designs for each elemental breakdown of the building become more developed, and the potential for reducing costs increases.

8. NEXT STEPS

GTFM will undertake a life cycle options appraisals of a range of M&E options put forward with regards to the Services Solution to ensure that the most cost effective solution is adopted from a whole life cost perspective.

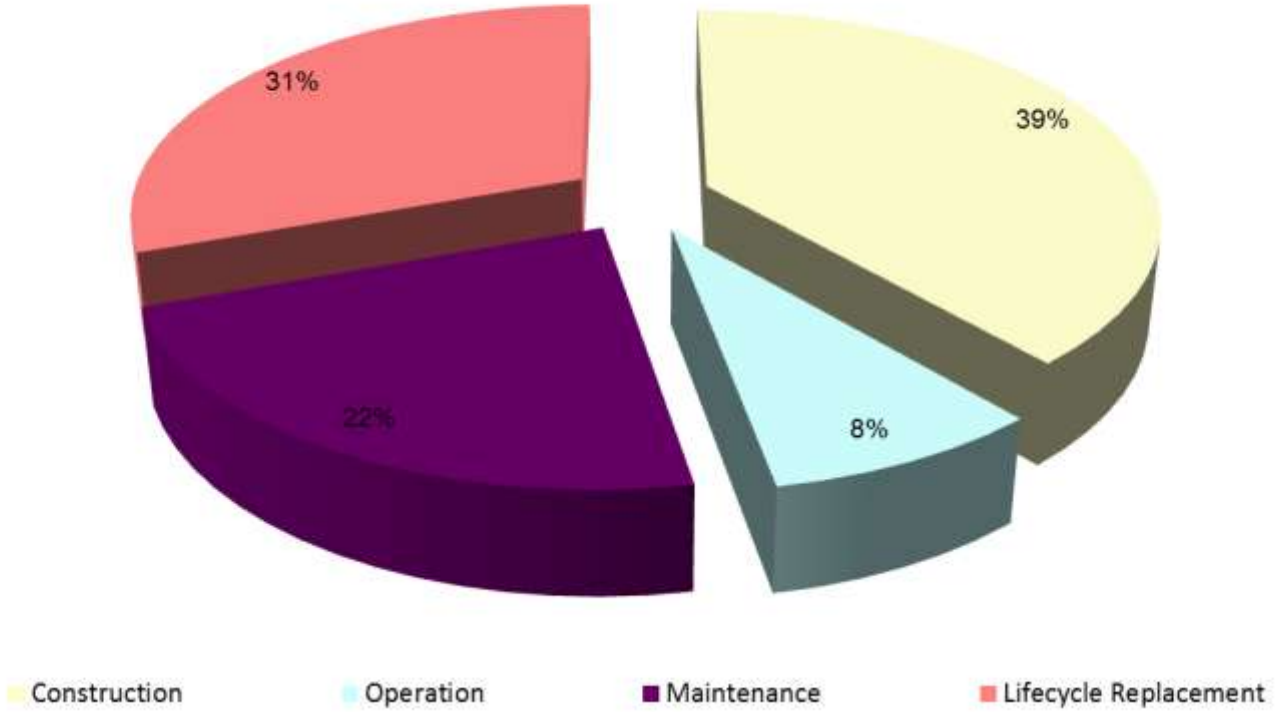
The above life cycle analysis and reports will be updated at **Stage 4**, as more detailed design will be available to achieve a more robust position on the potential life cycle cost for LMDC schools over the 25 and 60 year periods under review.

8.1 Options Appraisals

As the LMDC project progresses through the design development and different options are reviewed, it is important that all project stakeholders understand the importance of achieving optimum project life cycle cost. At a strategic and system level, the major focus should be on the key elements / items that have potential to add value to the project from a whole life perspective.

In order to take advantage of the benefits derived, an options analysis will be undertaken based on a range of services options chosen by the design team which are relevant and meet the performance criteria for the effective functioning of the building and are of critical value within the project.

APPENDIX A: ANALYSIS OF LIFE CYCLE COSTS



Lifecycle Replacement = 31%; Maintenance = 22%; Operation = 8% Construction = 39%

Figure 7– Stage 2 Primary School LCC profile 60 years

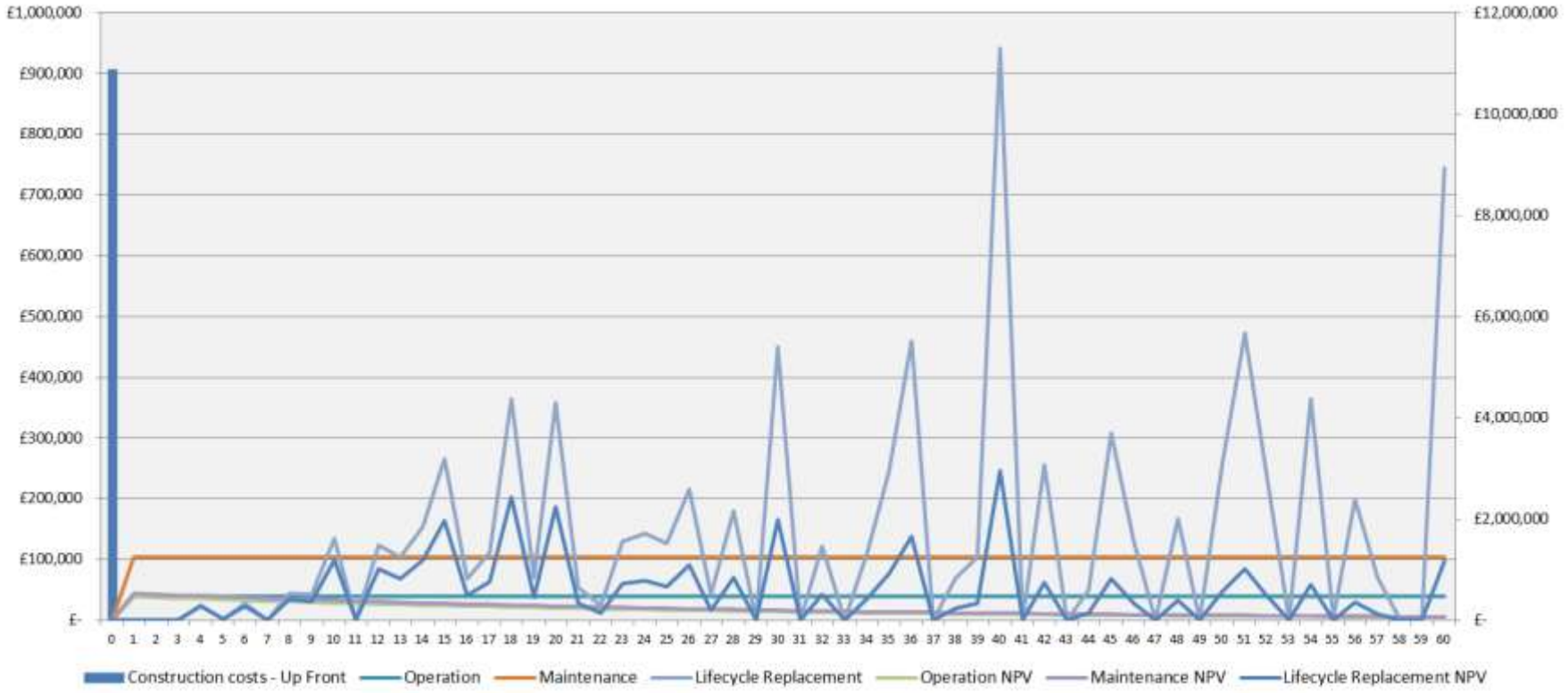


Figure 8 – Stage 2 Primary School LCC profile 60 years

	0	1	2	3	4	5	6	7	8	9	10
Construction costs - Up Front	£ 10,866,785	-	-	-	-	-	-	-	-	-	-
Non-construction costs	-	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
Income	-	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
Construction	-	-	-	-	-	-	-	-	-	-	-
Operation	-	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415
Maintenance	-	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261
Lifecycle Replacement	-	£ -	£ -	£ -	£ 25,369	£ 2,627	£ 28,238	£ 207	£ 44,569	£ 42,370	£ 134,263
End of Life	-	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -		**£ 143,675**	**£ 143,675**	**£ 143,675**	**£ 169,044**	**£ 146,303**	**£ 171,914**	**£ 143,883**	**£ 188,245**	**£ 186,045**	**£ 277,938**
£ -		**£ 143,675**	**£ 287,351**	**£ 431,026**	**£ 600,070**	**£ 746,373**	**£ 918,287**	**£ 1,062,169**	**£ 1,250,414**	**£ 1,436,459**	**£ 1,714,397**

11	12	13	14	15	16	17	18	19	20
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415
£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261
£ 1,268	£ 123,939	£ 104,284	£ 154,248	£ 265,830	£ 67,987	£ 111,619	£ 364,102	£ 70,183	£ 358,660
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 144,944	**£ 267,614**	**£ 247,960**	**£ 297,924**	**£ 409,505**	**£ 211,662**	**£ 255,294**	**£ 507,778**	**£ 213,858**	**£ 502,335**
£ 1,859,341	**£ 2,126,955**	**£ 2,374,915**	**£ 2,672,838**	**£ 3,082,344**	**£ 3,294,005**	**£ 3,549,300**	**£ 4,057,077**	**£ 4,270,935**	**£ 4,773,270**

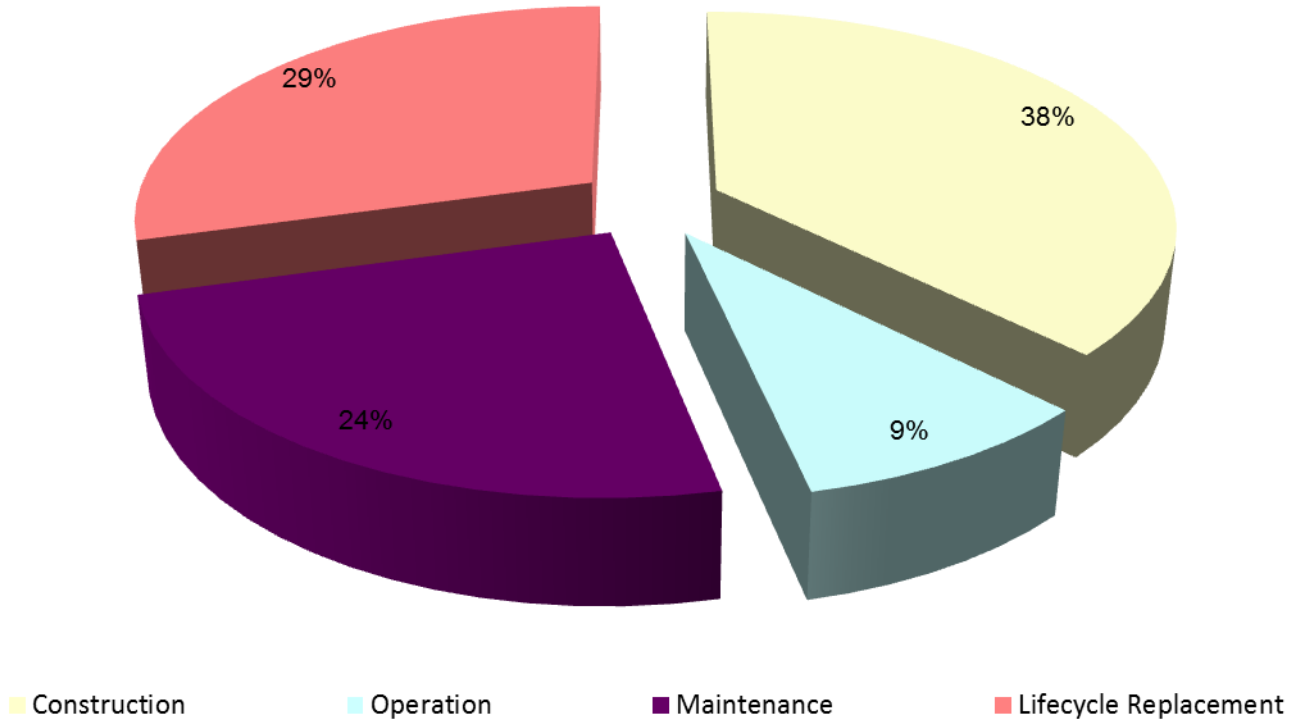
21	22	23	24	25	26	27	28	29	30
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415
£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261
£ 54,583	£ 24,463	£ 130,281	£ 143,139	£ 126,497	£ 214,991	£ 42,370	£ 179,769	£ -	£ 449,752
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 198,259	**£ 168,138**	**£ 273,957**	**£ 286,814**	**£ 270,172**	**£ 358,666**	**£ 186,045**	**£ 323,445**	**£ 143,675**	**£ 593,427**
£ 4,971,529	**£ 5,139,667**	**£ 5,413,624**	**£ 5,700,438**	**£ 5,970,610**	**£ 6,329,276**	**£ 6,515,321**	**£ 6,838,766**	**£ 6,982,441**	**£ 7,575,868**

31	32	33	34	35	36	37	38	39	40
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415
£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261
£ -	£ 122,627	£ 1,268	£ 111,619	£ 244,640	£ 459,803	£ -	£ 70,183	£ 104,284	£ 941,207
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 143,675	**£ 266,302**	**£ 144,944**	**£ 255,294**	**£ 388,315**	**£ 603,478**	**£ 143,675**	**£ 213,858**	**£ 247,960**	**£ 1,084,882**
£ 7,719,544	**£ 7,985,846**	**£ 8,130,790**	**£ 8,386,084**	**£ 8,774,399**	**£ 9,377,877**	**£ 9,521,552**	**£ 9,735,410**	**£ 9,983,370**	**£ 11,068,252**

41	42	43	44	45	46	47	48	49	50
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415
£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261
£ -	£ 256,267	£ -	£ 49,832	£ 308,199	£ 130,281	£ -	£ 166,556	£ 207	£ 258,132
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 143,675	**£ 399,943**	**£ 143,675**	**£ 193,507**	**£ 451,875**	**£ 273,957**	**£ 143,675**	**£ 310,232**	**£ 143,883**	**£ 401,807**
£ 11,211,927	**£ 11,611,870**	**£ 11,755,545**	**£ 11,949,052**	**£ 12,400,927**	**£ 12,674,884**	**£ 12,818,560**	**£ 13,128,791**	**£ 13,272,674**	**£ 13,674,481**

51	52	53	54	55	56	57	58	59	60
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415	£ 39,415
£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261	£ 104,261
£ 472,318	£ 240,359	£ -	£ 364,102	£ 3,896	£ 198,970	£ 70,183	£ -	£ -	£ 744,480
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 615,993	**£ 384,035**	**£ 143,675**	**£ 507,778**	**£ 147,571**	**£ 342,645**	**£ 213,858**	**£ 143,675**	**£ 143,675**	**£ 888,156**
£ 14,290,474	**£ 14,674,509**	**£ 14,818,184**	**£ 15,325,962**	**£ 15,473,533**	**£ 15,816,178**	**£ 16,030,036**	**£ 16,173,711**	**£ 16,317,387**	**£ 17,205,542**

Figure 9 – Stage 2 Primary School LCC profile 60 years



Lifecycle Replacement = 29%; Maintenance = 24%; Operation = 9% Construction = 38%

Figure 10– Stage 2 Secondary School & Sports Building LCC profile 60 years

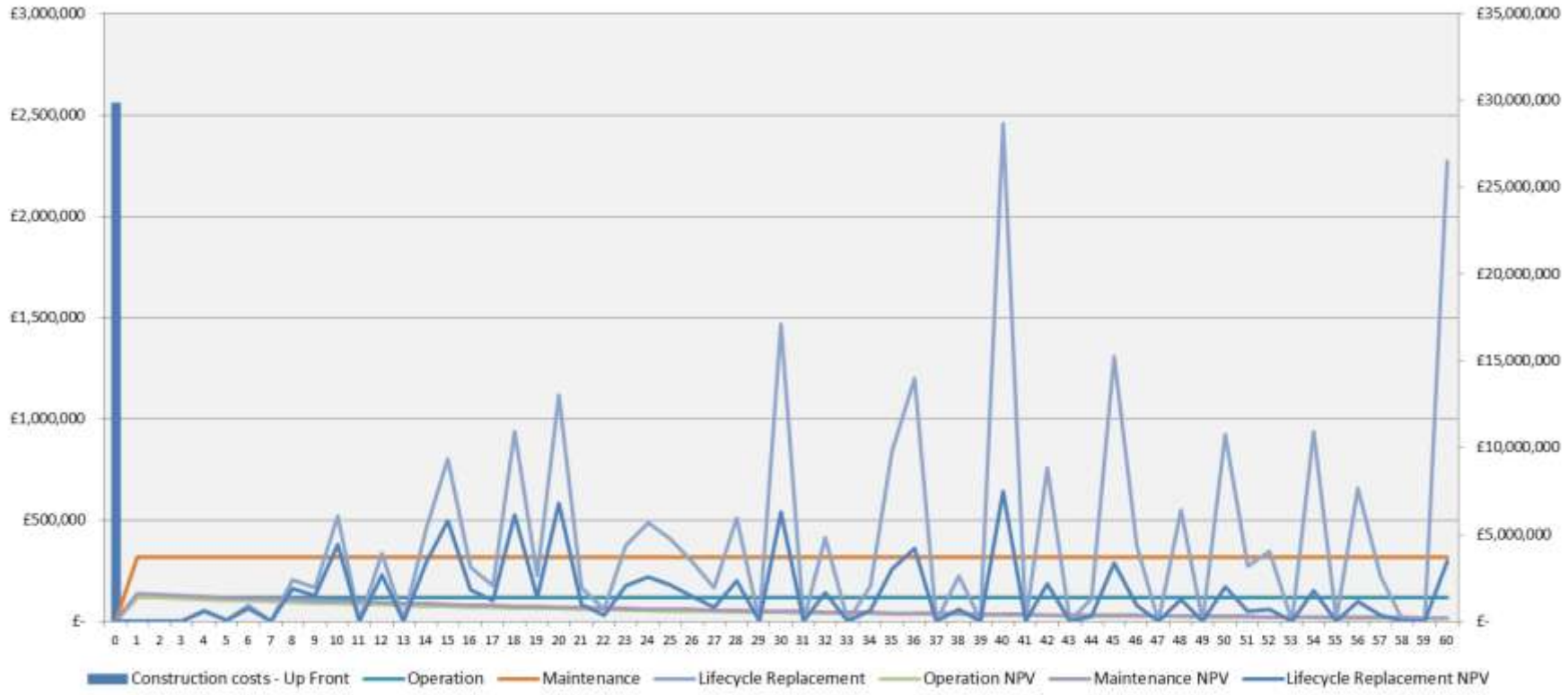


Figure 11 – Stage 2 Secondary School & Sports Building LCC profile 60 years

	0	1	2	3	4	5	6	7	8	9	10
Construction costs - Up Front	£ 29,852,976	-	-	-	-	-	-	-	-	-	-
Non-construction costs	-	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
Income	-	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
Construction	-	-	-	-	-	-	-	-	-	-	-
Operation	-	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756
Maintenance	-	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427
Lifecycle Replacement	-	£ -	£ -	£ -	£ 55,014	£ 7,770	£ 77,523	£ 635	£ 204,497	£ 165,971	£ 521,581
End of Life	-	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£	**-**	**£ 440,183**	**£ 440,183**	**£ 440,183**	**£ 495,197**	**£ 447,952**	**£ 517,705**	**£ 440,818**	**£ 644,680**	**£ 606,154**	**£ 961,763**
£	**-**	**£ 440,183**	**£ 880,365**	**£ 1,320,548**	**£ 1,815,744**	**£ 2,263,696**	**£ 2,781,402**	**£ 3,222,219**	**£ 3,866,899**	**£ 4,473,053**	**£ 5,434,816**

11	12	13	14	15	16	17	18	19	20
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756
£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427
£ 3,751	£ 336,022	£ 5,359	£ 459,238	£ 803,579	£ 267,360	£ 177,582	£ 939,532	£ 223,539	£ 1,119,657
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 443,933	**£ 776,205**	**£ 445,541**	**£ 899,420**	**£ 1,243,761**	**£ 707,543**	**£ 617,764**	**£ 1,379,714**	**£ 663,721**	**£ 1,559,839**
£ 5,878,750	**£ 6,654,954**	**£ 7,100,495**	**£ 7,999,916**	**£ 9,243,677**	**£ 9,951,219**	**£ 10,568,984**	**£ 11,948,698**	**£ 12,612,419**	**£ 14,172,258**

21	22	23	24	25	26	27	28	29	30
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756
£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427
£ 167,210	£ 60,765	£ 376,969	£ 485,505	£ 409,264	£ 291,357	£ 165,971	£ 509,214	£ -	£ 1,468,582
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 607,392	**£ 500,948**	**£ 817,152**	**£ 925,688**	**£ 849,446**	**£ 731,539**	**£ 606,154**	**£ 949,396**	**£ 440,183**	**£ 1,908,765**
£ 14,779,651	**£ 15,280,598**	**£ 16,097,750**	**£ 17,023,438**	**£ 17,872,884**	**£ 18,604,423**	**£ 19,210,577**	**£ 20,159,973**	**£ 20,600,156**	**£ 22,508,921**

31	32	33	34	35	36	37	38	39	40
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756
£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427
£ -	£ 414,041	£ 3,751	£ 177,582	£ 840,894	£ 1,198,031	£ -	£ 223,539	£ 5,359	£ 2,457,131
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 440,183	**£ 854,224**	**£ 443,933**	**£ 617,764**	**£ 1,281,076**	**£ 1,638,213**	**£ 440,183**	**£ 663,721**	**£ 445,541**	**£ 2,897,313**
£ 22,949,103	**£ 23,803,327**	**£ 24,247,260**	**£ 24,865,024**	**£ 26,146,100**	**£ 27,784,314**	**£ 28,224,496**	**£ 28,888,218**	**£ 29,333,759**	**£ 32,231,072**

41	42	43	44	45	46	47	48	49	50
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756
£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427
£ -	£ 757,276	£ -	£ 115,779	£ 1,304,488	£ 376,969	£ -	£ 548,368	£ 635	£ 923,075
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 440,183	**£ 1,197,458**	**£ 440,183**	**£ 555,962**	**£ 1,744,671**	**£ 817,152**	**£ 440,183**	**£ 988,551**	**£ 440,818**	**£ 1,363,257**
£ 32,671,254	**£ 33,868,712**	**£ 34,308,895**	**£ 34,864,857**	**£ 36,609,527**	**£ 37,426,679**	**£ 37,866,861**	**£ 38,855,412**	**£ 39,296,230**	**£ 40,659,487**

51	52	53	54	55	56	57	58	59	60
-	-	-	-	-	-	-	-	-	-
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
-	-	-	-	-	-	-	-	-	-
£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756	£ 120,756
£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427	£ 319,427
£ 271,341	£ 346,371	£ -	£ 939,532	£ 11,521	£ 658,697	£ 223,539	£ -	£ -	£ 2,270,143
£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
£ 711,523	**£ 786,553**	**£ 440,183**	**£ 1,379,714**	**£ 451,703**	**£ 1,098,879**	**£ 663,721**	**£ 440,183**	**£ 440,183**	**£ 2,710,326**
£ 41,371,010	**£ 42,157,564**	**£ 42,597,746**	**£ 43,977,460**	**£ 44,429,164**	**£ 45,528,043**	**£ 46,191,764**	**£ 46,631,947**	**£ 47,072,129**	**£ 49,782,455**

Figure 12 – Stage 2 Secondary School & Sports Building LCC profile 60 years

APPENDIX B: GLOSSARY OF TERMS

ISO 15686 defines whole life costs (WLC) and life-cycle costs (LCC) very broadly in the manner set out below, and are typically analysed over a 25 or 30 and 60-year period.

Whole Life Cost (WLC): This can include all the costs associated with the LCC, with the addition of potential income and non-construction / maintenance related costs.

Lifecycle Cost (LCC): May include some or all of the costs of construction, operation, maintenance and disposal of a building.

Lifecycle Replacement Cost (LCRC): Includes the cost of replacing major building systems and components, including periodic refurbishment of specific assets (such as lifts), and major redecoration. - Typically used for operational maintenance budgeting purposes, and therefore is often combined with maintenance costs (in doing so becoming a LCC analysis).

Real and Discounted Cost: ISO 15686 defines real cost as the cost expressed as a value at the base date, including estimated changes in price due to forecast changes in efficiency and technology, but excluding general price inflation or deflation. Discounted cost is the resulting cost when the real cost is discounted by the real discount rate, or when the nominal cost is discounted by the nominal discount rate. ISO15686 defines nominal cost as the expected price that will be paid when a cost is due to be paid, including estimated changes in price due to, for example, forecast change in efficiency, inflation or deflation and technology.