Gloucestershire County Council

Enhanced Materials Policy

October 2010

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Executive Summary/Foreword

This document has been created in order to set out the standards by which Gloucestershire County Council will approve materials used in adoptable highway assets, and collect commuted sums for future maintenance activity. This enhanced materials guidance does not discourage use of enhanced materials for surfacing and kerbing, but aims to encourage appropriate use, and sets out the palette of standard materials the County Council would normally utilise in scheme development. It is intended to complement existing policy and guidance documents in Gloucestershire.

This guidance document has been developed in accordance with established best practice, and using current commercial rates for calculating commuted sums by material type. The formula used has permitted Gloucestershire County Council to calculate commuted sums towards the ‘whole life’ maintenance costs ‘over and above’ the amount expected with standard paving materials. Updates to the appendices within this guidance document will be undertaken periodically to reflect industry developments and condition monitoring over time on Gloucestershire’s highway network.

It is intended for this enhanced materials guidance to form an appendix to the ‘Manual for Gloucestershire Streets’.

Introduction

1.1 Gloucestershire County Council acknowledges the contribution that appropriate material selection can make to the function, character and local identity of schemes that they may adopt. Traditional, proven highway materials provide uniformity of appearance and predictable performance characteristics and maintenance requirements when they designed and constructed in accordance with published standards and acknowledged best practice. In circumstances where Standard materials do not fulfil the aesthetic design aspirations, use of Enhanced materials may be appropriate. Such Enhanced materials offer variations in patterns, textures and colours that can complement the surroundings and create a sense of place. Permitting the use of an unrestricted palette of Enhanced materials presents the possibility of an incoherent visual appearance across the county along with uncertainty in long-term performance, maintenance requirements and lifecycle costs.

1.2 This document outlines Gloucestershire County Council's policy towards the acceptance and adoption of a range of highway materials.

Purpose of document

1.3 The purpose of this Enhanced Materials Policy is to document Gloucestershire County Council's requirements for the approval and adoption of materials used in highway infrastructure.

1.4 The document is intended to provide developers with a framework in which they can develop their proposals whilst being fully aware of the technical, practical and financial limitations that will be imposed upon them by the County Council.

1.5 The use of this Enhanced Materials Policy by developers, architects and engineers is recommended from the outset in the processes of:

- Planning;
- Urban regeneration; and,
- Heritage and conservation.

Scope

1.6 The scope of this Enhanced Materials Policy encompasses the surfacing and kerbing materials allowed for use in carriageways, footways, cycleways, car parks and shared spaces.

1.7 The principles outlined apply to the full network hierarchy.

1.8 It is not feasible or practical to document each and every material product that may be permitted on Gloucestershire County Council's network. This document has therefore been developed on the basis of describing material types rather than specific named products or processes. This approach is consistent with the Council's procurement rules.

1.9 Enhanced features such as Sustainable Drainage Systems (SuDS), landscaping, decorative street lighting etc are specifically excluded from this policy document. Developers proposing to incorporate such features into their schemes should liaise with Gloucestershire County Council officers from the outset.

1.10 This policy document for Enhanced materials provides a framework enabling developers to consider the financial implications of their proposals in negotiation with Gloucestershire County Council. This approach is consistent with the recent Chris Britton Consultancy guidance document on the subject [1] and will allow developers to use the most up-to-date cost data available to them at the time. This also prevents the restriction of Enhanced materials to specific, named products – which would be contrary to procurement best practice.

Overriding principles

1.11 For any surfacing or kerbing material to be used on Gloucestershire County Council's network it must fulfil the principles of:

- Safety
- Quality
- Contextual Suitability
- Durability
- Maintainability
- 'Fitness for Purpose'
- Sustainability
- Availability
- Functionality

1.12 In achieving these principles, the proposed material or process must not place an undue financial burden upon the Council, which will become responsible for the long-term maintenance of the asset upon adoption. In circumstances where a proposed Enhanced material introduces maintenance requirements and costs that are over and above those that would typically be expected for a Standard material then a commuted sum payment will be sought from the developer. The level of commuted sum to be paid will be the difference (only) between the lifecycle costs for the Enhanced and Standard materials.

1.13 This is a policy document. It is not a detailed design guide. Fulfilment of the requirements outlined in this policy will not automatically lead to the approval and adoption of a particular material or process. Notwithstanding any of the following text, all design proposals will still be subject to full and proper checking and approval procedures.

Document application

1.14 This Enhanced Materials Policy has been developed in consultation with the following Districts:

- Cheltenham Borough Council
- Cotswold District Council
- Forest of Dean District Council
- Gloucester City Council
- Stroud District Council
- Tewkesbury Borough Council

1.15 The contents of this Enhanced Materials Policy apply to all potentially adoptable highway infrastructure assets within Gloucestershire. This includes all classes of road in major conurbations, market towns, villages, conservation areas etc.

Document currency and review

1.16 This document was produced and adopted in 2010 and is based upon current best practice.

1.17 Updates will be undertaken periodically to reflect industry developments and condition monitoring over time on the local network.

Existing policy and documentation framework

1.18 This Enhanced Materials Policy is intended to be complementary to the following range of existing policy and guidance documents that are currently used within Gloucestershire. There is no hierarchy of precedence and any apparent inconsistency shall be referred to Gloucestershire County Council for resolution.

'Highway Requirements for Development' and "Manual for Gloucestershire Streets".

1.19 Gloucestershire County Council's "Highway Requirements for Development" (HRD) [2] provides local guidance and standards for new developments within the county. Section 7 provides the technical specifications for Standard surfacing materials (i.e. the "deemed to satisfy" options). Section 8 deals with procedural matters relating to planning and adoption.

1.20 The HRD will be replaced by an updated design guide; "Manual for Gloucestershire Streets" (MfGS) [3] in 2010. This will additionally provide advice on:

- Gloucestershire's approval and adoption processes.
- Gloucestershire's policy towards commuted sums.

Transport Asset Management Plan

1.21 Gloucestershire County Council's Transport Asset Management Plan (TAMP) [4] provides the tactical linkage between the Council's corporate objectives and its operational and business plans. It provides the framework for the management of highway assets to achieve value-for-money, reduce risks, deliver customer satisfaction and provide transparency in the decision making processes that inform maintenance and investment decisions.

1.22 Central to the TAMP is the definition of levels of service which describe what stakeholders want from their assets. Appropriate maintenance regimes are then formulated to achieve this delivery in the form of lifecycle plans. The lifecycle plans and associated whole-life-costs contained within the TAMP are used within the context of this Enhanced Materials Policy to derive commuted sum amounts.

Sustainability

1.23 Suppliers and contractors must demonstrate credentials and behaviours that align with and support Gloucestershire's corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.

1.24 Gloucestershire County Council would encourage the use of domestically/locally sourced paving materials where possible in the interests of sustainability, ease of availability for future repairs, and supporting the local economy.

Ethical sourcing of materials

1.25 Gloucestershire County Council would encourage the use of domestically/locally sourced paving materials wherever possible and appropriate.

Planning

1.26 In consultation with district councils, reference has been made to a number of Local Development Frameworks, Supplementary Planning Documents, public realm strategies etc.

- **Cheltenham Borough Council**
- PPS1 – Delivering Sustainable Development – a CLG document
- Cheltenham Borough Local Plan 2nd Review 2006 - Policy CP7 – Design

- Cheltenham Civic Pride Urban Design Framework SPD plus Technical Appendices (especially the Urban Design Strategy and the Public Realm Strategy)
- Cheltenham Conservation Area Character Appraisals (17 covering the central conservation area; others covering Prestbury, Swindon Village, The Poets area, Bafford, Cudnall Street and St Mary's Charlton Kings).
    - **Cotswold District Council**
- Cotswold District Design Code
- Cirencester Town Centre Supplementary Planning Guidance
    - **Forest of Dean District Council**
- Residential Design Guide
    - **Gloucester City Council**
- Second Stage Deposit Local Plan (2002)
- Emerging Gloucester/Cheltenham/Tewkesbury Joint Core Strategy
- Climate Change Strategy for Gloucester
- Planning Policy Statement: Planning and Climate Change – supplement to Planning Policy Statement 1 (Dec 2007)

1.27 District council documents listed in this policy often emphasise the need for enhanced materials in order to maintain or improve street scene, local context and character areas. Use of enhanced paving materials in existing adopted highway assets will be at the discretion of Gloucestershire County Council, and negotiations will be necessary on a case by case basis. The commuted sum calculation methodology (Appendix D) in this policy document could be used the calculate material, construction, and future maintenance costs for enhanced materials, over and above standard material use.

Commuted Sums

1.28 Gloucestershire County Council's policy for commuted sums is contained within MfGS. MfGS and this Enhanced Materials Policy have been produced to be consistent with the best practice recommendations provided in the recent Chris Britton Consultancy guidance document on the subject [1].

Department for Transport's 'Manual for Streets'

1.29 The Department for Transport's 'Manual for Streets' [5] is primarily intended for residential and other lightly trafficked streets. It is however, also considered applicable to other areas such as high streets. The aims of the document are to assist in the creation of streets that:

- help to build and strengthen the communities they serve;
- meet the needs of all users, by embodying the principles of inclusive design;
- form part of a well-connected network;
- are attractive and have their own distinctive identity;
- are cost-effective to construct and maintain; and
- are safe.

1.30 Whilst avoiding detailed specifications or technical advice it advocates a "*flexible approach to street layouts and the use of locally distinctive, durable and maintainable materials and street furniture*". It recommends that all materials meet the following requirements:

- easy to maintain;

- safe for purpose;
- durable;
- sustainable (including the manufacturing process and energy use); and
- appropriate to the local character.

1.31 At the time of this policy being prepared, The Chartered Institute of Highways and Transportation were in the process of announcing and releasing their latest guidance document, 'Manual for Streets 2'. Future editions of this policy will need to make reference to that document and its content.

Climate Change

1.32 According to projections reported by the South West Climate Change Impacts Partnership [6], by the 2080s, Gloucestershire is likely to experience:

- Warmer, wetter winters – up to 3.5^{o}C warmer and 30% wetter
- Hotter, drier summers – up to 5.5 ^{o}C warmer and 55% drier
- More frequent and extreme weather events
- Sea and estuary level rise up to 1m (on top of higher tides)

1.33 Gloucestershire County Council's approach towards climate changes is twofold:

- To limit the environmental impact of current and future highway works within the County by using responsible construction techniques and material specifications.
- To deliver robust infrastructure that can withstand the predicted effects of:
  - Excess water
  - Higher temperatures and increased temperature variations
  - Increased soil moisture variations
  - Increased UV radiation and reduced cloud cover
  - Increased wind speeds
  - Changing vegetation patterns (especially weeds).

1.34 Developers will need to ensure that their proposals satisfy these objectives. Further guidance can be found in the Department for Transport's publication; "*Maintaining pavements in a changing climate*" [7]

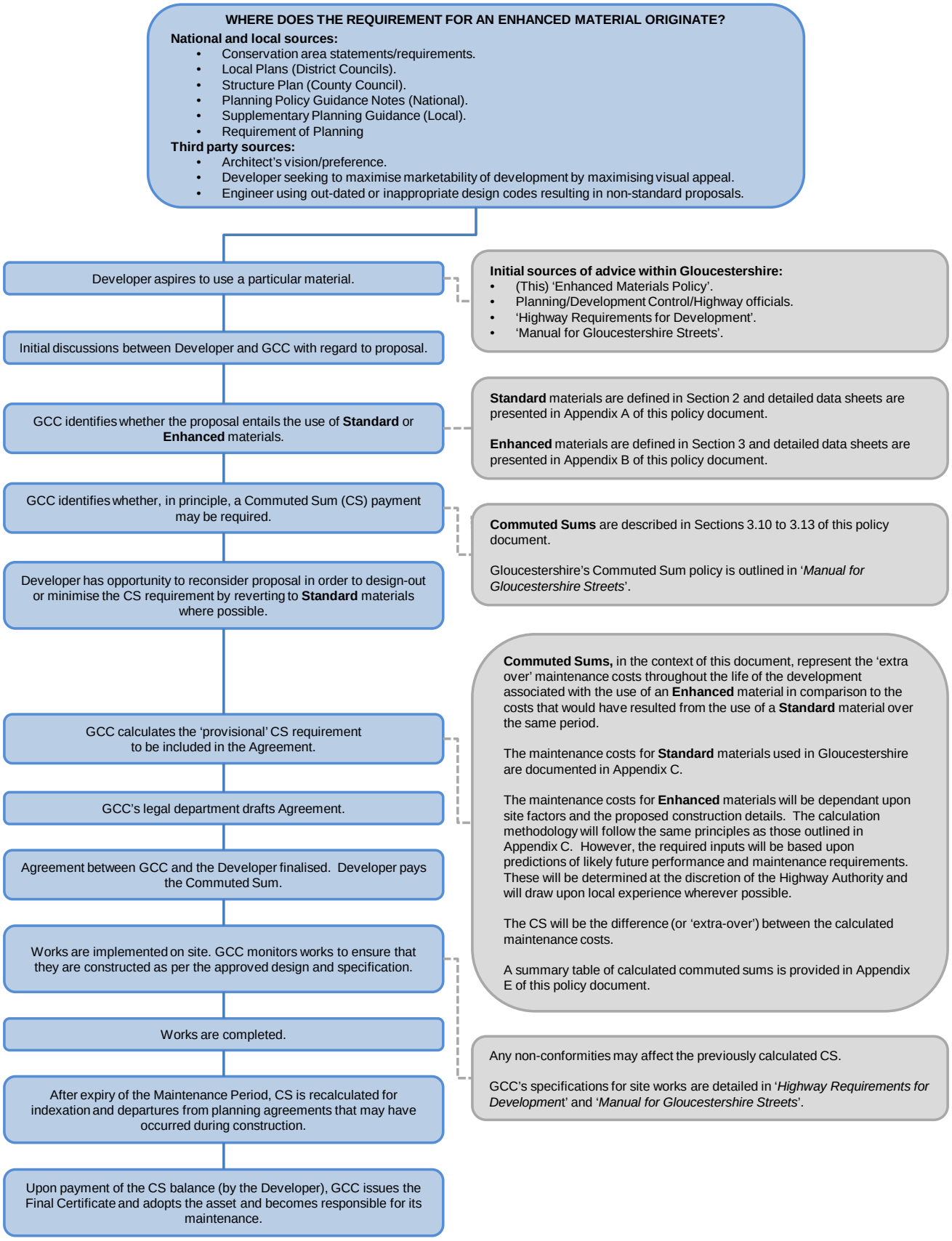
1.35 At the time of this policy being prepared, roll out of the Flood and Water Management Act 2010 was imminent. The Act is likely to establish Gloucestershire County Council as the SuDS approving body (SAB), responsible for approving proposed drainage systems in new developments and redevelopments, subject to exemptions and thresholds. The Government Spending Review may influence certain elements and responsibilities within this Act, but proposals involving SuDS will be assessed on a case by case basis whilst this Act is fully implemented. Discussions and negotiations should take place with Gloucestershire County Council officers at an early stage.

Disability Discrimination Act

1.36 The Disability Discrimination Act 1995 (revised in 2005) [8] is intended to prevent disabled people from being discriminated against in terms of their access to public services. The specification of Enhanced surfacing and kerbing materials in and around developments should consider the needs of all users, including disabled people.

Process flowchart

1.37 Figure 1(below) illustrates the process for incorporating an Enhanced material into a development. It also provides a guide to the structure and use of this policy document.



2. Standard materials

2.1 Gloucestershire's Standard palette of surfacing materials comprises the following:

- Hot Rolled Asphalt
- Close Graded Asphalt Concrete
- Dense Asphalt Concrete
- Precast Concrete Blocks
- Precast Concrete Flags

2.2 Precast concrete kerbs are also included in Gloucestershire's Standard palette of materials.

2.3 The Data Sheets provided in Appendix A document the design and specification requirements for these Standard materials along with practical considerations for their use.

2.4 Standard materials designed, specified or constructed otherwise in accordance with the guidance provided within this document (or other relevant published standards and industry best practice) will be regarded as an Enhanced material – for which the future maintenance implications will need to be assessed and a commuted sum determined (see Section 3).

Maintenance

2.5 The above (Standard) materials have a history of successful use within Gloucestershire. When designed, specified and constructed in accordance with established standards they deliver predictable performance and require the application of established maintenance regimes. Under these circumstances, the ongoing maintenance costs are (in theory) met through existing local authority funding streams. As such, no commuted sum payment will be sought from the developer[A].

2.6 The periodic maintenance costs for each of these Standard materials are outlined in Appendix C. These are based upon local experience.

[A] The exception being materials used in circumstances involving "*additional areas not required for normal highway purposes*" – reference should be made to Appendix 4 of the CSS Guidance Document [1] for further details.

3. Enhanced materials

3.1 The Department for Transport's Manual for Streets advocates that:

> "*One way of enabling designers to achieve local distinctiveness without causing excessive maintenance costs will be for highway authorities to develop a limited palette of special materials and street furniture. Such materials and components, and their typical application, could, for example, be set out in local design guidance and be adopted as a Supplementary Planning Document*".

3.2 Gloucestershire County Council has therefore developed the following palette of Enhanced surface material types:

- Pigmented Hot Rolled Asphalt
- Enhanced Stone Mastic Asphalt
- Exposed Gravel
- Unbound Gravel
- Natural Stone Slabs
- Natural Stone Setts
- Resin Bonded
- Resin Bound
- Premium concrete products with alternative shapes/ dimensions/colours/textures compared to the Standard palette options.
- Clay Pavers

3.3 Natural stone (or reproduction stone) kerbs are also included in the Enhanced palette of materials.

3.4 The Data Sheets provided in Appendix B document the design and specification requirements for these Enhanced materials along with practical considerations for their use. In line with standard procurement practice, the above palette deals with *types* of Enhanced materials rather than specific proprietary products.

3.5 Aesthetic considerations are only one factor in the selection of appropriate materials. Appendix B also provides design guidance on the circumstances where particular materials are not permitted on performance grounds.

3.6 Permeable Paving has not been included within this Enhanced Materials Policy. Such paving would form part of Sustainable Drainage Systems (SUDS). These are beyond the scope of this document. Gloucestershire County Council will consider the use of permeable paving on a scheme-by-scheme basis whilst the Flood and Water Management Act is fully implemented. Reference should be made to MfGS and negotiation with Gloucestershire County Council's Flood Risk Management team.

3.7 The intention of this Enhanced Materials Policy is not to be restrictive or inhibit the use of other appropriate surfacing materials. GCC may consider other Enhanced materials to those currently detailed in Appendix B. In such circumstances, the normal process for approval and adoption will apply and commuted sum amounts will be determined in accordance with the methodology outlined in this document.

Maintenance

3.8 The Standard palette of materials consists of proven, predictable, cost-effective materials that have traditionally been used throughout the county. Enhanced materials can vary in terms of their:

- capital cost;
- performance characteristics; and,
- maintenance requirements.

3.9 Gloucestershire County Council aims to limit its future maintenance liability within acceptable limits. This will be achieved by assessing the lifecycle plan of an Enhanced material and comparing it to that expected for a Standard material. In circumstances where the use of an Enhanced material will incur additional costs, these will be recovered from the developer in the form of a commuted sum payment.

Commuted Sums

3.10 The use of approved Enhanced materials that are likely to increase future maintenance costs will attract a commuted sum payment.

3.11 Gloucestershire County Council has adopted the recommendations of the recent Chris Britton Consultancy guidance document [1] for calculation of commuted sums. The commuted sum payment for Enhanced materials will recover the costs which are over and above those that would have been required if a Standard material had instead been provided.

3.12 Appendix D provides the calculation framework. The approach towards arriving at a commuted sum is summarised as follows:

- For an equivalent Standard material calculate the cost of future maintenance interventions required over a 40 year design life period – using the base data in Appendix C. Discount those costs to current day value.
- For the proposed Enhanced material calculate the likely future maintenance interventions required over a 40 year design life period discounted to current day value. This will require predictions on the type, extent and timing of future maintenance.

  Note: It is not practical or feasible for Gloucestershire County Council to document these in advance for all material products that might feasibly be permitted on its network (both now and in the future). Instead, the developer should work with contractors and suppliers to generate the required inputs to Appendix D. These will then be subject to negotiation and agreement with Gloucestershire County Council. Benchmarking will be undertaken wherever possible to similar materials used on comparative schemes elsewhere within the County.
- The difference between the discounted maintenance costs for the Enhanced material in comparison to the Standard alternative will be calculated. This difference will be the amount due as a commuted sum.

3.13 Appendix E provides the calculated commuted sum amounts by material type.

4. References

No.	Reference
1	"*Commuted sums for future maintenance in relation to Adoption and Transfer of Infrastructure Assets"*, Guidance Document, Chris Britton Consultancy 2008.
2	"*Highway Requirements for Development – Local guidance and standards for Gloucestershire*", Issue 2, GCC, 2000.
3	"*Manual for Gloucestershire Streets*", GCC, 2010.
4	"*Transport Asset management Plan*", GCC, July 2010 (draft).
5	"*Manual for Streets*", DfT, 2007.
6	South West Climate Change Impacts Partnership, http://www.oursouthwest.com/climate/
7	"*Maintaining pavements in a changing climate*", DfT and UK Roads Board, 2008.
8	"*Disability Discrimination Act*", The Stationary Office, London, 1995.
9	"*Manual handling operations regulations*", The Stationary Office, London, 1992 (as amended).
10	"Handling kerbs: Reducing the risks of musculoskeletal disorders", HSE Construction Information Sheet No. 57, HSE, Merseyside.
11	"*Design Manual for Roads and Bridges*", The Stationary Office, London.
12	HD 39 "*Footway Design*", DMRB, Volume 7, Section 2, Part 5.
13	HD 28 "*Skidding Resistance*", DMRB, Volume 7, Section 1, Part 1.
14	HD 36 "*Surfacing Materials for new and maintenance Construction*", DMRB, Volume 7, Section 4, Part 1.
15	HD 37 "*Bituminous Surfacing Materials and Techniques*, DMRB, Volume 7, Section 4, Part 2.
16	"*Specification for Highway Works*", MCHW, Volume 1, The Stationary Office, London.
17	BS 1217 "*Cast stone. Specification*", BSI, London.
18	BS EN 1338 "*Concrete paving blocks. Requirements and test methods*", BSI, London.
19	BS EN 1339 "*Concrete paving flags. Requirements and test methods*", BSI, London.
20	BS EN 1340 "*Concrete kerb units. Requirements and test methods*", BSI, London.
21	BS EN 1341 "*Slabs of natural stone for external paving. Requirements and test methods*" BSI, London.
22	BS EN 1342 "*Setts of natural stone for external paving. Requirements and test methods*", BSI, London.
23	BS EN 1343 "*Kerbs of natural stone. Requirements and test methods*", BSI, London.
24	BS 6677-1 "*Clay and calcium silicate pavers for flexible pavements. Specification for pavers*", BSI, London.
25	BS 7533-1 "*Pavements constructed with clay, natural stone or concrete pavers. Guide for the structural design of heavy duty pavements constructed of clay pavers or precast concrete paving blocks*", BSI, London.
26	BS 7533-2 "*Pavements constructed with clay, natural stone or concrete pavers. Guide for the structural design of lightly trafficked pavements constructed of clay pavers or precast concrete paving blocks*", BSI, London.
27	BS 7533-3 "*Pavements constructed with clay, natural stone or concrete pavers. Code of practice for laying precast concrete paving blocks and clay pavers for flexible pavements*", BSI, London.
28	BS 7533-4 "*Pavements constructed with clay, natural stone or concrete pavers. Code of practice for the construction of pavements of precast concrete flags or natural stone slabs*", BSI, London.
29	BS 7533-6 "*Pavements constructed with clay, natural stone or concrete pavers. Code of practice for laying natural stone, precast concrete and clay kerb units*", BSI, London.
30	BS 7533-7 "*Pavements constructed with clay, natural stone or concrete pavers. Code of practice for the construction of pavements of natural stone paving units and cobbles, and rigid construction with concrete block paving*", BSI, London.
31	BS 7533- 8 "*Pavements constructed with clay, natural stone or concrete pavers. Guide for the structural design of lightly trafficked pavements of precast concrete flags and natural stone flags*", BSI, London.
32	BS 7533-10 "*Pavements constructed with clay, natural stone or concrete pavers. Guide for the structural design of trafficked pavements constructed of natural stone setts and bound construction with concrete paving blocks*", BSI, London.
33	BS 7533- 12 "*Pavements constructed with clay, natural stone or concrete pavers. Guide to the structural design of trafficked pavements constructed on a bound base using concrete paving flags and natural stone slabs*", BSI, London.

No.	Reference
34	BS 7932 "*Determination of the unpolished and polished pendulum test value of surfacing units*", BSI, London.
35	BS 8500-2 "*Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete*", BSI, London.
36	BS DD ENV 12633 "*Method of determination of unpolished and polished slip/skid resistance value*", BSI, London.
37	BS 594987 "*Asphalt for roads and other paved areas – Specification for transport, laying and compaction and type testing protocols*", BSI, London.

5. Abbreviations

Abbreviation	Meaning
AAV	Aggregate Abrasion Value
ADEPT	Association of Directors of Environment, Economy, Planning and Transport
BSI	British Standards Institution
CSS	County Surveyors' Society (now ADEPT)
DDA	Disability Discrimination Act
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
GCC	Gloucestershire County Council
HRD	Highway Requirements for Development
MCHW	Manual of Contract documents for Highway Works
MfGS	Manual for Gloucestershire Streets (GCC publication)
MfS	Manual for Streets (DfT publication)
PPV	Polished Paver Value
PSV	Polished Stone Value
SHW	Specification for Highway Works
SuDS	Sustainable Drainage System
TAMP	Transport Asset Management Plan

Appendix A :
Standard materials data sheets

<table>
<tr><td colspan="6">Gloucestershire Highways - Standard palette of materials</td></tr>
<tr><td>MATERIAL</td><td colspan="5">HOT ROLLED ASPHALT</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">‘Recipe’, ‘Design’ and ‘Performance’ mixtures.
Generally 40/60 grade bitumen.
10mm or 14mm nominal size mixtures with 20mm coated chippings.
Standard material uses conventional unmodified binder with no pigmentation to any mixture component.
55% grade material (without chippings) can be used on housing estates and high stress locations with speeds less than 40mph. Whilst it is quieter than the chipped 35% grade material it offers limited texture and so should only be used in low speed locations requiring little skid resistance.</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Carriageway surface course.
No upper limit on traffic usage.</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">On narrow streets or traffic sensitive locations where there is insufficient working space for a chipper to operate.</td></tr>
<tr><td>PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td></td><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td></td><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">HD 28, HD 36 & HD 37 [13,14,15]
PSV and AAV of pre-coated chippings.
In high-risk locations an additional surface treatment may be required to provide enhanced skid resistance.</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Traditional ‘black-top’ finish.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">Nominal layer thickness as per BS594987 [37]</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">SHW [16] Cl. 910 (Recipe Mixtures), Cl. 911 (Design Mixtures) & Cl. 943 (Performance Related Design Mixtures).
HRD/MfGS [2,3]</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">When laid properly, offers a durable and ‘impermeable’ surface.
Expected design life 20 years.</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Available locally through GH supply chain.
Successful application requires particular attention to workmanship. Industry skill-base is declining.</td></tr>
<tr><td>SUSTAINABILITY CONSIDERATIONS</td><td colspan="5">Future availability of natural resources (bitumen and aggregate).
High energy requirements to extract, mix, transport and compact.
Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.</td></tr>
</table>

Table A.1 – Hot Rolled Asphalt data sheet (Standard palette)

<table>
<tr><td colspan="6">Gloucestershire Highways - Standard palette of materials</td></tr>
<tr><td>MATERIAL</td><td colspan="5">CLOSE GRADED ASPHALT CONCRETE</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">‘Recipe’ mixture.
Generally 70/100 or 100/150 grade bitumen.
10mm or 14mm nominal size.
Standard material has no pigmentation to any mixture component.</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Carriageway surface course.</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">Generally used for minor roads.
Not recommended in locations where high texture depth is required.
The use of the softer binder (grade 100/150) on high stress locations can result in ‘scrubbing’ of the surface especially during hot weather.</td></tr>
<tr><td rowspan="3">PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">HD 28, HD 36 & HD 37 [13,14,15].
Min PSV = 50. Max. AAV = 16.
In high-risk locations an additional surface treatment may be required to provide enhanced skid resistance.</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Standard ‘black-top’ finish.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">14mm size material on Local Distributor roads – 40mm to 55mm thick (depending on use).
10mm size material on lightly trafficked Local Distributor and Access Roads – 30mm to 40mm thick (depending on use).</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">SHW [16] Cl. 912.
HRD/MfGS [2,3.]</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">Expected design life = 15 years</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Available locally through GH supply chain.</td></tr>
<tr><td>SUSTAINABILITY CONSIDERATIONS</td><td colspan="5">Future availability of natural resources (bitumen and aggregate).
High energy requirements to extract, mix, transport and compact.
Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.</td></tr>
</table>

Table A.2 – Close Graded Asphalt Concrete data sheet (Standard palette)

*Gloucestershire Highways - **Standard** palette of materials*					
MATERIAL	**DENSE ASPHALT CONCRETE**				
TYPE AND FINISH	Traditional ‘macadam’. AC 6 Dense Surf 100/150 for hand-laid application in footways etc.				
APPLICATION	Cycle tracks/Footways/Footpaths and Vehicular Crossings subject to light traffic (only).				
APPLICATION RESTRICTIONS	Will only withstand very occasional heavy vehicle overrun (such as might occur two or three times a year with occasional delivery vehicles to private houses). Material is susceptible to surface damage in hot weather.				
PERMITTED BY DISTRICT COUNCIL	✓	Gloucester City	✓	Tewkesbury Borough	District Councils have been asked if they would support the use of this paving material ‘in principle’.
	✓	Cheltenham Borough	✓	Stroud District	
	✓	Forest of Dean District	✓	Cotswold District	
DESIGN CONSIDERATIONS	HD 28, HD 36, HD 37 & HD 39 [13,14,15,12]. Min PSV = 50. Max AAV = 16.				
AESTHETIC CONSIDERATIONS	Normal ‘black-top’ finish.				
SIZE CONSIDERATIONS	25mm thick.				
SPECIFICATION	SHW [16.] Cl. 909. HRD/MfGS [2,3.]				
MAINTENANCE REQUIREMENTS	Expected design life = 20 years.				
SOURCING AND AVAILABILITY	Available locally through GH supply chain.				
SUSTAINABILITY CONSIDERATIONS	Future availability of natural resources (bitumen and aggregate). High energy requirements to extract, mix, transport and compact. Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.				

Table A.3 **– Dense Asphalt Concrete data sheet (Standard palette)**

*Gloucestershire Highways - **Standard** palette of materials*					
MATERIAL	**PRECAST CONCRETE FLAGS** (Table A.4)				
TYPE AND FINISH	Standard material is traditional grey (or buff) concrete utilitarian paving with a plain surface finish in the sizes described below. Photographs are provided overleaf. Any other variation would be considered as an Enhanced material.				
APPLICATION	Pedestrian footways, precincts or lightly trafficked areas.				
APPLICATION RESTRICTIONS	Pavements subjected to heavy vehicle **over-run** shall be constructed on a bound base. Notwithstanding the provisions of BS 7533-8 and 12 [31 & 33] if regular heavy vehicle **trafficking** is anticipated then alternative surfacing materials or alternative sized concrete elements should be used. Footways which are vulnerable to heavy vehicle overrun shall either be protected by physical obstructions or else designed as heavy duty pavements incorporating a bound base. Flags are not recommended on pavements that are to be subject to dynamic impact loading (such as traffic calming or barrel deliveries). High point loads (such as those imparted by outriggers on access platforms used for maintaining street lighting) can also cause localised failures if the base is not adequately designed. In built-up areas that are to be subject to mechanical sweeping, the sand jointing material needs to be stabilized with a surface-applied elastomeric sealer. Laying patterns should be designed with regard to the type and flow of traffic.				
PERMITTED BY DISTRICT COUNCIL	✓	Gloucester City	✓	Tewkesbury Borough	District Councils have been asked if they would support the use of this paving material 'in principle'.
	✓	Cheltenham Borough	✓	Stroud District	
	✓	Forest of Dean District	✓	Cotswold District	
DESIGN CONSIDERATIONS	Structural design is covered by BS 7533-8 and 12 [31 & 33]. HD 28 [13]. Recommended slip/skid resistance measured in accordance with BS 7932 [34.]: • For pedestrian use – 40 • For slow-moving vehicle use – 45 Intermediate restraints to be incorporated on steep slopes. Abrasion resistance to be determined in accordance with BS EN 1341 and 1339 [21 & 19].				
AESTHETIC CONSIDERATIONS	Alternative colours and surface treatments are available but would be regarded as an Enhanced material. Length: Width ratio of flags should not exceed 2:1. Nominal width dimensions less than 300mm present an increased risk of failure.				
SIZE CONSIDERATIONS	Standard sizes are 300mm x 300mm small element units and 900mm x 600mm traditional units. Any other size is classed as an Enhanced material For pedestrian-only use the minimum thickness is 50mm. For trafficked slabs the minimum thickness is 60mm.				
SPECIFICATION	SHW [16] Cl. 1104. Manufacture: BS EN 1339 [19]. Code of Practice for laying: BS 7533-4[28]. HRD/MfGS [2 & 3].				
MAINTENANCE REQUIREMENTS	Jointing sand can be displaced by mechanical sweeping and/or suction effects. The sand jointing material needs to be stabilized with a surface-applied elastomeric sealer. Expected design life is 20 years.				
SOURCING AND AVAILABILITY	Long–term local availability is assured.				
SUSTAINABILITY CONSIDERATIONS	Use of standardised units supports local recycling agenda. Fully engineered and manufactured under controlled conditions to deliver a consistent product with predictable performance characteristics. Low environmental impact in comparison with imported materials. Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC's corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.				

*Gloucestershire Highways - **Standard** palette of materials*

PRECAST CONCRETE FLAGS

Photograph A.4.1 – Buff small element flags

Photograph A.4.2 – Traditional large sized flags

Photograph A.4.3 – Traditional small element flags

Photograph A.4.4 – Traditional large sized flags

<table>
<tr><td colspan="6">Gloucestershire Highways - Standard palette of materials</td></tr>
<tr><td>MATERIAL</td><td colspan="5">PRECAST CONCRETE BLOCKS</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">Standard 100mm x 200mm blocks in grey/buff/red/brindle with normal surface texture.
Standard material includes tumbled finishes.
Recycled/reconstituted concrete blocks are regarded as Enhanced materials.</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Carriageway or footway surfaces in the following categories:
• Lightly trafficked areas such as cul-de-sacs, car parks, precincts, lightly trafficked roads and paved areas.
• Heavy duty pavements trafficked by the usual broad spectrum of axle loads (up to 12msa).</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">For pedestrian applications the concrete blocks should be square edged (not chamfered).
In areas of severe braking or turning or specialised industrial areas.
In areas with sustained heavy rainfall combined with steep gradients, the laying course sand can be subject to movement – resulting in surface undulations.</td></tr>
<tr><td>PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td></td><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td></td><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">For lightly trafficked pavements (<= 0.5msa) use BS 7533-1 [25].
For heavy duty pavements (between 0.5msa and 12msa) use BS 7533–2 [26].
Adjustments are required to the traffic predictions used in the structural design to account for occurrences of channelized flow and dynamic loading.
HD 28 [13].
A minimum polished paver value (PPV) of 45 should be specified for general use.</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Trafficked concrete blocks should be laid in a herringbone pattern to minimise creep and ensure better distribution of imposed wheel loads.
Basket weave and running bond patterns should only be used in pedestrian areas.
Blocks should be “through coloured” as opposed to “face mixed” – this allows stained blocks to be overturned whilst also benefitting recycling.
Alternative concrete blocks with decorative textures, tumbled finishes or different colours would be regarded as ‘Enhanced Materials’.
The use of monotone coloured concrete blocks in areas prone to surface staining is not recommended. Staining will appear less prominent on multicoloured blocks.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">Plan dimensions 100mm x 200mm.
Minimum 80mm thick.</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">SHW [16] Cl. 1107.
Requirements & test methods: BS EN 1338, BS 7932 & DD ENV 12633 [18,34, & 36]
Code of practice for laying: 7533-3 [27].
HRD/MfGS [2,3]</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">Jointing sand can be displaced by mechanical sweeping and/or suction effects. The sand jointing material needs to be stabilized with a surface-applied elastomeric sealer.
Expected design life is 20 years</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Long–term local availability is assured.</td></tr>
<tr><td>SUSTAINABILITY CONSIDERATIONS</td><td colspan="5">Use of standardised units supports local recycling agenda.
Fully engineered and manufactured under controlled conditions to deliver a consistent product with predictable performance characteristics.
Low environmental impact in comparison with imported materials.
Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.</td></tr>
</table>

Table A.5 **– Precast Concrete Blocks data sheet (Standard palette)**

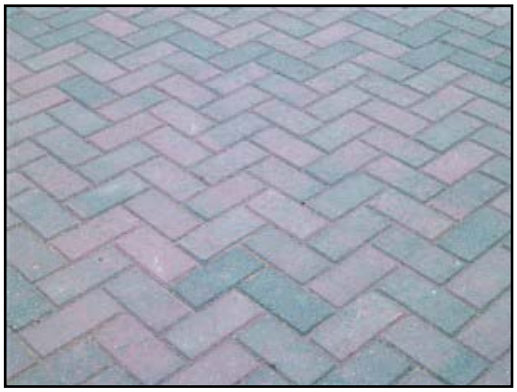
*Gloucestershire Highways - **Standard** palette of materials*

PRECAST CONCRETE BLOCKS

Photograph A.5.1 – Concrete blocks

Photograph A.5.2 – Concrete blocks

Photograph A.5.3 – Standard concrete blocks



Photograph A.5.4 – Brindles

<table>
<tr><td colspan="6">Gloucestershire Highways - Standard palette of materials</td></tr>
<tr><td>MATERIAL</td><td colspan="5">PRECAST CONCRETE KERBS (Table A.6)</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">‘British Standard’ precast concrete kerbs produced by hydraulic pressing. Standard grey concrete finish with a plain texture. Includes the followings standard profile types:
• Half battered • Transitions • Radius
• Bull nosed • Angles • Drop
• 45° splayed • Quadrants
The following kerb types are specifically excluded from the Standard palette and reference should be made to the process for the provision of Enhanced materials:
• High containment (‘Trief’/’Titan’). • Bus stop. • Combined kerb and drainage units (‘Beany’).</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Provision of edge restraint in pedestrian and vehicular applications.</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">The minimum radius that can be achieved using standard length straight units is 12m. Below this, radius kerbs must be used. Excessive trimming of standard length straight units to achieve tight radii is not permitted.
Splayed kerbs must not be used in the vicinity of footpaths.
Only bull nose kerbs are to be used for dropped crossings.
Where kerbs are likely to be subjected to regular heavy traffic (e.g. on approaches to traffic calming ramps) kerbs should be cut to a length of 300mm.
300mm is the minimum length that standard (914mm) precast concrete kerbs should be cut to. Smaller sized units must not be cut to less than one third of their original length and, in no case, should they be cut to less than 50mm.
Manual Handling Operations Regulations [9] provide restrictions for installation methods. Reference should be made to HSE Construction Information Sheet No. 57 [10] for further advice.</td></tr>
<tr><td>PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td></td><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td></td><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">Adequate slip/skid resistance, bending strength, abrasion resistance, resistance to freeze-thaw with de-icing salts: BS EN 1340 [20].
The following upstands should be provided:
• Full height = 100mm (min.) • Drop kerbs for vehicular access = 25mm
• On bridge decks = 75mm. • Drop kerbs for pedestrian crossings = 6mm (max.)</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Utilitarian feature.
Natural stone or stone reproduction alternatives are permitted but would be regarded as Enhanced product.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">Standard units are typically 914mm or 609mm in length.</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">• Product: BS EN 1340 [20].
• Code of practice for laying: BS7533–6 [29].
• SHW [16] Cl. 1101.
• Concrete bed and backing: BS 8500-2 [35].
• Vertical faces in contact with pavement construction require application of bond coat/tack coat: SHW [Ref.] Cl. 920 and BS 594987 [37].</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">Expected design life is 20 years.</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Long–term local availability is assured.</td></tr>
<tr><td>SUSTAINABILITY CONSIDERATIONS</td><td colspan="5">Use of standardised units supports local recycling agenda.
Fully engineered and manufactured under controlled conditions to deliver a consistent product with predictable performance characteristics.
Low environmental impact in comparison with imported materials.
Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.</td></tr>
</table>

*Gloucestershire Highways - **Standard** palette of materials*

PRECAST CONCRETE KERBS

Photograph A.6.1 – Standard kerbs

Photograph A.6.2 – Standard kerbs

Photograph A.6.3 – Standard kerbs

Photograph A.6.4 – Standard kerbs

Appendix B:
Enhanced material data sheets

*Gloucestershire Highways - **Enhanced** palette of materials*					
MATERIAL	**PIGMENTED HOT ROLLED ASPHALT**				
TYPE AND FINISH	‘Recipe’ and ‘Design’ mixtures. Generally 40/60 grade bitumen. 20mm coated chippings. Enhanced material uses pigmented binders and/or pigmented/ decorative chippings for improved visual effect. Pigmented 55% grade (unchipped) materials are not permitted.				
APPLICATION	Carriageway surface course material usually reserved for prestige areas or where delineation is required. No upper limit on traffic usage.				
APPLICATION RESTRICTIONS	On narrow streets or traffic sensitive locations where there is insufficient working space for a chipper to operate.				
PERMITTED BY DISTRICT COUNCIL	✓	Gloucester City	✓	Tewkesbury Borough	District Councils have been asked if they would support the use of this paving material ‘in principle’.
	✓	Cheltenham Borough	✓	Stroud District	
	✓	Forest of Dean District	✓	Cotswold District	
DESIGN CONSIDERATIONS	HD 28, HD 36 & HD 37 [13, 14, 15]. PSV and AAV of pre-coated chippings. In high-risk locations an additional surface treatment may be required to provide enhanced skid resistance. The binder on pre-coated chippings is intended to wear away (over time) under the action of traffic. If a pigmented binder is used for pre-coated chippings, consideration should be given to the type/colour of the aggregates used in order to safeguard long-term visual effect.				
AESTHETIC CONSIDERATIONS	Enhanced aesthetic effect (in comparison to ‘Standard’ Hot Rolled Asphalt).				
SIZE CONSIDERATIONS	Nominal layer thickness 40mm – 50mm.				
SPECIFICATION	SHW [16] Cl. 910 (Recipe Mixtures) & Cl. 911 (Design Mixtures). HRD/MfGS [2,3]				
MAINTENANCE REQUIREMENTS	When laid properly, offers a durable and ‘impermeable’ surface. Maintenance requirements (intervention types and frequencies) will be the same as per ‘Standard’ Hot Rolled Asphalt (Appendix A) but the capital cost of the mix components will be more expensive.				
SOURCING AND AVAILABILITY	Successful application requires particular attention to workmanship. Industry skill-base is declining.				
SUSTAINABILITY CONSIDERATIONS	Future availability of natural resources (bitumen and premium aggregates). High energy requirements to extract, mix, transport and compact. Additional processes to produce and incorporate pigmentation. Coloured binders and/or premium aggregate chippings may need to be transported from further afield. Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.				

Table C.1 – Pigmented Hot Rolled Asphalt data sheet (Enhanced palette)

*Gloucestershire Highways - **Enhanced** palette of materials*

PIGMENTED HOT ROLLED ASPHALT

Photograph C.1.1 – Pigmented Hot Rolled Asphalt
(Black binder + red coated chippings)

Photograph C.1.2 – Pigmented Hot Rolled Asphalt
(Black binder + red coated chippings)

Photograph C.1.3 – Pigmented Hot Rolled Asphalt
(Red binder + red coated chippings)
(Preferred option)

Photograph C.1.4 – Pigmented Hot Rolled Asphalt
(Red binder + red coated chippings)
(Coating removed to reveal decorative aggregate)

<table>
<tr><td colspan="6">Gloucestershire Highways - Enhanced palette of materials</td></tr>
<tr><td>MATERIAL</td><td colspan="5">ENHANCED STONE MASTIC ASPHALT (SMA)</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">Modified stone mastic asphalt with either a) pigmentation to provide distinction or b) a clear binder and decorative aggregates to give a ‘natural’ coloured surface.</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Normally used to mark out important boundaries such as bus lanes, cycle lanes, car parks and pedestrian areas.</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">~</td></tr>
<tr><td rowspan="3">PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">Smooth surface offers benefit to pushchairs, wheelchairs and bicycles (in comparison to modular surfaces).
This material offers enhanced resistance to scrubbing effects from modern power steering systems (in comparison to asphalt concrete or macadam surfaces).</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Smooth surface.
Enhanced appearance - available in a range of colours.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">6mm or 10mm nominal sized.
Typical layer thickness:
• 25mm for residential/pedestrian use.
• 30mm for carriageway use.</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">HD 28, HD 36, HD 37 & HD 39 [13,14,15,12].
PSV and AAV.
In high-risk locations an additional surface treatment may be required to provide enhanced skid resistance.</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">Specialist reinstatement required after utility incursions or minor surface repairs.
Maintenance requirements (intervention types and frequencies) will be the same as per ‘Standard’ bituminous option(s) for similar application but the capital cost of the mix components will be more expensive.</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Normally laid by Contractors operating under a licence from supplier. Potential threat to future colour matches if GH’s supply chain changes.</td></tr>
<tr><td>SUSTAINABILITY CONSIDERATIONS</td><td colspan="5">Future availability of natural resources (bitumen and premium aggregates).
High energy requirements to extract, mix, transport and compact.
Additional processes to produce and incorporate pigmentation.
Coloured binders and/or premium aggregate chippings may need to be transported from further afield.
Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.</td></tr>
</table>

Table C.2 – Enhanced Stone Mastic Asphalt data sheet (Enhanced palette)

*Gloucestershire Highways - **Enhanced** palette of materials*

ENHANCED STONE MASTIC ASPHALT (SMA)

Photograph C.2.1 – Red SMA with high PSV aggregate as an alternative to high friction surfacing

Photograph C.2.2 – Red SMA

Photograph C.2.3 – Buff SMA

Photograph C.2.4 – Buff and green SMA

*Gloucestershire Highways - **Enhanced** palette of materials*					
MATERIAL	**EXPOSED GRAVEL**				
TYPE AND FINISH	‘Natural’ gravel appearance in a bound carriageway surface course. Stone mastic asphalt with the binder stripped-off to expose the top surface of the aggregate.				
APPLICATION	Decorative carriageway finish generally used in slow speed areas such as estate roads, cul-de-sacs and car parks.				
APPLICATION RESTRICTIONS	Low texture depth generally renders it unsuitable for high speed locations and/or high traffic volumes.				
PERMITTED BY DISTRICT COUNCIL	✓	Gloucester City	✓	Tewkesbury Borough	District Councils have been asked if they would support the use of this paving material ‘in principle’.
	✓	Cheltenham Borough	✓	Stroud District	
	✓	Forest of Dean District	✓	Cotswold District	
DESIGN CONSIDERATIONS	Normally made from rounded gravel. Angular gravels have been used in circumstances where increased surface texture is required – this has created safety issues for children falling on the surface. This material offers enhanced resistance to scrubbing effects from modern power steering systems (in comparison to asphalt concrete or macadam surfaces).				
AESTHETIC CONSIDERATIONS	Golden gravel decorative finish.				
SIZE CONSIDERATIONS	Nominal stone size 6mm. Typical layer depth 25mm.				
SPECIFICATION	HD 28, HD 36, HD 37 & HD 39 [13,14,15,12]. PSV and AAV. In high-risk locations an additional surface treatment may be required to provide enhanced skid resistance.				
MAINTENANCE REQUIREMENTS	Specialist reinstatement required after utility incursions or minor surface repairs. Maintenance requirements (intervention types and frequencies) will be the same as per ‘Standard’ bituminous option(s) for similar application but the capital cost of the mix components will be more expensive. Laying costs will also increase due to the additional binder removal process.				
SOURCING AND AVAILABILITY	Normally laid by Contractors operating under a licence from patent holder. Potential threat to future aggregate colour matches if GH’s supply chain changes.				
SUSTAINABILITY CONSIDERATIONS	Stripping off the binder surface requires an additional process and can represent a waste of resources (i.e. discarded binder). Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.				

Table C.3 – Exposed Gravel data sheet (Enhanced palette)

*Gloucestershire Highways - **Enhanced** palette of materials*

EXPOSED GRAVEL

Photograph C.3.1 – Before and after the surface binder is removed to expose the gravel

Photograph C.3.2 – Exposed gravel used for delineation

Photograph C.3.3 – Exposed gravel footpath

Photograph C.3.4 – Exposed gravel footpath

*Gloucestershire Highways - **Enhanced** palette of materials*					
MATERIAL	**UNBOUND GRAVEL**				
TYPE AND FINISH	Unbound limestone gravel layer with natural self-setting agent.				
APPLICATION	Footways and tree-pits.				
APPLICATION RESTRICTIONS	Should not be used: • in areas prone to ponding/flooding. • where vehicle/cycle speeds and/or volumes are likely to be high. • in areas where mechanical sweeping is undertaken. • on steep slopes (greater than 1 in 15).				
PERMITTED BY DISTRICT COUNCIL	✓	Gloucester City	✓	Tewkesbury Borough	District Councils have been asked if they would support the use of this paving material 'in principle'.
	✓	Cheltenham Borough	✓	Stroud District	
	✓	Forest of Dean District	✓	Cotswold District	
DESIGN CONSIDERATIONS	Finished levels must ensure effective surface drainage. Use in high stress areas where vehicles are routinely braking and turning can lead to increased scarification of surface.				
AESTHETIC CONSIDERATIONS	Naturalistic finish can complement local surroundings and character.				
SIZE CONSIDERATIONS	Compacted layer thickness: 50mm. Typical grading: 12mm to fines.				
SPECIFICATION	Bespoke design – normally laid on a granular sub-base.				
MAINTENANCE REQUIREMENTS	Low-tech material can be hand or machine laid. The action of weather and traffic scarifies the surface to produce a loose dressing of chippings whilst maintaining a solid underlying layer. If a loose surface finish is not desirable (for aesthetic or safety reasons) then the pavement will need to be hand swept with a soft broom on a regular basis. Sweeping requirements may be onerous especially in areas receiving substantial leaf-fall. Weed growth is more likely to occur on this type of surface as compared to a bound material. "Resurfacing" requires the upper 25mm of material to be scarified and removed before fresh material is laid. Capital cost of material is very high. Commuted sum to be calculated on the basis of the additional maintenance cost in comparison to a standard bituminous surface.				
SOURCING AND AVAILABILITY	Leading quarry supplier is located in Derbyshire and so transportation is a factor to consider. Stockpile of material would be required for regular minor maintenance (pot-holes) and topping-up (around tree pits). Stockpile would need to be covered to prevent the Marl fines from being washed away by rain. Long-term availability of a finite natural resource requires consideration in the context of a commuted sum period of 60 years.				
SUSTAINABILITY CONSIDERATIONS	Natural material with comparatively low carbon footprint. Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC's corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.				

Table C.4 – Unbound Gravel data sheet (Enhanced palette)

*Gloucestershire Highways - **Enhanced** palette of materials*
UNBOUND GRAVEL

Photograph C.4.1 – Unbound gravel before rolling

Photograph C.4.2 – Unbound gravel tree pit surround

Photograph C.4.3 – Unbound gravel footpath

Photograph C.4.4 – Unbound gravel footpath

<table>
<tr><th colspan="6">Gloucestershire Highways - Enhanced palette of materials</th></tr>
<tr><td>MATERIAL</td><td colspan="5">NATURAL STONE SLABS (Table C.5)</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">Sandstone and Yorkstone (only) natural paving products in various sizes with various surface finishes.
Reconstituted/Reconstructed/Cast stone products may be permitted if they satisfy the criteria provided below.
Granite paving slabs are not permitted. This policy decision reflects the susceptibility of paving slabs to breakage in service and the unsustainable requirement to import granite replacements that may or may not provide an adequate future match.</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Pedestrian footways, precincts or lightly trafficked areas.</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">Pavements designed for regular heavy vehicle trafficking shall be constructed on a bound base.
Footways which are vulnerable to heavy vehicle overrun shall either be protected by physical obstructions or else designed as heavy duty pavements incorporating a bound base.
Slabs are not recommended on pavements that are to be subject to dynamic impact loading (such as traffic calming or barrel deliveries). High point loads (such as those imparted by outriggers on access platforms used for maintaining street lighting) can also cause localised failures if the base is not adequately designed.
In built-up areas that are to be subject to mechanical sweeping, the jointing material can become dislodged.
Laying patterns should be designed with regard to the type and flow of traffic.</td></tr>
<tr><td rowspan="3">PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">HD 28 [13]. Structural design is covered by BS 7533-8 and 12 [31,33].
The use of natural stone paving on the immediate approach to designated pedestrian crossings (or other areas with a high skid resistance investigatory level as defined within HD28) should be avoided unless low speeds are guaranteed.
Recommended minimum slip/skid resistance measured in accordance with BS 7932 [34]:
• For pedestrian use: 40 • For slow-moving vehicle use: 45
Intermediate restraints to be incorporated on steep slopes.
Abrasion resistance to be determined in accordance with BS EN 1341 and BS EN 1339 [19].</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Colour palette is limited to natural sandstone, natural yorkstone, buff and Cotswold.
Natural stone paving offers enhanced visual effect that can be more sympathetic to local surroundings.
Aesthetic issues can occur if small areas of slabs are replaced in the future from an inconsistent supply source.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">Stone slabs are defined as having a working width exceeding 150mm (and this generally exceeds two times the thickness).
With large sized slabs there is usually a requirement to increase the thickness to prevent damage/breakage during handling on site.</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">HRD/MfGS[2,3] and SHW [16] Cl. 1104.
Requirements and test methods: BS EN 1341 [21].
The Specification for Reconstituted/Reconstructed/Cast stone is provided by BS 1217. [17]
Code of Practice for laying: BS7533-4 [28].</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">It is recommended that the surfaces of natural stone products are protected by a regularly applied surface coating.
Retexturing and joint sealant replacement on a periodic basis.
Commuted sum to be calculated on the basis of the additional maintenance costs in comparison to a concrete flagged surface.</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Many natural stone products (esp. granite) are sourced from overseas. This is not consistent with GCC’s sustainability agenda. It also complicates the sourcing of replacement materials for future maintenance.
Maintenance costs are increased because, to undertake minor repairs, it is normally necessary to buy a full pallet of paving products for a particular site. (This is not an issue for materials from GCC’s Standard palette because those materials are in constant use across the county and so are invariably available in small quantities from other sites or stores)</td></tr>
</table>

SUSTAINABILITY CONSIDERATIONS	Use of standardised units supports local recycling agenda. Correctly specified natural stone products are extremely durable. Dimensional tolerances of natural stone products are greater than concrete alternatives. This can lead to increased wastage and wider surface joints (which require more filling). Performance characteristics of natural stone products are also more variable. The environmental impact of importing natural stone products is high. Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC's corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.

*Gloucestershire Highways - **Enhanced** palette of materials*

NATURAL STONE SLABS

Photograph C.5.1 – Yorkstone slabs

Photograph C.5.2 – Yorkstone slabs

Photograph C.5.3 – Sandstone Slabs

Photograph C.5.4 – Sandstone Slabs

<table>
<tr><td colspan="6">Gloucestershire Highways - Enhanced palette of materials</td></tr>
<tr><td>MATERIAL</td><td colspan="5">NATURAL STONE SETTS (Table C.6)</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">Sandstone, Yorkstone and Granite natural paving products in various sizes with various surface finishes.
Reconstituted/Reconstructed/Cast stone products may be permitted if they satisfy the criteria provided below.</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Pedestrian footways, precincts or lightly trafficked areas</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">Sett sizes and pavement construction are governed by the traffic categories defined in BS 7533-10 [32]
Notwithstanding the provisions of BS 7533 - the use of setts as decorative over-run areas is not permitted.
In noise sensitive locations the ‘rumble’ effect from tyres passing over the jointing can be a source of nuisance.
The use of setts on ramps to traffic calming features is not recommended.</td></tr>
<tr><td>PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td></td><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td></td><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">Structural design: BS 7533–10 [32].
Trafficked setts are to be constructed on a bound base.
The use of natural stone paving on the immediate approach to designated pedestrian crossings (or other areas with a high skid resistance investigatory level as defined within HD 28) should be avoided unless low speeds are guaranteed.
The use of wide surfacing joints in pedestrian areas hampers mobility impaired users.</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Colour palette is limited to natural sandstone, natural yorkstone, natural granite, buff and Cotswold.
Natural stone paving offers enhanced visual effect that can be more sympathetic to local surroundings.
Aesthetic issues can occur if small areas of setts are replaced in the future from an inconsistent supply source.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">By definition, a sett is less than 300mm x 300mm in plan dimension.
Actual dimensions are governed by predicted traffic loading in BS 7533-10 [32].
Only BS standard size categories shall be used in Gloucestershire. This simplifies future replacement whilst also enabling potential recycling on other sites.</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">Requirements and test methods: BS EN 1342 [22].
Code of practice for construction: BS 7533–7 [30].
Surface finish for trafficked granite setts shall be ‘fine-picked’.</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">It is recommended that the surfaces of natural stone products are protected by a regularly applied surface coating.
Retexturing and joint sealant replacement on a periodic basis.
Commuted sum to be calculated on the basis of the additional maintenance costs in comparison to a concrete block paving surface.</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Many natural stone products (esp. granite) are sourced from overseas. This is not consistent with GCC’s sustainability agenda. It also complicates the sourcing of replacement materials for future maintenance.
Maintenance costs are increased because, to undertake minor repairs, it is normally necessary to buy a full pallet of paving products for a particular site. (This is not an issue for materials from GCC’s Standard palette because those materials are in constant use across the county and so are invariably available in small quantities from other sites or stores)</td></tr>
<tr><td>SUSTAINABILITY CONSIDERATIONS</td><td colspan="5">Correctly specified natural stone products are extremely durable.
Use of standardised units supports local recycling agenda.
Dimensional tolerances of natural stone products are greater than concrete alternatives. This can lead to increased wastage and wider surface joints (which require more filling).
Performance characteristics of natural stone products are also more variable.
The environmental impact of importing natural stone products is high.
Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.</td></tr>
</table>

*Gloucestershire Highways - **Enhanced** palette of materials*

NATURAL STONE SETTS

Photograph C.6.1 – Granite setts

Photograph C.6.2 – Granite setts

Photograph C.6.2 – Sandstone setts

Photograph C.6.4 – Yorkstone setts

*Gloucestershire Highways - **Enhanced** palette of materials*					
MATERIAL	**RESIN BONDED**				
TYPE AND FINISH	Cold applied polyurethane/epoxy resin surface dressing used for bonding specially selected aggregates to bituminous or concrete surfaces.				
APPLICATION	Carriageway or footway surface course with a gravel-like surface and increased skid resistance.				
APPLICATION RESTRICTIONS	On sites with extensive ironworks – where the requirement to cut a 'key' and 'feather' the surfacing can be time consuming and/or problematic. Not recommended for heavily trafficked sites or high-stress areas.				
PERMITTED BY DISTRICT COUNCIL	✓	Gloucester City	✓	Tewkesbury Borough	District Councils have been asked if they would support the use of this paving material 'in principle'.
	✓	Cheltenham Borough	✓	Stroud District	
	✓	Forest of Dean District	✓	Cotswold District	
DESIGN CONSIDERATIONS	Designed as a surface 'veneer' with no structural strength contribution. HD 28, HD 36, HD 37 & HD 39 [13,14,15,12]. PSV and AAV. In high-risk locations an alternative surface treatment may be required to provide enhanced skid resistance.				
AESTHETIC CONSIDERATIONS	Resin bonded surface dressing can be used with a wide range of both natural and pigmented aggregates for both decorative and slip resistant dressings.				
SIZE CONSIDERATIONS	Minimum layer thickness: 6mm.				
SPECIFICATION	~				
MAINTENANCE REQUIREMENTS	Specialist reinstatement required after utility incursions or minor surface repairs. Commuted sum to be calculated on the basis of the maintenance costs in comparison to a conventional bituminous surfacing. Some systems require the application of a finishing seal coat – this should be factored into future maintenance costs.				
SOURCING AND AVAILABILITY	Can only be laid by licensed contractors. Potential threat to future colour and pattern matches if GH's supply chain changes.				
SUSTAINABILITY CONSIDERATIONS	Future availability of natural resources (aggregates). Technologies exist for recycling bituminous surface courses when they have reached the end of their design lives. Recycling resin bound materials is not currently undertaken and so the decorative aggregates would require disposal. Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC's corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.				

Table C.7 – Resin Bonded data sheet (Enhanced palette)

*Gloucestershire Highways - **Enhanced** palette of materials* **RESIN BONDED**	
	
Photograph C.7.1 – Resin bonded close-up	Photograph C.7.2 – Resin Bonded (with granite entry treatment)
	
Photograph C.7.3 – Resin bonded access	Photograph C.7.4 – Resin bonded footpath

*Gloucestershire Highways - **Enhanced** palette of materials*					
MATERIAL	**RESIN BOUND**				
TYPE AND FINISH	Graded aggregates bound with a clear polyurethane resin binder (rather than bituminous) which allows the decorative aggregate appearance to show through.				
APPLICATION	Decorative carriageway or footway surface course material. Also used for tree pits (porous design required).				
APPLICATION RESTRICTIONS	Not recommended for heavily trafficked sites or high-stress areas. Edge restraint is required – unsuitable for free-edge sites. Because the product is hand-finished it can be difficult to achieve good ride quality when used on large sites.				
PERMITTED BY DISTRICT COUNCIL	✓	Gloucester City	✓	Tewkesbury Borough	District Councils have been asked if they would support the use of this paving material 'in principle'.
	✓	Cheltenham Borough	✓	Stroud District	
	✓	Forest of Dean District	✓	Cotswold District	
DESIGN CONSIDERATIONS	Designed as a surface 'veneer' with no structural strength contribution. HD 28, HD 36, HD 37 & HD 39 [13,14,15,12]. PSV and AAV. In high-risk locations an alternative surface treatment may be required to provide enhanced skid resistance.				
AESTHETIC CONSIDERATIONS	Wide range of available finishes.				
SIZE CONSIDERATIONS	Minimum thickness: 10 – 15mm. Nominal size aggregate varies between 6mm and 14mm.				
SPECIFICATION	~				
MAINTENANCE REQUIREMENTS	Cold mixing and laying processes eliminate health and safety risks from traditional hot bituminous applications. However, handling resins poses new health and safety risks. Finished surface is 'floated' rather than rolled. Mixing and placing requires skilled operatives. Specialist reinstatement required after utility incursions or minor surface repairs. Commuted sum to be calculated on the basis of the additional maintenance costs in comparison to a conventional bituminous surfacing.				
SOURCING AND AVAILABILITY	Can only be laid by licensed contractors. Potential threat to future colour and pattern matches if GH's supply chain changes.				
SUSTAINABILITY CONSIDERATIONS	Future availability of natural resources (aggregates). Technologies exist for recycling bituminous surface courses when they have reached the end of their design lives. Recycling resin bound materials is not currently undertaken and so the decorative aggregates would require disposal. Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC's corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.				

Table C.8 – Resin Bound data sheet (Enhanced palette)

*Gloucestershire Highways - **Enhanced** palette of materials*

RESIN BOUND

Photograph C.8.1 – Resin bound close-up

Photograph C.8.2 – Resin bound access

Photograph C.8.3 – Resin bound access

Photograph C.8.4 – Resin bound tree pit surround

<table>
<tr><td colspan="6">Gloucestershire Highways - Enhanced palette of materials</td></tr>
<tr><td>MATERIAL</td><td colspan="5">CLAY PAVERS</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">‘Standard’ 100-105mm x 200-215mm bricks in red/brown/blue/buff colour with a common machine-made surface texture (i.e. smooth, sand-moulded or drag-face).</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Carriageway or footway surfaces in the following categories:
• Lightly trafficked areas such as cul-de-sacs, car parks, precincts, lightly trafficked roads and paved areas.
• Heavy duty pavements trafficked by the usual broad spectrum of axle loads (up to 12msa).</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">For pedestrian applications the clay bricks should be square edged (not chamfered).
Not permitted in areas subject to severe braking or turning.
Not permitted in situations where sustained heavy rainfall combined with steep gradients can lead to displacement of the laying course sand – resulting in surface undulations.
Not permitted in specialised industrial areas.
Clay pavers have a tendency to be slippery when wet. Therefore, they should not be used in locations where slip/skid resistance is a concern.</td></tr>
<tr><td>PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td></td><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td></td><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">Structural design: BS 7533-1 and 2 [25 & 26]. HD 28 [13].
A minimum polished paver value (PPV) of 45 should be specified for general use. All clay pavers must have a surface finish in order to achieve the required PPV.</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Trafficked clay bricks should be laid in a herringbone pattern to minimise creep and ensure better distribution of imposed wheel loads.
Basket weave and running bond patterns should only be used in pedestrian areas.
Clay bricks with decorative shapes and textures (incl. patterned, tumbled and hand-made) or alternative colours would be regarded as ‘Enhanced Materials’.
Pavers are made from clay from different areas of the country.
Local clays give distinctive colours to the pavers.
The use of monotone coloured clay pavers in areas prone to surface staining is not recommended. Staining will appear less prominent on multicoloured pavers.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">Minimum 80mm thick.</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">SHW [16] Cl. 1108. BS 6677-1 [24].
Code of practice for laying: 7533–3 [27].
HRD/MfGS [2,3].</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">Imperfect nature of clay pavers can lead to wider joints – from which the jointing sand can be scoured by surface water or mechanical sweeping. The sand jointing material needs to be stabilized with a surface-applied elastomeric sealer.
Expected design life is 40 years.</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Clay is a natural raw material available (locally within the UK) in abundance.</td></tr>
<tr><td>SUSTAINABILITY CONSIDERATIONS</td><td colspan="5">Highly durable material:
• colours are natural and will not fade.
• superior abrasion resistance in comparison to concrete blocks.
Kiln production has environmental impacts.
Dimensional accuracy is inferior to concrete products and usually requires more jointing sand.
Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.</td></tr>
</table>

Table C.9 **– Clay Pavers data sheet (Enhanced palette)**

*Gloucestershire Highways - **Enhanced** palette of materials*

CLAY PAVERS

Photograph C.9.1 – Clay pavers

Photograph C.9.2 – Clay pavers

Photograph C.9.3 – Clay pavers

Photograph C.9.4 – Clay pavers

<table>
<tr><td colspan="6">Gloucestershire Highways - Enhanced palette of materials</td></tr>
<tr><td>MATERIAL</td><td colspan="5">NATURAL STONE OR STONE REPRODUCTION KERBS (Table C.7)</td></tr>
<tr><td>TYPE AND FINISH</td><td colspan="5">NATURAL STONE - Sandstone, Yorkstone and Granite products in various sizes. Finishes vary as follows:
• Sandstone = shot-blasted
• Yorkstone = diamond sawn
• Granite = Fine picked for trafficked applications. Fine picked/flame textured for pedestrian applications.
STONE REPRODUCTION - Manufactured products incorporating recycled natural aggregate materials. The surface finish is produced by a shot blasting process to give an exposed aggregate finish and enhanced surface texture. These are sometimes referred to as ‘Conservation’ kerbs. This is a trade name. Other products are available.</td></tr>
<tr><td>APPLICATION</td><td colspan="5">Provision of edge restraint in pedestrian and vehicular applications.</td></tr>
<tr><td>APPLICATION RESTRICTIONS</td><td colspan="5">Natural stone must be free from vents, cracks, fissures or defects which may adversely affect strength or durability.
Where kerbs are likely to be subjected to regular heavy traffic (e.g. on approaches to traffic calming ramps) kerbs should be cut to a length of 300mm.
Natural stone kerb units must not be cut to less than one third of their original length and, in no case, should they be cut to less than 50mm.
Manual Handling Operations Regulations [9] provide restrictions for installation methods. Reference should be made to HSE Construction Information Sheet No. 57 [10] for further advice.</td></tr>
<tr><td rowspan="3">PERMITTED BY DISTRICT COUNCIL</td><td>✓</td><td>Gloucester City</td><td>✓</td><td>Tewkesbury Borough</td><td rowspan="3">District Councils have been asked if they would support the use of this paving material ‘in principle’.</td></tr>
<tr><td>✓</td><td>Cheltenham Borough</td><td>✓</td><td>Stroud District</td></tr>
<tr><td>✓</td><td>Forest of Dean District</td><td>✓</td><td>Cotswold District</td></tr>
<tr><td>DESIGN CONSIDERATIONS</td><td colspan="5">Adequate freeze/thaw resistance, flexural/bending strength, abrasion resistance and water absorption characteristics: BS EN 1340 [20] or BS EN 1343 [23].
See Precast Concrete Kerb data sheet for required upstands.</td></tr>
<tr><td>AESTHETIC CONSIDERATIONS</td><td colspan="5">Natural stone (or stone reproduction) products offer enhanced visual effect that can be more sympathetic to local surroundings.</td></tr>
<tr><td>SIZE CONSIDERATIONS</td><td colspan="5">Sizes vary but these kerbs are normally wider and squarer (in profile) than the ‘British Standard’ alternatives.
Typical length = 1.0m.
For natural stone kerbs, the front leading edge of the kerb must be rounded to a radius of 10mm.</td></tr>
<tr><td>SPECIFICATION</td><td colspan="5">• Product: BS EN 1343 [23] or BS EN 1340 [20].
• Code of practice for laying: BS 7533–6 [29].
• Concrete bed and backing: BS 8500-2 [35].
• The specification for reproduction (‘cast’) stone is provided by BS 1217 [17].
• SHW [16] Cl. 1101.
• Vertical faces in contact with pavement construction require application of bond coat/tack coat: SHW [16] Cl. 920 and BS 594987 [37].
• The developer’s/contractor’s proposals for protecting the kerbs during surfacing works must be agreed with GCC in advance.</td></tr>
<tr><td>MAINTENANCE REQUIREMENTS</td><td colspan="5">The surface of natural stone products is protected by a regularly applied surface coating.
Over-ridden or pedestrianised kerbs will require retexturing on a periodic basis.
Commuted sum to be calculated on the basis of the additional maintenance costs in comparison to a standard pre-cast concrete kerb (see Table A.7).</td></tr>
<tr><td>SOURCING AND AVAILABILITY</td><td colspan="5">Many natural stone products (esp. granite) are sourced from overseas. This is not consistent with GCC’s sustainability agenda. It also complicates the sourcing of replacement materials for future maintenance.
Maintenance costs are increased because, to undertake minor repairs, it is normally necessary to buy a full pallet of paving products for a particular site. (This is not an issue for materials from GCC’s Standard palette because those materials are in constant use across the county and so are invariably available in small quantities from other sites or stores).</td></tr>
<tr><td>SUSTAINABILITY CONSIDERATIONS</td><td colspan="5">Stone reproduction products utilise recycled materials.
Correctly specified natural stone products are extremely durable.
Use of standardised units supports local recycling agenda.
Dimensional tolerances of natural stone products are greater than concrete alternatives. This can lead to increased wastage and wider joints (which require more filling).
Performance characteristics of natural stone products are also more variable.
The environmental impact of importing natural stone products is high.
Suppliers and contractors must demonstrate credentials and behaviours that align with and support GCC’s corporate objectives in areas such as sustainability, energy, climate change, environmental management, ethical sourcing, corporate social responsibility and communities.</td></tr>
</table>

*Gloucestershire Highways - **Enhanced** palette of materials*

NATURAL STONE OR STONE REPRODUCTION KERBS

Photograph C.10.1 – Granite kerbs

Photograph C.10.2 – Stone reproduction kerb ('Conservation')

Photograph C.10.3 – Sandstone kerbs (Pennant)

Photograph C.10.4 – Stone reproduction kerb ('K-Lite traditional')

Appendix C:

Estimated periodic maintenance costs for standard and enhanced materials.

Estimating periodic maintenance costs

HRA, Close Graded and Dense Ashpalts
Expected design life 20 years

Lifecycle plan for estimating periodic maintenance costs per 1000m²
1 pothole or other minor maintenance repair per year for the 1st 6 years
2 pothole or other minor maintenance repair per year for years 7 to 13
1 patch and surface dressing treatment in year 13
1 pothole or other minor maintenance repair per year for years 13 to 20
Resurface or redress in year 20

Pothole or minor maintenance repair costs

5.95	Cost of material (1m² of asphalt)
24.61	Labour cost (2 men 1 hour)
4.40	Consumables
1.70	Traffic Management (average cost)
7.18	Plant
8.45	Uplift for overheads (20%)
£52.29	**Total**

Estimated Surface dressing costs per m²

£2.75	Double Dressed/Heavy Duty/10 & 6
£2.51	Racked in dressing/Heavy Duty/10 & 6
£2.31	Racked in dressing/Medium Duty/10 & 6
£1.57	Racked in dressing/Medium Duty/8
£1.90	Single Dressing/Medium Duty/8
£2.10	Double Dressed/Medium Duty/6 & 6
£1.86	Single Dressing/Medium Duty/6
£2.26	Double Dressed/Medium Duty/8 & 8

Estimated Resurfacing Cost per m²

£15.00	Plane off 40mm and relay 40mm surface course (Based on average cost of £13-£17 m²)

Text for Surface Dressing
The rates in this section are extracted for Kiely target prices for surface dressing programme for the 2010/11 season.
Rates are based on the resources required for each site divided by the area, hence the variation of rate for each site.
Rates include for labour, plant, materials, sweeping, TM, and risk, but do not include for road marks
Rates will vary year on year depending on the programme for that year e.g. Principal roads with large areas of dressing result in greater daily outputs and hence slightly lower prices.
The 'Actual Cost' for Kiely to date has shown a consistent small saving on target price.

Year	Cost		Year	Cost
1	52.29		21	15000
2	52.29		22	52.29
3	52.29		23	52.29
4	52.29		24	52.29
5	52.29		25	52.29
6	52.29		26	52.29
7	104.58		27	104.58
8	104.58		28	104.58
9	104.58		29	104.58
10	104.58		30	104.58
11	104.58		31	104.58
12	104.58		32	104.58
13	2750		33	2750
14	52.29		34	52.29
15	52.29		35	52.29
16	52.29		36	52.29
17	52.29		37	52.29
18	52.29		38	52.29
19	52.29		39	52.29
20	52.29		40	52.29
	£4,057.25			**£19,004.96**

Total	**£23,062.21**

Estimating periodic maintenance costs

Precast concrete flags - used in footway or pedestrianised areas (little or no vehicle traffic)
Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m²
1 minor repair based on replacement of 1sqm of flags per year for years 1 to 20
Replacement of 10% of total surface in year 15
2 minor repairs based on replacement of 1sqm of flags at each visit per year for years 21 to 40
Replacement of 10% of total surface in year 30

Minor repair/replacement of 1m² of flag

9.30	Cost of material (1sqm of flag)
49.22	Labour cost (2 men 2 hours)
8.80	Consumables
3.40	Traffic Management (average cost)
14.36	Plant
16.65	Uplift for overheads (20%)
£101.73	**Total**

Estimated cost of replacement of 20% of surface

200.00	Design and coordination
1860.00	Material
4922.00	Labour
340.00	TM (average cost)
1438.24	Plant
859.60	Supervision
1923.97	Uplift (20%)
11543.81	Total cost
£115.44	**Cost per m²**

Year	Cost		Year	Cost
1	101.73		21	203.46
2	101.73		22	203.46
3	101.73		23	203.46
4	101.73		24	203.46
5	101.73		25	203.46
6	101.73		26	203.46
7	101.73		27	203.46
8	101.73		28	203.46
9	101.73		29	203.46
10	101.73		30	11543.81
11	101.73		31	203.46
12	101.73		32	203.46
13	101.73		33	203.46
14	101.73		34	203.46
15	11543.81		35	203.46
16	101.73		36	203.46
17	101.73		37	203.46
18	101.73		38	203.46
19	101.73		39	203.46
20	101.73		40	203.46
	£13,476.68			**£15,409.55**

Total	**£28,886.23**

Estimating periodic maintenance costs

Precast concrete blocks - footway and pedestrian areas little or no vehicle traffic
Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m²
1 minor repair based on replacement of 1sqm of blocks per year for years 1 to 19
Replacement of 10% of total surface in year 15
2 minor repairs based on replacement of 1sqm of blocks at each visit per year for years 21 to 39
Replacement of 10% of total surface in year 30

Minor repair/replacement of 1m² of flag

10.00	Cost of material (1m² of blocks)
49.22	Labour cost (2 men 2 hours)
8.80	Consumables
3.40	Traffic Management (average cost)
14.36	Plant
17.16	Uplift for overheads (20%)
£102.94	**Total**

Estimated cost of replacement of 20% of surface

200.00	Design and coordination
2000.00	Material
4922.00	Labour
340.00	TM (average cost)
1438.24	Plant
859.60	Supervision
1951.97	Uplift (20%)
11711.81	Total cost (for 100m²)
£117.12	**Cost per m²**

Year	Cost		Year	Cost
1	102.94		21	205.88
2	102.94		22	205.88
3	102.94		23	205.88
4	102.94		24	205.88
5	102.94		25	205.88
6	102.94		26	205.88
7	102.94		27	205.88
8	102.94		28	205.88
9	102.94		29	205.88
10	102.94		30	11711.81
11	102.94		31	205.88
12	102.94		32	205.88
13	102.94		33	205.88
14	102.94		34	205.88
15	11711.81		35	205.88
16	102.94		36	205.88
17	102.94		37	205.88
18	102.94		38	205.88
19	102.94		39	205.88
20	102.94		40	205.88
	£13,667.67			**£15,623.53**

Total	**£29,291.20**

Estimating periodic maintenance costs

Pigmented HRA (coloured chippings)
Expected design life 20 years (40 year costs shown for comparison)

Lifecycle plan for estimating periodic maintenance costs per 1000m²
1 pothole or other minor maintenance repair per year for the 1st 6 years
2 pothole or other minor maintenance repair per year for years 7 to 20
Resurface or redress in year 20

Pothole or minor maintenance repair costs

20.00	Cost of material (1m² of asphalt)
24.61	Labour cost (2 men 1 hour)
4.40	Consumables
1.70	Traffic Management (average cost)
7.18	Plant
8.45	Uplift for overheads (20%)
£66.34	**Total**

Estimated Resurfacing Cost per m²

£30.00	Plane off 40mm and relay 40mm surface course

Year	Cost		Year	Cost
1	66.34		21	66.34
2	66.34		22	66.34
3	66.34		23	66.34
4	66.34		24	66.34
5	66.34		25	66.34
6	66.34		26	66.34
7	132.68		27	132.68
8	132.68		28	132.68
9	132.68		29	132.68
10	132.68		30	132.68
11	132.68		31	132.68
12	132.68		32	132.68
13	132.68		33	132.68
14	132.68		34	132.68
15	132.68		35	132.68
16	132.68		36	132.68
17	132.68		37	132.68
18	132.68		38	132.68
19	132.68		39	132.68
20	30000		40	132.68
	£32,056.54			**£2,255.56**

Total	**£34,312.10**

Estimating periodic maintenance costs

Pigmented SMA

Expected design life 20 years (40 year costs shown for comparison)

Lifecycle plan for estimating periodic maintenance costs per 1000m²

1 pothole or other minor maintenance repair per year for the 1st 6 years
2 pothole or other minor maintenance repair per year for years 7 to 20
Resurface or redress in year 20

Pothole or minor maintenance repair costs

30.00	Cost of material (1m² of asphalt)
24.61	Labour cost (2 men 1 hour)
4.40	Consumables
1.70	Traffic Management (average cost)
7.18	Plant
8.45	Uplift for overheads (20%)
£76.34	**Total**

Estimated Resurfacing Cost per m²

£35.00	Plane off 40mm and relay 40mm surface course

Year	Cost		Year	Cost
1	76.34		21	76.34
2	76.34		22	76.34
3	76.34		23	76.34
4	76.34		24	76.34
5	76.34		25	76.34
6	76.34		26	76.34
7	152.68		27	152.68
8	152.68		28	152.68
9	152.68		29	152.68
10	152.68		30	152.68
11	152.68		31	152.68
12	152.68		32	152.68
13	152.68		33	152.68
14	152.68		34	152.68
15	152.68		35	152.68
16	152.68		36	152.68
17	152.68		37	152.68
18	152.68		38	152.68
19	152.68		39	152.68
20	35000		40	152.68
	£37,442.88			**£2,595.56**

Total	**£40,038.44**

Estimating periodic maintenance costs

Exposed Gravel - Bitmac

Expected design life 20 years (40 year costs shown for comparison)

Lifecycle plan for estimating periodic maintenance costs per 1000m²

1 pothole or other minor maintenance repair per year for the 1st 6 years
2 pothole or other minor maintenance repair per year for years 7 to 20
Resurface or redress in year 20

Pothole or minor maintenance repair costs

25.00	Cost of material (1sqm of asphalt)
24.61	Labour cost (2 men 1 hour)
4.40	Consumables
1.70	Traffic Management (average cost)
7.18	Plant
8.45	Uplift for overheads (20%)
£71.34	**Total**

Estimated Resurfacing Cost per m²

£35.00	Plane off 40mm and relay 40mm surface course

Year	Cost		Year	Cost
1	71.34		21	71.34
2	71.34		22	71.34
3	71.34		23	71.34
4	71.34		24	71.34
5	71.34		25	71.34
6	71.34		26	71.34
7	142.68		27	142.68
8	142.68		28	142.68
9	142.68		29	142.68
10	142.68		30	142.68
11	142.68		31	142.68
12	142.68		32	142.68
13	142.68		33	142.68
14	142.68		34	142.68
15	142.68		35	142.68
16	142.68		36	142.68
17	142.68		37	142.68
18	142.68		38	142.68
19	142.68		39	142.68
20	35000		40	142.68
	£37,282.88			**£2,425.56**

Total	**£39,708.44**

Estimating periodic maintenance costs

Unbound gravel

Expected design life 10 years (40 year costs shown for comparison)

Lifecycle plan for estimating periodic maintenance costs per 1000m²

2 pothole or other minor maintenance repair per year

Scarify surface and relay every 10 years

Pothole or minor maintenance repair costs

12.50	Cost of material (1m² of gravel, 100mm deep)
24.61	Labour cost (2 men 1 hour)
4.40	Consumables
7.18	Plant
8.45	Uplift for overheads (20%)
£57.14	**Total**

Estimated cost of replacement of 50% of surface

200.00	Design and coordination
6250.00	Material
2461.00	Labour
719.12	Plant
429.80	Supervision
2011.98	Uplift (20%)
12071.90	Total cost
£120.72	**Cost per m²**

Year	Cost		Year	Cost
1	57.14		21	57.14
2	57.14		22	57.14
3	57.14		23	57.14
4	57.14		24	57.14
5	57.14		25	57.14
6	57.14		26	57.14
7	57.14		27	57.14
8	57.14		28	57.14
9	57.14		29	57.14
10	12071.9		30	12071.9
11	57.14		31	57.14
12	57.14		32	57.14
13	57.14		33	57.14
14	57.14		34	57.14
15	57.14		35	57.14
16	57.14		36	57.14
17	57.14		37	57.14
18	57.14		38	57.14
19	57.14		39	57.14
20	12071.9		40	57.14
	£25,172.32			**£13,157.56**

Total	**£38,329.88**

Estimating periodic maintenance costs

Natural stone flags - used in footway or pedestrianised areas (little or no vehicle traffic)
Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m²
1 minor repair based on replacement of 1m² of flags per year for years 1 to 19
Replacement of 10% of total surface in year 15
2 minor repairs based on replacement of 1sqm of flags at each visit per year for years 21 to 39
Replacement of 10% of total surface in year 30

Minor repair/replacement of 1m² of flag

73.85	Cost of material (1sqm of flag)
49.22	Labour cost (2 men 2 hours)
8.80	Consumables
3.40	Traffic Management (average cost)
14.36	Plant
16.65	Uplift for overheads (20%)
£166.28	**Total**

Estimated cost of replacement of 20% of surface

200.00	Design and coordination
14770.00	Material
4922.00	Labour
340.00	TM (average cost)
1438.24	Plant
859.60	Supervision
4505.97	Uplift (20%)
27035.81	Total cost
£270.36	**Cost per m²**

Year	Cost		Year	Cost
1	166.28		21	332.56
2	166.28		22	332.56
3	166.28		23	332.56
4	166.28		24	332.56
5	166.28		25	332.56
6	166.28		26	332.56
7	166.28		27	332.56
8	166.28		28	332.56
9	166.28		29	332.56
10	166.28		30	27035.81
11	166.28		31	332.56
12	166.28		32	332.56
13	166.28		33	332.56
14	166.28		34	332.56
15	27035.81		35	332.56
16	166.28		36	332.56
17	166.28		37	332.56
18	166.28		38	332.56
19	166.28		39	332.56
20	166.28		40	332.56
	£30,028.85			**£33,354.45**

Total	**£63,383.30**

Estimating periodic maintenance costs

Natural stone setts - footway and pedestrian areas little or no vehicle traffic
Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m²
1 minor repair based on replacement of 1sqm of blocks per year for years 1 to 20
Replacement of 10% of total surface in year 15
2 minor repairs based on replacement of 1sqm of blocks at each visit per year for years 21 to 40
Replacement of 10% of total surface in year 30

Minor repair/replacement of 1m² of setts

80.79	Cost of material (1m² of setts)
49.22	Labour cost (2 men 2 hours)
8.80	Consumables
3.40	Traffic Management (average cost)
14.36	Plant
31.31	Uplift for overheads (20%)
£187.88	**Total**

Estimated cost of replacement of 20% of surface

200.00	Design and coordination
16158.00	Material
4922.00	Labour
340.00	TM (average cost)
1438.24	Plant
859.60	Supervision
4783.57	Uplift (20%)
28701.41	Total cost (for 100m²)
£287.01	**Cost per m²**

Year	Cost		Year	Cost
1	187.88		21	375.76
2	187.88		22	375.76
3	187.88		23	375.76
4	187.88		24	375.76
5	187.88		25	375.76
6	187.88		26	375.76
7	187.88		27	375.76
8	187.88		28	375.76
9	187.88		29	375.76
10	187.88		30	28701.41
11	187.88		31	375.76
12	187.88		32	375.76
13	187.88		33	375.76
14	187.88		34	375.76
15	28701.41		35	375.76
16	187.88		36	375.76
17	187.88		37	375.76
18	187.88		38	375.76
19	187.88		39	375.76
20	187.88		40	375.76
	£32,271.13			**£35,840.85**

Total	**£68,111.98**

Estimating periodic maintenance costs

Recon stone setts - footway and pedestrian areas little or no vehicle traffic
Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m²
1 minor repair based on replacement of 1sqm of blocks per year for years 1 to 20
Replacement of 10% of total surface in year 15
2 minor repairs based on replacement of 1sqm of blocks at each visit per year for years 21 to 40
Replacement of 10% of total surface in year 30

Minor repair/replacement of 1m² of setts

11.08	Cost of material (1sqm of setts)
49.22	Labour cost (2 men 2 hours)
8.80	Consumables
3.40	Traffic Management (average cost)
14.36	Plant
17.37	Uplift for overheads (20%)
£104.23	**Total**

Estimated cost of replacement of 20% of surface

200.00	Design and coordination
2216.00	Material
4922.00	Labour
340.00	TM (average cost)
1438.24	Plant
859.60	Supervision
1995.17	Uplift (20%)
11971.01	Total cost (for 100m²)
£119.71	**Cost per m²**

Year	Cost		Year	Cost
1	104.23		21	208.46
2	104.23		22	208.46
3	104.23		23	208.46
4	104.23		24	208.46
5	104.23		25	208.46
6	104.23		26	208.46
7	104.23		27	208.46
8	104.23		28	208.46
9	104.23		29	208.46
10	104.23		30	11971.01
11	104.23		31	208.46
12	104.23		32	208.46
13	104.23		33	208.46
14	104.23		34	208.46
15	11971.01		35	208.46
16	104.23		36	208.46
17	104.23		37	208.46
18	104.23		38	208.46
19	104.23		39	208.46
20	104.23		40	208.46
	£13,951.38			**£15,931.75**

Total	**£29,883.13**

Estimating periodic maintenance costs

Clay Pavers

Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m²

1 minor repair based on replacement of 1sqm of pavers per year for years 1 to 19
Replacement of 10% of total surface in year 15
2 minor repairs based on replacement of 1sqm of pavers at each visit per year for years 21 to 39
Replacement of 10% of total surface in year 30

Minor repair/replacement of 1m² of flag

25.89	Cost of material (1sqm of clay pavers)
49.22	Labour cost (2 men 2 hours??)
8.80	Consumables
3.40	Traffic Management (average cost)
14.36	Plant
20.33	Uplift for overheads (20%)
£122.00	**Total**

Estimated cost of replacement of 20% of surface

200.00	Design and coordination
5178.00	Material
4922.00	Labour
340.00	TM (average cost)
1438.24	Plant
859.60	Supervision
2587.57	Uplift (20%)
15525.41	Total cost
£155.25	**Cost per sqm**

Year	Cost		Year	Cost
1	122		21	244
2	122		22	244
3	122		23	244
4	122		24	244
5	122		25	244
6	122		26	244
7	122		27	244
8	122		28	244
9	122		29	244
10	122		30	15525.41
11	122		31	244
12	122		32	244
13	122		33	244
14	122		34	244
15	15525.41		35	244
16	122		36	244
17	122		37	244
18	122		38	244
19	122		39	244
20	122		40	244
	£17,843.41			**£20,161.41**

Total	**£38,004.82**

Estimating periodic maintenance costs

Resin bonded surface treatment

Expected design life 15 years (40 year costs shown for comparison)

Lifecycle plan for estimating periodic maintenance costs per 1000m²

1 pothole or other minor maintenance repair per year for the 1st 7 years
2 pothole or other minor maintenance repair per year for years 8 to 14
Resurface in years 15 and 30 recommencing repair schedule after each event

Pothole or minor maintenance repair costs

12.00	Cost of material (1m² of asphalt)
24.61	Labour cost (2 men 1 hour)
4.40	Consumables
1.70	Traffic Management (average cost)
7.18	Plant
8.45	Uplift for overheads (20%)
£58.34	**Total**

Estimated Resurfacing Cost per m²

£27.00	Plane off 40mm and relay 40mm surface course

Year	Cost		Year	Cost
1	58.34		21	58.34
2	58.34		22	116.68
3	58.34		23	116.68
4	58.34		24	116.68
5	58.34		25	116.68
6	58.34		26	116.68
7	58.34		27	116.68
8	116.68		28	116.68
9	116.68		29	116.68
10	116.68		30	27000
11	116.68		31	58.34
12	116.68		32	58.34
13	116.68		33	58.34
14	116.68		34	58.34
15	27000		35	58.34
16	58.34		36	58.34
17	58.34		37	58.34
18	58.34		38	116.68
19	58.34		39	116.68
20	58.34		40	116.68
	£28,516.84			**£28,750.20**

Total	**£57,267.04**

Estimating periodic maintenance costs

Resin Bound Macadam

Expected design life 15 years (40 year costs shown for comparison)

Lifecycle plan for estimating periodic maintenance costs per 1000m²

1 pothole or other minor maintenance repair per year for the 1st 7 years
2 pothole or other minor maintenance repair per year for years 8 to 14
Resurface in years 15 and 30 recommencing repair schedule after each event

Pothole or minor maintenance repair costs

40.00	Cost of material (1m² of asphalt)
24.61	Labour cost (2 men 1 hour)
4.40	Consumables
1.70	Traffic Management (average cost)
7.18	Plant
8.45	Uplift for overheads (20%)
£86.34	**Total**

Estimated Resurfacing Cost per m²

£40.00	Plane off 40mm and relay 40mm surface course

Year	Cost		Year	Cost
1	86.34		21	86.34
2	86.34		22	172.68
3	86.34		23	172.68
4	86.34		24	172.68
5	86.34		25	172.68
6	86.34		26	172.68
7	86.34		27	172.68
8	172.68		28	172.68
9	172.68		29	172.68
10	172.68		30	40000
11	172.68		31	86.34
12	172.68		32	86.34
13	172.68		33	86.34
14	172.68		34	86.34
15	40000		35	86.34
16	86.34		36	86.34
17	86.34		37	86.34
18	86.34		38	172.68
19	86.34		39	172.68
20	86.34		40	172.68
	£42,244.84			**£42,590.20**

Total	**£84,835.04**

Estimating periodic maintenance costs

Standard Kerbs

Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m

2m of kerbs to be replaced every 5 years

Minor repair/replacement of 1m of kerbing

9.96	Cost of material (1m of kerbing)
12.11	Labour cost (2 men 30 mins)
2.20	Consumables
0.85	Traffic Management (average cost)
3.59	Plant
5.74	Uplift for overheads (20%)
£34.45	**Total**

Estimated cost of replacement of 1000m kerbing

600.00	Design and coordination
9960.00	Material
2906.40	Labour
255.00	TM (average cost)
1078.68	Plant
644.70	Supervision
3088.96	Uplift (20%)
£18,533.74	**Total cost**

Year	Cost		Year	Cost
1			21	
2			22	
3			23	
4			24	
5	68.9		25	68.9
6			26	
7			27	
8			28	
9			29	
10	68.9		30	68.9
11			31	
12			32	
13			33	
14			34	
15	68.9		35	68.9
16			36	
17			37	
18			38	
19			39	
20	68.9		40	68.9
	£275.60			**£275.60**

Total	**£551.20**

Estimating periodic maintenance costs

Natural Stone Kerbs
Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m

2m of kerbs to replaced every 5 years

Minor repair/replacement of 1m of kerbing

125.46	Cost of material (1m of kerbing)
12.11	Labour cost (2 men 30 mins)
2.20	Consumables
0.85	Traffic Management (average cost)
3.59	Plant
28.84	Uplift for overheads (20%)
£173.05	**Total**

Estimated cost of replacement of 1000m kerbing

600.00	Design and coordination
125460.00	Material
2906.40	Labour
255.00	TM (average cost)
1078.68	Plant
644.70	Supervision
26188.96	Uplift (20%)
£157,133.74	**Total cost**

Year	Cost		Year	Cost
1			21	
2			22	
3			23	
4			24	
5	346.1		25	346.1
6			26	
7			27	
8			28	
9			29	
10	346.1		30	346.1
11			31	
12			32	
13			33	
14			34	
15	346.1		35	346.1
16			36	
17			37	
18			38	
19			39	
20	346.1		40	346.1
	£1,384.40			**£1,384.40**

Total	**£2,768.80**

Estimating periodic maintenance costs

Reconstituted Stone Kerbs
Expected design life 40 years

Lifecycle plan for estimating periodic maintenance costs per 1000m

2m of kerbs to replaced every 5 years

Minor repair/replacement of 1m of kerbing

21.47	Cost of material (1m of kerbing)
12.11	Labour cost (2 men 30 mins)
2.20	Consumables
0.85	Traffic Management (average cost)
3.59	Plant
8.04	Uplift for overheads (20%)
£48.26	**Total**

Estimated cost of replacement of 1000m kerbing

600.00	Design and coordination
21470.00	Material
2906.40	Labour
255.00	TM (average cost)
1078.68	Plant
644.70	Supervision
5390.96	Uplift (20%)
£32,345.74	**Total cost**

Year	Cost		Year	Cost
1			21	
2			22	
3			23	
4			24	
5	96.52		25	96.52
6			26	
7			27	
8			28	
9			29	
10	96.52		30	96.52
11			31	
12			32	
13			33	
14			34	
15	96.52		35	96.52
16			36	
17			37	
18			38	
19			39	
20	96.52		40	96.52
	£386.08			**£386.08**

Total	**£772.16**

Totals:

Whole life cost over 40 years (1000m² for surfacing and 1000m for kerbing)

Standard materials (Surfacing)

Asphalt	£23,062.21
Concrete Flags	£28,886.23
Concrete Blocks	£29,291.20
Mean value	**£27,079.88**

Standard Materials (Kerbs)

Standard kerbs	£551.20

Enhanced Materials (Surfacing)	Whole Life Cost	**Extra Over £ per m²/year**
Pigmented HRA	£34,312.10	**£0.18**
Enhanced SMA	£40,038.44	**£0.32**
Exposed Gravel	£39,708.44	**£0.32**
Natural Stone Slabs	£63,383.30	**£0.91**
Natural Stone Setts	£68,111.98	**£1.03**
Resin Bonded	£57,267.04	**£0.75**
Resin Bound	£84,835.04	**£1.44**
Reconstituted Stone Setts	£29,883.13	**£0.07**
Unbound Gravel	£38,329.88	**£0.28**
Clay Pavers	£38,004.82	**£0.27**

Enhanced Materials (Kerbs)	Whole Life Cost	**Extra Over £ per m²/year**
Natural Stone	£2,768.80	£0.06
Stone reproduction	£772.16	£0.01

Note:

Figure to be fed into the commuted sum calculation is the extra over cost per m² per year workings shown below:

$$\frac{\text{Enhanced Material Cost - Standard Material Cost}}{1000} = \text{extra over whole life cost per m}^2$$

$$\frac{\text{Extra over whole life cost per m}^2}{40} = \text{Extra over cost per m}^2 \text{ per year}$$

Appendix D:

Commuted Sum calculation methodology for Enhanced materials.

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Pigmented HRA
Location	Carriageway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.18
2	2	£0.17
3	3	£0.17
4	4	£0.16
5	5	£0.16
6	6	£0.16
7	7	£0.15
8	8	£0.15
9	9	£0.15
10	10	£0.14
11	11	£0.14
12	12	£0.14
13	13	£0.14
14	14	£0.13
15	15	£0.13
16	16	£0.13
17	17	£0.12
18	18	£0.12
19	19	£0.12
20	20	£0.12
21	21	£0.11
22	22	£0.11
23	23	£0.11
24	24	£0.11
25	25	£0.10
26	26	£0.10
27	27	£0.10
28	28	£0.10
29	29	£0.10
30	30	£0.09
31	31	£0.09
32	32	£0.09
33	33	£0.09
34	34	£0.09
35	35	£0.08
36	36	£0.08
37	37	£0.08
38	38	£0.08
39	39	£0.08
40	40	£0.08

DATA ENTRY		
Mp	£0.18	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt
where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£4.76

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Pigmented SMA
Location	Carriageway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.31
2	2	£0.31
3	3	£0.30
4	4	£0.29
5	5	£0.29
6	6	£0.28
7	7	£0.27
8	8	£0.27
9	9	£0.26
10	10	£0.26
11	11	£0.25
12	12	£0.25
13	13	£0.24
14	14	£0.24
15	15	£0.23
16	16	£0.23
17	17	£0.22
18	18	£0.22
19	19	£0.21
20	20	£0.21
21	21	£0.20
22	22	£0.20
23	23	£0.19
24	24	£0.19
25	25	£0.19
26	26	£0.18
27	27	£0.18
28	28	£0.17
29	29	£0.17
30	30	£0.17
31	31	£0.16
32	32	£0.16
33	33	£0.16
34	34	£0.15
35	35	£0.15
36	36	£0.15
37	37	£0.14
38	38	£0.14
39	39	£0.14
40	40	£0.13

DATA ENTRY		
Mp	£0.32	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£8.45

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Exposed Gravel
Location	Carriageway/Footway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.31
2	2	£0.31
3	3	£0.30
4	4	£0.29
5	5	£0.29
6	6	£0.28
7	7	£0.27
8	8	£0.27
9	9	£0.26
10	10	£0.26
11	11	£0.25
12	12	£0.25
13	13	£0.24
14	14	£0.24
15	15	£0.23
16	16	£0.23
17	17	£0.22
18	18	£0.22
19	19	£0.21
20	20	£0.21
21	21	£0.20
22	22	£0.20
23	23	£0.19
24	24	£0.19
25	25	£0.19
26	26	£0.18
27	27	£0.18
28	28	£0.17
29	29	£0.17
30	30	£0.17
31	31	£0.16
32	32	£0.16
33	33	£0.16
34	34	£0.15
35	35	£0.15
36	36	£0.15
37	37	£0.14
38	38	£0.14
39	39	£0.14
40	40	£0.13

DATA ENTRY		
Mp	£0.32	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£8.45

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Natural Stone Slabs
Location	Footway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.89
2	2	£0.87
3	3	£0.85
4	4	£0.83
5	5	£0.82
6	6	£0.80
7	7	£0.78
8	8	£0.76
9	9	£0.75
10	10	£0.73
11	11	£0.72
12	12	£0.70
13	13	£0.69
14	14	£0.67
15	15	£0.66
16	16	£0.64
17	17	£0.63
18	18	£0.62
19	19	£0.60
20	20	£0.59
21	21	£0.58
22	22	£0.56
23	23	£0.55
24	24	£0.54
25	25	£0.53
26	26	£0.52
27	27	£0.51
28	28	£0.49
29	29	£0.48
30	30	£0.47
31	31	£0.46
32	32	£0.45
33	33	£0.44
34	34	£0.43
35	35	£0.42
36	36	£0.42
37	37	£0.41
38	38	£0.40
39	39	£0.39
40	40	£0.38

DATA ENTRY		
Mp	£0.91	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£24.04

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Stone Setts
Location	Footway

Calculation		
Event No.(n)	nt	Present Value
1	1	£1.01
2	2	£0.99
3	3	£0.96
4	4	£0.94
5	5	£0.92
6	6	£0.90
7	7	£0.88
8	8	£0.87
9	9	£0.85
10	10	£0.83
11	11	£0.81
12	12	£0.79
13	13	£0.78
14	14	£0.76
15	15	£0.74
16	16	£0.73
17	17	£0.71
18	18	£0.70
19	19	£0.68
20	20	£0.67
21	21	£0.65
22	22	£0.64
23	23	£0.62
24	24	£0.61
25	25	£0.60
26	26	£0.58
27	27	£0.57
28	28	£0.56
29	29	£0.55
30	30	£0.54
31	31	£0.52
32	32	£0.51
33	33	£0.50
34	34	£0.49
35	35	£0.48
36	36	£0.47
37	37	£0.46
38	38	£0.45
39	39	£0.44
40	40	£0.43

DATA ENTRY		
Mp	£1.03	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£27.21

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Resin Bonded surface treatment
Location	Carriageway/Footway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.73
2	2	£0.72
3	3	£0.70
4	4	£0.69
5	5	£0.67
6	6	£0.66
7	7	£0.64
8	8	£0.63
9	9	£0.62
10	10	£0.60
11	11	£0.59
12	12	£0.58
13	13	£0.57
14	14	£0.55
15	15	£0.54
16	16	£0.53
17	17	£0.52
18	18	£0.51
19	19	£0.50
20	20	£0.49
21	21	£0.47
22	22	£0.46
23	23	£0.45
24	24	£0.44
25	25	£0.44
26	26	£0.43
27	27	£0.42
28	28	£0.41
29	29	£0.40
30	30	£0.39
31	31	£0.38
32	32	£0.37
33	33	£0.37
34	34	£0.36
35	35	£0.35
36	36	£0.34
37	37	£0.34
38	38	£0.33
39	39	£0.32
40	40	£0.31

DATA ENTRY		
Mp	£0.75	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£19.82

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Resin Bound Macadam
Location	Carriageway/Footway

Calculation		
Event No.(n)	nt	Present Value
1	1	£1.41
2	2	£1.38
3	3	£1.35
4	4	£1.32
5	5	£1.29
6	6	£1.26
7	7	£1.24
8	8	£1.21
9	9	£1.18
10	10	£1.16
11	11	£1.13
12	12	£1.11
13	13	£1.09
14	14	£1.06
15	15	£1.04
16	16	£1.02
17	17	£0.99
18	18	£0.97
19	19	£0.95
20	20	£0.93
21	21	£0.91
22	22	£0.89
23	23	£0.87
24	24	£0.85
25	25	£0.84
26	26	£0.82
27	27	£0.80
28	28	£0.78
29	29	£0.77
30	30	£0.75
31	31	£0.73
32	32	£0.72
33	33	£0.70
34	34	£0.69
35	35	£0.67
36	36	£0.66
37	37	£0.64
38	38	£0.63
39	39	£0.62
40	40	£0.60

DATA ENTRY		
Mp	£1.44	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£38.04

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Reconstituted Stone Setts
Location	Carriageway/Footway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.07
2	2	£0.07
3	3	£0.07
4	4	£0.06
5	5	£0.06
6	6	£0.06
7	7	£0.06
8	8	£0.06
9	9	£0.06
10	10	£0.06
11	11	£0.06
12	12	£0.05
13	13	£0.05
14	14	£0.05
15	15	£0.05
16	16	£0.05
17	17	£0.05
18	18	£0.05
19	19	£0.05
20	20	£0.05
21	21	£0.04
22	22	£0.04
23	23	£0.04
24	24	£0.04
25	25	£0.04
26	26	£0.04
27	27	£0.04
28	28	£0.04
29	29	£0.04
30	30	£0.04
31	31	£0.04
32	32	£0.03
33	33	£0.03
34	34	£0.03
35	35	£0.03
36	36	£0.03
37	37	£0.03
38	38	£0.03
39	39	£0.03
40	40	£0.03

DATA ENTRY		
Mp	£0.07	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£1.85

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Clay Pavers
Location	Footway/Carriageway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.26
2	2	£0.26
3	3	£0.25
4	4	£0.25
5	5	£0.24
6	6	£0.24
7	7	£0.23
8	8	£0.23
9	9	£0.22
10	10	£0.22
11	11	£0.21
12	12	£0.21
13	13	£0.20
14	14	£0.20
15	15	£0.19
16	16	£0.19
17	17	£0.19
18	18	£0.18
19	19	£0.18
20	20	£0.17
21	21	£0.17
22	22	£0.17
23	23	£0.16
24	24	£0.16
25	25	£0.16
26	26	£0.15
27	27	£0.15
28	28	£0.15
29	29	£0.14
30	30	£0.14
31	31	£0.14
32	32	£0.13
33	33	£0.13
34	34	£0.13
35	35	£0.13
36	36	£0.12
37	37	£0.12
38	38	£0.12
39	39	£0.12
40	40	£0.11

DATA ENTRY		
Mp	£0.27	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£7.13

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Unbound Gravel
Location	Footway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.27
2	2	£0.27
3	3	£0.26
4	4	£0.26
5	5	£0.25
6	6	£0.25
7	7	£0.24
8	8	£0.24
9	9	£0.23
10	10	£0.23
11	11	£0.22
12	12	£0.22
13	13	£0.21
14	14	£0.21
15	15	£0.20
16	16	£0.20
17	17	£0.19
18	18	£0.19
19	19	£0.19
20	20	£0.18
21	21	£0.18
22	22	£0.17
23	23	£0.17
24	24	£0.17
25	25	£0.16
26	26	£0.16
27	27	£0.16
28	28	£0.15
29	29	£0.15
30	30	£0.15
31	31	£0.14
32	32	£0.14
33	33	£0.14
34	34	£0.13
35	35	£0.13
36	36	£0.13
37	37	£0.13
38	38	£0.12
39	39	£0.12
40	40	£0.12

DATA ENTRY		
Mp	£0.28	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£7.40

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Stone Kerbs
Location	Carriageway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.06
2	2	£0.06
3	3	£0.06
4	4	£0.05
5	5	£0.05
6	6	£0.05
7	7	£0.05
8	8	£0.05
9	9	£0.05
10	10	£0.05
11	11	£0.05
12	12	£0.05
13	13	£0.05
14	14	£0.04
15	15	£0.04
16	16	£0.04
17	17	£0.04
18	18	£0.04
19	19	£0.04
20	20	£0.04
21	21	£0.04
22	22	£0.04
23	23	£0.04
24	24	£0.04
25	25	£0.03
26	26	£0.03
27	27	£0.03
28	28	£0.03
29	29	£0.03
30	30	£0.03
31	31	£0.03
32	32	£0.03
33	33	£0.03
34	34	£0.03
35	35	£0.03
36	36	£0.03
37	37	£0.03
38	38	£0.03
39	39	£0.03
40	40	£0.03

DATA ENTRY		
Mp	£0.06	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£1.59

Calculation Completed By:	Chris Riley

Commuted Sum Calculation

40 year commuted sum period where annual maintenance is required

Site	Enhanced Material Policy
Asset type	
Description	Reconstituted Stone Kerbs
Location	Carriageway

Calculation		
Event No.(n)	nt	Present Value
1	1	£0.01
2	2	£0.01
3	3	£0.01
4	4	£0.01
5	5	£0.01
6	6	£0.01
7	7	£0.01
8	8	£0.01
9	9	£0.01
10	10	£0.01
11	11	£0.01
12	12	£0.01
13	13	£0.01
14	14	£0.01
15	15	£0.01
16	16	£0.01
17	17	£0.01
18	18	£0.01
19	19	£0.01
20	20	£0.01
21	21	£0.01
22	22	£0.01
23	23	£0.01
24	24	£0.01
25	25	£0.01
26	26	£0.01
27	27	£0.01
28	28	£0.01
29	29	£0.01
30	30	£0.01
31	31	£0.01
32	32	£0.00
33	33	£0.00
34	34	£0.00
35	35	£0.00
36	36	£0.00
37	37	£0.00
38	38	£0.00
39	39	£0.00
40	40	£0.00

DATA ENTRY		
Mp	£0.01	
T	1	Year
D	2.2	%
Tmax	40	Years

Mp	Estimated periodic maintenance cost (£)
T	Interval between periodic maintenance (years)
D	Discount rate (%)
Tmax	Time limit for commutation

Mp/(1+ D/100)^nt

where n is the number of maintenance events and nT does not exceed Tmax

Justification for annual maintenance cost:	
Inspection Frequency	Cost breakdown as per Appendix C - Enhanced Material Policy
Maintenance Frequency	
Cost per annum	

Notes:

Total Commuted Sum Due	£0.26

Calculation Completed By:	Chris Riley

Appendix E:

Commuted Sums Summary Table.

Commuted Sum Summary

Material	Commuted sum per m²
Pigmented HRA	£4.76
Enhanced SMA	£8.45
Exposed Gravel	£8.45
Natural Stone Slabs	£24.04
Natural Stone Setts	£27.21
Resin Bonded	£19.82
Resin Bound	£38.04
Reconstituted Stone Setts	£1.85
Clay Pavers	£7.13
Unbound Gravel	£7.40

Material	Commuted sum per m
Natural Stone Kerbs	£1.59
Reconstituted Stone Kerbs	£0.26