Locomotive overhaul and restoration strategy

Objective

To ensure the availability of working locomotives to meet the needs of the Didcot Railway Centre without compromising the long term conservation of the fleet while smoothing the flow of projects through the locomotive works.

Review

This strategy paper should be reviewed annually in mid-year to incorporate any alterations in timescales for project completion and any changes in the insurance and regulatory framework within which steam locomotives operate on heritage lines and the national rail network.

Drivers of the strategy

There are two main drivers of locomotive overhaul and restoration strategy at Didcot: the provision of locomotives to operate the service on the site at Didcot and the overarching need to ensure that the fleet is properly conserved and maintained. There should be no fundamental conflict between these objectives. Other factors therefore tend to play a disproportionate role in deciding restoration priorities. Principal among these factors are

- the availability of funding for restorations
- the willingness of volunteers to work on specific projects
- the relative costs of operating different locomotive types at Didcot
- demands for locomotives for main line operation
- potential demand from other heritage railways for hiring Didcot locomotives
- sentiment, never a good guide to best engineering practice.

Present situation

With most of the Didcot fleet having been restored to operating condition at least once during its time in the custody of the Great Western Society and Great Western Preservations, attention has increasingly turned to 'filling in the gaps' in the collection of Great Western locomotives held at Didcot and elsewhere. As a result, four major rebuild projects are currently under way, three under the banner of the Great Western Society, of which two are based at Didcot and one at Llangollen. The demands that these projects place on both finance and labour are considerable, but by their unique nature they are probably easier to fund (and probably easier to find volunteers for) than routine heavy overhauls of the inherited locomotives. Apart from these two projects, there are a number of other restoration projects in the loco works and lifting shop at Didcot: 4079 Pendennis Castle, 7202, 4144, 1363 and King George, the saddle tank locomotive to be converted to a Thomas. Only one of these – 1363 – is regarded as suitable for day-to-day operation of the branch line. Thomas is considered to be outwith the restoration strategy of the Great Western Society, being a project driven by commercial considerations that themselves depend on factors outwith our control. It is nevertheless a priority to see this locomotive

returned to traffic as both a source of revenue for the Society and a way of saving hiring-in costs.

Meeting the requirements for conservation

In general, conservation of the non-operational locomotives is not expensive in time or finance. Locomotives under cover do not deteriorate markedly with the possible exception of boilers. As these will deteriorate at a broadly constant rate so long as they are not in use, this factor does not weigh heavily in assessing the future restoration programme. A much greater danger is the temptation to use the static fleet as a source of spares to keep the operational fleet in traffic, and this needs to be countered by active intervention to monitor the static exhibits on a regular basis. It would be the aim to gradually restore all of these locomotives to a complete condition to smooth their eventual return to traffic. A separate strategy covers the conservation of the static exhibits.

Requirements for Didcot operations

The minimum requirement to be able to cover for routine maintenance and short term locomotive failures is three locomotives, two suitable for the branch line and one larger locomotive for 8 road. While we are able to cover some turns using the SRM and diesel railcar, fewer than three locomotives may lead to problems in meeting the expectations of visitors to the Centre.

The Didcot fleet (excluding No. 5) consists of only a handful of branch line engines (1338, 1340, 1363, 1466, 3650, 3738, 5572 and BPC), and we need some 25% of these to be available to meet our minimum requirement. This requires careful balancing of the overhaul schedules, something that we have not been conspicuously successful in achieving.

Large locomotives are currently in short supply, but this situation promises to change radically over the next few years as major works are completed on 4144, 4079 and 2999 and 6023 returns to Didcot. Two of these – 6023 and 4079 – are likely to be particularly heavy on fuel and water costs, however, and may therefore find restricted use at Didcot.

The present situation is that we have far too many projects under way, and of these the majority are in the rather less useful large locomotive category. They are, however, attractive to visitors, funders and volunteers. Despite the number of locomotives in bits, therefore, we may need to look at undertaking a fairly quick restoration of at least one small locomotive if we are not to run the risk of failing to meet visitor expectations for steam rides at some stage in the next five years.

Timeframe for overhauls

While it is well known that a boiler ticket lasts for ten years for use on heritage lines (subject to annual examination) of which seven years may be available for main line operation, matters are not always that simple. The regular imposition of the stress of a cold – hot – cold thermal cycle on a boiler can and often does adversely affect the

life of components, particularly tubes. Ten years should therefore be regarded as a maximum life between boiler overhauls: in the same way, seven years is a maximum for a main line ticket, and may not be achieved in practice. When considering the fleet, therefore, it is necessary to build in an allowance for a locomotive going out of service earlier than a simple study of due dates might suggest. It is also sensible to look at restricting the hire of locomotives to the middle period of a locomotive boiler ticket – say years 3 to 7 – so that there is a reduced likelihood of failure in the middle of a hire period. When a boiler has received a major overhaul, it is likely to be able to return to traffic after little more than a re-tube after the first ten year period: at the next overhaul, however, it may require more extensive work. Finally, increasingly sophisticated test techniques may start to show up faults that have not previously been detectable, and this might happen at almost any time.

Basis for the programme outlined

The assumption has been made that the standard 10 years will apply to boiler tickets and that at the end of the first ten year period after heavy overhaul there will be a two year period for re-tubing and any associated works on the boiler, and to correct any mechanical problems. This may prove optimistic, and contingency plans need to be in place to cover for this eventuality. It may be advisable to 'stretch' this two year period to obtain a better spread of loco availability, but this should not extend to more than perhaps five years, as deterioration of other boiler components may then start to require additional overhaul costs.

There is an obvious desire to see maximum benefit from the monies invested in the major rebuilds of 1014, 2999 and 4709. In addition, there are a number of anniversaries for which it might be hoped to have particular locomotives available. These are:
2017 – 5322
2021 – 1466
2024 and 2025 – 4079
2027 – 6023
2028 – 5900
2036 – 1466
2044 – 6998
2045 – 1014

Finally, there is the need to maintain a presence in main line operations so long as these continue. It seems unlikely that this will continue *sine die*, and at present it has been assumed to be an option for the next 25 years but possibly not longer. The plan has been designed to meet these diverse needs while making greater use of those locomotives that have seen major overhauls and/or are relatively modern. Two locomotives – BPC and 6697 – have not been included in this plan, the former because of its non-GWR background and the latter in view of its history at Didcot. There have been some tentative proposals for 7808 to be loaned out for restoration elsewhere, with a long term agreement for its operation. As a result, this locomotive has also been omitted from the plan for the moment, although agreement on any long-term loan is far from an agreed option.

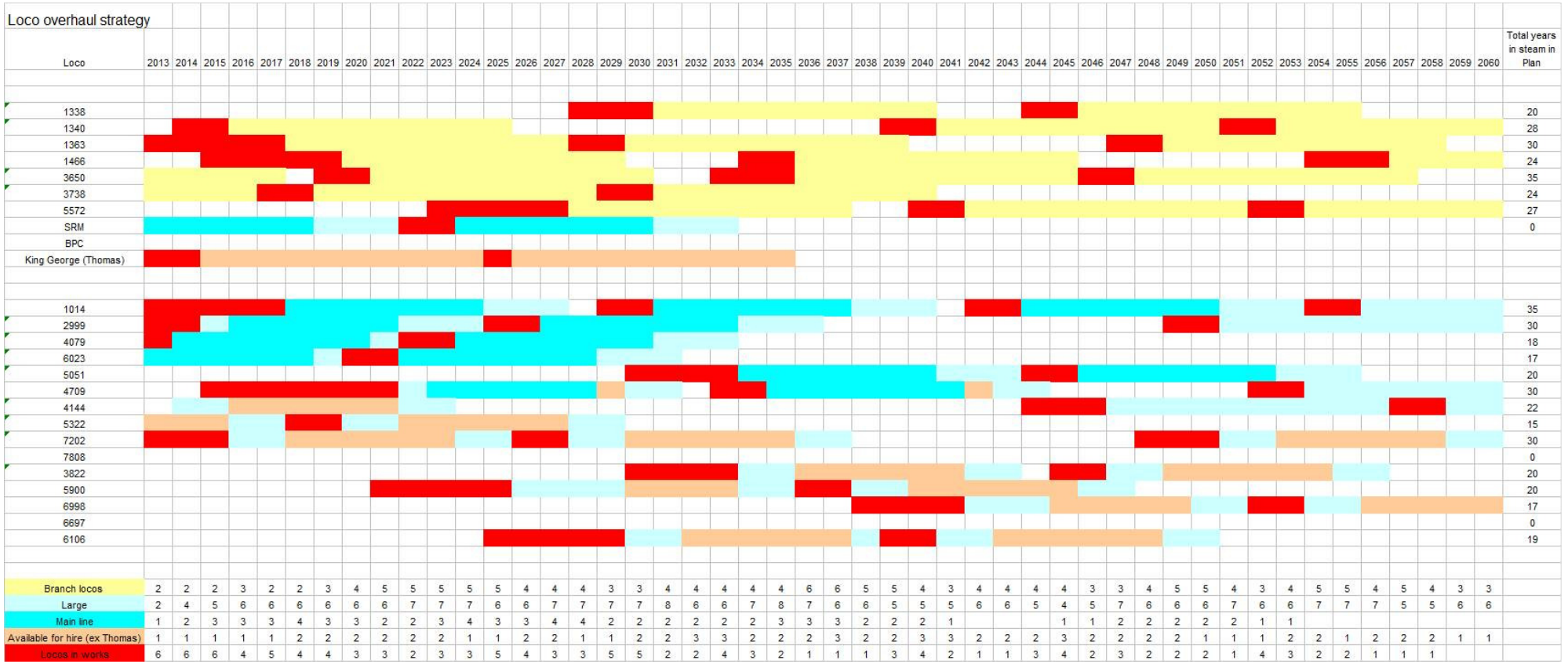
The Steam Rail Motor falls into a different category from other locomotives, being a unique category of vehicle with obvious attractions to other railways for hiring. While it is clearly very suited to branch line operation, it is possible that it might see periods away from Didcot and should not, therefore, be relied upon to form a core part of the

branch line operating fleet. Its relatively small power unit will, of course, require overhaul in the same way as conventional locomotives, but as it is essentially a new build as far as the power bogie is concerned, it should not require as long 'in works' to overhaul as the older locomotives. This paper does not include the power bogie in the 'locos in works' total in view of its limited demands on space and the as yet unknown potential life of the boiler.

While we seem to have a large number of big locomotives available for the first 20 or so years of this plan, this is a reflection of the present heavy emphasis on large locomotive projects. By careful organisation, this position can be eased in later years.

As a last point, even if the boiler life is reduced to 8 years, either as a result of a more conservative view being taken by insurers or as a result of early failure of tubes, there is adequate cover for the needs of the Didcot site in all years after 2017 with the exception of 2029. There is inadequate time to take steps to relieve this position before 2017.

Loco overhaul strategy



Loco	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	Total years in steam in Plan
1338																																																	20
1340																																																		28
1363																																																		30
1466																																																		24
3650																																																		35
3738																																																		24
5572																																																		27
SRM																																																		0
BPC																																																		
King George (Thomas)																																																		
1014																																																		35
2999																																																		30
4079																																																		18
6023																																																		17
5051																																																		20
4709																																																		30
4144																																																		22
5322																																																		15
7202																																																		30
7808																																																		0
3822																																																		20
5900																																																		20
6998																																																		17
6697																																																		0
6106																																																		19
Branch locos	2	2	2	3	2	2	3	4	5	5	5	5	5	4	4	4	3	3	4	4	4	4	4	6	6	5	5	4	3	4	4	4	4	3	3	4	5	5	4	3	4	5	5	4	5	4	3	3	
Large	2	4	5	6	6	6	6	6	6	7	7	7	6	6	7	7	7	7	8	6	6	7	8	7	6	6	5	5	5	6	6	5	4	5	7	6	6	6	7	6	6	7	7	7	5	5	6	6	
Main line	1	2	3	3	3	4	3	3	2	2	3	4	3	3	4	4	2	2	2	2	2	2	3	3	3	2	2	2	1				1	1	2	2	2	2	2	1	1								
Available for hire (ex Thomas)	1	1	1	1	1	2	2	2	2	2	2	1	1	2	2	1	1	2	2	3	3	2	2	2	3	2	2	3	3	2	2	2	3	2	2	2	2	1	1	1	2	2	1	2	2	2	1	1	
Locos in works	6	6	6	4	5	4	4	3	3	2	3	3	5	4	3	3	5	5	2	2	4	3	2	1	1	1	3	4	2	1	1	3	4	2	3	2	2	2	1	4	3	2	2	1	1	1			