

Bedford Mine Trail, Gulworthy, Devon Impact assessment



Historic Environment Projects

Bedford Mine Trail, Gulworthy, Devon

Impact Assessment Report

Client	Tamar Valley Mines Heritage Project	
Report Number	2012R063	
Date	August 2012	
Status	Final	
Report author	Colin Buck	
Checked by	AJ	
Approved by	AY	

Historic Environment, Cornwall Council

Kennall Building, Old County Hall, Station Road, Truro, Cornwall, TR1 3AY tel (01872) 323603 fax (01872) 323811 E-mail hes@cornwall.gov.uk www.cornwall.gov.uk

Acknowledgements

This archaeological recording was commissioned by West Devon Borough Council and the Tamar Valley Mining Heritage Project. It was carried out by the Historic Environment Projects team, Cornwall Council.

Within Historic Environment, the project manager was Colin Buck and figures reproduced in this report were compiled by Carolyn Royall, Colin Buck and Sherrell's Ltd. The report was edited by Andy Jones.

The views and recommendations expressed in this report are those of the Historic Environment Service projects team and are presented in good faith on the basis of professional judgement and on information currently available.

Freedom of Information Act

As Cornwall Council is a public authority it is subject to the terms of the Freedom of Information Act 2000, which came into effect from 1st January 2005.



Historic Environment, Cornwall Council is a Registered Organisation with the Institute for Archaeologists

Cover illustrations

Front cover image (\bigcirc C Buck CC) of one of many infilled surface outcrop stopes cutting across the route of the new Tamar Valley Mines Heritage Project Bedford Mine Trail (see Sherrells 2012 figure 4b).

© Cornwall Council 2012

No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without the prior permission of the publisher.

Contents

1	Sun	Summary 6			
2	Inti	Introduction			
	2.1	Project background	7		
	2.2	Aims	8		
	2.3	Building conservation philosophy	8		
3	Sta	tements of Significance	8		
	3.1	Definition of Outstanding Universal Value and Significance	8		
	3.2	General Statements of Significance for the Tamar Valley Mining District	9		
	3.3	Site specific Statements of Significance	11		
4	Sun	nmary table of building conservation works	15		
5	Ass	essment of impact and mitigation	20		
	5.1	Impact significance definitions	20		
	5.2	Building conservation works	20		
	5.2. 5.2	 Site impact and remediation summary Site inventory impact description and remediation measures 	20 21		
	5 3	Fencing works	27		
	54	Public access & interpretation	27		
	5.4.	1 Site description, site impact and impact remediation	27		
	5.5	Description of impacts during the post-project stage	28		
	5.6	Residual impacts	31		
	5.7	Assessment of impact on historic landscape character	31		
6	Imp	pact mitigation strategy: archaeological consultancy	31		
	6.1	Pre-works consultancy	31		
	6.2	Historic Buildings Consultancy	32		
	6.3	Programmes of archaeological recording	32		
7	Ref	erences	33		
	7.1	Primary sources	33		
	7.2	Publications	33		
	7.3	Websites	34		
8	Pro	ject archive	34		
9	Арр	oendices	35		
	9.1 <i>to TVN</i> Report	Appendix 1: Sherrells Ltd (Geotechnical Engineers) Letter report plans, Leta 11 AMA APPENDENT IN THE ADD AND A CONTRACT AND A CO 12 APPENDENT AND A CONTRACT AND A CO 13 APPENDENT AND A CONTRACT AND A CO	ter 35		
	9.2 TVMH	Appendix 2: Alastair Guy & Sons Letter report plans (July 2012), Plans for PRE: Proposed Bridge Crossing: Lode workings (end and side views)	39		
	9.3 projec	Appendix 3: Historic Buildings Consultancy and archaeological watching bridt design	ef 40		

List of Figures

- Fig 1 Location map
- Fig 2 1867 Estate Plan
- Fig 3 Map showing the archaeological sites relating to the proposed new mine track
- Fig 4 Map showing the sites of proposed works at Bedford United Mine
- Fig 5 Photo of Wheelpit tail race tunnel
- Fig 6 Photo Internal view of Marquis adit

Abbreviations

CC	Cornwall Council	
DCC	Devon County Council	
DCHES	Devon County Historic Environment service	
DGC	Devon Great Consolidated Mine	
DRO	Devon Record Office	
DHER	Devon Historic Environment Record	
HE (Projects) Historic Environment (Projects)		
NGR	National Grid Reference	
TVAONB	Tamar Valley Area of Outstanding Beauty	
TVMHP	Tamar Valley Mining Heritage Project	
WDBC	West Devon Borough Council	
WHS	World Heritage Site	

1 Summary

A new circular footpath trail is planned around parts of Bedford United Mine to/from the Sawmills Car Park as part of the Tamar Valley Mining Heritage Project. This impact assessment report is intended to inform and guide the Tamar Valley Mining Heritage Project (TVMHP), Devon County Council Historic Environment Service (DHES), and the Cornwall and West Devon World Heritage Site (Planning Advice Team), by assessing the impact of creation of the proposed trail and building conservation and site safety works upon the site's significant assets.

The Tamar Valley mines are nationally important mine sites, a proportion of the 19th century mining landscape is Scheduled but all are within the Cornwall and West Devon Mining Landscape World Heritage Site (WHS – Tamar Valley area Site A10), although none of the sites within this report are Listed or Scheduled. This report summarises the archaeological resource, and describes the impact and mitigation of the proposed works.

Most of the study area (Fig 1) is included within the former Bedford United Mine Sett, however, part of the northern section (using existing trackways and a TVMHP Trail) uses part of Wheal Thomas/Watson Mine (eastern side of Devon Great Consols Mine – see Fig 2). Both mines were worked from the late 1840s and include mine shafts, adits, sites of wheelpits, remains of flat rod gulleys and other mining related features.

The construction of a new track for public access along the steep sides of the Tamar Valley, often crossing open lode outcrop workings and close to open adits and closed shafts will impact upon its present woodland environment, so characteristic of the Tamar Valley Area of Outstanding Natural Beauty (TVAONB). However, mechanisms can be put in place (by DCHES) to ensure that there is an appropriate degree of consultancy and archaeological recording, as part of the project's impact remediation measures. Careful pre-works consultation with a site archaeologist has resulted in minimal impacts upon known archaeological features.

Archaeological impact recommendations include a programme of archaeological site consultancy before works start (to ensure the fencing/boardwalk/landing works will have a minimal impact), during works (for site supervision, archaeological recording, and liaison with DCHES), and after works to ensure the works were sensitively completed, as part of an overall mitigation strategy.

2 Introduction

2.1 Project background

The conservation and management of features relating to the TVMHP's mining heritage and enablement of safe public access forms the basis for the proposed new Bedford trail footpath creation and site conservation scheme. This report assesses the impact of the proposed building conservation works on the significant assets of the Bedford United Mine (and to a lesser extent Devon Great Consol's). There are no detailed schedule of works and specifications (apart from Appendix 2, a letter report by Sherrells dated February 2012), describing how the impact of the proposed works are minimised as part of a coherent mitigation strategy.

Cornwall Archaeological Unit (CAU – now Historic Environment Projects, Cornwall Council), produced an archaeological assessment of Devon Great Consols in 2002 (Buck 2002) and Bedford United Mine in 2003 (Buck 2003), which describes in detail each mine structure and their relative significance. The Historic Environment Service (HES) was commissioned in February 2012 (Project No. 2012010), by the Tamar Valley Mining Heritage Project (Chris Hariades as TVMHP Project Manager), to undertake Historic Buildings Consultancy (to ensure WHS consent to the nature and extent of the new track creation and limited building conservation specifications), photographic building recording of affected mine sites, and production of an impact assessment report for all sites affected and impacted by the proposed works.

An impact assessment project brief has not been produced, but it follows a similar project design by Cornwall Historic Environment Service; '*Project design for production of Scheduled Monument Impact Assessment Reports (Devon Great Consols and Gawton), as part of the Tamar Valley Mining Heritage Project (2006-2009)*', dated 23/6/06 (Reproduced as Appendix 1).

A summary statement of significance relating to structures likely to be affected by the proposed works has been produced (Section 3.3), followed by a summary table of each site's assets (Section 4). This report identifies the archaeological resources affected by the proposed building conservation scheme, and describes the impact and mitigation of the works on the site's significant assets (see Figs 1 and 3 for site inventory). In addition the report refers in detail to the management and maintenance plan that has been produced by the TVMHP (2006) and summarises the proposed short and long term site management as part of relevant conservation management plan policies (TVMHP 2006), and appropriate WHS management plan policies (2005).

It is proposed that the building conservation programme will address the following:

- The protection and consolidation of significant archaeological remains in their settings.
- Health and safety aspects of the site relating to public access.
- Provision of low-key public amenity use where appropriate, incorporating access.
- Interpretation of the site to the public, including on-site and written materials.
- Linking the site into the local economic, social, tourism and recreational contexts.

In terms of the management of archaeological features, engineering works will be kept to a minimum, but in view that the entire site is part of the Tamar Valley component (Area 10) of the Cornwall and West Devon World Heritage Site mining landscape, particular attention has been paid to suggestions for the best mitigation of any such works.

2.2 Aims

The purpose of this impact assessment is to:

- 1. Assess the impact of the new track creation and building conservation and safety works on the significance and character of Bedford United Mine. This report should be approved by DCC (Archaeology) and the WHS (Advice) team, before works on site can start.
- 2. Indicate the steps that have already been taken by the historic buildings consultant (HBC) to avoid or minimise adverse impacts upon the site, its features and archaeology and to ensure that the site methodologies accord with general EH guidance on the Conservation of Historic buildings.
- 3. Indicate that the proposed methods and techniques are appropriate to the history, character and outstanding universal value (OUV) of the site.
- 4. Make recommendations for an archaeological mitigation strategy.
- 5. Ensure the detailed site information (Sherrell 2011) conform to the overall mitigation strategy for the site.

2.3 Building conservation philosophy

All site works carried out by the project will be undertaken to the highest national standards, and in accordance with the policies and guidance set out in *Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment* (English Heritage 2008) and all other relevant guidance, irrespective of whether the heritage assets or components enjoy statutory protection or not.

The site conservation philosophy is based on respecting the character of each significant feature and its contextual relationship generally with other parts of the WHS. The long-term conservation and preservation of the built and standing archaeology should reflect its individuality, character and construction. The methodology of using traditional lime based mortar and timber structural components is intended to replicate its original construction technique; however, the end product is intended not to monumentalise the site but to conserve, protect and give the appearance of an old but safe structure. The building conservation text reproduced in the Appendix (9.1) is intended to describe in more detail the appropriate philosophy underlying building conservation works to enable safe public access and appropriate site interpretation.

An essential component of the mitigation strategy is the employment of an historic environment consultant who should ensure that English Heritage principles of conservation practice are adhered to both in terms of the design of appropriate schemes, to ensure that consolidation works are carried out to acceptable (EH) standards and to ensure close liaison between statutory agencies and the project scheme. In addition it is important that the nature, extent and development of the site conservation works should be guided by the relevant short and long-term management plan policies (statutory, archaeological, conservation, ecological, mineralogical and WHS, etc), which are an important part of any mitigation strategy of the site.

The appropriate statutory authorities (Devon County Historic Environment Services) will ensure that written scheme of investigations (or project designs), set standards for the archaeological recording and reporting during and after the works have ceased.

3 Statements of Significance

3.1 Definition of Outstanding Universal Value and Significance

The Outstanding Universal Value (OUV) of the Cornwall and West Devon Mining Landscape was described in the Nomination document for World Heritage Site Status 'The Cornwall and West Devon Mining Landscape was transformed during the period

1700 – 1914 by early industrial development that made a key contribution to the evolution of an industrialised economy and society in the United Kingdom, and throughout the world. Its outstanding survival, in a coherent series of distinctive cultural landscapes, is testimony to this achievement'. The 'coherent series of distinctive cultural landscapes' comprises ten areas of Cornwall, one of which is the Tamar Valley Mining District (Area A10); see Figure 1. There are seven main components identified in the Nomination Document through which the OUV is physically expressed: Mine sites, Mine transport, Ancillary industries, Mining settlements and social infrastructure, miners smallholdings, Great Houses and estates, and Mineralogical and other sites of scientific importance. Individual aspects of the cultural heritage making up the Site have differing levels of significance; some may be of an international importance, whilst others will be of national, regional or local significance (OUV of the Cornwall and West Devon Mining Landscape, 2007, 2).

Once the overall relative significance of mine sites has become apparent, through statutory (Scheduling), non statutory (WHS areas) designation, and the process of compiling a conservation management plan, identifying and prioritising significant elements within the mine site can take place. These are usually graded in relative categories from High, Medium to Low.

3.2 General Statements of Significance for the Tamar Valley Mining District

'The Tamar Valley forms the principal central landform of the district. Whilst the river flows from north to south, its great loops and bends follow a highly sinuous and changing course, its sides are often steep and frequently wooded. To the east the landscape above the banks of the river is rolling cultivated countryside that descends to the ancient market town of Tavistock, which nestles beneath the high granite uplands of Dartmoor. The 19th century mines of this district exploited an important concentration of (some) tin, but mostly copper, arsenic and silver-lead (north-south) lodes which run parallel with the east-west axis of the granite massif of Kit Hill and Hingston Down, and which were worked almost continuously from Callington to Tavistock' (Thorpe 2005, 64).

'Many of the most important mines in the Area were sited near to the river, where the lodes outcropped on its banks, and adit drainage was readily available. On the Cornish bank of the river these include New Consols, Wheal Benny, Gunnislake Clitters, Old Gunnislake, Okel Tor, Danescombe and Cotehele Consols, whilst a little away from the river were Calstock Consols, Wheal Zion, Wheal Edward and Wheal Arthur. On the Devon bank, Devon Great Consols and the Bedford United Mines were the largest and richest copper mines anywhere within the Site, the extraordinary amounts of ore they produced outstripping all other ventures; by the last decades of the 19th century they were supplying 25% of the world's arsenic. To the south are Russell United, George and Charlotte, Gawton, Tuckermarsh, South Ward, North and South Hooe, Furzehill and South Tamar Consols, the last of this group on the Bere Alston peninsula having been amongst the earliest to have been worked as true mines anywhere in Britain, their rich silver-lead deposits being exploited by the Crown from the 13th century.

A mining district with a long pedigree and which shared to a degree in the upsurge in mining which took place through the mid-19th century, but whose high point was around the second and third quarter of the century when undertakings like Devon Great Consols were amongst the largest and most important working for copper and arsenic in the Cornubian orefield. There were small and medium-sized mines scattered throughout the landscape on the Cornish side of the river, though on the Devon bank they are more or less confined to the river bank. Though tin and wolfram were mined, arsenic and copper dominate. John Taylor and the Dukes of Bedford were the key players in the development of the Devon mines, ports and communications systems, whilst the Duchy of Cornwall and the Williams family played significant roles to the west of the river' (CC 2007, Tamar Valley Mining District 94, 100).



3.3 Site specific Statements of Significance

A significant element of the TVMHP has focussed on identifying, prioritising and proposing a variety of site conservation works for the most significant elements of the mining landscape within the project area (Fig 1). The Historic Environment Service, Cornwall Council regards mine buildings (Engine Houses, boiler houses and chimneys), in Cornwall to be the most significant and iconic surface remains of the operations of a former mine site. As such, these buildings are considered to be the highest form of site significance when assessed with other more common building forms. However, for Devon Great Consols, these significant buildings were (most un-characteristically), demolished to ground level when the mine finally closed in 1903. Those at Bedford United Mine have also been taken/fallen down.

The following list of mine sites within the amalgamated mines of Devon Great Consols and Bedford United Mine includes a short statement of historical significance (denoting the reason why the site is worthy of building conservation works), and secondly, a short summary of the proposed conservation works. Archaeological assessment site references (Buck 2002; 2003), are given following the historical summary. It should be noted that all substantial extant buildings are of high significance and so justify a building conservation scheme within the context of the site's extant remains. Other lower significance sites may justify a conservation scheme (of limited extent) based on structural, Health & Safety and project finance criteria. These are listed in detail for every site in Section 4. Refer to Figure 1 for each site location within the project area, and Figure 3 for detailed site locations.

<u>Note</u>: A detailed history of Devonshire Great Consolidated (DGC) Mine and of Bedford United Mine is given in two earlier archaeological assessment reports (Buck 2002, 6-17; Buck 2003, 14-16). The landowner for the DGC project area (Fig 1) is the Earl of Bradford, whilst the Tavistock Estates which occupies this site operates a commercial forestry operation. The landowner for the Bedford United Mine site is Adrian High. See Figure 3 for site locations.

Historical summary of Bedford United Mine

'Although not equalling the extraordinary richness of its neighbour **Devon Great Consols**, the **Bedford United Sett** was highly productive with a recorded output of nearly 66,000 tons of copper ore, and smaller quantities of arsenic, tin and latterly wolfram' (Jenkin 1974, 29).

In the Bedford archive at Devon Record Office (Exeter), the earliest documentary records detail dues paid to the estate at the rate of 1/9th and a share of the profits for the estate as shareholder in the '**Marquess and Bedford Setts**' from 1712 (although there is an earlier reference to the sale of copper ore in 1711). Estate accounts also show copper ore sales from 1714 – 1720 (*pers comm* John Goodridge).

Slightly later observations were made by Hendrik Kahlmeter, a Swedish engineer, who visited the mine on 13th November 1724 (his text published in 2001 by Justin Brooke).'... in Collingswood, lies the Marquis copper mine, in the lands of the Duke of Bedford ... she was first discovered seventeen years ago on the bank of the river when some workmen got together, took a sett or lease of 20 fathoms from the water's edge ... and drove a level from the lowest point' (known today as the Deep Adit or 47 fathom level on Marquis Lode), and finding copper named this part of the mine **Bedford Mine**. Shortly afterwards a wealthier group of adventurers obtained another sett higher up the hillside where they started a second adit seven or eight fathoms above the first and drove it 60 fathoms. Subsequently the two workings were amalgamated and became known as the Marquis Mine. On commencing the upper adit, tin was met with near the outcrop of the lode, but on excavating deeper copper was encountered in considerable quantity and of a better grade than in the first adit. At length the water gained on the workmen to such an extent that sixty men were required to drain it until this became too costly and the working was abandoned for some years' (Brooke 2001, 12).

In 1722 the mine was acquired by the **Bristol Copper Company** who erected an underground engine near the adit end. This was driven by water directed down the shaft from surface which, after passing over a pumping wheel, flowed out through the adit mouth. By such means the Company contrived to sink the shaft 39 fathoms below adit, effectively draining the workings to that level. The lode ran due east-west and varied in width from 1 ft to 4 ft' (Jenkin 1974, 30).

Kahlmeter also states: 'No ore is smelted here, and it is only broken small and separated from the waste rock. The poorer kind is crushed and washed, and is sent by land (presumably via Newbridge) to a place two miles away called Net Stakes, where the River Tamar is navigable for barges or boats ... from there the ore is shipped to Bristol or to Neath in Wales'. Not far from this work and on the same side of the river lies another course of ore, which runs just as the previous one and is called **Tavistock**. It was worked for four or five years, but has been idle these seven years' (Brooke 2001, 12). This latter working appears to have been sited immediately north of the Marquis sett.

To date, there appears to be no further documentary evidence of these small setts (often following a single lode), until 1841 when the mines were reopened and amalgamated into the sett of **Bedford United Mines**. This included the lodes of Wheal Marquis, Wheal Tavistock, Delve's Kitchen, Bridge Lode and Ding Dong. 'In 1842 Captain Josiah Hitchens (who two years later discovered the enormous sulphide lode at **Wheal Maria** (Gard's Shaft - in what later became **Devon Great Consols**), and his associates were working the Marquis lode here by water power...The lode outcrops had been anciently worked away for 200 fathoms in length above the deep adit. From 1844 to 1856, 21,039 tons of copper ore were sold for £138,846' (Collins 1912, 412).

'In 1843 levels were being driven at 25, 30 and 40 fathoms below adit on the Marquis Lode where a 50 ft pumping wheel had been erected. To drive this and the wheel on Ding Dong Lode, water was brought through a leat from the southern end of the Tavistock Canal, high above Morwellham (for two miles – passing through tunnels and sometimes carried by launders slung in chains from the cliff face - Jenkin 1974, 32). 'Two large wheels were erected, 45 ft x 4.5 ft and 50 ft x 4.5ft, with another of 50 ft diameter under construction in 1844. In 1848 the company commenced paying dividends and later in the 1850's a new incline shaft was sunk (measuring 14 ft x 5 ft) with a double line of tram-roads' (Barton 1964, 96).

In 1849 a steam whim was erected and five shafts were in use. The deepest of these was Engine Shaft on the Tavistock Lode which followed its underlie down to an eventual depth of 150 fathoms from surface' (Jenkin 1974, 32). 'In the face of considerable opposition from this company a branch from the **Devon Great Consols** Railway for the conveyance of ores, coals and other materials was made by the Duke in 1863 at a cost of £275. The benefit of the railway to the company is now fully appreciated' (1868 Report on Mines). The company had previously conveyed its ores to Morwellham by wagon at a charge of 5s per ton. This rate was subsequently reduced to 1s.10d (a cost saving of over £962 from Jan. 1864 to Dec. 1868 for 8027 tons of copper ore and 424 tons of mundic).

Figure 2 (1867 shafts/lodes map) from the Bedford archive shows the extent of the workings. The Bedford Estates 1868 Report on the Mines (T1258M E 44a-b) by Gilson Martin (dated 31st Dec.), showed that the mine's first lease from the Duke of Bedford ran for 21 years from 1842 to 17/9/1863 (terminating on 17/9/1874), 4000 shares having been issued. The area of the sett was 218 acres (42 of which was woodland-but the area occupied by the mine totalled 5.5 acres), with 92 men and boys, 13 women and girls giving a total of 105 people. Four shafts were being used and 47,000 tons of ore had been sold, with over 1000 tons of mundic produced. '*This mine is drained by two large water wheels and the drawing and crushing is done by a small steam engine'* (1868 Report on Mines). The value of the copper ore was nearly £250,000, £880 of tin, and £557 of mundic. The dues to the Duke had, by 1868, amounted to £17,294;



Figure 2 1867 Bedford Estates Plan showing shafts/lodes within the Bedford United Mine Sett and adjacent Devon Great Consols Mine Sett.

 \pounds 11,733 capital had been expended. After dividends had been taken the mine's net profit was \pounds 42,667.

'In 1870 the mine was 148 fathoms deep and employed 160 people. In 1877 a limited liability company of 1200 shares (£1each) was registered' (Collins 1912, 412). 'In 1878 the company raised only sufficient ore to pay working costs in the hope that metal prices would ultimately recover... output of copper and mispickel fell off markedly in the 1880's.Underground activity finally ceased at the end of 1889, followed by liquidation of the company in August of the following year' (Barton 1964, 96).

The 1901 Report on Mines and Quarries by the Estate Manager (J. Paull-dated 31st Dec.) states (1901 Report on Mines and Quarries): 'two men are employed in the adit level on South lode-mostly going eastwards with little wolfram and arsenical mundic being found ... By the middle of December the licensee (Mr William Phillips), seems to have reached the end of his means for mining adventure (ventilation in the level was so bad that it no more could be done without incurring the censure of HM Inspector of Mines), funds to be attempted to be raised to cut a shaft from surface or to ventilate by mechanical means-so driving the level was stopped in mid December (Mr Phillip's lease terminates at Midsummer next (1902)'.

From 1915 to 1925, the mine was re-opened on a small scale above adit for mundic and arsenical pyrites, funded by the Bedford Estate. In 1918 76 men were employed. In later years (after 1922) mispickel was taken from the mine to **Devon Great Consols** along a re - laid narrow gauge (2 ft.) track for re-processing in the newly built arsenic refinery. Also arsenical pyrites and wolfram from **Wheal Frementor** (the south western part of **Devon Great Consols**), was taken to **Bedford United** for stamping, before being taken back to the arsenic calciners via the railway (Richardson 1995, 100). The mine continued to work in a small way until 1928 when it finally closed, producing 2,111 tons of arsenic, 1,053 tons of mispickel, 72 tons of 60% copper precipitate and 9 tons of wolfram (Dines 1956, 666). Richardson also states (1995, 129) that the mine was active to 1930 in conjunction with **Ding Dong Mine** and that it was worked to 10 fathoms below deep adit level (42 fms. below surface at Engine Shaft) with the aid of a small Cornish pump (still *in-situ* in 1938); '*in about 1978 some interest in the mine was shown by South West Consolidated Minerals' (ibid*).

Summary Bedford Mine heritage features impacted by the Bedford Trail (Fig 3)

- Archaeological features on North/Tavistock Lode (Sites 1/1.1, 2, 4, 5).
- Archaeological features on Marquis Lode (Sites 2, 3/3.1, 11).
- Archaeological features on Unrecorded Lode (Sites 12, 13, 14).
- Archaeological features on Phillips Lode (Site 10).
- Conservation repair of masonry tail race walls to stamps/crusher wheelpit (Site 17)
- Sites 15, 17.1, 39, 40, 41, 42.

Historical summary of Devon Great Consols Mine

'Devon Great Consols was the last great copper discovery in the West of England and for twenty years from 1845 to 1865 the seemingly inexhaustible deposits overlaid the copper mining world ... (and) was the richest copper mine in Europe, and when its lodes began to fail it went on to produce so much arsenic (half the world's supply), it had to be regulated to avoid swamping the market... It was the only mine in Devon and Cornwall to build and work its own standard gauge railway. In its own foundry it maintained and partly constructed many of the steam engines and water wheels used for pumping and crushing ore' (Booker 1974, 143/144). Refer to Figure 2, reproduction of an 1867 Bedford Estates Survey map.

From 1845 to 1903, sales of copper ore had been 742,400 tons (averaging 6.5%); the greatest total recorded for any mine, not only in Cornwall and Devon, but anywhere in the 'old world'. This had realised £3,473,046 on which dues of £261,587 had been paid. Tin sales had totalled only £170 (despite the large investment looking for it below the copper lode), but 72,279 tons of refined arsenic had realised £625,062 on which dues had been £27,967. In later years the mine's purser (Moses Bawden), estimated that 600,000 tons of mispickel had been calcined.

During the mine's career, a total dividend of £1,225,216 had been disbursed. £658,336 had been spent on the arsenic works, railway and other capital equipment (including houses and schools, etc). Approximately 45 miles of shafts/levels and winzes had been sunk, whilst waterwheels (totalling 33 fed by over 8 miles of leats), had been the main

power source for 2,420 fathoms (over 4.33km) of flat rods.

Wheal Thomas/Watson

This mine, which was sited in part of the project area, was named **Wheal Jack Thomas** up to the 1870s, and **Wheal Watson** thereafter (after Mr Peter Watson, the managing director from 1879) worked from the late 1840s, 12 Tutworkmen and 2 labourers being employed in 1850 (Fig 2). It developed the eastern end of South Fanny Lode: 'It had yielded arsenical mundic when it had been worked in 1855 and 1856, at which time the emphasis had been on copper production. The ore had then been left on one side, but 24 years later (after Main Lode had been exhausted and the arsenic market inflated) it represented a valuable asset. To speed up the work in the mine and to reduce labour costs by as much as ...30% the company decided to purchase rock drills and an air compressor' (Goodridge 1964, 253). Barton (1964, 79) goes further: 'This section of the sett (in 1879) ... was opened up vigorously and was pumped by a further 280 fathoms of flat-rods extended to the shaft from one of the existing pumping wheels'. By the early 1880s this mine and Wheal Emma were the only copper producing parts of Devon Great Consols (Buck 2002, 229).

The mine, shafts and flat-rod from the water wheel are shown on the 1857 Lease map (Fig 3). The site stretched from the water wheel at the bottom of the valley (Site 370), to Watson's Shaft (Site 383), and Old Eastern Shaft (Site 380) at the top of the hill (Buck 2002). Documentary evidence for the size of the water wheel comes from Hall (2000, 107), quoting an 1860 survey; '*Wheal Thomas pumping wheel, 36 ft. by 4 ft. cast-iron axle'*. The 1867 map (Fig 2), shows the site of the water wheel, an adjacent building (perhaps a flat rod crank pit), and the leat supply for the wheel (from Site 5 (Buck 2002), the leat from Scrubtor 2.5 miles away).

'Devon Great Consols was the last great copper discovery in the West of England and for twenty years from 1845 to 1865 the seemingly inexhaustible deposits overlaid the copper mining world ...(and) was the richest copper mine in Europe, and when its lodes began to fail it went on to produce so much arsenic (half the world's supply), it had to be regulated to avoid swamping the market...It was the only mine in Devon and Cornwall to build and work its own standard gauge railway. In its own foundry it maintained and partly constructed many of the steam engines and water wheels used for pumping and crushing ore' (Booker 1974, 143/144).

Summary Devon Great Consols Mine heritage features impacted by the Bedford Trail (Fig 1)

 Archaeological features on Thomas/Watsons Lode (Sites 374, 375, 376, 376.1) – sites not shown on maps in this report. Sites can be seen in Buck 2002 (Fig 38, site inventory map).

4 Summary table of building conservation works

The following sites are identified and described in detail in both the Devon Great Consols Mine and Bedford United Mine archaeological assessment reports. The impact significance column shows that some sites are regionally important **`R**', or Locally important **`L**'. The letter in brackets (**H**=High, **M**=Medium, **L**=Low) summarises the impact of the proposed works on the site, Section 5.1 and the site inventory text describes this in more detail (Section 5.2.2). Figure 3 shows the spatial relationship of the site's significant assets which may be affected by the new Bedford Mine Trail.

Table of archaeological sites and features affected (visually/physically) by the scheme

Bold (high impact) text sites are described in detail in Section 5.2.2. Site numbers in brackets are given by Sherrell (see Figs 4b-4d, 9-10). Bedford United Mine sites are shown in Figure 3, whilst Devon Great Consols Mine sites are shown in Figure 1.

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
	-	1	Bedford United Mine			
1 (34)	Adit	Open adit near leat (Site 15), accessed via cutting in rock outcrop	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None – but open adit may be visible from lower track
1.1 (34)	Shaft	Open shaft accessed just inside open adit (Site 1).	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
2	Leat	Well preserved C18 leat in places	Footpath (west side) to use leat channel throughout its length	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	Н (Н)	Leat base and downslope bank profile should be maintained. Visual impact of new fencing/boardwalk
3 (36)	Stope	Open stope cut into a rock outcrop	New track near site – site fencing of adit/workings and `walkway' over infilled stope.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	New site fencing and walkway
3.1 (36)	Working platform	Working platform/spalling floor adjacent to adit (Site 3)	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
4 (36)	Adit and spoil heap	Closed infilled adit (Tavistock/North lode) at end of lobby	Site visible from adjacent track, so adit entrance may be fenced.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Visual impact of round post and round rail fencing
5 (37)	Working area	Working platform/spalling floor adjacent to adit	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
10 (39)	Dam/reservoir pond	Extant masonry	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None. Visible from new track
11 (39)	Exploratory Adit	Small blocked adit	New track near open adit site – site fencing of adit workings	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	New site fencing
12 (40)	Working area	Working platform/spalling floor adjacent to adit	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
13 (40)	Adit opening	Collapsed opening	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
14 (40)	No 1 Shaft (Philips lode)	Poorly fenced open shaft, with side opening to west. Adjacent to proposed new track route.	Re-fence the mine shaft and steep drop on west side.	Issue 7 (Policy 7e)	L (M)	Visual impact of new fencing in small area
15 (41)	Leat	Extant in places	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
17 (43)	Wheelpit/tail race tunnel	Two sections of masonry wall – both collapsing	Rebuild collapsed sections and repoint throughout	Issue 8 (Policies 8a to 8c), Issue 10	R (M)	Repair and consolidation of the collapsed walls – new pointing visible
17.1 (43)	Leat (Tail race)	Extant profile	None – but re-use as track	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Increased wear and possible leat erosion

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
39 (52)	Rectangular pond	Deep, wide shaft or wheelpit	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (M)	None but sites can be seen from new track route
40 (52)	Turbine machinery plinth	Extant masonry wall/plinth	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (M)	None but sites can be seen from new track route
41 (52)	Large flooded depression	Difficult to view whether shaft or wheelpit	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None but sites can be seen from new track route
42 (53)	Large tailings dump, dressing floor	Extant overgrown dump	Fencing along parts of northern edge parallel to new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Walking along part of the dressing floor site
			Devon Great Consols			
374 (231)	Wheal Thomas/Watson Mine adit	Possibly a collapsed adit, 2.0m of portal rock face visible.	Possibly fence the front of the collapsed adit	Issue 7 (Policy 7e)	L (L)	Additional fencing – possibly visible from the lower track
375 (232)	Wheal Thomas/Watson Whim/Air Shaft, capstan and finger dump	The shaft is visible as a hollow (6.0m diam and 0.8m deep), marked by a granite stone.	Possibly fence around the shaft	Issue 7 (Policy 7e)	R (L)	Safety fencing around the shaft. Some tree thinning may be necessary for site fencing.
376 (232)	Wheal Thomas flat rod cutting and tunnel under track (SX 43721 73036 to 43900 73049)	Cuttings are approx. 1.0m wide and cut into ground at varying depths (0.5 to 0.75m deep). Site damaged in places by forestry activity. Tunnel robust to take vehicles	None. Retain the features undisturbed.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (L)	None. Cutting visible from footpath.

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
376.1 (232)	Wheal Thomas flat rod cutting (SX 43868 73063 to SX 43741 73073)	Cuttings are approx. 1.0m wide and cut into ground at varying depths (0.5 to 0.75m deep). Site damaged in places by forestry	None. Retain the features undisturbed.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (L)	None. Cutting visible from footpath.
Not in report Site A	Masonry feature/shaft (SX 43750 73070)	Rectangular feature at ground level (2.1m x 2.6m), all walls visible. Stone lined to visible depth of 0.6m. Infilled interior. Site fenced.	None. Feature already fenced	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None. Feature visible from footpath.
Not in report Site B	Unrecorded lode/stope outcrop (SX4378 7283)	Rock outcrop with two parallel C18 stope excavations	Timber bridge over northern rock outcrop/stope, continue timber walkway across second infilled stope	Issue 7 (Policy 7e)	L (L)	Ground impact of 0.3m depth for bridge/walkway foundations

5 Assessment of impact and mitigation

5.1 Impact significance definitions

The potential impacts during works are described below (and summarised in tabular form in Section 4), for each site. Impacts are described in the text section for each site on a feature-by-feature basis. The following site impact terms are used within each site identification description relating to the impact assessment and site gazetteer:

Major positive	Site continues in, or is restored to, its original design and use		
Moderate positive	Site restored as far as possible respecting its original function, but its use is altered		
Minor positive	Site partially restored; interpretation introduced		
Negligible positive	Stabilisation/maintenance of site		
Negligible negative	Benign neglect – losses of fabric over a long period of time		
Minor negative	Site suffers areas of alteration or damage, which contribute to loss of meaning		
Moderate negative	Significant loss of fabric or alteration, leading to erosion of original character		
Major negative	Complete demolition/removal		

5.2 Building conservation works

5.2.1 Site impact and remediation summary

The TVMHP has included all the track creation/building conservation works within the new Bedford Trail site into a single programme starting from January 2012 to the end of 2012. It is likely that the successful tenderer will undertake all the trackway works, although the site fencing may also be tendered.

There is no detailed schedule of works and specifications report. However, there has been a process of site consultation with the TVMHP site archaeologist to ensure that the nature and extent of the proposed works/impacts for every site is mitigated and minimised.

Figure 3 indicates the proposed route of the new trail, and the proximity to known archaeological sites. For the most part the site works to form this track along the steeply sides of the Tamar Valley – crossing a number of unrecorded lodes/stopes, to access the former 18th century mine workings and the lower parts of the 19th century Bedford United Mine, are formed by using existing routes along leats, old tracks and forming new ones, some with timber steps. In at least two locations, timber walkways and low impact bridges will need to be constructed with locally sourced timber, to cross lode outcrop workings and infilled stopes.

There is only one site for building conservation (Site 17). A tall conifer tree is to be removed (its roots have affected the masonry and structural stability). Soft and crumbling mortar will be removed (to a maximum depth of 40mm) from the masonry walls following a detailed site assessment of the feature by the site contractors (Darrock & Brown). The style and depth of re-pointing (slightly recessed from the masonry face), will mimic that of the original and will be decided when the test mortar panel is agreed with the site contractors and the historic buildings consultant. Site meetings and consultations will be held to ensure compliance with heritage building conservation guidelines.

Other general impacts:

Site compounds and site (vehicular) access

Figure 2 shows the location of the Woodlands car park which will site the compound and toilet (if necessary). Vehicular and pedestrian access to the site will also be via the Woodland car park.

Impact reduction measures:

A method statement will be produced by the TVMHP, and (where relevant) by the site contractors in order to promote a reduction of the impact of creating the new track works on the fabric and character of the site.

For the small conservation scheme (Site 17), only loose lime mortar will be removed from walls and replaced with a new equivalent. The style and colour of the new mortar will reflect the style and colour of the existing so reducing the visual impact of the conservation works. An historic buildings consultancy and archaeological recording during the site works may be able to minimise any further below ground site impacts, but also record any visible/disturbed archaeological features and to record the nature and extent of the building conservation works. A CC project design for this function has been produced in the Appendix (9.3) at the rear of the report.

Residual impact mitigation:

There will be the residual impact of the creation of a new footpath (timber stepped at steep locations), along a short section of the Tamar Valley. However, the residual visual impact will soon fade, as the benefits in terms of increased public access and increased site information will come to fruition as a substantial public gain.

For the small building conservation project, there will be the visual effect of new pointing – although this will fade in time. But by using the mechanism of trial test panels for matching new lime mortar aggregate mixes with the existing colour and pointing style, etc, it is hoped that the new lime mortar pointing will be very similar to the existing, resulting in little visual impact.

It is certain that there will be regular visiting members of the public throughout the year, and that there will be an increase in site visitor numbers. However, the scheme has been carefully and thoughtfully designed by the TVMHP to minimise negative affects to the character of the site.

5.2.2 Site inventory impact description and remediation measures

The following sites are described in more detail in each relevant archaeological assessment report (DGC Mine, Buck 2002, 6-17, and Bedford United Mine, Buck 2003, 14-16), summarised in bold in Section 4.1 and shown in the relevant site plan in Figures 1 and 3. All the sites mentioned are summarised in Section 4, and with have variable impacts – but some are very low (i.e., only visible from the new trackway. Therefore the following detailed site descriptions only refer to site or safety impacts that have a direct physical impact (sites in bold). The works on each site is described, followed by a section describing the reduction (or mitigation and remediation) of the impact, followed by a final section which details the residual impact. To avoid repetitive duplication in this site inventory section, site impact and remediation measures already given in Section 5.2.1 are not reproduced – simply referred to.



New circular track from Woodlands Car Park

(Figs 1, 3 and 4 for site location)

Site impact

Figure 4 is a plan of the various boardwalks, bridges, lined timber paths (due to the steep slopes), steps and re-used tracks throughout the course of the new circular trail route. The impact of all of these involves the on-site construction of ground level natural oak timber features, whose design and use will minimise the impact of the scheme which is in a woodland setting, and of great historic character. The approximate locations of archaeological features within Bedford United Mine are shown on Figure 3 and are also described in detail in this section.

Part of this project will necessitate the creation of a new track route along the steep Tamar Valley sides – by cutting and infilling, then using oak timber edging to form the side of the trackway. Other sections will consist of fixing and insertion of oak timber steps and short posts (of varying sizes), into the ground. These impacts should be minimal. However, the main impact is the visual effect of these new features on the setting and character of the woodland landscape.

The overall impact of these proposed works on the site can be defined as '*Negligible positive'*. The works will provide a greater element of safety and minimise footfall, although it will negatively affect the site's visual authenticity as a natural woodland environment.

Reduction of impact measures:

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to its route, location and extent. It is recommended that Tamar Valley volunteers walk the route twice a year to assess footfall damage, and if necessary propose remediation measures to reduce erosion affecting the nature, form and profile of the leat.

Residual impact mitigation:

There will be residual visual impacts of the track and mine site hazard fencing as well as the excavation for short sections of track creation itself. The natural oak timber fencing will complement the surrounding deciduous tree landscape, and will naturally discolour and age, in its original woodland setting.

Leat (18th century) (Site 2) (SX 43745 72791 to SX 43626 7253)

Site impact

The main impact on this leat will be footfall along its former water channel earth remnants. It is likely the original leat would have been lined with planking, or moulded river clay along its base. The earthwork remains are fragmentary, and seems to have been widened in places to form a track. Fencing will be necessary at some sites; either near mine outcrop/shaft/adits, etc or due to steep slopes on the down-slope side.

The overall impact of the proposed works on this feature can be defined as '*Negligible negative'*. The works will provide a safe footpath access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber boardwalks (see Figs 4b, 4c, and Fig 9 for their location and extent).

Residual impact

The main significant residual impact is the presence of occasional fencing along the new route, a new small bridge (Appendix 9.1 Site 4b) and two other boardwalks. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate.

Stope (lode outcrop) (Site 3) (SX 43740 72637)

Site impact

The main impact on this natural lode outcrop (evidence of a former 18th century stope mining operation: Marquis Lode, is the construction of a low profile boardwalk across the sides of the infilled stope and fencing across two former adits/stope access (see Fig 3, 4b and Appendix 2: Sherrell 2012, fig 4c for location). The rock outcrop will be drilled and steel dowels inserted through concrete pads (dimensions to be calculated on site – see Appendix 2, Fig 8), upon which the boardwalk will be founded. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber boardwalk, its location and extent.

Residual impact

The main significant residual impact is the presence of a new small bridge and boardwalk. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate.

Adit/Stope (Site 11) (SX 43726 72605)

Site impact

The main impact on this small exploratory adit outcrop evidence of a former 18th century stope mining operation (Marquis Lode) is mainly visual. A low fence will be constructed across the site entrance. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber bridge/boardwalk, location and extent.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

No 1 Shaft (Site 14) (SX 43742 72544)

Site impact

The main impact on this shaft is mainly visual. A fence will be constructed around the shaft (where appropriate using the existing postholes). The timber is to be locally sourced from the adjacent woodlands. A fence will also be located across the deep excavation to its west – possibly a related stope working. As public access is possible to this side of the shaft (see Fig 3 and Appendix 2: Sherrell 2012, fig 4d for site location).

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and nearby information boards will inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the shaft fence (rounded posts and wire fencing – in the style of other TVMHP shaft fences).

Residual impact

The main significant residual impact will be the presence of a newer tanalised timber, possibly higher, fence (replacing the existing inadequate one). It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of this section of the Tamar Woodlands and Bedford Mine.

Wheelpit masonry wall/tail race tunnel (Site 17) (SX 43771 72626)

<u>Note</u>:

This site, during the 2001 site assessment survey was interpreted to be a reservoir pond, with connecting leat to the wheelpit to the south west (Buck 2003, Site 17, 43). However, further assessment (and better field survey conditions) has resulted in a re-evaluation of the form and function of this site. It is now interpreted as a wheelpit (with attached crusher/stamps to the north) – contextually related to a probable nearby primary dressing floor.

Site impact

There are two masonry walls. An upper section of wall 1.0m wide and 1.2m high (0.6m thick), has become structurally unsound as the roots of an adjacent tree have caused damage throughout. The tree is to be carefully removed, and the wall rebuilt in places and repointed throughout (see Fig 6, a view of the site before works).

Approximately 1.0m below this is an underground wheelpit tailrace tunnel measuring 0.5m wide and 0.6m high and approximately 5.0m long to a collapse (Buck 2003, fig 12), which leads into the adjacent leat (Site 17.1). The tunnel arched portal stone has collapsed, and will need to be replaced, also the front wall will need to be repointed.

Reduction of impact

The stones to be used will, if possible, be the original stones that have fallen out of the wall. If there are insufficient stones, new stones should be used (from a similar quarry source), and should match the original in terms of colour and size. The style and colour of the new mortar will reflect the style and colour of the existing so reducing the visual impact of the conservation works. An archaeological watching brief recording during the works may be able to minimise any further site impacts, but also record any visible/disturbed archaeological features (Refer to Section 5.2.1).

The works will provide more structural stability and enhance the site's visual authenticity for at least another generation. The overall impact of the proposed works on this feature can be defined as '*Negligible positive*'.

Residual impact

Refer to Section 5.2.1.

Leat (Site 17.1) (SX 43771 72626 to SX 43715 72595)

Site impact

The main impact on this narrow (0.4m) leat starting from the end of the tail race, will be limited wear and tear along its course (approximately 80.0m which leads to Sites 38 to 40), due to footfall as it is used as part of the new trackway. There will be no additional material brought in for the footpath. A low fence will be constructed across the side of the leat where there is a steep drop (adjacent to Site 14). The fence timber is to be locally sourced from the surrounding woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the direction of the route and design of the fencing.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

Tailings dump/dressing floor (Site 42) (SX 43718 72516)

Site impact

The main impact to this long section of tailings dump and possible dressing floor adjacent (north side), is one of footfall. The proposed track route will be between the Philips lode outcrop features (Sites 9, 12 - 14), and the main tailings dump in the valley. Parts of this route are quite flat, and were probably formed for a dressing floor (unless the original 19th century site was over dumped in the 1920s). In places, due to adjacent steep drops to the track route, a low fence will be constructed. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the direction of the route and design of the fencing.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected

that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

Unrecorded stope/lode outcrop (SX 43779 72832)

Site impact

This site (not discovered during the 2003 archaeological assessment), is indicative of evidence of a former 18th century stope mining operation (Marquis Lode). The main impact on this natural rock outcrop (and mine stope) is the construction of a low timber bridge (see Fig 3 and Appendix 2: Sherrell 2012, fig 4b for location), over the open stope to permit access along the new track. The rock outcrop will be drilled and steel dowels inserted through concrete pads (dimensions to be calculated on site – see Appendix 2, fig 8), upon which the timber bridge (with handrails) will be founded. The timber is to be locally sourced from the adjacent woodlands (see Appendix 2: Sherrell 2012, fig 4b for site details).

On the south side of the open stope is another parallel working, another stope but infilled, presumably of similar date. A timber boardwalk (of similar wood to the nearby bridge) will be constructed over the top of the stope, founded on either side by timbers.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber bridge and boardwalk, location and extent.

Residual impact

The main significant residual impact will be the presence of a new small bridge and boardwalk. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

5.3 Fencing works

Safety remediation works to mine shafts and adits in proximity to newly opened tracks and footpaths have been undertaken during the TVMHP for past three years. The specifications for these works have been formulated and constructed with the agreement of TVMHP and the Devon Historic Environment Service. For this trail section, there are some steep down-slope sections adjacent to the newly created footpath that engineers advised to be fenced. Figure 4 is a summary plan showing the proposed works along the route of the track, and detailed drawings in Appendix 9 show the main site locations. Archaeological recording and consultancy have been undertaken during these works by HE Projects, Cornwall Council. An archaeological watching brief report will be produced to include both the fencing/trail works and building consolidation works. Many of the new shaft fences will need to have safety warning signs attached (to the existing fencing).

5.4 Public access & interpretation

5.4.1 Site description, site impact and impact remediation

Public access is restricted to well-defined (multi-use and trackway) routes within and from Devon Great Consols to Bedford Mine are primarily in private ownership.

Site interpretation facilities are to be installed at the Tavistock Woodlands car park (SX 43829 728969), in a newly built 'Orientation centre'. Smaller and site specific

information boards and sign posts/way-link guides will be distributed along the new Bedford trail at appropriate sites. However, in addition, web based site information and leaflets are planned for production by the TVMHP via the Tamar Valley Area of Outstanding Natural Beauty (TVAONB).

An archaeological watching brief recording and archaeological consultancy during the fencing safety works may be able to minimise any further site impacts.

Site impact

The overall impact of the public access and interpretation project on the site can be defined as '*Negligible positive*', and of very low impact. The works will provide a greater element of site information and safety and should not negatively enhance the site's visual authenticity.

Residual Impact

Fencing, signage, etc will have a localised, visual impact on the site and increased trampling may damage habitat/disturb wildlife.

Reduction of Impact

The visual impact of fencing, signage, etc will be reduced through careful project design, siting and installation of these features. Limited public access is to be provided, routed away from sensitive/hazardous areas.

5.5 Description of impacts during the post-project stage

The TVMHP aims to utilise a newly created localised network of multi-use trails (using former railway lines and footpaths), in and around the mining landscape of Devon Great Consols southwards to Morwellham Quay (via Bedford United mine, and Wheal Russell Mine to New Quay). It is likely that in the future these will link up to other footpath and trail routes in the west Devon area (and possibly into to Kit Hill in Cornwall, etc). As a result there may be the physical consequences in the short term of having a slightly greater number of people visiting these sites than previously. In addition there will be an ongoing need for annual vegetation maintenance from some paths and buildings with very occasional repair of occasional dislodged masonry. It is expected that the TVAONB will undertake site inspections (utilising public volunteer groups as part of an agreed management plan), along trackways and parts of the site that are subject to building conservation works.

The TVAONB has produced a ten year management and maintenance plan (2006), in order to define and advise the various groups (for example, volunteers) that will be involved in managing and maintaining the archaeological features within both Scheduled Monument areas and other adjacent World Heritage Site areas (Area 10: Tamar Valley).

Bedford Mine Trail IA CB September 2012



Figure 4 Site plan of proposed works along the route of the new Bedford Mine Trail (Sherrell 2012)

Bedford Mine Trail IA CB September 2012



Figure 5 A view of the end of the wheelpit tail race tunnel and wall before works. Site 17.

© CC HE Projects 2012



Figure 6 An internal view of the upper Marquis Adit stope before works Site 7 © CC HE Projects 2002

5.6 Residual impacts

Any short-term residual and regular maintenance issues (vegetation growth and possible vandalism), will be inspected (and work undertaken) by the TVAONB volunteer group. This should ensure that impacts to the site, if they occur, should be short-lived and quickly mitigated.

After the building conservation work has ceased and the site is open to members of the public, the main residual impact will be visual – in terms of new fencing and new lime mortar repointing. However, after a relatively short period of time the lime mortar will fade to a colour sympathetic to the existing colour, with the positive residual impact being that the building is conserved for at least another generation.

5.7 Assessment of impact on historic landscape character

The steeply sloping sides of this Tamar valley site are heavily wooded, hiding extensive evidence for past mining activity during the past three centuries. The landscape is characterised by numerous old mine shafts and adits, large and small spoil heaps, quarries, and other earthworks and mine transport infrastructures associated with its mining heritage of working clusters of lodes that culminated in the Tamar Valley being Europe's largest producer of copper ore in the 19th century.

Devon's Historic Landscape Characterisation project has been consulted and characterises most of the area as 'Ancient Woodland' and 'Woodland'. There is no doubt that given the steep slopes, it has been used for woodland since at least the medieval period, if not beyond. The site has been (since the 1960s been planted with conifers – only the very steep slopes still retain some semblance of its mixed deciduous origins.

The existing management of the site, and its impact could be defined as being of 'partial benign neglect – losses of fabric over a long period of time'. If work is not undertaken as soon as possible to the remainder of the site this process is set to continue and worsen – with in some cases the strong likelihood of having further serious structural collapse to the wing walls of the engine houses. The TVMHP aims to conserve the most important significant sites within the upper reaches of the Tamar Valley.

The overall impact of the proposed works on this significant site can be defined as **Negligible positive**: *Stabilisation/maintenance of site*. Within the project area the landscape character will be changed in the short term through track creation, vegetation clearance, particularly repairs to the building fabric. On balance the negative effect of these changes are minor and will diminish in the short term while providing a safe site for close public access to view mine buildings that represent the last working phase of an important mine, and to provide interpretation to understand an industrial process that operated for at least a century.

6 Impact mitigation strategy: archaeological consultancy

The impact mitigation strategy methodology is described below in three main stages: The pre-works consultancy, the historic buildings consultancy during works and the archaeological recording record (during and after works). This mechanism demonstrates the steps that have been taken to avoid or minimise adverse impacts, confirms that the proposed works have been designed in close liaison with the historic environment consultant. This is based on a clear understanding of the significance of the site using appropriate methods and techniques for site monitoring and recording.

6.1 Pre-works consultancy

The process developed by the Historic Environment Service, CC when undertaking historic buildings consultancies includes an important element of mitigating the impact of the works on the site during the project planning and specification stage. This

process has been ongoing during the past year. It has included an extensive dialogue with the project's structural and geotechnical engineer and mining landscape consultants. When the minimal impact of the scheme on any historic feature, landscape resource and historic character has been achieved as far as possible, the scheme progresses to any statutory/non statutory consent application and then the tendering stage for site contractors leading to site implementation works.

6.2 Historic Buildings Consultancy

The TVMHP manager has commissioned an Historic Buildings Consultant (HBC) based on the CC project design (re-produced in Appendix 9.3). Once the project details and specifications have been agreed and contractors commissioned, the project team (project manager/structural engineer/ecological consultant/historic buildings consultant), will ensure through dialogue that the impact of the conservation works by the site contractors is minimised as far as possible. For example, mortar test panels for building conservation works will attempt to minimise the visual impact of new lime mortar repointing and to attempt to replicate the existing style and finish of the existing mortar. Method statements will be sought from the site contractors to describe how (for example) working with lime can be achieved under variable weather conditions (although guidance will be given as part of the works specifications).

The HBC will monitor and advise on compliance to ensure (through a site meeting), that the methodologies and techniques of all aspects of the site works accord with the method statements and agreed methodologies outlined in any schedule of works and Specifications. In addition the TVMHP Principal Officer will enforce requirements based on the HBC advice. However, as a general philosophy, the extent of re-pointing and structural repairs on all buildings will only be minimal in order to ensure structural stability and conservation of the building for at least another generation.

A site meeting will be held at the completion of works to ensure that the site contractors clear the site of all debris, etc and to undertake a final visual check of the completed works. Site monitoring meetings and communication strategies with CC (WHS Advice), are also described in detail in the CC project design (Appendix 9.3).

Consultancy with other related specialists prior to and during the works (for example Geotechnical and Structural engineers, and the TVMHP manager), will be an ongoing process, an integral part of the Historic Building and archaeological consultancy, in order to create a site that will not be unduly affected by loss of significance or historic character as a result of carrying out the works, but rather its access, historic importance and site interpretation is enhanced by the project.

Regular site progress updates (every two weeks) will be provided by the HBC to the TVMHP Principal Officer and DCC archaeology (Bill Horner), usually in the form of emails. If an issue regarding a structural remediation technique or where the remediation works may go beyond that given approval by existing consents, as much advanced notification as possible will be given to DCC archaeology for a site consultation, etc.

6.3 **Programmes of archaeological recording**

The TVMHP will commission an historic buildings consultant who will also undertake the archaeological watching brief recording and production of a final report. A CC project design describes a detailed programme of archaeological recording, site monitoring and watching brief report production (Appendix 9.3). DCC archaeology and the Historic Environment Service, Cornwall Council (Advice) should approve this before works start.

Given the very small amount of masonry reconstruction/repointing, the detailed on-site archaeological recording techniques will only include detailed site photography (Black/White and digital colour). The archaeological recording report will include detailed 'before and after' site photographs as well as a descriptive text of the general works (refer to Appendix 9.3).

7 References

7.1 Primary sources

DRO Mine Plans:

MRO (R29B, R19A, 190, 15307, 15317, 13949, R19B, 3260)

T1258M (Bedford Estates Archive-leases, maps and Reports on Mines/Quarries)

Sherrell, F., 2000, Devon Great Consols and Bedford United Mines: Report on the results of a desk study and surface reconnaissance inspection, Report No. 1915

- Sherrell, F., 2002, Devon Great Consols and Bedford United Mines: A preliminary risk assessment in relation to public access within the site, Report No. 1915/2
- Sherrell, F., 2011, Proposed footpath below Bedford Sawmills, Gulworthy, Devon (A preliminary risk assessment in relation to public access within the site, Report No. 3685
- Sherrell, F., 2012, Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Report No. 3685

Symons, B, 1848 A Geological Map of the Tavistock Mining District, Cornwall, Truro TVMHP., 2006, *HLF TVMHP Management Plan*

7.2 Publications

Barton, D.B., 1961, A History of Copper Mining in Cornwall and Devon, Truro.

Barton, D.B., 1964, Historical Survey of the mines and mineral railways of East Cornwall and West Devon, Truro

Bennett, A., 1992, Images of Cornwall, Runpast Publishing

Booker, F., 1971, The Industrial Archaeology of the Tamar Valley, Newton Abbot

Brooke, J., 2001 ed Kalmeter Journal, Twelveheads Press, Truro

- Buck, C., 1998, *Preliminary assessment of industrial sites of archaeological importance*, CAU Report
- Buck, C., 2002, *Devon Great Consols Mine Assessment Report*, CAU Report (2002R069)
- Buck, C., 2003, Bedford United Mine Assessment Report, CAU Report (2003R043)
- Burt, R., Waite, P., and Burnley, R., 1987, *Cornish Mines: Metalliferous and associated Minerals 1845-1913,* Univ of Exeter

Collins, J.H., 1912, Observations on the West of England Mining Region, 1988.

- Dines, H.G. and Phemister, J., 1956 (reprinted, Beer, K.E., 1988), *The Metalliferous Mining Region of South-West England*, HMSO
- Jenkin, A.K.H., 1974, Mines of Devon, The Southern Area, Vol. 1 David and Charles

Patrick, A., 1983, *Copper production in the Tamar Valley in the Eighteenth Century*, Tamar Journal, Vol 5

Richardson, P, H, G., 1992, Mines of Dartmoor and the Tamar Valley after 1913

Thorpe, S, 2005, *Cornwall and West Devon Mining Landscape-Management Plan*, HES/CC

7.3 Websites

<u>http://www.stastier.co.uk</u> A particularly useful website by the manufacturers of St. Astier brand lime products detailing methodologies for their application.

<u>http://www.cornishlime.com</u> The website of the Cornish Lime Company

<u>http://www.matchingbrick.co.uk</u> A useful website for those seeking matching brick for the repair of historic structures

8 **Project archive**

The HES project number is 2012010

The project's documentary, photographic and drawn archive is housed at the offices of Historic Environment, Cornwall Council, Kennall Building, Old County Hall, Station Road, Truro, TR1 3AY. The contents of this archive are as listed below:

- 1. A project file (2012010) containing site records and notes, project correspondence and administration.
- 2. This report held in digital form as: G:\TWE\Waste & Env\Strat Waste & Land\Historic Environment\Projects\Sites\Devon\Bedford Mine Trail 201210\IA Report\Bedford Mine trail IA 2012010.doc
- 3. Oasis No. 134883

9 Appendices

9.1 Appendix 1: Sherrells Ltd (Geotechnical Engineers) Letter report plans, *Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter* Report 8/2/2012 No. 3685 (Figs 4b-4d, 10)



<u>Note</u>: Specifications for the Revised bridge location (Unrecorded Lode) is shown in Appendix 9.2 (Alastair Guy drawings). The southern 'bridge' site will have a boardwalk.



<u>Note</u>: The 'revised bridge location' shown on this plan will now site a fenced (with handrail) low impact boardwalk.


<u>Note</u>: It is likely that there will low impact site information boards near the viewing area to view part of the former Bedford United Mine site. All fencing will be timber and low visual impact. Shaft 13 will also be fenced.

Bedford Mine Trail IA CB September 2012



Sherrells Ltd (Geotechnical Mining Engineers) Letter report plans, *Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter* Report 14/6/2012 No. 3685 (Figure 10)

9.2 Appendix 2: Alastair Guy & Sons Letter report plans (July 2012), *Plans for TVMHP RE: Proposed Bridge Crossing: Lode workings (end and side views)*



9.3 Appendix 3: Historic Buildings Consultancy and archaeological watching brief project design

Tamar Valley Mining Heritage Project:

Written Scheme of Investigation - Historic Building and Archaeological Recording Consultancy 21/7/2006

Client: Tamar Valley Mining Heritage Project,

Client contact: C Hariades, Tamar Valley Mining Heritage Principal Officer

Client tel: 01872 888125

Client email: <u>chariades@cornwall.gov.u</u>k

1 Background

1.1 Introduction

The Tamar Valley Countryside Service, through the Tamar Valley Mining Heritage Project Officers, is managing conservation works to five historic industrial/mining sites in West Devon (Tamar valley) as part of the second stage of a Heritage Lottery Funded Mining Heritage Project. All of the sites are located within the proposed Cornwall and West Devon Mining Landscape World Heritage Site (see Thorpe, 2005 and Buck 2002-6).

There are other site works that are listed in the project's Heritage Sites Programme, but which are not covered in this Written Scheme, but are subject to different project designs (WSI's):

- 1. Trails and safety works consultancy and watching brief (all mine sites)
- 2. Archaeological (sub-surface) watching brief recording (new car parks at Tavistock woodlands, Morwellham, New Quay and new build at Morwellham)
- 3. Tavistock Canal archaeological consultancy and watching brief
- 4. Tavistock to Bere Alston Railway archaeological consultancy and watching brief

This Written Scheme of Investigation (WSI) has been prepared by the Historic Environment Service (Projects), Cornwall County Council, to set out how the Historic building and archaeological recording consultancy works are to be undertaken. These consist of an appropriate level of historic building consultancy work and historic building and archaeological recording which are likely to be required by conditions on the appropriate Planning, Listed Building Consents (LBC) and Scheduled Monument Consents, which are yet to be granted (see Appendix 1). These conditions are likely to require that a WSI should be produced by the archaeological contractor for:

(1)An historic buildings and safety works consultancy for the supervision of conservation works and

(2)A programme of historic building and archaeological recording

The preferred WSI will be submitted by the Tamar Valley Mining Heritage Project (TVMHP) Principal Officer to the Devon County Historic Environment Service (DCHES), the Local Planning Authority (LPA) where relevant, West Devon Conservation Officers, English heritage (for Scheduled sites), and the World Heritage Site Advice Team, CC, for written approval before work begins on site.

1.2 Project Background

No conservation works have previously been carried out to Tamar Valley (Devon) industrial mine sites and trails. The site work involves building consolidation and

provision of safe public access within five mining heritage sites (mainly former mining or industrial complexes), and the creation of a number of new trails (c 20Km, not including the railway or canal). Many of the mine sites contain significant heritage assets. Extant engine houses (some Scheduled Monuments), substantial ore quays and lime kilns are located on some sites, and all contain a number of mine shafts, legacies of the site's industrial past. Project funding will seek to make these sites safe and more accessible for a greater number of people, both for the local communities and visitors.

The five main sites which are to be conserved (Devon Great Consols, Bedford United Mine, Morwellham, New Quay and Gawton) are to be made publicly accessible, funded to a large degree by the Heritage Lottery Fund (HLF) and Objective 2. Each individual site has been subject to an archaeological assessment, a structural assessment by certified Structural Engineers and where necessary a Geotechnical Engineer. Also additional assessments have been carried out by a mineralogist, and an ecologist. All of these sites (and others), and the heritage trails between them have also been subject to a Conservation Management Plan, prepared as part of both the Stage 1and 2 bids.

Archaeological assessments have been undertaken (Buck 2002, 2003, 2005-006) containing historical research, copies of historical maps, photographs and plans of the sites, a description of each structure and colour photographs of each main structure. In addition the reports identified general repair proposals for each structure. Detailed recommendations for each building (on elevations and plans as agreed by the Consulting Engineer and the Historic Buildings Consultant), will be made as part of the Scheduled Monument Consent and tender specification document stages.

2 Site information and structures to be treated

The suggested level of archaeological consultancy/recording for each site should be referred to when reviewing Section 2 below.

2.1 Devon Great Consols and Bedford United Mines

(January 2012 – March 2012)

Opening 2km of a new footpath route within the former Bedford United mine and parts of Devon Great Consols mine, utilising existing forest tracks and features. The routes have been designed to make the most of the natural beauty and archaeological history of the area, while at the same time avoiding disturbance of local residents, sensitive ecological sites and the landowners working areas.

Carrying out safety works within a buffer zone of the new track, including fencing mine shafts and fitting metal bars to adits.

Consolidating archaeological remains at 35 sites, including work to preserve the arsenic condensers, calciners flue and chimney that form the Devon Great Consuls scheduled ancient monument. Arsenic conservation works (Scheduled Monument) to be carried out Dec 2007 – July 2008.

SITE INFORMATION AND STRUCTURES that may be affected (Devon Great Consols, Buck 2002)

• Archaeological features on Thomas/Watsons Lode (Sites 374, 375, 376, 376.1)

SITE INFORMATION AND STRUCTURES that may be affected (Bedford United Mine, Buck 2003)

- Archaeological features on North/Tavistock Lode (Sites 1/1.1, 4, 5)
- Archaeological features on Marquis Lode (Sites 3/3.1, 7, 8, 11)
- Archaeological features on Unrecorded Lode (Sites 12, 13, 14)
- Archaeological features on Phillips Lode (Sites 9, 10)
- Conservation repair of masonry tail race walls to stamps/crusher wheelpit (Site 17)
- Sites 15, 17.1, 18, 39, 41, 40, 42

3 Aims and objectives

The purpose of the historic buildings consultancy, historic buildings recording and archaeological recording is:

- To ensure that site works are undertaken in such a way as to maintain the integrity and authenticity of the historic resource, minimising adverse impact upon the resource.
- To ensure that the highest possible standards of workmanship are maintained during the conservation works, which must be carried out to recognised current best standards in this discipline.
- To ensure that works are undertaken in such a way as to allow adequate recording of remains affected by the works,
- To record sites, features, deposits and artefacts affected by or uncovered by the works.
- To record the character and extent of works to the sites.
- To disseminate the results of the project appropriately and arrange for the deposition of the project archive.

4 Working methods

All archaeological recording work will be undertaken according to the Institute of Field Archaeologists *Standards and Guidance for Archaeological Investigation and Recording.* Staff will follow the IFA *Code of Conduct* and *Code of Approved Practice for the Regulation of Contractual Arrangements in Archaeology.*

The principal factor in effective project delivery will be the employment of key project staff who are expert in the management and recording of the industrial heritage. Cornwall Historic Environment Service project staff are able to draw upon a substantial track record in undertaking similar work throughout Cornwall, as well as a detailed knowledge of the project area and its sites.

4.1 Historic buildings consultancy

- HES (Senior Archaeologist) will attend a pre-works meeting to agree site access and site compound and stockpile areas in order to minimise damage to archaeological features, agree site compound location, agree details of location/preparation/number of mortar test panels, agree working methods and any changes to proposed work programme and discuss Health and Safety issues and requirements.
- The HES (Senior Archaeologist) will liaise with the Devon County Historic Environment Service - DCHES (Bill Horner), West Devon Conservation Officer (Stephen Gill/Roger Duce), English Heritage (Inspector for buildings and ancient monuments (Shane Gould) the WHS Management team (Phil Copleston) and the TVMHP Officers (Chris Hariades and Richard Halliwell). The HES Senior Archaeologist will liaise with any additional archaeological recording officer on the extent of works carried out and the appropriate level of recording.
- HES (Senior Archaeologist) will provide historic building conservation advice to the site engineer and site contractor in line with English Heritage guidelines (referred to in section 7 below) during regular site visits.
- It is anticipated that an HES Senior Archaeologist (Colin Buck), will undertake Historic Buildings Consultancy as part of this work. This person will also photograph the buildings before, during and after works take place – liaising with any additional project recording archaeologist and undertake to fulfil any specific recommendations made by DCHES and DCMS as part of the Scheduled Monument Consent.
- The HES Senior Archaeologist will attend regular site meetings at an approximate frequency of 0.5 day per week for each building contract. The meetings will be held with the site engineer, site contractor and possibly the appropriate District

Conservation Officer, as appropriate, to discuss ongoing site conservation work methods, detail of repairs and resolve any conservation work problems. It is assumed that the structural engineer and site contractor will have a proven track record in historic building conservation.

- The HES Senior Archaeologist will liaise with any additional archaeological recording officer on the extent of works carried out and the appropriate level of recording.
- HES will ensure that site conservation works are carried out to standards recommended by English Heritage best practice, and will halt inappropriate or substandard work and inform DCHES, the building engineer and TVMHP Project Officer.
- HES will advise the Structural Engineer/TVMHPPO (Pete Leaver/Tom Fletcher), where variations to repair and conservation work and recording may need to be agreed with the LPA/English Heritage; this will be discussed with the DCHES (Bill Horner) in the first instance.

4.2 Fieldwork: historic building recording

- Detailed archaeological recording will be undertaken for all newly exposed architectural features and any features revealed through excavation. Recording will also include the extent of repointing and rebuild.
- Historic building recording will be undertaken by a Senior Archaeologist (Historic Buildings Consultant Colin Buck or a suitably experienced HES archaeologist).
- As well as new detail, the nature and extent of all conservation works will be added to the existing archaeological/engineering building survey drawings (to be supplied to HES by the client).
- Measured survey will be carried out by hand measurements (using offset techniques at a scale of 1:50), using a paper copy of the survey supplied by the Client. This record will then be added to the original survey using CAD (or equivalent) software.
- The resulting survey output will be a revised measured survey drawing showing all conservation works that have been undertaken. This will be reproduced at a scale of either 1:50 or 1:100 (appropriate to the size of area recorded) and will form part of the Historic Buildings archive watching brief report.
- Analysis of the building fabric will be recorded in the form of field notes and written up at the archive report production stage.

4.3 Fieldwork: archaeological recording during mine shaft and safety works treatment

- The DCHES (Bill Horner) has advised that archaeological recording should be undertaken during any excavation that has revealed archaeological features. Recording will be undertaken using a mix of direct measurement, sketch plotting and photography, as appropriate (constrained by safety factors).
- Where significant remains are encountered the site archaeologist will be given the opportunity to make an appropriate form of record before work proceeds; where a temporary stop of work is required to undertake this, the site archaeologist will make a request via the project resident Engineer.
- If archaeological deposits of a regional or national importance are uncovered, contingency should be allowed within the works programme to review options to ensure their preservation in situ. In the event that significant remains cannot be preserved in situ, strategies for their relocation or detailed recording will be agreed with the Devon County Archaeologist.
- Any variation in named personnel for archaeological recording and historic buildings consultancy will be agreed with DCHES, and the TVMH Project Officer.
- The chosen site archaeologist will adhere to Health and Safety Policies (see below), under the direction of the designated Site Safety Officer.

4.3.1 Site recording (general)

- Site drawings (plans, sections, locations of finds) will be made by pencil (4H) on drafting film; all plans will be linked to the Ordnance Survey landline map; all drawings will include standard information: site details, personnel, date, scale, north-point.
- The site archaeologist will undertake recording in line with recommendations given by IFA. Sections and plans will be drawn on site at appropriate scales which will adequately record structures or features at appropriate levels of detail, and appropriate sections reproduced in the archive report at either 1:50 or 1:100 to adequately demonstrate revealed archaeological features.
- All features and finds will be accurately located by means of a National Grid reference.
- All archaeological contexts will be described using a standard format and linked to a continuous numbering sequence.
- A location plan will be made which will allow site detail to be accurately placed within the context of the Ordnance Survey Landline mapping.
- The archaeological watching brief report will detail (and if appropriate summarise) all forms of archaeological recording that has been undertaken at each of the mine sites. Each major mine site will have a single archaeological watching brief report that details all project related work to that site (ie trails works, building conservation works, interpretation works etc).

4.3.2 Treatment of finds

- It is recognised that fieldwork may produce artefactual material.
- It will be important to agree the arrangements for deposition of any finds prior to the start of the project, and ensure that transfer agreements are arranged and signed..
- An allowance has been made for discussions with landowners for the deposition of archaeological finds in an appropriate museum have been included in the cost tender.
- All significant finds in stratified contexts will be plotted on a scaled base plan and described.
- All finds will be collected in sealable plastic bags which will be labelled immediately with the context number or other identifier.
- Plymouth City Museum is the designated museum. Their guidelines should be followed and accession numbers for finds and archives for each project should be obtained at the start of the project. Unless otherwise agreed, mining-related artefacts and small finds to be removed from site will be deposited at the Plymouth City Museum, pending detailed discussions over their final place of deposition or loan to other local smaller museums and interpretation centres (for example Morwellham and Tavistock) etc.

4.3.3 Photographic recording

- 1. Black and white scaled photography using either a 35mm camera or medium format camera using fine grain archive quality film (400ASA).
- 2. Provision will be made for a range of lighting conditions and the photographic equipment will be available to the historic building recording personnel listed in the WSI.
- 3. Each shot will be carefully composed, focused and lit appropriately with a flash gun if necessary. The photo record will comprise:
- general views and examples of structural and architectural detail.

Methodology for the archive standard photography is set out as follows:

- Photographs of details should be taken with lenses of appropriate focal length.
- Difficulties of back-lighting should be dealt with where necessary by balancing the lighting by the use of flash.
- A range of appropriate photographic scales should be used and a metric scale included in all archive recording photographs, except where health and safety considerations make this impractical.
- A photographic location plan for each building recorded will be produced for the report and each film will be fully printed to 6 x 4 or 7 x 5 size prints. Selected prints will be scanned into the archive reports.
- Black and white photographs will be archived to HER standards and incorporated into the HES photo database.
- Supporting colour photographs will be taken with a high resolution digital camera (3MP or higher), to illustrate the report and for possible presentation purposes. This will be archived electronically onto each report CD.
- Care will be taken that each shot is focused and that with delayed shutter action that camera shake does not occur. Each shot will be of appropriate quality and used for reports and/or power-point presentation.
- Digital colour photographs will be stored according to the Historic Environment Service's guidelines. Copies of the images will be provided to the client.
- The archaeological record will include a plan showing the location of the photographs reproduced in the report.

4.3.4 Post Fieldwork

Following completion of the fieldwork stage the results from the Historic buildings, Trails and any other main sites within the mine project will be combined into a single concise report for each major mine site.

4.4 Report production

Each site report will summarise the results of the measured survey, photographic recording and archaeological recording for buildings and shafts treated as part of this project, and will include the following components:

- Summary
- Project background
- Aims and objectives
- Methodology
- Summary description of conservation works undertaken at all structures
- Description of conservation works and works programme, together with results of any archaeological recording.
- Recommendations for future management, including any further requirement for conservation works or other archaeological work.
- Conclusions
- References
- Project archive index
- Supporting illustrations: location map, historic maps, plans, elevations/sections, photographs.
- 4.4.1 Draft and summary report

- A summary report will be produced within two weeks of the completion of the fieldwork for each site and circulated to the DCHES Team and WHS Advice teams.
- A draft report containing the project results, as outlined above, will be produced and circulated to the DCHES Team for comment.

4.4.2 Final report format

- A paper copy and a digital (PDF) copy of the report, illustrations and any other files will be held in the Cornwall HER.
- Four paper copies of each report, and a CD containing an electronic copy of the report and the digital photographic archive will be produced for the client and the DCHER.
- Paper copies of the report will be distributed to local archives (including the Historic Environment Record) and national archaeological record centres.

4.43 Archiving

Following review with the HES Project Manager the results from the fieldwork will be collated into an archive following the Society of Museum Archaeologists Guidelines. This will involve washing and cataloguing relevant finds, the indexing and cross-referencing of photographs, drawings and relevant context records.

- All finds and samples, etc will be stored in a proper manner (being clearly labelled and marked and stored according to HES and IFA guidelines).
- Following any necessary cleaning, stabilisation and recording, artefacts or small finds will be deposited at an appropriate location.
- All paper and photographic records will be ordered, catalogued and stored in an appropriate manner (according to HES guidelines). It is expected that the depository site for these records will be the Devon County Record Office, Exeter.
- An EH OASIS entry (on-line) will be prepared at this stage of the project summarising the site impacts for each mine and referring to each archaeological watching brief report.

4.4.4 Cornwall HES archive deposition

An index to the site archive will be created and the archive contents prepared for long term storage, in accordance with HES standards (which will follow Society of Museum Archaeologists Guidelines). Archiving will comprise the following:

- All correspondence relating to the project, the WSI, a single paper copy of the report together with an electronic copy on CD will be stored in an archive standard (acid-free) documentation box.
- The drawn archive will be stored in A2 plastic wallets.
- Photographic material will be stored in archive standard negative holders and archive print holders within an archive standard box.
- All black and white photographs are to be archived using captioned labels, appropriate record forms and location plans. Other photographic records to be supplied with written captions and subject to appropriate batch archiving to be held in safe archival storage.
- Devon's Historic Environment Service/Devon Museums will receive a copy of all site photographs, reports and relevant correspondence etc.

The written archive will be deposited in a registered archive or museum, in accordance with their deposition guidelines and within 4 months of the completion of fieldwork.

5 Public presentation

Given the importance of the Tamar Valley mine sites, the significant impact to local communities of the remaining engine houses and the inclusion of all the sites in the proposed World Heritage Site, it is acknowledged that there is scope for wider public

dissemination of the results of this project. This dissemination could take the form of one or more of the following, subject to the agreement of funding for this work by the Project Manager (this may not be included in the tender associated with this WSI, although it can be included if requested by the Project manager/DHES):

- Community Open Days to show members of the public around the mine sites
- Provision for public lectures to local organisations
- Provision of information about the sites, works carried out and dates of open days etc via web sites (CC, DCC, WHS)
- Popular publications:
 - Devon: DAS Newsletter, Articles in DAS proceedings/monographs
 - Cornwall: Archaeology Alive, CAS Journals
- Media/newspaper articles via TVCS publicity officer.

6 Project staff

- The Historic Environment Service (Projects) has accumulated unparalleled experience in industrial archaeology, having been involved in this aspect of archaeology for the last twenty years (see the HES CV and the specific personnel CV in Appendix 2). The project will be managed and carried out by an HES Senior Archaeologist with proven experience in industrial archaeology; this staff member will also carry out the historic buildings consultancy and historic buildings recording. The project manager will:
- Take responsibility for the overall direction of the historic building consultancy and archaeological recording project.
- Discuss and agree the detailed objectives and programme of each stage of the project with DHES and TVCS PO, including arrangements for health and safety.
- Monitor progress and results for each stage.
- Edit the project report.

Key personnel within the proposed team are (CVs summarised in the Appendix):

Colin Buck, DipCert, Senior Archaeologist. cbuck@cornwall.gov.uk

Specialist in Cornish mining landscapes and assessments since 1993. Involved in numerous recording and appraisal projects including conservation works to many engine houses and other structural conservation works, shaft safety works and mine site access improvements, particularly in the east of Cornwall. Projects include many archaeological impact assessments. Helped Tamar Valley AONB Service prepare CMP for West Devon Mining. Involved in the preparation of policies for the Cornish Mining World Heritage Site Bid's Management Plan and produced the Mineral Tramways Conservation Management Plan.

7 General arrangements

Timetable

Following guidelines provided by the TVMHP Principal Officer (and David Wilson Partnership – Pete Leaver), the consultancy and fieldwork (for a projected duration of three years), is anticipated to be commenced during late summer of 2006. HES will require at least three weeks notice before commencement of work, in order to allow the allocation of field staff time and arrange other logistics.

Monitoring and Signing Off Condition

- Monitoring of the project will be carried out by Historic Environment Projects and DCHES (Bill Horner).
- The Devon County Historic Environment Service Planning Advice Officer should be informed 1 week in advance of the intention to start the recording (although a three year project timetable has been prepared).

- HES will liaise with the DCHES Officer to discuss the programme, progress of work, and agree site meetings as required.
- A summary of the results for each major contract stage will be presented to the DCHES Officer within 2 weeks of the completion of the relevant fieldwork.
- Draft reports will be provided to the DCHES Advice Team for comment.
- Where the DCHES Officer is satisfied with the archive report and the deposition of the archive, written discharge of the planning condition will be expected from the local planning authority (LPA).

Monitoring points during the study will include:

- Approval of the WSI
- Completion of fieldwork for each mine site
- Completion of archive report and summary note for each mine site
- Deposition of the archive

Professional standards

The historic building and archaeological recording will be carried out to the standards of the Institute of Field Archaeologists and all work and advice will be carried out in line with the IFA Code of Conduct and Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology.

Copyright

Copyright of all material gathered as a result of the project will be reserved to Cornwall County Council and their funding partners (Devon County Council). Existing copyrights of external sources will be acknowledged where appropriate.

Compliance and Variations

Minor variations to this WSI will be discussed in liaison with the client and the Devon Historic Environment Planning Advice Officer. The TVMHPO will then agree these with the LPA/EH as appropriate. Major variations may require detailed agreement from the Local Planning Authority.

Contract

The HES projects team is part of the Historic Environment Service, within Environment and Heritage, Cornwall County Council. If accepted, the contract for this work will be between the client and Cornwall County Council.

The views and recommendations expressed will be those of the Historic Environment Service projects team and will be presented in good faith on the basis of professional judgement and on information currently available.

Health and safety

- The Service follows the County Council's *Statement of Safety Policy*. For more specific policy and guidelines the Unit uses the manual *Health and Safety in Field Archaeology* (2002) endorsed by the Standing Conference of Archaeological Unit Managers and also the Council for British Archaeology's Handbook No. 6 *Safety in Archaeological Field Work* (1989).
- The historic building consultant and the historic building/archaeological recording team will adhere to the Health and Safety Statement of the Principal Contractors.
- Prior to carrying out on-site work HES will carry out a Risk Assessment.

Insurance

As part of Cornwall County Council, HES is covered by Public Liability and Employers Liability Insurance.

Colin Buck, Senior Archaeologist, Historic Environment Projects, Cornwall Council



Bedford Mine Trail, Gulworthy, Devon Impact assessment



Historic Environment Projects

Bedford Mine Trail, Gulworthy, Devon

Impact Assessment Report

Client	Tamar Valley Mines Heritage Project	
Report Number	2012R063	
Date	August 2012	
Status	Final	
Report author	Colin Buck	
Checked by	AJ	
Approved by	AY	

Historic Environment, Cornwall Council

Kennall Building, Old County Hall, Station Road, Truro, Cornwall, TR1 3AY tel (01872) 323603 fax (01872) 323811 E-mail hes@cornwall.gov.uk www.cornwall.gov.uk

Acknowledgements

This archaeological recording was commissioned by West Devon Borough Council and the Tamar Valley Mining Heritage Project. It was carried out by the Historic Environment Projects team, Cornwall Council.

Within Historic Environment, the project manager was Colin Buck and figures reproduced in this report were compiled by Carolyn Royall, Colin Buck and Sherrell's Ltd. The report was edited by Andy Jones.

The views and recommendations expressed in this report are those of the Historic Environment Service projects team and are presented in good faith on the basis of professional judgement and on information currently available.

Freedom of Information Act

As Cornwall Council is a public authority it is subject to the terms of the Freedom of Information Act 2000, which came into effect from 1st January 2005.



Historic Environment, Cornwall Council is a Registered Organisation with the Institute for Archaeologists

Cover illustrations

Front cover image (\bigcirc C Buck CC) of one of many infilled surface outcrop stopes cutting across the route of the new Tamar Valley Mines Heritage Project Bedford Mine Trail (see Sherrells 2012 figure 4b).

© Cornwall Council 2012

No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without the prior permission of the publisher.

Contents

1	Sun	Summary 6			
2	Inti	Introduction			
	2.1	Project background	7		
	2.2	Aims	8		
	2.3	Building conservation philosophy	8		
3	Sta	tements of Significance	8		
	3.1	Definition of Outstanding Universal Value and Significance	8		
	3.2	General Statements of Significance for the Tamar Valley Mining District	9		
	3.3	Site specific Statements of Significance	11		
4	Sun	nmary table of building conservation works	15		
5	Ass	essment of impact and mitigation	20		
	5.1	Impact significance definitions	20		
	5.2	Building conservation works	20		
	5.2. 5.2	 Site impact and remediation summary Site inventory impact description and remediation measures 	20 21		
	5 3	Fencing works	27		
	54	Public access & interpretation	27		
	5.4.	1 Site description, site impact and impact remediation	27		
	5.5	Description of impacts during the post-project stage	28		
	5.6	Residual impacts	31		
	5.7	Assessment of impact on historic landscape character	31		
6	Imp	pact mitigation strategy: archaeological consultancy	31		
	6.1	Pre-works consultancy	31		
	6.2	Historic Buildings Consultancy	32		
	6.3	Programmes of archaeological recording	32		
7	Ref	erences	33		
	7.1	Primary sources	33		
	7.2	Publications	33		
	7.3	Websites	34		
8	Pro	ject archive	34		
9	Арр	oendices	35		
	9.1 <i>to TVN</i> Report	Appendix 1: Sherrells Ltd (Geotechnical Engineers) Letter report plans, Leta 11 AMA APPENDENT IN THE ADD AND A CONTRACT AND A CO 12 APPENDENT AND A CONTRACT AND A CO 13 APPENDENT AND A CONTRACT AND A CO	ter 35		
	9.2 TVMH	Appendix 2: Alastair Guy & Sons Letter report plans (July 2012), Plans for PRE: Proposed Bridge Crossing: Lode workings (end and side views)	39		
	9.3 projec	Appendix 3: Historic Buildings Consultancy and archaeological watching bridt design	ef 40		

List of Figures

- Fig 1 Location map
- Fig 2 1867 Estate Plan
- Fig 3 Map showing the archaeological sites relating to the proposed new mine track
- Fig 4 Map showing the sites of proposed works at Bedford United Mine
- Fig 5 Photo of Wheelpit tail race tunnel
- Fig 6 Photo Internal view of Marquis adit

Abbreviations

CC	Cornwall Council	
DCC	Devon County Council	
DCHES	Devon County Historic Environment service	
DGC	Devon Great Consolidated Mine	
DRO	Devon Record Office	
DHER	Devon Historic Environment Record	
HE (Projects) Historic Environment (Projects)		
NGR	National Grid Reference	
TVAONB	Tamar Valley Area of Outstanding Beauty	
TVMHP	Tamar Valley Mining Heritage Project	
WDBC	West Devon Borough Council	
WHS	World Heritage Site	

1 Summary

A new circular footpath trail is planned around parts of Bedford United Mine to/from the Sawmills Car Park as part of the Tamar Valley Mining Heritage Project. This impact assessment report is intended to inform and guide the Tamar Valley Mining Heritage Project (TVMHP), Devon County Council Historic Environment Service (DHES), and the Cornwall and West Devon World Heritage Site (Planning Advice Team), by assessing the impact of creation of the proposed trail and building conservation and site safety works upon the site's significant assets.

The Tamar Valley mines are nationally important mine sites, a proportion of the 19th century mining landscape is Scheduled but all are within the Cornwall and West Devon Mining Landscape World Heritage Site (WHS – Tamar Valley area Site A10), although none of the sites within this report are Listed or Scheduled. This report summarises the archaeological resource, and describes the impact and mitigation of the proposed works.

Most of the study area (Fig 1) is included within the former Bedford United Mine Sett, however, part of the northern section (using existing trackways and a TVMHP Trail) uses part of Wheal Thomas/Watson Mine (eastern side of Devon Great Consols Mine – see Fig 2). Both mines were worked from the late 1840s and include mine shafts, adits, sites of wheelpits, remains of flat rod gulleys and other mining related features.

The construction of a new track for public access along the steep sides of the Tamar Valley, often crossing open lode outcrop workings and close to open adits and closed shafts will impact upon its present woodland environment, so characteristic of the Tamar Valley Area of Outstanding Natural Beauty (TVAONB). However, mechanisms can be put in place (by DCHES) to ensure that there is an appropriate degree of consultancy and archaeological recording, as part of the project's impact remediation measures. Careful pre-works consultation with a site archaeologist has resulted in minimal impacts upon known archaeological features.

Archaeological impact recommendations include a programme of archaeological site consultancy before works start (to ensure the fencing/boardwalk/landing works will have a minimal impact), during works (for site supervision, archaeological recording, and liaison with DCHES), and after works to ensure the works were sensitively completed, as part of an overall mitigation strategy.

2 Introduction

2.1 Project background

The conservation and management of features relating to the TVMHP's mining heritage and enablement of safe public access forms the basis for the proposed new Bedford trail footpath creation and site conservation scheme. This report assesses the impact of the proposed building conservation works on the significant assets of the Bedford United Mine (and to a lesser extent Devon Great Consol's). There are no detailed schedule of works and specifications (apart from Appendix 2, a letter report by Sherrells dated February 2012), describing how the impact of the proposed works are minimised as part of a coherent mitigation strategy.

Cornwall Archaeological Unit (CAU – now Historic Environment Projects, Cornwall Council), produced an archaeological assessment of Devon Great Consols in 2002 (Buck 2002) and Bedford United Mine in 2003 (Buck 2003), which describes in detail each mine structure and their relative significance. The Historic Environment Service (HES) was commissioned in February 2012 (Project No. 2012010), by the Tamar Valley Mining Heritage Project (Chris Hariades as TVMHP Project Manager), to undertake Historic Buildings Consultancy (to ensure WHS consent to the nature and extent of the new track creation and limited building conservation specifications), photographic building recording of affected mine sites, and production of an impact assessment report for all sites affected and impacted by the proposed works.

An impact assessment project brief has not been produced, but it follows a similar project design by Cornwall Historic Environment Service; '*Project design for production of Scheduled Monument Impact Assessment Reports (Devon Great Consols and Gawton), as part of the Tamar Valley Mining Heritage Project (2006-2009)*', dated 23/6/06 (Reproduced as Appendix 1).

A summary statement of significance relating to structures likely to be affected by the proposed works has been produced (Section 3.3), followed by a summary table of each site's assets (Section 4). This report identifies the archaeological resources affected by the proposed building conservation scheme, and describes the impact and mitigation of the works on the site's significant assets (see Figs 1 and 3 for site inventory). In addition the report refers in detail to the management and maintenance plan that has been produced by the TVMHP (2006) and summarises the proposed short and long term site management as part of relevant conservation management plan policies (TVMHP 2006), and appropriate WHS management plan policies (2005).

It is proposed that the building conservation programme will address the following:

- The protection and consolidation of significant archaeological remains in their settings.
- Health and safety aspects of the site relating to public access.
- Provision of low-key public amenity use where appropriate, incorporating access.
- Interpretation of the site to the public, including on-site and written materials.
- Linking the site into the local economic, social, tourism and recreational contexts.

In terms of the management of archaeological features, engineering works will be kept to a minimum, but in view that the entire site is part of the Tamar Valley component (Area 10) of the Cornwall and West Devon World Heritage Site mining landscape, particular attention has been paid to suggestions for the best mitigation of any such works.

2.2 Aims

The purpose of this impact assessment is to:

- 1. Assess the impact of the new track creation and building conservation and safety works on the significance and character of Bedford United Mine. This report should be approved by DCC (Archaeology) and the WHS (Advice) team, before works on site can start.
- 2. Indicate the steps that have already been taken by the historic buildings consultant (HBC) to avoid or minimise adverse impacts upon the site, its features and archaeology and to ensure that the site methodologies accord with general EH guidance on the Conservation of Historic buildings.
- 3. Indicate that the proposed methods and techniques are appropriate to the history, character and outstanding universal value (OUV) of the site.
- 4. Make recommendations for an archaeological mitigation strategy.
- 5. Ensure the detailed site information (Sherrell 2011) conform to the overall mitigation strategy for the site.

2.3 Building conservation philosophy

All site works carried out by the project will be undertaken to the highest national standards, and in accordance with the policies and guidance set out in *Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment* (English Heritage 2008) and all other relevant guidance, irrespective of whether the heritage assets or components enjoy statutory protection or not.

The site conservation philosophy is based on respecting the character of each significant feature and its contextual relationship generally with other parts of the WHS. The long-term conservation and preservation of the built and standing archaeology should reflect its individuality, character and construction. The methodology of using traditional lime based mortar and timber structural components is intended to replicate its original construction technique; however, the end product is intended not to monumentalise the site but to conserve, protect and give the appearance of an old but safe structure. The building conservation text reproduced in the Appendix (9.1) is intended to describe in more detail the appropriate philosophy underlying building conservation works to enable safe public access and appropriate site interpretation.

An essential component of the mitigation strategy is the employment of an historic environment consultant who should ensure that English Heritage principles of conservation practice are adhered to both in terms of the design of appropriate schemes, to ensure that consolidation works are carried out to acceptable (EH) standards and to ensure close liaison between statutory agencies and the project scheme. In addition it is important that the nature, extent and development of the site conservation works should be guided by the relevant short and long-term management plan policies (statutory, archaeological, conservation, ecological, mineralogical and WHS, etc), which are an important part of any mitigation strategy of the site.

The appropriate statutory authorities (Devon County Historic Environment Services) will ensure that written scheme of investigations (or project designs), set standards for the archaeological recording and reporting during and after the works have ceased.

3 Statements of Significance

3.1 Definition of Outstanding Universal Value and Significance

The Outstanding Universal Value (OUV) of the Cornwall and West Devon Mining Landscape was described in the Nomination document for World Heritage Site Status 'The Cornwall and West Devon Mining Landscape was transformed during the period

1700 – 1914 by early industrial development that made a key contribution to the evolution of an industrialised economy and society in the United Kingdom, and throughout the world. Its outstanding survival, in a coherent series of distinctive cultural landscapes, is testimony to this achievement'. The 'coherent series of distinctive cultural landscapes' comprises ten areas of Cornwall, one of which is the Tamar Valley Mining District (Area A10); see Figure 1. There are seven main components identified in the Nomination Document through which the OUV is physically expressed: Mine sites, Mine transport, Ancillary industries, Mining settlements and social infrastructure, miners smallholdings, Great Houses and estates, and Mineralogical and other sites of scientific importance. Individual aspects of the cultural heritage making up the Site have differing levels of significance; some may be of an international importance, whilst others will be of national, regional or local significance (OUV of the Cornwall and West Devon Mining Landscape, 2007, 2).

Once the overall relative significance of mine sites has become apparent, through statutory (Scheduling), non statutory (WHS areas) designation, and the process of compiling a conservation management plan, identifying and prioritising significant elements within the mine site can take place. These are usually graded in relative categories from High, Medium to Low.

3.2 General Statements of Significance for the Tamar Valley Mining District

'The Tamar Valley forms the principal central landform of the district. Whilst the river flows from north to south, its great loops and bends follow a highly sinuous and changing course, its sides are often steep and frequently wooded. To the east the landscape above the banks of the river is rolling cultivated countryside that descends to the ancient market town of Tavistock, which nestles beneath the high granite uplands of Dartmoor. The 19th century mines of this district exploited an important concentration of (some) tin, but mostly copper, arsenic and silver-lead (north-south) lodes which run parallel with the east-west axis of the granite massif of Kit Hill and Hingston Down, and which were worked almost continuously from Callington to Tavistock' (Thorpe 2005, 64).

'Many of the most important mines in the Area were sited near to the river, where the lodes outcropped on its banks, and adit drainage was readily available. On the Cornish bank of the river these include New Consols, Wheal Benny, Gunnislake Clitters, Old Gunnislake, Okel Tor, Danescombe and Cotehele Consols, whilst a little away from the river were Calstock Consols, Wheal Zion, Wheal Edward and Wheal Arthur. On the Devon bank, Devon Great Consols and the Bedford United Mines were the largest and richest copper mines anywhere within the Site, the extraordinary amounts of ore they produced outstripping all other ventures; by the last decades of the 19th century they were supplying 25% of the world's arsenic. To the south are Russell United, George and Charlotte, Gawton, Tuckermarsh, South Ward, North and South Hooe, Furzehill and South Tamar Consols, the last of this group on the Bere Alston peninsula having been amongst the earliest to have been worked as true mines anywhere in Britain, their rich silver-lead deposits being exploited by the Crown from the 13th century.

A mining district with a long pedigree and which shared to a degree in the upsurge in mining which took place through the mid-19th century, but whose high point was around the second and third quarter of the century when undertakings like Devon Great Consols were amongst the largest and most important working for copper and arsenic in the Cornubian orefield. There were small and medium-sized mines scattered throughout the landscape on the Cornish side of the river, though on the Devon bank they are more or less confined to the river bank. Though tin and wolfram were mined, arsenic and copper dominate. John Taylor and the Dukes of Bedford were the key players in the development of the Devon mines, ports and communications systems, whilst the Duchy of Cornwall and the Williams family played significant roles to the west of the river' (CC 2007, Tamar Valley Mining District 94, 100).



3.3 Site specific Statements of Significance

A significant element of the TVMHP has focussed on identifying, prioritising and proposing a variety of site conservation works for the most significant elements of the mining landscape within the project area (Fig 1). The Historic Environment Service, Cornwall Council regards mine buildings (Engine Houses, boiler houses and chimneys), in Cornwall to be the most significant and iconic surface remains of the operations of a former mine site. As such, these buildings are considered to be the highest form of site significance when assessed with other more common building forms. However, for Devon Great Consols, these significant buildings were (most un-characteristically), demolished to ground level when the mine finally closed in 1903. Those at Bedford United Mine have also been taken/fallen down.

The following list of mine sites within the amalgamated mines of Devon Great Consols and Bedford United Mine includes a short statement of historical significance (denoting the reason why the site is worthy of building conservation works), and secondly, a short summary of the proposed conservation works. Archaeological assessment site references (Buck 2002; 2003), are given following the historical summary. It should be noted that all substantial extant buildings are of high significance and so justify a building conservation scheme within the context of the site's extant remains. Other lower significance sites may justify a conservation scheme (of limited extent) based on structural, Health & Safety and project finance criteria. These are listed in detail for every site in Section 4. Refer to Figure 1 for each site location within the project area, and Figure 3 for detailed site locations.

<u>Note</u>: A detailed history of Devonshire Great Consolidated (DGC) Mine and of Bedford United Mine is given in two earlier archaeological assessment reports (Buck 2002, 6-17; Buck 2003, 14-16). The landowner for the DGC project area (Fig 1) is the Earl of Bradford, whilst the Tavistock Estates which occupies this site operates a commercial forestry operation. The landowner for the Bedford United Mine site is Adrian High. See Figure 3 for site locations.

Historical summary of Bedford United Mine

'Although not equalling the extraordinary richness of its neighbour **Devon Great Consols**, the **Bedford United Sett** was highly productive with a recorded output of nearly 66,000 tons of copper ore, and smaller quantities of arsenic, tin and latterly wolfram' (Jenkin 1974, 29).

In the Bedford archive at Devon Record Office (Exeter), the earliest documentary records detail dues paid to the estate at the rate of 1/9th and a share of the profits for the estate as shareholder in the '**Marquess and Bedford Setts**' from 1712 (although there is an earlier reference to the sale of copper ore in 1711). Estate accounts also show copper ore sales from 1714 – 1720 (*pers comm* John Goodridge).

Slightly later observations were made by Hendrik Kahlmeter, a Swedish engineer, who visited the mine on 13th November 1724 (his text published in 2001 by Justin Brooke).'... in Collingswood, lies the Marquis copper mine, in the lands of the Duke of Bedford ... she was first discovered seventeen years ago on the bank of the river when some workmen got together, took a sett or lease of 20 fathoms from the water's edge ... and drove a level from the lowest point' (known today as the Deep Adit or 47 fathom level on Marquis Lode), and finding copper named this part of the mine **Bedford Mine**. Shortly afterwards a wealthier group of adventurers obtained another sett higher up the hillside where they started a second adit seven or eight fathoms above the first and drove it 60 fathoms. Subsequently the two workings were amalgamated and became known as the Marquis Mine. On commencing the upper adit, tin was met with near the outcrop of the lode, but on excavating deeper copper was encountered in considerable quantity and of a better grade than in the first adit. At length the water gained on the workmen to such an extent that sixty men were required to drain it until this became too costly and the working was abandoned for some years' (Brooke 2001, 12).

In 1722 the mine was acquired by the **Bristol Copper Company** who erected an underground engine near the adit end. This was driven by water directed down the shaft from surface which, after passing over a pumping wheel, flowed out through the adit mouth. By such means the Company contrived to sink the shaft 39 fathoms below adit, effectively draining the workings to that level. The lode ran due east-west and varied in width from 1 ft to 4 ft' (Jenkin 1974, 30).

Kahlmeter also states: 'No ore is smelted here, and it is only broken small and separated from the waste rock. The poorer kind is crushed and washed, and is sent by land (presumably via Newbridge) to a place two miles away called Net Stakes, where the River Tamar is navigable for barges or boats ... from there the ore is shipped to Bristol or to Neath in Wales'. Not far from this work and on the same side of the river lies another course of ore, which runs just as the previous one and is called **Tavistock**. It was worked for four or five years, but has been idle these seven years' (Brooke 2001, 12). This latter working appears to have been sited immediately north of the Marquis sett.

To date, there appears to be no further documentary evidence of these small setts (often following a single lode), until 1841 when the mines were reopened and amalgamated into the sett of **Bedford United Mines**. This included the lodes of Wheal Marquis, Wheal Tavistock, Delve's Kitchen, Bridge Lode and Ding Dong. 'In 1842 Captain Josiah Hitchens (who two years later discovered the enormous sulphide lode at **Wheal Maria** (Gard's Shaft - in what later became **Devon Great Consols**), and his associates were working the Marquis lode here by water power...The lode outcrops had been anciently worked away for 200 fathoms in length above the deep adit. From 1844 to 1856, 21,039 tons of copper ore were sold for £138,846' (Collins 1912, 412).

'In 1843 levels were being driven at 25, 30 and 40 fathoms below adit on the Marquis Lode where a 50 ft pumping wheel had been erected. To drive this and the wheel on Ding Dong Lode, water was brought through a leat from the southern end of the Tavistock Canal, high above Morwellham (for two miles – passing through tunnels and sometimes carried by launders slung in chains from the cliff face - Jenkin 1974, 32). 'Two large wheels were erected, 45 ft x 4.5 ft and 50 ft x 4.5ft, with another of 50 ft diameter under construction in 1844. In 1848 the company commenced paying dividends and later in the 1850's a new incline shaft was sunk (measuring 14 ft x 5 ft) with a double line of tram-roads' (Barton 1964, 96).

In 1849 a steam whim was erected and five shafts were in use. The deepest of these was Engine Shaft on the Tavistock Lode which followed its underlie down to an eventual depth of 150 fathoms from surface' (Jenkin 1974, 32). 'In the face of considerable opposition from this company a branch from the **Devon Great Consols** Railway for the conveyance of ores, coals and other materials was made by the Duke in 1863 at a cost of £275. The benefit of the railway to the company is now fully appreciated' (1868 Report on Mines). The company had previously conveyed its ores to Morwellham by wagon at a charge of 5s per ton. This rate was subsequently reduced to 1s.10d (a cost saving of over £962 from Jan. 1864 to Dec. 1868 for 8027 tons of copper ore and 424 tons of mundic).

Figure 2 (1867 shafts/lodes map) from the Bedford archive shows the extent of the workings. The Bedford Estates 1868 Report on the Mines (T1258M E 44a-b) by Gilson Martin (dated 31st Dec.), showed that the mine's first lease from the Duke of Bedford ran for 21 years from 1842 to 17/9/1863 (terminating on 17/9/1874), 4000 shares having been issued. The area of the sett was 218 acres (42 of which was woodland-but the area occupied by the mine totalled 5.5 acres), with 92 men and boys, 13 women and girls giving a total of 105 people. Four shafts were being used and 47,000 tons of ore had been sold, with over 1000 tons of mundic produced. '*This mine is drained by two large water wheels and the drawing and crushing is done by a small steam engine'* (1868 Report on Mines). The value of the copper ore was nearly £250,000, £880 of tin, and £557 of mundic. The dues to the Duke had, by 1868, amounted to £17,294;



Figure 2 1867 Bedford Estates Plan showing shafts/lodes within the Bedford United Mine Sett and adjacent Devon Great Consols Mine Sett.

 \pounds 11,733 capital had been expended. After dividends had been taken the mine's net profit was \pounds 42,667.

'In 1870 the mine was 148 fathoms deep and employed 160 people. In 1877 a limited liability company of 1200 shares (£1each) was registered' (Collins 1912, 412). 'In 1878 the company raised only sufficient ore to pay working costs in the hope that metal prices would ultimately recover... output of copper and mispickel fell off markedly in the 1880's.Underground activity finally ceased at the end of 1889, followed by liquidation of the company in August of the following year' (Barton 1964, 96).

The 1901 Report on Mines and Quarries by the Estate Manager (J. Paull-dated 31st Dec.) states (1901 Report on Mines and Quarries): 'two men are employed in the adit level on South lode-mostly going eastwards with little wolfram and arsenical mundic being found ... By the middle of December the licensee (Mr William Phillips), seems to have reached the end of his means for mining adventure (ventilation in the level was so bad that it no more could be done without incurring the censure of HM Inspector of Mines), funds to be attempted to be raised to cut a shaft from surface or to ventilate by mechanical means-so driving the level was stopped in mid December (Mr Phillip's lease terminates at Midsummer next (1902)'.

From 1915 to 1925, the mine was re-opened on a small scale above adit for mundic and arsenical pyrites, funded by the Bedford Estate. In 1918 76 men were employed. In later years (after 1922) mispickel was taken from the mine to **Devon Great Consols** along a re - laid narrow gauge (2 ft.) track for re-processing in the newly built arsenic refinery. Also arsenical pyrites and wolfram from **Wheal Frementor** (the south western part of **Devon Great Consols**), was taken to **Bedford United** for stamping, before being taken back to the arsenic calciners via the railway (Richardson 1995, 100). The mine continued to work in a small way until 1928 when it finally closed, producing 2,111 tons of arsenic, 1,053 tons of mispickel, 72 tons of 60% copper precipitate and 9 tons of wolfram (Dines 1956, 666). Richardson also states (1995, 129) that the mine was active to 1930 in conjunction with **Ding Dong Mine** and that it was worked to 10 fathoms below deep adit level (42 fms. below surface at Engine Shaft) with the aid of a small Cornish pump (still *in-situ* in 1938); '*in about 1978 some interest in the mine was shown by South West Consolidated Minerals' (ibid*).

Summary Bedford Mine heritage features impacted by the Bedford Trail (Fig 3)

- Archaeological features on North/Tavistock Lode (Sites 1/1.1, 2, 4, 5).
- Archaeological features on Marquis Lode (Sites 2, 3/3.1, 11).
- Archaeological features on Unrecorded Lode (Sites 12, 13, 14).
- Archaeological features on Phillips Lode (Site 10).
- Conservation repair of masonry tail race walls to stamps/crusher wheelpit (Site 17)
- Sites 15, 17.1, 39, 40, 41, 42.

Historical summary of Devon Great Consols Mine

'Devon Great Consols was the last great copper discovery in the West of England and for twenty years from 1845 to 1865 the seemingly inexhaustible deposits overlaid the copper mining world ... (and) was the richest copper mine in Europe, and when its lodes began to fail it went on to produce so much arsenic (half the world's supply), it had to be regulated to avoid swamping the market... It was the only mine in Devon and Cornwall to build and work its own standard gauge railway. In its own foundry it maintained and partly constructed many of the steam engines and water wheels used for pumping and crushing ore' (Booker 1974, 143/144). Refer to Figure 2, reproduction of an 1867 Bedford Estates Survey map.

From 1845 to 1903, sales of copper ore had been 742,400 tons (averaging 6.5%); the greatest total recorded for any mine, not only in Cornwall and Devon, but anywhere in the 'old world'. This had realised £3,473,046 on which dues of £261,587 had been paid. Tin sales had totalled only £170 (despite the large investment looking for it below the copper lode), but 72,279 tons of refined arsenic had realised £625,062 on which dues had been £27,967. In later years the mine's purser (Moses Bawden), estimated that 600,000 tons of mispickel had been calcined.

During the mine's career, a total dividend of £1,225,216 had been disbursed. £658,336 had been spent on the arsenic works, railway and other capital equipment (including houses and schools, etc). Approximately 45 miles of shafts/levels and winzes had been sunk, whilst waterwheels (totalling 33 fed by over 8 miles of leats), had been the main

power source for 2,420 fathoms (over 4.33km) of flat rods.

Wheal Thomas/Watson

This mine, which was sited in part of the project area, was named **Wheal Jack Thomas** up to the 1870s, and **Wheal Watson** thereafter (after Mr Peter Watson, the managing director from 1879) worked from the late 1840s, 12 Tutworkmen and 2 labourers being employed in 1850 (Fig 2). It developed the eastern end of South Fanny Lode: 'It had yielded arsenical mundic when it had been worked in 1855 and 1856, at which time the emphasis had been on copper production. The ore had then been left on one side, but 24 years later (after Main Lode had been exhausted and the arsenic market inflated) it represented a valuable asset. To speed up the work in the mine and to reduce labour costs by as much as ...30% the company decided to purchase rock drills and an air compressor' (Goodridge 1964, 253). Barton (1964, 79) goes further: 'This section of the sett (in 1879) ... was opened up vigorously and was pumped by a further 280 fathoms of flat-rods extended to the shaft from one of the existing pumping wheels'. By the early 1880s this mine and Wheal Emma were the only copper producing parts of Devon Great Consols (Buck 2002, 229).

The mine, shafts and flat-rod from the water wheel are shown on the 1857 Lease map (Fig 3). The site stretched from the water wheel at the bottom of the valley (Site 370), to Watson's Shaft (Site 383), and Old Eastern Shaft (Site 380) at the top of the hill (Buck 2002). Documentary evidence for the size of the water wheel comes from Hall (2000, 107), quoting an 1860 survey; '*Wheal Thomas pumping wheel, 36 ft. by 4 ft. cast-iron axle'*. The 1867 map (Fig 2), shows the site of the water wheel, an adjacent building (perhaps a flat rod crank pit), and the leat supply for the wheel (from Site 5 (Buck 2002), the leat from Scrubtor 2.5 miles away).

'Devon Great Consols was the last great copper discovery in the West of England and for twenty years from 1845 to 1865 the seemingly inexhaustible deposits overlaid the copper mining world ...(and) was the richest copper mine in Europe, and when its lodes began to fail it went on to produce so much arsenic (half the world's supply), it had to be regulated to avoid swamping the market...It was the only mine in Devon and Cornwall to build and work its own standard gauge railway. In its own foundry it maintained and partly constructed many of the steam engines and water wheels used for pumping and crushing ore' (Booker 1974, 143/144).

Summary Devon Great Consols Mine heritage features impacted by the Bedford Trail (Fig 1)

 Archaeological features on Thomas/Watsons Lode (Sites 374, 375, 376, 376.1) – sites not shown on maps in this report. Sites can be seen in Buck 2002 (Fig 38, site inventory map).

4 Summary table of building conservation works

The following sites are identified and described in detail in both the Devon Great Consols Mine and Bedford United Mine archaeological assessment reports. The impact significance column shows that some sites are regionally important **`R**', or Locally important **`L**'. The letter in brackets (**H**=High, **M**=Medium, **L**=Low) summarises the impact of the proposed works on the site, Section 5.1 and the site inventory text describes this in more detail (Section 5.2.2). Figure 3 shows the spatial relationship of the site's significant assets which may be affected by the new Bedford Mine Trail.

Table of archaeological sites and features affected (visually/physically) by the scheme

Bold (high impact) text sites are described in detail in Section 5.2.2. Site numbers in brackets are given by Sherrell (see Figs 4b-4d, 9-10). Bedford United Mine sites are shown in Figure 3, whilst Devon Great Consols Mine sites are shown in Figure 1.

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
	-	1	Bedford United Mine			
1 (34)	Adit	Open adit near leat (Site 15), accessed via cutting in rock outcrop	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None – but open adit may be visible from lower track
1.1 (34)	Shaft	Open shaft accessed just inside open adit (Site 1).	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
2	Leat	Well preserved C18 leat in places	Footpath (west side) to use leat channel throughout its length	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	Н (Н)	Leat base and downslope bank profile should be maintained. Visual impact of new fencing/boardwalk
3 (36)	Stope	Open stope cut into a rock outcrop	New track near site – site fencing of adit/workings and `walkway' over infilled stope.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	New site fencing and walkway
3.1 (36)	Working platform	Working platform/spalling floor adjacent to adit (Site 3)	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
4 (36)	Adit and spoil heap	Closed infilled adit (Tavistock/North lode) at end of lobby	Site visible from adjacent track, so adit entrance may be fenced.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Visual impact of round post and round rail fencing
5 (37)	Working area	Working platform/spalling floor adjacent to adit	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
10 (39)	Dam/reservoir pond	Extant masonry	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None. Visible from new track
11 (39)	Exploratory Adit	Small blocked adit	New track near open adit site – site fencing of adit workings	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	New site fencing
12 (40)	Working area	Working platform/spalling floor adjacent to adit	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
13 (40)	Adit opening	Collapsed opening	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
14 (40)	No 1 Shaft (Philips lode)	Poorly fenced open shaft, with side opening to west. Adjacent to proposed new track route.	Re-fence the mine shaft and steep drop on west side.	Issue 7 (Policy 7e)	L (M)	Visual impact of new fencing in small area
15 (41)	Leat	Extant in places	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
17 (43)	Wheelpit/tail race tunnel	Two sections of masonry wall – both collapsing	Rebuild collapsed sections and repoint throughout	Issue 8 (Policies 8a to 8c), Issue 10	R (M)	Repair and consolidation of the collapsed walls – new pointing visible
17.1 (43)	Leat (Tail race)	Extant profile	None – but re-use as track	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Increased wear and possible leat erosion

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
39 (52)	Rectangular pond	Deep, wide shaft or wheelpit	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (M)	None but sites can be seen from new track route
40 (52)	Turbine machinery plinth	Extant masonry wall/plinth	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (M)	None but sites can be seen from new track route
41 (52)	Large flooded depression	Difficult to view whether shaft or wheelpit	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None but sites can be seen from new track route
42 (53)	Large tailings dump, dressing floor	Extant overgrown dump	Fencing along parts of northern edge parallel to new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Walking along part of the dressing floor site
			Devon Great Consols			
374 (231)	Wheal Thomas/Watson Mine adit	Possibly a collapsed adit, 2.0m of portal rock face visible.	Possibly fence the front of the collapsed adit	Issue 7 (Policy 7e)	L (L)	Additional fencing – possibly visible from the lower track
375 (232)	Wheal Thomas/Watson Whim/Air Shaft, capstan and finger dump	The shaft is visible as a hollow (6.0m diam and 0.8m deep), marked by a granite stone.	Possibly fence around the shaft	Issue 7 (Policy 7e)	R (L)	Safety fencing around the shaft. Some tree thinning may be necessary for site fencing.
376 (232)	Wheal Thomas flat rod cutting and tunnel under track (SX 43721 73036 to 43900 73049)	Cuttings are approx. 1.0m wide and cut into ground at varying depths (0.5 to 0.75m deep). Site damaged in places by forestry activity. Tunnel robust to take vehicles	None. Retain the features undisturbed.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (L)	None. Cutting visible from footpath.

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
376.1 (232)	Wheal Thomas flat rod cutting (SX 43868 73063 to SX 43741 73073)	Cuttings are approx. 1.0m wide and cut into ground at varying depths (0.5 to 0.75m deep). Site damaged in places by forestry	None. Retain the features undisturbed.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (L)	None. Cutting visible from footpath.
Not in report Site A	Masonry feature/shaft (SX 43750 73070)	Rectangular feature at ground level (2.1m x 2.6m), all walls visible. Stone lined to visible depth of 0.6m. Infilled interior. Site fenced.	None. Feature already fenced	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None. Feature visible from footpath.
Not in report Site B	Unrecorded lode/stope outcrop (SX4378 7283)	Rock outcrop with two parallel C18 stope excavations	Timber bridge over northern rock outcrop/stope, continue timber walkway across second infilled stope	Issue 7 (Policy 7e)	L (L)	Ground impact of 0.3m depth for bridge/walkway foundations

5 Assessment of impact and mitigation

5.1 Impact significance definitions

The potential impacts during works are described below (and summarised in tabular form in Section 4), for each site. Impacts are described in the text section for each site on a feature-by-feature basis. The following site impact terms are used within each site identification description relating to the impact assessment and site gazetteer:

Major positive	Site continues in, or is restored to, its original design and use		
Moderate positive	Site restored as far as possible respecting its original function, but its use is altered		
Minor positive	Site partially restored; interpretation introduced		
Negligible positive	Stabilisation/maintenance of site		
Negligible negative	Benign neglect – losses of fabric over a long period of time		
Minor negative	Site suffers areas of alteration or damage, which contribute to loss of meaning		
Moderate negative	Significant loss of fabric or alteration, leading to erosion of original character		
Major negative	Complete demolition/removal		

5.2 Building conservation works

5.2.1 Site impact and remediation summary

The TVMHP has included all the track creation/building conservation works within the new Bedford Trail site into a single programme starting from January 2012 to the end of 2012. It is likely that the successful tenderer will undertake all the trackway works, although the site fencing may also be tendered.

There is no detailed schedule of works and specifications report. However, there has been a process of site consultation with the TVMHP site archaeologist to ensure that the nature and extent of the proposed works/impacts for every site is mitigated and minimised.

Figure 3 indicates the proposed route of the new trail, and the proximity to known archaeological sites. For the most part the site works to form this track along the steeply sides of the Tamar Valley – crossing a number of unrecorded lodes/stopes, to access the former 18th century mine workings and the lower parts of the 19th century Bedford United Mine, are formed by using existing routes along leats, old tracks and forming new ones, some with timber steps. In at least two locations, timber walkways and low impact bridges will need to be constructed with locally sourced timber, to cross lode outcrop workings and infilled stopes.

There is only one site for building conservation (Site 17). A tall conifer tree is to be removed (its roots have affected the masonry and structural stability). Soft and crumbling mortar will be removed (to a maximum depth of 40mm) from the masonry walls following a detailed site assessment of the feature by the site contractors (Darrock & Brown). The style and depth of re-pointing (slightly recessed from the masonry face), will mimic that of the original and will be decided when the test mortar panel is agreed with the site contractors and the historic buildings consultant. Site meetings and consultations will be held to ensure compliance with heritage building conservation guidelines.

Other general impacts:

Site compounds and site (vehicular) access

Figure 2 shows the location of the Woodlands car park which will site the compound and toilet (if necessary). Vehicular and pedestrian access to the site will also be via the Woodland car park.

Impact reduction measures:

A method statement will be produced by the TVMHP, and (where relevant) by the site contractors in order to promote a reduction of the impact of creating the new track works on the fabric and character of the site.

For the small conservation scheme (Site 17), only loose lime mortar will be removed from walls and replaced with a new equivalent. The style and colour of the new mortar will reflect the style and colour of the existing so reducing the visual impact of the conservation works. An historic buildings consultancy and archaeological recording during the site works may be able to minimise any further below ground site impacts, but also record any visible/disturbed archaeological features and to record the nature and extent of the building conservation works. A CC project design for this function has been produced in the Appendix (9.3) at the rear of the report.

Residual impact mitigation:

There will be the residual impact of the creation of a new footpath (timber stepped at steep locations), along a short section of the Tamar Valley. However, the residual visual impact will soon fade, as the benefits in terms of increased public access and increased site information will come to fruition as a substantial public gain.

For the small building conservation project, there will be the visual effect of new pointing – although this will fade in time. But by using the mechanism of trial test panels for matching new lime mortar aggregate mixes with the existing colour and pointing style, etc, it is hoped that the new lime mortar pointing will be very similar to the existing, resulting in little visual impact.

It is certain that there will be regular visiting members of the public throughout the year, and that there will be an increase in site visitor numbers. However, the scheme has been carefully and thoughtfully designed by the TVMHP to minimise negative affects to the character of the site.

5.2.2 Site inventory impact description and remediation measures

The following sites are described in more detail in each relevant archaeological assessment report (DGC Mine, Buck 2002, 6-17, and Bedford United Mine, Buck 2003, 14-16), summarised in bold in Section 4.1 and shown in the relevant site plan in Figures 1 and 3. All the sites mentioned are summarised in Section 4, and with have variable impacts – but some are very low (i.e., only visible from the new trackway. Therefore the following detailed site descriptions only refer to site or safety impacts that have a direct physical impact (sites in bold). The works on each site is described, followed by a section describing the reduction (or mitigation and remediation) of the impact, followed by a final section which details the residual impact. To avoid repetitive duplication in this site inventory section, site impact and remediation measures already given in Section 5.2.1 are not reproduced – simply referred to.



New circular track from Woodlands Car Park

(Figs 1, 3 and 4 for site location)

Site impact

Figure 4 is a plan of the various boardwalks, bridges, lined timber paths (due to the steep slopes), steps and re-used tracks throughout the course of the new circular trail route. The impact of all of these involves the on-site construction of ground level natural oak timber features, whose design and use will minimise the impact of the scheme which is in a woodland setting, and of great historic character. The approximate locations of archaeological features within Bedford United Mine are shown on Figure 3 and are also described in detail in this section.

Part of this project will necessitate the creation of a new track route along the steep Tamar Valley sides – by cutting and infilling, then using oak timber edging to form the side of the trackway. Other sections will consist of fixing and insertion of oak timber steps and short posts (of varying sizes), into the ground. These impacts should be minimal. However, the main impact is the visual effect of these new features on the setting and character of the woodland landscape.

The overall impact of these proposed works on the site can be defined as '*Negligible positive'*. The works will provide a greater element of safety and minimise footfall, although it will negatively affect the site's visual authenticity as a natural woodland environment.

Reduction of impact measures:

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to its route, location and extent. It is recommended that Tamar Valley volunteers walk the route twice a year to assess footfall damage, and if necessary propose remediation measures to reduce erosion affecting the nature, form and profile of the leat.

Residual impact mitigation:

There will be residual visual impacts of the track and mine site hazard fencing as well as the excavation for short sections of track creation itself. The natural oak timber fencing will complement the surrounding deciduous tree landscape, and will naturally discolour and age, in its original woodland setting.

Leat (18th century) (Site 2) (SX 43745 72791 to SX 43626 7253)

Site impact

The main impact on this leat will be footfall along its former water channel earth remnants. It is likely the original leat would have been lined with planking, or moulded river clay along its base. The earthwork remains are fragmentary, and seems to have been widened in places to form a track. Fencing will be necessary at some sites; either near mine outcrop/shaft/adits, etc or due to steep slopes on the down-slope side.

The overall impact of the proposed works on this feature can be defined as '*Negligible negative'*. The works will provide a safe footpath access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber boardwalks (see Figs 4b, 4c, and Fig 9 for their location and extent).

Residual impact

The main significant residual impact is the presence of occasional fencing along the new route, a new small bridge (Appendix 9.1 Site 4b) and two other boardwalks. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate.

Stope (lode outcrop) (Site 3) (SX 43740 72637)

Site impact

The main impact on this natural lode outcrop (evidence of a former 18th century stope mining operation: Marquis Lode, is the construction of a low profile boardwalk across the sides of the infilled stope and fencing across two former adits/stope access (see Fig 3, 4b and Appendix 2: Sherrell 2012, fig 4c for location). The rock outcrop will be drilled and steel dowels inserted through concrete pads (dimensions to be calculated on site – see Appendix 2, Fig 8), upon which the boardwalk will be founded. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber boardwalk, its location and extent.

Residual impact

The main significant residual impact is the presence of a new small bridge and boardwalk. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate.

Adit/Stope (Site 11) (SX 43726 72605)

Site impact

The main impact on this small exploratory adit outcrop evidence of a former 18th century stope mining operation (Marquis Lode) is mainly visual. A low fence will be constructed across the site entrance. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber bridge/boardwalk, location and extent.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.
No 1 Shaft (Site 14) (SX 43742 72544)

Site impact

The main impact on this shaft is mainly visual. A fence will be constructed around the shaft (where appropriate using the existing postholes). The timber is to be locally sourced from the adjacent woodlands. A fence will also be located across the deep excavation to its west – possibly a related stope working. As public access is possible to this side of the shaft (see Fig 3 and Appendix 2: Sherrell 2012, fig 4d for site location).

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and nearby information boards will inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the shaft fence (rounded posts and wire fencing – in the style of other TVMHP shaft fences).

Residual impact

The main significant residual impact will be the presence of a newer tanalised timber, possibly higher, fence (replacing the existing inadequate one). It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of this section of the Tamar Woodlands and Bedford Mine.

Wheelpit masonry wall/tail race tunnel (Site 17) (SX 43771 72626)

<u>Note</u>:

This site, during the 2001 site assessment survey was interpreted to be a reservoir pond, with connecting leat to the wheelpit to the south west (Buck 2003, Site 17, 43). However, further assessment (and better field survey conditions) has resulted in a re-evaluation of the form and function of this site. It is now interpreted as a wheelpit (with attached crusher/stamps to the north) – contextually related to a probable nearby primary dressing floor.

Site impact

There are two masonry walls. An upper section of wall 1.0m wide and 1.2m high (0.6m thick), has become structurally unsound as the roots of an adjacent tree have caused damage throughout. The tree is to be carefully removed, and the wall rebuilt in places and repointed throughout (see Fig 6, a view of the site before works).

Approximately 1.0m below this is an underground wheelpit tailrace tunnel measuring 0.5m wide and 0.6m high and approximately 5.0m long to a collapse (Buck 2003, fig 12), which leads into the adjacent leat (Site 17.1). The tunnel arched portal stone has collapsed, and will need to be replaced, also the front wall will need to be repointed.

Reduction of impact

The stones to be used will, if possible, be the original stones that have fallen out of the wall. If there are insufficient stones, new stones should be used (from a similar quarry source), and should match the original in terms of colour and size. The style and colour of the new mortar will reflect the style and colour of the existing so reducing the visual impact of the conservation works. An archaeological watching brief recording during the works may be able to minimise any further site impacts, but also record any visible/disturbed archaeological features (Refer to Section 5.2.1).

The works will provide more structural stability and enhance the site's visual authenticity for at least another generation. The overall impact of the proposed works on this feature can be defined as '*Negligible positive*'.

Residual impact

Refer to Section 5.2.1.

Leat (Site 17.1) (SX 43771 72626 to SX 43715 72595)

Site impact

The main impact on this narrow (0.4m) leat starting from the end of the tail race, will be limited wear and tear along its course (approximately 80.0m which leads to Sites 38 to 40), due to footfall as it is used as part of the new trackway. There will be no additional material brought in for the footpath. A low fence will be constructed across the side of the leat where there is a steep drop (adjacent to Site 14). The fence timber is to be locally sourced from the surrounding woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the direction of the route and design of the fencing.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

Tailings dump/dressing floor (Site 42) (SX 43718 72516)

Site impact

The main impact to this long section of tailings dump and possible dressing floor adjacent (north side), is one of footfall. The proposed track route will be between the Philips lode outcrop features (Sites 9, 12 - 14), and the main tailings dump in the valley. Parts of this route are quite flat, and were probably formed for a dressing floor (unless the original 19th century site was over dumped in the 1920s). In places, due to adjacent steep drops to the track route, a low fence will be constructed. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the direction of the route and design of the fencing.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected

that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

Unrecorded stope/lode outcrop (SX 43779 72832)

Site impact

This site (not discovered during the 2003 archaeological assessment), is indicative of evidence of a former 18th century stope mining operation (Marquis Lode). The main impact on this natural rock outcrop (and mine stope) is the construction of a low timber bridge (see Fig 3 and Appendix 2: Sherrell 2012, fig 4b for location), over the open stope to permit access along the new track. The rock outcrop will be drilled and steel dowels inserted through concrete pads (dimensions to be calculated on site – see Appendix 2, fig 8), upon which the timber bridge (with handrails) will be founded. The timber is to be locally sourced from the adjacent woodlands (see Appendix 2: Sherrell 2012, fig 4b for site details).

On the south side of the open stope is another parallel working, another stope but infilled, presumably of similar date. A timber boardwalk (of similar wood to the nearby bridge) will be constructed over the top of the stope, founded on either side by timbers.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber bridge and boardwalk, location and extent.

Residual impact

The main significant residual impact will be the presence of a new small bridge and boardwalk. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

5.3 Fencing works

Safety remediation works to mine shafts and adits in proximity to newly opened tracks and footpaths have been undertaken during the TVMHP for past three years. The specifications for these works have been formulated and constructed with the agreement of TVMHP and the Devon Historic Environment Service. For this trail section, there are some steep down-slope sections adjacent to the newly created footpath that engineers advised to be fenced. Figure 4 is a summary plan showing the proposed works along the route of the track, and detailed drawings in Appendix 9 show the main site locations. Archaeological recording and consultancy have been undertaken during these works by HE Projects, Cornwall Council. An archaeological watching brief report will be produced to include both the fencing/trail works and building consolidation works. Many of the new shaft fences will need to have safety warning signs attached (to the existing fencing).

5.4 Public access & interpretation

5.4.1 Site description, site impact and impact remediation

Public access is restricted to well-defined (multi-use and trackway) routes within and from Devon Great Consols to Bedford Mine are primarily in private ownership.

Site interpretation facilities are to be installed at the Tavistock Woodlands car park (SX 43829 728969), in a newly built 'Orientation centre'. Smaller and site specific

information boards and sign posts/way-link guides will be distributed along the new Bedford trail at appropriate sites. However, in addition, web based site information and leaflets are planned for production by the TVMHP via the Tamar Valley Area of Outstanding Natural Beauty (TVAONB).

An archaeological watching brief recording and archaeological consultancy during the fencing safety works may be able to minimise any further site impacts.

Site impact

The overall impact of the public access and interpretation project on the site can be defined as '*Negligible positive*', and of very low impact. The works will provide a greater element of site information and safety and should not negatively enhance the site's visual authenticity.

Residual Impact

Fencing, signage, etc will have a localised, visual impact on the site and increased trampling may damage habitat/disturb wildlife.

Reduction of Impact

The visual impact of fencing, signage, etc will be reduced through careful project design, siting and installation of these features. Limited public access is to be provided, routed away from sensitive/hazardous areas.

5.5 Description of impacts during the post-project stage

The TVMHP aims to utilise a newly created localised network of multi-use trails (using former railway lines and footpaths), in and around the mining landscape of Devon Great Consols southwards to Morwellham Quay (via Bedford United mine, and Wheal Russell Mine to New Quay). It is likely that in the future these will link up to other footpath and trail routes in the west Devon area (and possibly into to Kit Hill in Cornwall, etc). As a result there may be the physical consequences in the short term of having a slightly greater number of people visiting these sites than previously. In addition there will be an ongoing need for annual vegetation maintenance from some paths and buildings with very occasional repair of occasional dislodged masonry. It is expected that the TVAONB will undertake site inspections (utilising public volunteer groups as part of an agreed management plan), along trackways and parts of the site that are subject to building conservation works.

The TVAONB has produced a ten year management and maintenance plan (2006), in order to define and advise the various groups (for example, volunteers) that will be involved in managing and maintaining the archaeological features within both Scheduled Monument areas and other adjacent World Heritage Site areas (Area 10: Tamar Valley).

Bedford Mine Trail IA CB September 2012



Figure 4 Site plan of proposed works along the route of the new Bedford Mine Trail (Sherrell 2012)

Bedford Mine Trail IA CB September 2012



Figure 5 A view of the end of the wheelpit tail race tunnel and wall before works. Site 17.

© CC HE Projects 2012



Figure 6 An internal view of the upper Marquis Adit stope before works Site 7 © CC HE Projects 2002

5.6 Residual impacts

Any short-term residual and regular maintenance issues (vegetation growth and possible vandalism), will be inspected (and work undertaken) by the TVAONB volunteer group. This should ensure that impacts to the site, if they occur, should be short-lived and quickly mitigated.

After the building conservation work has ceased and the site is open to members of the public, the main residual impact will be visual – in terms of new fencing and new lime mortar repointing. However, after a relatively short period of time the lime mortar will fade to a colour sympathetic to the existing colour, with the positive residual impact being that the building is conserved for at least another generation.

5.7 Assessment of impact on historic landscape character

The steeply sloping sides of this Tamar valley site are heavily wooded, hiding extensive evidence for past mining activity during the past three centuries. The landscape is characterised by numerous old mine shafts and adits, large and small spoil heaps, quarries, and other earthworks and mine transport infrastructures associated with its mining heritage of working clusters of lodes that culminated in the Tamar Valley being Europe's largest producer of copper ore in the 19th century.

Devon's Historic Landscape Characterisation project has been consulted and characterises most of the area as 'Ancient Woodland' and 'Woodland'. There is no doubt that given the steep slopes, it has been used for woodland since at least the medieval period, if not beyond. The site has been (since the 1960s been planted with conifers – only the very steep slopes still retain some semblance of its mixed deciduous origins.

The existing management of the site, and its impact could be defined as being of 'partial benign neglect – losses of fabric over a long period of time'. If work is not undertaken as soon as possible to the remainder of the site this process is set to continue and worsen – with in some cases the strong likelihood of having further serious structural collapse to the wing walls of the engine houses. The TVMHP aims to conserve the most important significant sites within the upper reaches of the Tamar Valley.

The overall impact of the proposed works on this significant site can be defined as **Negligible positive**: *Stabilisation/maintenance of site*. Within the project area the landscape character will be changed in the short term through track creation, vegetation clearance, particularly repairs to the building fabric. On balance the negative effect of these changes are minor and will diminish in the short term while providing a safe site for close public access to view mine buildings that represent the last working phase of an important mine, and to provide interpretation to understand an industrial process that operated for at least a century.

6 Impact mitigation strategy: archaeological consultancy

The impact mitigation strategy methodology is described below in three main stages: The pre-works consultancy, the historic buildings consultancy during works and the archaeological recording record (during and after works). This mechanism demonstrates the steps that have been taken to avoid or minimise adverse impacts, confirms that the proposed works have been designed in close liaison with the historic environment consultant. This is based on a clear understanding of the significance of the site using appropriate methods and techniques for site monitoring and recording.

6.1 Pre-works consultancy

The process developed by the Historic Environment Service, CC when undertaking historic buildings consultancies includes an important element of mitigating the impact of the works on the site during the project planning and specification stage. This

process has been ongoing during the past year. It has included an extensive dialogue with the project's structural and geotechnical engineer and mining landscape consultants. When the minimal impact of the scheme on any historic feature, landscape resource and historic character has been achieved as far as possible, the scheme progresses to any statutory/non statutory consent application and then the tendering stage for site contractors leading to site implementation works.

6.2 Historic Buildings Consultancy

The TVMHP manager has commissioned an Historic Buildings Consultant (HBC) based on the CC project design (re-produced in Appendix 9.3). Once the project details and specifications have been agreed and contractors commissioned, the project team (project manager/structural engineer/ecological consultant/historic buildings consultant), will ensure through dialogue that the impact of the conservation works by the site contractors is minimised as far as possible. For example, mortar test panels for building conservation works will attempt to minimise the visual impact of new lime mortar repointing and to attempt to replicate the existing style and finish of the existing mortar. Method statements will be sought from the site contractors to describe how (for example) working with lime can be achieved under variable weather conditions (although guidance will be given as part of the works specifications).

The HBC will monitor and advise on compliance to ensure (through a site meeting), that the methodologies and techniques of all aspects of the site works accord with the method statements and agreed methodologies outlined in any schedule of works and Specifications. In addition the TVMHP Principal Officer will enforce requirements based on the HBC advice. However, as a general philosophy, the extent of re-pointing and structural repairs on all buildings will only be minimal in order to ensure structural stability and conservation of the building for at least another generation.

A site meeting will be held at the completion of works to ensure that the site contractors clear the site of all debris, etc and to undertake a final visual check of the completed works. Site monitoring meetings and communication strategies with CC (WHS Advice), are also described in detail in the CC project design (Appendix 9.3).

Consultancy with other related specialists prior to and during the works (for example Geotechnical and Structural engineers, and the TVMHP manager), will be an ongoing process, an integral part of the Historic Building and archaeological consultancy, in order to create a site that will not be unduly affected by loss of significance or historic character as a result of carrying out the works, but rather its access, historic importance and site interpretation is enhanced by the project.

Regular site progress updates (every two weeks) will be provided by the HBC to the TVMHP Principal Officer and DCC archaeology (Bill Horner), usually in the form of emails. If an issue regarding a structural remediation technique or where the remediation works may go beyond that given approval by existing consents, as much advanced notification as possible will be given to DCC archaeology for a site consultation, etc.

6.3 **Programmes of archaeological recording**

The TVMHP will commission an historic buildings consultant who will also undertake the archaeological watching brief recording and production of a final report. A CC project design describes a detailed programme of archaeological recording, site monitoring and watching brief report production (Appendix 9.3). DCC archaeology and the Historic Environment Service, Cornwall Council (Advice) should approve this before works start.

Given the very small amount of masonry reconstruction/repointing, the detailed on-site archaeological recording techniques will only include detailed site photography (Black/White and digital colour). The archaeological recording report will include detailed 'before and after' site photographs as well as a descriptive text of the general works (refer to Appendix 9.3).

7 References

7.1 Primary sources

DRO Mine Plans:

MRO (R29B, R19A, 190, 15307, 15317, 13949, R19B, 3260)

T1258M (Bedford Estates Archive-leases, maps and Reports on Mines/Quarries)

Sherrell, F., 2000, Devon Great Consols and Bedford United Mines: Report on the results of a desk study and surface reconnaissance inspection, Report No. 1915

- Sherrell, F., 2002, Devon Great Consols and Bedford United Mines: A preliminary risk assessment in relation to public access within the site, Report No. 1915/2
- Sherrell, F., 2011, Proposed footpath below Bedford Sawmills, Gulworthy, Devon (A preliminary risk assessment in relation to public access within the site, Report No. 3685
- Sherrell, F., 2012, Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Report No. 3685

Symons, B, 1848 A Geological Map of the Tavistock Mining District, Cornwall, Truro TVMHP., 2006, *HLF TVMHP Management Plan*

7.2 Publications

Barton, D.B., 1961, A History of Copper Mining in Cornwall and Devon, Truro.

Barton, D.B., 1964, Historical Survey of the mines and mineral railways of East Cornwall and West Devon, Truro

Bennett, A., 1992, Images of Cornwall, Runpast Publishing

Booker, F., 1971, The Industrial Archaeology of the Tamar Valley, Newton Abbot

Brooke, J., 2001 ed Kalmeter Journal, Twelveheads Press, Truro

- Buck, C., 1998, *Preliminary assessment of industrial sites of archaeological importance*, CAU Report
- Buck, C., 2002, *Devon Great Consols Mine Assessment Report*, CAU Report (2002R069)
- Buck, C., 2003, Bedford United Mine Assessment Report, CAU Report (2003R043)
- Burt, R., Waite, P., and Burnley, R., 1987, *Cornish Mines: Metalliferous and associated Minerals 1845-1913,* Univ of Exeter

Collins, J.H., 1912, Observations on the West of England Mining Region, 1988.

- Dines, H.G. and Phemister, J., 1956 (reprinted, Beer, K.E., 1988), *The Metalliferous Mining Region of South-West England*, HMSO
- Jenkin, A.K.H., 1974, Mines of Devon, The Southern Area, Vol. 1 David and Charles

Patrick, A., 1983, *Copper production in the Tamar Valley in the Eighteenth Century*, Tamar Journal, Vol 5

Richardson, P, H, G., 1992, Mines of Dartmoor and the Tamar Valley after 1913

Thorpe, S, 2005, *Cornwall and West Devon Mining Landscape-Management Plan*, HES/CC

7.3 Websites

<u>http://www.stastier.co.uk</u> A particularly useful website by the manufacturers of St. Astier brand lime products detailing methodologies for their application.

<u>http://www.cornishlime.com</u> The website of the Cornish Lime Company

<u>http://www.matchingbrick.co.uk</u> A useful website for those seeking matching brick for the repair of historic structures

8 **Project archive**

The HES project number is 2012010

The project's documentary, photographic and drawn archive is housed at the offices of Historic Environment, Cornwall Council, Kennall Building, Old County Hall, Station Road, Truro, TR1 3AY. The contents of this archive are as listed below:

- 1. A project file (2012010) containing site records and notes, project correspondence and administration.
- 2. This report held in digital form as: G:\TWE\Waste & Env\Strat Waste & Land\Historic Environment\Projects\Sites\Devon\Bedford Mine Trail 201210\IA Report\Bedford Mine trail IA 2012010.doc
- 3. Oasis No. 134883

9 Appendices

9.1 Appendix 1: Sherrells Ltd (Geotechnical Engineers) Letter report plans, *Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter* Report 8/2/2012 No. 3685 (Figs 4b-4d, 10)



<u>Note</u>: Specifications for the Revised bridge location (Unrecorded Lode) is shown in Appendix 9.2 (Alastair Guy drawings). The southern 'bridge' site will have a boardwalk.



<u>Note</u>: The 'revised bridge location' shown on this plan will now site a fenced (with handrail) low impact boardwalk.



<u>Note</u>: It is likely that there will low impact site information boards near the viewing area to view part of the former Bedford United Mine site. All fencing will be timber and low visual impact. Shaft 13 will also be fenced.

Bedford Mine Trail IA CB September 2012



Sherrells Ltd (Geotechnical Mining Engineers) Letter report plans, *Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter* Report 14/6/2012 No. 3685 (Figure 10)

9.2 Appendix 2: Alastair Guy & Sons Letter report plans (July 2012), *Plans for TVMHP RE: Proposed Bridge Crossing: Lode workings (end and side views)*



9.3 Appendix 3: Historic Buildings Consultancy and archaeological watching brief project design

Tamar Valley Mining Heritage Project:

Written Scheme of Investigation - Historic Building and Archaeological Recording Consultancy 21/7/2006

Client: Tamar Valley Mining Heritage Project,

Client contact: C Hariades, Tamar Valley Mining Heritage Principal Officer

Client tel: 01872 888125

Client email: <u>chariades@cornwall.gov.u</u>k

1 Background

1.1 Introduction

The Tamar Valley Countryside Service, through the Tamar Valley Mining Heritage Project Officers, is managing conservation works to five historic industrial/mining sites in West Devon (Tamar valley) as part of the second stage of a Heritage Lottery Funded Mining Heritage Project. All of the sites are located within the proposed Cornwall and West Devon Mining Landscape World Heritage Site (see Thorpe, 2005 and Buck 2002-6).

There are other site works that are listed in the project's Heritage Sites Programme, but which are not covered in this Written Scheme, but are subject to different project designs (WSI's):

- 1. Trails and safety works consultancy and watching brief (all mine sites)
- 2. Archaeological (sub-surface) watching brief recording (new car parks at Tavistock woodlands, Morwellham, New Quay and new build at Morwellham)
- 3. Tavistock Canal archaeological consultancy and watching brief
- 4. Tavistock to Bere Alston Railway archaeological consultancy and watching brief

This Written Scheme of Investigation (WSI) has been prepared by the Historic Environment Service (Projects), Cornwall County Council, to set out how the Historic building and archaeological recording consultancy works are to be undertaken. These consist of an appropriate level of historic building consultancy work and historic building and archaeological recording which are likely to be required by conditions on the appropriate Planning, Listed Building Consents (LBC) and Scheduled Monument Consents, which are yet to be granted (see Appendix 1). These conditions are likely to require that a WSI should be produced by the archaeological contractor for:

(1)An historic buildings and safety works consultancy for the supervision of conservation works and

(2)A programme of historic building and archaeological recording

The preferred WSI will be submitted by the Tamar Valley Mining Heritage Project (TVMHP) Principal Officer to the Devon County Historic Environment Service (DCHES), the Local Planning Authority (LPA) where relevant, West Devon Conservation Officers, English heritage (for Scheduled sites), and the World Heritage Site Advice Team, CC, for written approval before work begins on site.

1.2 Project Background

No conservation works have previously been carried out to Tamar Valley (Devon) industrial mine sites and trails. The site work involves building consolidation and

provision of safe public access within five mining heritage sites (mainly former mining or industrial complexes), and the creation of a number of new trails (c 20Km, not including the railway or canal). Many of the mine sites contain significant heritage assets. Extant engine houses (some Scheduled Monuments), substantial ore quays and lime kilns are located on some sites, and all contain a number of mine shafts, legacies of the site's industrial past. Project funding will seek to make these sites safe and more accessible for a greater number of people, both for the local communities and visitors.

The five main sites which are to be conserved (Devon Great Consols, Bedford United Mine, Morwellham, New Quay and Gawton) are to be made publicly accessible, funded to a large degree by the Heritage Lottery Fund (HLF) and Objective 2. Each individual site has been subject to an archaeological assessment, a structural assessment by certified Structural Engineers and where necessary a Geotechnical Engineer. Also additional assessments have been carried out by a mineralogist, and an ecologist. All of these sites (and others), and the heritage trails between them have also been subject to a Conservation Management Plan, prepared as part of both the Stage 1and 2 bids.

Archaeological assessments have been undertaken (Buck 2002, 2003, 2005-006) containing historical research, copies of historical maps, photographs and plans of the sites, a description of each structure and colour photographs of each main structure. In addition the reports identified general repair proposals for each structure. Detailed recommendations for each building (on elevations and plans as agreed by the Consulting Engineer and the Historic Buildings Consultant), will be made as part of the Scheduled Monument Consent and tender specification document stages.

2 Site information and structures to be treated

The suggested level of archaeological consultancy/recording for each site should be referred to when reviewing Section 2 below.

2.1 Devon Great Consols and Bedford United Mines

(January 2012 – March 2012)

Opening 2km of a new footpath route within the former Bedford United mine and parts of Devon Great Consols mine, utilising existing forest tracks and features. The routes have been designed to make the most of the natural beauty and archaeological history of the area, while at the same time avoiding disturbance of local residents, sensitive ecological sites and the landowners working areas.

Carrying out safety works within a buffer zone of the new track, including fencing mine shafts and fitting metal bars to adits.

Consolidating archaeological remains at 35 sites, including work to preserve the arsenic condensers, calciners flue and chimney that form the Devon Great Consuls scheduled ancient monument. Arsenic conservation works (Scheduled Monument) to be carried out Dec 2007 – July 2008.

SITE INFORMATION AND STRUCTURES that may be affected (Devon Great Consols, Buck 2002)

• Archaeological features on Thomas/Watsons Lode (Sites 374, 375, 376, 376.1)

SITE INFORMATION AND STRUCTURES that may be affected (Bedford United Mine, Buck 2003)

- Archaeological features on North/Tavistock Lode (Sites 1/1.1, 4, 5)
- Archaeological features on Marquis Lode (Sites 3/3.1, 7, 8, 11)
- Archaeological features on Unrecorded Lode (Sites 12, 13, 14)
- Archaeological features on Phillips Lode (Sites 9, 10)
- Conservation repair of masonry tail race walls to stamps/crusher wheelpit (Site 17)
- Sites 15, 17.1, 18, 39, 41, 40, 42

3 Aims and objectives

The purpose of the historic buildings consultancy, historic buildings recording and archaeological recording is:

- To ensure that site works are undertaken in such a way as to maintain the integrity and authenticity of the historic resource, minimising adverse impact upon the resource.
- To ensure that the highest possible standards of workmanship are maintained during the conservation works, which must be carried out to recognised current best standards in this discipline.
- To ensure that works are undertaken in such a way as to allow adequate recording of remains affected by the works,
- To record sites, features, deposits and artefacts affected by or uncovered by the works.
- To record the character and extent of works to the sites.
- To disseminate the results of the project appropriately and arrange for the deposition of the project archive.

4 Working methods

All archaeological recording work will be undertaken according to the Institute of Field Archaeologists *Standards and Guidance for Archaeological Investigation and Recording.* Staff will follow the IFA *Code of Conduct* and *Code of Approved Practice for the Regulation of Contractual Arrangements in Archaeology.*

The principal factor in effective project delivery will be the employment of key project staff who are expert in the management and recording of the industrial heritage. Cornwall Historic Environment Service project staff are able to draw upon a substantial track record in undertaking similar work throughout Cornwall, as well as a detailed knowledge of the project area and its sites.

4.1 Historic buildings consultancy

- HES (Senior Archaeologist) will attend a pre-works meeting to agree site access and site compound and stockpile areas in order to minimise damage to archaeological features, agree site compound location, agree details of location/preparation/number of mortar test panels, agree working methods and any changes to proposed work programme and discuss Health and Safety issues and requirements.
- The HES (Senior Archaeologist) will liaise with the Devon County Historic Environment Service - DCHES (Bill Horner), West Devon Conservation Officer (Stephen Gill/Roger Duce), English Heritage (Inspector for buildings and ancient monuments (Shane Gould) the WHS Management team (Phil Copleston) and the TVMHP Officers (Chris Hariades and Richard Halliwell). The HES Senior Archaeologist will liaise with any additional archaeological recording officer on the extent of works carried out and the appropriate level of recording.
- HES (Senior Archaeologist) will provide historic building conservation advice to the site engineer and site contractor in line with English Heritage guidelines (referred to in section 7 below) during regular site visits.
- It is anticipated that an HES Senior Archaeologist (Colin Buck), will undertake Historic Buildings Consultancy as part of this work. This person will also photograph the buildings before, during and after works take place – liaising with any additional project recording archaeologist and undertake to fulfil any specific recommendations made by DCHES and DCMS as part of the Scheduled Monument Consent.
- The HES Senior Archaeologist will attend regular site meetings at an approximate frequency of 0.5 day per week for each building contract. The meetings will be held with the site engineer, site contractor and possibly the appropriate District

Conservation Officer, as appropriate, to discuss ongoing site conservation work methods, detail of repairs and resolve any conservation work problems. It is assumed that the structural engineer and site contractor will have a proven track record in historic building conservation.

- The HES Senior Archaeologist will liaise with any additional archaeological recording officer on the extent of works carried out and the appropriate level of recording.
- HES will ensure that site conservation works are carried out to standards recommended by English Heritage best practice, and will halt inappropriate or substandard work and inform DCHES, the building engineer and TVMHP Project Officer.
- HES will advise the Structural Engineer/TVMHPPO (Pete Leaver/Tom Fletcher), where
 variations to repair and conservation work and recording may need to be agreed
 with the LPA/English Heritage; this will be discussed with the DCHES (Bill Horner) in
 the first instance.

4.2 Fieldwork: historic building recording

- Detailed archaeological recording will be undertaken for all newly exposed architectural features and any features revealed through excavation. Recording will also include the extent of repointing and rebuild.
- Historic building recording will be undertaken by a Senior Archaeologist (Historic Buildings Consultant Colin Buck or a suitably experienced HES archaeologist).
- As well as new detail, the nature and extent of all conservation works will be added to the existing archaeological/engineering building survey drawings (to be supplied to HES by the client).
- Measured survey will be carried out by hand measurements (using offset techniques at a scale of 1:50), using a paper copy of the survey supplied by the Client. This record will then be added to the original survey using CAD (or equivalent) software.
- The resulting survey output will be a revised measured survey drawing showing all conservation works that have been undertaken. This will be reproduced at a scale of either 1:50 or 1:100 (appropriate to the size of area recorded) and will form part of the Historic Buildings archive watching brief report.
- Analysis of the building fabric will be recorded in the form of field notes and written up at the archive report production stage.

4.3 Fieldwork: archaeological recording during mine shaft and safety works treatment

- The DCHES (Bill Horner) has advised that archaeological recording should be undertaken during any excavation that has revealed archaeological features. Recording will be undertaken using a mix of direct measurement, sketch plotting and photography, as appropriate (constrained by safety factors).
- Where significant remains are encountered the site archaeologist will be given the opportunity to make an appropriate form of record before work proceeds; where a temporary stop of work is required to undertake this, the site archaeologist will make a request via the project resident Engineer.
- If archaeological deposits of a regional or national importance are uncovered, contingency should be allowed within the works programme to review options to ensure their preservation in situ. In the event that significant remains cannot be preserved in situ, strategies for their relocation or detailed recording will be agreed with the Devon County Archaeologist.
- Any variation in named personnel for archaeological recording and historic buildings consultancy will be agreed with DCHES, and the TVMH Project Officer.
- The chosen site archaeologist will adhere to Health and Safety Policies (see below), under the direction of the designated Site Safety Officer.

4.3.1 Site recording (general)

- Site drawings (plans, sections, locations of finds) will be made by pencil (4H) on drafting film; all plans will be linked to the Ordnance Survey landline map; all drawings will include standard information: site details, personnel, date, scale, north-point.
- The site archaeologist will undertake recording in line with recommendations given by IFA. Sections and plans will be drawn on site at appropriate scales which will adequately record structures or features at appropriate levels of detail, and appropriate sections reproduced in the archive report at either 1:50 or 1:100 to adequately demonstrate revealed archaeological features.
- All features and finds will be accurately located by means of a National Grid reference.
- All archaeological contexts will be described using a standard format and linked to a continuous numbering sequence.
- A location plan will be made which will allow site detail to be accurately placed within the context of the Ordnance Survey Landline mapping.
- The archaeological watching brief report will detail (and if appropriate summarise) all forms of archaeological recording that has been undertaken at each of the mine sites. Each major mine site will have a single archaeological watching brief report that details all project related work to that site (ie trails works, building conservation works, interpretation works etc).

4.3.2 Treatment of finds

- It is recognised that fieldwork may produce artefactual material.
- It will be important to agree the arrangements for deposition of any finds prior to the start of the project, and ensure that transfer agreements are arranged and signed..
- An allowance has been made for discussions with landowners for the deposition of archaeological finds in an appropriate museum have been included in the cost tender.
- All significant finds in stratified contexts will be plotted on a scaled base plan and described.
- All finds will be collected in sealable plastic bags which will be labelled immediately with the context number or other identifier.
- Plymouth City Museum is the designated museum. Their guidelines should be followed and accession numbers for finds and archives for each project should be obtained at the start of the project. Unless otherwise agreed, mining-related artefacts and small finds to be removed from site will be deposited at the Plymouth City Museum, pending detailed discussions over their final place of deposition or loan to other local smaller museums and interpretation centres (for example Morwellham and Tavistock) etc.

4.3.3 Photographic recording

- 1. Black and white scaled photography using either a 35mm camera or medium format camera using fine grain archive quality film (400ASA).
- 2. Provision will be made for a range of lighting conditions and the photographic equipment will be available to the historic building recording personnel listed in the WSI.
- 3. Each shot will be carefully composed, focused and lit appropriately with a flash gun if necessary. The photo record will comprise:
- general views and examples of structural and architectural detail.

Methodology for the archive standard photography is set out as follows:

- Photographs of details should be taken with lenses of appropriate focal length.
- Difficulties of back-lighting should be dealt with where necessary by balancing the lighting by the use of flash.
- A range of appropriate photographic scales should be used and a metric scale included in all archive recording photographs, except where health and safety considerations make this impractical.
- A photographic location plan for each building recorded will be produced for the report and each film will be fully printed to 6 x 4 or 7 x 5 size prints. Selected prints will be scanned into the archive reports.
- Black and white photographs will be archived to HER standards and incorporated into the HES photo database.
- Supporting colour photographs will be taken with a high resolution digital camera (3MP or higher), to illustrate the report and for possible presentation purposes. This will be archived electronically onto each report CD.
- Care will be taken that each shot is focused and that with delayed shutter action that camera shake does not occur. Each shot will be of appropriate quality and used for reports and/or power-point presentation.
- Digital colour photographs will be stored according to the Historic Environment Service's guidelines. Copies of the images will be provided to the client.
- The archaeological record will include a plan showing the location of the photographs reproduced in the report.

4.3.4 Post Fieldwork

Following completion of the fieldwork stage the results from the Historic buildings, Trails and any other main sites within the mine project will be combined into a single concise report for each major mine site.

4.4 Report production

Each site report will summarise the results of the measured survey, photographic recording and archaeological recording for buildings and shafts treated as part of this project, and will include the following components:

- Summary
- Project background
- Aims and objectives
- Methodology
- Summary description of conservation works undertaken at all structures
- Description of conservation works and works programme, together with results of any archaeological recording.
- Recommendations for future management, including any further requirement for conservation works or other archaeological work.
- Conclusions
- References
- Project archive index
- Supporting illustrations: location map, historic maps, plans, elevations/sections, photographs.
- 4.4.1 Draft and summary report

- A summary report will be produced within two weeks of the completion of the fieldwork for each site and circulated to the DCHES Team and WHS Advice teams.
- A draft report containing the project results, as outlined above, will be produced and circulated to the DCHES Team for comment.

4.4.2 Final report format

- A paper copy and a digital (PDF) copy of the report, illustrations and any other files will be held in the Cornwall HER.
- Four paper copies of each report, and a CD containing an electronic copy of the report and the digital photographic archive will be produced for the client and the DCHER.
- Paper copies of the report will be distributed to local archives (including the Historic Environment Record) and national archaeological record centres.

4.43 Archiving

Following review with the HES Project Manager the results from the fieldwork will be collated into an archive following the Society of Museum Archaeologists Guidelines. This will involve washing and cataloguing relevant finds, the indexing and cross-referencing of photographs, drawings and relevant context records.

- All finds and samples, etc will be stored in a proper manner (being clearly labelled and marked and stored according to HES and IFA guidelines).
- Following any necessary cleaning, stabilisation and recording, artefacts or small finds will be deposited at an appropriate location.
- All paper and photographic records will be ordered, catalogued and stored in an appropriate manner (according to HES guidelines). It is expected that the depository site for these records will be the Devon County Record Office, Exeter.
- An EH OASIS entry (on-line) will be prepared at this stage of the project summarising the site impacts for each mine and referring to each archaeological watching brief report.

4.4.4 Cornwall HES archive deposition

An index to the site archive will be created and the archive contents prepared for long term storage, in accordance with HES standards (which will follow Society of Museum Archaeologists Guidelines). Archiving will comprise the following:

- All correspondence relating to the project, the WSI, a single paper copy of the report together with an electronic copy on CD will be stored in an archive standard (acid-free) documentation box.
- The drawn archive will be stored in A2 plastic wallets.
- Photographic material will be stored in archive standard negative holders and archive print holders within an archive standard box.
- All black and white photographs are to be archived using captioned labels, appropriate record forms and location plans. Other photographic records to be supplied with written captions and subject to appropriate batch archiving to be held in safe archival storage.
- Devon's Historic Environment Service/Devon Museums will receive a copy of all site photographs, reports and relevant correspondence etc.

The written archive will be deposited in a registered archive or museum, in accordance with their deposition guidelines and within 4 months of the completion of fieldwork.

5 Public presentation

Given the importance of the Tamar Valley mine sites, the significant impact to local communities of the remaining engine houses and the inclusion of all the sites in the proposed World Heritage Site, it is acknowledged that there is scope for wider public

dissemination of the results of this project. This dissemination could take the form of one or more of the following, subject to the agreement of funding for this work by the Project Manager (this may not be included in the tender associated with this WSI, although it can be included if requested by the Project manager/DHES):

- Community Open Days to show members of the public around the mine sites
- Provision for public lectures to local organisations
- Provision of information about the sites, works carried out and dates of open days etc via web sites (CC, DCC, WHS)
- Popular publications:
 - Devon: DAS Newsletter, Articles in DAS proceedings/monographs
 - Cornwall: Archaeology Alive, CAS Journals
- Media/newspaper articles via TVCS publicity officer.

6 Project staff

- The Historic Environment Service (Projects) has accumulated unparalleled experience in industrial archaeology, having been involved in this aspect of archaeology for the last twenty years (see the HES CV and the specific personnel CV in Appendix 2). The project will be managed and carried out by an HES Senior Archaeologist with proven experience in industrial archaeology; this staff member will also carry out the historic buildings consultancy and historic buildings recording. The project manager will:
- Take responsibility for the overall direction of the historic building consultancy and archaeological recording project.
- Discuss and agree the detailed objectives and programme of each stage of the project with DHES and TVCS PO, including arrangements for health and safety.
- Monitor progress and results for each stage.
- Edit the project report.

Key personnel within the proposed team are (CVs summarised in the Appendix):

Colin Buck, DipCert, Senior Archaeologist. cbuck@cornwall.gov.uk

Specialist in Cornish mining landscapes and assessments since 1993. Involved in numerous recording and appraisal projects including conservation works to many engine houses and other structural conservation works, shaft safety works and mine site access improvements, particularly in the east of Cornwall. Projects include many archaeological impact assessments. Helped Tamar Valley AONB Service prepare CMP for West Devon Mining. Involved in the preparation of policies for the Cornish Mining World Heritage Site Bid's Management Plan and produced the Mineral Tramways Conservation Management Plan.

7 General arrangements

Timetable

Following guidelines provided by the TVMHP Principal Officer (and David Wilson Partnership – Pete Leaver), the consultancy and fieldwork (for a projected duration of three years), is anticipated to be commenced during late summer of 2006. HES will require at least three weeks notice before commencement of work, in order to allow the allocation of field staff time and arrange other logistics.

Monitoring and Signing Off Condition

- Monitoring of the project will be carried out by Historic Environment Projects and DCHES (Bill Horner).
- The Devon County Historic Environment Service Planning Advice Officer should be informed 1 week in advance of the intention to start the recording (although a three year project timetable has been prepared).

- HES will liaise with the DCHES Officer to discuss the programme, progress of work, and agree site meetings as required.
- A summary of the results for each major contract stage will be presented to the DCHES Officer within 2 weeks of the completion of the relevant fieldwork.
- Draft reports will be provided to the DCHES Advice Team for comment.
- Where the DCHES Officer is satisfied with the archive report and the deposition of the archive, written discharge of the planning condition will be expected from the local planning authority (LPA).

Monitoring points during the study will include:

- Approval of the WSI
- Completion of fieldwork for each mine site
- Completion of archive report and summary note for each mine site
- Deposition of the archive

Professional standards

The historic building and archaeological recording will be carried out to the standards of the Institute of Field Archaeologists and all work and advice will be carried out in line with the IFA Code of Conduct and Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology.

Copyright

Copyright of all material gathered as a result of the project will be reserved to Cornwall County Council and their funding partners (Devon County Council). Existing copyrights of external sources will be acknowledged where appropriate.

Compliance and Variations

Minor variations to this WSI will be discussed in liaison with the client and the Devon Historic Environment Planning Advice Officer. The TVMHPO will then agree these with the LPA/EH as appropriate. Major variations may require detailed agreement from the Local Planning Authority.

Contract

The HES projects team is part of the Historic Environment Service, within Environment and Heritage, Cornwall County Council. If accepted, the contract for this work will be between the client and Cornwall County Council.

The views and recommendations expressed will be those of the Historic Environment Service projects team and will be presented in good faith on the basis of professional judgement and on information currently available.

Health and safety

- The Service follows the County Council's *Statement of Safety Policy*. For more specific policy and guidelines the Unit uses the manual *Health and Safety in Field Archaeology* (2002) endorsed by the Standing Conference of Archaeological Unit Managers and also the Council for British Archaeology's Handbook No. 6 *Safety in Archaeological Field Work* (1989).
- The historic building consultant and the historic building/archaeological recording team will adhere to the Health and Safety Statement of the Principal Contractors.
- Prior to carrying out on-site work HES will carry out a Risk Assessment.

Insurance

As part of Cornwall County Council, HES is covered by Public Liability and Employers Liability Insurance.

Colin Buck, Senior Archaeologist, Historic Environment Projects, Cornwall Council



Bedford Mine Trail, Gulworthy, Devon Impact assessment



Historic Environment Projects

Bedford Mine Trail, Gulworthy, Devon

Impact Assessment Report

Client	Tamar Valley Mines Heritage Project
Report Number	2012R063
Date	August 2012
Status	Final
Report author	Colin Buck
Checked by	AJ
Approved by	AY

Historic Environment, Cornwall Council

Kennall Building, Old County Hall, Station Road, Truro, Cornwall, TR1 3AY tel (01872) 323603 fax (01872) 323811 E-mail hes@cornwall.gov.uk www.cornwall.gov.uk

Acknowledgements

This archaeological recording was commissioned by West Devon Borough Council and the Tamar Valley Mining Heritage Project. It was carried out by the Historic Environment Projects team, Cornwall Council.

Within Historic Environment, the project manager was Colin Buck and figures reproduced in this report were compiled by Carolyn Royall, Colin Buck and Sherrell's Ltd. The report was edited by Andy Jones.

The views and recommendations expressed in this report are those of the Historic Environment Service projects team and are presented in good faith on the basis of professional judgement and on information currently available.

Freedom of Information Act

As Cornwall Council is a public authority it is subject to the terms of the Freedom of Information Act 2000, which came into effect from 1st January 2005.



Historic Environment, Cornwall Council is a Registered Organisation with the Institute for Archaeologists

Cover illustrations

Front cover image (\bigcirc C Buck CC) of one of many infilled surface outcrop stopes cutting across the route of the new Tamar Valley Mines Heritage Project Bedford Mine Trail (see Sherrells 2012 figure 4b).

© Cornwall Council 2012

No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without the prior permission of the publisher.

Contents

1	Sun	Summary	
2	Introduction		7
	2.1	Project background	7
	2.2	Aims	8
	2.3	Building conservation philosophy	8
3	Sta	Statements of Significance 8	
	3.1	Definition of Outstanding Universal Value and Significance	8
	3.2	General Statements of Significance for the Tamar Valley Mining District	9
	3.3	Site specific Statements of Significance	11
4	Sun	nmary table of building conservation works	15
5	Ass	essment of impact and mitigation	20
	5.1	Impact significance definitions	20
	5.2	Building conservation works	20
	5.2. 5.2	 Site impact and remediation summary Site inventory impact description and remediation measures 	20 21
	5 3	Fencing works	27
	54	Public access & interpretation	27
	5.4.	1 Site description, site impact and impact remediation	27
	5.5	Description of impacts during the post-project stage	28
	5.6	Residual impacts	31
	5.7	Assessment of impact on historic landscape character	31
6	Imp	pact mitigation strategy: archaeological consultancy	31
	6.1	Pre-works consultancy	31
	6.2	Historic Buildings Consultancy	32
	6.3	Programmes of archaeological recording	32
7 References		33	
	7.1	Primary sources	33
	7.2	Publications	33
	7.3	Websites	34
8	Pro	ject archive	34
9	Арр	oendices	35
	9.1 Appendix 1: Sherrells Ltd (Geotechnical Engineers) Letter report plans, <i>Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter</i> Report 8/2/2012 No. 3685 (Figs 4b-4d, 10) 35		
	9.2 TVMH	Appendix 2: Alastair Guy & Sons Letter report plans (July 2012), Plans for PRE: Proposed Bridge Crossing: Lode workings (end and side views)	39
	9.3 projec	Appendix 3: Historic Buildings Consultancy and archaeological watching bridt design	ef 40

List of Figures

- Fig 1 Location map
- Fig 2 1867 Estate Plan
- Fig 3 Map showing the archaeological sites relating to the proposed new mine track
- Fig 4 Map showing the sites of proposed works at Bedford United Mine
- Fig 5 Photo of Wheelpit tail race tunnel
- Fig 6 Photo Internal view of Marquis adit

Abbreviations

CC	Cornwall Council	
DCC	Devon County Council	
DCHES	Devon County Historic Environment service	
DGC	Devon Great Consolidated Mine	
DRO	Devon Record Office	
DHER	Devon Historic Environment Record	
HE (Projects) Historic Environment (Projects)		
NGR	National Grid Reference	
TVAONB	Tamar Valley Area of Outstanding Beauty	
TVMHP	Tamar Valley Mining Heritage Project	
WDBC	West Devon Borough Council	
WHS	World Heritage Site	

1 Summary

A new circular footpath trail is planned around parts of Bedford United Mine to/from the Sawmills Car Park as part of the Tamar Valley Mining Heritage Project. This impact assessment report is intended to inform and guide the Tamar Valley Mining Heritage Project (TVMHP), Devon County Council Historic Environment Service (DHES), and the Cornwall and West Devon World Heritage Site (Planning Advice Team), by assessing the impact of creation of the proposed trail and building conservation and site safety works upon the site's significant assets.

The Tamar Valley mines are nationally important mine sites, a proportion of the 19th century mining landscape is Scheduled but all are within the Cornwall and West Devon Mining Landscape World Heritage Site (WHS – Tamar Valley area Site A10), although none of the sites within this report are Listed or Scheduled. This report summarises the archaeological resource, and describes the impact and mitigation of the proposed works.

Most of the study area (Fig 1) is included within the former Bedford United Mine Sett, however, part of the northern section (using existing trackways and a TVMHP Trail) uses part of Wheal Thomas/Watson Mine (eastern side of Devon Great Consols Mine – see Fig 2). Both mines were worked from the late 1840s and include mine shafts, adits, sites of wheelpits, remains of flat rod gulleys and other mining related features.

The construction of a new track for public access along the steep sides of the Tamar Valley, often crossing open lode outcrop workings and close to open adits and closed shafts will impact upon its present woodland environment, so characteristic of the Tamar Valley Area of Outstanding Natural Beauty (TVAONB). However, mechanisms can be put in place (by DCHES) to ensure that there is an appropriate degree of consultancy and archaeological recording, as part of the project's impact remediation measures. Careful pre-works consultation with a site archaeologist has resulted in minimal impacts upon known archaeological features.

Archaeological impact recommendations include a programme of archaeological site consultancy before works start (to ensure the fencing/boardwalk/landing works will have a minimal impact), during works (for site supervision, archaeological recording, and liaison with DCHES), and after works to ensure the works were sensitively completed, as part of an overall mitigation strategy.

2 Introduction

2.1 Project background

The conservation and management of features relating to the TVMHP's mining heritage and enablement of safe public access forms the basis for the proposed new Bedford trail footpath creation and site conservation scheme. This report assesses the impact of the proposed building conservation works on the significant assets of the Bedford United Mine (and to a lesser extent Devon Great Consol's). There are no detailed schedule of works and specifications (apart from Appendix 2, a letter report by Sherrells dated February 2012), describing how the impact of the proposed works are minimised as part of a coherent mitigation strategy.

Cornwall Archaeological Unit (CAU – now Historic Environment Projects, Cornwall Council), produced an archaeological assessment of Devon Great Consols in 2002 (Buck 2002) and Bedford United Mine in 2003 (Buck 2003), which describes in detail each mine structure and their relative significance. The Historic Environment Service (HES) was commissioned in February 2012 (Project No. 2012010), by the Tamar Valley Mining Heritage Project (Chris Hariades as TVMHP Project Manager), to undertake Historic Buildings Consultancy (to ensure WHS consent to the nature and extent of the new track creation and limited building conservation specifications), photographic building recording of affected mine sites, and production of an impact assessment report for all sites affected and impacted by the proposed works.

An impact assessment project brief has not been produced, but it follows a similar project design by Cornwall Historic Environment Service; '*Project design for production of Scheduled Monument Impact Assessment Reports (Devon Great Consols and Gawton), as part of the Tamar Valley Mining Heritage Project (2006-2009)*', dated 23/6/06 (Reproduced as Appendix 1).

A summary statement of significance relating to structures likely to be affected by the proposed works has been produced (Section 3.3), followed by a summary table of each site's assets (Section 4). This report identifies the archaeological resources affected by the proposed building conservation scheme, and describes the impact and mitigation of the works on the site's significant assets (see Figs 1 and 3 for site inventory). In addition the report refers in detail to the management and maintenance plan that has been produced by the TVMHP (2006) and summarises the proposed short and long term site management as part of relevant conservation management plan policies (TVMHP 2006), and appropriate WHS management plan policies (2005).

It is proposed that the building conservation programme will address the following:

- The protection and consolidation of significant archaeological remains in their settings.
- Health and safety aspects of the site relating to public access.
- Provision of low-key public amenity use where appropriate, incorporating access.
- Interpretation of the site to the public, including on-site and written materials.
- Linking the site into the local economic, social, tourism and recreational contexts.

In terms of the management of archaeological features, engineering works will be kept to a minimum, but in view that the entire site is part of the Tamar Valley component (Area 10) of the Cornwall and West Devon World Heritage Site mining landscape, particular attention has been paid to suggestions for the best mitigation of any such works.

2.2 Aims

The purpose of this impact assessment is to:

- 1. Assess the impact of the new track creation and building conservation and safety works on the significance and character of Bedford United Mine. This report should be approved by DCC (Archaeology) and the WHS (Advice) team, before works on site can start.
- 2. Indicate the steps that have already been taken by the historic buildings consultant (HBC) to avoid or minimise adverse impacts upon the site, its features and archaeology and to ensure that the site methodologies accord with general EH guidance on the Conservation of Historic buildings.
- 3. Indicate that the proposed methods and techniques are appropriate to the history, character and outstanding universal value (OUV) of the site.
- 4. Make recommendations for an archaeological mitigation strategy.
- 5. Ensure the detailed site information (Sherrell 2011) conform to the overall mitigation strategy for the site.

2.3 Building conservation philosophy

All site works carried out by the project will be undertaken to the highest national standards, and in accordance with the policies and guidance set out in *Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment* (English Heritage 2008) and all other relevant guidance, irrespective of whether the heritage assets or components enjoy statutory protection or not.

The site conservation philosophy is based on respecting the character of each significant feature and its contextual relationship generally with other parts of the WHS. The long-term conservation and preservation of the built and standing archaeology should reflect its individuality, character and construction. The methodology of using traditional lime based mortar and timber structural components is intended to replicate its original construction technique; however, the end product is intended not to monumentalise the site but to conserve, protect and give the appearance of an old but safe structure. The building conservation text reproduced in the Appendix (9.1) is intended to describe in more detail the appropriate philosophy underlying building conservation works to enable safe public access and appropriate site interpretation.

An essential component of the mitigation strategy is the employment of an historic environment consultant who should ensure that English Heritage principles of conservation practice are adhered to both in terms of the design of appropriate schemes, to ensure that consolidation works are carried out to acceptable (EH) standards and to ensure close liaison between statutory agencies and the project scheme. In addition it is important that the nature, extent and development of the site conservation works should be guided by the relevant short and long-term management plan policies (statutory, archaeological, conservation, ecological, mineralogical and WHS, etc), which are an important part of any mitigation strategy of the site.

The appropriate statutory authorities (Devon County Historic Environment Services) will ensure that written scheme of investigations (or project designs), set standards for the archaeological recording and reporting during and after the works have ceased.

3 Statements of Significance

3.1 Definition of Outstanding Universal Value and Significance

The Outstanding Universal Value (OUV) of the Cornwall and West Devon Mining Landscape was described in the Nomination document for World Heritage Site Status 'The Cornwall and West Devon Mining Landscape was transformed during the period

1700 – 1914 by early industrial development that made a key contribution to the evolution of an industrialised economy and society in the United Kingdom, and throughout the world. Its outstanding survival, in a coherent series of distinctive cultural landscapes, is testimony to this achievement'. The 'coherent series of distinctive cultural landscapes' comprises ten areas of Cornwall, one of which is the Tamar Valley Mining District (Area A10); see Figure 1. There are seven main components identified in the Nomination Document through which the OUV is physically expressed: Mine sites, Mine transport, Ancillary industries, Mining settlements and social infrastructure, miners smallholdings, Great Houses and estates, and Mineralogical and other sites of scientific importance. Individual aspects of the cultural heritage making up the Site have differing levels of significance; some may be of an international importance, whilst others will be of national, regional or local significance (OUV of the Cornwall and West Devon Mining Landscape, 2007, 2).

Once the overall relative significance of mine sites has become apparent, through statutory (Scheduling), non statutory (WHS areas) designation, and the process of compiling a conservation management plan, identifying and prioritising significant elements within the mine site can take place. These are usually graded in relative categories from High, Medium to Low.

3.2 General Statements of Significance for the Tamar Valley Mining District

'The Tamar Valley forms the principal central landform of the district. Whilst the river flows from north to south, its great loops and bends follow a highly sinuous and changing course, its sides are often steep and frequently wooded. To the east the landscape above the banks of the river is rolling cultivated countryside that descends to the ancient market town of Tavistock, which nestles beneath the high granite uplands of Dartmoor. The 19th century mines of this district exploited an important concentration of (some) tin, but mostly copper, arsenic and silver-lead (north-south) lodes which run parallel with the east-west axis of the granite massif of Kit Hill and Hingston Down, and which were worked almost continuously from Callington to Tavistock' (Thorpe 2005, 64).

'Many of the most important mines in the Area were sited near to the river, where the lodes outcropped on its banks, and adit drainage was readily available. On the Cornish bank of the river these include New Consols, Wheal Benny, Gunnislake Clitters, Old Gunnislake, Okel Tor, Danescombe and Cotehele Consols, whilst a little away from the river were Calstock Consols, Wheal Zion, Wheal Edward and Wheal Arthur. On the Devon bank, Devon Great Consols and the Bedford United Mines were the largest and richest copper mines anywhere within the Site, the extraordinary amounts of ore they produced outstripping all other ventures; by the last decades of the 19th century they were supplying 25% of the world's arsenic. To the south are Russell United, George and Charlotte, Gawton, Tuckermarsh, South Ward, North and South Hooe, Furzehill and South Tamar Consols, the last of this group on the Bere Alston peninsula having been amongst the earliest to have been worked as true mines anywhere in Britain, their rich silver-lead deposits being exploited by the Crown from the 13th century.

A mining district with a long pedigree and which shared to a degree in the upsurge in mining which took place through the mid-19th century, but whose high point was around the second and third quarter of the century when undertakings like Devon Great Consols were amongst the largest and most important working for copper and arsenic in the Cornubian orefield. There were small and medium-sized mines scattered throughout the landscape on the Cornish side of the river, though on the Devon bank they are more or less confined to the river bank. Though tin and wolfram were mined, arsenic and copper dominate. John Taylor and the Dukes of Bedford were the key players in the development of the Devon mines, ports and communications systems, whilst the Duchy of Cornwall and the Williams family played significant roles to the west of the river' (CC 2007, Tamar Valley Mining District 94, 100).



3.3 Site specific Statements of Significance

A significant element of the TVMHP has focussed on identifying, prioritising and proposing a variety of site conservation works for the most significant elements of the mining landscape within the project area (Fig 1). The Historic Environment Service, Cornwall Council regards mine buildings (Engine Houses, boiler houses and chimneys), in Cornwall to be the most significant and iconic surface remains of the operations of a former mine site. As such, these buildings are considered to be the highest form of site significance when assessed with other more common building forms. However, for Devon Great Consols, these significant buildings were (most un-characteristically), demolished to ground level when the mine finally closed in 1903. Those at Bedford United Mine have also been taken/fallen down.

The following list of mine sites within the amalgamated mines of Devon Great Consols and Bedford United Mine includes a short statement of historical significance (denoting the reason why the site is worthy of building conservation works), and secondly, a short summary of the proposed conservation works. Archaeological assessment site references (Buck 2002; 2003), are given following the historical summary. It should be noted that all substantial extant buildings are of high significance and so justify a building conservation scheme within the context of the site's extant remains. Other lower significance sites may justify a conservation scheme (of limited extent) based on structural, Health & Safety and project finance criteria. These are listed in detail for every site in Section 4. Refer to Figure 1 for each site location within the project area, and Figure 3 for detailed site locations.

<u>Note</u>: A detailed history of Devonshire Great Consolidated (DGC) Mine and of Bedford United Mine is given in two earlier archaeological assessment reports (Buck 2002, 6-17; Buck 2003, 14-16). The landowner for the DGC project area (Fig 1) is the Earl of Bradford, whilst the Tavistock Estates which occupies this site operates a commercial forestry operation. The landowner for the Bedford United Mine site is Adrian High. See Figure 3 for site locations.

Historical summary of Bedford United Mine

'Although not equalling the extraordinary richness of its neighbour **Devon Great Consols**, the **Bedford United Sett** was highly productive with a recorded output of nearly 66,000 tons of copper ore, and smaller quantities of arsenic, tin and latterly wolfram' (Jenkin 1974, 29).

In the Bedford archive at Devon Record Office (Exeter), the earliest documentary records detail dues paid to the estate at the rate of 1/9th and a share of the profits for the estate as shareholder in the '**Marquess and Bedford Setts**' from 1712 (although there is an earlier reference to the sale of copper ore in 1711). Estate accounts also show copper ore sales from 1714 – 1720 (*pers comm* John Goodridge).

Slightly later observations were made by Hendrik Kahlmeter, a Swedish engineer, who visited the mine on 13th November 1724 (his text published in 2001 by Justin Brooke).'... in Collingswood, lies the Marquis copper mine, in the lands of the Duke of Bedford ... she was first discovered seventeen years ago on the bank of the river when some workmen got together, took a sett or lease of 20 fathoms from the water's edge ... and drove a level from the lowest point' (known today as the Deep Adit or 47 fathom level on Marquis Lode), and finding copper named this part of the mine **Bedford Mine**. Shortly afterwards a wealthier group of adventurers obtained another sett higher up the hillside where they started a second adit seven or eight fathoms above the first and drove it 60 fathoms. Subsequently the two workings were amalgamated and became known as the Marquis Mine. On commencing the upper adit, tin was met with near the outcrop of the lode, but on excavating deeper copper was encountered in considerable quantity and of a better grade than in the first adit. At length the water gained on the workmen to such an extent that sixty men were required to drain it until this became too costly and the working was abandoned for some years' (Brooke 2001, 12).

In 1722 the mine was acquired by the **Bristol Copper Company** who erected an underground engine near the adit end. This was driven by water directed down the shaft from surface which, after passing over a pumping wheel, flowed out through the adit mouth. By such means the Company contrived to sink the shaft 39 fathoms below adit, effectively draining the workings to that level. The lode ran due east-west and varied in width from 1 ft to 4 ft' (Jenkin 1974, 30).

Kahlmeter also states: 'No ore is smelted here, and it is only broken small and separated from the waste rock. The poorer kind is crushed and washed, and is sent by land (presumably via Newbridge) to a place two miles away called Net Stakes, where the River Tamar is navigable for barges or boats ... from there the ore is shipped to Bristol or to Neath in Wales'. Not far from this work and on the same side of the river lies another course of ore, which runs just as the previous one and is called **Tavistock**. It was worked for four or five years, but has been idle these seven years' (Brooke 2001, 12). This latter working appears to have been sited immediately north of the Marquis sett.

To date, there appears to be no further documentary evidence of these small setts (often following a single lode), until 1841 when the mines were reopened and amalgamated into the sett of **Bedford United Mines**. This included the lodes of Wheal Marquis, Wheal Tavistock, Delve's Kitchen, Bridge Lode and Ding Dong. 'In 1842 Captain Josiah Hitchens (who two years later discovered the enormous sulphide lode at **Wheal Maria** (Gard's Shaft - in what later became **Devon Great Consols**), and his associates were working the Marquis lode here by water power...The lode outcrops had been anciently worked away for 200 fathoms in length above the deep adit. From 1844 to 1856, 21,039 tons of copper ore were sold for £138,846' (Collins 1912, 412).

'In 1843 levels were being driven at 25, 30 and 40 fathoms below adit on the Marquis Lode where a 50 ft pumping wheel had been erected. To drive this and the wheel on Ding Dong Lode, water was brought through a leat from the southern end of the Tavistock Canal, high above Morwellham (for two miles – passing through tunnels and sometimes carried by launders slung in chains from the cliff face - Jenkin 1974, 32). 'Two large wheels were erected, 45 ft x 4.5 ft and 50 ft x 4.5ft, with another of 50 ft diameter under construction in 1844. In 1848 the company commenced paying dividends and later in the 1850's a new incline shaft was sunk (measuring 14 ft x 5 ft) with a double line of tram-roads' (Barton 1964, 96).

In 1849 a steam whim was erected and five shafts were in use. The deepest of these was Engine Shaft on the Tavistock Lode which followed its underlie down to an eventual depth of 150 fathoms from surface' (Jenkin 1974, 32). 'In the face of considerable opposition from this company a branch from the **Devon Great Consols** Railway for the conveyance of ores, coals and other materials was made by the Duke in 1863 at a cost of £275. The benefit of the railway to the company is now fully appreciated' (1868 Report on Mines). The company had previously conveyed its ores to Morwellham by wagon at a charge of 5s per ton. This rate was subsequently reduced to 1s.10d (a cost saving of over £962 from Jan. 1864 to Dec. 1868 for 8027 tons of copper ore and 424 tons of mundic).

Figure 2 (1867 shafts/lodes map) from the Bedford archive shows the extent of the workings. The Bedford Estates 1868 Report on the Mines (T1258M E 44a-b) by Gilson Martin (dated 31st Dec.), showed that the mine's first lease from the Duke of Bedford ran for 21 years from 1842 to 17/9/1863 (terminating on 17/9/1874), 4000 shares having been issued. The area of the sett was 218 acres (42 of which was woodland-but the area occupied by the mine totalled 5.5 acres), with 92 men and boys, 13 women and girls giving a total of 105 people. Four shafts were being used and 47,000 tons of ore had been sold, with over 1000 tons of mundic produced. '*This mine is drained by two large water wheels and the drawing and crushing is done by a small steam engine'* (1868 Report on Mines). The value of the copper ore was nearly £250,000, £880 of tin, and £557 of mundic. The dues to the Duke had, by 1868, amounted to £17,294;


Figure 2 1867 Bedford Estates Plan showing shafts/lodes within the Bedford United Mine Sett and adjacent Devon Great Consols Mine Sett.

 \pounds 11,733 capital had been expended. After dividends had been taken the mine's net profit was \pounds 42,667.

'In 1870 the mine was 148 fathoms deep and employed 160 people. In 1877 a limited liability company of 1200 shares (£1each) was registered' (Collins 1912, 412). 'In 1878 the company raised only sufficient ore to pay working costs in the hope that metal prices would ultimately recover... output of copper and mispickel fell off markedly in the 1880's.Underground activity finally ceased at the end of 1889, followed by liquidation of the company in August of the following year' (Barton 1964, 96).

The 1901 Report on Mines and Quarries by the Estate Manager (J. Paull-dated 31st Dec.) states (1901 Report on Mines and Quarries): 'two men are employed in the adit level on South lode-mostly going eastwards with little wolfram and arsenical mundic being found ... By the middle of December the licensee (Mr William Phillips), seems to have reached the end of his means for mining adventure (ventilation in the level was so bad that it no more could be done without incurring the censure of HM Inspector of Mines), funds to be attempted to be raised to cut a shaft from surface or to ventilate by mechanical means-so driving the level was stopped in mid December (Mr Phillip's lease terminates at Midsummer next (1902)'.

From 1915 to 1925, the mine was re-opened on a small scale above adit for mundic and arsenical pyrites, funded by the Bedford Estate. In 1918 76 men were employed. In later years (after 1922) mispickel was taken from the mine to **Devon Great Consols** along a re - laid narrow gauge (2 ft.) track for re-processing in the newly built arsenic refinery. Also arsenical pyrites and wolfram from **Wheal Frementor** (the south western part of **Devon Great Consols**), was taken to **Bedford United** for stamping, before being taken back to the arsenic calciners via the railway (Richardson 1995, 100). The mine continued to work in a small way until 1928 when it finally closed, producing 2,111 tons of arsenic, 1,053 tons of mispickel, 72 tons of 60% copper precipitate and 9 tons of wolfram (Dines 1956, 666). Richardson also states (1995, 129) that the mine was active to 1930 in conjunction with **Ding Dong Mine** and that it was worked to 10 fathoms below deep adit level (42 fms. below surface at Engine Shaft) with the aid of a small Cornish pump (still *in-situ* in 1938); '*in about 1978 some interest in the mine was shown by South West Consolidated Minerals' (ibid*).

Summary Bedford Mine heritage features impacted by the Bedford Trail (Fig 3)

- Archaeological features on North/Tavistock Lode (Sites 1/1.1, 2, 4, 5).
- Archaeological features on Marquis Lode (Sites 2, 3/3.1, 11).
- Archaeological features on Unrecorded Lode (Sites 12, 13, 14).
- Archaeological features on Phillips Lode (Site 10).
- Conservation repair of masonry tail race walls to stamps/crusher wheelpit (Site 17)
- Sites 15, 17.1, 39, 40, 41, 42.

Historical summary of Devon Great Consols Mine

'Devon Great Consols was the last great copper discovery in the West of England and for twenty years from 1845 to 1865 the seemingly inexhaustible deposits overlaid the copper mining world ... (and) was the richest copper mine in Europe, and when its lodes began to fail it went on to produce so much arsenic (half the world's supply), it had to be regulated to avoid swamping the market... It was the only mine in Devon and Cornwall to build and work its own standard gauge railway. In its own foundry it maintained and partly constructed many of the steam engines and water wheels used for pumping and crushing ore' (Booker 1974, 143/144). Refer to Figure 2, reproduction of an 1867 Bedford Estates Survey map.

From 1845 to 1903, sales of copper ore had been 742,400 tons (averaging 6.5%); the greatest total recorded for any mine, not only in Cornwall and Devon, but anywhere in the 'old world'. This had realised £3,473,046 on which dues of £261,587 had been paid. Tin sales had totalled only £170 (despite the large investment looking for it below the copper lode), but 72,279 tons of refined arsenic had realised £625,062 on which dues had been £27,967. In later years the mine's purser (Moses Bawden), estimated that 600,000 tons of mispickel had been calcined.

During the mine's career, a total dividend of £1,225,216 had been disbursed. £658,336 had been spent on the arsenic works, railway and other capital equipment (including houses and schools, etc). Approximately 45 miles of shafts/levels and winzes had been sunk, whilst waterwheels (totalling 33 fed by over 8 miles of leats), had been the main

power source for 2,420 fathoms (over 4.33km) of flat rods.

Wheal Thomas/Watson

This mine, which was sited in part of the project area, was named **Wheal Jack Thomas** up to the 1870s, and **Wheal Watson** thereafter (after Mr Peter Watson, the managing director from 1879) worked from the late 1840s, 12 Tutworkmen and 2 labourers being employed in 1850 (Fig 2). It developed the eastern end of South Fanny Lode: 'It had yielded arsenical mundic when it had been worked in 1855 and 1856, at which time the emphasis had been on copper production. The ore had then been left on one side, but 24 years later (after Main Lode had been exhausted and the arsenic market inflated) it represented a valuable asset. To speed up the work in the mine and to reduce labour costs by as much as ...30% the company decided to purchase rock drills and an air compressor' (Goodridge 1964, 253). Barton (1964, 79) goes further: 'This section of the sett (in 1879) ... was opened up vigorously and was pumped by a further 280 fathoms of flat-rods extended to the shaft from one of the existing pumping wheels'. By the early 1880s this mine and Wheal Emma were the only copper producing parts of Devon Great Consols (Buck 2002, 229).

The mine, shafts and flat-rod from the water wheel are shown on the 1857 Lease map (Fig 3). The site stretched from the water wheel at the bottom of the valley (Site 370), to Watson's Shaft (Site 383), and Old Eastern Shaft (Site 380) at the top of the hill (Buck 2002). Documentary evidence for the size of the water wheel comes from Hall (2000, 107), quoting an 1860 survey; '*Wheal Thomas pumping wheel, 36 ft. by 4 ft. cast-iron axle'*. The 1867 map (Fig 2), shows the site of the water wheel, an adjacent building (perhaps a flat rod crank pit), and the leat supply for the wheel (from Site 5 (Buck 2002), the leat from Scrubtor 2.5 miles away).

'Devon Great Consols was the last great copper discovery in the West of England and for twenty years from 1845 to 1865 the seemingly inexhaustible deposits overlaid the copper mining world ...(and) was the richest copper mine in Europe, and when its lodes began to fail it went on to produce so much arsenic (half the world's supply), it had to be regulated to avoid swamping the market...It was the only mine in Devon and Cornwall to build and work its own standard gauge railway. In its own foundry it maintained and partly constructed many of the steam engines and water wheels used for pumping and crushing ore' (Booker 1974, 143/144).

Summary Devon Great Consols Mine heritage features impacted by the Bedford Trail (Fig 1)

 Archaeological features on Thomas/Watsons Lode (Sites 374, 375, 376, 376.1) – sites not shown on maps in this report. Sites can be seen in Buck 2002 (Fig 38, site inventory map).

4 Summary table of building conservation works

The following sites are identified and described in detail in both the Devon Great Consols Mine and Bedford United Mine archaeological assessment reports. The impact significance column shows that some sites are regionally important **`R**', or Locally important **`L**'. The letter in brackets (**H**=High, **M**=Medium, **L**=Low) summarises the impact of the proposed works on the site, Section 5.1 and the site inventory text describes this in more detail (Section 5.2.2). Figure 3 shows the spatial relationship of the site's significant assets which may be affected by the new Bedford Mine Trail.

Table of archaeological sites and features affected (visually/physically) by the scheme

Bold (high impact) text sites are described in detail in Section 5.2.2. Site numbers in brackets are given by Sherrell (see Figs 4b-4d, 9-10). Bedford United Mine sites are shown in Figure 3, whilst Devon Great Consols Mine sites are shown in Figure 1.

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
	-	1	Bedford United Mine			
1 (34)	Adit	Open adit near leat (Site 15), accessed via cutting in rock outcrop	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None – but open adit may be visible from lower track
1.1 (34)	Shaft	Open shaft accessed just inside open adit (Site 1).	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
2	Leat	Well preserved C18 leat in places	Footpath (west side) to use leat channel throughout its length	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	Н (Н)	Leat base and downslope bank profile should be maintained. Visual impact of new fencing/boardwalk
3 (36)	Stope	Open stope cut into a rock outcrop	New track near site – site fencing of adit/workings and `walkway' over infilled stope.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	New site fencing and walkway
3.1 (36)	Working platform	Working platform/spalling floor adjacent to adit (Site 3)	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
4 (36)	Adit and spoil heap	Closed infilled adit (Tavistock/North lode) at end of lobby	Site visible from adjacent track, so adit entrance may be fenced.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Visual impact of round post and round rail fencing
5 (37)	Working area	Working platform/spalling floor adjacent to adit	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
10 (39)	Dam/reservoir pond	Extant masonry	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None. Visible from new track
11 (39)	Exploratory Adit	Small blocked adit	New track near open adit site – site fencing of adit workings	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	New site fencing
12 (40)	Working area	Working platform/spalling floor adjacent to adit	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
13 (40)	Adit opening	Collapsed opening	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
14 (40)	No 1 Shaft (Philips lode)	Poorly fenced open shaft, with side opening to west. Adjacent to proposed new track route.	Re-fence the mine shaft and steep drop on west side.	Issue 7 (Policy 7e)	L (M)	Visual impact of new fencing in small area
15 (41)	Leat	Extant in places	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
17 (43)	Wheelpit/tail race tunnel	Two sections of masonry wall – both collapsing	Rebuild collapsed sections and repoint throughout	Issue 8 (Policies 8a to 8c), Issue 10	R (M)	Repair and consolidation of the collapsed walls – new pointing visible
17.1 (43)	Leat (Tail race)	Extant profile	None – but re-use as track	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Increased wear and possible leat erosion

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
39 (52)	Rectangular pond	Deep, wide shaft or wheelpit	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (M)	None but sites can be seen from new track route
40 (52)	Turbine machinery plinth	Extant masonry wall/plinth	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (M)	None but sites can be seen from new track route
41 (52)	Large flooded depression	Difficult to view whether shaft or wheelpit	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None but sites can be seen from new track route
42 (53)	Large tailings dump, dressing floor	Extant overgrown dump	Fencing along parts of northern edge parallel to new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Walking along part of the dressing floor site
			Devon Great Consols			
374 (231)	Wheal Thomas/Watson Mine adit	Possibly a collapsed adit, 2.0m of portal rock face visible.	Possibly fence the front of the collapsed adit	Issue 7 (Policy 7e)	L (L)	Additional fencing – possibly visible from the lower track
375 (232)	Wheal Thomas/Watson Whim/Air Shaft, capstan and finger dump	The shaft is visible as a hollow (6.0m diam and 0.8m deep), marked by a granite stone.	Possibly fence around the shaft	Issue 7 (Policy 7e)	R (L)	Safety fencing around the shaft. Some tree thinning may be necessary for site fencing.
376 (232)	Wheal Thomas flat rod cutting and tunnel under track (SX 43721 73036 to 43900 73049)	Cuttings are approx. 1.0m wide and cut into ground at varying depths (0.5 to 0.75m deep). Site damaged in places by forestry activity. Tunnel robust to take vehicles	None. Retain the features undisturbed.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (L)	None. Cutting visible from footpath.

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
376.1 (232)	Wheal Thomas flat rod cutting (SX 43868 73063 to SX 43741 73073)	Cuttings are approx. 1.0m wide and cut into ground at varying depths (0.5 to 0.75m deep). Site damaged in places by forestry	None. Retain the features undisturbed.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (L)	None. Cutting visible from footpath.
Not in report Site A	Masonry feature/shaft (SX 43750 73070)	Rectangular feature at ground level (2.1m x 2.6m), all walls visible. Stone lined to visible depth of 0.6m. Infilled interior. Site fenced.	None. Feature already fenced	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None. Feature visible from footpath.
Not in report Site B	Unrecorded lode/stope outcrop (SX4378 7283)	Rock outcrop with two parallel C18 stope excavations	Timber bridge over northern rock outcrop/stope, continue timber walkway across second infilled stope	Issue 7 (Policy 7e)	L (L)	Ground impact of 0.3m depth for bridge/walkway foundations

5 Assessment of impact and mitigation

5.1 Impact significance definitions

The potential impacts during works are described below (and summarised in tabular form in Section 4), for each site. Impacts are described in the text section for each site on a feature-by-feature basis. The following site impact terms are used within each site identification description relating to the impact assessment and site gazetteer:

Major positive	Site continues in, or is restored to, its original design and use		
Moderate positive	Site restored as far as possible respecting its original function, but its use is altered		
Minor positive	Site partially restored; interpretation introduced		
Negligible positive	Stabilisation/maintenance of site		
Negligible negative	Benign neglect – losses of fabric over a long period of time		
Minor negative	Site suffers areas of alteration or damage, which contribute to loss of meaning		
Moderate negative	Significant loss of fabric or alteration, leading to erosion of original character		
Major negative	Complete demolition/removal		

5.2 Building conservation works

5.2.1 Site impact and remediation summary

The TVMHP has included all the track creation/building conservation works within the new Bedford Trail site into a single programme starting from January 2012 to the end of 2012. It is likely that the successful tenderer will undertake all the trackway works, although the site fencing may also be tendered.

There is no detailed schedule of works and specifications report. However, there has been a process of site consultation with the TVMHP site archaeologist to ensure that the nature and extent of the proposed works/impacts for every site is mitigated and minimised.

Figure 3 indicates the proposed route of the new trail, and the proximity to known archaeological sites. For the most part the site works to form this track along the steeply sides of the Tamar Valley – crossing a number of unrecorded lodes/stopes, to access the former 18th century mine workings and the lower parts of the 19th century Bedford United Mine, are formed by using existing routes along leats, old tracks and forming new ones, some with timber steps. In at least two locations, timber walkways and low impact bridges will need to be constructed with locally sourced timber, to cross lode outcrop workings and infilled stopes.

There is only one site for building conservation (Site 17). A tall conifer tree is to be removed (its roots have affected the masonry and structural stability). Soft and crumbling mortar will be removed (to a maximum depth of 40mm) from the masonry walls following a detailed site assessment of the feature by the site contractors (Darrock & Brown). The style and depth of re-pointing (slightly recessed from the masonry face), will mimic that of the original and will be decided when the test mortar panel is agreed with the site contractors and the historic buildings consultant. Site meetings and consultations will be held to ensure compliance with heritage building conservation guidelines.

Other general impacts:

Site compounds and site (vehicular) access

Figure 2 shows the location of the Woodlands car park which will site the compound and toilet (if necessary). Vehicular and pedestrian access to the site will also be via the Woodland car park.

Impact reduction measures:

A method statement will be produced by the TVMHP, and (where relevant) by the site contractors in order to promote a reduction of the impact of creating the new track works on the fabric and character of the site.

For the small conservation scheme (Site 17), only loose lime mortar will be removed from walls and replaced with a new equivalent. The style and colour of the new mortar will reflect the style and colour of the existing so reducing the visual impact of the conservation works. An historic buildings consultancy and archaeological recording during the site works may be able to minimise any further below ground site impacts, but also record any visible/disturbed archaeological features and to record the nature and extent of the building conservation works. A CC project design for this function has been produced in the Appendix (9.3) at the rear of the report.

Residual impact mitigation:

There will be the residual impact of the creation of a new footpath (timber stepped at steep locations), along a short section of the Tamar Valley. However, the residual visual impact will soon fade, as the benefits in terms of increased public access and increased site information will come to fruition as a substantial public gain.

For the small building conservation project, there will be the visual effect of new pointing – although this will fade in time. But by using the mechanism of trial test panels for matching new lime mortar aggregate mixes with the existing colour and pointing style, etc, it is hoped that the new lime mortar pointing will be very similar to the existing, resulting in little visual impact.

It is certain that there will be regular visiting members of the public throughout the year, and that there will be an increase in site visitor numbers. However, the scheme has been carefully and thoughtfully designed by the TVMHP to minimise negative affects to the character of the site.

5.2.2 Site inventory impact description and remediation measures

The following sites are described in more detail in each relevant archaeological assessment report (DGC Mine, Buck 2002, 6-17, and Bedford United Mine, Buck 2003, 14-16), summarised in bold in Section 4.1 and shown in the relevant site plan in Figures 1 and 3. All the sites mentioned are summarised in Section 4, and with have variable impacts – but some are very low (i.e., only visible from the new trackway. Therefore the following detailed site descriptions only refer to site or safety impacts that have a direct physical impact (sites in bold). The works on each site is described, followed by a section describing the reduction (or mitigation and remediation) of the impact, followed by a final section which details the residual impact. To avoid repetitive duplication in this site inventory section, site impact and remediation measures already given in Section 5.2.1 are not reproduced – simply referred to.



New circular track from Woodlands Car Park

(Figs 1, 3 and 4 for site location)

Site impact

Figure 4 is a plan of the various boardwalks, bridges, lined timber paths (due to the steep slopes), steps and re-used tracks throughout the course of the new circular trail route. The impact of all of these involves the on-site construction of ground level natural oak timber features, whose design and use will minimise the impact of the scheme which is in a woodland setting, and of great historic character. The approximate locations of archaeological features within Bedford United Mine are shown on Figure 3 and are also described in detail in this section.

Part of this project will necessitate the creation of a new track route along the steep Tamar Valley sides – by cutting and infilling, then using oak timber edging to form the side of the trackway. Other sections will consist of fixing and insertion of oak timber steps and short posts (of varying sizes), into the ground. These impacts should be minimal. However, the main impact is the visual effect of these new features on the setting and character of the woodland landscape.

The overall impact of these proposed works on the site can be defined as '*Negligible positive'*. The works will provide a greater element of safety and minimise footfall, although it will negatively affect the site's visual authenticity as a natural woodland environment.

Reduction of impact measures:

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to its route, location and extent. It is recommended that Tamar Valley volunteers walk the route twice a year to assess footfall damage, and if necessary propose remediation measures to reduce erosion affecting the nature, form and profile of the leat.

Residual impact mitigation:

There will be residual visual impacts of the track and mine site hazard fencing as well as the excavation for short sections of track creation itself. The natural oak timber fencing will complement the surrounding deciduous tree landscape, and will naturally discolour and age, in its original woodland setting.

Leat (18th century) (Site 2) (SX 43745 72791 to SX 43626 7253)

Site impact

The main impact on this leat will be footfall along its former water channel earth remnants. It is likely the original leat would have been lined with planking, or moulded river clay along its base. The earthwork remains are fragmentary, and seems to have been widened in places to form a track. Fencing will be necessary at some sites; either near mine outcrop/shaft/adits, etc or due to steep slopes on the down-slope side.

The overall impact of the proposed works on this feature can be defined as '*Negligible negative'*. The works will provide a safe footpath access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber boardwalks (see Figs 4b, 4c, and Fig 9 for their location and extent).

Residual impact

The main significant residual impact is the presence of occasional fencing along the new route, a new small bridge (Appendix 9.1 Site 4b) and two other boardwalks. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate.

Stope (lode outcrop) (Site 3) (SX 43740 72637)

Site impact

The main impact on this natural lode outcrop (evidence of a former 18th century stope mining operation: Marquis Lode, is the construction of a low profile boardwalk across the sides of the infilled stope and fencing across two former adits/stope access (see Fig 3, 4b and Appendix 2: Sherrell 2012, fig 4c for location). The rock outcrop will be drilled and steel dowels inserted through concrete pads (dimensions to be calculated on site – see Appendix 2, Fig 8), upon which the boardwalk will be founded. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber boardwalk, its location and extent.

Residual impact

The main significant residual impact is the presence of a new small bridge and boardwalk. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate.

Adit/Stope (Site 11) (SX 43726 72605)

Site impact

The main impact on this small exploratory adit outcrop evidence of a former 18th century stope mining operation (Marquis Lode) is mainly visual. A low fence will be constructed across the site entrance. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber bridge/boardwalk, location and extent.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

No 1 Shaft (Site 14) (SX 43742 72544)

Site impact

The main impact on this shaft is mainly visual. A fence will be constructed around the shaft (where appropriate using the existing postholes). The timber is to be locally sourced from the adjacent woodlands. A fence will also be located across the deep excavation to its west – possibly a related stope working. As public access is possible to this side of the shaft (see Fig 3 and Appendix 2: Sherrell 2012, fig 4d for site location).

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and nearby information boards will inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the shaft fence (rounded posts and wire fencing – in the style of other TVMHP shaft fences).

Residual impact

The main significant residual impact will be the presence of a newer tanalised timber, possibly higher, fence (replacing the existing inadequate one). It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of this section of the Tamar Woodlands and Bedford Mine.

Wheelpit masonry wall/tail race tunnel (Site 17) (SX 43771 72626)

<u>Note</u>:

This site, during the 2001 site assessment survey was interpreted to be a reservoir pond, with connecting leat to the wheelpit to the south west (Buck 2003, Site 17, 43). However, further assessment (and better field survey conditions) has resulted in a re-evaluation of the form and function of this site. It is now interpreted as a wheelpit (with attached crusher/stamps to the north) – contextually related to a probable nearby primary dressing floor.

Site impact

There are two masonry walls. An upper section of wall 1.0m wide and 1.2m high (0.6m thick), has become structurally unsound as the roots of an adjacent tree have caused damage throughout. The tree is to be carefully removed, and the wall rebuilt in places and repointed throughout (see Fig 6, a view of the site before works).

Approximately 1.0m below this is an underground wheelpit tailrace tunnel measuring 0.5m wide and 0.6m high and approximately 5.0m long to a collapse (Buck 2003, fig 12), which leads into the adjacent leat (Site 17.1). The tunnel arched portal stone has collapsed, and will need to be replaced, also the front wall will need to be repointed.

Reduction of impact

The stones to be used will, if possible, be the original stones that have fallen out of the wall. If there are insufficient stones, new stones should be used (from a similar quarry source), and should match the original in terms of colour and size. The style and colour of the new mortar will reflect the style and colour of the existing so reducing the visual impact of the conservation works. An archaeological watching brief recording during the works may be able to minimise any further site impacts, but also record any visible/disturbed archaeological features (Refer to Section 5.2.1).

The works will provide more structural stability and enhance the site's visual authenticity for at least another generation. The overall impact of the proposed works on this feature can be defined as '*Negligible positive*'.

Residual impact

Refer to Section 5.2.1.

Leat (Site 17.1) (SX 43771 72626 to SX 43715 72595)

Site impact

The main impact on this narrow (0.4m) leat starting from the end of the tail race, will be limited wear and tear along its course (approximately 80.0m which leads to Sites 38 to 40), due to footfall as it is used as part of the new trackway. There will be no additional material brought in for the footpath. A low fence will be constructed across the side of the leat where there is a steep drop (adjacent to Site 14). The fence timber is to be locally sourced from the surrounding woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the direction of the route and design of the fencing.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

Tailings dump/dressing floor (Site 42) (SX 43718 72516)

Site impact

The main impact to this long section of tailings dump and possible dressing floor adjacent (north side), is one of footfall. The proposed track route will be between the Philips lode outcrop features (Sites 9, 12 - 14), and the main tailings dump in the valley. Parts of this route are quite flat, and were probably formed for a dressing floor (unless the original 19th century site was over dumped in the 1920s). In places, due to adjacent steep drops to the track route, a low fence will be constructed. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the direction of the route and design of the fencing.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected

that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

Unrecorded stope/lode outcrop (SX 43779 72832)

Site impact

This site (not discovered during the 2003 archaeological assessment), is indicative of evidence of a former 18th century stope mining operation (Marquis Lode). The main impact on this natural rock outcrop (and mine stope) is the construction of a low timber bridge (see Fig 3 and Appendix 2: Sherrell 2012, fig 4b for location), over the open stope to permit access along the new track. The rock outcrop will be drilled and steel dowels inserted through concrete pads (dimensions to be calculated on site – see Appendix 2, fig 8), upon which the timber bridge (with handrails) will be founded. The timber is to be locally sourced from the adjacent woodlands (see Appendix 2: Sherrell 2012, fig 4b for site details).

On the south side of the open stope is another parallel working, another stope but infilled, presumably of similar date. A timber boardwalk (of similar wood to the nearby bridge) will be constructed over the top of the stope, founded on either side by timbers.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber bridge and boardwalk, location and extent.

Residual impact

The main significant residual impact will be the presence of a new small bridge and boardwalk. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

5.3 Fencing works

Safety remediation works to mine shafts and adits in proximity to newly opened tracks and footpaths have been undertaken during the TVMHP for past three years. The specifications for these works have been formulated and constructed with the agreement of TVMHP and the Devon Historic Environment Service. For this trail section, there are some steep down-slope sections adjacent to the newly created footpath that engineers advised to be fenced. Figure 4 is a summary plan showing the proposed works along the route of the track, and detailed drawings in Appendix 9 show the main site locations. Archaeological recording and consultancy have been undertaken during these works by HE Projects, Cornwall Council. An archaeological watching brief report will be produced to include both the fencing/trail works and building consolidation works. Many of the new shaft fences will need to have safety warning signs attached (to the existing fencing).

5.4 Public access & interpretation

5.4.1 Site description, site impact and impact remediation

Public access is restricted to well-defined (multi-use and trackway) routes within and from Devon Great Consols to Bedford Mine are primarily in private ownership.

Site interpretation facilities are to be installed at the Tavistock Woodlands car park (SX 43829 728969), in a newly built 'Orientation centre'. Smaller and site specific

information boards and sign posts/way-link guides will be distributed along the new Bedford trail at appropriate sites. However, in addition, web based site information and leaflets are planned for production by the TVMHP via the Tamar Valley Area of Outstanding Natural Beauty (TVAONB).

An archaeological watching brief recording and archaeological consultancy during the fencing safety works may be able to minimise any further site impacts.

Site impact

The overall impact of the public access and interpretation project on the site can be defined as '*Negligible positive*', and of very low impact. The works will provide a greater element of site information and safety and should not negatively enhance the site's visual authenticity.

Residual Impact

Fencing, signage, etc will have a localised, visual impact on the site and increased trampling may damage habitat/disturb wildlife.

Reduction of Impact

The visual impact of fencing, signage, etc will be reduced through careful project design, siting and installation of these features. Limited public access is to be provided, routed away from sensitive/hazardous areas.

5.5 Description of impacts during the post-project stage

The TVMHP aims to utilise a newly created localised network of multi-use trails (using former railway lines and footpaths), in and around the mining landscape of Devon Great Consols southwards to Morwellham Quay (via Bedford United mine, and Wheal Russell Mine to New Quay). It is likely that in the future these will link up to other footpath and trail routes in the west Devon area (and possibly into to Kit Hill in Cornwall, etc). As a result there may be the physical consequences in the short term of having a slightly greater number of people visiting these sites than previously. In addition there will be an ongoing need for annual vegetation maintenance from some paths and buildings with very occasional repair of occasional dislodged masonry. It is expected that the TVAONB will undertake site inspections (utilising public volunteer groups as part of an agreed management plan), along trackways and parts of the site that are subject to building conservation works.

The TVAONB has produced a ten year management and maintenance plan (2006), in order to define and advise the various groups (for example, volunteers) that will be involved in managing and maintaining the archaeological features within both Scheduled Monument areas and other adjacent World Heritage Site areas (Area 10: Tamar Valley).

Bedford Mine Trail IA CB September 2012



Figure 4 Site plan of proposed works along the route of the new Bedford Mine Trail (Sherrell 2012)

Bedford Mine Trail IA CB September 2012



Figure 5 A view of the end of the wheelpit tail race tunnel and wall before works. Site 17.

© CC HE Projects 2012



Figure 6 An internal view of the upper Marquis Adit stope before works Site 7 © CC HE Projects 2002

5.6 Residual impacts

Any short-term residual and regular maintenance issues (vegetation growth and possible vandalism), will be inspected (and work undertaken) by the TVAONB volunteer group. This should ensure that impacts to the site, if they occur, should be short-lived and quickly mitigated.

After the building conservation work has ceased and the site is open to members of the public, the main residual impact will be visual – in terms of new fencing and new lime mortar repointing. However, after a relatively short period of time the lime mortar will fade to a colour sympathetic to the existing colour, with the positive residual impact being that the building is conserved for at least another generation.

5.7 Assessment of impact on historic landscape character

The steeply sloping sides of this Tamar valley site are heavily wooded, hiding extensive evidence for past mining activity during the past three centuries. The landscape is characterised by numerous old mine shafts and adits, large and small spoil heaps, quarries, and other earthworks and mine transport infrastructures associated with its mining heritage of working clusters of lodes that culminated in the Tamar Valley being Europe's largest producer of copper ore in the 19th century.

Devon's Historic Landscape Characterisation project has been consulted and characterises most of the area as 'Ancient Woodland' and 'Woodland'. There is no doubt that given the steep slopes, it has been used for woodland since at least the medieval period, if not beyond. The site has been (since the 1960s been planted with conifers – only the very steep slopes still retain some semblance of its mixed deciduous origins.

The existing management of the site, and its impact could be defined as being of 'partial benign neglect – losses of fabric over a long period of time'. If work is not undertaken as soon as possible to the remainder of the site this process is set to continue and worsen – with in some cases the strong likelihood of having further serious structural collapse to the wing walls of the engine houses. The TVMHP aims to conserve the most important significant sites within the upper reaches of the Tamar Valley.

The overall impact of the proposed works on this significant site can be defined as **Negligible positive**: *Stabilisation/maintenance of site*. Within the project area the landscape character will be changed in the short term through track creation, vegetation clearance, particularly repairs to the building fabric. On balance the negative effect of these changes are minor and will diminish in the short term while providing a safe site for close public access to view mine buildings that represent the last working phase of an important mine, and to provide interpretation to understand an industrial process that operated for at least a century.

6 Impact mitigation strategy: archaeological consultancy

The impact mitigation strategy methodology is described below in three main stages: The pre-works consultancy, the historic buildings consultancy during works and the archaeological recording record (during and after works). This mechanism demonstrates the steps that have been taken to avoid or minimise adverse impacts, confirms that the proposed works have been designed in close liaison with the historic environment consultant. This is based on a clear understanding of the significance of the site using appropriate methods and techniques for site monitoring and recording.

6.1 Pre-works consultancy

The process developed by the Historic Environment Service, CC when undertaking historic buildings consultancies includes an important element of mitigating the impact of the works on the site during the project planning and specification stage. This

process has been ongoing during the past year. It has included an extensive dialogue with the project's structural and geotechnical engineer and mining landscape consultants. When the minimal impact of the scheme on any historic feature, landscape resource and historic character has been achieved as far as possible, the scheme progresses to any statutory/non statutory consent application and then the tendering stage for site contractors leading to site implementation works.

6.2 Historic Buildings Consultancy

The TVMHP manager has commissioned an Historic Buildings Consultant (HBC) based on the CC project design (re-produced in Appendix 9.3). Once the project details and specifications have been agreed and contractors commissioned, the project team (project manager/structural engineer/ecological consultant/historic buildings consultant), will ensure through dialogue that the impact of the conservation works by the site contractors is minimised as far as possible. For example, mortar test panels for building conservation works will attempt to minimise the visual impact of new lime mortar repointing and to attempt to replicate the existing style and finish of the existing mortar. Method statements will be sought from the site contractors to describe how (for example) working with lime can be achieved under variable weather conditions (although guidance will be given as part of the works specifications).

The HBC will monitor and advise on compliance to ensure (through a site meeting), that the methodologies and techniques of all aspects of the site works accord with the method statements and agreed methodologies outlined in any schedule of works and Specifications. In addition the TVMHP Principal Officer will enforce requirements based on the HBC advice. However, as a general philosophy, the extent of re-pointing and structural repairs on all buildings will only be minimal in order to ensure structural stability and conservation of the building for at least another generation.

A site meeting will be held at the completion of works to ensure that the site contractors clear the site of all debris, etc and to undertake a final visual check of the completed works. Site monitoring meetings and communication strategies with CC (WHS Advice), are also described in detail in the CC project design (Appendix 9.3).

Consultancy with other related specialists prior to and during the works (for example Geotechnical and Structural engineers, and the TVMHP manager), will be an ongoing process, an integral part of the Historic Building and archaeological consultancy, in order to create a site that will not be unduly affected by loss of significance or historic character as a result of carrying out the works, but rather its access, historic importance and site interpretation is enhanced by the project.

Regular site progress updates (every two weeks) will be provided by the HBC to the TVMHP Principal Officer and DCC archaeology (Bill Horner), usually in the form of emails. If an issue regarding a structural remediation technique or where the remediation works may go beyond that given approval by existing consents, as much advanced notification as possible will be given to DCC archaeology for a site consultation, etc.

6.3 **Programmes of archaeological recording**

The TVMHP will commission an historic buildings consultant who will also undertake the archaeological watching brief recording and production of a final report. A CC project design describes a detailed programme of archaeological recording, site monitoring and watching brief report production (Appendix 9.3). DCC archaeology and the Historic Environment Service, Cornwall Council (Advice) should approve this before works start.

Given the very small amount of masonry reconstruction/repointing, the detailed on-site archaeological recording techniques will only include detailed site photography (Black/White and digital colour). The archaeological recording report will include detailed 'before and after' site photographs as well as a descriptive text of the general works (refer to Appendix 9.3).

7 References

7.1 Primary sources

DRO Mine Plans:

MRO (R29B, R19A, 190, 15307, 15317, 13949, R19B, 3260)

T1258M (Bedford Estates Archive-leases, maps and Reports on Mines/Quarries)

Sherrell, F., 2000, Devon Great Consols and Bedford United Mines: Report on the results of a desk study and surface reconnaissance inspection, Report No. 1915

- Sherrell, F., 2002, Devon Great Consols and Bedford United Mines: A preliminary risk assessment in relation to public access within the site, Report No. 1915/2
- Sherrell, F., 2011, Proposed footpath below Bedford Sawmills, Gulworthy, Devon (A preliminary risk assessment in relation to public access within the site, Report No. 3685
- Sherrell, F., 2012, Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Report No. 3685

Symons, B, 1848 A Geological Map of the Tavistock Mining District, Cornwall, Truro TVMHP., 2006, *HLF TVMHP Management Plan*

7.2 Publications

Barton, D.B., 1961, A History of Copper Mining in Cornwall and Devon, Truro.

Barton, D.B., 1964, Historical Survey of the mines and mineral railways of East Cornwall and West Devon, Truro

Bennett, A., 1992, Images of Cornwall, Runpast Publishing

Booker, F., 1971, The Industrial Archaeology of the Tamar Valley, Newton Abbot

Brooke, J., 2001 ed Kalmeter Journal, Twelveheads Press, Truro

- Buck, C., 1998, *Preliminary assessment of industrial sites of archaeological importance*, CAU Report
- Buck, C., 2002, *Devon Great Consols Mine Assessment Report*, CAU Report (2002R069)
- Buck, C., 2003, Bedford United Mine Assessment Report, CAU Report (2003R043)
- Burt, R., Waite, P., and Burnley, R., 1987, *Cornish Mines: Metalliferous and associated Minerals 1845-1913,* Univ of Exeter

Collins, J.H., 1912, Observations on the West of England Mining Region, 1988.

- Dines, H.G. and Phemister, J., 1956 (reprinted, Beer, K.E., 1988), *The Metalliferous Mining Region of South-West England*, HMSO
- Jenkin, A.K.H., 1974, Mines of Devon, The Southern Area, Vol. 1 David and Charles

Patrick, A., 1983, *Copper production in the Tamar Valley in the Eighteenth Century*, Tamar Journal, Vol 5

Richardson, P, H, G., 1992, Mines of Dartmoor and the Tamar Valley after 1913

Thorpe, S, 2005, *Cornwall and West Devon Mining Landscape-Management Plan*, HES/CC

7.3 Websites

<u>http://www.stastier.co.uk</u> A particularly useful website by the manufacturers of St. Astier brand lime products detailing methodologies for their application.

<u>http://www.cornishlime.com</u> The website of the Cornish Lime Company

<u>http://www.matchingbrick.co.uk</u> A useful website for those seeking matching brick for the repair of historic structures

8 **Project archive**

The HES project number is 2012010

The project's documentary, photographic and drawn archive is housed at the offices of Historic Environment, Cornwall Council, Kennall Building, Old County Hall, Station Road, Truro, TR1 3AY. The contents of this archive are as listed below:

- 1. A project file (2012010) containing site records and notes, project correspondence and administration.
- 2. This report held in digital form as: G:\TWE\Waste & Env\Strat Waste & Land\Historic Environment\Projects\Sites\Devon\Bedford Mine Trail 201210\IA Report\Bedford Mine trail IA 2012010.doc
- 3. Oasis No. 134883

9 Appendices

9.1 Appendix 1: Sherrells Ltd (Geotechnical Engineers) Letter report plans, *Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter* Report 8/2/2012 No. 3685 (Figs 4b-4d, 10)



<u>Note</u>: Specifications for the Revised bridge location (Unrecorded Lode) is shown in Appendix 9.2 (Alastair Guy drawings). The southern 'bridge' site will have a boardwalk.



<u>Note</u>: The 'revised bridge location' shown on this plan will now site a fenced (with handrail) low impact boardwalk.



<u>Note</u>: It is likely that there will low impact site information boards near the viewing area to view part of the former Bedford United Mine site. All fencing will be timber and low visual impact. Shaft 13 will also be fenced.

Bedford Mine Trail IA CB September 2012



Sherrells Ltd (Geotechnical Mining Engineers) Letter report plans, *Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter* Report 14/6/2012 No. 3685 (Figure 10)

9.2 Appendix 2: Alastair Guy & Sons Letter report plans (July 2012), *Plans for TVMHP RE: Proposed Bridge Crossing: Lode workings (end and side views)*



9.3 Appendix 3: Historic Buildings Consultancy and archaeological watching brief project design

Tamar Valley Mining Heritage Project:

Written Scheme of Investigation - Historic Building and Archaeological Recording Consultancy 21/7/2006

Client: Tamar Valley Mining Heritage Project,

Client contact: C Hariades, Tamar Valley Mining Heritage Principal Officer

Client tel: 01872 888125

Client email: <u>chariades@cornwall.gov.u</u>k

1 Background

1.1 Introduction

The Tamar Valley Countryside Service, through the Tamar Valley Mining Heritage Project Officers, is managing conservation works to five historic industrial/mining sites in West Devon (Tamar valley) as part of the second stage of a Heritage Lottery Funded Mining Heritage Project. All of the sites are located within the proposed Cornwall and West Devon Mining Landscape World Heritage Site (see Thorpe, 2005 and Buck 2002-6).

There are other site works that are listed in the project's Heritage Sites Programme, but which are not covered in this Written Scheme, but are subject to different project designs (WSI's):

- 1. Trails and safety works consultancy and watching brief (all mine sites)
- 2. Archaeological (sub-surface) watching brief recording (new car parks at Tavistock woodlands, Morwellham, New Quay and new build at Morwellham)
- 3. Tavistock Canal archaeological consultancy and watching brief
- 4. Tavistock to Bere Alston Railway archaeological consultancy and watching brief

This Written Scheme of Investigation (WSI) has been prepared by the Historic Environment Service (Projects), Cornwall County Council, to set out how the Historic building and archaeological recording consultancy works are to be undertaken. These consist of an appropriate level of historic building consultancy work and historic building and archaeological recording which are likely to be required by conditions on the appropriate Planning, Listed Building Consents (LBC) and Scheduled Monument Consents, which are yet to be granted (see Appendix 1). These conditions are likely to require that a WSI should be produced by the archaeological contractor for:

(1)An historic buildings and safety works consultancy for the supervision of conservation works and

(2)A programme of historic building and archaeological recording

The preferred WSI will be submitted by the Tamar Valley Mining Heritage Project (TVMHP) Principal Officer to the Devon County Historic Environment Service (DCHES), the Local Planning Authority (LPA) where relevant, West Devon Conservation Officers, English heritage (for Scheduled sites), and the World Heritage Site Advice Team, CC, for written approval before work begins on site.

1.2 Project Background

No conservation works have previously been carried out to Tamar Valley (Devon) industrial mine sites and trails. The site work involves building consolidation and

provision of safe public access within five mining heritage sites (mainly former mining or industrial complexes), and the creation of a number of new trails (c 20Km, not including the railway or canal). Many of the mine sites contain significant heritage assets. Extant engine houses (some Scheduled Monuments), substantial ore quays and lime kilns are located on some sites, and all contain a number of mine shafts, legacies of the site's industrial past. Project funding will seek to make these sites safe and more accessible for a greater number of people, both for the local communities and visitors.

The five main sites which are to be conserved (Devon Great Consols, Bedford United Mine, Morwellham, New Quay and Gawton) are to be made publicly accessible, funded to a large degree by the Heritage Lottery Fund (HLF) and Objective 2. Each individual site has been subject to an archaeological assessment, a structural assessment by certified Structural Engineers and where necessary a Geotechnical Engineer. Also additional assessments have been carried out by a mineralogist, and an ecologist. All of these sites (and others), and the heritage trails between them have also been subject to a Conservation Management Plan, prepared as part of both the Stage 1and 2 bids.

Archaeological assessments have been undertaken (Buck 2002, 2003, 2005-006) containing historical research, copies of historical maps, photographs and plans of the sites, a description of each structure and colour photographs of each main structure. In addition the reports identified general repair proposals for each structure. Detailed recommendations for each building (on elevations and plans as agreed by the Consulting Engineer and the Historic Buildings Consultant), will be made as part of the Scheduled Monument Consent and tender specification document stages.

2 Site information and structures to be treated

The suggested level of archaeological consultancy/recording for each site should be referred to when reviewing Section 2 below.

2.1 Devon Great Consols and Bedford United Mines

(January 2012 – March 2012)

Opening 2km of a new footpath route within the former Bedford United mine and parts of Devon Great Consols mine, utilising existing forest tracks and features. The routes have been designed to make the most of the natural beauty and archaeological history of the area, while at the same time avoiding disturbance of local residents, sensitive ecological sites and the landowners working areas.

Carrying out safety works within a buffer zone of the new track, including fencing mine shafts and fitting metal bars to adits.

Consolidating archaeological remains at 35 sites, including work to preserve the arsenic condensers, calciners flue and chimney that form the Devon Great Consuls scheduled ancient monument. Arsenic conservation works (Scheduled Monument) to be carried out Dec 2007 – July 2008.

SITE INFORMATION AND STRUCTURES that may be affected (Devon Great Consols, Buck 2002)

• Archaeological features on Thomas/Watsons Lode (Sites 374, 375, 376, 376.1)

SITE INFORMATION AND STRUCTURES that may be affected (Bedford United Mine, Buck 2003)

- Archaeological features on North/Tavistock Lode (Sites 1/1.1, 4, 5)
- Archaeological features on Marquis Lode (Sites 3/3.1, 7, 8, 11)
- Archaeological features on Unrecorded Lode (Sites 12, 13, 14)
- Archaeological features on Phillips Lode (Sites 9, 10)
- Conservation repair of masonry tail race walls to stamps/crusher wheelpit (Site 17)
- Sites 15, 17.1, 18, 39, 41, 40, 42

3 Aims and objectives

The purpose of the historic buildings consultancy, historic buildings recording and archaeological recording is:

- To ensure that site works are undertaken in such a way as to maintain the integrity and authenticity of the historic resource, minimising adverse impact upon the resource.
- To ensure that the highest possible standards of workmanship are maintained during the conservation works, which must be carried out to recognised current best standards in this discipline.
- To ensure that works are undertaken in such a way as to allow adequate recording of remains affected by the works,
- To record sites, features, deposits and artefacts affected by or uncovered by the works.
- To record the character and extent of works to the sites.
- To disseminate the results of the project appropriately and arrange for the deposition of the project archive.

4 Working methods

All archaeological recording work will be undertaken according to the Institute of Field Archaeologists *Standards and Guidance for Archaeological Investigation and Recording.* Staff will follow the IFA *Code of Conduct* and *Code of Approved Practice for the Regulation of Contractual Arrangements in Archaeology.*

The principal factor in effective project delivery will be the employment of key project staff who are expert in the management and recording of the industrial heritage. Cornwall Historic Environment Service project staff are able to draw upon a substantial track record in undertaking similar work throughout Cornwall, as well as a detailed knowledge of the project area and its sites.

4.1 Historic buildings consultancy

- HES (Senior Archaeologist) will attend a pre-works meeting to agree site access and site compound and stockpile areas in order to minimise damage to archaeological features, agree site compound location, agree details of location/preparation/number of mortar test panels, agree working methods and any changes to proposed work programme and discuss Health and Safety issues and requirements.
- The HES (Senior Archaeologist) will liaise with the Devon County Historic Environment Service - DCHES (Bill Horner), West Devon Conservation Officer (Stephen Gill/Roger Duce), English Heritage (Inspector for buildings and ancient monuments (Shane Gould) the WHS Management team (Phil Copleston) and the TVMHP Officers (Chris Hariades and Richard Halliwell). The HES Senior Archaeologist will liaise with any additional archaeological recording officer on the extent of works carried out and the appropriate level of recording.
- HES (Senior Archaeologist) will provide historic building conservation advice to the site engineer and site contractor in line with English Heritage guidelines (referred to in section 7 below) during regular site visits.
- It is anticipated that an HES Senior Archaeologist (Colin Buck), will undertake Historic Buildings Consultancy as part of this work. This person will also photograph the buildings before, during and after works take place – liaising with any additional project recording archaeologist and undertake to fulfil any specific recommendations made by DCHES and DCMS as part of the Scheduled Monument Consent.
- The HES Senior Archaeologist will attend regular site meetings at an approximate frequency of 0.5 day per week for each building contract. The meetings will be held with the site engineer, site contractor and possibly the appropriate District

Conservation Officer, as appropriate, to discuss ongoing site conservation work methods, detail of repairs and resolve any conservation work problems. It is assumed that the structural engineer and site contractor will have a proven track record in historic building conservation.

- The HES Senior Archaeologist will liaise with any additional archaeological recording officer on the extent of works carried out and the appropriate level of recording.
- HES will ensure that site conservation works are carried out to standards recommended by English Heritage best practice, and will halt inappropriate or substandard work and inform DCHES, the building engineer and TVMHP Project Officer.
- HES will advise the Structural Engineer/TVMHPPO (Pete Leaver/Tom Fletcher), where
 variations to repair and conservation work and recording may need to be agreed
 with the LPA/English Heritage; this will be discussed with the DCHES (Bill Horner) in
 the first instance.

4.2 Fieldwork: historic building recording

- Detailed archaeological recording will be undertaken for all newly exposed architectural features and any features revealed through excavation. Recording will also include the extent of repointing and rebuild.
- Historic building recording will be undertaken by a Senior Archaeologist (Historic Buildings Consultant Colin Buck or a suitably experienced HES archaeologist).
- As well as new detail, the nature and extent of all conservation works will be added to the existing archaeological/engineering building survey drawings (to be supplied to HES by the client).
- Measured survey will be carried out by hand measurements (using offset techniques at a scale of 1:50), using a paper copy of the survey supplied by the Client. This record will then be added to the original survey using CAD (or equivalent) software.
- The resulting survey output will be a revised measured survey drawing showing all conservation works that have been undertaken. This will be reproduced at a scale of either 1:50 or 1:100 (appropriate to the size of area recorded) and will form part of the Historic Buildings archive watching brief report.
- Analysis of the building fabric will be recorded in the form of field notes and written up at the archive report production stage.

4.3 Fieldwork: archaeological recording during mine shaft and safety works treatment

- The DCHES (Bill Horner) has advised that archaeological recording should be undertaken during any excavation that has revealed archaeological features. Recording will be undertaken using a mix of direct measurement, sketch plotting and photography, as appropriate (constrained by safety factors).
- Where significant remains are encountered the site archaeologist will be given the opportunity to make an appropriate form of record before work proceeds; where a temporary stop of work is required to undertake this, the site archaeologist will make a request via the project resident Engineer.
- If archaeological deposits of a regional or national importance are uncovered, contingency should be allowed within the works programme to review options to ensure their preservation in situ. In the event that significant remains cannot be preserved in situ, strategies for their relocation or detailed recording will be agreed with the Devon County Archaeologist.
- Any variation in named personnel for archaeological recording and historic buildings consultancy will be agreed with DCHES, and the TVMH Project Officer.
- The chosen site archaeologist will adhere to Health and Safety Policies (see below), under the direction of the designated Site Safety Officer.

4.3.1 Site recording (general)

- Site drawings (plans, sections, locations of finds) will be made by pencil (4H) on drafting film; all plans will be linked to the Ordnance Survey landline map; all drawings will include standard information: site details, personnel, date, scale, north-point.
- The site archaeologist will undertake recording in line with recommendations given by IFA. Sections and plans will be drawn on site at appropriate scales which will adequately record structures or features at appropriate levels of detail, and appropriate sections reproduced in the archive report at either 1:50 or 1:100 to adequately demonstrate revealed archaeological features.
- All features and finds will be accurately located by means of a National Grid reference.
- All archaeological contexts will be described using a standard format and linked to a continuous numbering sequence.
- A location plan will be made which will allow site detail to be accurately placed within the context of the Ordnance Survey Landline mapping.
- The archaeological watching brief report will detail (and if appropriate summarise) all forms of archaeological recording that has been undertaken at each of the mine sites. Each major mine site will have a single archaeological watching brief report that details all project related work to that site (ie trails works, building conservation works, interpretation works etc).

4.3.2 Treatment of finds

- It is recognised that fieldwork may produce artefactual material.
- It will be important to agree the arrangements for deposition of any finds prior to the start of the project, and ensure that transfer agreements are arranged and signed..
- An allowance has been made for discussions with landowners for the deposition of archaeological finds in an appropriate museum have been included in the cost tender.
- All significant finds in stratified contexts will be plotted on a scaled base plan and described.
- All finds will be collected in sealable plastic bags which will be labelled immediately with the context number or other identifier.
- Plymouth City Museum is the designated museum. Their guidelines should be followed and accession numbers for finds and archives for each project should be obtained at the start of the project. Unless otherwise agreed, mining-related artefacts and small finds to be removed from site will be deposited at the Plymouth City Museum, pending detailed discussions over their final place of deposition or loan to other local smaller museums and interpretation centres (for example Morwellham and Tavistock) etc.

4.3.3 Photographic recording

- 1. Black and white scaled photography using either a 35mm camera or medium format camera using fine grain archive quality film (400ASA).
- 2. Provision will be made for a range of lighting conditions and the photographic equipment will be available to the historic building recording personnel listed in the WSI.
- 3. Each shot will be carefully composed, focused and lit appropriately with a flash gun if necessary. The photo record will comprise:
- general views and examples of structural and architectural detail.

Methodology for the archive standard photography is set out as follows:

- Photographs of details should be taken with lenses of appropriate focal length.
- Difficulties of back-lighting should be dealt with where necessary by balancing the lighting by the use of flash.
- A range of appropriate photographic scales should be used and a metric scale included in all archive recording photographs, except where health and safety considerations make this impractical.
- A photographic location plan for each building recorded will be produced for the report and each film will be fully printed to 6 x 4 or 7 x 5 size prints. Selected prints will be scanned into the archive reports.
- Black and white photographs will be archived to HER standards and incorporated into the HES photo database.
- Supporting colour photographs will be taken with a high resolution digital camera (3MP or higher), to illustrate the report and for possible presentation purposes. This will be archived electronically onto each report CD.
- Care will be taken that each shot is focused and that with delayed shutter action that camera shake does not occur. Each shot will be of appropriate quality and used for reports and/or power-point presentation.
- Digital colour photographs will be stored according to the Historic Environment Service's guidelines. Copies of the images will be provided to the client.
- The archaeological record will include a plan showing the location of the photographs reproduced in the report.

4.3.4 Post Fieldwork

Following completion of the fieldwork stage the results from the Historic buildings, Trails and any other main sites within the mine project will be combined into a single concise report for each major mine site.

4.4 Report production

Each site report will summarise the results of the measured survey, photographic recording and archaeological recording for buildings and shafts treated as part of this project, and will include the following components:

- Summary
- Project background
- Aims and objectives
- Methodology
- Summary description of conservation works undertaken at all structures
- Description of conservation works and works programme, together with results of any archaeological recording.
- Recommendations for future management, including any further requirement for conservation works or other archaeological work.
- Conclusions
- References
- Project archive index
- Supporting illustrations: location map, historic maps, plans, elevations/sections, photographs.
- 4.4.1 Draft and summary report

- A summary report will be produced within two weeks of the completion of the fieldwork for each site and circulated to the DCHES Team and WHS Advice teams.
- A draft report containing the project results, as outlined above, will be produced and circulated to the DCHES Team for comment.

4.4.2 Final report format

- A paper copy and a digital (PDF) copy of the report, illustrations and any other files will be held in the Cornwall HER.
- Four paper copies of each report, and a CD containing an electronic copy of the report and the digital photographic archive will be produced for the client and the DCHER.
- Paper copies of the report will be distributed to local archives (including the Historic Environment Record) and national archaeological record centres.

4.43 Archiving

Following review with the HES Project Manager the results from the fieldwork will be collated into an archive following the Society of Museum Archaeologists Guidelines. This will involve washing and cataloguing relevant finds, the indexing and cross-referencing of photographs, drawings and relevant context records.

- All finds and samples, etc will be stored in a proper manner (being clearly labelled and marked and stored according to HES and IFA guidelines).
- Following any necessary cleaning, stabilisation and recording, artefacts or small finds will be deposited at an appropriate location.
- All paper and photographic records will be ordered, catalogued and stored in an appropriate manner (according to HES guidelines). It is expected that the depository site for these records will be the Devon County Record Office, Exeter.
- An EH OASIS entry (on-line) will be prepared at this stage of the project summarising the site impacts for each mine and referring to each archaeological watching brief report.

4.4.4 Cornwall HES archive deposition

An index to the site archive will be created and the archive contents prepared for long term storage, in accordance with HES standards (which will follow Society of Museum Archaeologists Guidelines). Archiving will comprise the following:

- All correspondence relating to the project, the WSI, a single paper copy of the report together with an electronic copy on CD will be stored in an archive standard (acid-free) documentation box.
- The drawn archive will be stored in A2 plastic wallets.
- Photographic material will be stored in archive standard negative holders and archive print holders within an archive standard box.
- All black and white photographs are to be archived using captioned labels, appropriate record forms and location plans. Other photographic records to be supplied with written captions and subject to appropriate batch archiving to be held in safe archival storage.
- Devon's Historic Environment Service/Devon Museums will receive a copy of all site photographs, reports and relevant correspondence etc.

The written archive will be deposited in a registered archive or museum, in accordance with their deposition guidelines and within 4 months of the completion of fieldwork.

5 Public presentation

Given the importance of the Tamar Valley mine sites, the significant impact to local communities of the remaining engine houses and the inclusion of all the sites in the proposed World Heritage Site, it is acknowledged that there is scope for wider public

dissemination of the results of this project. This dissemination could take the form of one or more of the following, subject to the agreement of funding for this work by the Project Manager (this may not be included in the tender associated with this WSI, although it can be included if requested by the Project manager/DHES):

- Community Open Days to show members of the public around the mine sites
- Provision for public lectures to local organisations
- Provision of information about the sites, works carried out and dates of open days etc via web sites (CC, DCC, WHS)
- Popular publications:
 - Devon: DAS Newsletter, Articles in DAS proceedings/monographs
 - Cornwall: Archaeology Alive, CAS Journals
- Media/newspaper articles via TVCS publicity officer.

6 Project staff

- The Historic Environment Service (Projects) has accumulated unparalleled experience in industrial archaeology, having been involved in this aspect of archaeology for the last twenty years (see the HES CV and the specific personnel CV in Appendix 2). The project will be managed and carried out by an HES Senior Archaeologist with proven experience in industrial archaeology; this staff member will also carry out the historic buildings consultancy and historic buildings recording. The project manager will:
- Take responsibility for the overall direction of the historic building consultancy and archaeological recording project.
- Discuss and agree the detailed objectives and programme of each stage of the project with DHES and TVCS PO, including arrangements for health and safety.
- Monitor progress and results for each stage.
- Edit the project report.

Key personnel within the proposed team are (CVs summarised in the Appendix):

Colin Buck, DipCert, Senior Archaeologist. cbuck@cornwall.gov.uk

Specialist in Cornish mining landscapes and assessments since 1993. Involved in numerous recording and appraisal projects including conservation works to many engine houses and other structural conservation works, shaft safety works and mine site access improvements, particularly in the east of Cornwall. Projects include many archaeological impact assessments. Helped Tamar Valley AONB Service prepare CMP for West Devon Mining. Involved in the preparation of policies for the Cornish Mining World Heritage Site Bid's Management Plan and produced the Mineral Tramways Conservation Management Plan.

7 General arrangements

Timetable

Following guidelines provided by the TVMHP Principal Officer (and David Wilson Partnership – Pete Leaver), the consultancy and fieldwork (for a projected duration of three years), is anticipated to be commenced during late summer of 2006. HES will require at least three weeks notice before commencement of work, in order to allow the allocation of field staff time and arrange other logistics.

Monitoring and Signing Off Condition

- Monitoring of the project will be carried out by Historic Environment Projects and DCHES (Bill Horner).
- The Devon County Historic Environment Service Planning Advice Officer should be informed 1 week in advance of the intention to start the recording (although a three year project timetable has been prepared).

- HES will liaise with the DCHES Officer to discuss the programme, progress of work, and agree site meetings as required.
- A summary of the results for each major contract stage will be presented to the DCHES Officer within 2 weeks of the completion of the relevant fieldwork.
- Draft reports will be provided to the DCHES Advice Team for comment.
- Where the DCHES Officer is satisfied with the archive report and the deposition of the archive, written discharge of the planning condition will be expected from the local planning authority (LPA).

Monitoring points during the study will include:

- Approval of the WSI
- Completion of fieldwork for each mine site
- Completion of archive report and summary note for each mine site
- Deposition of the archive

Professional standards

The historic building and archaeological recording will be carried out to the standards of the Institute of Field Archaeologists and all work and advice will be carried out in line with the IFA Code of Conduct and Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology.

Copyright

Copyright of all material gathered as a result of the project will be reserved to Cornwall County Council and their funding partners (Devon County Council). Existing copyrights of external sources will be acknowledged where appropriate.

Compliance and Variations

Minor variations to this WSI will be discussed in liaison with the client and the Devon Historic Environment Planning Advice Officer. The TVMHPO will then agree these with the LPA/EH as appropriate. Major variations may require detailed agreement from the Local Planning Authority.

Contract

The HES projects team is part of the Historic Environment Service, within Environment and Heritage, Cornwall County Council. If accepted, the contract for this work will be between the client and Cornwall County Council.

The views and recommendations expressed will be those of the Historic Environment Service projects team and will be presented in good faith on the basis of professional judgement and on information currently available.

Health and safety

- The Service follows the County Council's *Statement of Safety Policy*. For more specific policy and guidelines the Unit uses the manual *Health and Safety in Field Archaeology* (2002) endorsed by the Standing Conference of Archaeological Unit Managers and also the Council for British Archaeology's Handbook No. 6 *Safety in Archaeological Field Work* (1989).
- The historic building consultant and the historic building/archaeological recording team will adhere to the Health and Safety Statement of the Principal Contractors.
- Prior to carrying out on-site work HES will carry out a Risk Assessment.

Insurance

As part of Cornwall County Council, HES is covered by Public Liability and Employers Liability Insurance.

Colin Buck, Senior Archaeologist, Historic Environment Projects, Cornwall Council


Bedford Mine Trail, Gulworthy, Devon Impact assessment



Historic Environment Projects

Bedford Mine Trail, Gulworthy, Devon

Impact Assessment Report

Client	Tamar Valley Mines Heritage Project	
Report Number	2012R063	
Date	August 2012	
Status	Final	
Report author	Colin Buck	
Checked by	AJ	
Approved by	AY	

Historic Environment, Cornwall Council

Kennall Building, Old County Hall, Station Road, Truro, Cornwall, TR1 3AY tel (01872) 323603 fax (01872) 323811 E-mail hes@cornwall.gov.uk www.cornwall.gov.uk

Acknowledgements

This archaeological recording was commissioned by West Devon Borough Council and the Tamar Valley Mining Heritage Project. It was carried out by the Historic Environment Projects team, Cornwall Council.

Within Historic Environment, the project manager was Colin Buck and figures reproduced in this report were compiled by Carolyn Royall, Colin Buck and Sherrell's Ltd. The report was edited by Andy Jones.

The views and recommendations expressed in this report are those of the Historic Environment Service projects team and are presented in good faith on the basis of professional judgement and on information currently available.

Freedom of Information Act

As Cornwall Council is a public authority it is subject to the terms of the Freedom of Information Act 2000, which came into effect from 1st January 2005.



Historic Environment, Cornwall Council is a Registered Organisation with the Institute for Archaeologists

Cover illustrations

Front cover image (\bigcirc C Buck CC) of one of many infilled surface outcrop stopes cutting across the route of the new Tamar Valley Mines Heritage Project Bedford Mine Trail (see Sherrells 2012 figure 4b).

© Cornwall Council 2012

No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without the prior permission of the publisher.

Contents

1	Sun	Summary 6			
2	Inti	Introduction			
	2.1	Project background	7		
	2.2	Aims	8		
	2.3	Building conservation philosophy	8		
3	Sta	tements of Significance	8		
	3.1	Definition of Outstanding Universal Value and Significance	8		
	3.2	General Statements of Significance for the Tamar Valley Mining District	9		
	3.3	Site specific Statements of Significance	11		
4	Sun	nmary table of building conservation works	15		
5	Ass	essment of impact and mitigation	20		
	5.1	Impact significance definitions	20		
	5.2	Building conservation works	20		
	5.2. 5.2	 Site impact and remediation summary Site inventory impact description and remediation measures 	20 21		
	5 3	Fencing works	27		
	54	Public access & interpretation	27		
	5.4.	1 Site description, site impact and impact remediation	27		
	5.5	Description of impacts during the post-project stage	28		
	5.6	Residual impacts	31		
	5.7	Assessment of impact on historic landscape character	31		
6	Imp	pact mitigation strategy: archaeological consultancy	31		
	6.1	Pre-works consultancy	31		
	6.2	Historic Buildings Consultancy	32		
	6.3	Programmes of archaeological recording	32		
7	Ref	erences	33		
	7.1	Primary sources	33		
	7.2	Publications	33		
	7.3	Websites	34		
8	Pro	ject archive	34		
9	Арр	oendices	35		
	9.1 <i>to TVN</i> Report	Appendix 1: Sherrells Ltd (Geotechnical Engineers) Letter report plans, Leta 11 AMA APPENDENT IN THE ADD AND A CONTRACT AND A CO 12 APPENDENT AND A CONTRACT AND A CO 13 APPENDENT AND A CONTRACT AND A CO	ter 35		
	9.2 TVMH	Appendix 2: Alastair Guy & Sons Letter report plans (July 2012), Plans for PRE: Proposed Bridge Crossing: Lode workings (end and side views)	39		
	9.3 projec	Appendix 3: Historic Buildings Consultancy and archaeological watching bridt design	ef 40		

List of Figures

- Fig 1 Location map
- Fig 2 1867 Estate Plan
- Fig 3 Map showing the archaeological sites relating to the proposed new mine track
- Fig 4 Map showing the sites of proposed works at Bedford United Mine
- Fig 5 Photo of Wheelpit tail race tunnel
- Fig 6 Photo Internal view of Marquis adit

Abbreviations

CC	Cornwall Council	
DCC	Devon County Council	
DCHES	Devon County Historic Environment service	
DGC	Devon Great Consolidated Mine	
DRO	Devon Record Office	
DHER	Devon Historic Environment Record	
HE (Projects) Historic Environment (Projects)		
NGR	National Grid Reference	
TVAONB	Tamar Valley Area of Outstanding Beauty	
TVMHP	Tamar Valley Mining Heritage Project	
WDBC	West Devon Borough Council	
WHS	World Heritage Site	

1 Summary

A new circular footpath trail is planned around parts of Bedford United Mine to/from the Sawmills Car Park as part of the Tamar Valley Mining Heritage Project. This impact assessment report is intended to inform and guide the Tamar Valley Mining Heritage Project (TVMHP), Devon County Council Historic Environment Service (DHES), and the Cornwall and West Devon World Heritage Site (Planning Advice Team), by assessing the impact of creation of the proposed trail and building conservation and site safety works upon the site's significant assets.

The Tamar Valley mines are nationally important mine sites, a proportion of the 19th century mining landscape is Scheduled but all are within the Cornwall and West Devon Mining Landscape World Heritage Site (WHS – Tamar Valley area Site A10), although none of the sites within this report are Listed or Scheduled. This report summarises the archaeological resource, and describes the impact and mitigation of the proposed works.

Most of the study area (Fig 1) is included within the former Bedford United Mine Sett, however, part of the northern section (using existing trackways and a TVMHP Trail) uses part of Wheal Thomas/Watson Mine (eastern side of Devon Great Consols Mine – see Fig 2). Both mines were worked from the late 1840s and include mine shafts, adits, sites of wheelpits, remains of flat rod gulleys and other mining related features.

The construction of a new track for public access along the steep sides of the Tamar Valley, often crossing open lode outcrop workings and close to open adits and closed shafts will impact upon its present woodland environment, so characteristic of the Tamar Valley Area of Outstanding Natural Beauty (TVAONB). However, mechanisms can be put in place (by DCHES) to ensure that there is an appropriate degree of consultancy and archaeological recording, as part of the project's impact remediation measures. Careful pre-works consultation with a site archaeologist has resulted in minimal impacts upon known archaeological features.

Archaeological impact recommendations include a programme of archaeological site consultancy before works start (to ensure the fencing/boardwalk/landing works will have a minimal impact), during works (for site supervision, archaeological recording, and liaison with DCHES), and after works to ensure the works were sensitively completed, as part of an overall mitigation strategy.

2 Introduction

2.1 Project background

The conservation and management of features relating to the TVMHP's mining heritage and enablement of safe public access forms the basis for the proposed new Bedford trail footpath creation and site conservation scheme. This report assesses the impact of the proposed building conservation works on the significant assets of the Bedford United Mine (and to a lesser extent Devon Great Consol's). There are no detailed schedule of works and specifications (apart from Appendix 2, a letter report by Sherrells dated February 2012), describing how the impact of the proposed works are minimised as part of a coherent mitigation strategy.

Cornwall Archaeological Unit (CAU – now Historic Environment Projects, Cornwall Council), produced an archaeological assessment of Devon Great Consols in 2002 (Buck 2002) and Bedford United Mine in 2003 (Buck 2003), which describes in detail each mine structure and their relative significance. The Historic Environment Service (HES) was commissioned in February 2012 (Project No. 2012010), by the Tamar Valley Mining Heritage Project (Chris Hariades as TVMHP Project Manager), to undertake Historic Buildings Consultancy (to ensure WHS consent to the nature and extent of the new track creation and limited building conservation specifications), photographic building recording of affected mine sites, and production of an impact assessment report for all sites affected and impacted by the proposed works.

An impact assessment project brief has not been produced, but it follows a similar project design by Cornwall Historic Environment Service; '*Project design for production of Scheduled Monument Impact Assessment Reports (Devon Great Consols and Gawton), as part of the Tamar Valley Mining Heritage Project (2006-2009)*', dated 23/6/06 (Reproduced as Appendix 1).

A summary statement of significance relating to structures likely to be affected by the proposed works has been produced (Section 3.3), followed by a summary table of each site's assets (Section 4). This report identifies the archaeological resources affected by the proposed building conservation scheme, and describes the impact and mitigation of the works on the site's significant assets (see Figs 1 and 3 for site inventory). In addition the report refers in detail to the management and maintenance plan that has been produced by the TVMHP (2006) and summarises the proposed short and long term site management as part of relevant conservation management plan policies (TVMHP 2006), and appropriate WHS management plan policies (2005).

It is proposed that the building conservation programme will address the following:

- The protection and consolidation of significant archaeological remains in their settings.
- Health and safety aspects of the site relating to public access.
- Provision of low-key public amenity use where appropriate, incorporating access.
- Interpretation of the site to the public, including on-site and written materials.
- Linking the site into the local economic, social, tourism and recreational contexts.

In terms of the management of archaeological features, engineering works will be kept to a minimum, but in view that the entire site is part of the Tamar Valley component (Area 10) of the Cornwall and West Devon World Heritage Site mining landscape, particular attention has been paid to suggestions for the best mitigation of any such works.

2.2 Aims

The purpose of this impact assessment is to:

- 1. Assess the impact of the new track creation and building conservation and safety works on the significance and character of Bedford United Mine. This report should be approved by DCC (Archaeology) and the WHS (Advice) team, before works on site can start.
- 2. Indicate the steps that have already been taken by the historic buildings consultant (HBC) to avoid or minimise adverse impacts upon the site, its features and archaeology and to ensure that the site methodologies accord with general EH guidance on the Conservation of Historic buildings.
- 3. Indicate that the proposed methods and techniques are appropriate to the history, character and outstanding universal value (OUV) of the site.
- 4. Make recommendations for an archaeological mitigation strategy.
- 5. Ensure the detailed site information (Sherrell 2011) conform to the overall mitigation strategy for the site.

2.3 Building conservation philosophy

All site works carried out by the project will be undertaken to the highest national standards, and in accordance with the policies and guidance set out in *Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment* (English Heritage 2008) and all other relevant guidance, irrespective of whether the heritage assets or components enjoy statutory protection or not.

The site conservation philosophy is based on respecting the character of each significant feature and its contextual relationship generally with other parts of the WHS. The long-term conservation and preservation of the built and standing archaeology should reflect its individuality, character and construction. The methodology of using traditional lime based mortar and timber structural components is intended to replicate its original construction technique; however, the end product is intended not to monumentalise the site but to conserve, protect and give the appearance of an old but safe structure. The building conservation text reproduced in the Appendix (9.1) is intended to describe in more detail the appropriate philosophy underlying building conservation works to enable safe public access and appropriate site interpretation.

An essential component of the mitigation strategy is the employment of an historic environment consultant who should ensure that English Heritage principles of conservation practice are adhered to both in terms of the design of appropriate schemes, to ensure that consolidation works are carried out to acceptable (EH) standards and to ensure close liaison between statutory agencies and the project scheme. In addition it is important that the nature, extent and development of the site conservation works should be guided by the relevant short and long-term management plan policies (statutory, archaeological, conservation, ecological, mineralogical and WHS, etc), which are an important part of any mitigation strategy of the site.

The appropriate statutory authorities (Devon County Historic Environment Services) will ensure that written scheme of investigations (or project designs), set standards for the archaeological recording and reporting during and after the works have ceased.

3 Statements of Significance

3.1 Definition of Outstanding Universal Value and Significance

The Outstanding Universal Value (OUV) of the Cornwall and West Devon Mining Landscape was described in the Nomination document for World Heritage Site Status 'The Cornwall and West Devon Mining Landscape was transformed during the period

1700 – 1914 by early industrial development that made a key contribution to the evolution of an industrialised economy and society in the United Kingdom, and throughout the world. Its outstanding survival, in a coherent series of distinctive cultural landscapes, is testimony to this achievement'. The 'coherent series of distinctive cultural landscapes' comprises ten areas of Cornwall, one of which is the Tamar Valley Mining District (Area A10); see Figure 1. There are seven main components identified in the Nomination Document through which the OUV is physically expressed: Mine sites, Mine transport, Ancillary industries, Mining settlements and social infrastructure, miners smallholdings, Great Houses and estates, and Mineralogical and other sites of scientific importance. Individual aspects of the cultural heritage making up the Site have differing levels of significance; some may be of an international importance, whilst others will be of national, regional or local significance (OUV of the Cornwall and West Devon Mining Landscape, 2007, 2).

Once the overall relative significance of mine sites has become apparent, through statutory (Scheduling), non statutory (WHS areas) designation, and the process of compiling a conservation management plan, identifying and prioritising significant elements within the mine site can take place. These are usually graded in relative categories from High, Medium to Low.

3.2 General Statements of Significance for the Tamar Valley Mining District

'The Tamar Valley forms the principal central landform of the district. Whilst the river flows from north to south, its great loops and bends follow a highly sinuous and changing course, its sides are often steep and frequently wooded. To the east the landscape above the banks of the river is rolling cultivated countryside that descends to the ancient market town of Tavistock, which nestles beneath the high granite uplands of Dartmoor. The 19th century mines of this district exploited an important concentration of (some) tin, but mostly copper, arsenic and silver-lead (north-south) lodes which run parallel with the east-west axis of the granite massif of Kit Hill and Hingston Down, and which were worked almost continuously from Callington to Tavistock' (Thorpe 2005, 64).

'Many of the most important mines in the Area were sited near to the river, where the lodes outcropped on its banks, and adit drainage was readily available. On the Cornish bank of the river these include New Consols, Wheal Benny, Gunnislake Clitters, Old Gunnislake, Okel Tor, Danescombe and Cotehele Consols, whilst a little away from the river were Calstock Consols, Wheal Zion, Wheal Edward and Wheal Arthur. On the Devon bank, Devon Great Consols and the Bedford United Mines were the largest and richest copper mines anywhere within the Site, the extraordinary amounts of ore they produced outstripping all other ventures; by the last decades of the 19th century they were supplying 25% of the world's arsenic. To the south are Russell United, George and Charlotte, Gawton, Tuckermarsh, South Ward, North and South Hooe, Furzehill and South Tamar Consols, the last of this group on the Bere Alston peninsula having been amongst the earliest to have been worked as true mines anywhere in Britain, their rich silver-lead deposits being exploited by the Crown from the 13th century.

A mining district with a long pedigree and which shared to a degree in the upsurge in mining which took place through the mid-19th century, but whose high point was around the second and third quarter of the century when undertakings like Devon Great Consols were amongst the largest and most important working for copper and arsenic in the Cornubian orefield. There were small and medium-sized mines scattered throughout the landscape on the Cornish side of the river, though on the Devon bank they are more or less confined to the river bank. Though tin and wolfram were mined, arsenic and copper dominate. John Taylor and the Dukes of Bedford were the key players in the development of the Devon mines, ports and communications systems, whilst the Duchy of Cornwall and the Williams family played significant roles to the west of the river' (CC 2007, Tamar Valley Mining District 94, 100).



3.3 Site specific Statements of Significance

A significant element of the TVMHP has focussed on identifying, prioritising and proposing a variety of site conservation works for the most significant elements of the mining landscape within the project area (Fig 1). The Historic Environment Service, Cornwall Council regards mine buildings (Engine Houses, boiler houses and chimneys), in Cornwall to be the most significant and iconic surface remains of the operations of a former mine site. As such, these buildings are considered to be the highest form of site significance when assessed with other more common building forms. However, for Devon Great Consols, these significant buildings were (most un-characteristically), demolished to ground level when the mine finally closed in 1903. Those at Bedford United Mine have also been taken/fallen down.

The following list of mine sites within the amalgamated mines of Devon Great Consols and Bedford United Mine includes a short statement of historical significance (denoting the reason why the site is worthy of building conservation works), and secondly, a short summary of the proposed conservation works. Archaeological assessment site references (Buck 2002; 2003), are given following the historical summary. It should be noted that all substantial extant buildings are of high significance and so justify a building conservation scheme within the context of the site's extant remains. Other lower significance sites may justify a conservation scheme (of limited extent) based on structural, Health & Safety and project finance criteria. These are listed in detail for every site in Section 4. Refer to Figure 1 for each site location within the project area, and Figure 3 for detailed site locations.

<u>Note</u>: A detailed history of Devonshire Great Consolidated (DGC) Mine and of Bedford United Mine is given in two earlier archaeological assessment reports (Buck 2002, 6-17; Buck 2003, 14-16). The landowner for the DGC project area (Fig 1) is the Earl of Bradford, whilst the Tavistock Estates which occupies this site operates a commercial forestry operation. The landowner for the Bedford United Mine site is Adrian High. See Figure 3 for site locations.

Historical summary of Bedford United Mine

'Although not equalling the extraordinary richness of its neighbour **Devon Great Consols**, the **Bedford United Sett** was highly productive with a recorded output of nearly 66,000 tons of copper ore, and smaller quantities of arsenic, tin and latterly wolfram' (Jenkin 1974, 29).

In the Bedford archive at Devon Record Office (Exeter), the earliest documentary records detail dues paid to the estate at the rate of 1/9th and a share of the profits for the estate as shareholder in the '**Marquess and Bedford Setts**' from 1712 (although there is an earlier reference to the sale of copper ore in 1711). Estate accounts also show copper ore sales from 1714 – 1720 (*pers comm* John Goodridge).

Slightly later observations were made by Hendrik Kahlmeter, a Swedish engineer, who visited the mine on 13th November 1724 (his text published in 2001 by Justin Brooke).'... in Collingswood, lies the Marquis copper mine, in the lands of the Duke of Bedford ... she was first discovered seventeen years ago on the bank of the river when some workmen got together, took a sett or lease of 20 fathoms from the water's edge ... and drove a level from the lowest point' (known today as the Deep Adit or 47 fathom level on Marquis Lode), and finding copper named this part of the mine **Bedford Mine**. Shortly afterwards a wealthier group of adventurers obtained another sett higher up the hillside where they started a second adit seven or eight fathoms above the first and drove it 60 fathoms. Subsequently the two workings were amalgamated and became known as the Marquis Mine. On commencing the upper adit, tin was met with near the outcrop of the lode, but on excavating deeper copper was encountered in considerable quantity and of a better grade than in the first adit. At length the water gained on the workmen to such an extent that sixty men were required to drain it until this became too costly and the working was abandoned for some years' (Brooke 2001, 12).

In 1722 the mine was acquired by the **Bristol Copper Company** who erected an underground engine near the adit end. This was driven by water directed down the shaft from surface which, after passing over a pumping wheel, flowed out through the adit mouth. By such means the Company contrived to sink the shaft 39 fathoms below adit, effectively draining the workings to that level. The lode ran due east-west and varied in width from 1 ft to 4 ft' (Jenkin 1974, 30).

Kahlmeter also states: 'No ore is smelted here, and it is only broken small and separated from the waste rock. The poorer kind is crushed and washed, and is sent by land (presumably via Newbridge) to a place two miles away called Net Stakes, where the River Tamar is navigable for barges or boats ... from there the ore is shipped to Bristol or to Neath in Wales'. Not far from this work and on the same side of the river lies another course of ore, which runs just as the previous one and is called **Tavistock**. It was worked for four or five years, but has been idle these seven years' (Brooke 2001, 12). This latter working appears to have been sited immediately north of the Marquis sett.

To date, there appears to be no further documentary evidence of these small setts (often following a single lode), until 1841 when the mines were reopened and amalgamated into the sett of **Bedford United Mines**. This included the lodes of Wheal Marquis, Wheal Tavistock, Delve's Kitchen, Bridge Lode and Ding Dong. 'In 1842 Captain Josiah Hitchens (who two years later discovered the enormous sulphide lode at **Wheal Maria** (Gard's Shaft - in what later became **Devon Great Consols**), and his associates were working the Marquis lode here by water power...The lode outcrops had been anciently worked away for 200 fathoms in length above the deep adit. From 1844 to 1856, 21,039 tons of copper ore were sold for £138,846' (Collins 1912, 412).

'In 1843 levels were being driven at 25, 30 and 40 fathoms below adit on the Marquis Lode where a 50 ft pumping wheel had been erected. To drive this and the wheel on Ding Dong Lode, water was brought through a leat from the southern end of the Tavistock Canal, high above Morwellham (for two miles – passing through tunnels and sometimes carried by launders slung in chains from the cliff face - Jenkin 1974, 32). 'Two large wheels were erected, 45 ft x 4.5 ft and 50 ft x 4.5ft, with another of 50 ft diameter under construction in 1844. In 1848 the company commenced paying dividends and later in the 1850's a new incline shaft was sunk (measuring 14 ft x 5 ft) with a double line of tram-roads' (Barton 1964, 96).

In 1849 a steam whim was erected and five shafts were in use. The deepest of these was Engine Shaft on the Tavistock Lode which followed its underlie down to an eventual depth of 150 fathoms from surface' (Jenkin 1974, 32). 'In the face of considerable opposition from this company a branch from the **Devon Great Consols** Railway for the conveyance of ores, coals and other materials was made by the Duke in 1863 at a cost of £275. The benefit of the railway to the company is now fully appreciated' (1868 Report on Mines). The company had previously conveyed its ores to Morwellham by wagon at a charge of 5s per ton. This rate was subsequently reduced to 1s.10d (a cost saving of over £962 from Jan. 1864 to Dec. 1868 for 8027 tons of copper ore and 424 tons of mundic).

Figure 2 (1867 shafts/lodes map) from the Bedford archive shows the extent of the workings. The Bedford Estates 1868 Report on the Mines (T1258M E 44a-b) by Gilson Martin (dated 31st Dec.), showed that the mine's first lease from the Duke of Bedford ran for 21 years from 1842 to 17/9/1863 (terminating on 17/9/1874), 4000 shares having been issued. The area of the sett was 218 acres (42 of which was woodland-but the area occupied by the mine totalled 5.5 acres), with 92 men and boys, 13 women and girls giving a total of 105 people. Four shafts were being used and 47,000 tons of ore had been sold, with over 1000 tons of mundic produced. '*This mine is drained by two large water wheels and the drawing and crushing is done by a small steam engine'* (1868 Report on Mines). The value of the copper ore was nearly £250,000, £880 of tin, and £557 of mundic. The dues to the Duke had, by 1868, amounted to £17,294;



Figure 2 1867 Bedford Estates Plan showing shafts/lodes within the Bedford United Mine Sett and adjacent Devon Great Consols Mine Sett.

 \pounds 11,733 capital had been expended. After dividends had been taken the mine's net profit was \pounds 42,667.

'In 1870 the mine was 148 fathoms deep and employed 160 people. In 1877 a limited liability company of 1200 shares (£1each) was registered' (Collins 1912, 412). 'In 1878 the company raised only sufficient ore to pay working costs in the hope that metal prices would ultimately recover... output of copper and mispickel fell off markedly in the 1880's.Underground activity finally ceased at the end of 1889, followed by liquidation of the company in August of the following year' (Barton 1964, 96).

The 1901 Report on Mines and Quarries by the Estate Manager (J. Paull-dated 31st Dec.) states (1901 Report on Mines and Quarries): 'two men are employed in the adit level on South lode-mostly going eastwards with little wolfram and arsenical mundic being found ... By the middle of December the licensee (Mr William Phillips), seems to have reached the end of his means for mining adventure (ventilation in the level was so bad that it no more could be done without incurring the censure of HM Inspector of Mines), funds to be attempted to be raised to cut a shaft from surface or to ventilate by mechanical means-so driving the level was stopped in mid December (Mr Phillip's lease terminates at Midsummer next (1902)'.

From 1915 to 1925, the mine was re-opened on a small scale above adit for mundic and arsenical pyrites, funded by the Bedford Estate. In 1918 76 men were employed. In later years (after 1922) mispickel was taken from the mine to **Devon Great Consols** along a re - laid narrow gauge (2 ft.) track for re-processing in the newly built arsenic refinery. Also arsenical pyrites and wolfram from **Wheal Frementor** (the south western part of **Devon Great Consols**), was taken to **Bedford United** for stamping, before being taken back to the arsenic calciners via the railway (Richardson 1995, 100). The mine continued to work in a small way until 1928 when it finally closed, producing 2,111 tons of arsenic, 1,053 tons of mispickel, 72 tons of 60% copper precipitate and 9 tons of wolfram (Dines 1956, 666). Richardson also states (1995, 129) that the mine was active to 1930 in conjunction with **Ding Dong Mine** and that it was worked to 10 fathoms below deep adit level (42 fms. below surface at Engine Shaft) with the aid of a small Cornish pump (still *in-situ* in 1938); '*in about 1978 some interest in the mine was shown by South West Consolidated Minerals' (ibid*).

Summary Bedford Mine heritage features impacted by the Bedford Trail (Fig 3)

- Archaeological features on North/Tavistock Lode (Sites 1/1.1, 2, 4, 5).
- Archaeological features on Marquis Lode (Sites 2, 3/3.1, 11).
- Archaeological features on Unrecorded Lode (Sites 12, 13, 14).
- Archaeological features on Phillips Lode (Site 10).
- Conservation repair of masonry tail race walls to stamps/crusher wheelpit (Site 17)
- Sites 15, 17.1, 39, 40, 41, 42.

Historical summary of Devon Great Consols Mine

'Devon Great Consols was the last great copper discovery in the West of England and for twenty years from 1845 to 1865 the seemingly inexhaustible deposits overlaid the copper mining world ... (and) was the richest copper mine in Europe, and when its lodes began to fail it went on to produce so much arsenic (half the world's supply), it had to be regulated to avoid swamping the market... It was the only mine in Devon and Cornwall to build and work its own standard gauge railway. In its own foundry it maintained and partly constructed many of the steam engines and water wheels used for pumping and crushing ore' (Booker 1974, 143/144). Refer to Figure 2, reproduction of an 1867 Bedford Estates Survey map.

From 1845 to 1903, sales of copper ore had been 742,400 tons (averaging 6.5%); the greatest total recorded for any mine, not only in Cornwall and Devon, but anywhere in the 'old world'. This had realised £3,473,046 on which dues of £261,587 had been paid. Tin sales had totalled only £170 (despite the large investment looking for it below the copper lode), but 72,279 tons of refined arsenic had realised £625,062 on which dues had been £27,967. In later years the mine's purser (Moses Bawden), estimated that 600,000 tons of mispickel had been calcined.

During the mine's career, a total dividend of £1,225,216 had been disbursed. £658,336 had been spent on the arsenic works, railway and other capital equipment (including houses and schools, etc). Approximately 45 miles of shafts/levels and winzes had been sunk, whilst waterwheels (totalling 33 fed by over 8 miles of leats), had been the main

power source for 2,420 fathoms (over 4.33km) of flat rods.

Wheal Thomas/Watson

This mine, which was sited in part of the project area, was named **Wheal Jack Thomas** up to the 1870s, and **Wheal Watson** thereafter (after Mr Peter Watson, the managing director from 1879) worked from the late 1840s, 12 Tutworkmen and 2 labourers being employed in 1850 (Fig 2). It developed the eastern end of South Fanny Lode: 'It had yielded arsenical mundic when it had been worked in 1855 and 1856, at which time the emphasis had been on copper production. The ore had then been left on one side, but 24 years later (after Main Lode had been exhausted and the arsenic market inflated) it represented a valuable asset. To speed up the work in the mine and to reduce labour costs by as much as ...30% the company decided to purchase rock drills and an air compressor' (Goodridge 1964, 253). Barton (1964, 79) goes further: 'This section of the sett (in 1879) ... was opened up vigorously and was pumped by a further 280 fathoms of flat-rods extended to the shaft from one of the existing pumping wheels'. By the early 1880s this mine and Wheal Emma were the only copper producing parts of Devon Great Consols (Buck 2002, 229).

The mine, shafts and flat-rod from the water wheel are shown on the 1857 Lease map (Fig 3). The site stretched from the water wheel at the bottom of the valley (Site 370), to Watson's Shaft (Site 383), and Old Eastern Shaft (Site 380) at the top of the hill (Buck 2002). Documentary evidence for the size of the water wheel comes from Hall (2000, 107), quoting an 1860 survey; '*Wheal Thomas pumping wheel, 36 ft. by 4 ft. cast-iron axle'*. The 1867 map (Fig 2), shows the site of the water wheel, an adjacent building (perhaps a flat rod crank pit), and the leat supply for the wheel (from Site 5 (Buck 2002), the leat from Scrubtor 2.5 miles away).

'Devon Great Consols was the last great copper discovery in the West of England and for twenty years from 1845 to 1865 the seemingly inexhaustible deposits overlaid the copper mining world ...(and) was the richest copper mine in Europe, and when its lodes began to fail it went on to produce so much arsenic (half the world's supply), it had to be regulated to avoid swamping the market...It was the only mine in Devon and Cornwall to build and work its own standard gauge railway. In its own foundry it maintained and partly constructed many of the steam engines and water wheels used for pumping and crushing ore' (Booker 1974, 143/144).

Summary Devon Great Consols Mine heritage features impacted by the Bedford Trail (Fig 1)

 Archaeological features on Thomas/Watsons Lode (Sites 374, 375, 376, 376.1) – sites not shown on maps in this report. Sites can be seen in Buck 2002 (Fig 38, site inventory map).

4 Summary table of building conservation works

The following sites are identified and described in detail in both the Devon Great Consols Mine and Bedford United Mine archaeological assessment reports. The impact significance column shows that some sites are regionally important **`R**', or Locally important **`L**'. The letter in brackets (**H**=High, **M**=Medium, **L**=Low) summarises the impact of the proposed works on the site, Section 5.1 and the site inventory text describes this in more detail (Section 5.2.2). Figure 3 shows the spatial relationship of the site's significant assets which may be affected by the new Bedford Mine Trail.

Table of archaeological sites and features affected (visually/physically) by the scheme

Bold (high impact) text sites are described in detail in Section 5.2.2. Site numbers in brackets are given by Sherrell (see Figs 4b-4d, 9-10). Bedford United Mine sites are shown in Figure 3, whilst Devon Great Consols Mine sites are shown in Figure 1.

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
	-	1	Bedford United Mine			
1 (34)	Adit	Open adit near leat (Site 15), accessed via cutting in rock outcrop	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None – but open adit may be visible from lower track
1.1 (34)	Shaft	Open shaft accessed just inside open adit (Site 1).	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
2	Leat	Well preserved C18 leat in places	Footpath (west side) to use leat channel throughout its length	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	Н (Н)	Leat base and downslope bank profile should be maintained. Visual impact of new fencing/boardwalk
3 (36)	Stope	Open stope cut into a rock outcrop	New track near site – site fencing of adit/workings and `walkway' over infilled stope.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	New site fencing and walkway
3.1 (36)	Working platform	Working platform/spalling floor adjacent to adit (Site 3)	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
4 (36)	Adit and spoil heap	Closed infilled adit (Tavistock/North lode) at end of lobby	Site visible from adjacent track, so adit entrance may be fenced.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Visual impact of round post and round rail fencing
5 (37)	Working area	Working platform/spalling floor adjacent to adit	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
10 (39)	Dam/reservoir pond	Extant masonry	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None. Visible from new track
11 (39)	Exploratory Adit	Small blocked adit	New track near open adit site – site fencing of adit workings	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	New site fencing
12 (40)	Working area	Working platform/spalling floor adjacent to adit	None.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
13 (40)	Adit opening	Collapsed opening	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
14 (40)	No 1 Shaft (Philips lode)	Poorly fenced open shaft, with side opening to west. Adjacent to proposed new track route.	Re-fence the mine shaft and steep drop on west side.	Issue 7 (Policy 7e)	L (M)	Visual impact of new fencing in small area
15 (41)	Leat	Extant in places	None	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None
17 (43)	Wheelpit/tail race tunnel	Two sections of masonry wall – both collapsing	Rebuild collapsed sections and repoint throughout	Issue 8 (Policies 8a to 8c), Issue 10	R (M)	Repair and consolidation of the collapsed walls – new pointing visible
17.1 (43)	Leat (Tail race)	Extant profile	None – but re-use as track	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Increased wear and possible leat erosion

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
39 (52)	Rectangular pond	Deep, wide shaft or wheelpit	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (M)	None but sites can be seen from new track route
40 (52)	Turbine machinery plinth	Extant masonry wall/plinth	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (M)	None but sites can be seen from new track route
41 (52)	Large flooded depression	Difficult to view whether shaft or wheelpit	Fencing along western edge near end of new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None but sites can be seen from new track route
42 (53)	Large tailings dump, dressing floor	Extant overgrown dump	Fencing along parts of northern edge parallel to new track route	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	Walking along part of the dressing floor site
			Devon Great Consols			
374 (231)	Wheal Thomas/Watson Mine adit	Possibly a collapsed adit, 2.0m of portal rock face visible.	Possibly fence the front of the collapsed adit	Issue 7 (Policy 7e)	L (L)	Additional fencing – possibly visible from the lower track
375 (232)	Wheal Thomas/Watson Whim/Air Shaft, capstan and finger dump	The shaft is visible as a hollow (6.0m diam and 0.8m deep), marked by a granite stone.	Possibly fence around the shaft	Issue 7 (Policy 7e)	R (L)	Safety fencing around the shaft. Some tree thinning may be necessary for site fencing.
376 (232)	Wheal Thomas flat rod cutting and tunnel under track (SX 43721 73036 to 43900 73049)	Cuttings are approx. 1.0m wide and cut into ground at varying depths (0.5 to 0.75m deep). Site damaged in places by forestry activity. Tunnel robust to take vehicles	None. Retain the features undisturbed.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (L)	None. Cutting visible from footpath.

Site No:	Description	Summary site description	Proposed conservation works	WHS Management policies (2005)	Impact significance	Site impact
376.1 (232)	Wheal Thomas flat rod cutting (SX 43868 73063 to SX 43741 73073)	Cuttings are approx. 1.0m wide and cut into ground at varying depths (0.5 to 0.75m deep). Site damaged in places by forestry	None. Retain the features undisturbed.	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	R (L)	None. Cutting visible from footpath.
Not in report Site A	Masonry feature/shaft (SX 43750 73070)	Rectangular feature at ground level (2.1m x 2.6m), all walls visible. Stone lined to visible depth of 0.6m. Infilled interior. Site fenced.	None. Feature already fenced	Issue 10 (Policy 10) and Issue 11 (Policy 11c)	L (L)	None. Feature visible from footpath.
Not in report Site B	Unrecorded lode/stope outcrop (SX4378 7283)	Rock outcrop with two parallel C18 stope excavations	Timber bridge over northern rock outcrop/stope, continue timber walkway across second infilled stope	Issue 7 (Policy 7e)	L (L)	Ground impact of 0.3m depth for bridge/walkway foundations

5 Assessment of impact and mitigation

5.1 Impact significance definitions

The potential impacts during works are described below (and summarised in tabular form in Section 4), for each site. Impacts are described in the text section for each site on a feature-by-feature basis. The following site impact terms are used within each site identification description relating to the impact assessment and site gazetteer:

Major positive	Site continues in, or is restored to, its original design and use		
Moderate positive	Site restored as far as possible respecting its original function, but its use is altered		
Minor positive	Site partially restored; interpretation introduced		
Negligible positive	Stabilisation/maintenance of site		
Negligible negative	Benign neglect – losses of fabric over a long period of time		
Minor negative	Site suffers areas of alteration or damage, which contribute to loss of meaning		
Moderate negative	Significant loss of fabric or alteration, leading to erosion of original character		
Major negative	Complete demolition/removal		

5.2 Building conservation works

5.2.1 Site impact and remediation summary

The TVMHP has included all the track creation/building conservation works within the new Bedford Trail site into a single programme starting from January 2012 to the end of 2012. It is likely that the successful tenderer will undertake all the trackway works, although the site fencing may also be tendered.

There is no detailed schedule of works and specifications report. However, there has been a process of site consultation with the TVMHP site archaeologist to ensure that the nature and extent of the proposed works/impacts for every site is mitigated and minimised.

Figure 3 indicates the proposed route of the new trail, and the proximity to known archaeological sites. For the most part the site works to form this track along the steeply sides of the Tamar Valley – crossing a number of unrecorded lodes/stopes, to access the former 18th century mine workings and the lower parts of the 19th century Bedford United Mine, are formed by using existing routes along leats, old tracks and forming new ones, some with timber steps. In at least two locations, timber walkways and low impact bridges will need to be constructed with locally sourced timber, to cross lode outcrop workings and infilled stopes.

There is only one site for building conservation (Site 17). A tall conifer tree is to be removed (its roots have affected the masonry and structural stability). Soft and crumbling mortar will be removed (to a maximum depth of 40mm) from the masonry walls following a detailed site assessment of the feature by the site contractors (Darrock & Brown). The style and depth of re-pointing (slightly recessed from the masonry face), will mimic that of the original and will be decided when the test mortar panel is agreed with the site contractors and the historic buildings consultant. Site meetings and consultations will be held to ensure compliance with heritage building conservation guidelines.

Other general impacts:

Site compounds and site (vehicular) access

Figure 2 shows the location of the Woodlands car park which will site the compound and toilet (if necessary). Vehicular and pedestrian access to the site will also be via the Woodland car park.

Impact reduction measures:

A method statement will be produced by the TVMHP, and (where relevant) by the site contractors in order to promote a reduction of the impact of creating the new track works on the fabric and character of the site.

For the small conservation scheme (Site 17), only loose lime mortar will be removed from walls and replaced with a new equivalent. The style and colour of the new mortar will reflect the style and colour of the existing so reducing the visual impact of the conservation works. An historic buildings consultancy and archaeological recording during the site works may be able to minimise any further below ground site impacts, but also record any visible/disturbed archaeological features and to record the nature and extent of the building conservation works. A CC project design for this function has been produced in the Appendix (9.3) at the rear of the report.

Residual impact mitigation:

There will be the residual impact of the creation of a new footpath (timber stepped at steep locations), along a short section of the Tamar Valley. However, the residual visual impact will soon fade, as the benefits in terms of increased public access and increased site information will come to fruition as a substantial public gain.

For the small building conservation project, there will be the visual effect of new pointing – although this will fade in time. But by using the mechanism of trial test panels for matching new lime mortar aggregate mixes with the existing colour and pointing style, etc, it is hoped that the new lime mortar pointing will be very similar to the existing, resulting in little visual impact.

It is certain that there will be regular visiting members of the public throughout the year, and that there will be an increase in site visitor numbers. However, the scheme has been carefully and thoughtfully designed by the TVMHP to minimise negative affects to the character of the site.

5.2.2 Site inventory impact description and remediation measures

The following sites are described in more detail in each relevant archaeological assessment report (DGC Mine, Buck 2002, 6-17, and Bedford United Mine, Buck 2003, 14-16), summarised in bold in Section 4.1 and shown in the relevant site plan in Figures 1 and 3. All the sites mentioned are summarised in Section 4, and with have variable impacts – but some are very low (i.e., only visible from the new trackway. Therefore the following detailed site descriptions only refer to site or safety impacts that have a direct physical impact (sites in bold). The works on each site is described, followed by a section describing the reduction (or mitigation and remediation) of the impact, followed by a final section which details the residual impact. To avoid repetitive duplication in this site inventory section, site impact and remediation measures already given in Section 5.2.1 are not reproduced – simply referred to.



New circular track from Woodlands Car Park

(Figs 1, 3 and 4 for site location)

Site impact

Figure 4 is a plan of the various boardwalks, bridges, lined timber paths (due to the steep slopes), steps and re-used tracks throughout the course of the new circular trail route. The impact of all of these involves the on-site construction of ground level natural oak timber features, whose design and use will minimise the impact of the scheme which is in a woodland setting, and of great historic character. The approximate locations of archaeological features within Bedford United Mine are shown on Figure 3 and are also described in detail in this section.

Part of this project will necessitate the creation of a new track route along the steep Tamar Valley sides – by cutting and infilling, then using oak timber edging to form the side of the trackway. Other sections will consist of fixing and insertion of oak timber steps and short posts (of varying sizes), into the ground. These impacts should be minimal. However, the main impact is the visual effect of these new features on the setting and character of the woodland landscape.

The overall impact of these proposed works on the site can be defined as '*Negligible positive'*. The works will provide a greater element of safety and minimise footfall, although it will negatively affect the site's visual authenticity as a natural woodland environment.

Reduction of impact measures:

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to its route, location and extent. It is recommended that Tamar Valley volunteers walk the route twice a year to assess footfall damage, and if necessary propose remediation measures to reduce erosion affecting the nature, form and profile of the leat.

Residual impact mitigation:

There will be residual visual impacts of the track and mine site hazard fencing as well as the excavation for short sections of track creation itself. The natural oak timber fencing will complement the surrounding deciduous tree landscape, and will naturally discolour and age, in its original woodland setting.

Leat (18th century) (Site 2) (SX 43745 72791 to SX 43626 7253)

Site impact

The main impact on this leat will be footfall along its former water channel earth remnants. It is likely the original leat would have been lined with planking, or moulded river clay along its base. The earthwork remains are fragmentary, and seems to have been widened in places to form a track. Fencing will be necessary at some sites; either near mine outcrop/shaft/adits, etc or due to steep slopes on the down-slope side.

The overall impact of the proposed works on this feature can be defined as '*Negligible negative'*. The works will provide a safe footpath access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber boardwalks (see Figs 4b, 4c, and Fig 9 for their location and extent).

Residual impact

The main significant residual impact is the presence of occasional fencing along the new route, a new small bridge (Appendix 9.1 Site 4b) and two other boardwalks. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate.

Stope (lode outcrop) (Site 3) (SX 43740 72637)

Site impact

The main impact on this natural lode outcrop (evidence of a former 18th century stope mining operation: Marquis Lode, is the construction of a low profile boardwalk across the sides of the infilled stope and fencing across two former adits/stope access (see Fig 3, 4b and Appendix 2: Sherrell 2012, fig 4c for location). The rock outcrop will be drilled and steel dowels inserted through concrete pads (dimensions to be calculated on site – see Appendix 2, Fig 8), upon which the boardwalk will be founded. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber boardwalk, its location and extent.

Residual impact

The main significant residual impact is the presence of a new small bridge and boardwalk. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate.

Adit/Stope (Site 11) (SX 43726 72605)

Site impact

The main impact on this small exploratory adit outcrop evidence of a former 18th century stope mining operation (Marquis Lode) is mainly visual. A low fence will be constructed across the site entrance. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber bridge/boardwalk, location and extent.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

No 1 Shaft (Site 14) (SX 43742 72544)

Site impact

The main impact on this shaft is mainly visual. A fence will be constructed around the shaft (where appropriate using the existing postholes). The timber is to be locally sourced from the adjacent woodlands. A fence will also be located across the deep excavation to its west – possibly a related stope working. As public access is possible to this side of the shaft (see Fig 3 and Appendix 2: Sherrell 2012, fig 4d for site location).

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and nearby information boards will inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the shaft fence (rounded posts and wire fencing – in the style of other TVMHP shaft fences).

Residual impact

The main significant residual impact will be the presence of a newer tanalised timber, possibly higher, fence (replacing the existing inadequate one). It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of this section of the Tamar Woodlands and Bedford Mine.

Wheelpit masonry wall/tail race tunnel (Site 17) (SX 43771 72626)

<u>Note</u>:

This site, during the 2001 site assessment survey was interpreted to be a reservoir pond, with connecting leat to the wheelpit to the south west (Buck 2003, Site 17, 43). However, further assessment (and better field survey conditions) has resulted in a re-evaluation of the form and function of this site. It is now interpreted as a wheelpit (with attached crusher/stamps to the north) – contextually related to a probable nearby primary dressing floor.

Site impact

There are two masonry walls. An upper section of wall 1.0m wide and 1.2m high (0.6m thick), has become structurally unsound as the roots of an adjacent tree have caused damage throughout. The tree is to be carefully removed, and the wall rebuilt in places and repointed throughout (see Fig 6, a view of the site before works).

Approximately 1.0m below this is an underground wheelpit tailrace tunnel measuring 0.5m wide and 0.6m high and approximately 5.0m long to a collapse (Buck 2003, fig 12), which leads into the adjacent leat (Site 17.1). The tunnel arched portal stone has collapsed, and will need to be replaced, also the front wall will need to be repointed.

Reduction of impact

The stones to be used will, if possible, be the original stones that have fallen out of the wall. If there are insufficient stones, new stones should be used (from a similar quarry source), and should match the original in terms of colour and size. The style and colour of the new mortar will reflect the style and colour of the existing so reducing the visual impact of the conservation works. An archaeological watching brief recording during the works may be able to minimise any further site impacts, but also record any visible/disturbed archaeological features (Refer to Section 5.2.1).

The works will provide more structural stability and enhance the site's visual authenticity for at least another generation. The overall impact of the proposed works on this feature can be defined as '*Negligible positive*'.

Residual impact

Refer to Section 5.2.1.

Leat (Site 17.1) (SX 43771 72626 to SX 43715 72595)

Site impact

The main impact on this narrow (0.4m) leat starting from the end of the tail race, will be limited wear and tear along its course (approximately 80.0m which leads to Sites 38 to 40), due to footfall as it is used as part of the new trackway. There will be no additional material brought in for the footpath. A low fence will be constructed across the side of the leat where there is a steep drop (adjacent to Site 14). The fence timber is to be locally sourced from the surrounding woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the direction of the route and design of the fencing.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

Tailings dump/dressing floor (Site 42) (SX 43718 72516)

Site impact

The main impact to this long section of tailings dump and possible dressing floor adjacent (north side), is one of footfall. The proposed track route will be between the Philips lode outcrop features (Sites 9, 12 - 14), and the main tailings dump in the valley. Parts of this route are quite flat, and were probably formed for a dressing floor (unless the original 19th century site was over dumped in the 1920s). In places, due to adjacent steep drops to the track route, a low fence will be constructed. The timber is to be locally sourced from the adjacent woodlands.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the direction of the route and design of the fencing.

Residual impact

The main significant residual impact will be the presence of a new low fence. However, natural oak/chestnut timber is being used for the works where possible. It is expected

that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

Unrecorded stope/lode outcrop (SX 43779 72832)

Site impact

This site (not discovered during the 2003 archaeological assessment), is indicative of evidence of a former 18th century stope mining operation (Marquis Lode). The main impact on this natural rock outcrop (and mine stope) is the construction of a low timber bridge (see Fig 3 and Appendix 2: Sherrell 2012, fig 4b for location), over the open stope to permit access along the new track. The rock outcrop will be drilled and steel dowels inserted through concrete pads (dimensions to be calculated on site – see Appendix 2, fig 8), upon which the timber bridge (with handrails) will be founded. The timber is to be locally sourced from the adjacent woodlands (see Appendix 2: Sherrell 2012, fig 4b for site details).

On the south side of the open stope is another parallel working, another stope but infilled, presumably of similar date. A timber boardwalk (of similar wood to the nearby bridge) will be constructed over the top of the stope, founded on either side by timbers.

The overall impact of the proposed works on this feature can be defined as '*Negligible positive'*. The works will provide a safe access route and inform the site's mining background to its visitors.

Reduction of impact

The site contractors and the TVMHP will attempt to minimise the visual impact of the scheme by giving careful thought to the design of the timber bridge and boardwalk, location and extent.

Residual impact

The main significant residual impact will be the presence of a new small bridge and boardwalk. However, natural oak/chestnut timber is being used for the works where possible. It is expected that there will be a steady increase of site visitor numbers, as local walkers learn of and appreciate the character and history of the Tamar Woodlands and Bedford Mine.

5.3 Fencing works

Safety remediation works to mine shafts and adits in proximity to newly opened tracks and footpaths have been undertaken during the TVMHP for past three years. The specifications for these works have been formulated and constructed with the agreement of TVMHP and the Devon Historic Environment Service. For this trail section, there are some steep down-slope sections adjacent to the newly created footpath that engineers advised to be fenced. Figure 4 is a summary plan showing the proposed works along the route of the track, and detailed drawings in Appendix 9 show the main site locations. Archaeological recording and consultancy have been undertaken during these works by HE Projects, Cornwall Council. An archaeological watching brief report will be produced to include both the fencing/trail works and building consolidation works. Many of the new shaft fences will need to have safety warning signs attached (to the existing fencing).

5.4 Public access & interpretation

5.4.1 Site description, site impact and impact remediation

Public access is restricted to well-defined (multi-use and trackway) routes within and from Devon Great Consols to Bedford Mine are primarily in private ownership.

Site interpretation facilities are to be installed at the Tavistock Woodlands car park (SX 43829 728969), in a newly built 'Orientation centre'. Smaller and site specific

information boards and sign posts/way-link guides will be distributed along the new Bedford trail at appropriate sites. However, in addition, web based site information and leaflets are planned for production by the TVMHP via the Tamar Valley Area of Outstanding Natural Beauty (TVAONB).

An archaeological watching brief recording and archaeological consultancy during the fencing safety works may be able to minimise any further site impacts.

Site impact

The overall impact of the public access and interpretation project on the site can be defined as '*Negligible positive*', and of very low impact. The works will provide a greater element of site information and safety and should not negatively enhance the site's visual authenticity.

Residual Impact

Fencing, signage, etc will have a localised, visual impact on the site and increased trampling may damage habitat/disturb wildlife.

Reduction of Impact

The visual impact of fencing, signage, etc will be reduced through careful project design, siting and installation of these features. Limited public access is to be provided, routed away from sensitive/hazardous areas.

5.5 Description of impacts during the post-project stage

The TVMHP aims to utilise a newly created localised network of multi-use trails (using former railway lines and footpaths), in and around the mining landscape of Devon Great Consols southwards to Morwellham Quay (via Bedford United mine, and Wheal Russell Mine to New Quay). It is likely that in the future these will link up to other footpath and trail routes in the west Devon area (and possibly into to Kit Hill in Cornwall, etc). As a result there may be the physical consequences in the short term of having a slightly greater number of people visiting these sites than previously. In addition there will be an ongoing need for annual vegetation maintenance from some paths and buildings with very occasional repair of occasional dislodged masonry. It is expected that the TVAONB will undertake site inspections (utilising public volunteer groups as part of an agreed management plan), along trackways and parts of the site that are subject to building conservation works.

The TVAONB has produced a ten year management and maintenance plan (2006), in order to define and advise the various groups (for example, volunteers) that will be involved in managing and maintaining the archaeological features within both Scheduled Monument areas and other adjacent World Heritage Site areas (Area 10: Tamar Valley).

Bedford Mine Trail IA CB September 2012



Figure 4 Site plan of proposed works along the route of the new Bedford Mine Trail (Sherrell 2012)

Bedford Mine Trail IA CB September 2012



Figure 5 A view of the end of the wheelpit tail race tunnel and wall before works. Site 17.

© CC HE Projects 2012



Figure 6 An internal view of the upper Marquis Adit stope before works Site 7 © CC HE Projects 2002

5.6 Residual impacts

Any short-term residual and regular maintenance issues (vegetation growth and possible vandalism), will be inspected (and work undertaken) by the TVAONB volunteer group. This should ensure that impacts to the site, if they occur, should be short-lived and quickly mitigated.

After the building conservation work has ceased and the site is open to members of the public, the main residual impact will be visual – in terms of new fencing and new lime mortar repointing. However, after a relatively short period of time the lime mortar will fade to a colour sympathetic to the existing colour, with the positive residual impact being that the building is conserved for at least another generation.

5.7 Assessment of impact on historic landscape character

The steeply sloping sides of this Tamar valley site are heavily wooded, hiding extensive evidence for past mining activity during the past three centuries. The landscape is characterised by numerous old mine shafts and adits, large and small spoil heaps, quarries, and other earthworks and mine transport infrastructures associated with its mining heritage of working clusters of lodes that culminated in the Tamar Valley being Europe's largest producer of copper ore in the 19th century.

Devon's Historic Landscape Characterisation project has been consulted and characterises most of the area as 'Ancient Woodland' and 'Woodland'. There is no doubt that given the steep slopes, it has been used for woodland since at least the medieval period, if not beyond. The site has been (since the 1960s been planted with conifers – only the very steep slopes still retain some semblance of its mixed deciduous origins.

The existing management of the site, and its impact could be defined as being of 'partial benign neglect – losses of fabric over a long period of time'. If work is not undertaken as soon as possible to the remainder of the site this process is set to continue and worsen – with in some cases the strong likelihood of having further serious structural collapse to the wing walls of the engine houses. The TVMHP aims to conserve the most important significant sites within the upper reaches of the Tamar Valley.

The overall impact of the proposed works on this significant site can be defined as **Negligible positive**: *Stabilisation/maintenance of site*. Within the project area the landscape character will be changed in the short term through track creation, vegetation clearance, particularly repairs to the building fabric. On balance the negative effect of these changes are minor and will diminish in the short term while providing a safe site for close public access to view mine buildings that represent the last working phase of an important mine, and to provide interpretation to understand an industrial process that operated for at least a century.

6 Impact mitigation strategy: archaeological consultancy

The impact mitigation strategy methodology is described below in three main stages: The pre-works consultancy, the historic buildings consultancy during works and the archaeological recording record (during and after works). This mechanism demonstrates the steps that have been taken to avoid or minimise adverse impacts, confirms that the proposed works have been designed in close liaison with the historic environment consultant. This is based on a clear understanding of the significance of the site using appropriate methods and techniques for site monitoring and recording.

6.1 Pre-works consultancy

The process developed by the Historic Environment Service, CC when undertaking historic buildings consultancies includes an important element of mitigating the impact of the works on the site during the project planning and specification stage. This

process has been ongoing during the past year. It has included an extensive dialogue with the project's structural and geotechnical engineer and mining landscape consultants. When the minimal impact of the scheme on any historic feature, landscape resource and historic character has been achieved as far as possible, the scheme progresses to any statutory/non statutory consent application and then the tendering stage for site contractors leading to site implementation works.

6.2 Historic Buildings Consultancy

The TVMHP manager has commissioned an Historic Buildings Consultant (HBC) based on the CC project design (re-produced in Appendix 9.3). Once the project details and specifications have been agreed and contractors commissioned, the project team (project manager/structural engineer/ecological consultant/historic buildings consultant), will ensure through dialogue that the impact of the conservation works by the site contractors is minimised as far as possible. For example, mortar test panels for building conservation works will attempt to minimise the visual impact of new lime mortar repointing and to attempt to replicate the existing style and finish of the existing mortar. Method statements will be sought from the site contractors to describe how (for example) working with lime can be achieved under variable weather conditions (although guidance will be given as part of the works specifications).

The HBC will monitor and advise on compliance to ensure (through a site meeting), that the methodologies and techniques of all aspects of the site works accord with the method statements and agreed methodologies outlined in any schedule of works and Specifications. In addition the TVMHP Principal Officer will enforce requirements based on the HBC advice. However, as a general philosophy, the extent of re-pointing and structural repairs on all buildings will only be minimal in order to ensure structural stability and conservation of the building for at least another generation.

A site meeting will be held at the completion of works to ensure that the site contractors clear the site of all debris, etc and to undertake a final visual check of the completed works. Site monitoring meetings and communication strategies with CC (WHS Advice), are also described in detail in the CC project design (Appendix 9.3).

Consultancy with other related specialists prior to and during the works (for example Geotechnical and Structural engineers, and the TVMHP manager), will be an ongoing process, an integral part of the Historic Building and archaeological consultancy, in order to create a site that will not be unduly affected by loss of significance or historic character as a result of carrying out the works, but rather its access, historic importance and site interpretation is enhanced by the project.

Regular site progress updates (every two weeks) will be provided by the HBC to the TVMHP Principal Officer and DCC archaeology (Bill Horner), usually in the form of emails. If an issue regarding a structural remediation technique or where the remediation works may go beyond that given approval by existing consents, as much advanced notification as possible will be given to DCC archaeology for a site consultation, etc.

6.3 **Programmes of archaeological recording**

The TVMHP will commission an historic buildings consultant who will also undertake the archaeological watching brief recording and production of a final report. A CC project design describes a detailed programme of archaeological recording, site monitoring and watching brief report production (Appendix 9.3). DCC archaeology and the Historic Environment Service, Cornwall Council (Advice) should approve this before works start.

Given the very small amount of masonry reconstruction/repointing, the detailed on-site archaeological recording techniques will only include detailed site photography (Black/White and digital colour). The archaeological recording report will include detailed 'before and after' site photographs as well as a descriptive text of the general works (refer to Appendix 9.3).

7 References

7.1 Primary sources

DRO Mine Plans:

MRO (R29B, R19A, 190, 15307, 15317, 13949, R19B, 3260)

T1258M (Bedford Estates Archive-leases, maps and Reports on Mines/Quarries)

Sherrell, F., 2000, Devon Great Consols and Bedford United Mines: Report on the results of a desk study and surface reconnaissance inspection, Report No. 1915

- Sherrell, F., 2002, Devon Great Consols and Bedford United Mines: A preliminary risk assessment in relation to public access within the site, Report No. 1915/2
- Sherrell, F., 2011, Proposed footpath below Bedford Sawmills, Gulworthy, Devon (A preliminary risk assessment in relation to public access within the site, Report No. 3685
- Sherrell, F., 2012, Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Report No. 3685

Symons, B, 1848 A Geological Map of the Tavistock Mining District, Cornwall, Truro TVMHP., 2006, *HLF TVMHP Management Plan*

7.2 Publications

Barton, D.B., 1961, A History of Copper Mining in Cornwall and Devon, Truro.

Barton, D.B., 1964, Historical Survey of the mines and mineral railways of East Cornwall and West Devon, Truro

Bennett, A., 1992, Images of Cornwall, Runpast Publishing

Booker, F., 1971, The Industrial Archaeology of the Tamar Valley, Newton Abbot

Brooke, J., 2001 ed Kalmeter Journal, Twelveheads Press, Truro

- Buck, C., 1998, *Preliminary assessment of industrial sites of archaeological importance*, CAU Report
- Buck, C., 2002, *Devon Great Consols Mine Assessment Report*, CAU Report (2002R069)
- Buck, C., 2003, Bedford United Mine Assessment Report, CAU Report (2003R043)
- Burt, R., Waite, P., and Burnley, R., 1987, *Cornish Mines: Metalliferous and associated Minerals 1845-1913,* Univ of Exeter

Collins, J.H., 1912, Observations on the West of England Mining Region, 1988.

- Dines, H.G. and Phemister, J., 1956 (reprinted, Beer, K.E., 1988), *The Metalliferous Mining Region of South-West England*, HMSO
- Jenkin, A.K.H., 1974, Mines of Devon, The Southern Area, Vol. 1 David and Charles

Patrick, A., 1983, *Copper production in the Tamar Valley in the Eighteenth Century*, Tamar Journal, Vol 5

Richardson, P, H, G., 1992, Mines of Dartmoor and the Tamar Valley after 1913

Thorpe, S, 2005, *Cornwall and West Devon Mining Landscape-Management Plan*, HES/CC

7.3 Websites

<u>http://www.stastier.co.uk</u> A particularly useful website by the manufacturers of St. Astier brand lime products detailing methodologies for their application.

<u>http://www.cornishlime.com</u> The website of the Cornish Lime Company

<u>http://www.matchingbrick.co.uk</u> A useful website for those seeking matching brick for the repair of historic structures

8 **Project archive**

The HES project number is 2012010

The project's documentary, photographic and drawn archive is housed at the offices of Historic Environment, Cornwall Council, Kennall Building, Old County Hall, Station Road, Truro, TR1 3AY. The contents of this archive are as listed below:

- 1. A project file (2012010) containing site records and notes, project correspondence and administration.
- 2. This report held in digital form as: G:\TWE\Waste & Env\Strat Waste & Land\Historic Environment\Projects\Sites\Devon\Bedford Mine Trail 201210\IA Report\Bedford Mine trail IA 2012010.doc
- 3. Oasis No. 134883

9 Appendices

9.1 Appendix 1: Sherrells Ltd (Geotechnical Engineers) Letter report plans, *Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter* Report 8/2/2012 No. 3685 (Figs 4b-4d, 10)



<u>Note</u>: Specifications for the Revised bridge location (Unrecorded Lode) is shown in Appendix 9.2 (Alastair Guy drawings). The southern 'bridge' site will have a boardwalk.



<u>Note</u>: The 'revised bridge location' shown on this plan will now site a fenced (with handrail) low impact boardwalk.


<u>Note</u>: It is likely that there will low impact site information boards near the viewing area to view part of the former Bedford United Mine site. All fencing will be timber and low visual impact. Shaft 13 will also be fenced.

Bedford Mine Trail IA CB September 2012



Sherrells Ltd (Geotechnical Mining Engineers) Letter report plans, *Letter to TVMHP RE: Proposed footpath below Bedford Sawmills, Gulworthy, REF: Letter* Report 14/6/2012 No. 3685 (Figure 10)

9.2 Appendix 2: Alastair Guy & Sons Letter report plans (July 2012), *Plans for TVMHP RE: Proposed Bridge Crossing: Lode workings (end and side views)*



9.3 Appendix 3: Historic Buildings Consultancy and archaeological watching brief project design

Tamar Valley Mining Heritage Project:

Written Scheme of Investigation - Historic Building and Archaeological Recording Consultancy 21/7/2006

Client: Tamar Valley Mining Heritage Project,

Client contact: C Hariades, Tamar Valley Mining Heritage Principal Officer

Client tel: 01872 888125

Client email: <u>chariades@cornwall.gov.u</u>k

1 Background

1.1 Introduction

The Tamar Valley Countryside Service, through the Tamar Valley Mining Heritage Project Officers, is managing conservation works to five historic industrial/mining sites in West Devon (Tamar valley) as part of the second stage of a Heritage Lottery Funded Mining Heritage Project. All of the sites are located within the proposed Cornwall and West Devon Mining Landscape World Heritage Site (see Thorpe, 2005 and Buck 2002-6).

There are other site works that are listed in the project's Heritage Sites Programme, but which are not covered in this Written Scheme, but are subject to different project designs (WSI's):

- 1. Trails and safety works consultancy and watching brief (all mine sites)
- 2. Archaeological (sub-surface) watching brief recording (new car parks at Tavistock woodlands, Morwellham, New Quay and new build at Morwellham)
- 3. Tavistock Canal archaeological consultancy and watching brief
- 4. Tavistock to Bere Alston Railway archaeological consultancy and watching brief

This Written Scheme of Investigation (WSI) has been prepared by the Historic Environment Service (Projects), Cornwall County Council, to set out how the Historic building and archaeological recording consultancy works are to be undertaken. These consist of an appropriate level of historic building consultancy work and historic building and archaeological recording which are likely to be required by conditions on the appropriate Planning, Listed Building Consents (LBC) and Scheduled Monument Consents, which are yet to be granted (see Appendix 1). These conditions are likely to require that a WSI should be produced by the archaeological contractor for:

(1)An historic buildings and safety works consultancy for the supervision of conservation works and

(2)A programme of historic building and archaeological recording

The preferred WSI will be submitted by the Tamar Valley Mining Heritage Project (TVMHP) Principal Officer to the Devon County Historic Environment Service (DCHES), the Local Planning Authority (LPA) where relevant, West Devon Conservation Officers, English heritage (for Scheduled sites), and the World Heritage Site Advice Team, CC, for written approval before work begins on site.

1.2 Project Background

No conservation works have previously been carried out to Tamar Valley (Devon) industrial mine sites and trails. The site work involves building consolidation and

provision of safe public access within five mining heritage sites (mainly former mining or industrial complexes), and the creation of a number of new trails (c 20Km, not including the railway or canal). Many of the mine sites contain significant heritage assets. Extant engine houses (some Scheduled Monuments), substantial ore quays and lime kilns are located on some sites, and all contain a number of mine shafts, legacies of the site's industrial past. Project funding will seek to make these sites safe and more accessible for a greater number of people, both for the local communities and visitors.

The five main sites which are to be conserved (Devon Great Consols, Bedford United Mine, Morwellham, New Quay and Gawton) are to be made publicly accessible, funded to a large degree by the Heritage Lottery Fund (HLF) and Objective 2. Each individual site has been subject to an archaeological assessment, a structural assessment by certified Structural Engineers and where necessary a Geotechnical Engineer. Also additional assessments have been carried out by a mineralogist, and an ecologist. All of these sites (and others), and the heritage trails between them have also been subject to a Conservation Management Plan, prepared as part of both the Stage 1and 2 bids.

Archaeological assessments have been undertaken (Buck 2002, 2003, 2005-006) containing historical research, copies of historical maps, photographs and plans of the sites, a description of each structure and colour photographs of each main structure. In addition the reports identified general repair proposals for each structure. Detailed recommendations for each building (on elevations and plans as agreed by the Consulting Engineer and the Historic Buildings Consultant), will be made as part of the Scheduled Monument Consent and tender specification document stages.

2 Site information and structures to be treated

The suggested level of archaeological consultancy/recording for each site should be referred to when reviewing Section 2 below.

2.1 Devon Great Consols and Bedford United Mines

(January 2012 – March 2012)

Opening 2km of a new footpath route within the former Bedford United mine and parts of Devon Great Consols mine, utilising existing forest tracks and features. The routes have been designed to make the most of the natural beauty and archaeological history of the area, while at the same time avoiding disturbance of local residents, sensitive ecological sites and the landowners working areas.

Carrying out safety works within a buffer zone of the new track, including fencing mine shafts and fitting metal bars to adits.

Consolidating archaeological remains at 35 sites, including work to preserve the arsenic condensers, calciners flue and chimney that form the Devon Great Consuls scheduled ancient monument. Arsenic conservation works (Scheduled Monument) to be carried out Dec 2007 – July 2008.

SITE INFORMATION AND STRUCTURES that may be affected (Devon Great Consols, Buck 2002)

• Archaeological features on Thomas/Watsons Lode (Sites 374, 375, 376, 376.1)

SITE INFORMATION AND STRUCTURES that may be affected (Bedford United Mine, Buck 2003)

- Archaeological features on North/Tavistock Lode (Sites 1/1.1, 4, 5)
- Archaeological features on Marquis Lode (Sites 3/3.1, 7, 8, 11)
- Archaeological features on Unrecorded Lode (Sites 12, 13, 14)
- Archaeological features on Phillips Lode (Sites 9, 10)
- Conservation repair of masonry tail race walls to stamps/crusher wheelpit (Site 17)
- Sites 15, 17.1, 18, 39, 41, 40, 42

3 Aims and objectives

The purpose of the historic buildings consultancy, historic buildings recording and archaeological recording is:

- To ensure that site works are undertaken in such a way as to maintain the integrity and authenticity of the historic resource, minimising adverse impact upon the resource.
- To ensure that the highest possible standards of workmanship are maintained during the conservation works, which must be carried out to recognised current best standards in this discipline.
- To ensure that works are undertaken in such a way as to allow adequate recording of remains affected by the works,
- To record sites, features, deposits and artefacts affected by or uncovered by the works.
- To record the character and extent of works to the sites.
- To disseminate the results of the project appropriately and arrange for the deposition of the project archive.

4 Working methods

All archaeological recording work will be undertaken according to the Institute of Field Archaeologists *Standards and Guidance for Archaeological Investigation and Recording.* Staff will follow the IFA *Code of Conduct* and *Code of Approved Practice for the Regulation of Contractual Arrangements in Archaeology.*

The principal factor in effective project delivery will be the employment of key project staff who are expert in the management and recording of the industrial heritage. Cornwall Historic Environment Service project staff are able to draw upon a substantial track record in undertaking similar work throughout Cornwall, as well as a detailed knowledge of the project area and its sites.

4.1 Historic buildings consultancy

- HES (Senior Archaeologist) will attend a pre-works meeting to agree site access and site compound and stockpile areas in order to minimise damage to archaeological features, agree site compound location, agree details of location/preparation/number of mortar test panels, agree working methods and any changes to proposed work programme and discuss Health and Safety issues and requirements.
- The HES (Senior Archaeologist) will liaise with the Devon County Historic Environment Service - DCHES (Bill Horner), West Devon Conservation Officer (Stephen Gill/Roger Duce), English Heritage (Inspector for buildings and ancient monuments (Shane Gould) the WHS Management team (Phil Copleston) and the TVMHP Officers (Chris Hariades and Richard Halliwell). The HES Senior Archaeologist will liaise with any additional archaeological recording officer on the extent of works carried out and the appropriate level of recording.
- HES (Senior Archaeologist) will provide historic building conservation advice to the site engineer and site contractor in line with English Heritage guidelines (referred to in section 7 below) during regular site visits.
- It is anticipated that an HES Senior Archaeologist (Colin Buck), will undertake Historic Buildings Consultancy as part of this work. This person will also photograph the buildings before, during and after works take place – liaising with any additional project recording archaeologist and undertake to fulfil any specific recommendations made by DCHES and DCMS as part of the Scheduled Monument Consent.
- The HES Senior Archaeologist will attend regular site meetings at an approximate frequency of 0.5 day per week for each building contract. The meetings will be held with the site engineer, site contractor and possibly the appropriate District

Conservation Officer, as appropriate, to discuss ongoing site conservation work methods, detail of repairs and resolve any conservation work problems. It is assumed that the structural engineer and site contractor will have a proven track record in historic building conservation.

- The HES Senior Archaeologist will liaise with any additional archaeological recording officer on the extent of works carried out and the appropriate level of recording.
- HES will ensure that site conservation works are carried out to standards recommended by English Heritage best practice, and will halt inappropriate or substandard work and inform DCHES, the building engineer and TVMHP Project Officer.
- HES will advise the Structural Engineer/TVMHPPO (Pete Leaver/Tom Fletcher), where
 variations to repair and conservation work and recording may need to be agreed
 with the LPA/English Heritage; this will be discussed with the DCHES (Bill Horner) in
 the first instance.

4.2 Fieldwork: historic building recording

- Detailed archaeological recording will be undertaken for all newly exposed architectural features and any features revealed through excavation. Recording will also include the extent of repointing and rebuild.
- Historic building recording will be undertaken by a Senior Archaeologist (Historic Buildings Consultant Colin Buck or a suitably experienced HES archaeologist).
- As well as new detail, the nature and extent of all conservation works will be added to the existing archaeological/engineering building survey drawings (to be supplied to HES by the client).
- Measured survey will be carried out by hand measurements (using offset techniques at a scale of 1:50), using a paper copy of the survey supplied by the Client. This record will then be added to the original survey using CAD (or equivalent) software.
- The resulting survey output will be a revised measured survey drawing showing all conservation works that have been undertaken. This will be reproduced at a scale of either 1:50 or 1:100 (appropriate to the size of area recorded) and will form part of the Historic Buildings archive watching brief report.
- Analysis of the building fabric will be recorded in the form of field notes and written up at the archive report production stage.

4.3 Fieldwork: archaeological recording during mine shaft and safety works treatment

- The DCHES (Bill Horner) has advised that archaeological recording should be undertaken during any excavation that has revealed archaeological features. Recording will be undertaken using a mix of direct measurement, sketch plotting and photography, as appropriate (constrained by safety factors).
- Where significant remains are encountered the site archaeologist will be given the opportunity to make an appropriate form of record before work proceeds; where a temporary stop of work is required to undertake this, the site archaeologist will make a request via the project resident Engineer.
- If archaeological deposits of a regional or national importance are uncovered, contingency should be allowed within the works programme to review options to ensure their preservation in situ. In the event that significant remains cannot be preserved in situ, strategies for their relocation or detailed recording will be agreed with the Devon County Archaeologist.
- Any variation in named personnel for archaeological recording and historic buildings consultancy will be agreed with DCHES, and the TVMH Project Officer.
- The chosen site archaeologist will adhere to Health and Safety Policies (see below), under the direction of the designated Site Safety Officer.

4.3.1 Site recording (general)

- Site drawings (plans, sections, locations of finds) will be made by pencil (4H) on drafting film; all plans will be linked to the Ordnance Survey landline map; all drawings will include standard information: site details, personnel, date, scale, north-point.
- The site archaeologist will undertake recording in line with recommendations given by IFA. Sections and plans will be drawn on site at appropriate scales which will adequately record structures or features at appropriate levels of detail, and appropriate sections reproduced in the archive report at either 1:50 or 1:100 to adequately demonstrate revealed archaeological features.
- All features and finds will be accurately located by means of a National Grid reference.
- All archaeological contexts will be described using a standard format and linked to a continuous numbering sequence.
- A location plan will be made which will allow site detail to be accurately placed within the context of the Ordnance Survey Landline mapping.
- The archaeological watching brief report will detail (and if appropriate summarise) all forms of archaeological recording that has been undertaken at each of the mine sites. Each major mine site will have a single archaeological watching brief report that details all project related work to that site (ie trails works, building conservation works, interpretation works etc).

4.3.2 Treatment of finds

- It is recognised that fieldwork may produce artefactual material.
- It will be important to agree the arrangements for deposition of any finds prior to the start of the project, and ensure that transfer agreements are arranged and signed..
- An allowance has been made for discussions with landowners for the deposition of archaeological finds in an appropriate museum have been included in the cost tender.
- All significant finds in stratified contexts will be plotted on a scaled base plan and described.
- All finds will be collected in sealable plastic bags which will be labelled immediately with the context number or other identifier.
- Plymouth City Museum is the designated museum. Their guidelines should be followed and accession numbers for finds and archives for each project should be obtained at the start of the project. Unless otherwise agreed, mining-related artefacts and small finds to be removed from site will be deposited at the Plymouth City Museum, pending detailed discussions over their final place of deposition or loan to other local smaller museums and interpretation centres (for example Morwellham and Tavistock) etc.

4.3.3 Photographic recording

- 1. Black and white scaled photography using either a 35mm camera or medium format camera using fine grain archive quality film (400ASA).
- 2. Provision will be made for a range of lighting conditions and the photographic equipment will be available to the historic building recording personnel listed in the WSI.
- 3. Each shot will be carefully composed, focused and lit appropriately with a flash gun if necessary. The photo record will comprise:
- general views and examples of structural and architectural detail.

Methodology for the archive standard photography is set out as follows:

- Photographs of details should be taken with lenses of appropriate focal length.
- Difficulties of back-lighting should be dealt with where necessary by balancing the lighting by the use of flash.
- A range of appropriate photographic scales should be used and a metric scale included in all archive recording photographs, except where health and safety considerations make this impractical.
- A photographic location plan for each building recorded will be produced for the report and each film will be fully printed to 6 x 4 or 7 x 5 size prints. Selected prints will be scanned into the archive reports.
- Black and white photographs will be archived to HER standards and incorporated into the HES photo database.
- Supporting colour photographs will be taken with a high resolution digital camera (3MP or higher), to illustrate the report and for possible presentation purposes. This will be archived electronically onto each report CD.
- Care will be taken that each shot is focused and that with delayed shutter action that camera shake does not occur. Each shot will be of appropriate quality and used for reports and/or power-point presentation.
- Digital colour photographs will be stored according to the Historic Environment Service's guidelines. Copies of the images will be provided to the client.
- The archaeological record will include a plan showing the location of the photographs reproduced in the report.

4.3.4 Post Fieldwork

Following completion of the fieldwork stage the results from the Historic buildings, Trails and any other main sites within the mine project will be combined into a single concise report for each major mine site.

4.4 Report production

Each site report will summarise the results of the measured survey, photographic recording and archaeological recording for buildings and shafts treated as part of this project, and will include the following components:

- Summary
- Project background
- Aims and objectives
- Methodology
- Summary description of conservation works undertaken at all structures
- Description of conservation works and works programme, together with results of any archaeological recording.
- Recommendations for future management, including any further requirement for conservation works or other archaeological work.
- Conclusions
- References
- Project archive index
- Supporting illustrations: location map, historic maps, plans, elevations/sections, photographs.
- 4.4.1 Draft and summary report

- A summary report will be produced within two weeks of the completion of the fieldwork for each site and circulated to the DCHES Team and WHS Advice teams.
- A draft report containing the project results, as outlined above, will be produced and circulated to the DCHES Team for comment.

4.4.2 Final report format

- A paper copy and a digital (PDF) copy of the report, illustrations and any other files will be held in the Cornwall HER.
- Four paper copies of each report, and a CD containing an electronic copy of the report and the digital photographic archive will be produced for the client and the DCHER.
- Paper copies of the report will be distributed to local archives (including the Historic Environment Record) and national archaeological record centres.

4.43 Archiving

Following review with the HES Project Manager the results from the fieldwork will be collated into an archive following the Society of Museum Archaeologists Guidelines. This will involve washing and cataloguing relevant finds, the indexing and cross-referencing of photographs, drawings and relevant context records.

- All finds and samples, etc will be stored in a proper manner (being clearly labelled and marked and stored according to HES and IFA guidelines).
- Following any necessary cleaning, stabilisation and recording, artefacts or small finds will be deposited at an appropriate location.
- All paper and photographic records will be ordered, catalogued and stored in an appropriate manner (according to HES guidelines). It is expected that the depository site for these records will be the Devon County Record Office, Exeter.
- An EH OASIS entry (on-line) will be prepared at this stage of the project summarising the site impacts for each mine and referring to each archaeological watching brief report.

4.4.4 Cornwall HES archive deposition

An index to the site archive will be created and the archive contents prepared for long term storage, in accordance with HES standards (which will follow Society of Museum Archaeologists Guidelines). Archiving will comprise the following:

- All correspondence relating to the project, the WSI, a single paper copy of the report together with an electronic copy on CD will be stored in an archive standard (acid-free) documentation box.
- The drawn archive will be stored in A2 plastic wallets.
- Photographic material will be stored in archive standard negative holders and archive print holders within an archive standard box.
- All black and white photographs are to be archived using captioned labels, appropriate record forms and location plans. Other photographic records to be supplied with written captions and subject to appropriate batch archiving to be held in safe archival storage.
- Devon's Historic Environment Service/Devon Museums will receive a copy of all site photographs, reports and relevant correspondence etc.

The written archive will be deposited in a registered archive or museum, in accordance with their deposition guidelines and within 4 months of the completion of fieldwork.

5 Public presentation

Given the importance of the Tamar Valley mine sites, the significant impact to local communities of the remaining engine houses and the inclusion of all the sites in the proposed World Heritage Site, it is acknowledged that there is scope for wider public

dissemination of the results of this project. This dissemination could take the form of one or more of the following, subject to the agreement of funding for this work by the Project Manager (this may not be included in the tender associated with this WSI, although it can be included if requested by the Project manager/DHES):

- Community Open Days to show members of the public around the mine sites
- Provision for public lectures to local organisations
- Provision of information about the sites, works carried out and dates of open days etc via web sites (CC, DCC, WHS)
- Popular publications:
 - Devon: DAS Newsletter, Articles in DAS proceedings/monographs
 - Cornwall: Archaeology Alive, CAS Journals
- Media/newspaper articles via TVCS publicity officer.

6 Project staff

- The Historic Environment Service (Projects) has accumulated unparalleled experience in industrial archaeology, having been involved in this aspect of archaeology for the last twenty years (see the HES CV and the specific personnel CV in Appendix 2). The project will be managed and carried out by an HES Senior Archaeologist with proven experience in industrial archaeology; this staff member will also carry out the historic buildings consultancy and historic buildings recording. The project manager will:
- Take responsibility for the overall direction of the historic building consultancy and archaeological recording project.
- Discuss and agree the detailed objectives and programme of each stage of the project with DHES and TVCS PO, including arrangements for health and safety.
- Monitor progress and results for each stage.
- Edit the project report.

Key personnel within the proposed team are (CVs summarised in the Appendix):

Colin Buck, DipCert, Senior Archaeologist. cbuck@cornwall.gov.uk

Specialist in Cornish mining landscapes and assessments since 1993. Involved in numerous recording and appraisal projects including conservation works to many engine houses and other structural conservation works, shaft safety works and mine site access improvements, particularly in the east of Cornwall. Projects include many archaeological impact assessments. Helped Tamar Valley AONB Service prepare CMP for West Devon Mining. Involved in the preparation of policies for the Cornish Mining World Heritage Site Bid's Management Plan and produced the Mineral Tramways Conservation Management Plan.

7 General arrangements

Timetable

Following guidelines provided by the TVMHP Principal Officer (and David Wilson Partnership – Pete Leaver), the consultancy and fieldwork (for a projected duration of three years), is anticipated to be commenced during late summer of 2006. HES will require at least three weeks notice before commencement of work, in order to allow the allocation of field staff time and arrange other logistics.

Monitoring and Signing Off Condition

- Monitoring of the project will be carried out by Historic Environment Projects and DCHES (Bill Horner).
- The Devon County Historic Environment Service Planning Advice Officer should be informed 1 week in advance of the intention to start the recording (although a three year project timetable has been prepared).

- HES will liaise with the DCHES Officer to discuss the programme, progress of work, and agree site meetings as required.
- A summary of the results for each major contract stage will be presented to the DCHES Officer within 2 weeks of the completion of the relevant fieldwork.
- Draft reports will be provided to the DCHES Advice Team for comment.
- Where the DCHES Officer is satisfied with the archive report and the deposition of the archive, written discharge of the planning condition will be expected from the local planning authority (LPA).

Monitoring points during the study will include:

- Approval of the WSI
- Completion of fieldwork for each mine site
- Completion of archive report and summary note for each mine site
- Deposition of the archive

Professional standards

The historic building and archaeological recording will be carried out to the standards of the Institute of Field Archaeologists and all work and advice will be carried out in line with the IFA Code of Conduct and Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology.

Copyright

Copyright of all material gathered as a result of the project will be reserved to Cornwall County Council and their funding partners (Devon County Council). Existing copyrights of external sources will be acknowledged where appropriate.

Compliance and Variations

Minor variations to this WSI will be discussed in liaison with the client and the Devon Historic Environment Planning Advice Officer. The TVMHPO will then agree these with the LPA/EH as appropriate. Major variations may require detailed agreement from the Local Planning Authority.

Contract

The HES projects team is part of the Historic Environment Service, within Environment and Heritage, Cornwall County Council. If accepted, the contract for this work will be between the client and Cornwall County Council.

The views and recommendations expressed will be those of the Historic Environment Service projects team and will be presented in good faith on the basis of professional judgement and on information currently available.

Health and safety

- The Service follows the County Council's *Statement of Safety Policy*. For more specific policy and guidelines the Unit uses the manual *Health and Safety in Field Archaeology* (2002) endorsed by the Standing Conference of Archaeological Unit Managers and also the Council for British Archaeology's Handbook No. 6 *Safety in Archaeological Field Work* (1989).
- The historic building consultant and the historic building/archaeological recording team will adhere to the Health and Safety Statement of the Principal Contractors.
- Prior to carrying out on-site work HES will carry out a Risk Assessment.

Insurance

As part of Cornwall County Council, HES is covered by Public Liability and Employers Liability Insurance.

Colin Buck, Senior Archaeologist, Historic Environment Projects, Cornwall Council