

**DRAFT v0.20**



**Highway Asset Investment Strategy  
June 2016**



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## 1. Executive Summary

Traditionally Highway Maintenance budgets have been set annually often based on previous or historic values which create a short term reactive approach to management of the assets. This report will define a long term strategic approach to Highway Maintenance funding based on sound Asset Management principles utilising tools developed by the CSS Wales (County Surveyors Society Wales), joint All Wales & SCOTS HAMP working group. This will provide a long term agreed approach with stability for future service delivery and present a series of available options.

This approach supports Welsh Government strategy of applying asset management principles to long term maintenance spending, and was the basis/ principle behind the LGFI funding allocation.

Another driver for asset management planning and a long term strategic approach is the requirement of CIPFA in 'Whole of Government Accounts' which requires local authorities to report on replacement costs and condition of infrastructure assets from 2015/16.

### Investment options

The table below is a summary of the investment options available. These are detailed in the body of the report.

**\*\* THIS TABLE REQUIRES UPDATE – AWAITING FINANCIAL DATA \*\***

Overview of Investment Options					
Asset Group	2015/16 Revenue Budget (£,000)	2015/16 Capital Budget (£,000)	Future Capital Investment Option Costs		
			Managed Decline (£,000)	Steady State (£,000)	Enhanced (£,000)
Carriageways	TBC	£850**	£850	£3,075	£5,175
Footways	TBC	£695	£470	£2,360	£3,810
Drainage	TBC	0	0	£160*	£160*
Street Furniture	TBC	0	0	£125*	£125*
Street Lighting	TBC	£270	£300	£1,200*	£1,200*
Structures	TBC	£613	£0	£400	£400
<b>Total</b>	TBC	£2,428	£1,620	£7,320	£10,870

\*- indicated funding profile varies over time, see table below.

\*\* - excludes £750k one off pressure bid for carriageway reconstruction and £400k for carriageway permanent patching improvements.

### Recommendation

It is recommended that the 'Steady State' investment option is chosen for the long term of the highway and associated assets. The reason for this recommendation is that this proves to be the best long term economic solution whilst enabling the network to support other corporate priorities such as economic growth in the city.

The 'Managed Decline' option is not recommended as this would result in a drop of asset condition in the early years as well as an eventual drop in service levels. There are serious revenue implications (see below) relating to this option, resulting in an overall increase in the long term cost of the service without the benefits of maintaining the corporate assets in a managed way.

The 'Enhanced' option would bring all the highway and associated assets to an 'ideal' or as new state, and the revenue requirements would be reduced to a level where only wear and tear maintenance would be required. Although this option would require the least amount of long term revenue funding, maintain the highest possible levels of service etc, it could also be considered the 'Rolls Royce' option. It is therefore not recommended as this option would over emphasise the importance of these assets over other corporate objectives.

### Profile of budget

It is appreciated that a move from the existing funding situation to an investment strategy that requires additional funding will take a short while implement from a funding source and an operational perspective. The profile of how funding is increased can therefore be altered to suit funding availability in the short term, for example by moving the injection of street lighting capital further into future years. The table below is an example of how funding could be implemented if a near flat-line implementation is desirable.

<b>10 Year Profile of Future Steady State Asset Investment</b>										
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
<b>Carriageways</b>	£3,075	£3,075	£3,075	£3,075	£3,075	£3,075	£3,075	£3,075	£3,075	£3,075
<b>Footways</b>	£2,360	£2,360	£2,360	£2,360	£2,360	£2,360	£2,360	£2,360	£2,360	£2,360
<b>Drainage</b>	£60	£60	£60	£60	£60	£60	£60	£60	£60	£60
<b>Street Furniture</b>	£500	£500	£500	£500	£500	£500	£500	£500	£500	£500
<b>Street Lighting</b>	£1,200	£1,200	£1,200	£1,200	£900	£900	£900	£900	£900	£900
<b>Structures</b>	£400	£400	£400	£400	£400	£400	£400	£400	£400	£400
<b>Required Total</b>	<b>£7,595</b>	<b>£7,595</b>	<b>£7,595</b>	<b>£7,595</b>	<b>£7,295</b>	<b>£7,295</b>	<b>£7,295</b>	<b>£7,295</b>	<b>£7,295</b>	<b>£7,295</b>
<b>Current Funding</b>	£2,428	£2,428	£2,428	£2,428	£2,428	£2,428	£2,428	£2,428	£2,428	£2,428

### Inflation pressure

There are annual inflationary pressures that apply to this area of work. Historically the inflation indices that apply to construction have increased at a greater level than RPI. However, RPI alone would mean an inflationary pressure on the steady state level of funding of between £150k and £200k per annum.

### Possible funding sources and shortfalls

Section 10 details the possible funding sources and the remaining amount that would need to be funded from other sources. These are indicative at this stage, and depending on the decision made regarding this strategy, further work will be required on building the funding plan.

## Revenue Implications

There are revenue implications dependent on the agreed way forward with regard to this Investment Strategy. Over recent years there have been significant revenue cuts to the highway budgets reducing the in-house capability and making best use of the external market to deliver work in the most cost effective manner. In addition to this, all possible capital type work has been moved from the revenue spend and capitalised in a manner that reflects proper accounting practice. However, on completion of the 2014/15 savings programme, revenue levels are as low as is possible to maintain a steady state asset condition and maintain sustainable service levels, assuming steady state funding is agreed.

Should the decision to be made to increase capital funding to reduce the backlogs in all asset categories, and as a result create near 'ideal' asset conditions, there would be the opportunity to reduce revenue levels by a small amount i.e. better condition of asset, more planned work would mean less reactive maintenance requirements.

In contrast, should the decision be to opt for a managed decline, then there would be increasing revenue pressures to deal with the increase in reactive and emergency repairs that would be generated. This increase would be exponential over time and ultimately result in a requirement to reduce service standards and/ or to prime pump additional major capital funding in the medium to long term.

## Service Levels

As with the revenue implications, the service levels will vary depending on the investment strategy chosen.

Managed Decline – for service levels to be maintained, gradually increasing revenue would be required as the assets depreciated and fall into a state of decline. E.g. the current number of highway defect gangs (7) would need to increase as the number of defects in the roads increased. This strategy would quickly result in the service levels in each asset area needing to be reduced in order to deal with essential emergency work only, thus not enabling any other work from being done. E.g. If a sign post was to rust through and fall over, the post and sign would be collected, the site made safe, but no replacement would be provided.

Steady state – given steady state capital funding, and a continuation of the current revenue levels, the services would be able to maintain the current service standards. These could be adjusted in minor ways in order to meet council objectives and priorities.

Enhanced state – given additional funding beyond steady state, depending on the profile of the additional investment, would enable service levels to improve and increase over time. In other words, the eventual state would be that each asset was in a near perfect condition meaning resources could be concentrated to allow speedy responses and more planned maintenance work.

## Consequences

This paper will enable a decision to be made regarding the long term strategy for highways and related assets. Each option has been described with respective costs, revenue cost implications, service standards and the effect on the asset condition backlog.

The option selected will determine the future service levels and revenue requirements.

## 2 Background

Traditionally Highway Maintenance budgets have been set annually often based on previous or historic values which create a short term reactive approach to management of the assets. This report will define a long term strategic approach to Highway Maintenance funding based on sound Asset Management principles utilising tools developed by the CSS Wales (County Surveyors Society Wales), joint All Wales & SCOTS HAMP working group. This will provide a long term agreed approach with stability for future service delivery and present a series of available options.

This approach supports Welsh Government strategy of applying asset management principles to long term maintenance spending, and was the basis/ principle behind the LGBI funding allocation.

Another driver for asset management planning and a long term strategic approach is the requirement of CIPFA in 'Whole of Government Accounts' which requires local authorities to report on replacement costs and condition of infrastructure assets from 2015/16.

### 2.1 Overview of the Highway Asset

The table below shows the quantities of the highway asset

Asset Group	Element	Quantity	Data Confidence
Carriageway	Including lay-bys, bus lanes etc.	1,099 km	High
Footway	Adjacent to carriageway	1,400 km	High
Footpath	Remote from c/way Public Rights of Way	200 km	Medium
Cycleway	On c/ways; shared with f/ways; remote from c/ways	103 km	Medium
Structures	Bridge	101 No	Medium
	Unusual Structures e.g. post tensioned viaducts such as Grangetown, Cogan etc	14 No	High
	Footbridge	57 No	Medium
	Culvert > 0.9m < 1.5m	190 No	High
	Retaining Wall	86 No	Low
	Underpass / Subway	65 No	High
	Tunnel	1	High
Street Lighting	Lighting columns	37,457	Medium
	Illuminated Signs and Posts	5,083 No	Medium
	Illuminated Bollards	437	Medium
Traffic Signals	Signalised junctions – <i>under Council control</i>	196	High
	Signalised pedestrian crossings – <i>under Council control</i>	115	High
Safety Fences	Vehicle safety fences	68,000 m	Medium
Non illuminated Signs	Warning, Regulatory and local direction/information signs/posts	23,000 No	Medium
Drainage	Gullies, piped drains, watercourses, roadside ditches, swales, etc.	See section 4	Low
Traffic Calming	Speed humps and cushions	2,600	Medium
Road	All road markings	900 km	Medium



Asset Group	Element	Quantity	Data Confidence
Marking			
Street Furniture	Bollards	22,000 No	Medium
	Pedestrian Guardrail	20,000 m	Medium
	Street Name Plates	8,815 No	Medium
	Bins – <i>under Waste Management control</i>	3,000 No	Low
	Grit bins	600	Medium
	Cattle grids	3	Medium
	Seating	411 No	Low
	Weather Stations	7 No	High
	Bus Shelters – <i>under City Management control</i>	1,419 No	Medium
Verges and Planted Areas	Verges, soft landscaped areas and Street Trees (appx12,000 no.) planted within the adopted highway – <i>under Parks Services control</i>	Not included in investment strategy	
Highway Trees		Not included in investment strategy	

## 2.2 Asset Valuation

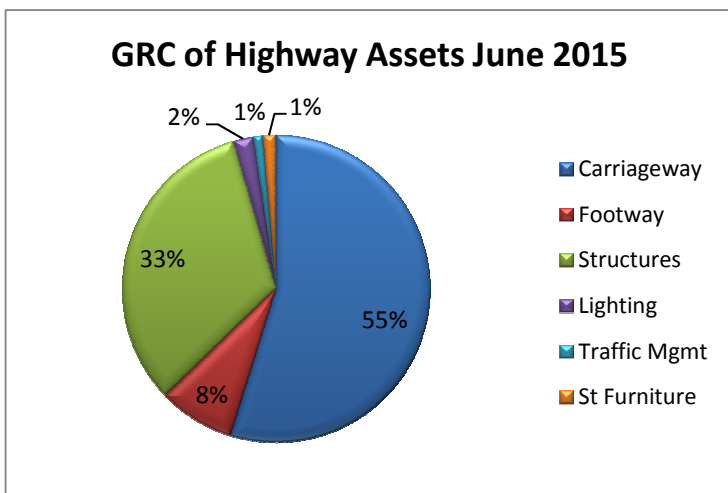
The valuation provides the council with an initial replacement cost of the highway asset which is estimated at approx. £2.4bn. The calculation is undertaken annually for use in the Whole of Government Accounts return, and has been achieved by utilising specialist tools generated by the All Wales County Surveyors Society Wales HAMP project and undertaken in accordance with the methods set out in the CIPFA Transport Asset Infrastructure Code. The table below shows the:

- Gross Replacement Cost (GRC) which is an estimated value of replacing the existing asset with a new equivalent, and
- Depreciated replacement Cost (DRC) which is the estimated value of cost of physical deterioration of the asset.

Gross Replacement Cost of Highway Assets – June 2015		
Asset Group	GRC £'000	DRC £'000
Carriageway <sup>1</sup>	£1,322,143	£142,626
Footways & Cycle Tracks	£192,758	£58,006
Structures (including tunnel)	£791,876	£64,268
Lighting	£50,850	£28,692
Traffic Management	£24,275	£5,974
Street furniture	£32,350	£16,680
<b>Total<sup>2</sup></b>	<b>£2,414,252</b>	<b>£316,246</b>

<sup>1</sup> - Carriageway GRC includes consideration for highway drainage

<sup>2</sup> - Total excludes land valuation



### 2.3 Current Investment in the Highway Asset

The table below shows the capital and revenue investment for the highway asset groups. It includes the Welsh Government Local Government Borrowing Initiative (LGBI) grant funding for the period 2012-15.

Note: These values are for asset replacements and do not include one off new builds

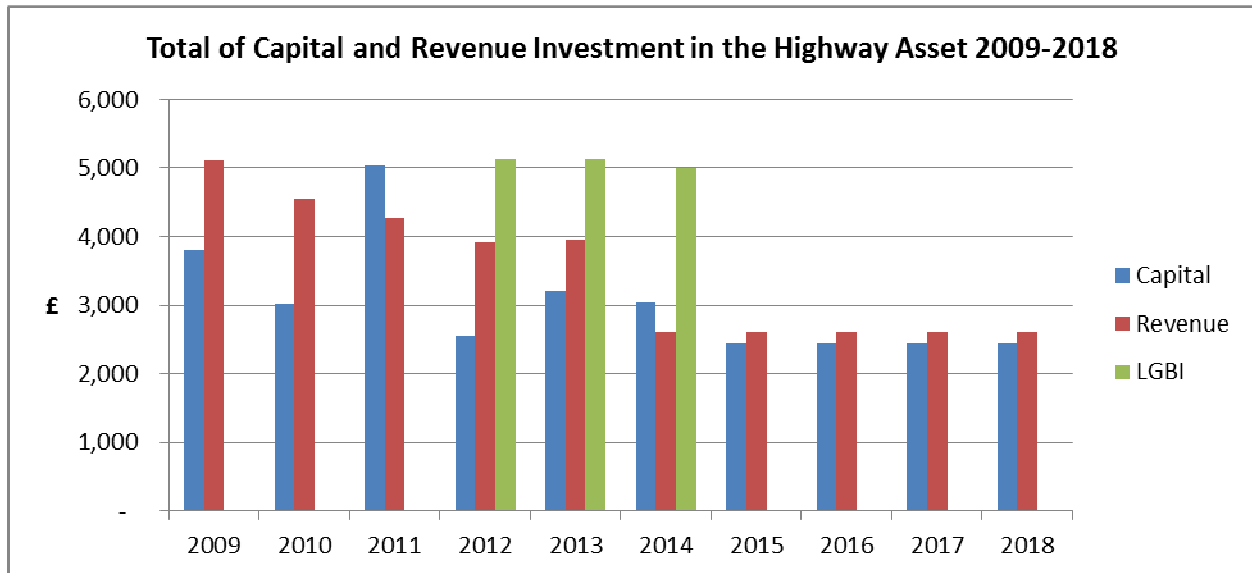
**\*\* THIS TABLE REQUIRES UPDATE – AWAITING FINANCIAL DATA \*\***

Asset	2009/2010		2010/2011		2011/2012		2012/2013			2013/2014			2014/2015			2015/2016 onwards	
	Revenue	Capital	Revenue	Capital	Revenue	Capital	Revenue	Capital	LGBI	Revenue	Capital	LGBI	Revenue	Capital	LGBI	Revenue	Capital
Carriageway	1,098	1,954	908	797	1,141	3,301	970	1,118	3,714	796	930	3,056	423	1,295	4,230*	423	850
Footway	1,140	938	1,118	850	832	562	643	937		1,053	403	107	592	487	881*	592	470
Lighting	1,293	674	814	1,059	818	619	789	419		707		13	759	700*	2,687*	759	270
Structures	140	242	152	313	228	557	241	74		210	80		208	2,091*		208	500
Drainage	359		313		294		196			140		22	125		272*	125	
Safety Fence	107		97		71		48			55		26	15		172*	15	
Signs	148		153		83		78			67	30		49			49	
Lines	102		141		88		60			76			60			60	
Street Furniture	42		83		116		93			108			28			28	
Cycleways	10		24		24		13			24			10			10	
Traffic Signals	397		446		395		374			376			376			376	
PROW	40		40		47		12			31			40			40	
Total Revenue	<b>4,876</b>		<b>4,289</b>		<b>4,137</b>		<b>3,517</b>			<b>3,643</b>			<b>2,685</b>			<b>2,685</b>	
Total Capital	<b>3,808</b>		<b>3,019</b>		<b>5,039</b>		<b>2,548</b>			<b>1,443</b>			<b>4,573</b>			<b>2,090</b>	
Total Capital Including LGBI	<b>3,808</b>		<b>3,019</b>		<b>5,039</b>		<b>6,262</b>			<b>4,667</b>			<b>12,815</b>			<b>2,090</b>	

Note – For 2014/15\* denotes slippage from previous year

The chart below shows the total investment since 2009. 2015-2018 are indicative budgets and subject to further savings cuts. It can be seen that there has been a steady reduction of revenue investment with 2015/16 being approximately 50% less than the 2009/10 level.

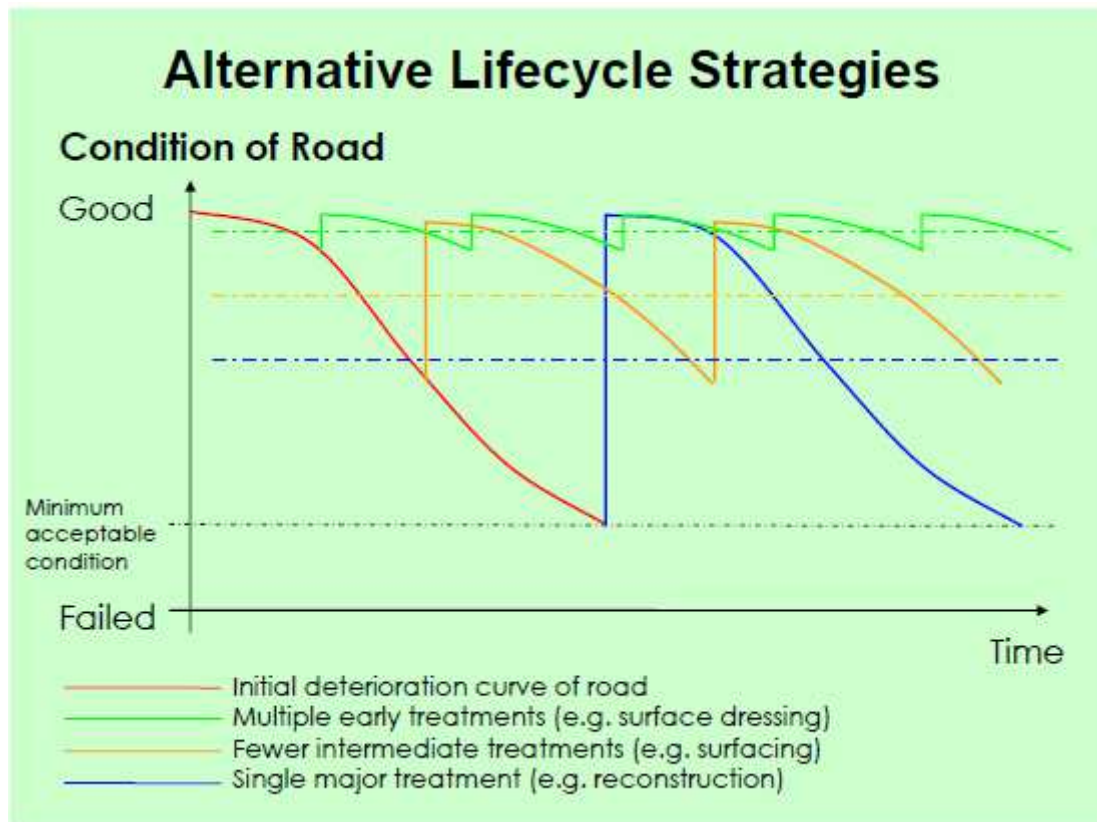
**\*\* THIS TABLE REQUIRES UPDATE – AWAITING FINANCIAL DATA \*\***



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### 3. Carriageway Capital Investment Strategy

The diagram below illustrates the lifecycle of carriageway deterioration and when during this deterioration different maintenance interventions (Treatments) should be used.



#### 3.1 Overview of the Carriageway Asset

The table below shows Cardiff's carriageway network lengths

Road Classification	Urban (km) i.e. <40mph	Rural (km) i.e. >40mph	Total (km)
A	52.2	33.8	86
B	20.3	5.2	25.5
C	75.6	36.4	112
U	865	10.9	875.9
Sub Total	1013.1	86.3	<b>1099.4</b>

### 3.2 Asset Condition

The tables below list the statutory performance indicators that the Council report relating to the carriageway asset. They reflect the quantity of A, B and C class roads that are measured in red condition (i.e. in need of maintenance) by the UK accredited SCANNER machine survey.

<b>THS011a</b> Percentage of principal (A) roads that are in overall poor condition (red)	
<b>Result Period</b>	<b>Result</b>
2010/2011	9.2%
2011/2012	6.9%
2012/2013	7.0%
2013/2014	4.0%
2014/2015	4.3%
2015/2016	3.7%

<b>THS011b</b> Percentage of principal/classified (B) roads that are in overall poor condition (red)	
<b>Result Period</b>	<b>Result</b>
2010/2011	15.0%
2011/2012	9.6%
2012/2013	8.4%
2013/2014	8.2%
2014/2015	7.4%
2015/2016	6.5%

<b>THS011c</b> Percentage of principal/classified (C) roads that are in overall poor condition (red)	
<b>Result Period</b>	<b>Result</b>
2010/2011	10.1%
2011/2012	11.4%
2012/2013	12.8%
2013/2014	10.1%
2014/2015	9.3%
2015/2016	6.6%

<b>THS012</b> Percentage of principal (A) roads and non-principal/classified (B & C) roads that are in overall poor condition (red)	
<b>Result Period</b>	<b>Result</b>
2010/2011	n/a
2011/2012	9.12%
2012/2013	9.43%
2013/2014	6.9%
2014/2015	6.8%
2015/2016	5.2%

Note: Due to the topography of Cardiff's U class network the SCANNER machine survey results are not deemed representative of actual condition and not used for any scheme decision making. Based upon Annual Engineering inspection survey of the carriageway network **U Class condition in red is estimated at 12%**

The pictures below show the general on site condition of the carriageway relating to the condition classification of red, amber and green discussed previously.



Photos illustrating a range of **red** condition roads (includes need for resurfacing (a) & reconstruction (b & c))



Photo's illustrating a range of **amber1 and amber2** condition roads (includes need for surface dressing (a) and Micro Asphalt (b))



Photos illustrating a range of **green** condition roads that require no treatment

### 3.3 Current Asset Investment

Based on current anticipated capital carriageway surfacing investment levels (i.e. £850k pa) an approximation of carriageway maintenance frequencies has been calculated, it should be noted that depending on carriageway hierarchy its anticipated lifespan would be between 20 and 40 years:

Road Class	Approx. Length (km)	Approx. Width (m)	Treatment Cost (£/m.sq)	Max Expected Service Life (years)	Network Maintenance Frequency <sup>b</sup>
A	86km	9m	£25m <sup>2</sup>	20	91yrs <sup>b</sup>
B	25km	7m	£25m <sup>2</sup>	25	101yrs <sup>b</sup>
C	112km	7m	£20m <sup>2</sup>	30	101yrs <sup>b</sup>
U	865km	6m	£18m <sup>2</sup>	40	220yrs <sup>b</sup>

Notes:

b – The Maintenance Frequency is based on anticipated annual investment of **£850k potentially split between each category of road class** as shown below:

A class = 25% of budget = £212.5k

B & C class = 25% of budget = £212.5k

U class = 50% of budget = £425k

Note: Treatment costs were based on lower cost surfacing options and depending on split of allocation these frequencies will alter.

e.g for A class Frequency:

Area = 86,000m x 9m = 774,000m<sup>2</sup>

Annual treatment area = £212,500 / £25m<sup>2</sup> = 6,800m<sup>2</sup> p.a

Therefore 774,000m<sup>2</sup> / 6,800m<sup>2</sup> = 91 i.e. the entire network treated over a 91 year period

### 3.4 Asset Investment Options

The investment options (graphs) illustrated below have been developed utilising the CSS HAMP project tools. This is an all Wales project managed via the County Surveyors Society (CSS) Wales and supported by Welsh Government.

Three investment options have assessed using the CSSW carriageway deterioration prediction tool and the predicted condition profile reported graphically in the graphs below. In simple terms these options involved varying investment levels in a combination of preventative treatments (such as micro asphalt and surface dressing) and corrective treatments (such as resurfacing, overlays and inlays).

In order to help compare the various investment options, a SWOT analysis has been provided for each.

The carriageway asset is predicted to deteriorate with current funding levels as illustrated below, consequently the objective of the option is to adequately maintain the carriageway network at a consistent level over a 20yr period; the SWOT analysis will identify the internal and external factors that are favourable and unfavourable to achieve this objective.

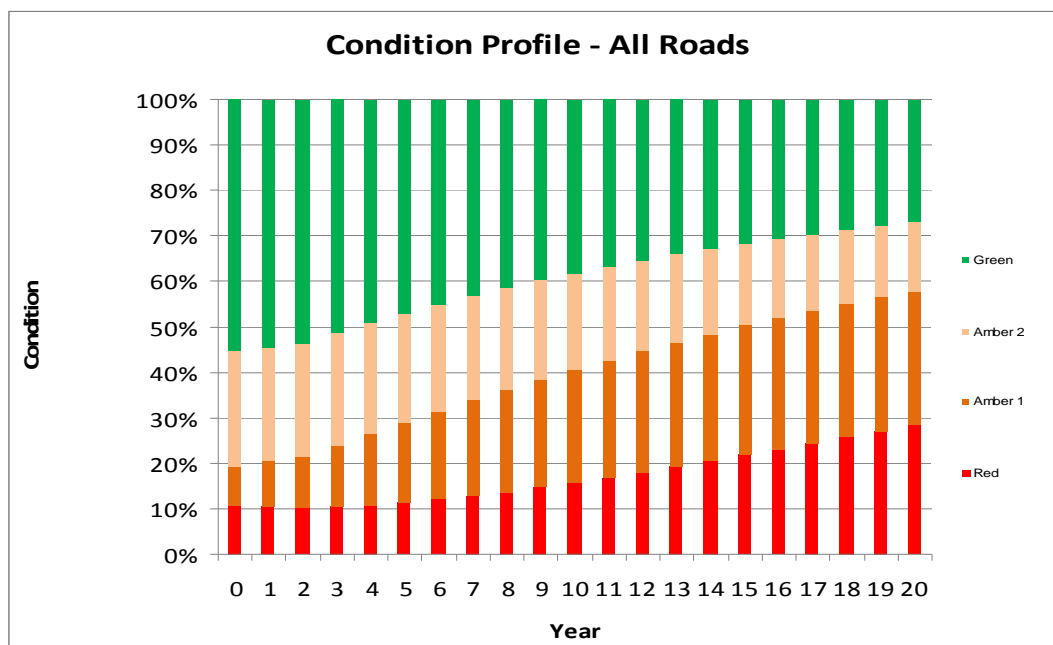


### 3.4.1 Capital Investment Option 1: *Managed Decline* based on a continuation of historic investment levels

The table below illustrates the funding profile over the LGBI investment period (2012-15) then reverting to anticipated historical capital funding levels up to year 20.

	2011/12	2012/13	2013/14	2014/15	2015 to 32
LGBI funding	n/a	£3,714m	£3,056m	£4,230m	n/a
Council funding	£3,301m	£1,118m	£930k	£1,295m	£850k

Based on the funding profile illustrated above the graph below shows a continued deterioration of carriageway condition over time. This will result in the percentage of carriageway in need of maintenance (red + amber condition) increasing from the current 45% (11% red & 34% amber) to 74% (29% red and 45% amber) in 20 years.



Therefore the backlog of maintenance on roads in a red condition will rise from £13.6m to £38m in year 20. The table below illustrated this backlog affecting the network over a 20yr period (at today's values)

Road Class	Red Condition Year 1	Backlog £	Red Condition Year 10	Backlog £	Red Condition Year 20	Backlog £
A	4%	£800k	11.68%	£2m	33.11%	£6.5m
B	8.2%	£350k	8.63%	£400k	15.5%	£700k
C	10.1%	£1.5m	11.81%	£2m	25.05%	£4m
U	12%	£11m	17.25%	£16m	28.84%*	£27m

\*- 28.84% of U class network equates to 243km of road in very poor condition

<b>SWOT Analysis</b>	
<b>Option:</b> Adopt a <i>Managed Decline</i> based on continuation of historic funding levels	
<b>Objective:</b> Adequately maintain the carriageway network at a consistent level over a 20yr period	
<b>Strengths</b>	<b>Weaknesses</b>
1. Reduced short term capital cost compared to other higher cost investment strategies	1. Condition deteriorates 2. Reduced safety by increasing reactive repairs 3. Higher long term maintenance costs 4. Road closures 5. Does not support an asset management approach
<b>Opportunities</b>	<b>Threats</b>
1. Short term Council savings made through reallocation of funding	1. Unable to satisfy WG LGBI borrowing requirements (i.e. maintaining cw for 20yr period) on WG asset investment enhancements. 2. Increasing 3 <sup>rd</sup> party claims / serious injury 3. Increasing customer dissatisfaction 4. Could hinder the Councils social and economic agendas

### 3.4.2 Capital Investment Option 2: *Steady State* Investment Level

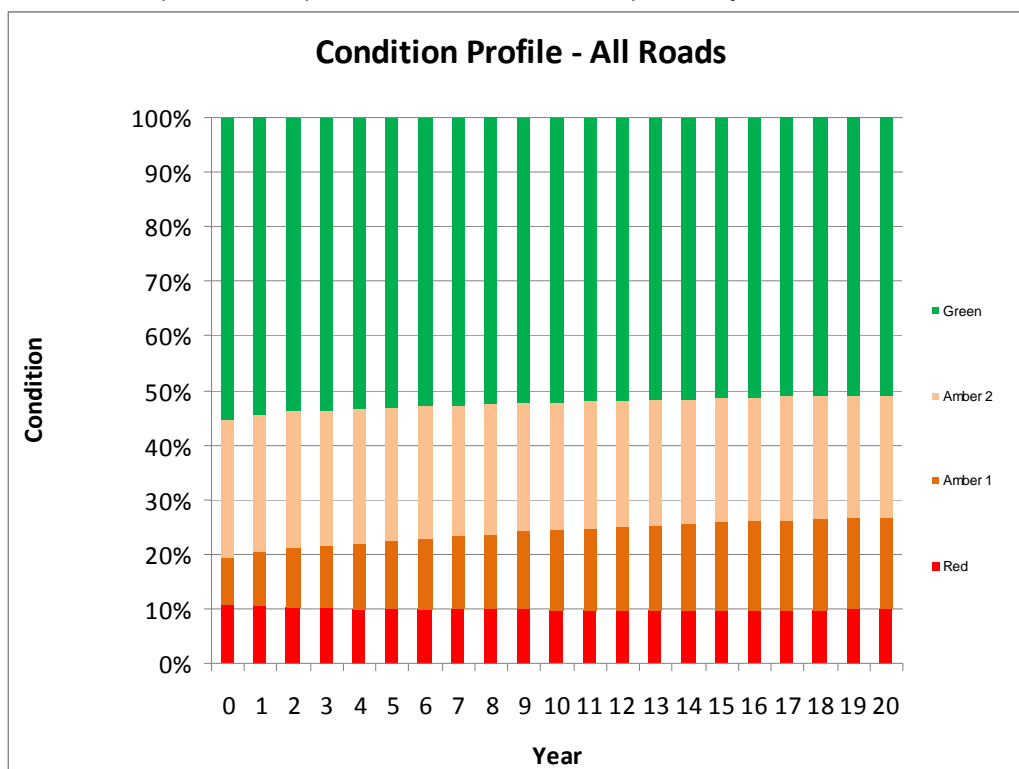
The table below show the proposed condition targets for the carriageway network. These percentages are calculated based on expected service lives.

Road Class	Target (% of network in red condition)	Acceptable tolerance
A	5%	+/- 1%
B	8%	+/- 1%
C	8%	+/- 1%
U	11%	+/- 2%

The table below illustrates the funding profile over the LGBI investment period (2012-15) with an increased level of Council Capital Funding to achieve steady state up to year 20.

	2011/12	2012/13	2013/14	2014/15	2015 to 32
LGBI funding	n/a	£3,714m	£3,056m	£4,230m	n/a
Council funding	£3,301m	£1,118m	£930k	£1,295m	£3,075m

Based on the funding profile illustrated above the graph below shows a very low level of deterioration over time resulting in the percentage of carriageway in need of maintenance (red + amber condition) increasing from the current 45% (11% red & 34% amber) to 49% (10% red & 39% amber) in 20 years.



Therefore the backlog of maintenance on roads in a red condition will reduce slightly from £13.6m to £13m in year 20. The table below illustrates this backlog affecting the network over a 20yr period.

Road Class	Red Condition Year 1	Backlog £	Red Condition Year 10	Backlog £	Red Condition Year 20	Backlog £
A	4%	£800k	3.43%	£665k	4.18%	£810k
B	8.2%	£350k	7.58%	£332k	8.11%	£350k
C	10.1%	£1.5m	5.69%	£890k	8.05%	£1.3m
U	12%	£11m	11.41%	£11m	11.04%	£10.5m

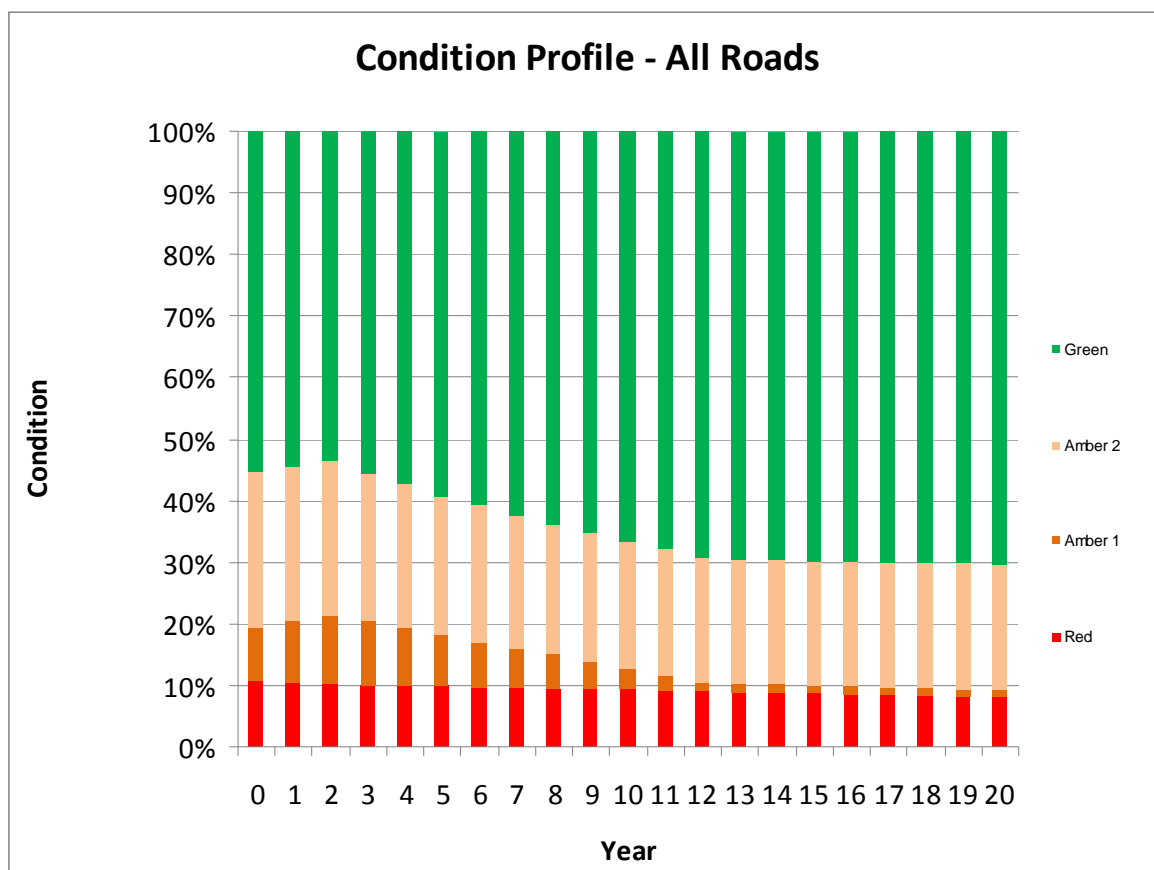
<b>SWOT Analysis</b>	
<b>Option:</b> <b>Steady State</b> Investment Levels	
<b>Objective:</b> Adequately maintain the carriageway network at a consistent level over a 20yr period	
<b>Strengths</b>	<b>Weaknesses</b>
<ol style="list-style-type: none"> <li>1. Prevent increase in backlog and reduce revenue costs</li> <li>2. Halt ongoing deterioration</li> <li>3. Improve safety by reducing reactive repairs</li> <li>4. Reduce 3rd party claims</li> <li>5. Improve customer satisfaction</li> <li>6. Supports an asset management approach</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased cost on existing capital investment levels</li> <li>2. No ongoing improvement of condition</li> </ol>
<b>Opportunities</b>	<b>Threats</b>
<ol style="list-style-type: none"> <li>1. Satisfy WG LGBI borrowing requirements (i.e. maintaining cw for 20yr period)</li> <li>2. Employment opportunities to satisfy increased investment</li> <li>3. Improves social and economic agendas of the council</li> </ol>	<ol style="list-style-type: none"> <li>1. Budgets increasing in highways when overall decrease in Council funding</li> </ol>

### 3.4.3 Capital Investment Option 3: *Enhanced / Ideal State* Investment Level

The table below illustrates the funding profile over the LGBI investment period (2012-15) with an increased level of Council Capital Funding to achieve an improvement in overall condition up to year 20.

	2011/12	2012/13	2013/14	2014/15	2015 to 32
<b>LGBI funding</b>	n/a	£3,714m	£3,056m	£4,230m	n/a
<b>Council funding</b>	£3,301m	£1,118m	£930k	£1,295m	£5,175m

Based on the funding profile illustrated above the graph below shows improved condition over time resulting in the percentage of carriageway in need of maintenance (red + amber condition) increasing from the current 45% (11% red & 34% amber) to 30% (8% red & 22% amber) in 20 years.



Therefore the backlog of maintenance on roads in a red condition will reduce from £13.6m to £10.4m n year 20. The table below illustrates this backlog affecting the network over a 20yr period.

Road Class	Red Condition Year 1	Backlog £	Red Condition Year 10	Backlog £	Red Condition Year 20	Backlog £
A	4%	£800k	3.43%	£660k	2.73%	£520k
B	8.2%	£350k	7.58%	£330k	6.79%	£300k
C	10.1%	£1.5m	6.26%	£980k	5.57%	£870k
U	12%	£11m	10.67%	£10m	9.36%	£8.7m

### SWOT Analysis

**Option: Enhanced / Ideal State Investment Level**

**Objective:** Adequately maintain the carriageway network at a consistent level over a 20yr period

#### Strengths

1. Prevent increase in backlog and reduce revenue costs
2. Ongoing Improvement of condition
3. Halt deterioration
4. Improve safety by reducing reactive repairs
5. Reduce 3rd party claims
6. Improve customer satisfaction
7. Supports an asset management approach

#### Weaknesses

1. Increased cost on existing capital investment

#### Opportunities

1. Satisfy WG LGBI borrowing requirements (i.e. maintaining cw for 20yr period)
2. Employment opportunities to satisfy increasing investment over time
3. Improves social and economic agendas of the council

#### Threats

1. Budgets increasing in highways when overall decrease in Council funding

## 4. Drainage Capital Investment Strategy

### 4.1 Overview of the Drainage Asset Base

The risks of flooding have grown over recent years due to changing weather patterns and more localised high intensity rainfall events. Flooding can have a significant impact on our lives, property, and businesses with more and more serious incidents being recorded across the UK each year. Flooding can come from various sources; rivers, streams, the sea and more commonly in Cardiff from blocked drains or old sewers that cannot cope with the volumes of water from heavy rainfall.

The Flood and Water Management Act (FWMA) that was introduced in 2010, places a duty on Cardiff Council to act as the Lead Local Flood Authority (LLFA) and prepare a Local Flood Risk Management Strategy (LFRMS). This strategy sets out how the Council will seek to manage flood risk in the area and prepare our communities. The Council's legal responsibilities are to develop, maintain, apply and monitor a programme for local flood risk management.

The highway drainage inventory in common with many other local authorities consists of highway gullies, highway drains, kerb & channel drainage, culverted watercourses, associated trash screens, manholes and catch pit chambers.

Whilst inventory information in relation to the adopted highway gullies (carriageway & footway) is relatively good as historically their locations are plotted onto a GIS layer, there are still a significant amount of gully locations that are still to be recorded following the construction of new developments. In addition, there is an absence of information relating to the other assets within the highway drainage system (e.g. connecting pipework). There has been no common methodology in place for capturing changes to the existing network or incorporating newly constructed drainage systems and thus the confidence level of the information held is variable. There are also a number of ownership queries that need to be resolved in many instances.

The key Inventory assets are identified below:

Asset	Total	Confidence
Highway Gullies	50,000+	Med / Low
Highway Drains / Sewers	Total length unknown	Low
Kerb & Channel Drainage	25,000m	Medium
Culverted Watercourses	Total length unknown	Low
Trash Screens	80+	Medium
Manholes & Catchpit Chambers	Unknown	Low
Petrol Interceptors	10+	Low
Soakaways	10+	Low

## 4.2 Asset Condition

The condition of the visible, regularly inspected sections of the drainage network (e.g. highway gullies, channel drainage, trash screens) is generally known and they are in reasonable working order. However, the condition of the remainder of the network, which is largely underground, is less well known. During heavy rainfall periods, increased localised flooding is one of the key management issues. This is currently managed reactively in order to protect properties from flooding and ensure safety to road users.

## 4.3 Current Asset Investment Principles

Routine and reactive maintenance activities for existing drainage assets are currently carried out for; Gully cleansing, Culverts & trash screen cleaning and other reactive repairs reported or found e.g. cleansing of pipes, manholes or ditches.

The following performance gaps have been identified and will need to be addressed as part of the Highway Asset Investment Strategy:

- The current level of inventory and condition data held is believed to be insufficient to manage the asset to the required level.
- There are a number of ownership issues still to be resolved regarding the drainage asset base.
- Major and minor works undertaken by internal service areas are not routinely recorded and used to update inventory & condition data.

### Historical Investment in the Drainage asset

	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
<b>Revenue</b>	359k	313k	294k	196k	140k	125k
<b>Capital</b>	0	0	0	0	0	0
<b>LGBI</b>	0	0	0	0	22	272k
<b>Total</b>	<b>359k</b>	<b>313k</b>	<b>294k</b>	<b>196k</b>	<b>162k</b>	<b>397k</b>

### Future Investment in the Drainage asset

	2015/16	2016/17	2017/18
<b>Revenue</b>	125K	TBA	TBA
<b>Capital</b>	0	0	0
<b>Total</b>	<b>125K</b>	<b>TBA</b>	<b>TBA</b>

**\*\* THIS TABLE REQUIRES UPDATE – AWAITING FINANCIAL DATA \*\***



## **Backlog**

The Local Flood Risk Management Strategy has identified a list of “key” localised flooding work programmes for future delivery to alleviate localised flooding across the City together with improvements to the drainage assets. The estimated costs associated with the delivery of the “key” work programmes is projected to be in the region of £400k. On completion of the 2014/15 capital schemes to address some of these, it is anticipated that there will be a remaining backlog of approximately £160k.

In addition to this, new problems of drainage capacity and flooding arise on a regular basis as the current infrastructure ages. It is estimated that an additional £60k of problem areas is added to the list each year.

### **4.4 Asset Investment Options**

#### **1. Current Investment - Managed Decline**

Continuing with the current situation where there is no investment into the drainage asset over and above the basic reactive and routine maintenance will mean the existing small backlog will increase from £160k to approximately £800k within ten years. In addition to this, there will be a greater call on reactive maintenance resulting in an increase in resources needed. This is likely to add a revenue pressure of £600k per annum by year 10. (based on an additional 3 gully machines with operatives).

#### **2. Steady State (Ideal state) Investment Level**

There is a very small backlog for the drainage asset, and the steady state investment level would also be the ideal state. This would comprise of a year 1 and 2 investment of £160k followed by a year 3 onward investment of £60k per annum to deal with new drainage problems where upgrades and additional capacity is needed. The implication of this is a steady state cost of the revenue routine and reactive maintenance functions.

## 5. Footway Capital Investment Strategy

### 5.1 Overview of the footway asset

The table below shows Cardiff's footway network area and length.

<b>Material</b>	<b>Total Quantity</b>
Bituminous	2,037,000m <sup>2</sup>
Concrete Slabs	516,000m <sup>2</sup>
Stone	87,000m <sup>2</sup>
Concrete	69,000m <sup>2</sup>
Concrete Blocks	206,000m <sup>2</sup>
<b>Total Area</b>	<b>2,915,000m<sup>2</sup></b>
<b>Total Length</b>	<b>1,400km</b>

The footways asset will deteriorate with current funding. Additional funding of footways resurfacing works will assist to meet a need to

- Improve condition/reduce deterioration
- Improve safety by reducing reactive repairs
- Reduce 3rd party claims
- Improve customer satisfaction – the improvements above may contribute to improved customer satisfaction

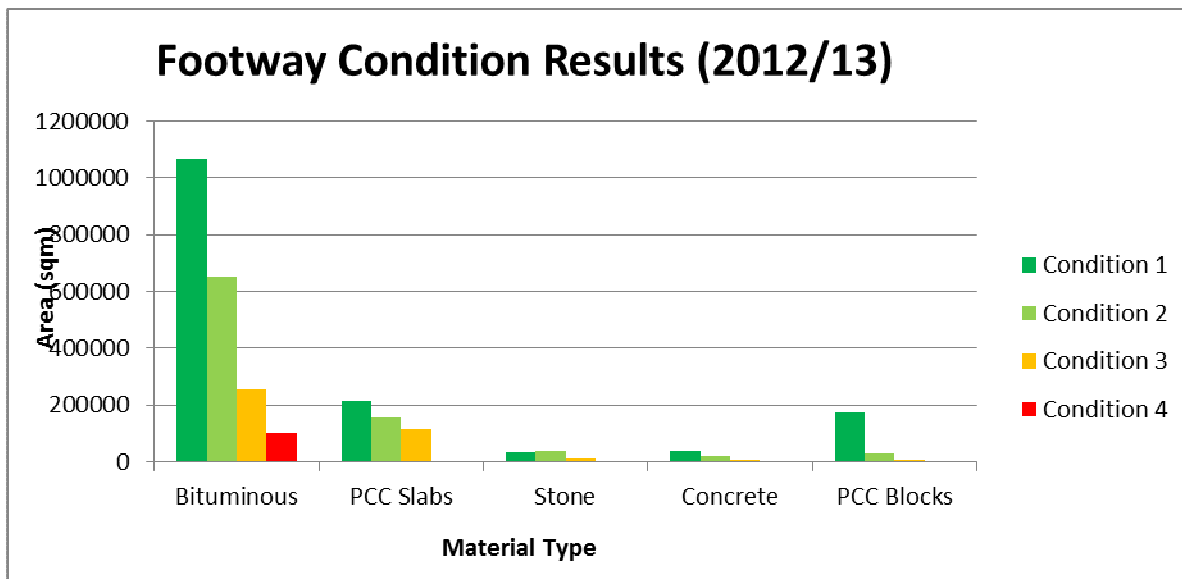
<b>Areas of Footway Condition</b>					
<b>Year</b>	<b>Total Area (sqm)</b>	<b>Condition 1</b>	<b>Condition 2</b>	<b>Condition 3</b>	<b>Condition 4</b>
<b>Bituminous</b>	2063461	1065688	650623	254304	101242
<b>PCC Slabs</b>	487260	213671	155807	114216	4697
<b>Stone</b>	89347	34587	39502	13338	2327
<b>Concrete</b>	69726	40948	22486	5108	1526
<b>PCC Blocks</b>	214278	175040	31230	6897	816

Note: condition rating explained in photos below

The Council will continue to target those areas of slabbed footway that are subject to vehicular cross over that are a burden on revenue repairs and pose higher third party claim possibilities. However, this approach will accompany ongoing reconstruction schemes and supplemented by the use of preventative treatments.

### 5.2 Asset Condition

The condition of the footway asset has been obtained from the footway network survey undertaken in 2013. The results in the graph below are from this survey.



The pictures below show the general on site condition of the footway relating to the condition classification of 1, 2, 3 and 4 as shown above.

a.



b.



Photos showing condition 1 footway – As new

a.



b.

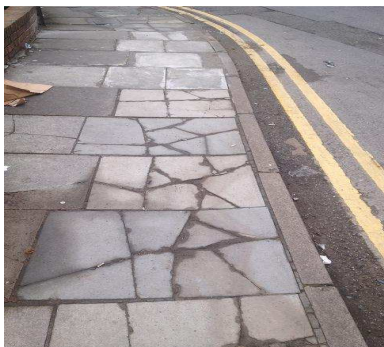


Photos showing condition 2 footway – Aesthetically Impaired

a.



b.



Photos showing condition 3 footway – Functionally Impaired

a.



b.



Photos showing condition 4 footway – Structurally unsound

Current Footway Condition					
Footway Class	Length (km)	% in Condition 1	% in Condition 2	% in Condition 3	% in Condition 4
All Footways Combined	1285km	52.48%	30.71%	13.39%	3.76%
Prestige Walking Zones (1a)	4.5km	75.00%	22.50%	2.00%	0.50%
Primary Walking Routes (1)	15km	64.59%	30.35%	5.13%	0.00%
Secondary Walking Routes (2)	47km	51.45%	36.18%	3.88%	7.74%
Link Footways (3)	347km	48.23%	40.05%	8.88%	2.96%
Local Access Footways (4)	871km	53.65%	26.52%	16.38%	3.97%

### 5.3 Current Asset Investment

Based on anticipated capital investment levels (i.e. £470k pa) an approximation of footway maintenance frequencies has been calculated. It should be noted that depending on the footway material its anticipated lifespan would be between 20 and 40 years (max):

Footway Class	Approx. Length (km)	Approx. Width (m)	Treatment Cost (£/m.sq)	Network Maintenance Frequency <sup>b</sup>
1A	4.5km	4.5m	£70m <sup>2</sup>	60yrs <sup>b</sup>
1	15km	4.5m	£50m <sup>2</sup>	72yrs <sup>b</sup>
2	47km	2.9m	£50m <sup>2</sup>	356yrs <sup>b</sup>
3	347km	2.3m	£40m <sup>2</sup>	356yrs <sup>b</sup>
4	871km	2.2m	£40m <sup>2</sup>	356yrs <sup>b</sup>

Notes:

b – The Maintenance Frequency is based on anticipated annual investment of **£470k split between each category of footway** as shown below:

Class 1A = 5% of budget = £23.5k

Class 1 = 10% of budget = £47k

Class 2,3, & 4 = 85% of budget = £399.5k

Note: Treatment costs were based on lower cost surfacing options and depending on split of allocation these frequencies will alter.

e.g for 1 class Frequency:

Area = 15,000m x 4.5m = 67,500m<sup>2</sup>

Annual treatment area = £47,000 / £50m<sup>2</sup> = 940m<sup>2</sup> p.a

Therefore 67,500m<sup>2</sup> / 940m<sup>2</sup> = 72 i.e. the entire network treated over a 72 year period

### 5.4 Asset Investment Options

The table below show the condition targets for the footway network.

Footway Class	Current % of condition 3 & 4 (considered poor)	Target (% of network in category 3 & 4 condition)	Acceptable tolerance
Prestige Walking Zones (1a)	2.5%	2%	+/- 0.5%
Primary Walking Routes (1)	5.1%	2%	+/- 0.5%
Secondary Walking Routes (2)	11.6%	10%	+/- 1%
Link Footways (3)	11.8%	15%	+/- 2%
Local Access Footways (4)	20.3%	15%	+/- 2%

The investment options (graphs) illustrated below have been developed utilising the CSS HAMP project tools. This is an all Wales project managed via the County Surveyors Society (CSS) Wales and supported by Welsh Government.

In order to help compare the various investment options, a SWOT analysis has been provided for each.

**1.4.1 Capital Investment Option 1: *Managed Decline* based on a continuation of historic investment levels**

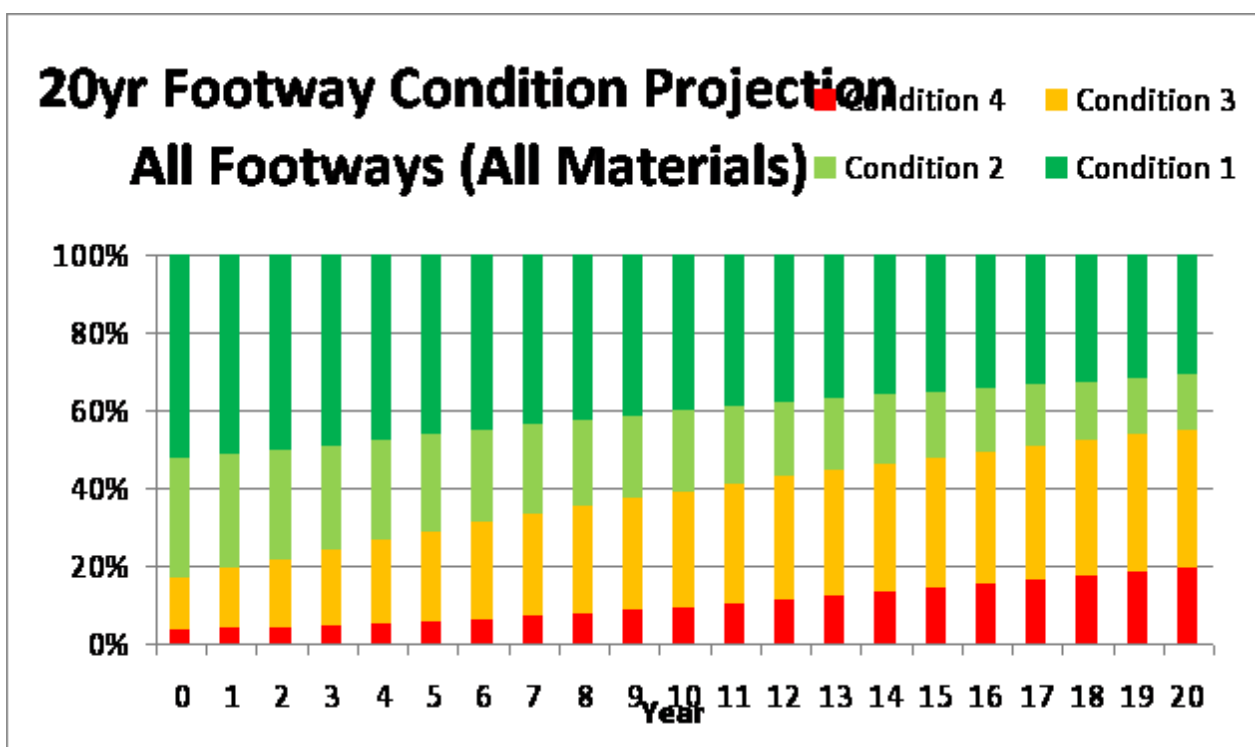
The table below illustrates the funding profile over the LGBI investment period (2012-15) then reverting to anticipated historical capital funding levels up to year 20.

	2011/12	2012/13	2013/14	2014/15	2015 to 32
<b>LGBI funding</b>	n/a	£0	£107k	£881k	n/a
<b>Council Funding</b>	£562k	£937k	£403k	£487k	£470

Based on the funding profile illustrated above the graph below shows a continued deterioration of footway condition over time. This results in the percentage of footway in need of maintenance (condition 3 + 4) increasing from the current 18% (3.76% condition 4 & 13.39% condition 3) to 55% (19.6% condition 4 & 35.55% condition 3) in 20 years.

Therefore the backlog of maintenance on footways in condition 4 will increase from £4.5m to £23m in year 20. The table below illustrates this backlog affecting the network over a 20yr period

Footway Class	Condition 4 in Year 1	Backlog £	Condition 4 in Year 10	Backlog £	Condition 4 in Year 20	Backlog £
1A	0.5%	£5k	0.5%	£5k	0.5%	£5k
1	0	£0	4.1%	£140k	13.11%	£450k
2	7.74%	£540k	10.16%	£705k	16.77%	£1.1m
3	2.96%	£950k	8.32%	£2.6m	18.69%	£6m
4	3.97%	£3m	10.26%	£7.8m	20.62%	£15.8



<b>SWOT Analysis</b>	
<b>Option: <span style="color: red;">Managed Decline</span> based on continuation of historic funding levels</b>	
<b>Objective:</b> Adequately maintain the footway network at a consistent level over a 20yr period	
<b>Strengths</b>	<b>Weaknesses</b>
1. Reduced short term capital cost compared to other higher cost investment strategies	1. Condition deteriorates 2. Reduced safety by increasing reactive repairs 3. Higher long term maintenance costs 4. Road closures 5. Does not support an asset management approach
<b>Opportunities</b>	<b>Threats</b>
1. Short term Council savings made through reallocation of funding	1. Unable to satisfy WG LGBI borrowing requirements (i.e. maintaining fw for 20yr period) on WG asset investment enhancements. 2. Increasing 3 <sup>rd</sup> party claims / serious injury 3. Increasing customer dissatisfaction 4. Could hinder the Councils social and economic agendas

### 1.4.2 Capital Investment Option 2: **Steady State** Investment Level

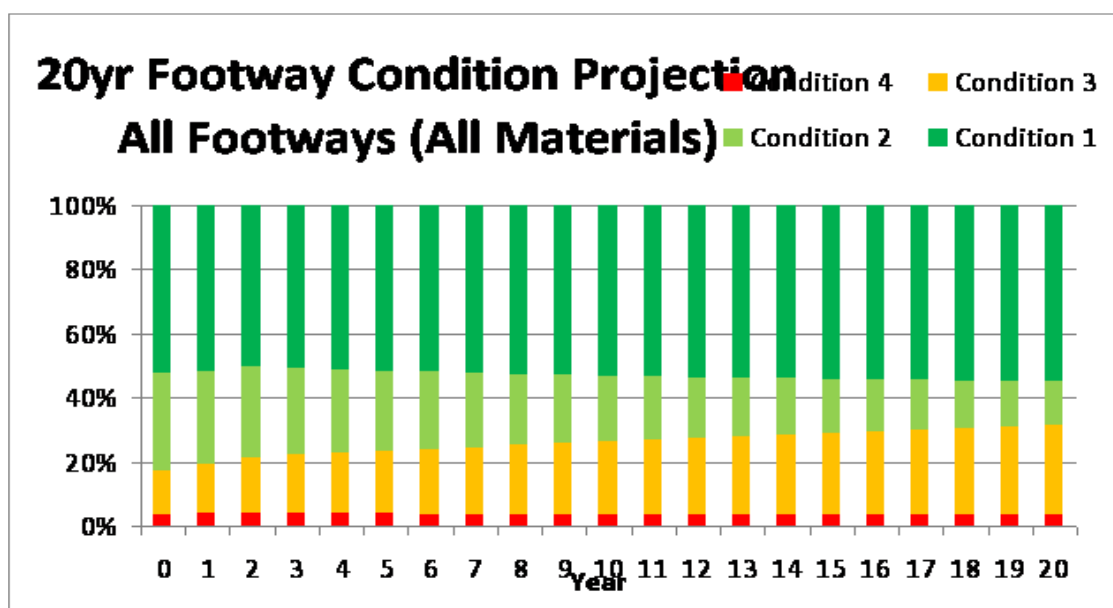
The table below illustrates the funding profile over the LGBI investment period (2012-15) with an increased level of Council Capital Funding to achieve steady state up to year 20.

	2011/12	2012/13	2013/14	2014/15	2015 to 32
<b>LGBI funding</b>	n/a	£0	£107k	£881k	n/a
<b>Council Funding</b>	£562k	£937k	£403k	£487k	£2.36m

Based on the funding profile illustrated above the graph below shows little or no deterioration over time resulting in the percentage of footway in need of maintenance (red + amber condition) remaining constant over the 20 year period. That is, the current condition of 18% (3.76% condition 4 & 13.39% condition 3) remains generally consistent for the 20 year period

Therefore the backlog of maintenance on footways in condition 4 will generally remain in the region of £4.5m for the entire 20 year period. The table below illustrates this backlog affecting the network over a 20yr period

Footway Class	Condition 4 in Year 1	Backlog £	Condition 4 in Year 10	Backlog £	Condition 4 in Year 20	Backlog £
<b>1A</b>	0.5%	£5k	0.5%	£5k	0.5%	£5k
<b>1</b>	0%	£0	0.11%	£4k	0.11%	£4k
<b>2</b>	7.74%	£540k	7.77%	£540k	8.39%	£580k
<b>3</b>	2.96%	£950k	2.64%	£850k	4.31%	£1.4m
<b>4</b>	3.97%	£3m	3.77%	£2.9m	3.12%	£2.4m





<b>SWOT Analysis</b>	
<b>Option:</b> Steady State Investment Levels	
<b>Objective:</b> Adequately maintain the footway network at a consistent level over a 20yr period	
<b>Strengths</b>	<b>Weaknesses</b>
<ol style="list-style-type: none"> <li>1. Prevent increase in backlog and reduce revenue costs</li> <li>2. Halt ongoing deterioration</li> <li>3. Improve safety by reducing reactive repairs</li> <li>4. Reduce 3rd party claims</li> <li>5. Improve customer satisfaction</li> <li>6. Supports an asset management approach</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased cost on existing capital investment levels</li> <li>2. No ongoing improvement of condition</li> </ol>
<b>Opportunities</b>	<b>Threats</b>
<ol style="list-style-type: none"> <li>1. Satisfy WG LGBI borrowing requirements (i.e. maintaining fw for 20yr period)</li> <li>2. Employment opportunities to satisfy increased investment</li> <li>3. Improves social and economic agendas of the council</li> </ol>	<ol style="list-style-type: none"> <li>1. Budgets increasing in highways when overall decrease in Council funding</li> </ol>

### 5.4.3 Capital Investment Option 3: Enhanced / Ideal State Investment Level

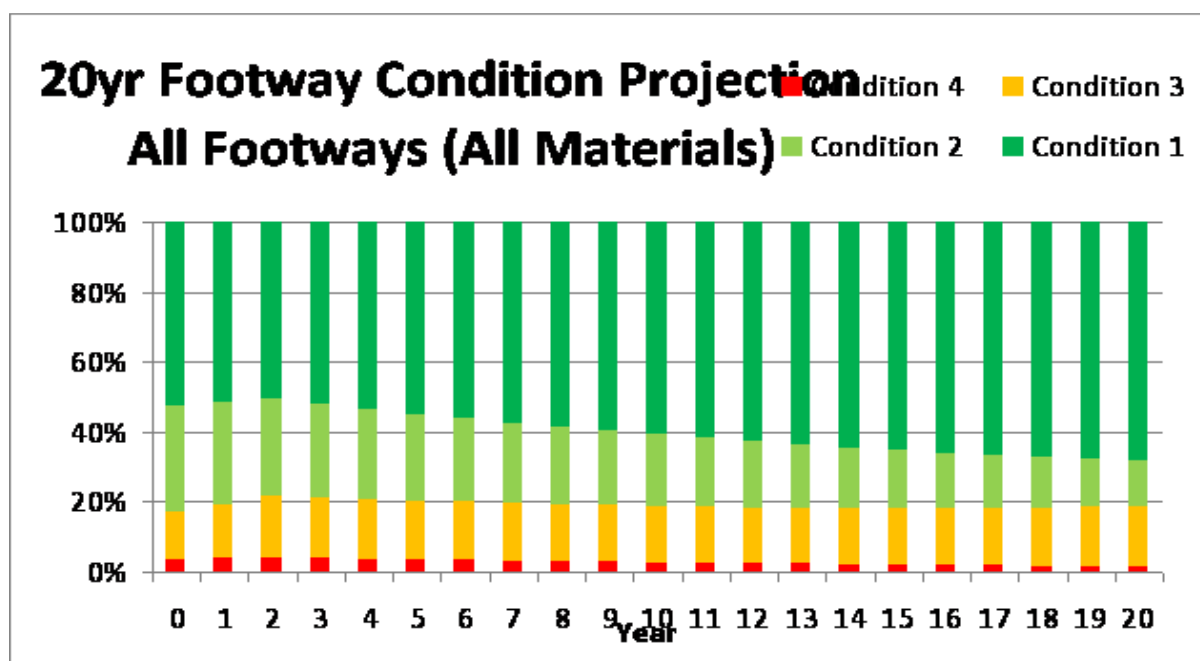
The table below illustrates the funding profile over the LGBI investment period (2012-15) with an increased level of Council Capital Funding to achieve an improvement in overall condition up to year 20.

	2011/12	2012/13	2013/14	2014/15	2015 to 32
<b>LGBI funding</b>	n/a	£0	£107k	£881k	n/a
<b>Council Funding</b>	£562k	£937k	£403k	£487k	£3.81m

Based on the funding profile illustrated above the graph below shows an improvement in overall condition over time resulting in the percentage of footway in condition 4 decreasing from the current 3.76% to 1.47% in 20 years.

Therefore the backlog of maintenance on footways in condition 4 will reduce from £4.5m to £1.7m over the 20 year period. The table below illustrates this backlog affecting the network over a 20yr period

Footway Class	Condition 4 in Year 1	Backlog £	Condition 4 in Year 10	Backlog £	Condition 4 in Year 20	Backlog £
1A	0.5%	£5k	0.5%	£5k	0.5%	£5k
1	0%	£0	0.11%	£4k	0.11%	£4k
2	7.74%	£540k	2.39%	£165k	0.06%	£4k
3	2.96%	£950k	1.98%	£630k	0.64%	£205k
4	3.97%	£3m	3.21%	£2.5m	1.99%	£1.5m



<b>SWOT Analysis</b>	
<b>Option: Enhanced / Ideal State Investment Level</b>	
<b>Objective:</b> Adequately maintain the footway network at a consistent level over a 20yr period	
<b>Strengths</b>	<b>Weaknesses</b>
<ol style="list-style-type: none"> <li>1. Prevent increase in backlog and reduce revenue costs</li> <li>2. Ongoing Improvement of condition</li> <li>3. Halt deterioration</li> <li>4. Improve safety by reducing reactive repairs</li> <li>5. Reduce 3rd party claims</li> <li>6. Improve customer satisfaction</li> <li>7. Supports an asset management approach</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased cost on existing capital investment</li> </ol>
<b>Opportunities</b>	<b>Threats</b>
<ol style="list-style-type: none"> <li>1. Satisfy WG LGBI borrowing requirements (i.e. maintaining fw for 20yr period)</li> <li>2. Employment opportunities to satisfy increasing investment over time</li> <li>3. Improves social and economic agendas of the council</li> </ol>	<ol style="list-style-type: none"> <li>1. Budgets increasing in highways when overall decrease in Council funding</li> </ol>

## 6 Street Furniture Capital Investment Strategy

### 6.1 Overview of the Street Furniture Asset

The table below shows the approximate quantities of Cardiff's street furniture asset including average expected service lives and average replacement costs. It should be noted that the lifespan and cost data has been based on unit rates developed by the CSS Wales HAMP group for Whole of Government Accounts purposes.

Street Furniture Asset Item	Approximate Quantity	Average Expected Service Life	Average Unit Replacement Cost	Anticipated Annual Replacement Cost <sup>a</sup>
<b>Bollards</b>	22,000 No	15	£200ea	£290k
<b>Vehicle Safety Barrier</b>	68,000m	50	£100/m	£140k
<b>Traffic Signs (illuminated &amp; non-illuminated)</b>	28,000 No	45	£400ea	£250k
<b>Pedestrian Guardrail</b>	20,000m	50	£50/m	£20k
<b>Street Name Plates</b>	8,815 No	25	£200ea	£70k
<b>Grit bins</b>	600 No	20	£120ea	£4k
<b>Cattle grids</b>	3 No	25	£5000ea	£1k
<b>Seating</b>	411 No	25	£600ea	£10k
<b>Weather Stations</b>	7 No	25	£15,000ea	£4k
<b>Total</b>				<b>£789k</b>
a - The anticipated annual replacement cost is based upon the asset quantity divided by the expected service life multiplied by the unit cost				

### 6.2 Current Asset Investment

There is no current capital investment in the street furniture asset group with the exception of vehicle safety barriers that were treated within the LGFI bid. The asset groups are maintained through reactive revenue maintenance responding to damage or customer complaint. The possible future strategy due to funding levels will be make safe and/or remove dangerous street furniture with the possibility of no replacement.

### 6.3 Steady State / Ideal Investment Level

Whilst the steady state investment level of £785k as calculated in the table above is based on a sound logical engineering approach it is felt that this level of investment is too high at this point in time. It is proposed that a phased investment approach is adopted as follows:

Year 1 - **£125k** including asset condition review (This will consider street furniture rationalisation and aim to reduce the inventory in order to reduce the steady state investment level by £250k to a total value of £500k)

Year 2 - **£250k**

Year 3 - **£500k**

## 7 Street Lighting Capital Investment Strategy

### 7.1 Overview of the Street Lighting Asset

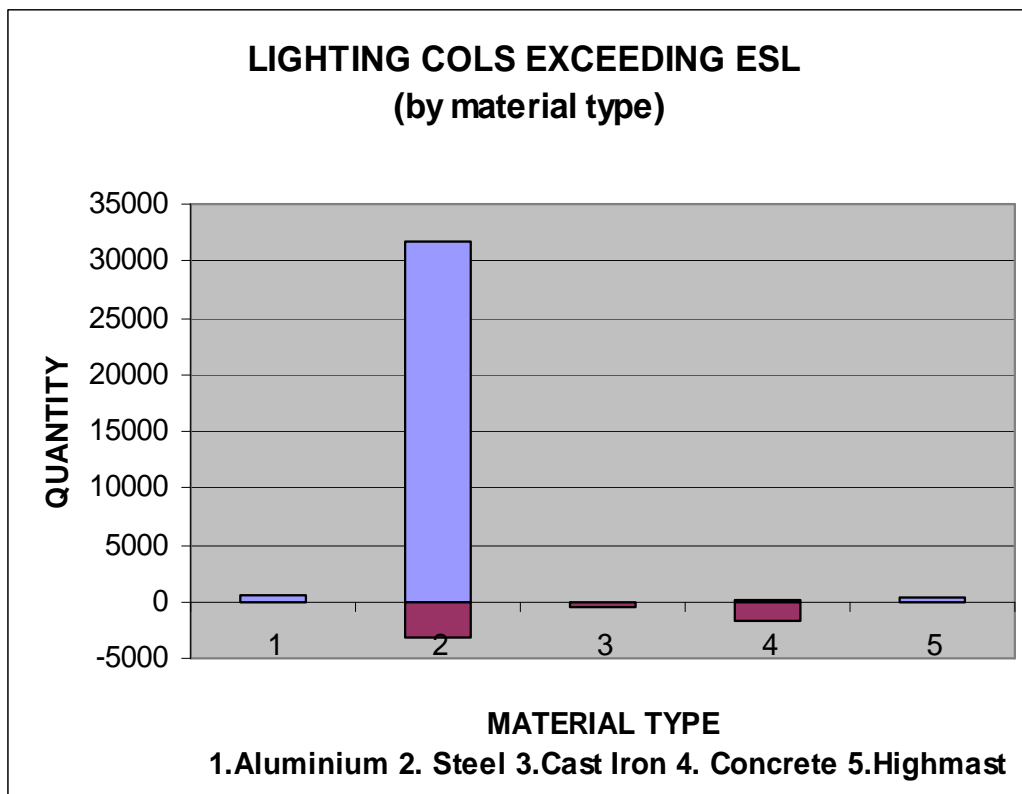
The authority's street lighting asset comprises:

- 37457 street lighting columns
  - 39763 Luminaires (lanterns)
- Current Street Lighting asset comprises 37,457 lighting columns. This figure is likely to grow at a rate of 0.79% per annum based on the period 2007 to 2013. However, this may increase further with development related to the LDP.
  - A recent achieved priority for lighting column replacement was the removal of remaining concrete columns, (approximately 1400.no) all of which were located on the main highway network. These remaining concrete lighting columns were replaced by April 2015.
  - Less efficient sodium lighting has been replaced with energy efficient LED units coupled with a dimming regime on 22,000 residential lighting columns achieving significant energy savings.
  - A proposed project of approx. 13,000 LED replacements is programmed to commence in 2016/17 on the strategic network resulting in further energy savings

### 7.2 Asset Condition

Aged steel columns have the most columns exceeding their expected service lives which are shown in the graph below. A programme of replacing concrete columns has been in place for the last 15 years and the last remaining concrete columns were addressed through Tranche 2&3 of LGBI funding in conjunction with Council Capital funding for asset renewal by April 2015.

**\*\* THIS GRAPH REQUIRES UPDATE – AWAITING DATA \*\***

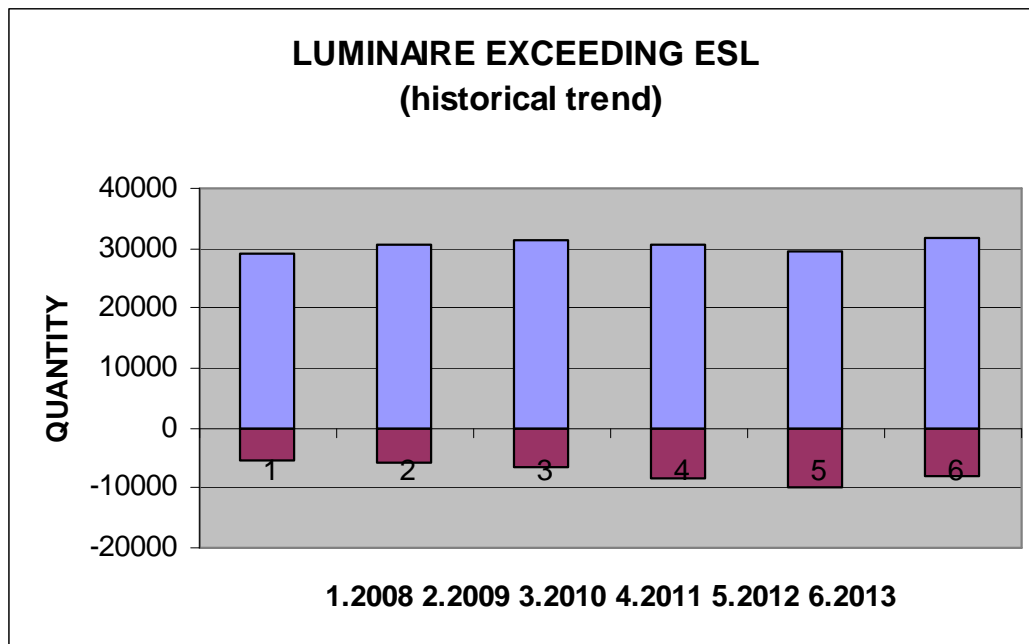


The graphs above and below show the quantity of asset exceeding service life. i.e. the red bar below zero represents the quantity of age expired components

Luminaires and other equipment also have a finite life and can require replacement either as a result of reaching the end of their service life or as a result of becoming obsolete / in need of replacement with more modern equipment.

Using a fixed expected service life of 20 years for all luminaires the number exceeding their ESL can be illustrated as per below. Approximately 20% of the stock of luminaires exceeds an average service life of 20 years. This figure has been increasing year on year for the last 6 years.

**\*\* THIS GRAPH REQUIRES UPDATE – AWAITING DATA \*\***



### 7.3 Current Asset Investment

The strategy for future investment is based on the following:

1. Structural Condition: The replacement of columns that are structurally unsound or approaching that condition.
2. Lanterns/Equipment Age and Obsolescence: Replacement of equipment that is either reaching its end of service life or there is merit in replacing it. Older, less efficient lanterns to be replaced in conjunction with the lighting column renewal programme.
3. Energy Efficiency: Replacement of existing or installation of new equipment in initiatives designed to deliver improved energy efficiency and / or energy use reduction.
4. Routine and Reactive Maintenance Standard: potential changes to the standards applied to reactive and routine repairs.

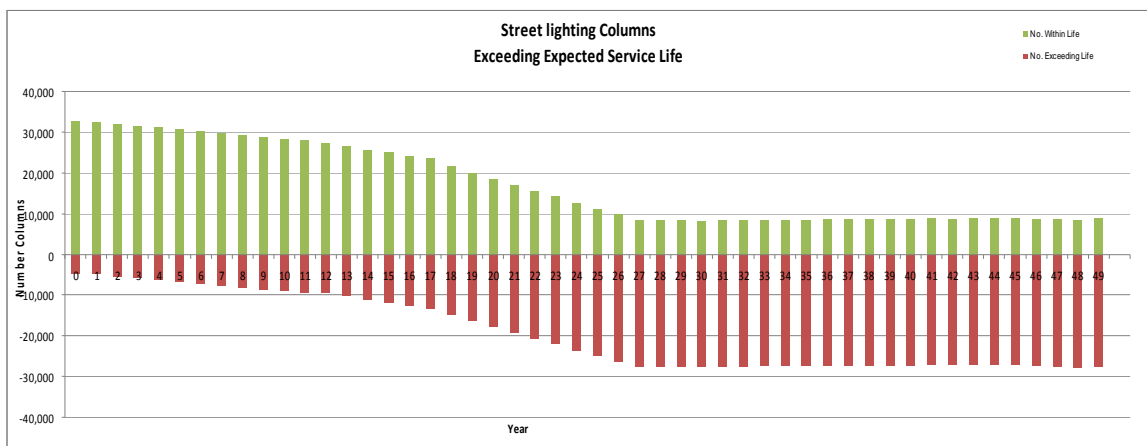
- 5. Inspection and Testing: Independent structural testing of lighting columns to be carried out on annual basis.

### 7.4 Asset Investment Options

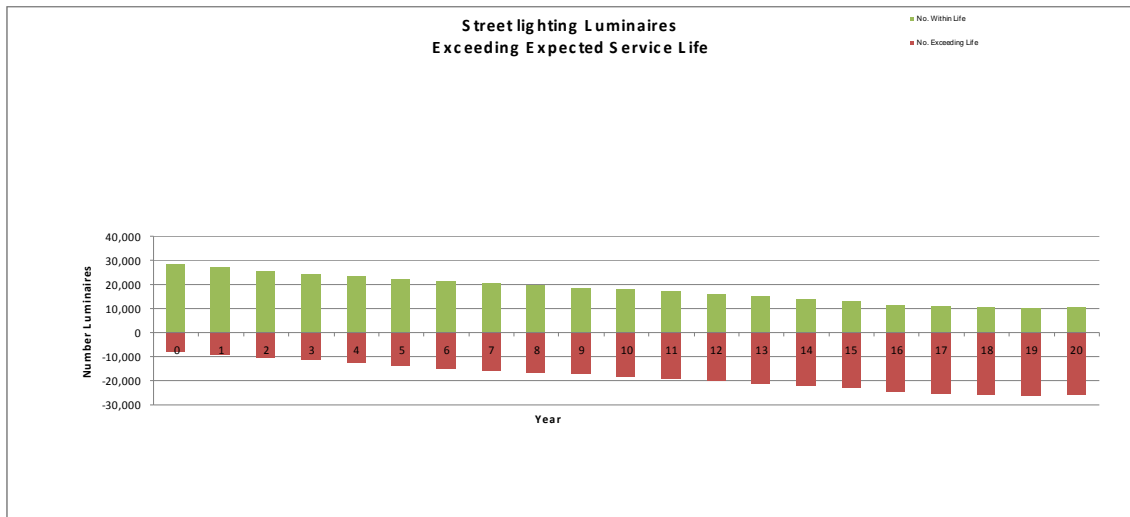
The investment options (graphs) illustrated below have been developed utilising the CSS HAMP project tools. This is an all Wales project, managed via the County Surveyors Society (CSS) Wales and supported by Welsh Government.

#### 7.4.1 Option 1 - Continuation of Historic Investment Levels – Lighting Columns and Luminaires (lanterns).

The graph below shows the predicted condition of street lighting columns (expressed as numbers within / exceeding expected service life) under a continuance of current funding levels at **£300k per annum**, this budget includes the replacement of lanterns. The current backlog of column replacement is **approximately £6m**



The graph below represents those street lighting lanterns which are presently within their expected design life (highlighted in green) and those which have exceeded their expected design life (highlighted in red). It is estimated that approaching 20% of lanterns exceed their expected service life and that this amounts to a financial backlog situation in the region of £1.6m as shown by the graph below:

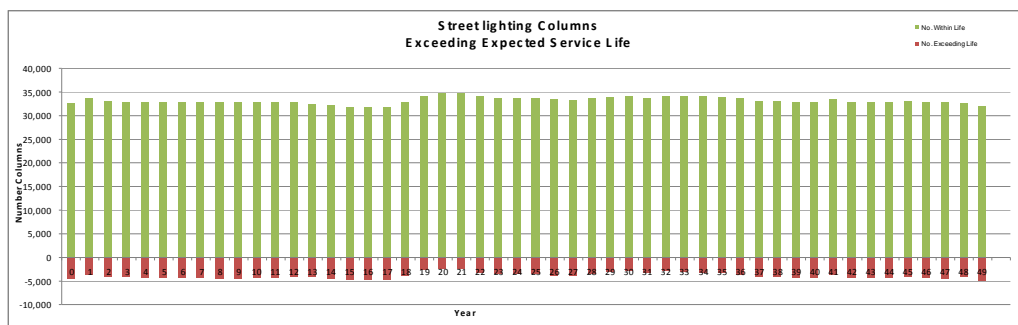


It is estimated that by year 10, the proportion of luminaires exceeding their service life will increase to 51% representing backlog value of £4.6m  
 By year 20 approximately 71% of the luminaire stock will have exceeded their service life resulting in a financial backlog of £7m.

**7.4.2 Option 2 – Enhanced / Steady State Investment Level – Lighting Columns**

Maintaining the lighting columns at the current age profile (“steady state” condition), with an average of 10% (this is a local estimate) of the stock “life expired” will therefore require an annual investment of approx. £700,000 (this follows a two year LGBI investment of £1.7m p.a)

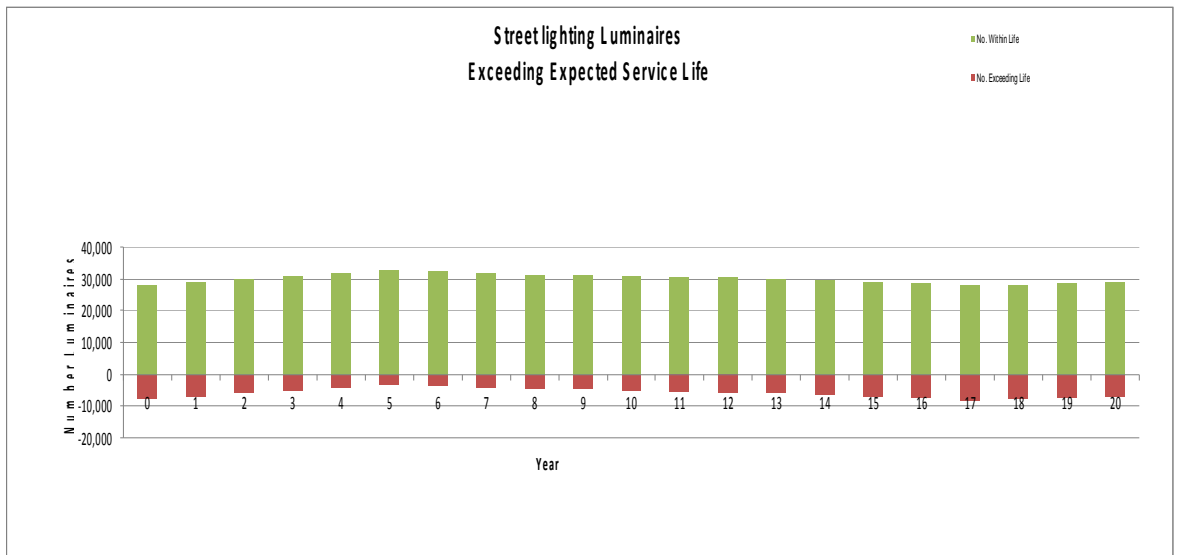
This level of investment indicates that lighting column age profile would remain relatively stable until year 16. To maintain such steady state conditions beyond year 16, annual investment ranging between £1m and £4m would be necessary up to year 28 as shown in the graph below:



**7.4.3 Option 2 – Enhanced / Steady State Investment Level – Luminaires**

Maintaining the luminaire stock at the current age profile (“steady state” condition), with an average of 10% (this is a local estimate) of the stock “life expired”, will require a level of funding in the region of £500k pa up to year 6. In order to maintain steady state conditions beyond year 6 and up to year 20, an annual investment of £200k would be required as shown below:





## 8 Structures & Bridges Capital Investment Strategy

**\*\* THIS SECTION REQUIRES UPDATE – AWAITING DATA \*\***

### 8.1 Overview of the Structures & Bridges Asset

The design life of Highway structures is notionally 120 years. Structures assets generally deteriorate slowly, however maintaining their overall condition is dependant on undertaking maintenance on elements of the structures that have a lesser design life. These elements vary dependant on the type of structure but include, such elements as: bearings, waterproofing, surfacing, expansion joints and painting of steel parapets and steel beams. The impact of a specific level of investment cannot be fully understood by solely looking at the predicted impact over the next couple of years. Methods of predicting deterioration of structures and structural elements have not yet been developed by the CSS working group; however this report includes some initial assessment of long term funding needs by identifying the current maintenance backlog. The details provided in this report are based on information collated for the “Annual Status and Options Report – Nov.2013” Updated to August 2014.

The authority’s Highway Structures asset are shown in the table below

Highway Structures Inventory by Highway Class					
Structure Type	Total no.	No. Structures Located by Road Classification			No. of Listed Structures
		A	B+C	U	
Road Bridges	101	40	60	1	-
Footbridges	57	7	-	50	-
Unusual Structures*	14	11	2	1	4
Retaining Walls	86	19	48	19	-
Sign and Signal Gantries	7	7	-	-	-
Culverts	190	21	143	23	-
Subways	65	21	2	42	-
Tunnel	1	1	-	-	-

\* - Unusual Structures include: Post Tensioned Viaducts such as Grangetown, Cogan, Taff and Southern Way Viaducts and Listed structures.

It should be noted that the Highway Authority also has some financial liability for the load carrying capacity of other bridge owners on the network. This currently includes 36 Network Rail underbridges.

## 8.2 Asset Condition

The condition of structures is determined by inspection in accordance with the Code of Practice for the “Management of Highway Structures”.

Bridge Stock Indicator	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13
BCI <sub>ave</sub>	90.3	86.9	85.7	86.2	86.2	86.1
BCI <sub>crit</sub>	93.1	90.3	86.2	88.2	88.0	88.0

BCI<sub>ave</sub> : The BCI average is the numerical value of a bridge stock evaluated as an average of the BCI values weighted by the deck area of each bridge.

BCI<sub>crit</sub> : The BCI critical is the numerical value of the critical condition index for the bridge stock evaluated using the BCI<sub>crit</sub> values for each bridge.

N.B. – A Principal Inspection programme commenced in 2012/13; this will provide an improved and more robust indication of the condition of the bridge stock.

## 8.3 Current Structural Condition

Highway Structure BCI <sub>crit</sub> 2012/3 by Sub-Group										
Bridge Sub-Group	Very Poor (0-39)		Poor (40-64)		Fair (65-79)		Good (80-89)		Very Good (90-100)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Road Bridges	2	2.0	20	19.8	15	14.9	25	24.8	39	24.5
Footbridges	3	5.3	10	17.5	17	29.8	7	12.3	20	21.5
Unusual Structures	1	7.1	2	14.3	1	7.0	7	50.0	3	21.4
Retaining Walls	13	15.1	14	16.3	18	20.9	15	17.4	26	20.3
Gantries	1	14.3	3	42.9	-	-	1	14.3	2	28.6
Culverts	-	-	11	5.8	5	2.6	10	5.3	164	2.8
Subways	1	1.5	6	9.2	8	12.3	17	26.2	33	50.8
Tunnel	-	-	-	-	-	-	-	-	1	100
Total	21	4.1	66	12.0	64	12	82	15	288	56.2

It should be noted that the condition of elements that contribute to the BCI<sub>crit</sub> value are not necessarily critical to the strength of the structure. For a number of the structures the elements in poor/very poor condition relate to joint sealants and painting. This work is usually addressed in a Routine Maintenance Programme or bridge specific painting contracts.

It should also be noted that as the results of Principal Inspections are progressively included it is probable that BCI values will reduce. This is due to the inspection of elements of the structure being examined that are currently not accessible in the General Inspection Programme.

Examples of Bridge components in very poor condition are shown below:-

**Mechanical Bearing.**



(Corrosion causing deformation of sliding surfaces, restrict movement)

**Elastomeric Bearing**



(Failure of elastomeric layers, loss of movement ability)

**Structural Steelwork.**



(Corrosion, loss of section and reduction in strength)

**Asphaltic Plug Expansion Joint.**



(loss of material and cracking, water ingress to structure and bearings below)

### **Mechanical Expansion Joint.**



(Split in rubber seal, water ingress and corrosion of expansion joint)

## **8.4 Current Asset Investment Principles**

Currently Bridge Maintenance is funded by a nominal revenue budget supplemented by ad-hoc bids for Capital funding.

## **8.5 Historical Investment in Structures £,000**

Historical Investment in Structures is shown in the table below:

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	Anticipated 2015-16
Capital	£242k	£313k	£557k	£74k	£80k	£2.091m**	£500k
Revenue	£140k	£152k	£228k	£241k	£210k	£208k	£208k
Totals							

Note: \*\* - includes slippage from previous year

The table above includes total spend on structures and their critical elements

## 8.6 Asset Investment Options

Using the HAMP CSSW Structures Cost Projection spreadsheet the following overall needs have been identified:

### Maintenance Backlog.

The table below is abstracted from the output of the CSS Structures HAMP spreadsheet.

<b>STRENGTHENING NEEDS / WORK BACKLOG</b>		
<b>Road Bridges</b>	Structure Strengthening Works	£1,344,000
	Parapet Upgrade Works	£201,600
	Scour Protection Works	£88,700
<b>Footbridges</b>	Structure Strengthening Works	£281,200
	Parapet Upgrade Works	£22,000
	Support Upgrade Works	£0
	Scour Protection Works	£0
<b>Unusual Structures</b>	Structure Strengthening Works	£987,000
	Parapet Upgrade Works	£180,000
	Scour Protection Works	£20,000
<b>Retaining Walls</b>	Parapet Upgrade Works	£52,750
	Scour Protection Works	£0
<b>Height, Sign and Signal Gantries</b>	n/a	
<b>Culverts</b>	Structure Strengthening Works	£62,550
	Parapet Upgrade Works	£2,500
	Scour Protection Works	£2,500
<b>Subways</b>	Structure Strengthening Works	£69,700
	Parapet Upgrade Works	£31,550
	Total ***	£3,345,850

### Important Note

\*\*\* The value of the backlog is currently underestimated, the figures are currently based on the findings of General Inspections, the section has currently completed two years of a six year programme of Principal Inspections which will better inform the backlog value. In the 6months between the Annual Status and Options report and this report the value has increased from £3,025,250 to £3,345,850.

If this increase is representative of the findings of Principal Inspections for the remaining structures it is likely that the Backlog could increase to circa £5,500,000.

## 8.7 Investment Options

### Managed Deterioration

Current levels of investment will lead to continued deterioration of the structures asset. The methodology for modelling this deterioration is not yet developed and it is noted that due to the design life of structures being 120 years Deterioration is normally slow and difficult to measure in the short term.

However it should be understood that failure to maintain elements of a structure has an impact on the actual service life of a structure beyond just the life of that element. Ultimately the consequence of under investment is the reduce load carrying capacity of the structure, leading to weight restrictions, costly strengthening works or even premature bridge reconstruction.

### Steady State / Ideal

As structures are identified for replacement individual capital bids will be made for them in the future.

The funding requirement for achieving steady state as calculated by the CSS tool is **£400k**. This includes replacement of critical elements such as bearings, expansion joints, parapets as well as the painting of steel beams to maintain their strength and durability. However, it must be noted that replacement of bearings, waterproofing, drainage and silane on the Council's special structures (e.g. viaducts) will be subject to separate dedicated capital bids as required due to the high cost and long maintenance intervals (between 15-25 years) on these types of structures.



## 9. Highway Revenue Investment Impacts

### 9.1 Revenue Pressures

It is an important consideration that if capital investment remains static and therefore below steady state investment required the associated asset condition will also deteriorate. As this level of deterioration increases so will the associated level of revenue maintenance i.e. there will be an increased demand on financial, staff and materials resources to repair reactive defects.

The table below provides an illustration on how the demand on revenue budgets in **year 10**, (i.e. extent of carriageway in red and amber condition where repair may be required) is affected by the preceding year's capital investment. Only the carriageway asset is illustrated (excluding RPI) for simplicity of calculation, however, values should be expected to increase significantly if all highway assets are considered.

**\*\* THIS TABLE REQUIRES UPDATE – AWAITING FINANCIAL DATA \*\***

Asset Group	Year 1 Revenue Investment	Investment Strategy					
		Decline		Steady State		Enhanced	
		Capital Investment (£,000)	Estimated Year 10 Revenue Requirement (£,000)	Capital Investment (£,000)	Year 10 Revenue Requirement (£,000)	Capital Investment (£,000)	Estimated Year 10 Revenue Requirement (£,000)
Carriageways	£ tbc	£850	£ tbc	£3,075	£ tbc	£5175	£ tbc

### 9.2 Carriageway Revenue Pressures

As capital investment reduces, over time the quantity of reactive repairs such as potholes and patches will increase. Therefore, if a steady state investment strategy is followed it would be reasonable to assume reactive revenue demands would also remain fairly constant. However, based on the condition profiles detailed previously, if historic investment levels are maintained and a managed decline is selected the deterioration in condition rises from 45% (11% red & 34% amber) to 61% (16% red and 45% amber) in year 10. Therefore, considering this increase of deterioration as a proportion of the original it would be reasonable to assume that revenue repairs would rise a similar amount

### 9.3 Drainage Revenue Pressures

If the drainage backlog is not reduced it will result in an increase in flooding incidents on the network. As condition deteriorates instances of flooding will increase creating a greater demand for revenue resource to deal with them.

### 9.4 Footway Revenue Pressures

In a similar way to carriageways, as capital investment reduces, over time the quantity of reactive repairs such as replacing slabs, potholes and patches will increase. Therefore, if a steady state investment strategy is followed it would be reasonable to assume reactive revenue demands would also remain fairly constant. However, based on the condition profiles, if historic investment

levels are maintained and a managed decline is selected the deterioration in condition rises from 18% (3.76% condition 4 & 13.39% condition 3) to 39% (29.83% condition 3 and 9.52% condition 4) in 10 years. Therefore, considering this increase of deterioration as a proportion of the original it would be reasonable to assume that revenue repairs would rise a similar amount.

### **9.5 Street Furniture Revenue Pressures**

As discussed earlier in section 6 every effort will be made to rationalise street furniture therefore help reduce ongoing maintenance costs.

### **9.6 Street Lighting Revenue Pressures**

The scope of the work generally covered under revenue is:

- Reactive Repairs : emergencies / accidents / vandalism
- Reactive Repairs : non-emergency
- Routine Inspection / Testing : structural / electrical
- Routine Cyclical : high mast servicing
- Planned Preventative : painting
- Energy

The budget for Revenue funding has seen a reduction approximately 50% since 2010/11.

Future under-funding for street lighting maintenance is also likely to create a significant backlog of day to day repairs and general maintenance issues, all resulting in poor image and public perception. Nationally reported key performance indicators would also suffer as a consequence.

Failure to provide the necessary Capital investment to replace structurally deteriorating columns would result in an increasing pressure on Revenue funding to address emergency and make safe situations. If investment levels continue to fall it may become necessary to remove columns from the network. However, significant costs would be expected in relation to cutting down metal lighting columns for safety reasons where necessary. Prolonged non-replacement of street lighting columns would require formal disconnection of each individual electrical service provided by the District Network Operator. The current charge for an individual column to be disconnected stands at £400.



A discussed previously energy reduction initiatives are being accelerated during with consideration given to ne dimming and LED lighting technology. It is anticipated that these initiatives could save up to 50% in energy and maintenance costs.

### **9.7 Structures, Bridges & Tunnel Revenue Pressures**

There is a direct link between levels of revenue funding for ongoing planned routine maintenance and reactive repairs and Capital Investment. The current level of revenue funding has lead to a backlog of £3.2m and a declining asset condition. In order to fully consider the appropriate levels of Capital and revenue budgets it will be necessary to agree the appropriate classification of elements of work between the two categories.

It should be understood that an appropriate level of funding in either category will extend the durability and service life of other elements of the structure and reduce the need for reactive maintenance

## 10 Funding Considerations

The level of investment required based on the options selected will vary. However, consideration must be given to the funding mechanisms available to the Council. Investment in the assets discussed in this document could possibly be supplemented by the following sources; however, **this must be looked at in detail following selection of investment options and consequent budget requirements:**

### **Insurance Reduction Reassignment –**

The Council currently pays out in the region of £1.5m to £2m per annum on third party insurance claims against the highway asset. An opportunity for funding could be utilised in the form of investment from insurance into the highway asset to be offset against reductions in this 3<sup>rd</sup> party pay out. This investment is based upon the assumption a robust Section 58 defence of claims in line with the new highway maintenance policy implemented in 2014. There is a time lag in these savings coming forward.

### **Parking and Moving Traffic Offences**

The Council generates income from charging for parking. Moving traffic offences have been introduced within Cardiff which generates income. These two mechanisms could be utilised to partly fund highway asset improvement/replacement. In addition, there is work ongoing to make this area more efficient, therefore use of this income will not put reserves at risk.

### **Phased Increase in Capital Investment**

In order to make investment more affordable a “phased approach” to increasing Capital investment could be adopted. This would mean capital investment would be increased annually over an agreed period to the required level. However, it should be noted that during this period of “ramping up” to reach steady state the backlog will continue to increase.

### **Consideration of Capital Financing Costs**

Based on an assumption of phased steady state investment and useful life of expenditure incurred, the cumulative revenue budget requirement (Capital Financing costs) to meet the incremental capital expenditure requirements is c£3 million by 2027/28 and c£6.5 million by 2037/38.