

# Chapter I

Quernmore | Abbeystead | Roeburndale | Wray | Dolphinhholme

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This story started in 2000, when the people in one of the villages of rural Lancashire—Wray—came together to lobby for ‘broadband.’ Our area, which is in the top corner of Lancashire, close to Yorkshire and Cumbria, was sparsely populated as the photo shows. We, like many others, struggled with dial up internet access. We did not then know we were too far from the telephone exchanges ever to get it—and we still can not, over that technology. Despite our lobbying of local and national government, we got no help at all from councils, rural agencies, or Whitehall. (All this is explained in later chapters).

Our frustration led us to build a community that could help us overcome it. That acorn became B4RN. Other roots were nurturing what would become a giant, branching tree of connectivity, and we will get to many of those roots in this book, but this was the group that nurtured the seed of an idea and made it burst forth into the sunshine.

When we first started B4RN, we talked a lot about tribes and how to build a tribe. The idea came from Seth Godin—building a tribe meant finding people with shared interests who can connect with an idea and run with it. The concept comes from marketing, but it applies to mobilising a movement, too.

Think about it like this: the village of Wray, and 6 miles away, the nearby village of Caton, have a great rivalry in team sports. Wray always desperately wants to beat Caton at football. However, in order to beat the stronger team from the town of Lancaster, 10 miles away, suddenly Wray and Caton have to work together. Now maybe there are two players from Wray, two from Caton, two from Hornby—and we all get along because we are on the same side. A better team. Then if Lancashire is playing Yorkshire, Lancaster becomes part of our team, and now we are part of the same tribe, united in a shared mission. We are in it to win. That is how we knew we had to build B4RN. There is a lot of competition, and different interests, like in a team sport, but we had to fix it so all these different communities would work together. Barry Forde called it ‘herding cats’, but we were really building a cohesive tribe, slowly and surely. (We will get to Barry later, as he is the genius whose vision enabled hundreds of people to build the early network and who still volunteer and support it.



## WrayNet and WenNet

The Wray campaign to get 'broadband' started in 2000 but went nowhere for a while, as we all believed BT would bring broadband to us. It actually got going when about ten villagers formed a group, headed by Aftab Gujral in 2003. Aftab lived in Wray, and we elected him as the first chairperson of our group. We called it WrayNet. Deborah Perrins was Treasurer and applied for funding for an internet connection from different places – with absolutely no luck, but she was absolutely brilliant and indefatigable.

At the time, all we had was dial-up internet. It was very slow, and each time the phone rang it would cut out. Web pages were starting to have photos on, and there was a button on the browser that you could click to turn the photos off, to let the pages load.

So, we looked around for support. It was probably Aftab who first mentioned that there was a research department at the University of Lancaster, working on digital connectivity, and we could ask them for help. The university took a bit of convincing, but eventually we persuaded Dr Nicholas Race, then Head of the Network Research Special Projects (NRSP) unit, to help us. It had the potential to be a mutually beneficial project: he could do experiments on our village, which advanced his research, and gave his students hands-on experience, and we got the connectivity we wanted. With the help of a (very) little bit of money, and several keen students, Nick got us a two-megabit-per-second (2 Mbps) internet feed into the village of Wray in 2003/4. Almost no website could run on a 2 Mbps connection today, but back then, it was revolutionary.



"JFDI" - the unofficial B4RN motto, which stands for either "Just Farmers Doing It" or "Just Flippin' Do It (depending on who you ask); On the left: Tommy putting antennas on the buildings for the mesh network, two of which were on the post office and the tea rooms; On the right: Sheila, Tony and son Paul interacting with the new digital notice board, available via a computer in the post office, which was the village's first taste of broadband internet.

There was a free internet connection that anyone could use if they did not want to disrupt the calls on their own phone lines. The technology Nick and his NRSP team were using was a wireless mesh network, which used Locust World mesh-boxes, with antennae on them, and it shared the feed around the village. In 2009/10 it was upgraded to a newly designed mesh unit the NRSP built themselves.

A mesh network is a type of wireless internet network that uses a network of wifi routers (or “nodes”), that communicate with one another to transmit an internet connection across a large area. In the case of the Wray mesh network, the main internet signal came from a radio receiver at the village school, which was then shared across several mesh boxes with antennae on people’s roofs to pick up the signal on them.

Our local group helped the NRSP build out the wireless mesh wifi network to people’s homes. We also started a club to show people how to use computers, and we put a digital noticeboard in our post office, and another in the village pub. The feed for the network— known as “backhaul” —was from CLEO (Cumbria and Lancashire Education Online), an internet network that had been built by LUNS (Lancaster University Network Services) serving educational institutions.

“WrayNet” brought free internet to the village, and in return, we supported several student projects. We were very happy to be the white mice in the Living Lab.



The computer club in Wray Institute, 2004-2015.

Online at last, we started using the internet to learn about how we could improve our internet access, and we joined online communities of allies and supporters.

We started a village website and kept a diary of progress.



“If you have an apple and I have an apple and we exchange these apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas.”

**- George Bernard Shaw**



This is Paul Colton on the left, observing a university project on display in the village, where an internet connected robot would drop a sweet, so the kids were big fans.



#### **Beyond the book:**

[The digital scarecrow story](#)

[NRSP Wray project,](#)  
[the Living Lab](#)

[Diary of Wray Wifi Network](#)

Many of us around Wray (and Wennington) could not get a signal from the WrayNet village mesh, because our houses and farms were too far away, and the signal was impeded by various blockages (like hills and trees). You need a clear line of sight to get a strong wifi/mesh connection. So, we joined a trial with a company called Avanti, and it installed a satellite dish at a farm and used wifi to share it with other farms.

That initial connection allowed us to join a nationwide tribe, bringing different ideas, skills and talents together and freely sharing them. Lindsey Annison organised meetings across the country to exchange information between diverse communities and make plans. Lindsey had travelled to Europe, South America and the USA, visiting altnets, and brought their ideas back to the tribe. She was a great motivator and inspired many projects. She lived in a tiny village in Cumbria that desperately needed connectivity and she needed it for her family and business. It is fair to say that Digital Britain would not have happened without her input. Originally, the meetings Lindsey organised were part of a Yorkshire Dales project—Digital Dales—which, with the ABC (Access to Broadband Campaign), organised events around the country from tiny villages through to the City of London with the goal of raising awareness of the growing digital divide, and trying to convince the Department of Trade and Industry and politicians to open their minds and offer help. Later, once it was clear that there was more than enough demand, a national group called the Community Broadband Network (CBN) was formed with funding and support from then-Minister Stephen Timms. CBN provided mentors for community groups to share information and learn the technology to build their own networks.



Lindsey Annison with Rory Stewart, MP, when we filmed our Archers video.

During this time, other villages in the valley, near to Wray, started asking for help, and the technical challenges were different in each case. Abbeystead (15 miles away) wanted to join the Wray Network, or to have help building their own, but despite lots of site surveys, we could not find a way to get the signal over the fells to them. In 2004-2005, Deborah (still chasing the funding) finally managed to secure some money, with the goal of connecting a nearby valley - Old Wennington.

Old Wennington (WenNet), was within sight of Wray. It was a long valley served by three different exchanges in three counties, on extremely long line lengths, and even dial-up would not work because of the distances involved. The money came from a funded approach called “Project Access.”

The Northwest Regional Development Agency (NWDA) had £20 million, and thanks to Debbie in 2005 they gave us £25,000 + VAT for six case studies. The idea was that we would write the case studies of the different businesses in the valley and why they needed broadband connectivity. This was to advance the NWDA’s own agenda.

We used all that money to build them a wireless mesh network using the knowledge we had gained from the university project WrayNet, and the CBN tribe, and we wrote the case studies for free. Joel Smith, who we knew from CBN, built and configured the first Locustworld mesh boxes and showed Ian Threlfall, a WenNet



activist and resident, how to run it for ourselves. We bought an internet feed from the university, again on CLEO. This became the WenNet network, giving access to six businesses initially, which later we grew to 23 users. Out of the £20 million that Project Access allocated, our little project (0.125% of the fund) became



**Beyond the book:**

[JFDI Wennington Lindsey's book link](#)

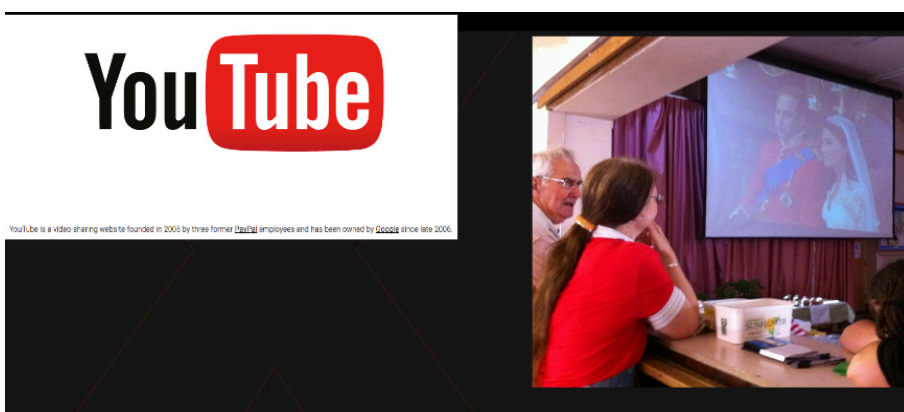
[Project Access Video](#)

[European Commission](#)

[The Reivers' Archers video link](#)

the flagship network and arguably the most successful, in Project Access. They even made a video about us. Almost all the rest of the £20 million went to BT Openreach which provided little or nothing to show for it.

Lindsey Annison wrote a book about the Wennington case studies. We set up a Community Interest Company (CIC) and paid a monthly subscription to it.



Both Wraynet and Wennenet had a 2Mbps internet feed to share for the next few years, and that was proving to be insufficient to stream video. The university started another project for TV for WrayNet, and bought a fibre feed from Openreach at massive expense. They built a new mesh system to run the

We streamed the Prince Williams's wedding on YouTube in the Village Hall, - everyone came to watch it so we did not each individually use up bandwidth streaming at home.

faster service. The University's WrayNet project had been a great success, and we could stream the royal wedding from our village hall on the 29 Apr 2011. WenNet also upgraded their network from the CIC funds. We knew we needed more backhaul, but CLEO would not support us. The County Council made it quite clear they believed BT Openreach could supply rural areas.

In 2014 we joined the WenNet network to WrayNet via a node at a farm on the top of a hill above the village which had line of sight between them. Thanks to that link, WenNet finally had a bigger feed and joined the Living Lab.

The Living Lab ticked along for a few more years, but the satellite solution (for the more distant farms) could not be extended, and the upload speed was dire. Latency on the satellite connection was also a big problem, especially for video calls, which were coming into use. And there were other villages around us interested in getting a connection, but we could not support them unless we had an internet backhaul feed or a clear "line of sight"—a real challenge. We also knew the University projects would not be a permanent solution to our problems, and both WenNet and the WrayNet activists looked for solutions. Once Arkholme got a B4RN feed we put both the networks on to it via a wireless link, and that kept them going until they got their fibre in. One of the experiences we had at WenNet back in 2009 led to the solution to our problems.



Laying electric cables in Wray in the 1930s.

The WenNet group had been worrying about two customers whose signal had been blocked by growing trees and had an idea – inspired by farmers digging in mains water, and an old photo that sat in the village hall, of when Wray got electricity in the 1930s

Chris, who was on both the WrayNet and the WenNet teams, had married a local farmer in 1973 and promptly had three children. From May to October every year they had no water from their spring and had to cart it from the river for the house and the animals. Chris used to wash the

nappies in the river every day, and bathe the children, and do the main family wash at her parents' house in the next village.

No matter how much she moaned, her husband and his family said there was nothing that could be done and she would have to get used to it. 'It had always been that way'.

Then, in 1978, a new family moved into the big house higher up the hill, and they had the same issue. So did the other three farms near them. The new arrival in the community (Richard Bond), looked at what they thought was normal and said 'we have to do something.' He looked into the legal and technical requirements to get running water to the homes. Four farms joined forces, one provided a digger, another money, two did the manual work, and they connected themselves to the water mains system. Chris learned that problems can be solved by working with neighbours. Working together, they came up with a plan to dig to the nearest mains supply and join on. Chris's youngest child was 3, and no longer in nappies by then, but she says, "The joy I have in turning on a tap and water comes out, and flushing a loo without carting a bucket full of river water to it has never decreased".

It was a case of JFDI - Just Farmers Doing It. Necessity, the mother of invention. - The origins of "JFDI")?

The WenNet tribe knew this story of getting water by working together, and so they took it upon themselves to lay the first rural fibre to the home in the UK themselves. 1930, 1978 and 2009 - learning from history. **This community experience was the tap root of B4RN.**





We called a CBN team member, Guy Jarvis, and asked him whether he could get us some fibre optic cable. We told him we would bring the diggers. Well, he had to cut a bit off the reel to get it to fit into Simon's car, but a few hours later, they arrived in Wray with the fibre.

We rang John Colton at Lucid Optical Services and asked if he could source the kit needed to convert wifi to fibre and fuse the fibre for us. John said yes, so we rang a friend called Rusty (Ian



Simon's car with the cable crammed in the boot.'

Mason) and asked if he could dig a trench from one farm to the two customers up the road whose connections were down.

He told us about mole ploughs—machines that bore a narrow channel in the ground in which you can lay a duct, usually used for water pipes or soil aeration, but also for fibre optic cable—and he knew someone who had one we could rent.

By 3 o'clock that afternoon, we were all at the farm, and by 7:30 pm, we had moled in and laid 800 metres of fibre, accidentally cut and then mended a water pipe, and drunk a great deal of tea. That left us with 400 metres to dig the next day, through a wood.



Simon Davidson, John Colton, Dave Galivan and Guy Jarvis, all there by 3pm. Simon and Guy built a wifi network in Hull, Dave Galivan worked for John Colton at Lucid.



Tony Swidenbank's mole plough arrives and we put the fibre on its reeler.



Oops. We struck water.



Julie, who lived in the first house, (where the man who got the water had lived), had to dig through her lovely tennis court with a spade.

Dave from Lucid fused the fibres and coupled the ends to the university wifi feed at the farm, making a network called a “FiWiPie”—Fibre-to-Wireless network solution—and our neighbours got their internet back.

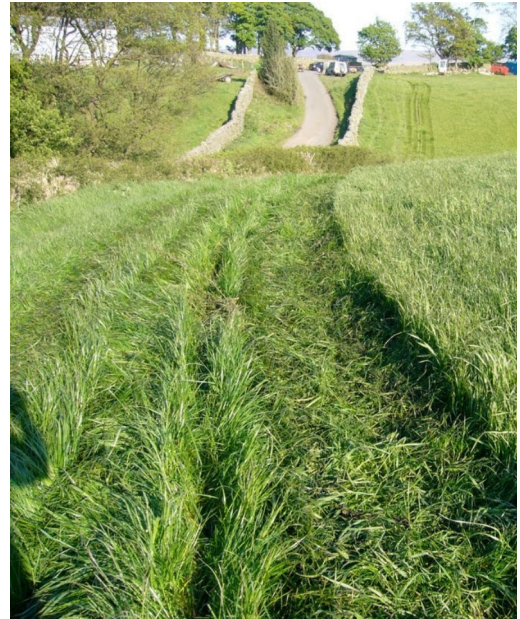
In a matter of 18 hours work over three days, we proved that we could do what British Telecom stated was impossible: connect rural properties to fibre. This was probably the first rural fibre-to-the-home connection in Britain.



The media convertor that would turn the farm wifi via ethernet into light to feed the fibre to Julie's house.



John Colton and Dave Galivan from Lucid fusing the first rural fibre watched by Debbie.



The 800 metre mole plough, the first done by a rural altnet.



A few days later and Julie's tennis court looks great after the fibre went through.



Julie's house, Cragg Hall, at Wray.

It was easy, it was fun, and it was a challenge. It cemented our motto: JFDI - Just Farmers Doing It. We knew this was only the beginning.

Video was not going to go away, and everyone would eventually need higher speeds, which meant we needed a serious upgrade for our wireless network.

Beyond the book:



[JFDI video](#)



## Twicket

We mercilessly campaigned for and publicised the JFDI dig and the Wray and WenNet networks we had built with the University. One such campaign was the village cricket match and tug of war, masterminded by John Popham. #Twicket became a global phenomenon. This event was held on Easter Monday, 25<sup>th</sup> April 2011. John came from Huddersfield and was an expert on social media, which at the time was still gathering pace. Facebook and Twitter were the main contenders and John had many followers. Even Stephen Fry joined in.



Stephen Fry's tweet.



Brenda Mickle commenting. Photo by Mike Rawlins

John came up with a plan to livestream an event that was held in Wray every year, using the amazing symmetrical upload that the living lab had given WrayNet access to. He built a massive tribe of people to help him, including the brilliant Brenda the commentator. The full story is in the blue box 'beyond the book' link and is well worth a read. A great tribute to a great man, who is sadly missed but was a massive supporter of B4RN. We did TV and Radio interviews, spoke to the press, politicians and government departments, but still nobody would or could help us.

Beyond the book:  
[Twicket story](#)  
[Twicket video](#)



The Tug of War. Photo by Mike Rawlins



Aunt Sally invades the pitch. Photo by Mike Rawlins



John Popham interviews John Marshall, the umpire. Photo by Mike Rawlins

## The Four ‘A’s

This is where Barry comes in. The genius who enabled B4RN to exist. A highly experienced professor of networking and technical services, Barry Forde had just retired from Lancaster University. He was bored. Also, luckily for us, he happened to live in Quernmore, one of the parishes near Wray that wanted connectivity. He also wanted to help all the other parishes as well as his own. He had vision.

Barry and his team at LUNS had already helped the Wray and WenNet networks. Barry had been the brains behind CLEO, an enormous network built for Cumbria and Lancashire councils, providing broadband connections for educational institutions in the area. CLEO had provided backhaul for the village mesh projects, so Barry knew all the technical details. Plus, he had contacts in “the trade” for fibre network equipment. The stage was set for our community connectivity projects to get a major upgrade.

First, a little background on CLEO. When the network was built to connect local schools, it was also intended to eventually provide connectivity for rural networks. In that sense, building our village mesh networks on the back of CLEO was a natural extension of its original purpose. For whatever reason, the local councils hedged at pursuing this other use case, while rural communities waited and waited for the internet. The Wray and WenNet networks were driven by us, the local people, so we were able to take advantage of CLEO before the project was handed over fully from LUNS to the councils in 2010. And with that, Barry and his team’s ambitious vision came to an abrupt end. The councils handed CLEO to BT, which promptly stripped the assets, absorbed them into its much bigger commercial network, and put all the schools back on its inferior service, while charging the schools a lot more money.

But back to B4RN. Lindsey, from Digital Dales, Access to Broadband Campaign, BSG and CBN, had travelled extensively abroad, returning with information, equipment, and contacts. She visited community broadband networks in many countries, bringing people, suppliers, network engineers, mayors, and many more, together to help the many others delivering valuable connected communities. Meanwhile, the Wray and Wennington communities were forming a tribe of people committed to getting better connectivity for the local area. We had the motivation, skills, contacts, and commitment, and were ready for action.

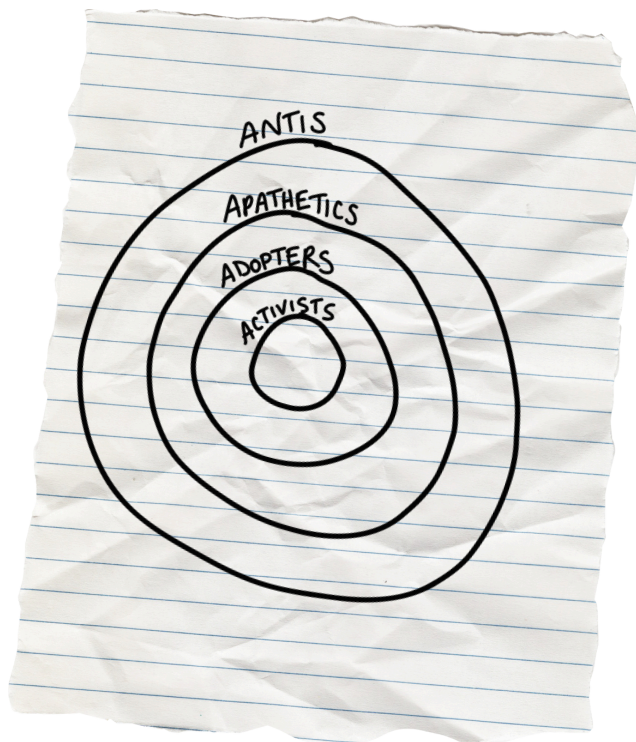


Lindsey and Walter at the Day of the Spades

We were the Activists. The first of the “Four ‘A’s”, as we often said. Every social movement starts with this small core, packed with energy and passion. Success hinges on understanding and engaging with more people, several degrees removed from the first circle. In the next category were the Adopters, people whom the Activists inspired to get involved. They were massively important. There are always more Adopters than Activists, and they get the word out to more people, and they can speak from their own experience about why they got interested and engaged. Beyond the Adopters are the Apathetics, who are not too bothered either way about what is going on. Last come the Antis—people who are just against the whole idea and the hardest to bring around.



Among the new tribe's Activists there was Tommy Hartley, the installer for the WenNet network and an agricultural engineer. Then there was Ian Threlfall, a security specialist from the original WenNet network, and Martyn Dews, an IT consultant, who joined us. Together we formed a management team around Barry. We also recruited new folks from the local parishes, who also brought new skills. Bruce Alexander, Tim Dawson, Iain Robertson, Mary Jackson, Carl Hunter, and Chris May – each village that became part of the original project plan had a representative. There was also Monica Lee, who had worked with Barry to get the CLEO network to the school in Abbeystead, and who had been gathering information about the number of businesses, householders and potential users in the area. We were building momentum.



Barry had a plan to build a resilient fibre loop from Quernmore to Arkholme, where there were already breakout points, connecting to the UK's dark fibre backbone, (a kind of wholesale fibre network), and connect all the parishes in between. Barry's first plan for building a new, fit-for-purpose network involved working with the local government to access funding for rural broadband. He made a business case to get a backhaul feed to all our parishes. Each parish would then build their own local network, either quickly and cheaply with wifi, or a more permanent solution with fibre-optic cable. It was going to be the feed we needed to keep WrayNet and WenNet going. More representatives from the other villages were continuing to join our team.

We bid for funding from Defra, the Department for Environment, Food, & Rural Affairs, but the North West Development Agency (NWDA) had the final say in the funding allocation, and they decided to give it to the Lancashire County Council rather than Lancaster City Council, who were supporting our proposal. Lancashire County Council gave the money to BT Openreach, which was rolling out a much inferior 'Fibre To The Cabinet' (FTTC) solution, protecting its existing copper assets and tying people to phone lines.

It was frustrating.

The UK Government claimed to want to address the problem of slow internet in rural communities, but all the funding went to BT, whose technical approach did NOT fulfil the promise of fast internet for all.

We knew we needed a more radical solution—an overhaul of the way things had traditionally 'been done'.

With Barry we all put our heads together and we came up with another plan. This might seem like a lengthy preamble, but this is really where the story of B4RN begins.

## A New Plan

We came up with a new name and a new plan, namely to build our own fibre to the home network that would give each home a 1Gbps link for both uploads and downloads. We called it Broadband for the Rural North, or “B4RN” for short. We registered as a Community Benefit Society, a CBS. The WenNet project had been a Community Interest company, a CIC, and we did not have the complication of shares back then. Under Community Benefit Society rules shares are known as ‘withdrawable’ and can only be sold back to B4RN, and all surplus has to go back to the community. This was one of the key reasons why people were initially willing to invest in B4RN. As a start-up company, B4RN fell within the requirements of the Enterprise Investment Scheme (EIS), which meant that people who invested in shares got 30% tax back. This incentivised the richer members of the community to invest, subsidising those who could not afford shares, allowing everyone to get a connection, shareholders or not.



We also added a bonus that for each £1500 investment, the shareholder would get a free connection and would receive 12 months of free service. We set the monthly subscription fee for internet service at £30. We gave free service to churches, village schools and other community assets. We would also give farmers shares for volunteering their time on the project, rather than pay them. They would be called ‘digging shares’.

We knew we could build a sustainable network and let each community decide if they wanted to do it, and that if they did, then we would help them achieve it. We paid £1.50 per metre for digging the duct into the trenches.

All the areas that wanted connectivity were divided into phases, and we sketched out a timeline for completing each phase. We included the original seven parishes that had been part of the failed funding bid and we added Tatham, so there were eight parishes in Phase 1. (Light-green on the map.) Every parish brought different gifts, skills and know-how, and some really good ideas came from all sorts of places. For example, take our postman, Keith, who said to his barber (one of the Activists) “Why don’t you dig across the fields to put the fibre in the ground”? - This was a game-changing suggestion.

It made technical sense: fibre networks are most robust when they are laid underground in ducting that is not subject to weather disruptions. When the farmers were willing to help with labour and equipment that they already had, the whole process would be much cheaper than digging up the roads.

We asked the AONB (Area of Natural Beauty) group if they could help us with a grant for publicity. They gave us some money, and we used it for leaflets, posters, application forms and banners. A local photographer, John Hamlett, provided the photo for the banners, which we still use to this day.





The Original B4RN poster 2011

We approached every parish council in the area, told them what we wanted to achieve and how we would do it, and invited them all to hold a public meeting for all their residents. Then we held a meeting in each parish. There was a lot of interest, and pretty soon, our circle of Adopters or should we call them Advocates? was growing rapidly and bringing in many Apathetics to see the light and join us.



Tatham (Lowgill) parish meeting.

We determined that we needed 1200 connections for the network to be viable, and if 600 people registered their interest, we would form a company. We leafleted every house, so those without the internet could register, too. Each community seemed to have its own champions and motivators, so we were growing our Activist base, and they inspired others to sign up. We did not think about it in terms of leaders and followers— Activists motivated Adopters, and Adopters worked on convincing the Apathetics. Everyone had a role to play.

Lindsey made a website on Google sites for free during a marathon 36-hour work session, and we invested £10 in a domain name. We had a Google form to register interest, and a counter on the website for each registration.

On the 15<sup>th</sup> December 2011 we held a big public launch meeting in Lancaster, as we had passed the mark of 662 registrations on the visitor counter.

**About B4RN**

The purpose of B4RN is to build a fibre optic network which will differ from a standard BT or telecom company offer. It will be a high quality 1Gbps (1000Mbps) future proofed solution, owned and operated by the community. Read more about the project - [Maps](#), [Timeline](#), [Business Plan](#), [Management Team](#). Our **presentation** is also attached to this page if you want to download it. (Scroll to the bottom)

**Subscriptions**

B4RN is a community benefit society registered with the Financial Services Authority under the Industrial and Provident Societies Act 1965, similar to a co-operative. Everyone is invited to become a member and buy [Shares](#) in B4RN. [Services](#) offered include 1Gbps symmetrical broadband.

**Register an Interest**

Our initial schedule is aggressive and we need potential subscribers and shareholders to express a no-obligation interest **AS SOON AS POSSIBLE** to decide whether to proceed or to seek an alternative route. Please complete the [Registration Form](#) to express an interest.

NB: December 2011 this point has been reached and we are proceeding. Communities will be connected to the core route in the order of highest number of subscribers first.

This community can lead the way for many other rural businesses, farms, and consumers who want to see the job done once, and done right.

**The b4rn Beanstalk register NOW and help us reach the sky**

662

nb: many more than the total shown have registered, but some are out of the area of phase 1 and are offering to buy shares/take service at later date. Only those in the phase 1 parishes are entered on the beanstalk.

Top village take up so far:

**Tatham**  
being chased by  
**Abbeystead, Wray and Arkholme**

click on the fibre wordle to read the words:

The original B4RN website on Google sites (Wayback Machine).

Barry told everyone the plan: that first the community needed to raise the money, invest in shares to fund the materials, then start digging. He said that it would not be easy, but that if we did not do this, no one else would. Serving the remotest properties would be unprofitable for the traditional telecoms companies so they would never connect us, he said.

Our goal was to raise £200,000 to get the project off the ground. We had an earlybird scheme, where anyone investing £1500 before our deadline of February 29<sup>th</sup> in the leap year 2012 would not only get a free connection and the benefits of the Enterprise Investment Scheme, EIS, they would also get 15 months of free service.

Our first shareholder was Walter Willcox from Surrey. (He also became our millionth shareholder on April 1st 2015.) Walter was a great supporter of B4RN and made many trips up to our northern villages to help out. He wanted to do the same thing in his own area, and working on the B4RN project gave him the inspiration to found his own local group called B4SH, Broadband for the Surrey Hills. This has since become a viable network and a credit to Walter's persistence.

On the 29<sup>th</sup> of February 2012, Barry announced that instead of our target of £200,000, we had raised £300,000. So we pressed the "Go" button. We held regular meetings in the Wray village hall, or in the pub if it was too cold in the hall. We kept working on our plans. One month later we all met up for the Day of the Spades.



Walter Willcox buying the first shares in the company. Dec 15th 2011



Walter presented with the millionth share by Barry a few years later!



#### Beyond the book:

[John Hamlett's video of the launch](#)

[John Popham's video of Day of the spades](#)

[John Hamlett's video of Day of the spades](#)

[Radio Wales interview](#)

[Radio interview Twicket](#)



David Smith and Eric Lange, Arkholme champions, talking to Walter on one of his visits.





The Day of the Spades, with John Popham (on the left) filming it for posterity. The video lives on - in his memory on YouTube.



Paul Woodruff, Barry, Eric Ollerenshaw MP.



Paul Woodruff cuts the first sod.



Paul Woodruff, accosted by Walter.



Walter talks to John Metcalfe, a local farmer, about the problems they have with connectivity.

## Day of the Spades

On the 31<sup>st</sup> of March 2012, people came from far and wide to join our local mayor, Paul Woodruff, and our MP, Eric Ollerenshaw, for the “Day of the Spades,” as we called it—the day we started digging on John Metcalfe’s land just below Jubilee Tower.

Paul, the mayor, cut the first sod. (He was promptly accosted by Walter, who told him about his plans to replicate B4RN in Surrey.)

Many of the Activists were there, and a fair few Adopters, too.



Lindsey and Barry at the Day of the Spades.

The original start point for Phase 1 was Quernmore. This was where Barry had identified a breakout point where we could join to the Geo dark fibre. That cabinet came live in the summer of 2012. Immediately, it was picked up by Abbeystead, who were really desperate for connectivity. They had no reliable dial-up, no mobile, no terrestrial TV signal and limited areas where satellites worked due to south facing hills. The major landowner there also bought digging shares for all his properties, so that meant duct was available, and made starting with Abbeystead an obvious choice.



Map of Phase 1.

However a few problems emerged at the first AGM in 2012, when the Adopters (or “cats” in Barry’s terminology) started clamouring for information about when ‘we’ were going to connect ‘them’. We told them that, like Abbeystead, they would have to dig it in themselves and we all would work together as a community.

Dealing with people’s expectations became a running issue in the roll-out of B4RN. Sometimes we found there was a lot of enthusiasm and little patience for the phased roll-out, which required an existing connection nearby to connect a new community and also required a high level of community effort. We had a strong team of volunteers, but more were always needed when we started in a new area. Digging, and connections had started at the Quernmore end of the loop, and Arkholme was at the other end of Phase 1, so we thought they would be a good one to get going to make the loop resilient, and they were really keen. The problem was that a 4.5km dig was required to get from the fibre at the Geo (a dark fibre wholesaler) breakout point at the top of the parish down to Arkholme village hall, where the cabinet would be located for the village. None of the farmers had diggers or wanted to do it. So, a few of them got together, bought extra shares, and hired the diggers. They completed the dig in eight working days at a cost of £4400, and the shares paid for it. They got three free connections for that amount of shares, which they donated to the school, church and village hall. We will come back to Arkholme later on in this book.

The plan was then to get across the River Lune to Melling, and then via Wennington to get to Wray and up Roeburndale to join Quernmore and complete the resilient loop, but the railway people would not let us run the fibre along the bridge over the Lune, so the join up had to wait.

And that is when the cats became harder to herd. Gressingham, Whittington, Borwick and Priest Hutton sprouted new buds on the Arkholme branch, and Dolphinholme (Ellet) joined onto the Quernmore branch. Four phases were basically digging at once. Barry had warned us about herding cats in a community-led project, but nobody could foresee that they would be so feral. The trunk was not even grown yet. There was no earthly reason why parishes in later phases should not get digging, but where was the money to come from to buy more supplies?



The business model hinged on raising money for new phases while a previous phase was being completed. In reality, current projects were paying for phases not due to start yet, ie later phases, which meant that rather than raising money for yet-to-be-started projects, we were raising money to pay for already started projects. This complicated our best laid plan, and we had to adapt. First we tried to source some funding from the Lottery and other groups—with no success. Government would not help. Banks would not loan money until we had been trading for three years.

We had to get our hands on more duct, chambers and enclosures, not to mention all the bits that went with them, and the network equipment. Monica applied to the Prince's Trust, and Tommy was awarded a Land Rover Freelander, and that really helped, as it could be used as a standalone vehicle for fusing fibre and could tow the trailers.

Monica came up with a loan scheme at 6.5% interest and opened it to the community. They could do one-, three-, five-, or ten-year loans. The loans were paid back, with interest at the end of the terms, apart from the 10-year loans, which were amortised. This eased the situation, but we needed more, as so many groups were building.

The farmers and some contractors would work for shares, which meant we were not paying for labour, but in some areas we had to use contractors, and they needed paying. In addition, road and river crossings cost a great deal of money. During this time Emtelle, (a fibre equipment company), had given us 90 days credit, unheard of in the industry, and they were very supportive. Simon Wade from Emtelle even arranged training days in our local area for other telecom providers, and that meant we could get our fibre blown in the days before we could actually afford a blower ourselves. Simon also arranged 'showtell' days, (info is in later chapters). We had a 'sponsor a metre' of duct scheme, and many people from all over the world paid a fiver (£5) for a metre of duct with their name on.

Monica applied to the Esme Fairburn Foundation, and they generously lent us £300,000. All of a sudden we could buy supplies, and off we went, with our cats.

We wanted to get the network live that year to show sceptics they were wrong. TV stations did features about us, newspapers covered our progress, and our name spread. The first thing Barry did with our windfall of funding was buy more duct, chambers,



Our first delivery of duct and fibre.



Our first delivery of chambers.



Our new little office at the auction mart.



Members of the B4RN management team. Kristina Fournier, Carl Hunter, Monica Lee, John Hamlett, Chris Carr, Tom Rigg, Tommy Hartley, Iain Roberston, Mary Jackson, Martyn Dews, Ian Threlfall and Barry Forde.



The first cabinet, at Quernmore.

and cabinets for the first main routes. We stored them at a local farm.

Monica found us an office space at the Lancaster Auction Mart, and we moved in. Mary sorted out insurance for all the volunteers.

The management team grew, bringing in new skills.

There was a lot of paperwork involved, which Barry needed help with, and Mary gave up her back bedroom to store all of our documents and also helped with the office admin. Mary initially worked with the shares, until Monica took over as Company Secretary in 2015 and dealt with the shares and Membership of B4RN, later to be joined by Kristina as one of our very early employees. This freed Barry up a bit to continue doing all the network mapping, ordering, design, and oversight.

Once we got the office space and a phone, we needed someone to answer it, so Judy and Sheena volunteered. It was obvious that we were going to need a lot more staff, but we still had to use all the money for materials, so everyone working for B4RN in those days was a volunteer.

Thanks to Emtelle, we got the first fibre in, and Tom Rigg who was a volunteer at the time (and who would later become B4RN Chief Operating Officer and then CEO) and Simon Littlefield (a contractor) fused it. We lit the fibre at Quernmore at the end of summer in 2012, four months after the first sod was turned.

Our first 15 customers in Quernmore came live in October. A free service was provided for The Rec (the local village hall), which also hosted our first cabinet.

We had done it. Our network, our 'tree' had its first blossoms.



## Roeburndale

### Extreme Digging

Two of the challenges of building a fibre-optic network in our area were the terrain and the distances we had to cover. Another heroic farmer, Richard Johnson from Roeburndale, with help from Robert Taylor and with a big digger, dug over the mountain where he lived in 2012. There was nothing to join to at either end but he dug an enormous stretch because “he could.” He had to dam the trenches to keep digging, and Richard dug a large proportion of the route between Quernmore, where the first dig had started, and the next village, Wray, passing right by his farm in the process. Robert helped, as he had done a lot of the dig towards Abbeystead, so he knew what to do and they were Just Farmers Doing It—they dug the route down to the valley.

After the finished route was backfilled, the scar was gone within a year.



A trench dammed to run off the water.



Finished trench healing up.



The dig seen from a distance.



The extreme dig down through Roeburndale to Wray.

The route to join Quernmore to Wray was beset with problems, the main one being a landowner with a large amount of moorland. He would not give permission no matter who approached him. Eventually one of the villagers who knew him well offered to chat to him. Miraculously, this worked, and digging commenced again. This was a lesson well learned, and passed on to other villages: “Make sure the right person approaches landowners in the first place!”



#### **Beyond the book:**

[The Xtreme Video](#)

Eventually the digging from Quernmore reached Richard, and then Wray joined up to Richard's Roeburndale link, and Wray became a "live super-hub." Reaching Wray, which was our largest village with the most customers (229 properties) was crucial to our plans.

Back to the present though. By this time, all the people who had bought shares in all the other villages started

asking when they were going to get their internet, and we constantly had to remind them that they needed to do the digging. Literally, they had to lay the groundwork themselves.

The winter was harsh, but digging continued. We delivered duct to the areas who needed it -often having to dig through snow drifts. Some villages waited until the core got closer to them, but others grabbed the chance and just got started.

Abbeystead was the first parish to dig in earnest. They had to get their feed from Quernmore, and the farmers did most of the digging with Robert Taylor contracting for some of them, and they bought shares to pay him. Once the dig reached Abbeystead, the estate workers did a lot of it.

We dug in all sorts of conditions—in rain, in snow, through rock-filled fields, muddy marshland, and thick clay, avoiding drains, utilities and septic tanks.

Drains on farm land are at least a metre deep, so theoretically this depth meant we would not damage the drains. Sometimes they are not deep enough due to land erosion over time, but if we broke any of them, we fixed them, often going under them.

Water pipes vary, with some farmers digging them very deep and others digging them very shallow. Electric cables sit much deeper underground, but we would find them before a dig started.

We had to bring in the gas people if we had to go over gas mains, and they would locate them and monitor the dig. Telephone lines were always a nuisance because they are usually just under the sod.

Each new leg of a route was a bit of an adventure.



Collecting duct through snow drifts



Robert Taylor approaching Abbeystead village.



Going under septic tank drains.



## Blowing Fibre



A reel of fibre.



The blowing trailer.



A mole plough.



The blowing machine.

Tommy kitted out an old trailer to hold the compressor and all the gear we needed for blowing, including petrol cans and shelves for smaller items. The trailer was usually pulled by Bruce's old Volvo, with someone else bringing the reeling trailer. The fibre comes on big reels, sometimes 6 kilometres and are from 1 metre to 1.5 meters in diameter.

Core duct is 16mm high-density polyethylene (HDPE), and the inside of it measures 12mm. Fibre runs through this duct underground and so is protected. The duct is buried in the ground to a depth of 60cm. It is either dug in by hand or machine, or mole ploughed.

To get the fibre into the ducting, it is "blown" into the empty duct using compressed air from a special machine. The wheels on the machine feed it through on the air.

Firstly the duct is coupled up to air and this is blown through to the other end of the blow, and someone with a radio confirms they have 'air' - and the right duct. Once the message is received that air is coming through, the first sponge is loaded and blown through. It confirms the duct is clear when they catch the sponges. When we started, we used empty pop bottles to catch the sponges at the other end of the duct. We started building up our 'essential tool kit': used pop bottles were in demand because the sponges had to be re-used, every penny counted. When ducts have been left uncapped, this often results in the catcher getting showered in cold water or the pop bottle flying off into a tree, so we later changed the kit to using onion sacks, which let the water and air out but caught the valuable sponges.

Then the duct has the magic combo of sponge/lubricant/sponge blown through. (We used a recycled hairdressing bottle). Then another sponge, then turn on the blower and hope the sponges reach the other end.



In the early days, we stored the fibre reels outside, so we also needed volunteers cleaning the fibre cable with old towels before it entered the duct. (Once we had facilities to store the reels inside this became unnecessary).



Alistair, putting the lubricant into the duct.



Putting the sponge into the duct.



Feeding the fibre into the machine using cleaning cloths.



Essential kit, sponges caught in pop bottle.

The fibre is now ready to blow.

The blowers thread the fibre from the reel into the machine, and the machine pushes the fibre through the lubricated duct with air to ‘float’ it.

Every 500 metres or so, there is a chamber – a box dug into the ground that houses spare fibre and/or a “bullet” or several bullets, which are watertight containers where fibres that meet one another underground are fused together to extend the connection.



Round chamber with bullet, oblong chamber with 20 metres of fibre in it.

In each chamber we leave 20 metres of fibre still attached to the core, so that if in the future there is a break between two chambers, we have spare fibre to pull back to do a repair. The other reason for chambers is that if the fibre gets stuck during the blowing process and can not go any further through the duct, we can fleet it out - meaning you blow the fibre onto a sheet on the ground and wrap it in a figure of eight - and then you turn it over (sometimes a few kilometres). The blowing machine is brought to the fleet. Then the blow resumes.

Fleeting means we do not need to do a join – fusing several fibres together to make the connection longer. A good fuse will not impede the signal, but any fuse is an opportunity for something to go wrong. The fewer joins, the better.

A smaller fibre tends to blow further than a big one of course, and the circumference of the fibre gets smaller as manufacturers find new ways of production.





Bruce getting the duct ready for the next blow.



The blow under way.



Fibre fleeted onto a tarpaulin to keep it clean.



First fleet on a long blow.



Second fleet on a long blow.



Fleeting fibre on the way from Wray to Thrushgill and Lowgill.



Final fleet, and turning the fleet before starting the blow again.





A multiple big fleet.

The length of the blows varies from a few hundred metres to six kilometres. It all depends on the number of properties on that route. As properties are passed, enough fibres are left in chambers ready for them, so the fibre count (and the cost) reduces.

A blow can start with a massive 288 fibres, (288f), then split a few chambers down into a 192f and a 144f and a 48f as different cores join on. Spare fibre is left in chambers every 500 metres, and this is generally where the fibre is fleeted on long blows where the machine cannot push it any further.

Iain designed a fleeting table to make the process easier for the volunteers to form the figure of eight. This is a skill in itself, and we used to call it “infinity” – to the future and back!

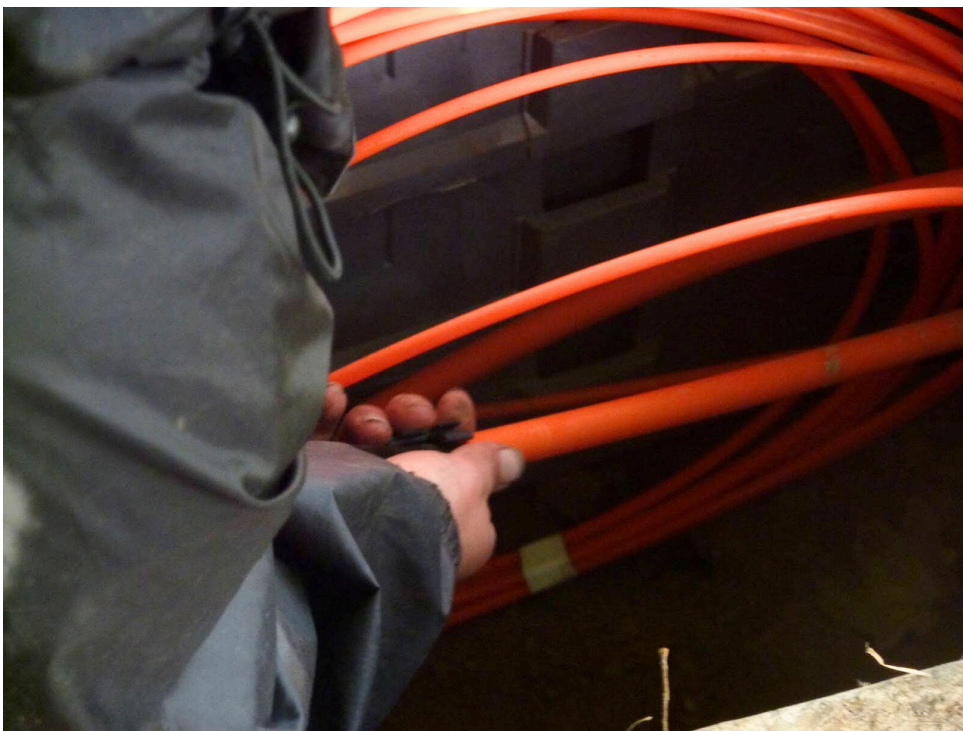
We used drain pipes and tree branches to extend the table ‘arms’ on big fleets.

We did not go wrong very often, but once a volunteer got a phone call and a steam train passed at the same time, and she got distracted so a couple of hundred metres ended up as spaghetti on the field. We do not have photos of this, as everyone was too busy trying to unravel it.



Using bits of duct to extend the drainpipe arms of the fleeting table.





Putting a gas block on the end of a duct in a chamber.

Once the fibre is blown into the ducts, the duct is then sealed to stop gas or water ingress with a special little stopper that clips round the fibre. This means that the fibre can still be moved if needed in a clean duct. It is also a block against radon gas which can degrade the fibre. Everything is then rolled up back inside the chamber to await the fusers.

The fleets got smaller as the blows progressed over the Littledale Fells, where the extreme diggers had laid the duct for many miles.

We bought our ducting and fibre from Emtelle, who also trained us how to blow the fibre through the tubes in the ground. Tommy became our first core blower, and Bruce did the house blows, and also trained Chris Hall to blow. Throughout the whole project Emtelle has been very supportive, we are very grateful to them and their representative at the time, Simon Wade.

Fibre comes bundled in tubes, with 12 fibres in each tube. At the start of the project the highest fibre count was usually 96 fibres. A 96-count has 8 tubes of fibre. We used 48 fibres in smaller routes with fewer properties. Twenty-four fibres are allocated to the cabinets they connect to on core routes, and each customer gets two fibres each coming into their home. Just one fibre the width of a human hair can carry a fully symmetrical gigabit connection, but we always installed two per property for resilience and to enable a connection to be split or who knows what the future holds. Barry always plans ahead to achieve even faster speeds in the future.



To infinity and beyond, Paul and Frank turning a fleet on an epic blow between Barbon and Dent.

Where more than 96 fibres were needed on a route, we used multicore ducts and two or more lots of 96f. So the first cabinet had seven 16mm ducts going out on the routes to the different places. We then found 144f was pretty affordable, and that meant we could use less ducting. Nowadays a lot of routes start with 288f, but because our fibre is housed underground in ducts, we can put any amount of fibre in them that will fit. It was all designed to be future-proof.



## Tom Hartley

Tom, or Tommy as most call him, one of our first Activists from WenNet, became our logistics person for B4RN and our first blowing expert. He sourced some cable reelers, which were needed for reeling off duct and fibre and also delivering reels to different sites. The farmers then used tractors to get it where they needed it.

Tommy, with Monica's help, was awarded the use of Land Rover Freelander for a year from the Prince's Countryside Fund, and the Prince's Trust made a film with him.

As an agricultural engineer, Tommy also had the gear to mole under walls and little roads and farm tracks. He used the ground radar to mark drains and utilities before the dig to Abbeystead village hall. He bought his own mole plough and helped many other villages get on board, including Hornby, his own village. He also helped many other villages with lane crossings with his directional mole machinery.

We were doing great until May, when it started to rain, and rain, and rain... 2012 was the wettest year on record, with the floodplain that is Lune Valley under water.



2012, and the Lune Valley became a lake.



Tom Hartley on our first customer blow at Quernmore.



Tommy with the new reeler delivering fibre.



Farmers getting supplies to where they were needed with the trailer.



We could not use the mole plough, and we had to dig instead. Many farmers, hit by the bad weather, did not have the enthusiasm to dig, which in some areas was virtually impossible anyway.

One dedicated farmer bought enough shares to pay one of the big “bad weather” diggers, which can work on wet land without wrecking it, and connected their parish and their school. (More later in the Arkholme chapter)

Tommy even taught Prince Charles - now King Charles III - how to blow fibre. (We also showed him how to fuse, and he fused our 1000th customer’s fibre.)



Tom showing Prince Charles how the blower works.

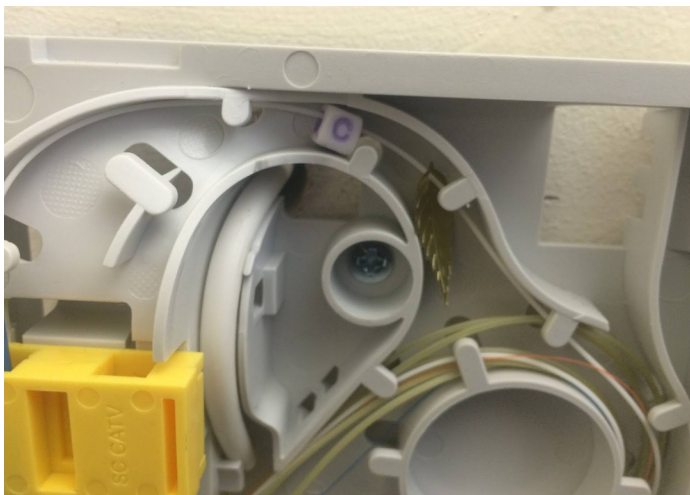


Preparing for Prince Charles to do a fuse for the 1000th customer.

We threaded a little gold leaf and a C on the pigtail to commemorate the event.

Tom also went on training courses and learned to prepare bullets for fibre and also to fuse.

A man with many talents and a great asset to the project as he went on to teach others to do all the jobs too.



Prince Charles's royal fuse: a letter C and a gold leaf, in the FTU at Newton Business centre.



Tom prepping a bullet at Arkholme.

 **Beyond the book:**

[Freelander film](#)





Tom using the ground radar to locate underground services at Abbeystead village hall.



Taking supplies to various digs.



Tom with Chris and the Arkholme volunteers getting duct under a wall and farm track.



Volunteers Keith and John in Wray helping Tom get his mole through track and a hedge.



Tom blowing fibre in Abbeystead.



Tom catching the mole from under the road.



Sponsored duct carrying the fibre to the cabinet in Abbeystead



## Bruce Alexander

Bruce Alexander was another one of the champion volunteers we found at the end of a rainbow. A pot of pure gold.



Sponsored duct, £5 per metre.



Roeburndale chamber.

Bruce had run the Quernmore village Post Office until it closed, and then worked at Bowerham Post Office. He kept busy with DIY jobs for family and was clerk to two local parish councils. He was active in the Recreation Club and generally helpful and involved in the community. He was one of the early Quernmore Activists and joined the management team when it formed. He had been an engineer and was very practical, so it made sense to him to join the project. On the day the first house boxes arrived, he and Barry worked out how to install them. Once the build got underway he was so interested in how it all worked he ended up learning about blowing and fusing too. He ultimately installed all the houses in his village and dug through their gardens to the main core that the contractor had dug in and separated out the customer ducts. Then Emtelle, our duct suppliers, showed us how to blow our own fibre. The blowing trailer held the big compressor for core duct but was also set up to blow house fibre.

Bruce used the house blower to blow fibre to the houses, and the fusers came and joined them up. After hiring contractors to fuse in the first year, we soon learned how to do it ourselves.



House fibre being blown from the pan.



Bruce blowing house fibres.



The first delivery of routers and their back boxes (FTU) and Bruce and Barry figure out how they all work. Then Bruce gets going and makes it all work, fixing up a house install, suitably bribed with tea and cake.



Bruce and Tommy put their heads together and decided which core blower to purchase.

Bruce blew all the early home fibre, and learned how important it is to keep the ducts dry and clean. The contractor had left many ducts in the chambers without end caps on, and they wound up full of water and muck. Sponges had to be blown through each one to clean them before the fibre was blown. It made each job a marathon, but Bruce persevered and got the houses all done in his village, and Tommy did the core.

However, Tommy had to return to his day job, so Bruce continued to help every other village with Chris Hall. Bruce would bring the blowing trailer and Chris would bring the reel trailer, and these three did all the overland core blows between the villages. The blowing trailer held the big compressor needed for core work and was all set up to blow the small 2f to each property. Hiring contractors was too expensive and inflexible. Bruce, Chris, and Tommy realised that the expensive and complicated equipment was really a job for those who knew how to use it, and a small team of B4RN volunteers was set up to take it on. None of the three could be paid what they were worth, but they knew what they were doing was worth more than gold to the community.

Meanwhile the community was working hard to buy and then lay the empty duct ready for the fibre, and the Team were regarded as “the Cavalry” when they turned up to get the fibre in and start the process of getting the services live. Each day was a challenge, but Bruce cannot remember being defeated, even if it took several attempts!

Getting the first customers live in Quernmore proved that the B4RN project would work. We had a product (rather than a dream) to sell and the pace started to ramp up. As it became clearer that it was all going to work, Bruce had a great sense of achievement—he felt proud of the project and justified in his faith in it from the beginning. He was firmly committed to making Barry’s vision work. As soon as it was financially possible, Bruce was taken on as staff part-time, and then he gave up his other part time jobs



Bruce training Rob to blow, the blowing trailer, and the blowing machine.





The blowing trailer, which often got stuck in muddy places.



Bruce fixing the outside installation.

and became full-time. He also trained the new young staff to use the blowing machines. Over time, Bruce got the trailer to some pretty remote places, but he could not always get it out. He often had to ring a local farmer to rescue him, but nothing stopped him getting where he had to be. He had more power once he had the use of the Frelander, and he always got home (eventually).



Bruce, Chris and Alistair blowing fibre over Littledale.



Bruce fusing customer fibres into a bullet.



All weathers: Bruce getting customer ducts out of the chamber ready to blow fibre in.

Bruce worked in all weathers and against all odds. He organised a great deal of the early record keeping and documentation for B4RN before we had staff. For the first five years, we used Bruce's spreadsheets for customer records and for router MACs. (MACs are the unique numbers on appliances that are used to record where they are being used.) He also did spreadsheets for the fibre reels for stock control. He was also involved in writing the customer contracts and the first edition of the B4RN "bible" for the communities. He wrote most of the wayleave document, which is still in use today. Bruce was a problem solver and came up with some innovative solutions, notably the "pencil sharpener" to reduce the diameter of the surface duct so we could join it to the buried duct, as well as "Bruce's Blowing Box," which we used to get fibre out of the duct! When he wrecked his ankle and had to wear a cast for ten weeks, it did not stop him. Luckily, it was his left leg, so he just got a car with automatic transmission and continued to work; the staff allocated him a parking space next to the front door.

He learned how to put the bullets onto the duct and blow the fibre into them. Eventually he "bit the bullet" (pun intended) and learned how to fuse them, too. He masterminded the spreadsheets we used to keep track of which fibres to fuse, and he learned how to patch customers in the cabinets. He had become a one-stop shop.





Bruce at work on a bullet.



Bruce cleaning the patch leads to connect new customers in the cabinet.



Bruce explaining to Jonny Morton how the bullets work.

Bruce did a lot of hard graft for B4RN, but he always had time to talk to the community and let them know what was going on, advise them, or ask their advice about things. He says the difference between what he did at B4RN and all his previous jobs was that B4RN was never a proper job: it was fun, got him out in the fresh air (in all weathers) in some beautiful if remote parts of the countryside, and he was able to meet the local groups who were all desperate for and committed to getting the best broadband for their communities. There was also a lot of coffee, cake and laughs! He says he knew it was a brilliant project—it just needed people who had the time to give to make it work. He certainly gave it his best shot. JFDI.



Bruce and John Calnan, the Yealand champion, deciding on the order of blows to get the customers' fibre blown.



James Taylor putting up a reserved parking sign next to the door when Bruce hurt his foot.



Bruce's sign, on the window of B4RN HQ.



Bruce's sign, close up.



Bruce with his busted foot but still working. He had to fuse sitting down for a while.



(A fan tells her (unedited) story)

## Appreciation for Bruce

The guy that had an affinity with the blowing machine was Bruce Alexander from Quernmore. He took to it like a duck to water and had the patience and perseverance to cajole the machine and maintain and manhandle all the extraneous kit needed to make it function. Bruce began by loading everything into his old Volvo and trundling it across the landscape to places an old Volvo should not have to go. Tractors often were called out to drag him out of places he certainly should not have gone.

When all the ducting is buried along smooth bottomed trenches with no difficult right angles or vicious ups and downs it is time to call Bruce, the man with the hi-tech blowing machine who can waft fibre beneath the landscape with astonishing speed. Bruce's job is an interesting mix of mega scientific, precision work and a lot of mud and clart. The blowing kit consists of a compressor, a curious thing that looks like a cross between a very small church organ and a miniature version of bash the rat, and a yellow box full of cogs and drive belts. All this kit has to be working seamlessly to effect a trouble free blow.



Once everything is set up on a venerable old trestle table the first job is to blast some air through the duct so that someone standing at the other end gets their hair ruffled to prove the duct is clear. The next thing is to blow some tiny sponges through to make sure there are no obstructive kinks or grotty bits of debris that could impede the fibre. With luck (and the following wind) the sponges shoot out of the far end and land somewhere across the field and it is most satisfying. A recent time and sponge saving method involves pushing

the end of the ducting into a net onion sack, so that any water can spray out but the sponges are caught and no one has to go chasing across the field. However, if the sponges fail to appear then the fun starts.

By some mystic means Bruce is able to fathom roughly how far the sponges have travelled before they got stuck and here endeth the hi-tech phase. Bruce dons his wellies and waterproof trousers, in the knowledge that the next bit will probably mean he has to kneel in a bog and dig up the duct. Sometimes the duct can just be straightened and re-settled. On other occasions the glitch is more problematic and the duct has to be cut. If this happens, the blowing kit has to be moved to the problem site and the fibre blown on from there. It then has to be spliced together by the splicing team and covered with a breakout chamber. All in all it makes what could be a straightforward job very time consuming and really rather irksome.



On a good day, a straightforward blow can deliver fibre over a few kilometres. Progress is swift, problem free and very satisfying. This is how it should be and a good no hitch blow is the gold standard.

When things go wrong, occasionally they go very wrong and everyone involved gets that sinking feeling – metaphorically and often literally. Thankfully, Bruce is a cool, pragmatic and patient soul who stays calm in the face of adversity and

perseveres when lesser mortals might well have kicked over the compressor and gone home.

He is a terrific asset to the project and were it possible to clone people a couple more Bruces would be top of the list.

Heavily involved with community matters, Bruce and his wife Jan have lived in Quernmore since 1986. He ran the village Post Office until it closed 2008 and was Clerk to both Quernmore and Caton-with-Littledale Parish Councils. When the magic of B4RN was first mooted Bruce had no problems seeing its huge potential and realised that a proper Internet connection would be absolutely essential to rural living, if we were not all going to dwell in the dark ages or be forced to move into towns and cities.





## Abbeystead

Eileen Wallbank was a farmer's wife in the parish of Abbeystead. Much of the land is part of a large estate, and there are many tenant farmers. She was also the bursar at the local school. The school had a CLEO microwave connection via one of the local farms that could "see" a mast and could also see the school. It supplied them with 30Mbps on a good day, but that was not really enough, and there were plenty of not good days. At that time, 30Mbps was the best speed the network could ever do. On top of that, there was no mobile signal at all in the village, and the old copper phone lines were always dropping out so the dial-up did not work well either. Eileen was on dial-up at the farm, and it was driving her nuts. She heard about B4RN as the Quernmore project was getting underway, and she thought it was a brilliant idea, so she went to a meeting in Quernmore and met Bruce. That was all it took—Abbeystead got its champion, its first A ("Activist")! Barry gave a presentation at the Abbeystead village hall. Eileen went to the Day of the Spades, met and chatted to all sorts of people, and realised someone had to JFDI if high-speed internet was ever going to come to the village.



Cawthornes Endowed School, Abbeystead, the first one to get a free B4RN connection.



Barry at the Abbeystead meeting.

Eileen was determined to get it to her farm, and to the school. She went round all the local farmers and tenants and explained it all to them, and she managed to get many Adopters on board. Three local farming families then decided to dig for shares; in those days that is what people did, which kept the costs down and meant all the money raised could go into supplies to build the network.



Robert Taylor, one of the extreme diggers, working in Abbeystead.

William, Mark and Joshua (grandfather, son and grandson), John Metcalfe, and Richard Rhodes picked up the Quernmore dig and brought it to where Eileen's land started. Her husband and son, Alan and David, dug it almost to the school. Working with the farmers, Eileen helped plan the routes through this barren landscape to avoid obstacles. As they passed a farm, Bruce would install the house kits on the property, ready for fibre. The last bit of the dig was through a field, and she paid Robert Taylor to do that with his big digger, and to take it to the village hall where the cabinet was to be sited.



Another family, the Longtons, dug their own trench to their farm. Keith was a very good digger, and he dug a lot for the estate.



The road to a friend's house is never long. Keith Longton's dig healed up very quickly. Each farm in Abbeystead was reached.



Digging to the farms in Abbeystead.



Prior to Tom getting the reel trailer the farmers found other ways of reeling off duct and fibre.



Andrew and Robert Taylor in Abbeystead.



Robert and Tommy also did the road crossings on estate land.



A rocky dig between Quernmore and Abbeystead.

Once all the digging was done, it was time for the blowing.

Tommy was the main blower at the time, and was training Bruce and Chris Hall to blow too.



Bruce had already mastered house blowing, and on the first big Abbeystead blow, he was in at the deep end.

Half the route had been blown, reaching Hare Appletree and Monica in the summer, and the reel of fibre waited there until the dig to Abbeystead joined up.



Joining the route from Quernmore to Abbeystead. Zoom in to see how shallow the BT phone lines are buried, we have to go under them.



Frank Balassa and Chas Lee join Bruce and Tom blowing fibre from Quernmore to Abbeystead.



Chas Lee and Bruce on the last fleet before this Quernmore fibre joins the Abbeystead line.

The fibre left on the reel was flected out onto the ground, and the blow over the fell started. The next chamber was not accessible by car, so Bruce and Chas Lee set off on foot up the hill to catch the fibre and fleet it. The farmer brought the compressor and blowing machine up with the quad bike later.

Once the fibre was all flected out, it was blown to the next chamber, and the Abbeystead line to Eileen was underway.

Bruce fixed most of the house kits, as he had done in Quernmore and he arrived to blow the fibre to them. Once the house fibre was blown, it was fused inside the house and the router connected to it. It could not come live until the bullets had been done, and there were many to do on the route.

By the time the digs reached Eileen, Bruce was blowing the core fibres too. Eileen let him know when routes were ready, so he came with Alistair and blew the fibre.

The families helped with the blowing and kept everyone topped up with tea.



Carrying the fleeting gear up the fell, this blow will bring connection to Abbeystead.





A fleet on the way to Abbeystead.



A fleet being done at the top of the fell on the way to Abbeystead.



Walter holding a small bullet (an FST) which was fused in the house due to the high winds and dust outside.



Rhodes tea and rosy cheeks.



Walter in the windbreak.

We actually fused a bullet inside one house out of the wind and then rolled it back up in its chamber outside. Then Iain designed a windbreak that was easy to carry, so bullets further into fields could be done in shelter from the wind. There was an awful lot of rain that year. There was also a lot of wind, and they ended up carrying sandbags to weigh down the canopy, or stones, or empty reels. Though on nice days, just a windbreak could enable fusing to continue.

Meanwhile, the diggers were approaching the Abbeystead Community Hall, and preparations were underway to get an electricity supply to the cabinet in the car park and to get a duct into the hall. There was no mobile signal there, so a connection there meant they could install a VoIP phone, so people could call for taxis after an event and use online services in the building.





Alistair Adams Huset joins the blowing team in Abbeystead.

Tommy organised deliveries of fibre and chambers to where they were needed. Then the fusers came to fuse the bullet at Eileen's farm. Alistair was a volunteer blower back then, helping Bruce.

Alistair had started by labouring for Robert Taylor, soft filling the trenches before the digger backfilled them.

The weather was so bad the fusing of Eileen's bullet was done with the wooden bullet holder jammed in the car window to keep it out of the horizontal rain. It worked well, as a perfect fuse to the farm was made. Then poor Iain had to wind it all back up tidy and put it back in the chamber and he was full of cold. Eileen's chamber was accessible by car, but further down the line the fields were too wet to drive on, and a scaffolding tent was used to speed up the core fusing in bad weather. And Eileen kept the fusers well-fuelled with tea and cake.



Peter Arnold and Tom loading supplies to deliver to digs.



Eileen brings tea and cake...



Alistair and Bruce blowing core fibre at Eileen's farm in Abbeystead, 17th May 2013.

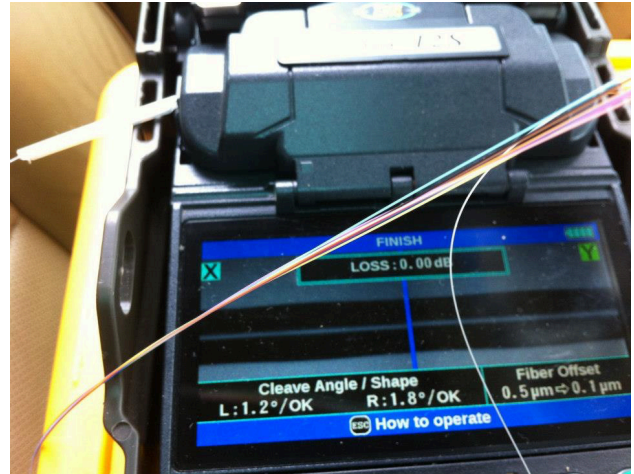


Iain doing the bullet to connect Eileen at Abbeystead.

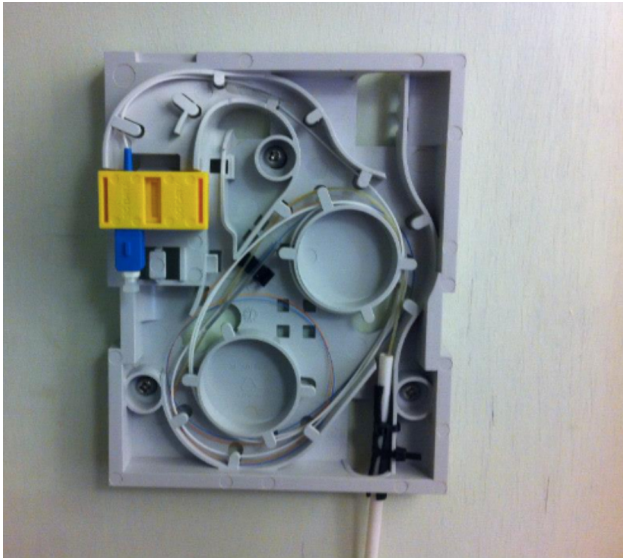




Fusing Eileen's bullet with the FRBU holder jammed in the car window to keep dry.



Eileen got a spot-on fuse.



The house fibre blown and fused to a pigtail inside the FTU at Eileen's.



The router in position on the FTU.



Empty reels and sandbags holding the tent down in the high winds of Abbeystead.



The wind won. In Abbeystead.





David, Tom and Chris unloading fibre from Tom's van.



Doing Jackie's bullet in Abbeystead, with home-made scaffolding tent.



A sunny fusing day fusing the fibre where the Quernmore and Abbeystead routes join below Jubilee Tower.



Cat testing for utilities at Abbeystead.

Tommy masterminded it all and brought in Mark Bell with a digger. Iain Robertson came too. The cabinet was already in place next to the recycle bin in the car park. They first of all scanned for metal pipes with the CAT scanner, and then used ground radar to detect a suspected duct and for water pipes. Tommy had marked the line he had to follow, and the gravel went to one side and the spoil to the other.

We made a film about it all, and when it was done, there was tea. All this work was done even while other communities were still sceptical that it was all going to work.

Eileen was still one of the early ones—a real Activist who brought other local farmers on board.

Once the village hall was installed, the estate got interested, and the estate manager Neil Kilgour, joined by Harry Balderson, who led the estate workforce, asked to meet Eileen. They were keen to get all their properties signed up, but they needed someone to talk to all the tenants, so Eileen got to work. She printed leaflets and went 'round to all of them and got them to sign up.

There were one or two elderly tenants who were not interested at first, but they all seemed to come 'round in the end as word spread. Again, Eileen chatted to farmers and organised routes to them all and got wayleaves.





Iain Robertson fusing in the snow.



Cobble mining to get the connection to old estate houses.



The routes extend to the remote properties at Lower Lee.



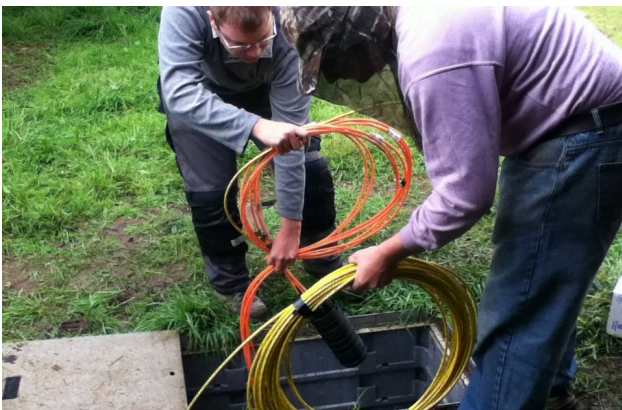
Cobble mining.



Tommy, Phil Durrow and Chris Hall blowing fibre to Lower Lee



One of the Lower Lee families helping out.



Alistair and Frank (with a mosquito net) finishing the Lower Lee bullet.



Happy customers at Lower Lee.



The estate owned most of the land, but the tenants needed to be up for it too. The local landowner bought shares for all his farms and properties, and his estate workers dug the network into the whole parish of Abbeystead at the southern end of Phase 1. They even did cobble mining.

Harry supervised the estate workers, who dug the routes to all the properties, and nobody was missed out, even the farms farthest away.



Laying the trench to the village hall at Abbeystead.



Abbeystead Hall install.



Mark Bell, digging the trench at Abbeystead



Trench filled in, and Tom whacking it down level.



Everything stopped for tea. At Abbeystead.



All done and dusted.



On the short film produced by the One Show, the manager of BT Openreach had said farms like that would be impossible to reach, but we got there. Harry and Eileen proved him wrong.

BBC Look North also came to film, as did a Russian News company, and Eileen had her first TV appearance. She still thinks about it as it was “a real thrill and something I had never done before,” she said. And they also interviewed Dr Nicholas Race from the Wray project that had started it all.



Then came all the digs and blows from the cabinet to all the different farms and properties on the estate. Some were extremely difficult ones, and much fleeing was done. We found out later that the estate diggers had been given the wrong (or not enough) training, and the trenches were not as smooth as they should have been.

Nevertheless, the team would not be beaten, and they dug down to each blockage, fledged, blew again and got it through.

BBC One Show interviews Brendan Dick, head of Openreach, where he states that 'with the best will in the world, BT can not deliver fibre to this remote area'.



FTU installed at Abbeystead village hall.

We were learning as we went along. Word spread about the problems with the trenches, and the standard of digging improved. The rest of the routes continued to be dug by the estate workers, the farmers, and contractors.

Then we had tea.

#### **Beyond the book:**

[B4RN FTTH Abbeystead Video](#)

[BBC North West features B4RN](#)

[BBC OneShow features B4RN](#)



Refreshments at Monica and Chas's house after the blows.



The weather continued to be horrendous all through that year. You could more or less guarantee that if there was to be a blockage it would be in the worst place possible – but Bruce could always find it and fix it.

The canopy that Iain had designed allowed the fusers to work under it if the wind was not too strong and if the Prince's Freelanders could get us there. There were some lovely views from the office.

All the blowers and fusers were volunteers throughout the early years, but they got where they had to be, and all the routes were done, dug, blown, enclosures fitted and fused.

Frank Balassa took charge of the cabinets doing both the electrics and the fusing of them with his team at this time. He built a bespoke trailer to work from. (More in later chapters).

Shortly after, Frank, Bruce, Alistair, and Iain were able to be reimbursed with shares (as we still could not afford to pay anyone because all our money had to go into materials). Demand was growing.

Deliveries kept coming as people bought shares, and if you did not keep an eye on it, then the volunteers from one village would nab the duct that was intended for another village.

We could not afford more duct until more money came in, and it was all a case of managing our herd of cats as best we could. Because word kept spreading about the amazing speeds these communities were getting, it actually prompted more to think: if they can do it, why can't we? All it needed was someone to step up and recruit their own team. And the tribe kept growing. Once they decided to JFDI, it was full steam ahead.

Whilst the Abbeystead project was underway, people from Dolphinhholme in Ellet got in touch with Eileen, and she met them to discuss how they could join. Dolphinhholme was not really in our plan for Phase 1, but the trenches were very near to them, and they were very persistent. On top of that, Eileen had land and a bungalow in Dolphinhholme, and once she got a taste of B4RN speed, she she wanted it there as well.

Eileen paid Robert Taylor to dig her Dolphinhholme land, and she persuaded the other farmers to let the duct run through their properties, too. She met Dolphinhholme's Allen Norris a few times, and she encouraged him to get the village on board. He had a great team of people and carried on to have a successful project. More about Dolphinhholme later.

Eileen used to buy her computers from a local company in Lancaster, which also did upgrades and repairs. The company, Black Box, has since closed down, but she remembers going in once, and Mark, the owner, asked her who her internet provider was. She said B4RN and told him that she had a gigabit connection. His jaw dropped when he heard how fast it was, and he said he was jealous. He lived in Caton. A few years later, when she went in again, he delightedly told her he was also on B4RN. "I've got it!" he exclaimed. And she was tickled to think she had got it up to her hilltop farm before a big village in the valley got it. That was the model: we did the hardest bits first.

These days, Eileen says the connection has been brilliant—at home as well as for all the farm work and at the

school, where she works as a bursar. It's also been great for the children and teachers. The world now comes to them.

She was one of the first farmer's wives to be trained for digital VAT returns, and she says the connection has made her life so much easier. During the Covid pandemic, they had Zoom meetings, and all the lessons from school worked because all the children had B4RN at home, too.

Other schools in the area have contacted her, and she has encouraged them all to take up the B4RN service, which is provided free for small primary schools.

The motto upon the old stone, "Vel doce vel disce vel discede" ("Either teach or learn or depart") may well be taken as the motto of the School.



Photo credit to Lancaster Guardian.



INSCRIPTION : ABBEYSTEAD SCHOOL



Photo credit to Lancaster Guardian.



## Wray



Some of the Wray volunteers.

Of course, when herding cats, some will go their own way. Around the time that Abbeystead and Dolphinholme were well underway, and Arkholme at the other end of the network, we also found at this point that a marooned village started to install all the houses with no sign of a core duct anywhere near them.

This was the village that had been Lancaster University's Living Lab, the project that started it all, and the villagers certainly knew how useful the internet could be.

Wray had contributed a lot of money in shares to the project by this point, and they were itching to get going. As mentioned earlier, it would be the biggest village in Phase 1—229 properties—so it was the closest we would get to a “city.” Some villages in the project consisted of only 6 properties!

Wray would bring in a lot of connections in one hit. We had to get there to start making money and paying some staff instead of relying totally on volunteers.

The villagers launched a campaign to raise awareness of the benefits of joining B4RN, and the majority got on board. Local activists went door to door to explain things to people who had not heard about it.

The village decided that, even though the digging had not reached them from Arkholme, and the Quernmore dig had not reached them yet either, they would get going and get all the village ducted up, so they were ready for when it did.



Wray volunteers spreading the word. Iain Robertson, Shirley Worrall, Judy Robertson and Jan Cookson.



John Yellowly was one of the Wray champions, and his job was handling the complicated spreadsheet and maps, and checking the location of utilities. He mapped the routes around the village and planned how each house would get its duct, marking the field for the contractor. Wray used a lot of multicore duct, and John kept detailed records and photos of which duct went where. Sometimes, several cores would go through a wall in one go to reach several properties. In future years, John could mark out where the routes went when any work was done on the field. The community team collected wayleaves and organised the diggers.

The volunteers ran multicore (24\*7mm +1\*14mm core) round to the back of everyone's house and the householders dug it to the property, with help from the volunteers if needed. The volunteers also worked with the digger men and backfilled the trenches to cover the duct with soft fill before the digger completed the job and put the sod back on. They split out the multicore at each property and marked it all down on John's spreadsheet for the blowers. Each duct had a number stamped on it so you could tell which went where when you looked in the chamber.

John : "Tony Bateson (locally known as 'Baco') used his Fergie tractor to help us lay out the duct. He was also instrumental in getting the ducting from behind Home Farm Close and into the lower end of Main Street, where it continued at high level across the terrace of houses, across a driveway and into his own property".



Several multicore ducts going under a fence.



Multicore ducts being moleploughed under a road by Tom, and Robert Brian and Phil helping John get it through.



Multicore customer duct in a bucket, each one numbered.



Splitting ducts off from the multicore into houses.



House ducts going under hedge.



Field markings showing where the duct is.





Backfilling the trench with soft fill.



The road crossing into the school field.



Phil Wring and Keith Wilson digging the chapel car park for the cabinet.

Across the north side of the village they laid a 7x16, 4x16 and a 24x7 in the same trench. They used Tommy's impact mole to go under farm tracks and hedges.

Brian Kirkby was the digger man, and Phil, Keith, John Y, John D and Bob brought the duct and laid it out. Keith Wilson, despite a bad hip, spent whole days backfilling trenches as the others put the duct in. They also did a lot of hand-digging, especially in places where the digger could not go (like people's gardens). Barry then had to find enough money for the Wray cabinet and equipment, and he sited it at the Methodist chapel. Phil and Keith hand-dug the electricity and duct to the cabinet.

The Staveley family, who farmed in the village—mother, father, and son, Rob, had dug round the back of the village to the chapel. Duct was taken right round the school field to reach a lot of properties.

The B4RN team organised a road crossing from the school field to the bottom half of the village and the route to Lowgill and beyond.



Rob Staveley's first chamber for the chapel in Wray.



The villagers kept asking when the main core would reach them, but it had stalled about three miles from the village where it started to come down from the fell. There were only a couple of farms on the route, and they did not show much interest initially. The villagers motivated them, and they also raised more money to pay Keith Sykes and Malcolm Woodhouse as contractors to dig in the core over to the connection coming from Quernmore. The dig was also progressing in Quernmore to join the Extreme diggers of Roeburndale thanks to Robert managing to get wayleaves. Keith the postman started that dig.

At long last Barry got enough money to do the road crossing out of Wray to connect the Eastern branch of the core. It was a real milestone in the project as we finally had enough customers to cross the break-even boundary. At last we were able to pay all our operating costs.



The long awaited road crossing out of Wray and onwards to Lowgill and Yorkshire.



Keith starts the dig out of Wray, to Lowgill and the Bobbin Mill.



Bobbiners levelling the trench.



Malcolm Woodhouse digging up from Wray.



Malcolm Woodhouse and the volunteers digging up from Wray.

The bobbin mill gang took over the trench work, as this route would pass their group of houses on the way. The bobbin mill had been an industrial factory in the nineteenth century but was now housing. Robert Partington, (aka Bob) one of the Bobbiners, had been pivotal in getting wayleaves over the fells to get the connection to Wray. Malcolm Woodhouse took it up the field to the first farm. Then he branched off and took



it to the woods above the bobbin mill. The Bobbiners bought a special duct to take the B4RN duct through the woodland and protect it from squirrels, and they got it to their houses. They then had a manic weekend when Andy borrowed Keith's digger and, armed with spades, they dug to almost every house round the mill. Two more houses were done a bit later, but the majority were done in that one weekend. Robert had been helping in the main village, so he had learned all the tricks to make the operation as slick as it could be. Digging (and many tea breaks) continued. It was backbreaking work in all weathers.

Once they got past the bobbin mill, the main village dig was done, and all the volunteers concentrated on getting gardens dug and house kits fitted.

The dig went through Botton, and different farmers all dug their own land on this section, as they knew it better than anyone, and there were some very tricky bits to get through, including an alluvial plain. Some of the terrain was bog, some peat and some heavy clay.

Our job as volunteers was to make sure that whatever the land was like we got the bottom of the trenches flat, and the duct covered with something soft before backfilling. The diggers dug, and the volunteers made sure there were no stones in the trench and the duct was safe. As the weather improved, it meant that in some areas we could use a mole plough, and we could cover long distances with very little impact on the land. Preparation is key to using a mole. The landowners need to let you know where drains and utilities are. Usually drains are three feet deep, so the mole does not bother them. Little gullies, fences and hedges have to be dug out by hand or with a digger before ploughing, otherwise more joiners need to be used on the duct, and joiners often cause issues. Unless the tractor has its own reeler, it is best if all the duct is rolled out first. If there are any utilities on the land (phone, water or electric), we use a CAT scanner (Cable Avoidance Tool) and ground radar to locate them. Then they are dug down by hand before the mole comes near. Often our duct is threaded underneath them, as they tend to be close to the surface. Wray's job, as well as the village dig, was to join on to where the Extreme Diggers had dug over the fell the year before. They had to raise the money to pay for all the supplies and to pay the contractors and help them do it. This route continued to Lowgill via Thrushgill, but yet another route was underway to get to Quernmore.



Even Bobbiners stop for tea.



Bobbiners laying duct in the trench.



A tractor mole plough in action.



John Day, Phil Wring, John Marshall and John Yellowly working on the Roeburndale dig to join to the Extreme Diggers and to Quernmore.

Many branches were growing from the trunk. Another route left the village and went up the other side of the Hyndburn valley and Yorkshire, and yet another went to Wennington and again on to Yorkshire and also Cumbria. The village had a lot of work to do!

And even with all that digging, the lynchpin was a route over the fell that would ultimately bring Wray and all the areas west of the Lune live. The route up the fells would be a challenge, as the peaty land was still waterlogged, and it was a dirty job.

John Marshall, John Day and Phil Wring joined John Yellowly for most of that dig, and they got very muddy together helping the contractors. They took duct to all the farms on the way, and the farmers and residents came out to help them, but the bulk of the work was done by the few.

Halfway down Salter Valley a chap at the other side of the valley dug his own duct to the chamber where the above photos were taken, and joined his farmhouse on. George Gordon already knew how to dig the duct as he had been volunteering at Quernmore the year before. His story comes later,



Dave Bissel digging the multicore out of Quernmore to Littledale.

The start of the route to Wray was in Quernmore, Tony Swidenbank had moled it from the hub at the Rec before the weather turned bad in 2012, but now it was so wet it had to be dug. Dave Bissel dug the first bit to Littledale that would join other routes. The duct he used had 7 separate cores in it. Two of these ducts were on their way to Wray,

Once the duct was to the chambers, Chris Hall, Bruce, and Alistair blew the fibre from Quernmore to Wray, over the Littledale fells. The sponge proved the duct was blowable and all the joints were intact. Then the blowers would start the blow and the sponge catcher would catch 20 metres of fibre and roll it up into the chamber to wait for the fusers to come. Once the fell blow was done, the blowers moved into the village to blow the routes from the cabinet around the village and off to other villages, too.



Iain, Chris and Alistair were the only fusers at this time, and by this time, they were using the “spray tan tent,” which Iain had bought at a fraction of the price of a proper tent. Our proper tent had been destroyed in bad weather at Arkholme. This new one eventually followed the fate of the previous tents, and many chambers were fused in the shelter of cattle trailers loaned by farmers on this route.

Once it was blown the Quernmore route was terminated at Wray cabinet. At the same time, the dig from Wray progressed up the other side of the fell to Thrushgill, and the weather got a bit parky, but the blows went on. This was the route that would connect Iain and Judy, and then swing around, picking up additional farms on its way. Walter came up to visit and helped with all these blows. Lowgill was the next stop on this line, this was their second route in, and the Keasden cohort started making noises.

We were approaching Yorkshire from three different routes now, and starting to knock on Cumbria’s door. Malcolm and Keith were digging to take the core to Lowgill, Thrushgill and east to Yorkshire. Meanwhile, another route out of Wray headed to Wennington and northwards, with TP Metcalfe digging, with another going to Millhouses, mainly dug by Brian.

Wray had turned into a super-hub, growing many branches, From the back of Wray, the route coming in from Quernmore branched off to Brookhouse and Hornby,



The Thrushgill blow.



Mike Winstanley helping with the fibre blow from Wray to Quernmore. This was his practice run for when the duct reached Millhouses.



John catching sponges on the fell blow to Quernmore.

The idea for B4RN was sparked at Wray, and it now became the critical part of the network that would enable it to scale dramatically. Meanwhile the intrepid diggers had set off back up the hillside to reach the next village in Phase 1: Lowgill. There would be two routes going there, the first one from the road crossing and the second one over Mealbank to Millhouses.

Their own chapters follow.

Wray dug over 34 kilometres of trench to connect its properties.

Once the fibre was blown over the fell and Wray came live, we finally passed the 300 customer mark, which meant we were cash-positive. Over the next few months we hit the 600 mark, which meant we could take on staff at last. Our first staff member was Alistair.

## Alistair Adams-Huset



Alistair blowing fibre.



Alistair blowing the fibre over Littledale.



Alistair in the spray tan tent.

Alistair had started volunteering when digging was going on in his parish of Abbeystead. He followed the digger and backfilled the trench as it came closer to where he lived. He had just finished university but could not apply online for jobs and wanted the internet very badly. He was spotted by Bruce and Iain, so he got his start on the blowing team first. We then showed him how to fuse, and it turned out that was where he excelled. He was soon fusing faster and better than any of us, so we sent him off to Lucid, a fibre optic training company, for further training. He learned a lot more technical stuff than we knew and came back and taught us about Optical Time Domain



Alistair's first fusing experience.

Reflectors. (OTDR). OTDR machines meant we could measure the length and quality of a fibre route with just one simple machine. It was revolutionary. A beam of light pulses down the fibre and a computer programme measures it accurately so you know where every join is and where a break occurs.

A slight speck of dust can ruin a fuse, which is when two tiny fibres are joined together. We used various methods in those days to protect ourselves and our fusing machines from the elements. Iain was the master of invention. At first we had fused out of his boot. Then he designed a table which was the right height to save our backs, and a portable windbreak so we could fuse in a bit of a breeze. For wet days we tried tents, but they did not last long. Sheena's old Land Rover got us to places where our other cars could not.





Iain and Alistair working out of the back of Sheena's Land Rover.



The volunteers bring umbrellas for Alistair.



Working out of the back of a cattle trailer with a view.



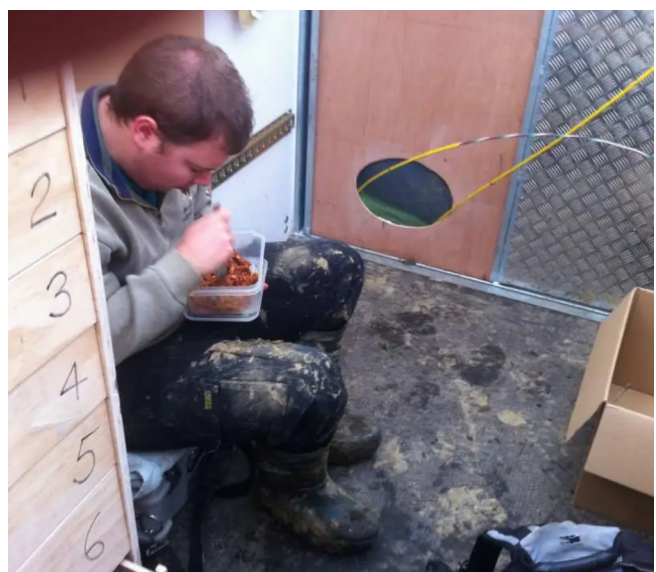
The late blow to Quernmore from Wray.

Often a volunteer would be handy with an umbrella. Alistair did not like rain at all. We mainly fused in the back of cattle trailers, and despite the different makeshift conditions, we could not complain about the view from the office. Eventually after trying many shelters, Iain designed the bespoke trailer, so that we could fuse in warmth, light and comfort.

It also doubled as the canteen. Having survived self-catering at Uni, Alistair often brought home-cooked stuff instead of sandwiches. (As a matter of interest, he bakes exceedingly good cakes when it is someone's birthday too. A man of many talents.) Alistair now leads the entire core team of fusing staff, and he has trained many local youngsters. Lucid has also certified them, so many of them now have great jobs with B4RN.



Working in the bespoke new trailer.



Alistair's canteen in the new trailer.

## George Gordon

George Gordon, who had helped with the digging at Quernmore, saw the duct coming down the opposite hillside to Wray, and so he got digging himself. His farm was within sight of one of the West Roeburndale routes. He lived in East Roeburndale. Between them was a big valley with a river at the bottom. To get to the other side, he had to drive all the way down to Wray and back up the other side of the valley.

This was a real challenge for fibre. The choice was either to take the (very) long route, or cross a river. George, often referred to in the village as “the other Jeremy Clarkson” because he looks, talks and acts a bit like him, was undeterred and set about the task.

To cross the river he built two stands to hold towers that spanned the river with a catenary wire to hold his duct. He protected it with alkathene pipe. He had to cart concrete up and down the valley for a few days, but the crossing got built. He then had to dig up both sides of the valley, lay his duct, and backfill it all. He did not complete the backfill until after the fibre was blown in case it had a blockage and had to be dug up. He got the duct to his house - actually two, in case of future needs and to save doing it again.



Dave takes his photo to take back to the office.



Discussing the problems...

Dave Rames from Emtelle came to help and advise on this blow. Because of the zig-zag over the river, it was over a kilometre long. We had never blown house fibre that far over such difficult terrain, and he was interested to see it, too. He could not believe his eyes when he arrived at George's house, and he took a photo to take back to the Emtelle office. He had brought a bigger and stronger blowing machine than we had, but Bruce and Chris really wanted to test ours to the limit. Plus, the danger of a stronger machine was that the fibre could be damaged. After some discussion, it was decided to use our own blower. Meanwhile, another discussion was held about the madness of it all, and we waited until Bruce got to the other side of the valley with the walkie talkie to confirm he had “air.” The sponges were blown through, more coffee from George's cappuccino machine was drunk, and the fibre blow started.

Bruce came back because it was going to take a long time, and we suspected there would be some digging to do...



... sure enough, the blow stopped and George and Bruce went off to dig for the blockage. Chris stayed at the helm and set the fibre off again when they cleared it.



Waiting for Bruce to ring to say the fibre has got there.



Chris hearing from Bruce that the fibre has at last arrived at the chamber.

Eventually the fibre blowing through the machine had been measured to roughly the right distance, and Bruce set off again to the other end and confirmed it had indeed arrived at the chamber into its blowing tail. There were great celebrations and more coffee. The house fusing was done and a router supplied. The following day the fusers arrived at the chamber. George came live on 30th January 2014.

Once it became known that Wray was mobilising and there was progress over the mountain, the Lowgill and Wennington teams started their core routes. A new group, B4YS had started up (Borwick, Yealands and Silverdale from the Arkholme cabinet). Dolphinholme had started from the Quernmore/Abbeystead lines. B4SW (Broadband for South Westmorland) also kicked off. It was a manic few years to be sure. So far everything which had been done had been organised and planned by Barry, and built by the management team and volunteers.

When we reached Wray we got our customer base high enough to pay backhaul costs, and the more customers we added, the closer we got to hiring admin staff to ease the load on Barry.



George did not backfill his trench totally until the blow was complete in case they had to dig down to a bend or a blockage.



The following day Iain and Alistair, the fusers, arrived at the chamber. George came live on 30th January 2014.

## Dolphinholme



Dolphinholme was at the Abbeystead end of the parish, and again not in B4RN Phase 1, but that did not stop them in the slightest. Whatever it took, this group was determined to get a gig. Allen and his cohorts armed with mattocks and pickaxes took up the challenge.



John Klotz, Graeme Chapman, Donald Hantom and Allen Norris

### The Dolphinholme story

by Allen Norris

In February 2012 Andy Collinson alerted Suzette Heald that someone in Quernmore was touting a project to bring high speed broadband to rural villages. Suzette and others in Dolphinholme had been talking about setting up a Residents Association following earlier discussions about establishing a Neighbourhood Forum for Dolphinholme. The fact that Dolphinholme is split between two parish councils and two local authorities means that we lacked (and still lack) a single voice for the whole village. Suzette sent an email to Barry Forde who agreed to come and talk about his ideas. At the meeting Barry explained that Dolphinholme had originally been placed in Phase 2 of the proposed B4RN project. This was in part because it was thought that broadband speeds in Dolphinholme were similar to Galgate (i.e. 2-30 Mbps). We were able to show that, on the contrary, 'broadband' speeds were non-existent and we were lucky to achieve the 56 kbps dial-up speed!

Barry explained that we might join in Phase 1, if we got enough people interested and committed investment. The gauntlet had been thrown down!



Under the auspices of the yet-to-be-fully-constituted Residents Association we called a public meeting. After receiving enough expressions of interest, we set up the Dolphinholme B4RN Action Group (DB4RNAG) led by Allen Norris, Suzette Heald, Andy and Liz Collinson. We were quickly joined by Sam Ud-din, Graham and AnnaGerd Chapman and Graeme Chapman.

We realised that we had two initial tasks. First, we had to raise awareness of the project and convince enough people to both register their interest and indeed purchase shares, since we needed to raise around £75,000. This was no easy task for a village with only some 120 homes. Second, we needed to map out a possible route for the ducting and then obtain wayleaves to access the land. Dolphinholme had some advantages in this case, since much of the village is surrounded by the Duchy of Lancaster on one side and the Abbeystead Estate on the other. This meant that there were relatively few landowners to convince.

To raise awareness we issued our first communication flyers in May 2012, Broadband in Dolphinholme. At the time Dolphinholme had two main means of communication. There was the long established village monthly magazine, The Grapevine, and as chance would have it, the nascent Residents Association (DRA) had recently set up a closed email newsletter, The DRA Newsletter, courtesy of Tim Hucklin, who ran Ictis (a technical software company) and lived in the village at the time. These two channels together with a new closed email newsletter, DB4RNAG Newsletter, were to prove invaluable in raising support for the project.

We produced a whole series of flyers which were distributed at various village meetings both in the Village Hall and the Chapel Rooms as well as the Fleece (the local pub) and the Church. In addition to our own public meetings we also set out our stall at other village events, such as the Easter and Christmas markets.

Gradually we began to attract a number of people who were prepared to take the risk and actually purchase shares, bearing in mind that, at this stage, there was nothing really on the ground as security. An advantage we did have is that there were many people in the village who could see the potential benefit of high speed broadband, not just as a nice to have but as becoming a necessity. We were also aided by a considerable groundswell of feeling that we had been misled by BT for far too long about the prospect of getting true, affordable broadband connectivity, and if we really wanted to get anywhere we were going to have to do the job ourselves.

From the discussions we had with Barry Forde, Chris Conder and others, we understood that the declared objective was to get the core duct to the boundary of every property in the village. As a matter of principle the offer was to be made to everyone who wanted it, although not necessarily at the same time.

Dolphinholme is a village in three parts with considerable areas of farmland between the three parts, Dolphinholme, Four Lane Ends and Lower Dolphinholme. (Now, the Bowland View estate adds a potential fourth part, which is a matter of some concern, and something B4RN may help with.)

Fortunately most of the village properties back onto farmland or are very close to farmland, all of which made access to homes more straightforward.

With this in mind the action group started walking the fields and boundaries to try and map out potential duct routes. We knew that there would need to be a cabinet and that the cabinet would need electrical power, so the logical place to put it was the village hall. We obtained the consent of the Village Hall committee and identified a piece of land which bordered open farmland right next to the carpark.

Dolphinholme is surrounded on three sides by the Duchy of Lancaster. At the start, obtaining wayleaves from the Duchy was problematic, mainly because we were dealing with land agents who really had little idea what we were talking about. Fortunately Barry, Chris and the other 'founders' had been talking to the Prince's Trust about possible support and were getting encouraging responses. Once the Duchy agents realised that, things became much smoother and eventually we received a wayleave that basically allowed us to go anywhere provided the incumbent tenant agreed.

A similar situation existed in Abbeystead where the Duke of Westminster wanted B4RN and similarly gave access. The remaining farmers surrounding the village were, with one exception, keen to have the service, so wayleaves were given. One farming family however simply refused wayleave permission because they thought we were hiding something. This meant we had to change our planned route to one part of the village. This delayed service to other properties on that route for a number of years. The B4RN management decided to exclude this farm from the roll-out, a situation that still persists.

One other issue was whether householders should provide a wayleave for their own connection. It was clear that where ducts to another house were crossing the land, a wayleave was needed, but some thought that this was not necessary for individual households crossing their own land. The Dolphinholme team felt this might be unwise and have continued to seek wayleaves from every household. We felt it helped people feel more involved and helped with mapping and record keeping.

In all cases actual detailed access was agreed with the landowner. Typically we tried to route ducting around the edge of fields some two metres from the fence line, the idea being the duct was unlikely to be disturbed by fence posts or supporting posts. In gardens we normally went along the fence lines, but this sometimes became quite complex when we had to avoid garden features. In theory of course the householder was responsible for putting this duct in, but we found that by offering to help as part of a work team, things went much more smoothly. We also tried to keep our own copies of wayleaves, the late Graham Chapman acting as 'wayleaves officer' something that has proved helpful several times since. All the route details were lodged with the B4RN office and plotted on Google Earth. This system proved rather limited during actual construction, so we plotted out our own 'duct maps' showing the location of each house duct and the links between them. This could be printed out and handed to the team actually digging as a reference, and any deviations could be noted and amendments made. In the early days this proved invaluable.

A further consideration in route planning was the presence of existing underground services. As a team



we were lucky that one of our members, Jane Entwistle, is a fully qualified civil engineer. Her assistance in locating plans of existing services proved invaluable. We were trying to route through open countryside as much as possible to avoid existing infrastructure; but where we had to get into more developed areas, this was more difficult. The main exception to this was the gas pipeline that runs next to the village. Fortunately the farmers are well-versed in the protocols to be followed near the pipeline. We were also given the contact number to call to avoid any confrontation which can occur if the daily helicopter spots activity near the pipeline of which they have not been informed.

As mentioned the presence of existing underground services needed to be managed. Although we had access to plans, one can never be absolutely certain of their accuracy. Where main electric cables were concerned these had to be at a depth well below that at which we were working. Nevertheless we initially borrowed CAT (cable avoidance tool) scanning equipment from builders in the village (ideally with an operator) since we had no training in interpreting the readings. B4RN later acquired its own CAT equipment, which we borrowed by arrangement. In addition, when we were digging in the area of Common Bank, we borrowed a ground radar kit. It turned out that we had someone in the village who was familiar with this equipment and had used it to help the Home Office scan for bodies. (Ah, the advantage of living near a university!) Despite such kit, we still proceeded with great caution. When we were digging in the vicinity of power or gas services, no power tools were used; it was hand-digging only, on the assumption we would locate the services before causing any damage. Furthermore we did not use pick-axes but only a flat-bladed mattock to reduce the chance of inadvertently penetrating the services. For drains we lifted the nearest manhole covers to assess the invert levels and used this to guide our digging.



Dolphinholme Bridge crossing.

As we were all volunteers, there was a considerable variation in the familiarity of using tools etc. Those with more experience gave safety briefings to others. In effect we were conducting risk assessments at each stage of the dig, guided by the duct and route plans, the service plans and any additional information. We also tried to match more experienced 'tool operatives' with those less experienced, and also tried to match jobs to capabilities. As you might imagine, this was, on occasion, an exercise in herding cats as well as managing the bloody-minded.

Our initial plan showed that we would need three road crossings in the village, one over Wagon Road, one in front of Corless Cottages, and one across Starbank Lane. Now to cross the public highway required permission from Lancashire County Council and the use of a certified highways engineer. The latter was not too much of a problem since one of our supporters owned a construction company who employed such a team and agreed they would help. Getting permission proved more of an obstacle. One

would have thought we were trying to cross the M6! There was talk of road closure orders, traffic diversions and miles of red tape. It took months but we managed to persuade the Highways Department to send an engineer to actually talk to us and see what we actually wanted to do. When he eventually came and saw this team of fairly ancient, shovel-toting enthusiasts, I think he was a little taken aback. But we clearly impressed him because he finally agreed we could control the traffic with Stop/Go signs, and talk of closure and diversion ceased.

Permit granted, we set to work one Saturday morning at 7:00 and by 10:00 all three crossings were in and resurfaced. In all that time we saw one car and a horse, and the horse simply stepped over the trench! Dolphinholme Bridge presented a greater challenge. Our first thought was to suspend the duct's hangers over the side of the bridge, the hangers having previously been used to carry the old mill gas pipe. This did not work, so the only alternative was a bridge crossing. It took considerable research to establish what was already in the road over the bridge. This time we had to use the full works of road closure orders etc. By this time however we had some working infrastructure in the village so the powers that be were putting up much less resistance.

One of our first exercises was to go over to Gressingham to meet John Hammett and see how the team over there was working. B4RN's Chris Conder introduced Liz Collinson and Allen Norris to John. John showed us how they had laid out their trenches around the buildings and then rolled the ducting out into the trenches. He then showed us the 'riddling' technique to remove large stones from the immediate fill. This lessened the chance that the weight of fill would kink the duct, which would have prevented the fibre being blown. Another thing we learned was to cover the ends of the duct to stop water getting in. Now ideally one uses little caps to seal the ends, but in these early days such items were in short supply. So we learned another technique to seal the ends with the infamous black duct tape. Done correctly it can be very effective. Seeing the duct in the flesh, so to speak, also brought home the need to label each duct, since they all look the same in the ground, and it is easy to lose track. At this stage we were also trying to put indicator tape over the initial fill to act as a warning to anyone digging after us. Getting indicator tape that said Optical Fibre was difficult, so in most cases we used electrical warning tape. We were forever running out of tape and so often used it only where we felt a later digging was more likely. Other issues we discussed with the Gressingham team were how to get under hedges, and the 'little matter' of dry stone walls. In the latter case, putting a trench either side of the wall and knocking an old piece of scaffold tube under the wall often worked. Later we obtained a six-foot crowbar which was useful as a drill to lead the pole. A further refinement we added later was to put steel wool into the end of the pipes after the duct was through; this blocked the end and hopefully makes it less attractive as a home for a rat.

One outstanding memory is of our first 'official' days digging. I arrived at the field behind the church at 7:30 on a Saturday morning. It was pouring with rain and there I found Iris Rogers in wellies already digging with a spade. True Grit!



Iris Rogers RIP.





Backfilling the trench by hand, Wendy and Donald Hantom

Our initial method of working was indeed with spades, hand-digging a trench some 200 mm wide and 600 mm deep and removing projecting stones from the bottom of the trench. Once a suitable length of trench had been dug, we manhandled the duct into the trench. We then worked our way along the trench backfilling by sieving fine material over the duct to a depth of some 200mm.

The idea was to protect the duct from sharp kinks or stones. Once the initial soft-fill was in, we back-filled the trench with the coarser material to

just above ground level and allowed it to settle. We knew farmers would not welcome any large stones being left on the surface to catch machine blades, so we removed them to the side of the field. We quickly realised that this was a very slow process, so we got the okay from the B4RN office to hire James and his mini digger.

As we were still backfilling by hand, James quickly obtained a very narrow bucket for the digger. This reduced the width of the trench and therefore the amount of back-filling required.

We also found that a Bulldog trenching spade is a great asset. Not only did this dig a narrower trench, which reduced the amount of backfilling, but with a stout blade and long handle it exerted very considerable leverage, excellent for moving the many stones we encountered. Later our trenching spade suffered the misfortune of contact with a tractor. I took it to the manufacturers in Wigan for repair. Not only did Bulldog re-handle it for me, but they also donated a second trenching spade to the cause.

The steering group had decided that the first building to go live should be the Village Hall. We felt this would provide good publicity because anyone in the village would have access to hyper speed broadband should they wish, and also hopefully tell their friends and family, spreading the message.

We decided to have a formal opening to which the village, the press including local radio etc. were invited. We set up a whole series of demonstrations to illustrate the benefits of hyperfast broadband. These included streaming a film and linking that to a digital projector, transferring large files to the cloud, email and even working in the cloud. The event was scheduled to start at 7:00 pm. At around 5:30 pm everything was tested and working fine. At around 6.00 pm we had no internet. A rapid check of the cabinet and the router showed both appeared to be working fine. A series of phone calls were rapidly made to B4RN and to Barry and Alistair who acted as the technical team. They quickly established that there appeared to be a cut in the fibre near Abbeystead. Investigation revealed that North West Electricity was working on a substation near Abbeystead. They had dug a trench to expose their cable and in doing so had cut our fibre. Worse, they had left the site with an exposed electrical cable with no indication whether or not it was live. This prevented us getting in the trench to repair the fibre! We now had a real problem. It was too late to cancel the launch, so what could we do? The group decided to go ahead with the opening, and explain what had happened. We then went through all the demonstrations

we had planned, explaining in detail what people would have seen had the internet been available!

Well, the reaction was amazing. Not only was the audience behind us but local radio featured us and we even featured on the NW Tonight television broadcast. Far more people signed up for the service than



AnnaGerd and Allen showing the routes the trenches took.



Andy showing other routes the trenches took.



Lots of discussions about routes the trenches took.



Allen Norris, Graham Chapman, Gary Troughton, Iris Rogers, Sam Ud-din laying the cabinet base.

time, the design was little more than a back of an envelope sketch. We selected the location for the base to be opposite the point at which the electrical supply cable entered the village hall, and which backed onto open farmland. Having got the dimensions from Bruce Alexander at Quernmore, we dug out the

we could have hoped, giving us a real triumph over adversity. The service was back up the next day, and in the following weeks we converted a lot of prospective customers who had heard what had

happened into new customers, and connected them. You could not make it up!

Just as we had benefited from visiting Gressingham so see how they were working, so we were happy to show others what we were doing. There were a number of show and tell days where visitors (some bused in by the duct suppliers Emtelle) came to see what we were doing. These included people from other parts of the country interested in trying this for themselves, coming even from as far away as California.

When the Emtelle show and tell day visited Dolphinholme, Allen and the volunteers told the visitors what they were doing and showed them the route the fibre took.

We also hosted a number of 'bring your own IT equipment' days in the village hall for people to see for themselves what B4RN could offer them under real live conditions. Back at the build-out, it was clear that the cabinet base needed to be of a standard design. The only problem was that, at the



foundations for the base, constructed a wooden former, and then fitted the necessary access pipes in place, ready to lay a concrete base. This was a Saturday morning job with the team assembling on what, (for once!) was a fine day. We borrowed a mini mixer, several garden barrows, and lots of shovels and set



Sam putting the ducts in the trenches.



AnnaGerd putting the ducts in the trenches.

to. None of us were really builders but many were keen DIY 'ers. It turned out to be a very satisfactory day's work; at the end of it we actually had



Volunteers sorting and taping ducts ready to go in the trenches.

something concrete to show for it (pun intended).

There then followed some time awaiting the delivery of the cabinet (with fingers crossed that it was going to fit). Locating the cabinet in its new home was a potential challenge, but fortunately, with the aid of an excavator used as a crane, we managed with far less difficulty than anticipated. All that remained was to drill out anchor points, epoxy in stainless steel studs and bolt the whole thing down. Job done.



Next, we had to complete all the trenches leading to the cabinet and locate the ends of the access pipes. This meant more hand-digging with a trowel on hands and knees and beneath a fence. Amazing what one can do when one has to. Later, we had to repeat the hand-digging exercise when Barry announced that we needed to put another fibre duct in the cabinet. That exercise was not helped by the presence of curious cattle in the field– just one more factor of rural life.

The first priority for our dig was to get from Abbeystead to the chamber at the village hall. The teams from Quernmore and Abbeystead together with the farmers and the estate got the main duct as far as Greenbank. The farmer who has the land from Damas Ghyll to Dolphinholme decided to dig for shares and bring the duct to the edge of the village using a contractor. Our job was therefore to get the duct from the edge of the village to the village hall.

Our route lay across the field behind the school, from a chamber adjacent to the road crossing at Wagon Road, to the corner of the field by Livestock. For this section we used James and his mini digger, which was by now equipped with

a small bucket. To fund this, we agreed with Barry that if an investor in Dolphinholme bought shares, then we could keep a log of digging, and in effect allocate that expenditure to those shares, thus modelling the way landowners could dig for shares. In these early days, with money being very tight, this was all by direct agreement, and we had to get permission before we went ahead.

Digging went as planned until, about halfway across the field, we began to find enormous stones. This required a few changes to the route. In one case the stone was so large it nearly turned the digger over. We later established that although the field appears almost flat today, that is not its original landform. There was once a deep gully leading right up to the edge of the road, but at some point this was filled with rocks and then levelled. Next to the road we also found a big culvert that simply disappears into the ground and is clearly directing the water down into this gully.

After the excitement of that one large stone, we were working at the other end of the route next to Brookside Drive and needed to connect the duct leading to Damas Ghyll left by the contractor. We dug a trench to the agreed location for the chamber and started to dig out the chamber. Needless to say, Dave Stirling and Allen hit rock just below the surface and spent hours chipping out stones. Having just about exhausted ourselves, we fitted the preformed chamber sides, only to find we were not quite deep enough at one point. We tried to chip out a few more stones but to no avail. It turned out to be a single massive boulder.

At the time we had no machinery, so after a bit of head scratching we thought, 'Well men moved Stonehenge with no machinery and if they could do that, then we could do it now'. We proceeded to excavate around the boulder to give ourselves some room, and then applied a six-foot crowbar to the end. Raising the boulder a few centimetres, we repacked it with sand and stones and repeated the process. Eventually, moving a few centimetres at a time, we managed to move the boulder enough to sink the chamber to the correct depth. One more job done.

To get the duct from the chamber to the side of Abbeystead Road we had to dig along the edge of a garden, under tree roots and along the bank of the stream. We got there, but then had to cross the road. Our solution was to lay an alkathene water pipe looped up along the roof of the concrete culvert that carries the stream and then to bury either end, locking it in place and ensuring it could not restrict the flow in the culvert. We then fed the duct through the alkathene pipe.



Graeme and Allen.

On the far side of the road we had to dig around two field boundaries and cross an old hedge. Again, alkathene pipe laid under the hedge protected the duct.

At this point we had another little challenge. To move large rolls of duct we had been borrowing Liz and Andy Collinson's faithful old Nissan Shogun, but, typically, at the time we needed it, it was out of action, and none of the farmers was available to move the duct.

Graeme Chapman came to the rescue. He has an Audi A4



convertible. Did you know that with the roof down and someone in the back holding things clear, one can move a hundred metres of coiled 16mm duct? Well, you can.

As the operation progressed so did knowledge of what we were doing. Our local MP, Cat Smith, became aware of our project and asked to come and see it for herself. All credit to her, she came complete with wellies and joined in.

The area in front of Common Bank was our first taste of digging through a concreted area. The properties at Common Bank surround a private road (it was originally a farmyard) but the area is surfaced partly in concrete and partly in asphalt.

We worked out a route that essentially followed the edge of the concrete and used as many existing channels as possible. We planned to approach the houses by widening the nearest existing crack or joint. We scanned and marked out the area. We planned to use a disc grinder to make two parallel cuts about 50-60 mm apart, lever out the concrete, and then use crowbars to dig out the narrow trench deep enough to sink the duct below the concrete base. We would then insert the duct, cover it with soft-fill, and then top-up with mortar to level the surface.

As was our practice, we convened a working party one Saturday morning. We only had one nine-inch angle grinder with concrete cutting discs. The tool was mains-powered so we had to rig extension cables. Now this is a pretty dangerous tool and cutting concrete produces vast amounts of dust. As it uses electrical power, we could not flood the cut with water to keep the dust down. The operator was wearing a suitable dust mask, ear defenders and goggles, but even so, we had to keep everyone else clear, and to work in small stages. The method worked, but also showed us we had to go slowly. Later in the day one operator took over and allowed his enthusiasm to run away with him. He cut the concrete but also burned out the angle grinder motor! At times slow and steady wins the race.



Mike Rudd and Graham Chapman.

We also learned that using a diamond cutting saw is a much better option than concrete cutting discs. Another useful tool was a small electric jack hammer, which made loosening the ground beneath the concrete much easier, a technique we later used to great effect in Greenbank. For final finishing we used mortar and cold roll asphalt as the need arose.

Once the ducting was in, we turned to digging out the chamber. As so often in Dolphinholme, the first half metre was fine, then we hit rock. It took longer to dig the chamber out than to dig the duct in.

Getting duct down to Lower Dolphinholme was a challenge. The obvious route would have been to take the duct down the side of Livestock path, but that was surfaced and may have had some less well-documented services in it. The alternative was to come across the field behind the school and then drop

down the bank to where the cinder track joins Wagon Road. The only problem was this was too steep to walk down let alone get the mini digger in. Never daunted, a couple of our group are pretty experienced mountaineers. Their solution? Rope up, belay, and then descend on ropes, dig out a trench by hand as you go, lay the duct and fix it at several points, and then backfill. You would struggle to find a contractor to do that! We used this technique a couple more times to bring the duct to the other side of Wagon Road and later to bring the duct down behind the church. One learns as one goes.

To the south of the river lies Dolphinholme House Farm. The farmer, John Gorst, decided to dig for shares and elected to try a mole plough. Now we had heard about mole ploughing and it appeared a very useful technique in that a very narrow trench is ploughed and the duct inserted in the base of the trench from a reel carried on the plough as it proceeds. The trench itself closes behind the plough blade, removing the need to backfill. Potentially this is a huge time and effort saver. The plough they proposed to use was towed behind a massive tractor with four wheel drive and huge tyres. As it turned out, this was its downfall. We started in soft ground at the lowest point of the route, just next to the old mill chimney in Dolphinholme. Within a few metres the tractor had effectively buried itself rather than the duct! Not a very encouraging start. The driver then decided to try ploughing from the other end, so went to the top of the hill to come back down to the original start point. This was a bit more successful until the ground got really soft again, which brought things to a halt. The remaining part of the trench had to be finished using an excavator. Concluding that the field was just too wet, we took the rig to the top end of the field and put in another section up to where we had to cross a road. Then we took the rig over the road and ploughed two more trenches on the far side of Wagon Road, both leading to a track crossing which we were to tunnel using a mole.

We made both crossings using a tunnelling mole. This meant excavating a trench at the appropriate depth on both sides of the road. Each trench has to be long enough to fit the full length of the tunnelling mole. The mole is a slim pipe with a cone on one end and on the other, an air line connected to a compressor. The compressed air projects the mole forward into the ground and the unit gradually drives itself forward. Provided the ground is suitable, i.e. no very large stones, and the mole is correctly lined up, it should emerge into the trench on the other side of the road. We lined up the mole in the bottom of the trench, crossed our fingers, and set it to work. Perhaps rather to the amazement of the team, the mole did in fact emerge in the right place, allowing us to feed a duct through the tunnel under the road. This moleing technique is limited to areas where it is known there are no underground services and few large rocks. Rocks may stop the mole or make it swerve. When this happens, the mole will miss the receiving trench and lead to much digging to find it again. Our first experience with this method was somewhat mixed. The tunnelling was fine, but the ploughing hit difficulties that proved rather more serious than we first thought. When the fibre team came to blow the fibre, they found they were blocked on a number of occasions. This meant we had to dig a trench across the line of the ploughed section (bearing in mind this was no longer visible) to find the duct. Then we had to dig out the duct and try to clear the blockage. This was eventually achieved after very considerable effort by the fibre team, so the Dolphinholme team decided mole ploughing was a non-starter.

There is an interesting postscript to this story. A few years later, when we were engaged on another part of the route at the west end of Starbank Lane, a contractor was using a mole plough to bring a duct from



Quernmore. Given our earlier experience, we were somewhat sceptical, but the contractor was adamant. This was, however, a very different kind of mole plough. The unit was self-propelled on caterpillar tracks. The duct reel was suspended on the machine, and the duct fed to the base of the plough blade through a tube on the blade. The biggest difference lay in the mode of operation. Rather than simply being pulled



James Gardner (Bondy) Allen Norris, Mike Rudd, Jane Stringfellow and AnnaGerd Chapman with Whisky the mascot dog RIP working at Trough Road.

through the ground, the blade vibrated and effectively drove itself along. The difference was remarkable, and the unit moved along at a steady walking pace, with the trench vanishing behind it.

The next section at the end of the field entailed going around the end of a stone quarry. We had already brought a trench up to the other side of the quarry using the mini digger and knew that the stone was virtually at the surface. The mole plough contractor seemed quite unperturbed by this, and with justification— the unit just carried on regardless. It is fair to say that, from this point on, the Dolphinholme team was converted. Where money was available, this was the preferred option from then on.



Laying out the duct for the dig.

To the south-west of the river lies Wyreside Hall. The same person owns the hall and the land around it, and was converting the property into an hotel. The owner also had an engineering business on a farm further along our proposed route. The landowner was keen to have B4RN connectivity, and agreed to dig for shares.

The company had acquired an old Case trenching machine which it proposed to use. The machine looked like a track-mounted chainsaw where the blade could be lowered into the ground. To us, this was another unknown. In operation it cut a narrow trench about four inches wide. As it cut, it piled the spoil up on either side of the trench. The cutting action broke up the spoil, making it much easier to handle, provided large stones were removed. Having laid out the appropriate length of duct under tension (we had learned that lesson by now!), we adopted the technique of following behind the machine with the duct, and lifting the duct into the trench. We then covered the duct with a layer of fine spoil from the side heaps to ensure that the duct was appropriately protected. The trench was just wide enough to enable us to shuffle along it, bedding down the spoil and duct. At the end of the dig, the trenching machine lifted its blade, drove back to the start, and, using a small dozer blade on the front, back-filled the trench with

the remaining spoil. All we had to do then was to remove any large stones that could later catch a plough blade. At the time this was a great improvement over our previous practice of mini-digging. It was not foolproof—one had to be careful to maintain the depth of the trench—but it certainly sped up the whole operation. James Pickering and his team did a great job for us when we needed it.

Once the basic route to Dolphinholme was in, we were asked to continue in two directions. One was to bring the duct from Lower Catshaw near Abbeystead back to the village. Apart from the significant distance, this route contained a couple of obstacles. First was the ‘minor matter’ of crossing the big gully at Hall Gill, which lies at the bottom of a very steep-sided wooded valley, and the other was the exposed nature of the land across Lower Swainshead.

There is a small footbridge below Catshaw Hall; the farmer was able to get the duct down the bank and across the gill next to the footbridge (thanks to scaffolding pipe) but we were not sure how we were going to get up the opposite bank. The neighbouring but one farmer had a mini digger. One morning he decided he could get it down the bank to the foot bridge. This he did, and brought the trench and the duct right up the bank and into the field. Quite how he achieved this, we do not know, but he did! At this point we had another bit of good luck; the owner of Wyreside Hall agreed to use the trenching machine to dig this section, once again digging for shares. An incentive for him was that this part of the route provided a link to some of his other properties.

This part of the route provided one of those epic events that characterise this project. In the foulest weather imaginable, AnnaGerd Chapman and Allen back-filled almost two miles of trench by hand and on hands and knees. It became so ridiculous that we somehow just kept going, and another seemingly impossible task got done.

While on the subject of the land around Wyreside Hall, the owner wanted to link security cameras from various properties. It was agreed that he could use some of the dark fibre in the B4RN route at that point, and the fibre team rigged the system for him.

In the same area we initially had a problem with the number of available fibres. The team at B4RN, by that time at Melling, used some novel technology to in effect increase the number of available fibres. As far as we know, this was the first time this technique was used. I believe that subsequent routes have increased the available fibre and this has been reversed but at the time it was significant. (CWDM is a prism which uses wavelengths so each connection gets a full gigabit. It is useful until more routes are completed and then it can be replaced)

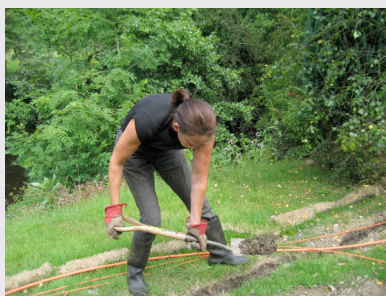
The basic B4RN philosophy is that the householder is responsible for their house installation. This means they are responsible for digging through their gardens and drilling through their own house walls to get the fibre into their homes.

The action group thought about this and decided that while this is great in theory, we could see it being a major barrier to the uptake of B4RN. There were two problems in our view. First, some people were not physically able to dig their own gardens, but secondly, some lacked the confidence to actually do it.



In addition there was the matter of having the right tools to do the job, bearing in mind that some of the old farmhouse walls are two feet thick! Farmers might think nothing of whacking a hole in a two foot barn wall, but many lack the finesse to do it in the farmhouse! We therefore decided that we would offer to ‘assist’ where required, provided certain matters were agreed. As volunteers, we would not take responsibility for any damage done; it was purely the householder’s responsibility—we were simply assisting. Secondly, we expected the householder to help where they could (even if this was limited to providing tea and cake!) Thirdly, it was up to the volunteer team to assess whether they felt what was being asked of them was reasonable, and of course we also assessed the safety of what was being done. Despite all this and just in case, B4RN insured volunteers against injury to person or property. In practice this tended to mean that most of the team were happy to help in the digging ‘bit’ but the need for specialist tools such as drills of appropriate length and power to drill and fit wall boxes, for example, limited who actually did these jobs. As we were all volunteers we did not charge for this service, but we encouraged donations to charity or taking shares in B4RN, but neither were compulsory.

In doing this work we identified a couple of really useful techniques, which we record here. Before undertaking an installation we encouraged the householder to think carefully about where they actually



Ewan, Andy and Jane trenching a garden. Ewan is our youngest recruit.

needed the router to go. At this stage routers were wall-mounted directly onto the inner wall plate termination box. Since moving a fibre installation is not straightforward, we stressed it was better to give the router a permanent home rather than put it where it was easiest to fit, and then regret it later. This meant that in some cases we had to fit the router at some distance from the point where the fibre entered the house. This required a length of white, more flexible duct to be fitted between the entry point and the router, through which the fibre could later be blown. In some cases this was quite a distance, and involved going through the loft or even under the floor. Sometimes, as volunteers, we had to say no, and advise the owner to get a contractor in. For example, in one case, the whole floor had to be lifted.

We also made some interesting discoveries. When we drilled through the floor in what appears to be a single-storey 18th century house, we found a second floor some 500 mm below it. Subsequent investigation in the cellars revealed that the building was not a single house but several that had been subsequently joined together. We also found when the road outside had been raised, new floors had been fitted, and the whole outside of the house had been remodelled to take account of the new elevation. We also found several farmhouses whose lofts had been extensively remodelled, which was not surprising, given their age. Several houses in Dolphinholme are listed buildings. This limited what we could fit and where. For example, on stone buildings, wherever possible, we drilled through a mortar

joint so that we did not damage the stonework. It is much easier to repair plaster than it is to repair damaged stone. We could often see the handwork that had gone into shaping the stone, and we had no wish to damage that. We were also very conscious that we could not assume that the electric cables in these old buildings followed modern routing standards. We found cables set in walls running at 45 degrees to the horizontal, cables tucked behind panelling and skirting boards and in many other curious places. We learned we could not rely on cable detectors, and it was standard practice to have all the power to the house turned off when drilling, no matter how certain the householder was that there were no cables!

Fortunately gas is a relative newcomer to most of the village so these installations were much more obvious. This is ironic really, since Dolphinholme is home to the world's oldest surviving gasworks. Generally water was also easy to track for the most part, at least inside the building. There were several times when we had to ask the local plumber what lay outside. When trenching of course both the farmer and the plumber could sometimes be wrong, which was why James Gardner always carried some repair fittings.

With the basic route in, the team turned its attention to reaching the Fleece Inn. The initial task was to



Liz and AnnaGerd rolling duct out to the Fleece.

get another duct under Greaves Lane in the existing duct channel. This task was not helped by the presence of cattle in the field. Now sheep are not too bad, they tend to keep out of the way and provided one does not leave anything lying about, there are few problems. Cattle are something else. They are intensely curious and immediately wander over to see what is up, trampling everything as they come. One can shoo them away but they will still come back. They knock in the side of trenches and the area soon becomes a midden. We had to use half the team to keep the cattle away while

the other half did the digging. Once we got going we decided to try to use the trenching machine to dig through the fields, and the mini digger to dig the chambers and bed in the tube used to cross the stream.

Now our research had shown that there was a water pipe running down through these fields and we were anxious to avoid it. The problem was that no one was quite sure where it went. We consulted all who might know but were still unsure. James Pickering then turned up with a couple of divining rods (bent welding rod to you and me). He proceeded to walk down the field and to everyone's amazement the rods moved. He put down a marker and proceeded. Again the rods moved. In a short time we had a line of markers running down the field. Now as a scientist I could not but be sceptical about this. James told me to try it. Well, I took the rods up to the top of the field, well away from the markers, and proceeded to walk along the hedge line. I felt the rods move, and when I stopped and looked around, it did seem to be in line with those markers further down the field. Following the markers, we successfully put the trench



in without hitting the water pipe, and then proceeded to do the hedge crossing. I took the time to have a good root around in the base of the trench, and lo and behold, in the line marked, there was a buried water company marker.

I am no longer a sceptic of water-divining.

Corless Cottages is a twin row of late 18th Century, listed terraced cottages in Dolphinholme. The two rows are separated by a row of single-story terraced 'sheds'. Access to the back row of cottages was feasible via gardens and across a narrow lane surfaced with large flagstones. Access to the front row was more of a challenge. It was not practical to access the front row from the front since it is surfaced and also already contains all the services. Access to the rear required crossing a narrow cobbled lane. We decided that the most practical solution was to take a 16mm duct from the chamber in the field alongside the cottages opposite the village hall, around the rear of the cottages to a small chamber situated in the



drying ground (a small grassed area adjacent to the sheds). We considered branching the 7mm ducts from this point, but 27 ducts is a large bundle to bury. Instead we took some seven ducts out from the small chamber and led them across the lane via existing cracks and under flagstones to fan out to the first seven houses. In some cases we had to run the 7mm duct along the walls at first floor level. The remaining houses were fed from two wall-mounted chambers fitted to the inside walls of two small ginnels that run across the lines of the sheds. (Wayleaves were interesting since the sheds are not necessarily in line with the houses that own them!) We were indebted to Bruce Alexander for pointing us to the advantages of wall-mounted chambers.



To feed the chambers we needed to get a 16mm duct along the lane. To achieve this we devised 'cobble mining'. Basically we lifted a line of cobbles about one metre long and excavated out a channel using a trowel. We put the duct in the trench and then replaced the cobbles. We had

already cut the ducts to length and labelled and coiled them. That way we could ensure there was never a long length of open 'trench' and could move progressively along.

On reaching the first ginnel we took the duct up the inside wall and into the chamber. From the chamber we continued 16mm by the same method to the second ginnel. Next, we took 7mm ducts from the wall-mounted chambers and either across the lane using the cobble mining method or in some cases where we needed to avoid concrete, along the front wall of the shed up beneath the guttering. At the end we managed to reach the outside rear wall of each cottage and leave a coil of black 7mm duct ready for house connections with all the intervening ducting hidden from view.

I should make a special mention of one member of the team who was on paternity leave with his baby daughter. She sat happily in her pram whilst dad ‘cobble mined’ next to her. Job done. The back row was somewhat easier since we found the lane to be largely surfaced with flagstones that were simply laid on sand. We were thus able to lift flags and hide the duct bundles beneath. One final point, in this location and elsewhere where we had bundles of 7mm ducts to lay, we added a couple of spares, just in case.

One of our first concerns was how to communicate quickly within the group, bearing in mind that this is before the days of WhatsApp and its ilk. The Dolphinholme Residents Association had, with the aid of Tim Hucklin, set up a closed email newsletter. We decided that we might do the same thing and set up the DB4RNAG Newsletter system. The basic idea is that we ask people to sign up to the group which then allows all members to send or receive emails within the group without revealing everyone’s email addresses. Obviously whoever sends the message needs to sign it or no-one knows who to reply to, but the system worked extremely well. We used it to plan working parties, ask for assistance and even to seek materials.

The sad fact is that at least 10 per cent of building materials purchased never gets used on the job for which it is bought. We realised that we could actually make use of much of this material, and the email became our way of seeking it out. The system also allowed us to keep track of what was happening. Sometimes we had several working groups active on different parts of the route, and when they reported back we were able to keep track of progress. An excellent example was when we were putting duct into the school. We had to take the duct along a narrow trench over part of the asphalt-covered front playground. We put out an appeal for anyone who just might have some asphalt work being done hoping, we might scrounge a little material to finish off the trench, and a gang turned up and did it for us in their spare time.

As a community project B4RN brought and continues to bring a lot of side benefits to Dolphinholme. Perhaps one of the more significant has been the engagement of men ‘of a certain age’ who previously were much less likely to socialise than women.

We were fortunate that the project arose just as a number of able-bodied people in the village were retiring or approaching retirement. This gave us access to a workforce not just at weekends but one with



Allen and Sam awarded their Lindsey spades.

some availability during the week as well. It also allowed us to access a whole range of skill sets. In our experience women seem to find it much easier to socialise and to get involved in village projects, but it somehow seems more difficult for men. B4RN was a project where men and women could both get involved, and because of its novelty and the technological aspects, it seemed to attract people. The range of tasks we faced meant that almost anyone had relevant experience they could bring to the party, and no matter what that was, we welcomed it. On the one hand we had those who simply wanted to dig (with or without tea and



cake), those who were record keepers, those with marketing skills, and of course those with IT skills. While most of the IT element came 'centrally', once we had customers connected, the number of IT queries increased dramatically, and it is a measure of the community nature of the project that, at least to a first level, we were able to respond within the village, something that continues to this day.



One can still see the little yellow spades proudly displayed around the village (thanks, Lindsey Annison!) and they prompt questions from school children who of course cannot conceive of a world without the internet.

The community nature of the project was something we emphasised right from the start and continue to do so. B4RN has a regular feature in the village newsletter, The Grapevine, and the Village Hall, Chapel Room and the school showcase the B4RN connection. Of course in the wider B4RN world, the Computer Club, website and technical support feature widely, but here in Dolphinhholme many queries still come to the team and we are happy to help. We keep a couple of spare routers here in the village to help with the occasional emergency. However, we cannot guarantee to beat this response record: once, when the tech team phoned to say the router in the school had failed, Allen was parked outside the school and happened to have a new router in the car. The failed unit was replaced in about five minutes! By far the greatest number of issues that arise are WiFi-related. The plaintive call 'my internet has gone down' is often followed by the realisation that the call is being made over that same internet connection, and the problem in fact relates to WiFi. If there is one technology where the industry has over-egged the pudding it has to be WiFi.

There were a couple of gaps to be filled in bringing the duct through from Abbeystead. The first was to bring the duct through the woods near Gallows Clough. There was no way to get a mini digger into the



Nigel Gillian, Allen Norris, Eleni Troughton, Harris Troughton, Garry Troughton, Mike Rudd, digging in Lower Dolphinhholme and Livestock.

wood so we had to dig the trench by hand. Of course we immediately hit enormous tree roots. We decided to have a working party and to dig under each tree root and then thread the duct under the root. This was slow and laborious work, but with a full working party we turned it into a lot of fun. Of course there will always be the possibility that if one of those ancient trees comes down it may drag the duct out but after 10 years they are still all standing so

we believe no harm was done to the trees and the duct remains hidden.

In the same area we also had a little challenge to cross an access track that had been surfaced. The obvious solution was to cut out a slot in the concrete as we had done elsewhere, but we had mains-powered tools and no mains power. We appealed for someone to lend us a suitable generator, but none of the farms had one available. We were eventually successful in borrowing a small portable one from the army. That overcame the problem of the track, and then it was back to digging through the woods.

With quite a lot of the first route to Dolphinholme in place, we were still awaiting the connection from Abbeystead and Greenbank to reach Damas Ghyll. It became clear that the team at Greenbank needed some help, which was not really surprising as it is a very small place. We decided that the best option was to join forces and to work together.

The first challenge was to get the duct through behind the main properties at Greenbank. This was fairly straightforward, but then we faced the problem of getting down the steep bank to Damas Ghyll. At the foot of the incline we were able to direct the alkathene pipe onto the bank, ready to lead into a trench in the small field leading to the crossing for Damas Ghyll. But the field was too wet to use the mini digger. Not wishing to waste time we managed to insert the duct through the alkathene successfully. We then made a basic error. Believing that, once the field dried out, we could dig the trench and roll the duct in, we laid out the duct on the surface to ensure we had enough to reach the crossing. Of course we did not think this through. If you pull out a long length of 16mm ducting and do not keep it under tension, once you let go, it coils itself into a bird's nest! It took two of us a day to sort that out. Lesson learned the hard way.

Along the way we found a few useful techniques that greatly eased the job.

For house installations a heavy-duty battery-powered SDS drill was a godsend as were a selection of SDS bits from 4.5, 6, 10 mm plus 10mm 1 metre long SDS bits and 20mm bits. And we learned never to drill a house wall until the electrics have been isolated—you only get one chance.

A one metre length of welding rod proved invaluable to push through the wall into the drilled 10mm hole to prevent it collapsing from insulation falling in. We could also fit 6/7mm duct to the end of the rod and pull it back through the hole.

A long slender Pozidrive 1 and 2 screwdriver was helpful to get into the wall-mounting kits where a normal blade was too tight.

A selection of stainless steel screws was helpful, as half those supplied with the house kits were rubbish, as were some of the wall plugs.

Flat walls are a rarity in Dolphinholme, so a length of black 7mm duct that can be cut to produce spacers was helpful, as was a small spirit level, for the same reason. Good quality black duct tape was essential.



## Laying duct – some tips

- A length of surplus 7mm duct with a round-headed screw inserted into the end is ideal to thread through alkathene water pipe. Once through, rope can be attached to the 7mm duct and then pulled through, followed by the 16mm duct we wish to insert. Just pushing the 16mm duct through, even when lubricated with Fairy liquid soap, proved difficult.
- Scraps of 16mm duct can be used beneath hedges to protect a 7mm duct, and for larger duct sizes, black alkathene water pipe is an alternative, as are old scaffold poles.
- Similar scrap can be used to line holes drilled in walls.
- Duct can be labelled with plastic garden labels secured with zip ties.
- Scaffold poles or, even better, stainless steel tubes can be used to cross streams, but must be high enough to prevent obstruction.
- Mattocks and trenching spades are useful to dig narrow trenches and are safer than a pickaxe. A curved crowbar can be used to scrape the bottom of a trench, and a trowel has a myriad of uses. A six-foot crowbar is a handy tool but is very heavy.
- Concrete saw discs are better than concrete grinding discs to slot concrete. Ideally, cut wet to minimise dust, but of course not with a mains-powered tool. Dust masks and ear defenders are essential when cutting concrete.
- Always check for services using a CAT scanner and diagrams, if available.

This whole project has been a tribute to all members of the team. I have mentioned some by name and will try to list the others.

If I have missed someone, I apologise in advance and put it down to a failing memory.

Suzette Heald and Andy Collinson got things started. Liz Collinson and Allen Norris set up the teams aided by AnnaGerd and Graham Chapman, Sam Ud-din, Dave Stirling, Donald Hanton, John Klotz, Graeme and Ruth Chapman, Gary Troughton, Mike Rudd, Iris Rogers, John and Jane Entwistle, John Gorst, Mike Coogan, Andrew Birchall, Simon Tate, Martin and Jane Stringfellow and Whisky - the mascot dog..

Special thanks to contractors James Gardner and James Pickering. From B4RN Chris Conder, Bruce Alexander, Tom Hartley, Barry Forde, Alistair Adams-Huset, Frank Brown, Iain Robertson and later Flick Greenwood

And all the local landowners and others who contributed along the way.

*Allen Norris, 2024*



The first reel of duct being picked up by Andy Collinson.



Liz delivering duct.



Liz and Suzette picking up more duct from the farm.

Whenever they needed a crowbar, they called Liz who kept it in the boot of her car. Her husband Andy did not need the car as he was usually out with Allen, digging. She also carted duct to where it was needed, and was a regular visitor at the farm to pick up supplies. They soon had the duct dug up to their village hall, and contractors were bringing it over to them from the north. They dug all round the village, levelling the trenches and laying the duct.

After particularly hard digs up the banks of the old mill race, AnnaGerd was always on hand with tea.

They sited their cabinet at the village hall, and soon Bruce came to blow the fibre for them. Frank came with his caravan trailer and fused up the cabinet, and Allen and his team got all the houses ready for blowing. The team came to blow fibre, then Alistair and Iain started working to the bullets to bring the



Allen was known to deliver pizza too.



school live. Allen called Bruce in whenever he had a batch ready, and Dave Stirling, who had been busy digging, ended up catching sponges and got a red Lindsey spade for his work.

Once the cabinet was live the fusers had all the joining bullets to do as well as all the customer joins. They also worked in the fields around the village, fusing the enclosures in the chambers while Frank fused the cabinet.

Sam Ud-din wished he had a bike as stuff had to be carried right round Corless cottages to where the teams were working.



Sam doing his 'sherpa' routine carrying bullets up behind the cottages.



Alistair and Iain working behind the school on a bullet.



The cabinet in the village hall car park.



Frank's trailer at the cabinet car park.



Dave Stirling helping with the blows and earning a spade award.



The volunteers all helped Bruce with the blows.





The photos show Alistair and Iain round the back of the school and Corless cottages where Allen and the team had been cobble mining.



Liz Collinson.



Alistair and Iain fusing the bullet that will bring the school live.

Liz got her Simon's silver spade - These were a new addition to our awards programme, Simon Wade from Emtelle donated them to B4RN to reward ladies of Grit.

Suzette Heald from Dolphinhholme sponsored James Uren to make a film about the project to be entered in the Cannes film festival. It was shortlisted but did not win, but it is there as a memorial to the communities' grit and determination.

They dug 25 kilometres of trench.  
They came live in May 2014.

**Beyond the book:**



[BBC News article about Dolphinhholme](#)

[Suzette's Cannes Festival Film](#)





AnnaGerd with tea and cake, and her Lindsey spade.



"One day you'll look back and realise how hard it was, and just how well you did."



Allen being interviewed for Suzette's film.



### Beyond the book:

[View all the photos from this chapter in the B4RN Book Gallery](#)

[Watch videos from this Chapter in the B4RN Book Playlist](#)