MoorLIFE 2020:

D5 A Carbon Audit Case Study

May 2018

(LIFE14 NAT/UK/000070)

Creating a positive carbon impact through Moorland restoration

The Moors for the Future Partnership (MFFP) is a conservation organisation that works with key stakeholders to conserve and restore Blanket Bog habitats using innovative conservation techniques, with key sites being monitored to help inform future restoration work. Additionally, the organisation aims to educate and promote the responsible use of these habitats.

One way MFFP is delivering these aims is through the MoorLIFE 2020 project, which is an EU funded LIFE project that aims to support environmental, nature conservation and climate action projects throughout Europe. The project focuses on the landscape of the South Pennine Moors (SPM) Special Area of Conservation (SAC), see figure 1 below. Working at a landscape scale provides greater resilience to climate change and increases the opportunity for wildlife migration and movement. Furthermore, the SPM SAC forms one of the most southerly and significant areas of Active Blanket Bog, which is protected by both UK and European legislation. MFFP are delivering the outcomes of the project in partnership with the National Trust, Pennine Prospects, RSPB, Yorkshire Water, United Utilities and Severn Trent Water.

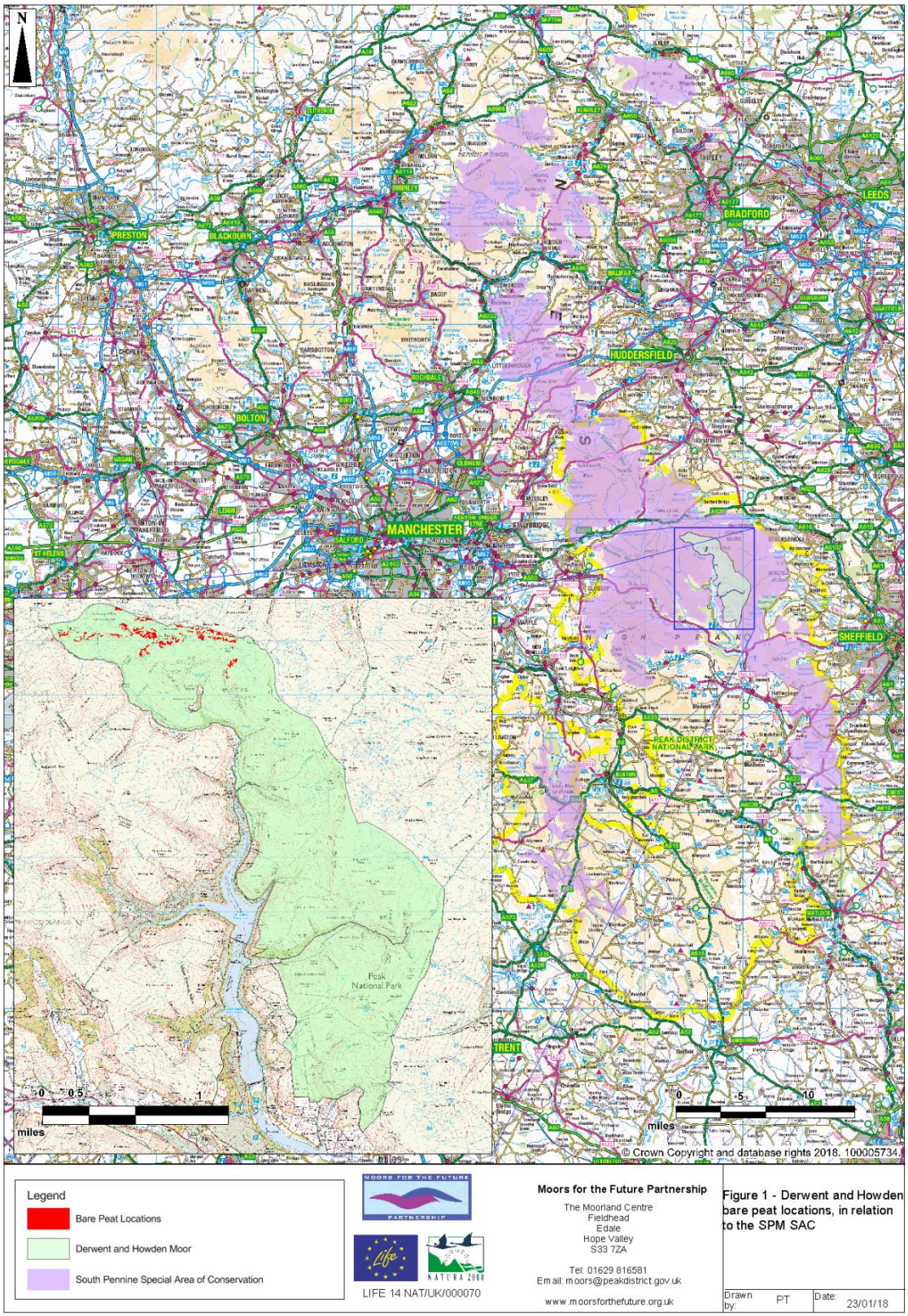

Figure 1 – The location of the brash spreading on Derwent and Howden in relation to the SPM SAC

As part of the MoorLIFE 2020 project, MFFP are undertaking a Carbon Audit that aims to calculate the greenhouse gas emissions associated with the work (e.g. from conservation activities to office work) undertaken by all partners involved in delivering MoorLIFE 2020. These actions are then split depending upon the scope of the action as defined by DEFRA (Department Environment Food and Rural Affairs), see figure 2 below. The scope of the action then determines which conversion factors are used to calculate carbon dioxide equivalents.

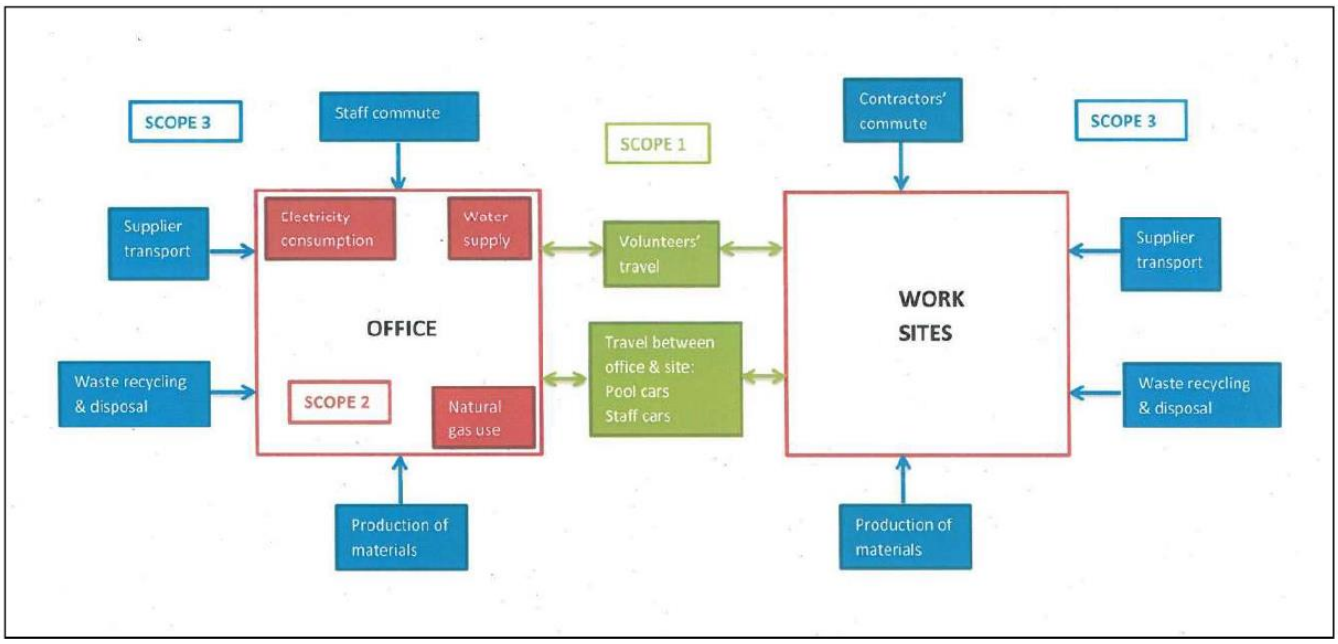

Figure 2 – Explanation of the scopes associated with our carbon audit [1]

One site where MFFP is working in partnership with the National Trust (NT) to deliver conservation works as part of MoorLIFE 2020 is Derwent and Howden Moor, which is located close to Ladybower Reservoir in the Peak District National Park, see figure 1 above. On this site areas of bare peat were covered with Heather brash (which is double chopped heather), see figure 3, and is applied to stabilise approximately 3.6km^2 of bare peat. This reduces erosion rates and prepares these areas for re-vegetation,

Figure 3 – Example of Heather brash spreading

1 - Defra, (2013) Environmental reporting guidelines: Including mandatory greenhouse gas emissions reporting guidance. Department for Environment Food and Rural Affairs, London.

providing a number of ecosystem services including water regulation and carbon sequestration. Conserving Blanket Bogs helps to avoid carbon loss through reducing the amount of peat being dissolved and washed away, allowing vegetation to grow on site trapping atmospheric carbon.

Figure 4 – Delivering materials to site

To successfully deliver heather brash spreading work, MFFP used GIS to map areas of bare peat using the latest aerial photographs. Staff members were then able to work out the amount of Heather brash required to cover the areas of bare peat. This work was undertaken at MFFP office where our greenhouse gas emissions were captured as part of our office energy usage (which includes electricity and water) and was calculated using the methodology outlined within the MoorLIFE 2020: D5 update report 2016 produced by Benson, Titterton, Crouch, Thorpe and Walker (2016)[2], and can be found here www.moorsforthefuture.org.uk/carbon-audit.

Once the actions associated with setting up the project were completed, Heather brash was flown from the cutting site to the work areas using a Hughes 500 helicopter by the contractor, see figure 4. On average this was a journey of 5.7km, and involved undertaking 200 flights to deliver 80 tonnes of brash to the work areas. To ensure that emissions were captured from all contractors associated with delivering this work we included a sentence within their contracts stating that they had to provide us with the distance they travel to site, the number of trips made to the site and the vehicles used, this enabled us to calculate their carbon expenditure associated with this work.

A template was developed to record this information for each of the main activities undertaken in ML2020 (delivery, flying, contractor travel), and whilst the template varied slightly depending on the type of activity (e.g. the make of helicopter was included in the flying template) the key information included the number of journeys, the type of vehicle used, distance travelled and the type of fuel used see figure 5 below.

2 – Benson, J., Titterton, P., Crouch, T., Thorpe, K., and Walker, J.S. (2016) MoorLIFE 2020: D5 Update Report 2016: A guide to the project carbon audit processes and protocols, including a presentation of Year 1 project audit figures, Moors For the Future report, Edale

Flying Template

Date	Site	Type of Lifting	Shape reference	Number of bags	Number of flights	Helicopter type	Invoice	Helicopter company	Lift site	Kilometres between lift site & centre of polygon (x2)	Total km flown	Total Hours flying	No. Units used	Unit	Scope 3 Total Direct GHG kg CO_2e per vehicle	Scope 3 CO_2 kg CO_2e per vehicle	Scope 3 CH_4 kg CO_2 per vehicle	Scope 3 N_2O kg CO_2e per vehicle	Total Scope 3 Total Direct GHG Total kg CO_2e	Total Scope 3 CO_2 Total kg CO_2	Total Scope 3 CH_4 Total kg CO_2e	Total Scope 3 N_2O Total kg CO_2e

Delivery Template

Contractor	Invoice numbers associated with job	Cutting site	Journey Start	Journey End	Km travelled to delivery site (round trip)	Bags per delivery	No. bags delivered	No. of deliveries	Type of vehicle	Total km travelled	Total Units Used	Unit	Scope 3 Total Direct GHG kg CO_2e per vehicle unit	Scope 3 CO_2 kg CO_2e per vehicle unit	Scope 3 CH_4 kg CO_2 per vehicle unit	Scope 3 N_2O kg CO_2e per vehicle unit	Total Scope 3 Total Direct GHG Total kg CO_2e	Total Scope 3 CO_2 Total kg CO_2	Total Scope 3 CH_4 Total kg CO_2e	Total Scope 3 N_2O Total kg CO_2e

Contractor Travel

Lead Benefici	Contractor	Contractor office location	Lift Site	Site	km travelled 2 way journey	Job	Invoice numbers	Start date of work	End date of work	Approx. number of days work	Number of vehicles	Type of vehicle	Total km Travelled	No. Units used	Unit	Scope 3 Total Direct GHG kg CO_2e per vehicle unit	Scope 3 CO_2 kg CO_2e per vehicle unit	Scope 3 CH_4 kg CO_2 per vehicle unit	Scope 3 N_2O kg CO_2e per vehicle unit	Total Scope 3 Total Direct GHG Total kg CO_2e	Total Scope 3 CO_2 Total kg CO_2	Total Scope 3 CH_4 Total kg CO_2e	Total Scope 3 N_2O Total kg CO_2e

Figure 5 - Templates used to collate the major actions

The aim of these templates is to collate all operations associated with the project in one place, and then using conversion factors from DEFRA's Environmental reporting guidelines[3], convert the operational information into Kg of Carbon Dioxide equivalents (kg of CO2e). A full explanation of the methodology used is presented in the MoorLIFE 2020: D5 update report 2016 produced by Benson, Titterton, Crouch, Thorpe and Walker (2016) [2], which can be found here www.moorsforthefuture.org.uk/carbon-audit.

Once the heather brash was on site the material was spread on areas of bare peat by a different contractor. During and after the works, teams from MFFP and the NT went out to supervise and to inspect that the work was completed to the correct standards. For the carbon audit this meant collecting tail pipe emissions associated with any staff travel to the site, and included works vehicles, employees and volunteers own vehicles. This was then captured using the template in figure 6 below.

									Scope 1 OR Scope 3				Scope 3	All Scopes	Scope 1 OR Scope 3				Scope 3	All Scopes
									CO_2	CH_4	N_2O	Total Direct GHG	Total Indirect GHG	Grand Total GHG	CO_2	CH_4	N_2O	Total Direct GHG	Total Indirect GHG	Grand Total GHG
Partner Organisation	Vehicle	Date	Total Miles	Action	Vehicle	Km	No. Units	Unit	kg CO_2 per vehicle unit	kg CO_2e per vehicle unit	kg CO_2e per vehicle unit	kg CO_2e per vehicle unit	kg CO_2e per vehicle unit	kg CO_2e per vehicle unit	Total kg CO_2	Total kg CO_2e	Total kg CO_2e	Total kg CO_2e	Total kg CO_2e	Total kg CO_2e
								km												

Figure 6 – Travel Template

2 – Benson, J., Titterton, P., Crouch, T., Thorpe, K., and Walker, J.S. (2016) MoorLIFE 2020: D5 Update Report 2016: A guide to the project carbon audit processes and protocols, including a presentation of Year 1 project audit figures, Moors For the Future report, Edale

3 – DEFRA. (2013) Environmental Reporting Guidelines: including mandatory greenhouse gas emissions reporting guidance [online] Available at: https://www.gov.uk/government/publications/environmental-reporting-guidelines-including-mandatory-greenhouse-gas-emissions-reporting-guidance Accessed 05.02.2018

In total 11,734kg of CO2e was emitted during the brash spreading work on Derwent and Howden Moor, which equates to a carbon intensity figure of 3,829 kg of CO2e per hectare. Carbon intensity figures are calculated to allow a comparison between the amount of carbon emitted on different sites and even different activities by using a common factor (e.g. area). The Carbon intensity figure was calculated by dividing total kg of CO2e emitted by the number of hectares covered by brash [3].

Undertaking bare peat stabilization work on Derwent and Howden Moor provides a carbon benefit of 13,729 kg of CO2e per year (estimated using findings in Worrell's 2011 Carbon fluxes from managed peatlands report [4]). In total, the carbon benefit is approximately 1.2 times greater than the one-off carbon emissions from the works and the carbon benefit will continue to accrue over time. The carbon benefit is equal to driving 2,868 miles in an average family car every year!

All figures were converted into carbon dioxide equivalents to allow for comparison and aggregation between the different types of greenhouse gas emissions (e.g. Carbon Dioxide, Methane).

Whilst the conservation work undertaken on Derwent and Howden Moor and other sites is carbon positive, we are always looking for ways to reduce our emissions further, including ensuring lift sites are as close as possible to the delivery location, to cut down on the amount of emissions used in helicopter work, see figure 7 below, and sharing lifts between employees and organisations.

3 – DEFRA. (2013) Environmental Reporting Guidelines: including mandatory greenhouse gas emissions reporting guidance [online] Available at: https://www.gov.uk/government/publications/environmental-reporting-guidelines-including-mandatory-greenhouse-gas-emissions-reporting-guidance Accessed 05.02.2018

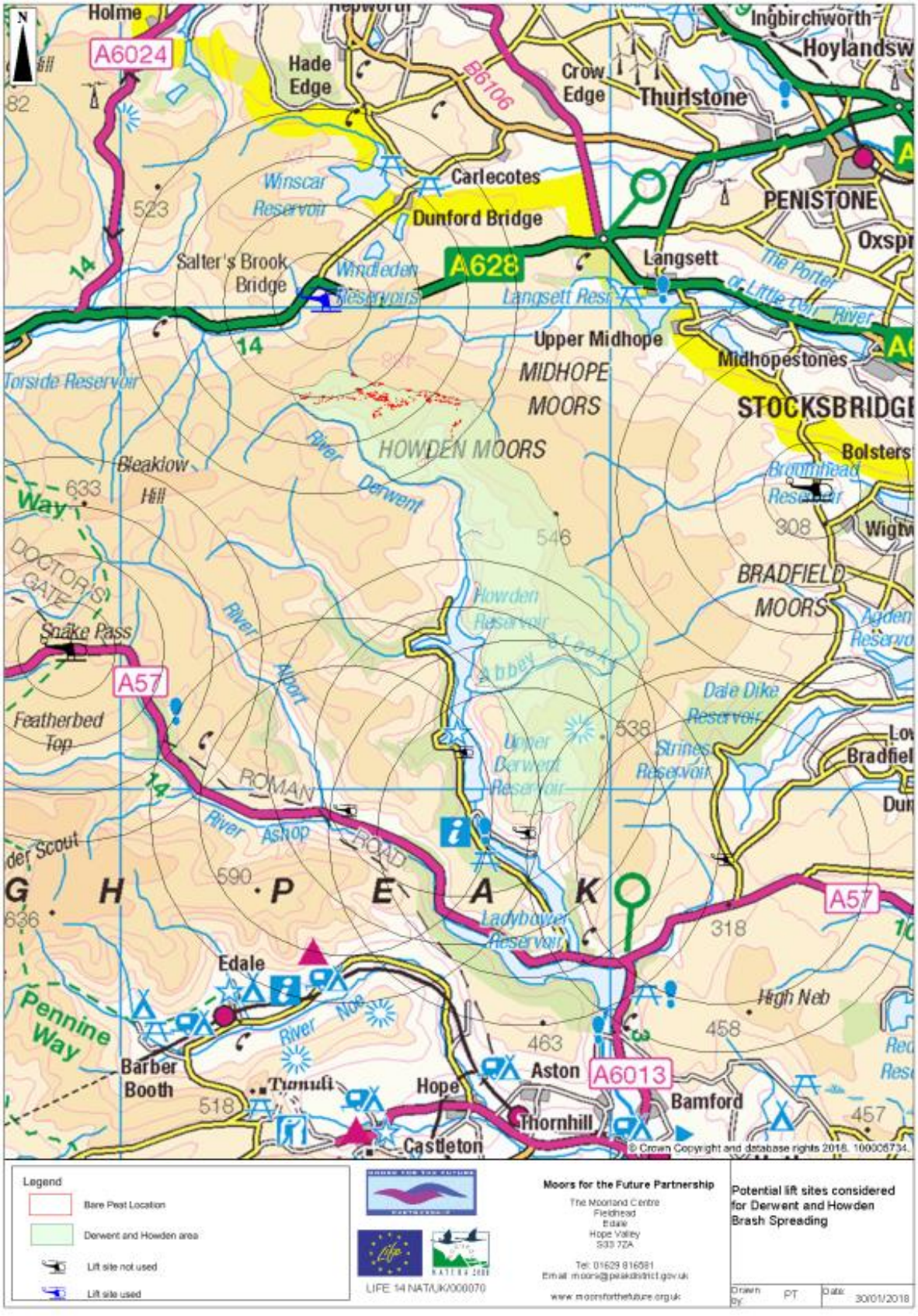

Figure 7 – Potential and the actual lift site locations

3 – DEFRA. (2013) Environmental Reporting Guidelines: including mandatory greenhouse gas emissions reporting guidance [online] Available at: https://www.gov.uk/government/publications/environmental-reporting-guidelines-including-mandatory-greenhouse-gas-emissions-reporting-guidance Accessed 05.02.2018

Brash spreading on Derwent and Howden Moor represents 6.9% of the total area of bare peat treated under the MoorLIFE 2020 project. Scaling this up to the whole project, we would expect to see approximate carbon benefits of 16,957kg of CO2e per year for all brash spreading associated with MoorLIFE2020 works, which is equal to driving 41,561 miles in an average family car every year!

Spreading brash to stabilise bare peat is just one action being undertaken by MFFP and our partners on a specific moor, in total MoorLIFE 2020 encompasses 53 different moors across the whole length of the SPM SAC. This meant that the methodology developed had to be easy to use and adaptable to suit all actions (e.g. Sphagnum Moss planting on Snailsden Moor, see figure 8). As our actions vary, a master spreadsheet was developed, see figure 9 below, to allow all the data to be collated in one place and a total kg of CO2e figure calculated on an annual basis. Figures have been calculated for the first two years of the project, which so far has emitted in total 190,111kg of CO2e which equates to 16,783kg of CO2e in year 1, which was a preparatory year allowing staff to put the support systems in place and only covers 6 months, whereas in year 2, 173,328 kg of CO2e was produced, and represents the first year of works. Carbon benefit figures have not been calculated per year yet as carbon budget figures do not currently exist for the benefits of planting *Sphagnum* Moss, which comprises the majority of the work under MoorLIFE 2020.

Figure 8 – Sphagnum planting

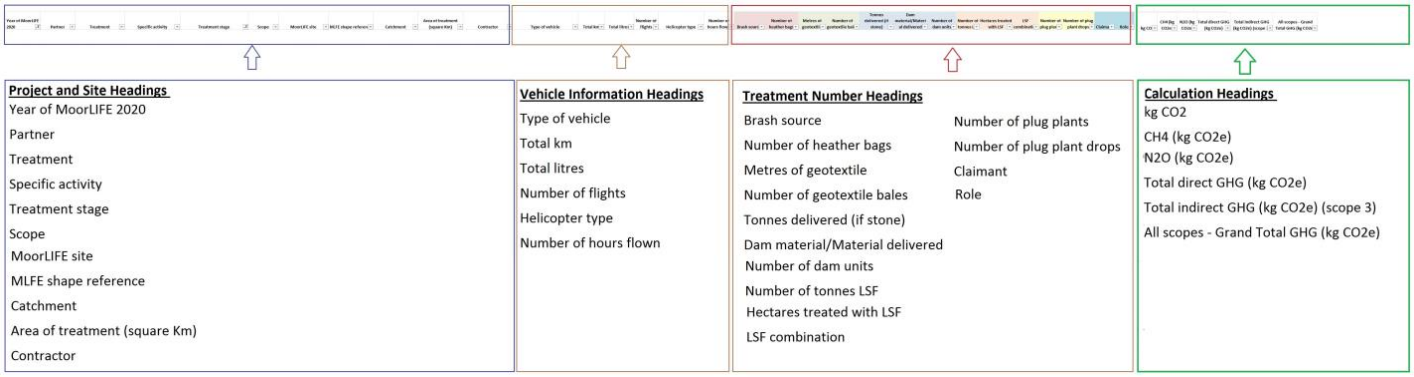

Figure 9 – Master spreadsheet used to record all actions

Another challenge that had to be overcome was creating a methodology which suited all partners and actions. To overcome this, DEFRA guidelines and notes were used along with quarterly update meetings to check that all partners were making good progress with the carbon audit and allow any issues to be resolved. This allowed each partner organisation to complete the carbon audit actions associated with their organisations, with MFFP collating and calculating total emission figures annually.

Thank you to the National Trust, Tenant Farmers and Shoot Tenants on Derwent and Howden Moor for allowing us to use their site as a case study.

For more information on MoorLIFE 2020 please visit our website at www.moorsforthefuture.org