

NETWORK HIERARCHY PLAN

JUNE 2018

AN ELEMENT OF THE HIGHWAY INFRASTRUCTURE
ASSET MANAGEMENT SYSTEM

Document Information

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TABLE OF DEFINITIONS	
TERM	DEFINITION
AHMP	Accelerated Highways Maintenance Project
DBVHM	Delivering Best Value in Highway Maintenance
DCC	Derbyshire County Council
TDAT	Transportation Data & Analysis Team
GIS	Geographic Information Systems
AADT	Annual Average Daily Traffic Flow
MSIG	Midlands Service Improvement Group

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INTRODUCTION AND SCOPE

The Road User Hierarchy, which was agreed in 2003, has been used to support the most effective and efficient approach to the management of the Derbyshire highway network. It has changed over time to reflect the obvious changes in the network and the information provided by the Highway Inspectors. These changes, however, have been undertaken in an ad hoc manner with little reference to the original Road User Hierarchy. Additionally, there has been no audit trail detailing the reasons behind any changes or additions. The existing Footway Hierarchy has also been developed in a similar manner to the Road User Hierarchy which again has implications for consistency, audit and completeness, and therefore requires further refinement.

At the time of the Road User Hierarchy's inception, the available information regarding the network traffic flow and composition was fairly limited across the network, focussing primarily on the more major and well frequented routes. The Road User Hierarchy document was based on information supplied through consultations with officers with knowledge in the fields of network management. The Road User Hierarchy Framework provided the specific parameters that described the routes and the roads that made up the hierarchy. This tended to lead to whole routes and individual roads being labelled with the same hierarchy and hence, the same attributes, irrespective of the actual segmentation of a route in terms of its characteristics.

The purpose of this document is to create a new Network Hierarchy to meet the requirements of the current Derbyshire Highways Infrastructure Asset Management Strategy and the 2016 Code of Practice for Well-Managed Highway Infrastructure. The Network Hierarchy only relates to the roads within the management of Derbyshire County Council's Highway Authority and, as a consequence, does not include Highways England roads or roads under the jurisdiction of Derby City.

The establishment of a Derbyshire Network Hierarchy helps to:-

INNOVATE

tools to advance the use of information to help prioritise service & business planning

DEVELOP

a risk based approach to allow priorities to be evidence based and provide the foundations for the new Code of Practice for Well-Managed Highway Infrastructure

ENHANCE

the use of data to make more informed decisions

PROGRESS

toward a road inspection and footway hierarchy

ENSURE

the best use of finance and resource

PROVIDE

a link between maintenance policy and implementation

UNDERSTAND

processes we use to determine priorities and hence spend

REVIEW OF THE 2003 ROAD USER HIERARCHY

In order to establish the development process for the new Network Hierarchy, a review of the existing 2003 Road User Hierarchy was undertaken. To ensure that the review and Network Hierarchy development process was robust and shared amongst officers, a working group, made up of those with a direct operational relationship to the proposed Network Hierarchy, was formed to provide critical review whilst the project was underway. Whilst the initial work was underway, there was also a pressing need to provide an early version of the Network Hierarchy to support and help prioritise the development of a 3 year Accelerated Highways Maintenance Project (AHMP). This provided further critical review and the opportunity to test and refine the Network Hierarchy and to deliver the forward works programme for the AHMP.

The original road user hierarchy was developed in response to the Government's good practice guidance on Local Transport Plans as a core tool in managing the local road network. The purpose behind the guidance was to undertake an assessment of the County's entire road network and decide whether individual roads and routes reflected the current and desired function and use.

In response to the guidance, a Road User Hierarchy Framework was developed that set out how the County managed roads on the network. The Framework included five main tiers: Strategic Routes (County and Regional), Main Distributors, Secondary Distributors, Link Roads and Access Roads. The Framework described each of the tiers in the Road User Hierarchy and provided guidance on how the County would seek to manage the network and to deliver key Government transport objectives.

An important intended application of the Road User Hierarchy was the development of the County's highway maintenance standards based on the 2001 Government publication of revised guidance, 'Delivering Best Value in Highway Maintenance' (DBVHM), that set out a Code of Practice for the maintenance and management of the highway network. This guidance was not mandatory but provided a benchmark for local highway authorities to base their own policies and procedures for delivering 'Best Value' highway maintenance services and network safety obligations. The Code of Practice recommended that the Highway Maintenance Strategy should be based on a systematic approach and that the development of a user hierarchy was the key to which standards could be attached together with associated targets and performance objectives. In summary, the Road User Hierarchy would provide the link between maintenance policies and implementation and hence, spending and investment plans, whilst leaving room for professional judgement and consultation where appropriate.

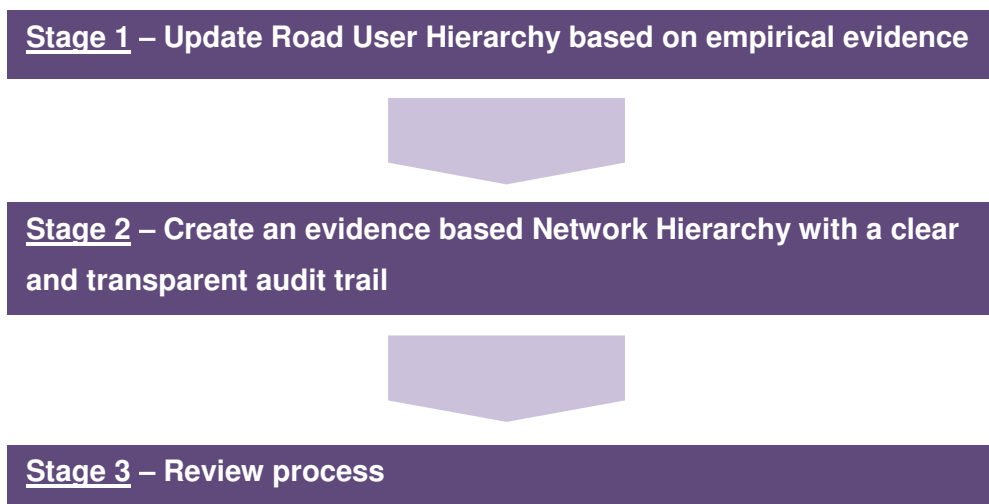
Whilst the original Road User Hierarchy was presented as a series of tiers from 'strategic' to 'local access' roads, it was not intended that this prescribed priorities for investment, i.e. some areas of delivery, such as maintenance, may tend to focus spending at the 'higher' levels but others, such as traffic management schemes, may have reinforced the Road User Hierarchy through investment in the 'lower' levels.

The review drew the following conclusions:

1. The development of the original Road User Hierarchy was subjective as the work was carried out in 3 areas teams leading to a degree of inconsistency. However, it concluded that there is value in maintaining an evidence based Road User Hierarchy

- to provide a tool for strategic network management purposes and to group roads together based on how users move around the network.
2. The original Road User Hierarchy was based on desired use of the network and cannot be adopted to service the needs of a Network Hierarchy that is fundamental to a risk based approach to asset management, and meet the requirements of the Derbyshire Highways Infrastructure Asset Management Strategy and the new Code of Practice for Well-Managed Highway Infrastructure. The availability of traffic data on flow and composition allows the Network Hierarchy to be evidence based and for the update process to be managed as part of the overall Highway Infrastructure Asset Management Strategy.
 3. The original Road User Hierarchy was created in 2003 and evolved with no audit trail of additions or changes which has led to inconsistencies. It was decided that future decisions should be clear and transparent to any user.
 4. The process of updating the Network Hierarchy should be as dynamic as possible but, regardless, should be carried out at a specified interval, i.e. annually, and take into account feedback from inspectors, road users and changes to the network.

The review identified a Network Hierarchy Development Process which contains three clear stages. These are shown in the diagram below:



STAGE 1 – UPDATE ROAD USER HIERARCHY BASED ON EMPIRICAL EVIDENCE

Overview

The Road User Hierarchy's main purpose was to group the roads within the County in terms of how road users connect key locations around the County. This Road User Hierarchy was also used as the basis for operationally practical highway inspection. Clearly, any changes to the Road User Hierarchy would have implications for the inspection frequency of individual roads and would need to be carefully considered as to the impact.

Table 1 overleaf provides a breakdown of the Road User Hierarchy in Derbyshire. The proportions indicate that the vast majority of roads (77%) are in hierarchy group 4, and as a consequence are associated with a similar maintenance and inspection regime i.e. quarterly for group 4a or yearly inspections for group 4b, whereas Road User Hierarchy groups 2

through 3 are all monthly inspections. Hence, the aggregated nature of this hierarchy means that it is difficult to describe sufficiently, the range of maintenance activities associated with all the roads in Derbyshire, and hence a more disaggregated Network Hierarchy is needed to address this. In turn, a Derbyshire Network Hierarchy would provide a fundamental tool in delivering the requirements of a Derbyshire Highways Infrastructure Asset Management Strategy and the new Code of Practice for Well-Managed Highway Infrastructure.

Table 1

Road User Hierarchy Group	Broad Description of Roads in each Hierarchy Band	Length (km)	Length (%)
2	Strategic Regional Routes - Trunk Roads and some Principal County A roads between primary destinations	50	<1%
2a	Strategic County Routes - Principal County A roads between primary destinations that are used by local and some regional traffic	276	5%
3a	Main Distributor Roads - A Roads and some B Roads between major urban network and inter-primary links primarily used by local traffic	363	7%
3b	Secondary Distributor Roads - Mainly B and C classified roads and some unclassified primary bus routes that carry local traffic with frontage access and frequent junctions	524	10%
4a	Link Roads - Roads linking between the main and secondary distributor network with frontage access and frequent junctions	1376	26%
4b	Local Access Roads - Roads serving limited numbers of properties carrying only access traffic	2716	51%
Total		5305	100%

Road User Hierarchy Update Process

It was established through the review of the 2003 Road User Hierarchy that the process followed in creating it was sound and the descriptions of the roads making up the hierarchy were not changed. It is the data that underpinned the hierarchy descriptions that has been re-evaluated in light of the greater availability of data and in line with the strategic nature of the network. Figure 1 overleaf provides the broad non-technical outline of the process in reviewing the Road User Hierarchy.

Updating the Road User Hierarchy provided the basis to develop back office systems to automate the overall review and audit process. Working with existing back office software suppliers, the Transport Data and Analysis Team (TDAT) has developed more automated processes to deliver the traffic flow information that forms the basis of the Road User Hierarchy review and the development of a Derbyshire Network Hierarchy.

The Road User Hierarchy was not sufficiently detailed to provide the variation that is present where traffic-flow and use vary along a route. Hence, a Network Hierarchy was developed that provided the level of detail required to support and deliver the requirements of a Derbyshire Highway Infrastructure Asset Management. This will be covered in the next section.

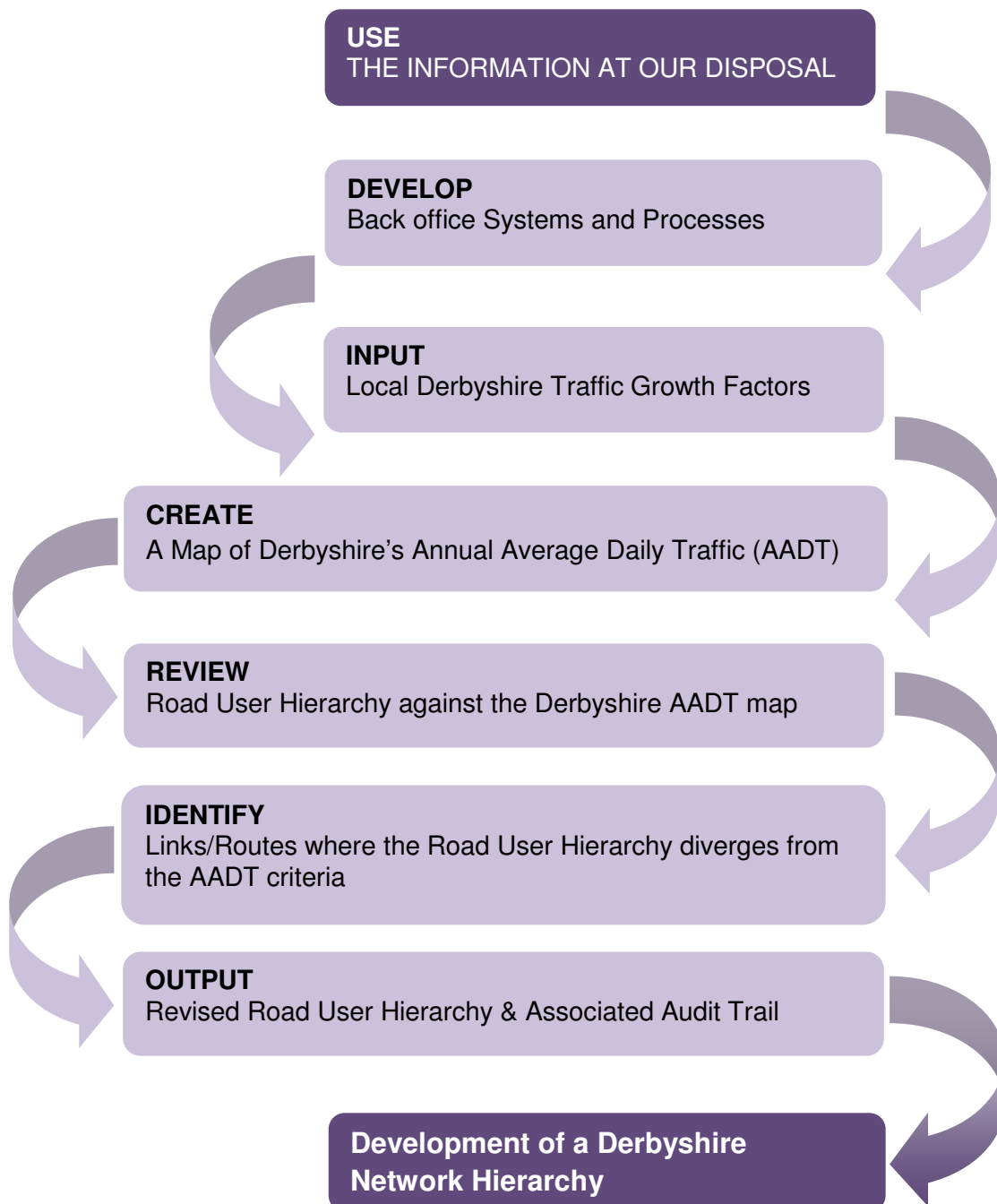


Figure 1

STAGE 2 – CREATE AN EVIDENCE BASED NETWORK HIERARCHY WITH A CLEAR AND TRANSPARENT AUDIT TRAIL

Overview

The Well-Managed Highway Infrastructure – A Code of Practice Recommendation 12 states that:-

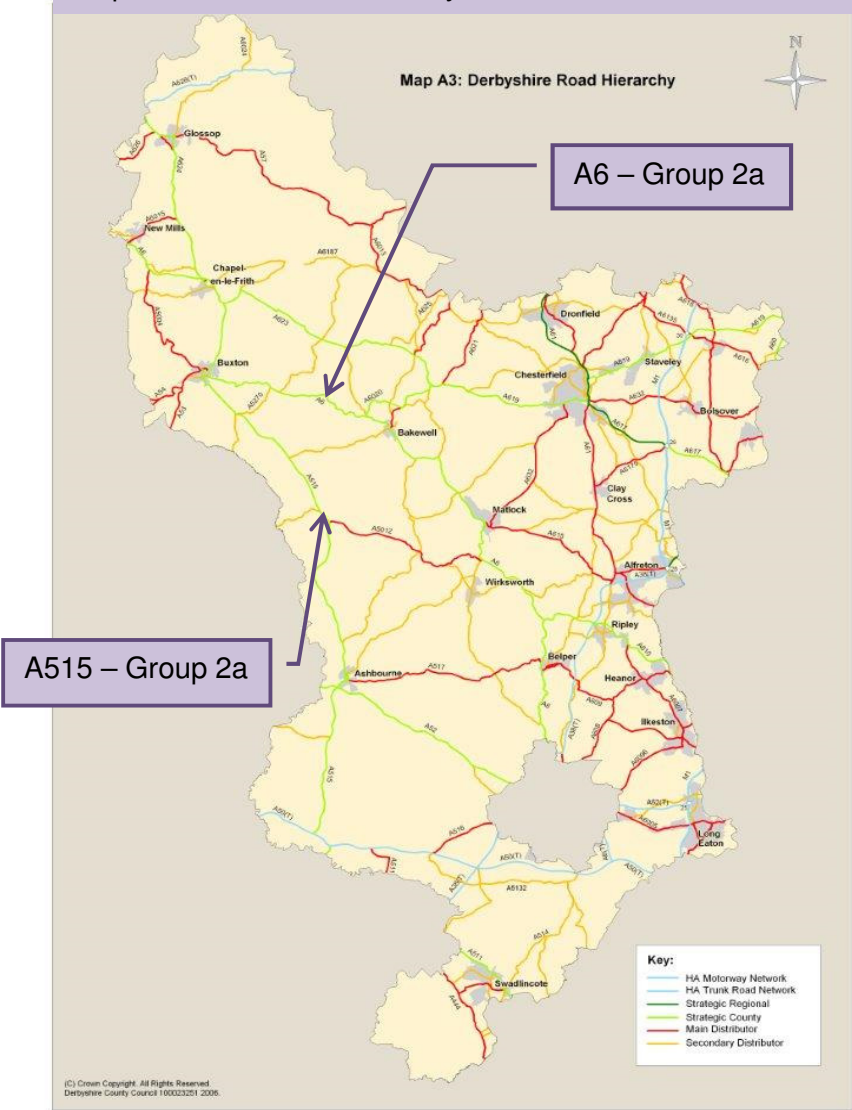
A network hierarchy, or a series of related hierarchies, should be defined which include all elements of the highway network, including carriageways, footways, cycle routes, structures, lighting and rights of way. The hierarchy should take into account current and expected use, resilience, and local economic and social factors such as industry, schools, hospitals and similar, as well as the desirability of continuity and of a consistent approach for walking and cycling.

As mentioned in the previous section, the review and update of the Road User Hierarchy consolidated the need to develop a separate Network Hierarchy that would service the needs of a risk based Derbyshire Highways Infrastructure Asset Management Strategy and the new Code of Practice for Well-Managed Highway Infrastructure. This was a change in emphasis in that it allowed for the potential to describe the uses of the roads in the Derbyshire Highway Network without necessarily being linked to their classification or description, i.e. road number or class. The Network Hierarchy separated actual use (i.e. numbers of road users) from the desired use of the road which the original Road User Hierarchy effectively fulfilled. To help to explain this and to understand the basis of the need for a Network Hierarchy, it is useful to consider the A6 and the A515 in this context.

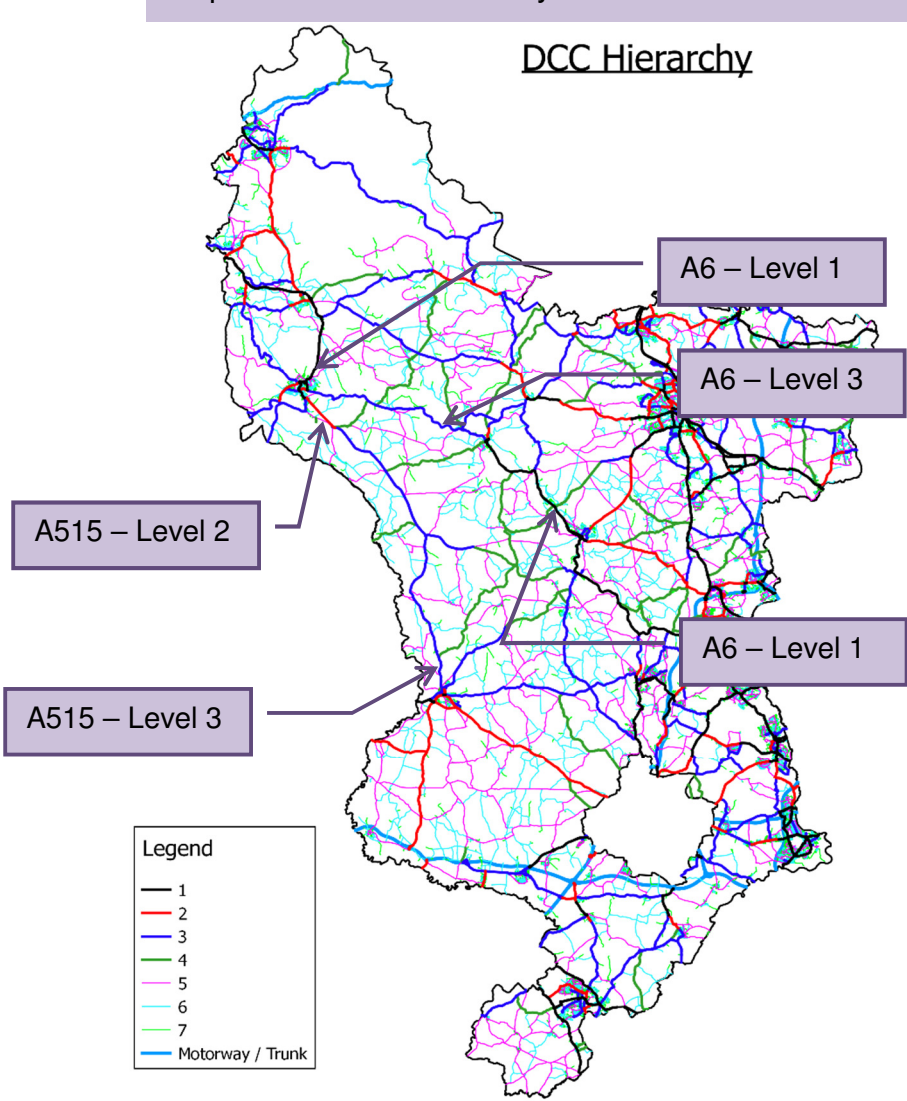
In the Road User Hierarchy, both the A6 and the A515 are described as Strategic County Roads – Group 2a – that are mainly A roads essentially connecting primary destinations, i.e. connecting Derby and Ashbourne with Buxton and ultimately Manchester (See Map 1 overleaf). So the main purpose in the road users mind is to connect places with roads and the Road User Hierarchy provides this strategic overview. However, when one looks at this from a risk based maintenance perspective, primarily looking at use which has the biggest impact on maintenance operations (i.e. frequency of maintenance operations and the selection of the appropriate surface treatment), then a very different picture emerges (See Map 2 overleaf). It is clear that, under a Network Hierarchy based on use, the A515 would be level 3 throughout most of its length, apart from some short stretches on the approach to the larger towns en-route, thus indicating a lower level of priority than the original Road User Hierarchy, whereas the A6 would vary between levels 1 to 3 throughout its length thus indicating a far greater variance in use and priority as compared to the original Road User Hierarchy. Hence, in order to deliver a Highways Infrastructure Asset Management Strategy based on a risk based approach, then these roads need to be considered differently in terms of their strategic importance, priority, treatment, finance, and inspection regimes. If there are operational reasons that do not justify this level of disaggregation, when developing inspection routes for example, this can be documented when the relevant policies are being developed.

A key aim for the Network Hierarchy was for it to be objective, unbiased and hence, transparent in its development, application and repeatability. In response to this key aim there was a requirement to develop an audit trail or record of decisions. The audit trail was not developed as a separate process at two key stages but was a key part of the overall development of the Network Hierarchy described under Phase 2.

Map 1 – Road User Hierarchy



Map 2 – Network Hierarchy



The next section identifies the steps taken to develop the Network Hierarchy and the associated clear and transparent audit trail.

Process

The development of a Derbyshire Network Hierarchy has been iterative, in as much that there has been the need to develop back office systems to help develop a transparent and repeatable process.

Figure 2 provides the outline of the process undertaken and Table 2 provides the current network proportions for each level of the Network Hierarchy and identifies the percentage composition from the roads in the original Road User Hierarchy. Chart 1 is provided as a summary of the shift in roads between the Road User Hierarchy and the new Network Hierarchy, clearly demonstrating the change in emphasis from a more strategic Road User Hierarchy to an evidence based Network Hierarchy. As indicated in Figure 2, the lower levels of the Network Hierarchy will require further refinement and on-going review through:-

- The use of appropriate Geographic Information System (GIS) tools that deliver a repeatable and transparent process
- Feedback from the public and our own Inspectors
- Improvements to the knowledge of network usage – see 'Next Steps' section
- Review

This is fundamental to a risk based approach to asset management, helping Derbyshire County Council to link policy, service levels and treatments to roads, that is clear and transparent.

The following points are key elements of the audit trail and hence, the Network Hierarchy:-

- Provide a record of the quality levels of the information used to base decisions on thus enabling a strategic, risk based update and infill of traffic use.
- Identify opportunities for improvement.
- Provide an audit trail for decisions in the creation of the Network Hierarchy.
- Record all audit information as an attribute for each element of the Network Hierarchy.
- Provide a review process, as well as identifying opportunities for improvement and development.

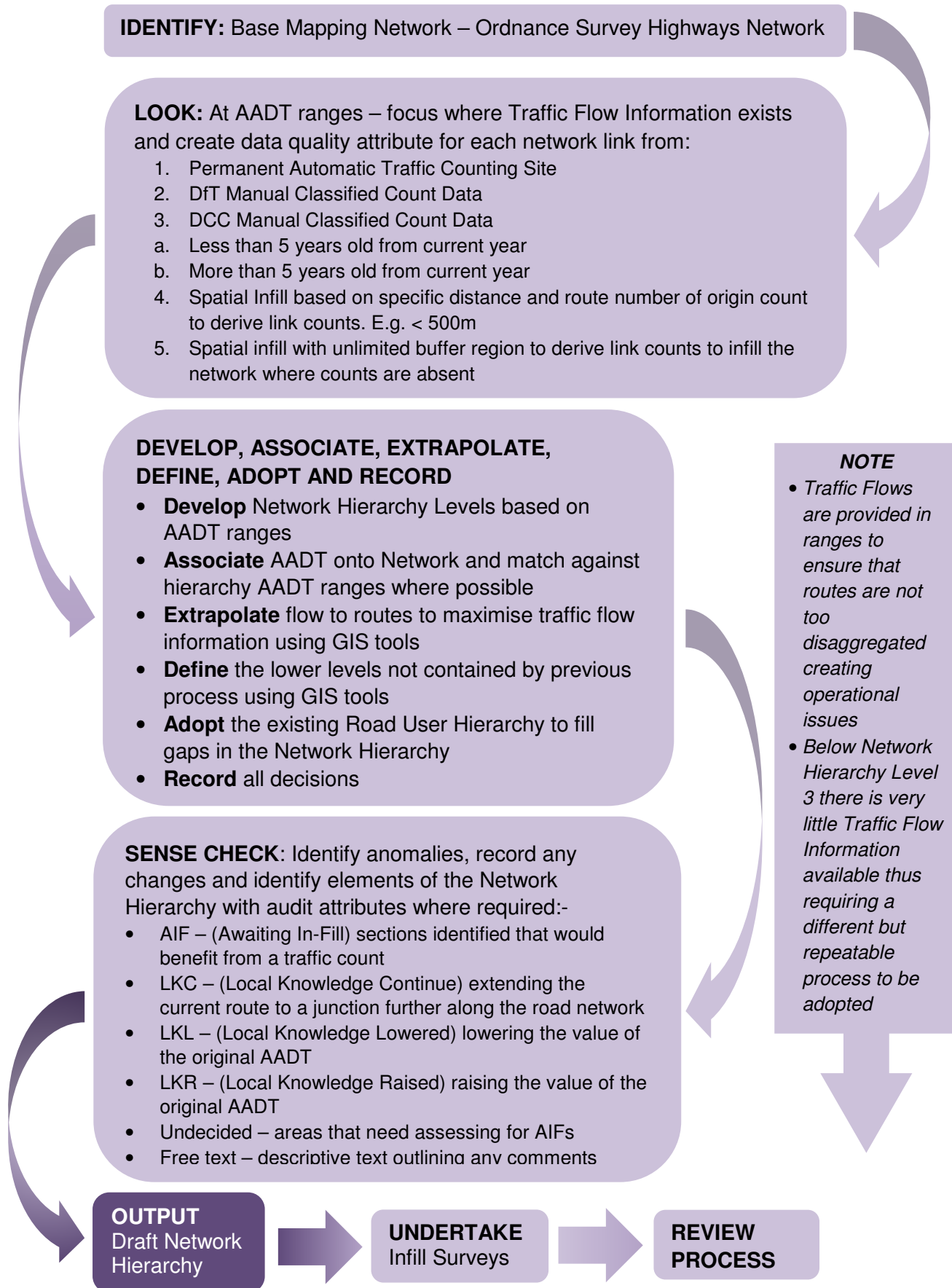


Figure 2

Table 2

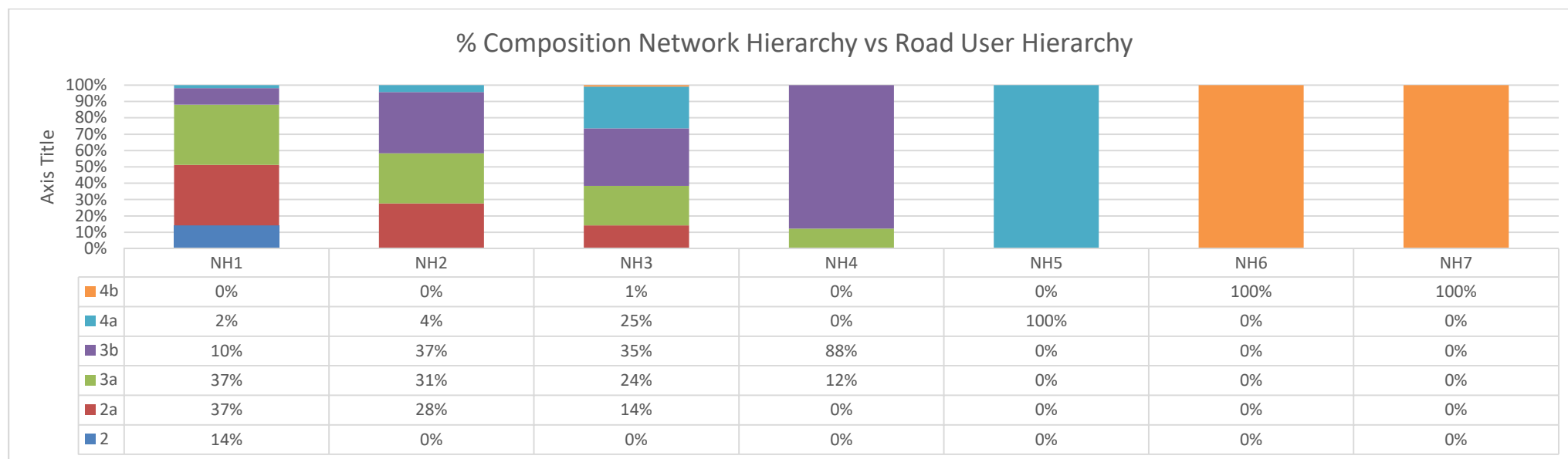
Network Hierarchy Group	Broad Description of Roads in each Hierarchy Band	Road User Hierarchy								% Composition MH vs RUH					
		2	2a	3a	3b	4a	4b	Grand Total (Km)	Grand Total %	2	2a	3a	3b	4a	4b
NH1	AADT >= 9000	50	130	129	35	7		351	7%	14%	37%	37%	10%	2%	0%
NH2	AADT >= 6000 and AADT < 12000		67	75	92	10		244	5%	0%	28%	31%	37%	4%	0%
NH3	AADT >= 3000 and AADT < 8000		78	131	192	138	5	544	10%	0%	14%	24%	35%	25%	1%
NH4	Any sections assigned a value of 2a, 3a or 3b from the old Road User Hierarchy not on MH 1-3		1	28	205			234	4%	0%	0%	12%	88%	0%	0%
NH5	Any sections assigned a value of 4a from the old Road User Hierarchy not on MH 1-3					1221		1221	23%	0%	0%	0%	0%	100%	0%
NH6	Any sections assigned a value of 4b from the old Road User Hierarchy not on MH 1-3 and not a cul-de-sac						1847	1847	35%	0%	0%	0%	0%	0%	100%
NH7	Any sections assigned a value of 4b from the old Road User Hierarchy not on MH 1-3 and part of cul-de-sac (potential to disaggregate further)						864	864	16%	0%	0%	0%	0%	0%	100%
	Grand Total	50	276	363	524	1376	2716	5305	100%						

Note – there will be rounding errors

Looking at Table 2 and Chart 1 below indicates very clearly the need to move away from a Road User Hierarchy to a Network Hierarchy to support an evidence and risk based approach to asset management. In summary:-

- For each of the original Road User Hierarchies shaded orange in table 2, there are roads that when considered, in terms of the Network Hierarchy criteria, are split into different Network Hierarchy Groups. This can also be seen in Chart 1 which graphically indicates the shift.
- For example Road User Hierarchy 2a, 3a, 3b and 4a are split between the top 3 levels of the Network Hierarchy thus indicating significant variation in roads as compared to the original Road User Hierarchy.
- Table 2 provides numeric evidence in support of the text above and Maps 1 and 2, providing further evidence for a disaggregated Network Hierarchy.

Chart 1



Next Steps

As mentioned earlier, in developing the process to support a Derbyshire Network Hierarchy, a number of opportunities were identified that would help to provide additional data to support future Network Hierarchy reviews. In addition, a number of practical considerations were also identified that would help to facilitate the review (Stage 3). These are considered below:-

- **Strategic In-fills** – to support an evidence based Network Hierarchy, there needs to be sufficient information on network usage. In developing the Network Hierarchy, a number of gaps were identified that required a more subjective assessment of use, resorted to the original Road User Hierarchy attributes for roads, or used information that was not current, thus requiring more factoring to bring up to date. In order to remove subjectivity and base decisions on current use, a systematic infill of traffic flow information has been implemented through an on-going programme prioritised based on risk.
- **Data Management** – A key element of the Network Hierarchy is the base network upon which all information is connected to. As we hold many data sets that are associated geographically with different mapping (base network), there is a need to have distinct controls that ensure we adopt a common mapping or spatial framework. This has been developed as part of the asset management suite of policies through the Data Management Strategy.
- **Footway and Cycleway Hierarchy** – The existing footway and cycleway hierarchies will be reviewed to include public rights of way where they occur within or on the fringe of urban areas. The existing footway and cycleway hierarchies have been developed based on local knowledge and officer judgement. This has sufficed to date in as much there was very little objective evidence to draw upon to inform the footway and cycleway hierarchies. There is still very little data available on actual footway and cycleway usage, however, there are GIS tools, feedback from users and our own Inspectors that can be employed to provide a more rigorous, standardised and repeatable review process that can then be a basis for future footway and cycleway hierarchy reviews.
- **Collaboration** – This continues to be achieved through our membership of the Midlands Service Improvement Group (MSIG) where the approach described in this document has been presented to member authorities to aid the development of their own network hierarchies.

STAGE 3 – REVIEW PROCESS

Overview

It is also important that hierarchies are dynamic and regularly reviewed to reflect changes in network characteristics and functionality, so that maintenance policies, practices and standards reflect the current situation rather than the use expected when the hierarchy was originally defined. Where major maintenance, construction or other development involves significant traffic diversion, or when congestion in one part of the network results in traffic shift to another part of the network, it is important that these changes are reflected in the hierarchy and subsequently in the maintenance and network management regimes. Taking into account feedback from the road user is also a key component of this aspect.

Process

In order to facilitate this Stage, a rolling programme has been developed taking into account the points indicated in the previous paragraph, as well as addressing any opportunities raised whilst developing the Network Hierarchy. The annual review will ensure that Derbyshire's Highway Infrastructure Asset Management Strategy is supported by a systematic and transparent process, thus allowing risk based decisions to be made using quality evidence.

Stakeholder engagement is a key component of the overall communications approach to the Derbyshire Highways Infrastructure Asset Management Strategy. As part of the highways communications approach, this will help local stakeholders to appreciate asset management principles and how this determines priorities, how budgets will be set and spent. Figure 3 provides the broad non-technical outline of the Review Process that will be developed.

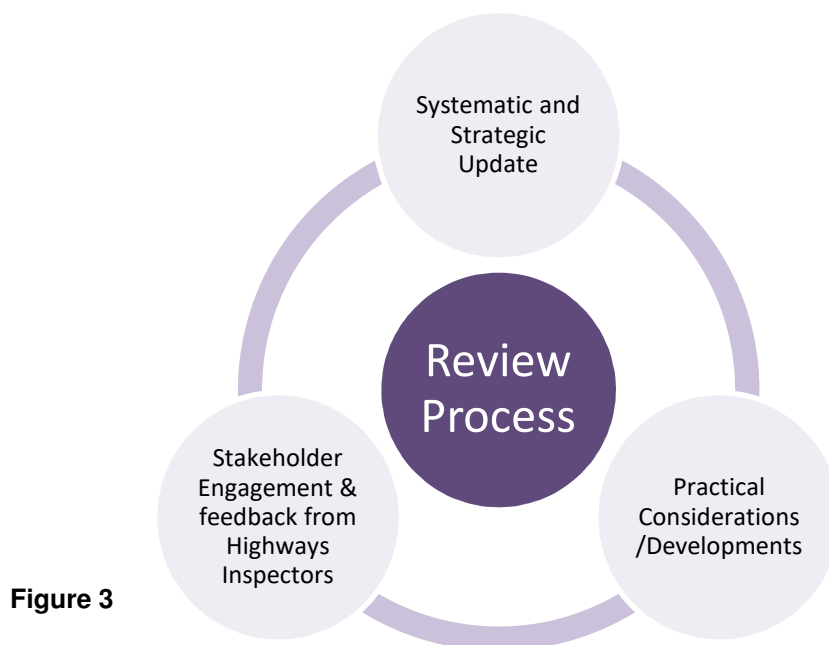


Figure 3

FIRST REVIEW

Completed Outputs and Progress

The following outputs and progress have been completed:

- High risk cycle network: this has been devised by examining data relating to sections with gradients >10%, the National Cycle Network, Key Cycle Network, Strava heat map, pro cycling legacy routes and Matlock 10 supportive. These locations have been incorporated into the new safety inspections and defect reporting processes. Further details on the process can be found [here](#).
- Strategic in-fills traffic surveys: the in-fill project has been in operation since May 2018 and is ongoing. Upon completion Hierarchy levels 4 & 5 will be revised with new counts being undertaken for necessary sections to justify their inclusion within the hierarchy 1-3 banding.

- Automation of the Annual Average Daily Traffic Flow process: further work has continued to improve the process to automate the management of the data for the network hierarchy.
- New Highway Infrastructure Asset Safety Inspection Process: this was implemented on the 1st April 2019. As part of this process inspector feedback relating to the hierarchy is actively encouraged and will form part of future reviews.

Next Steps

It is anticipated that the next review should commence in May 2020, however it should only commence once the following information is available:

- a full year of inspector data has been received from the new safety inspection process
- further improvements to the automation of the Annual Average Daily Traffic flow process
- further strategic in-fill surveys have been completed
- the base network providing a single truth to which all assets and surveys will be attached has been developed
- work will have commenced on developing the footway hierarchy following receipt of the Annual Engineers Inspection currently being undertaken

Further reviews will be biannual and not annual to ensure that a full year's worth of data is available for analysis within each review.