So I had to start a telco

Or ... Fiber to Jared’s house

Jared Mauch - Washtenaw Fiber Properties LLC
@jaredmauch

Background

- In 2002 I moved to a new home on the outskirts of Ann Arbor, MI
- My employer at the time provided me a T1 to the local pop
- 1.5Mb/s in 2002 symmetric at home was still decent

More Background

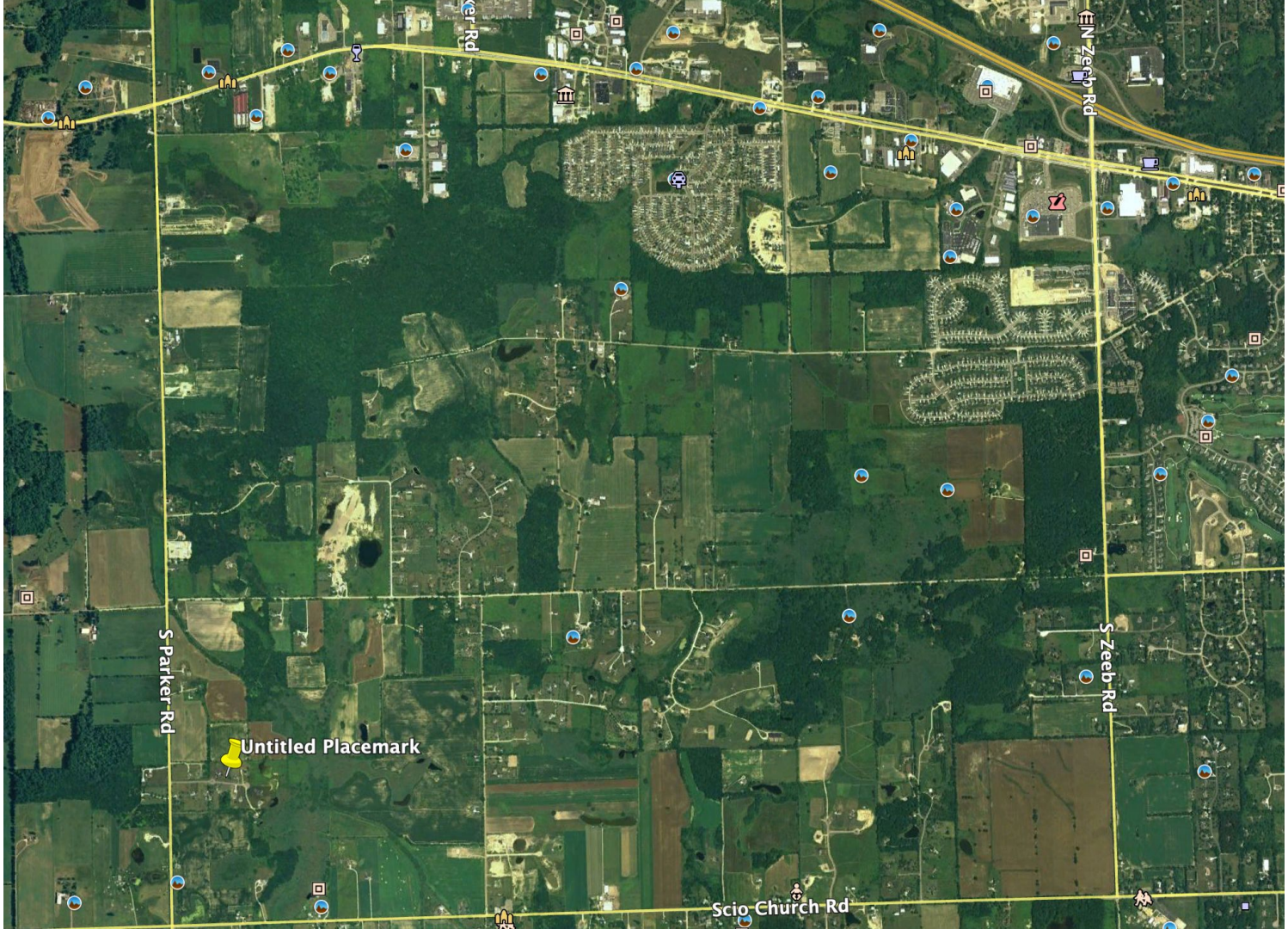
- Development in and around Ann Arbor was putting in new subdivisions nearby
- I expected broadband would reach my new home eventually (Cable, DSL, FTTx)
- But.. nothing came
- About 2+ (3.3km) miles away from existing service area

Where do I live?

- West side of Ann Arbor, MI
- No ... Further west

Keep going...

- Ok, can I describe it as farm adjacent?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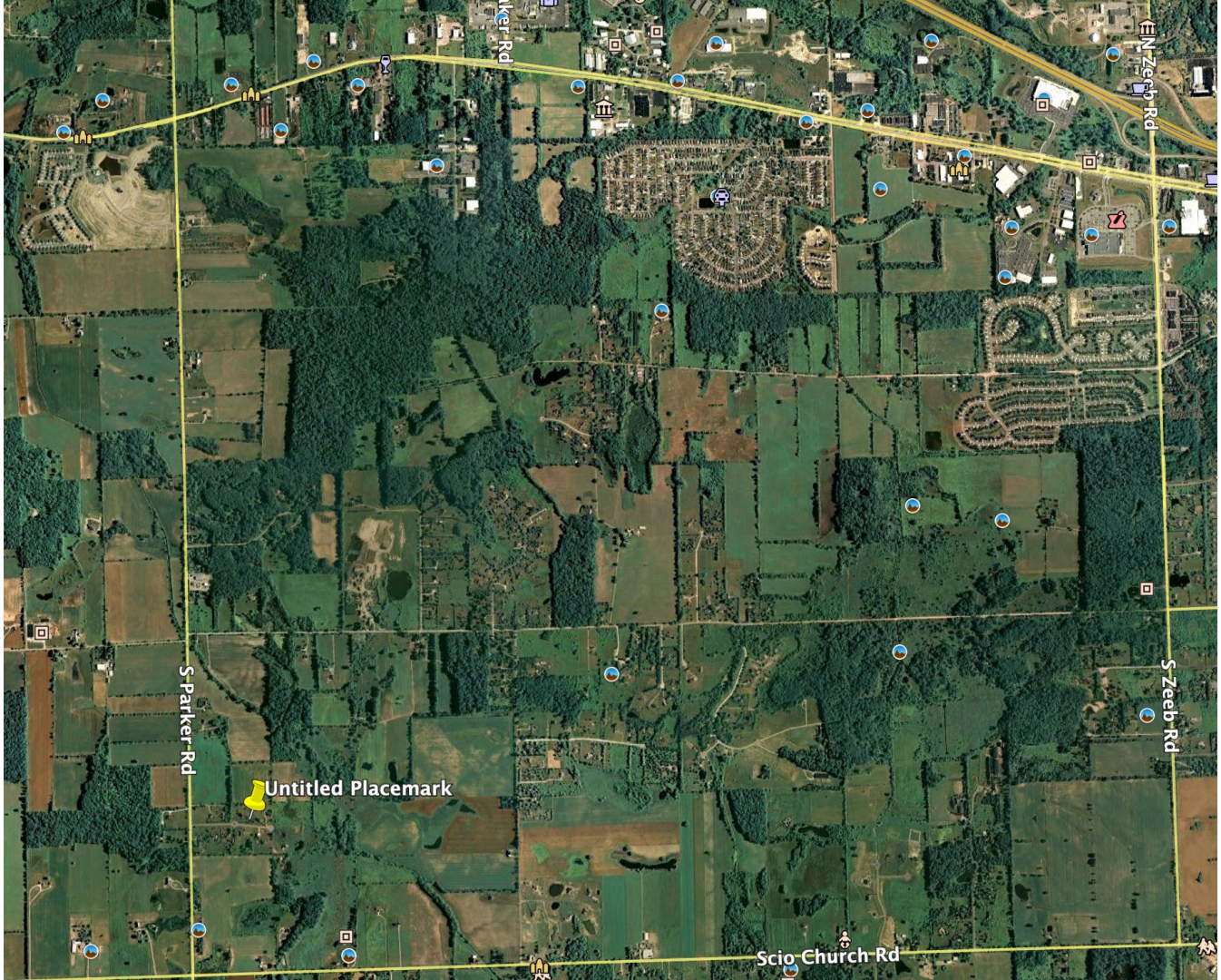
S-Zeeb-Rd
Scio Church Rd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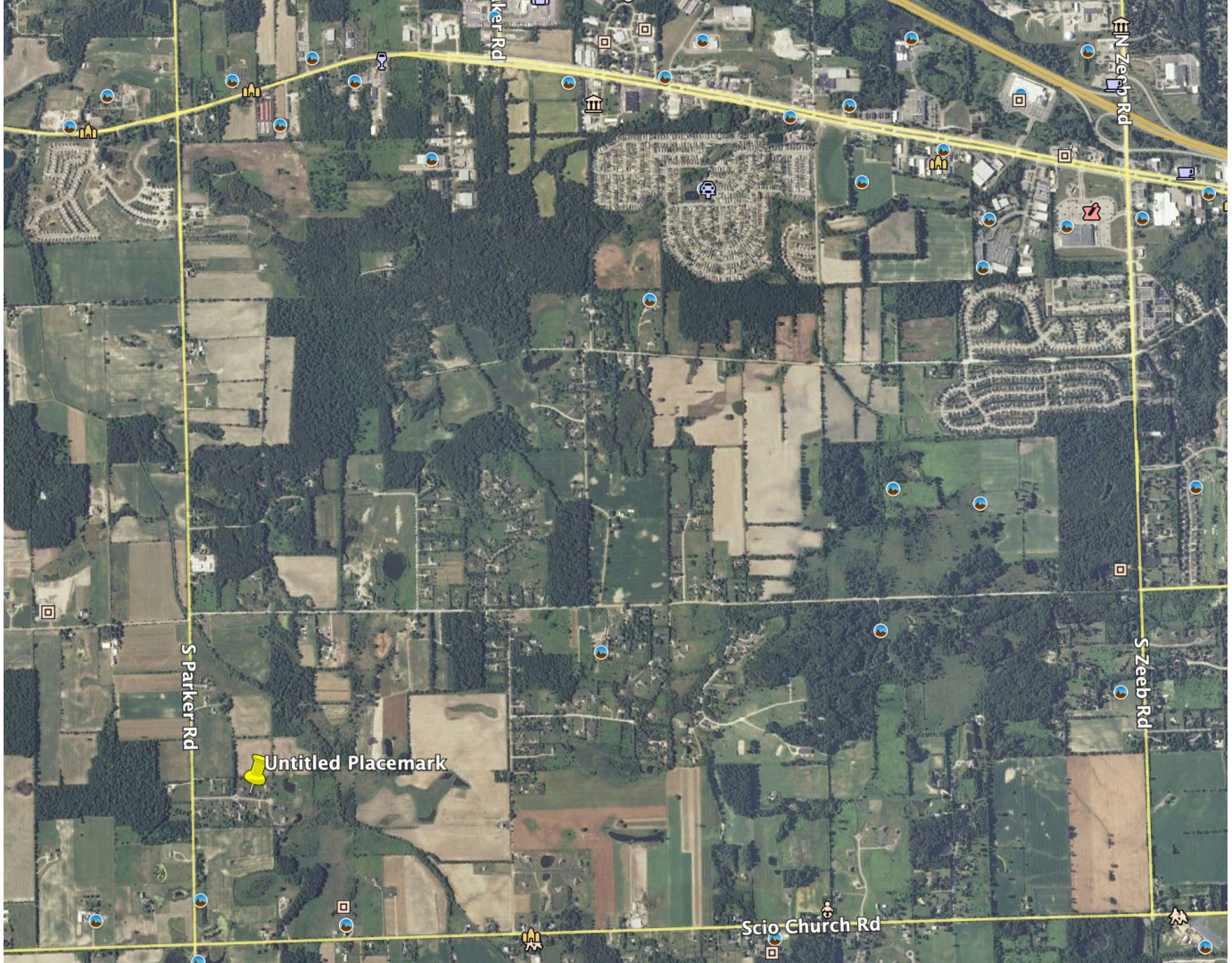
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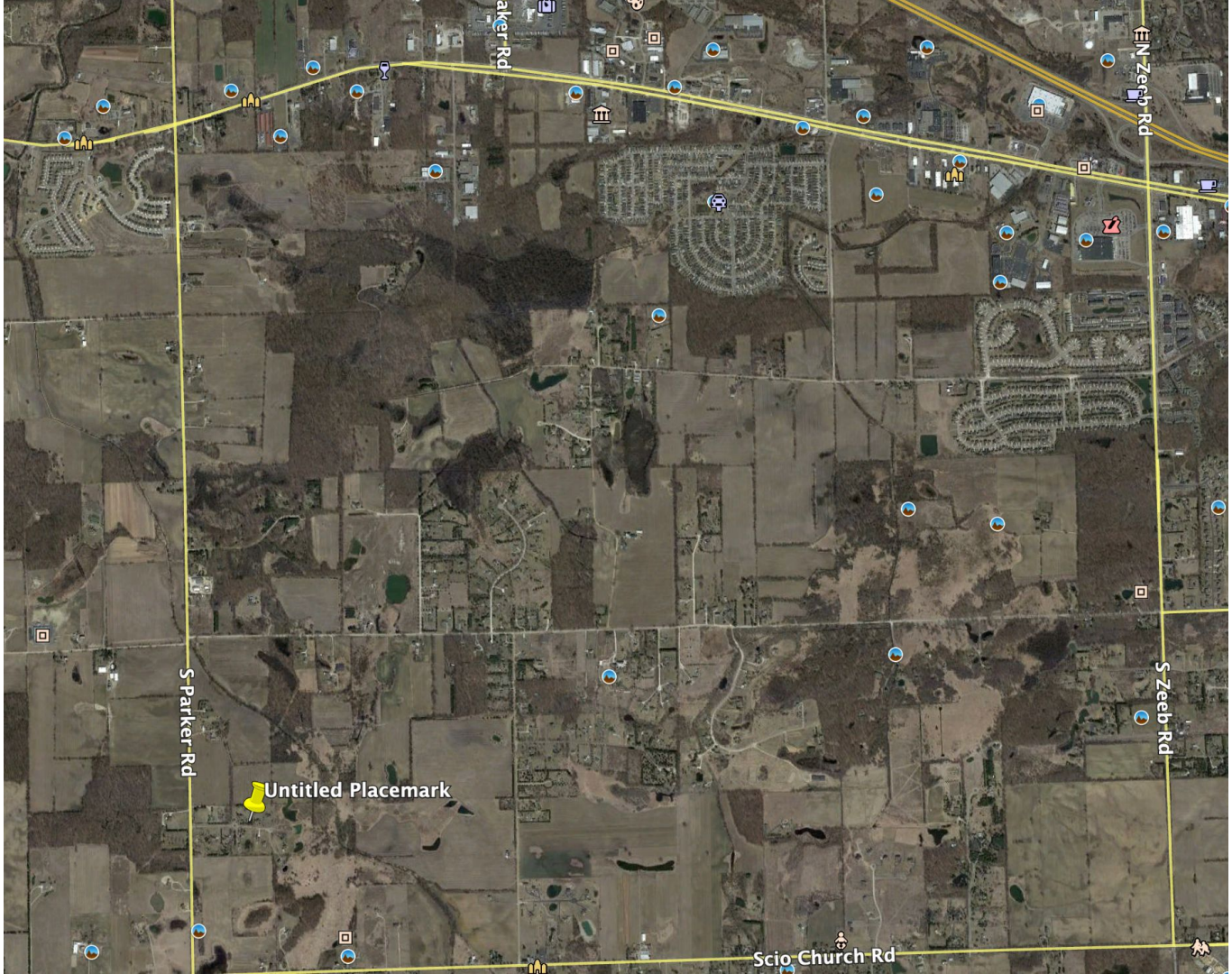
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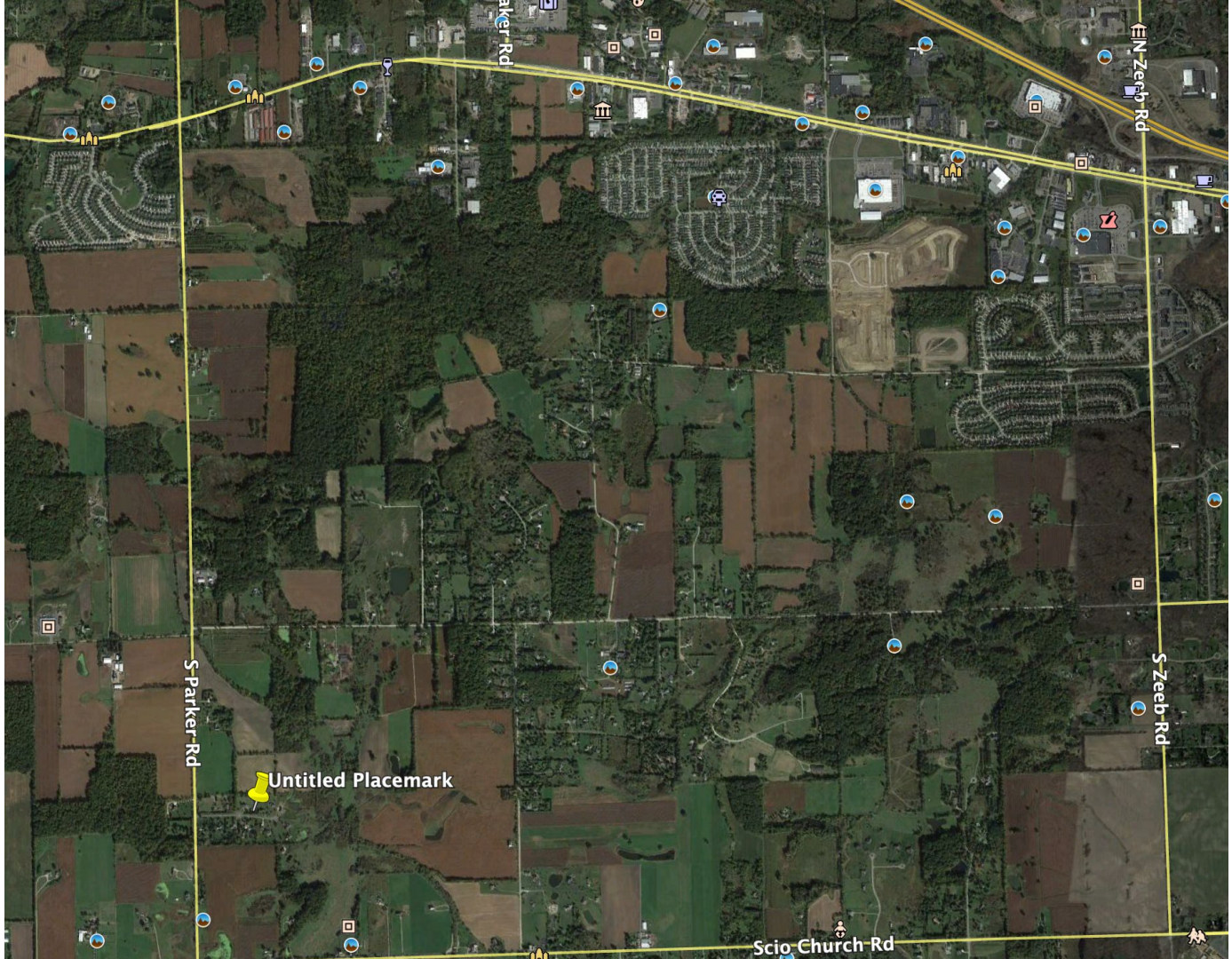
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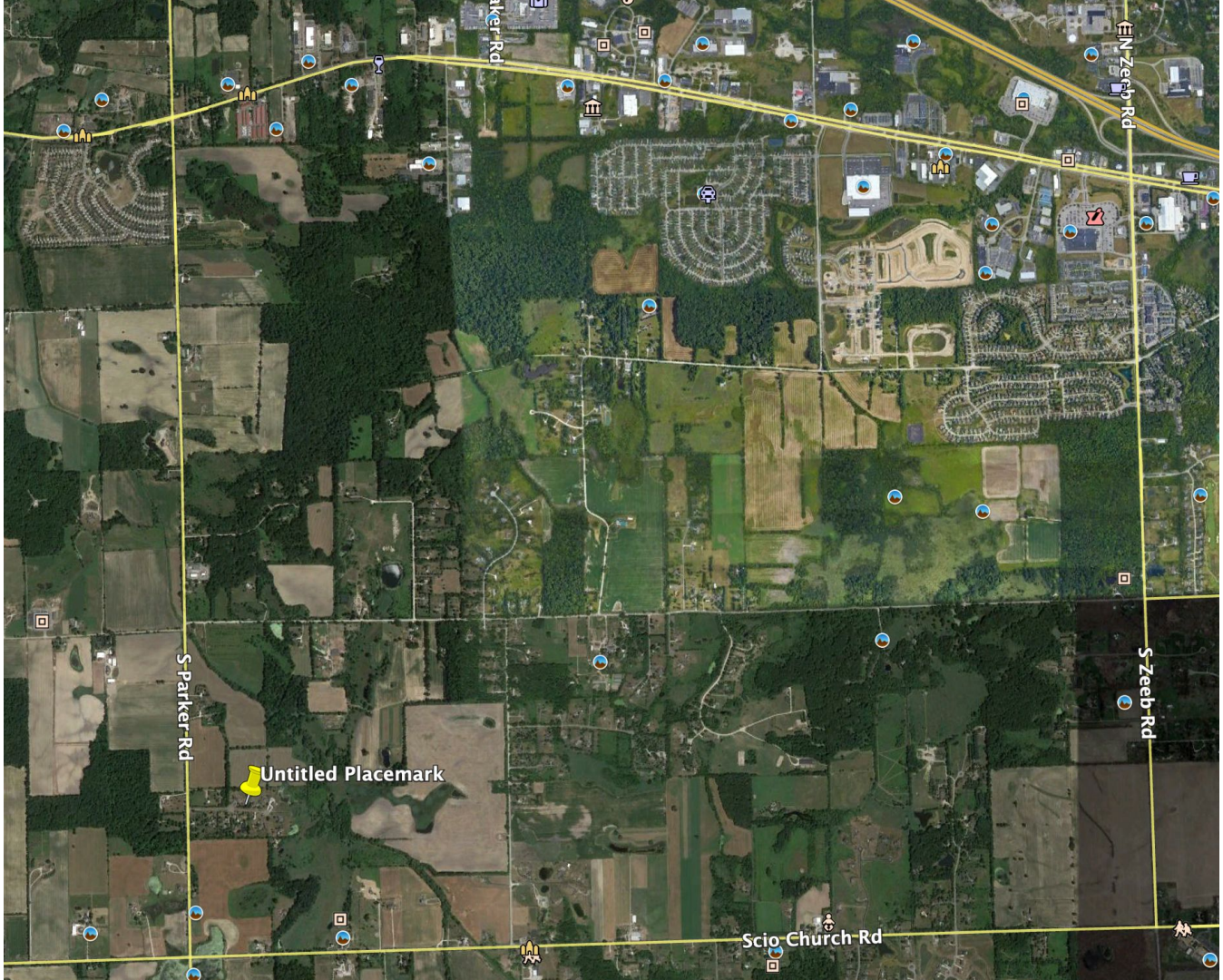

N Zeeb Rd
S Parker Rd
S Zeeb Rd
Untitled Placemark
Scio Church Rd

So, problem... Conflict

- No high speed internet
- Move?
  - Seller pays commission based on sale price, significant cost to move
  - Home devalued as no high speed available
- WISP (Wireless ISP) to temporary rescue

What is a geek to do?

I know…

- Start a telco!
- File a tariff - https://washftth.com/tariff/
- …
- Profit?

More details

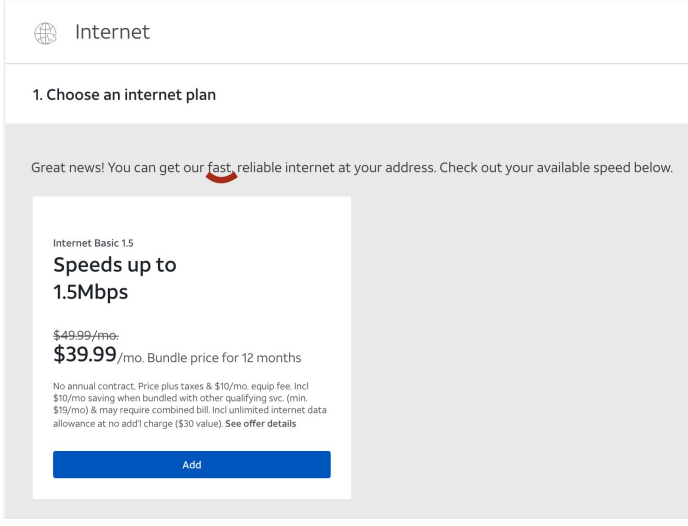
- Customers
- Internet Access
- Construction
- Contractors
- Fiber

Backing up now

- Research
- Planning
- Finances
- Pre-builds
  - 2018 - Started to connect WISP customers to fiber

Research

- Access, Costs
  - Tried to get existing providers to build
  - Comcast was most approachable and easy to work with - wanted $50k
  - AT&T? 1.5Mb/s



More research

- Technology
  - Active Ethernet
  - GPON (UF-OLT, some drawbacks here)
- Marketing!
  - Talked to many people
  - Mailed letters to potential subscribers

It never ends the research

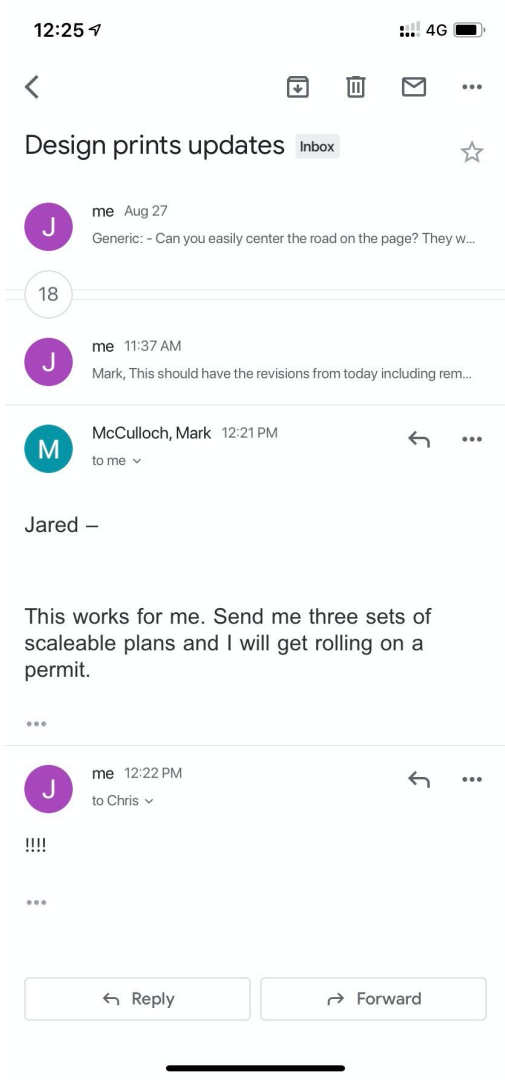
- Talked to many ISPs doing existing FTTH
- Community Groups
- Local ISP cooperative
  - They offer wireless
- Local township passed millage to fund build costs

Let’s spend some cash!

- Purchased fusion splicer in 2016
- Purchased first 2km of Fiber in 2017
- Purchased OTDR in 2018

Let’s spend some cash!

- Design and Permitting
  - Drew up master plans
  - Filed tariff with regulators
  - Joined MissDIG (811) system
  - Permit filed for April 2019
  - Issued September 2019
- Time of year pushed schedule into 2020



Finances, or ... start small

- Key was to spread out costs over a longer period of time
- Found distributors for underground supplies
- A little bit here, a little bit there goes a long way
- Planning told me it would be a $60k project (at least)

Finances, or starting small

- Had to line up bonus, HELOC, customer $
- Pre-pay model copied from VBFiber
  - Can pay $5,000 up-front and receive $50 credit for 100 months
  - Stays with property
  - Keeps customer paying something
  - Offset startup costs (£¢$)

Fun with Spreadsheets

	A	B	C	D	E	F	G	H	I	J
1	Monthly Operating Expenses	1	2	3	4	5	6	7	8	9
2	123.net Internet fee	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	123.net Install fee	$10,000				$0	$36,000			
4	ACD Internet Fee	$1,550	$1,550	$1,550	$1,550	$1,550	$1,550	$1,550	$1,550	$1,550
5	ACD Install Fee	$0								
6	Right of Way/Permits	$700								
7	Staking of right of way	$5,000								
8	Repairs	$200	$200	$200	$200	$200	$200	$200	$200	$200
9	$7.25									
10	Construction	$94,250								
11	Hand Holes (installation costs	**$5,238**	$200	$200	$200	$200	$200	$200	$200	$200
12	811-Membership	$1,500								
13	Insurance	$1,000								
14	Conduit	$9,920								
15	Fiber	$9,000								
16										
17	CAP Filing	$1,000								
18	Total Costs	$139,358	$1,950	$1,950	$1,950	$1,950	$37,950	$1,950	$1,950	$1,950
19										

More fun with spreadsheets

20	NumCusts	33	34	36	38	40	42	44	46	48	50	52
21	Revenue											
22	Customer Installations	24	2	2	2	2	2	2	2	2	2	2
23	Install Price	$99	$199	$199	$199	$199	$199	$199	$199	$199	$199	$199
24	Low Tier Customers	23	25	27	29	31	33	35	37	39	41	43
25	Low Tier Price	$65	$65	$65	$65	$65	$65	$65	$65	$65	$65	$65
26	Mid-Tier Customers	6	6	6	6	6	6	6	6	6	6	6
27	Mid-tier price	$75	$75	$75	$75	$75	$75	$75	$75	$75	$75	$75
28	High Tier Customers	3	3	3	3	3	3	3	3	3	3	3
29	High Tier Price	$99	$99	$99	$99	$99	$99	$99	$99	$99	$99	$99
30												
31	Total Consumer Revenue	$2,242	$2,372	$2,502	$2,632	$2,762	$2,892	$3,022	$3,152	$3,282	$3,412	$3,542
32	Ezwisp (Business customer)	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
33	Customer Payments	$5,018	$3,170	$3,300	$3,430	$3,560	$3,690	$3,820	$3,950	$4,080	$4,210	$4,340
34	Total Revenue	$5,418	$3,570	$3,700	$3,830	$3,960	$4,090	$4,220	$4,350	$4,480	$4,610	$4,740
35												
36	Monthly Profit	(133,940)	1,620	1,750	1,880	2,010	(33,860)	2,270	2,400	2,530	2,660	2,790
37	Operating Profit	(133,940)	(132,320)	(130,570)	(128,690)	(126,680)	(160,540)	(158,270)	(155,870)	(153,340)	(150,680)	(147,890)
38	Profit @Mth if Growth Stops	Never	82	75	68	63	Never	70	65	61	57	53

Financial modeling is key

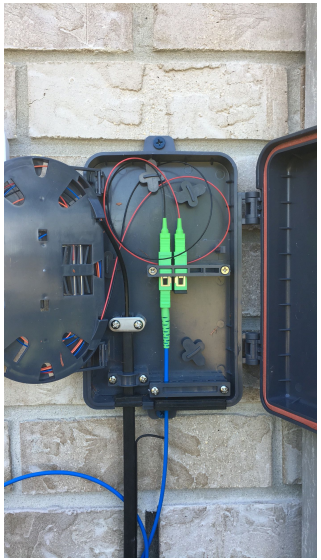
- You need to understand what your costs are
- What your monthly run-rate is for expenses and income
- Essential to forecast full year expenses
  - Some costs are monthly, others quarterly or annual
- Forecast for unexpected expenses
  - Repairs, disputes, refunds, bad debt

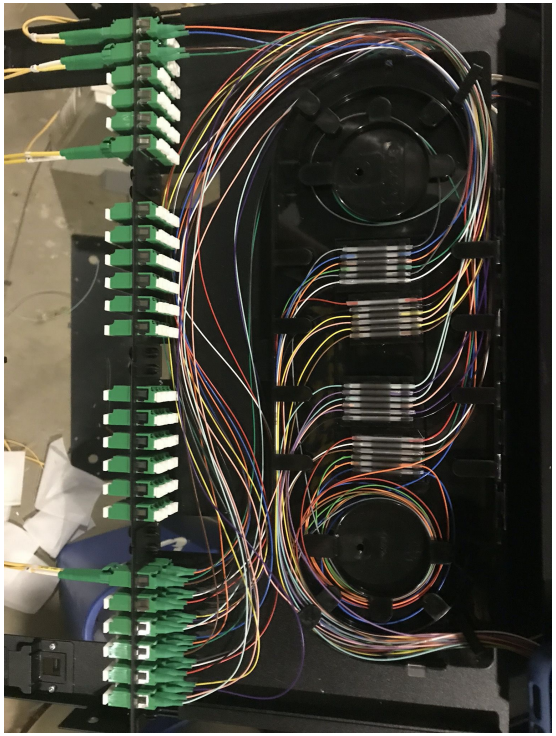
Pre-builds

- Worked with existing WISP who had antennas on my house
- Pre-wired neighbors with fiber at my expense
- Pre-wired and pre-constructed my property
- Racks, Fiber distribution, patch panels...

What does an install look like?

-





Typical customer installation

- RBFTC11
- UF-Instant
- FPP-6S-W-15
- Armored patch cord
- POE from inside to outside
- HAP AC2 router (I sell this at cost)

Supplies and Supply runs!

Customer Acquisition

- Local county has tool MapWashtenaw
- Can look at property shapes
- Get owner names
- Sent them a letter
    - In the mail
        - On paper
            - Yes in 2019 (and 2020 as construction started)

Customer Acquisition (cont’d)

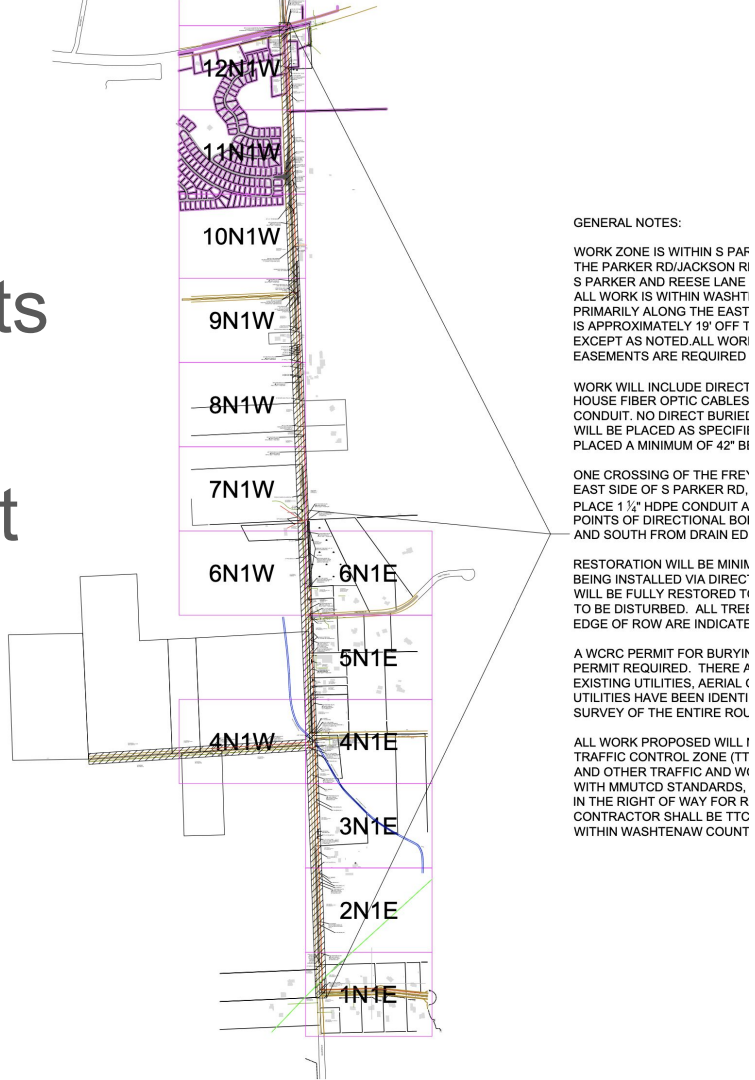
- Invited to neighborhood meeting
- Construction start letter also went out to people who did not sign up
  - More people signed up
- Around 70% of homes passed ultimately signed up

Internet Access

- ACD.net (Enabling IPv6 for me)
- 123.net (Connection Pending)
- Detroit IX (Connection Pending)
- ARIN
  - Can apply for IPv6 space
  - Can apply for IPv4 space if you have IPv6
  - Already had an ASN

Project picture

- Turned in blueprints early 2019
- Permit issued Sept 2019
- …
-



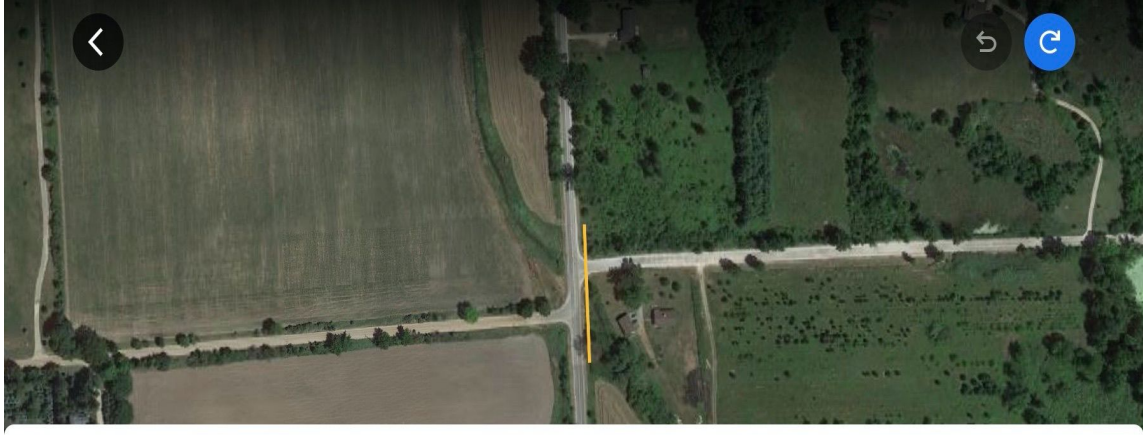
Contractors

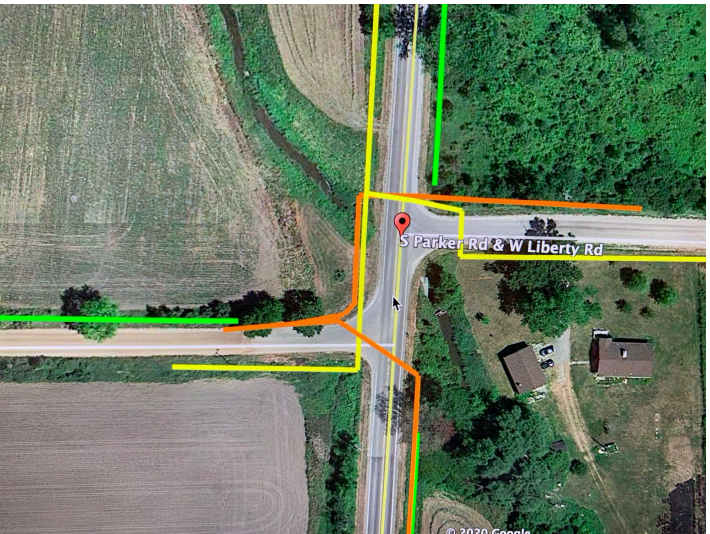
- Have a good working relationship with them
- Perhaps buy them food
  - Keep them happy and working
- Resolve issues along the way
- Consider policies for social media posts
- Get a good referral
- Make sure they have all the right equipment

Boring past a 18” Natural gas pipeline

Expect problems

- Cursed corner!
- Never located twice the same





- Took 3x to bore successfully
- Heard after the fact about challenges others had with that corner

My Equipment

- Purchased Ditch Witch JT820 Drill
  - Vintage - 1995
  - $8,000
- Borrowed cable plow
  - Used to bury service drops
  - Owned by WISP

My Equipment

Theft of equipment!

- For sale on Facebook!

Marketplace › Miscella

Ditch witch z100sx

Aurora, IL · over a week

$6,500

2006 Ditch Witch Z100 boring attachment... M

Condition Use

Brand Ditc

Seller Information

[redacted]

Joined Faceb

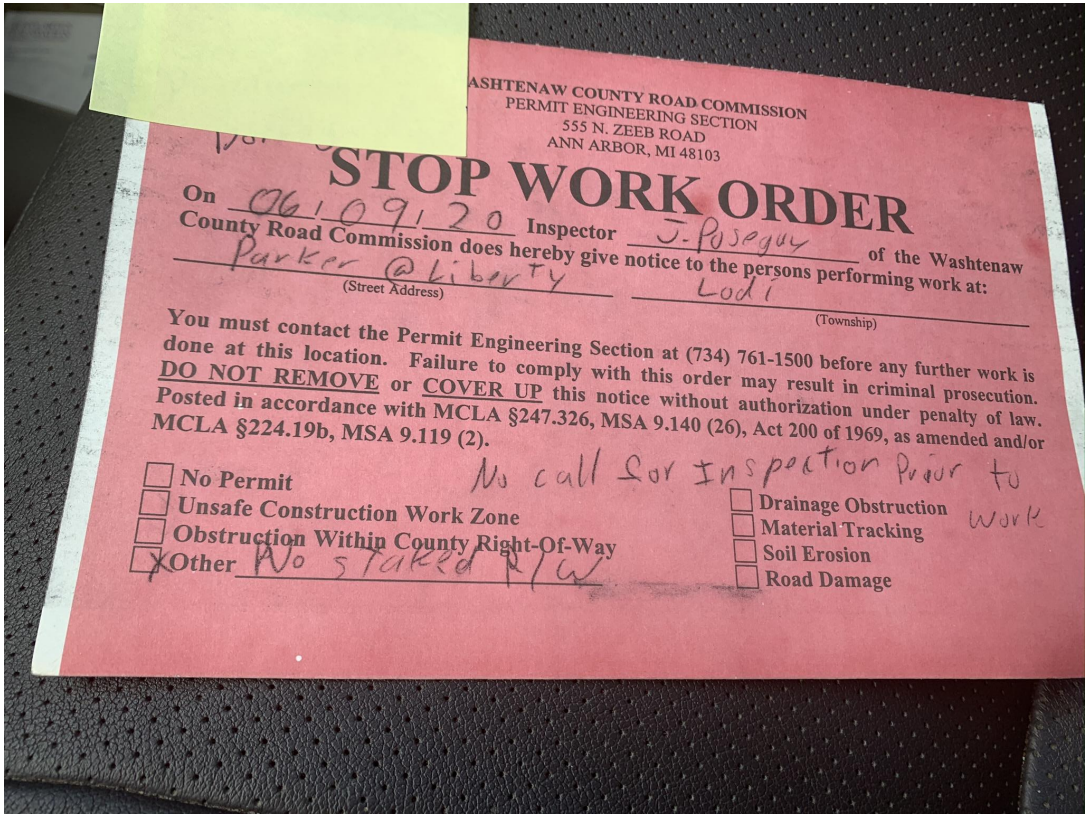
Send seller a messag

Is this available

Message

Construction issues

- Other



ASHTENAW COUNTY ROAD COMMISSION
PERMIT ENGINEERING SECTION
555 N. ZEEB ROAD
ANN ARBOR, MI 48103

STOP WORK ORDER

On 06/09/20 Inspector J. Posegay of the Washtenaw County Road Commission does hereby give notice to the persons performing work at:

Parker @ Liberty (Street Address) Lodi (Township)

You must contact the Permit Engineering Section at (734) 761-1500 before any further work is done at this location. Failure to comply with this order may result in criminal prosecution. DO NOT REMOVE or COVER UP this notice without authorization under penalty of law. Posted in accordance with MCLA §247.326, MSA 9.140 (26), Act 200 of 1969, as amended and/or MCLA §224.19b, MSA 9.119 (2).

- ☐ No Permit — No call for Inspection Prior to work
- ☐ Unsafe Construction Work Zone
- ☐ Obstruction Within County Right-Of-Way
- ☒ Other No staked R/W
- ☐ Drainage Obstruction
- ☐ Material Tracking
- ☐ Soil Erosion
- ☐ Road Damage

Unbudgeted costs

- Survey and staking of right of way
  - $5,000
- Marking wire for conduit to end stop-work order
  - $300
- Employee badges
  - Helpful during COVID-19
- Water
  - $1,500 (may be revised) for contractor

Other problems

- Unmarked utilities?
  - Always!

Fiber Installation

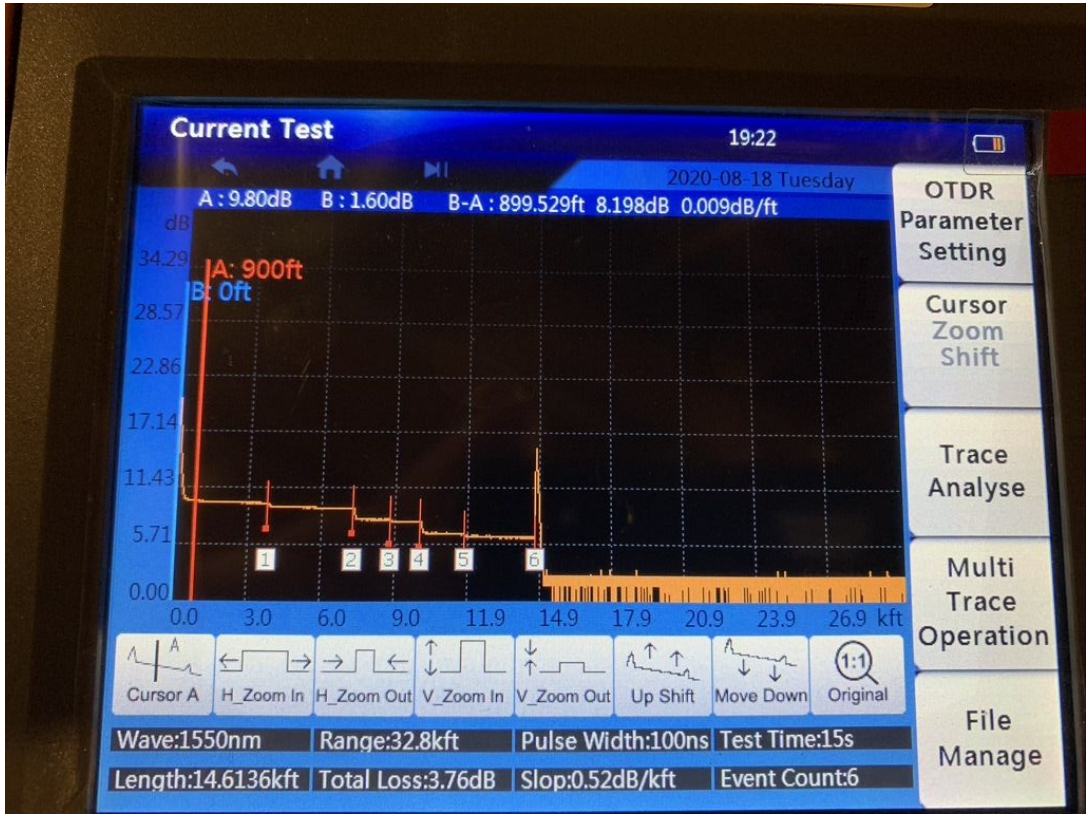
Build your own tools!

- Built a small fiber blower
- Worked decent
- 2,700 (822m) feet without issue

Splicing time!

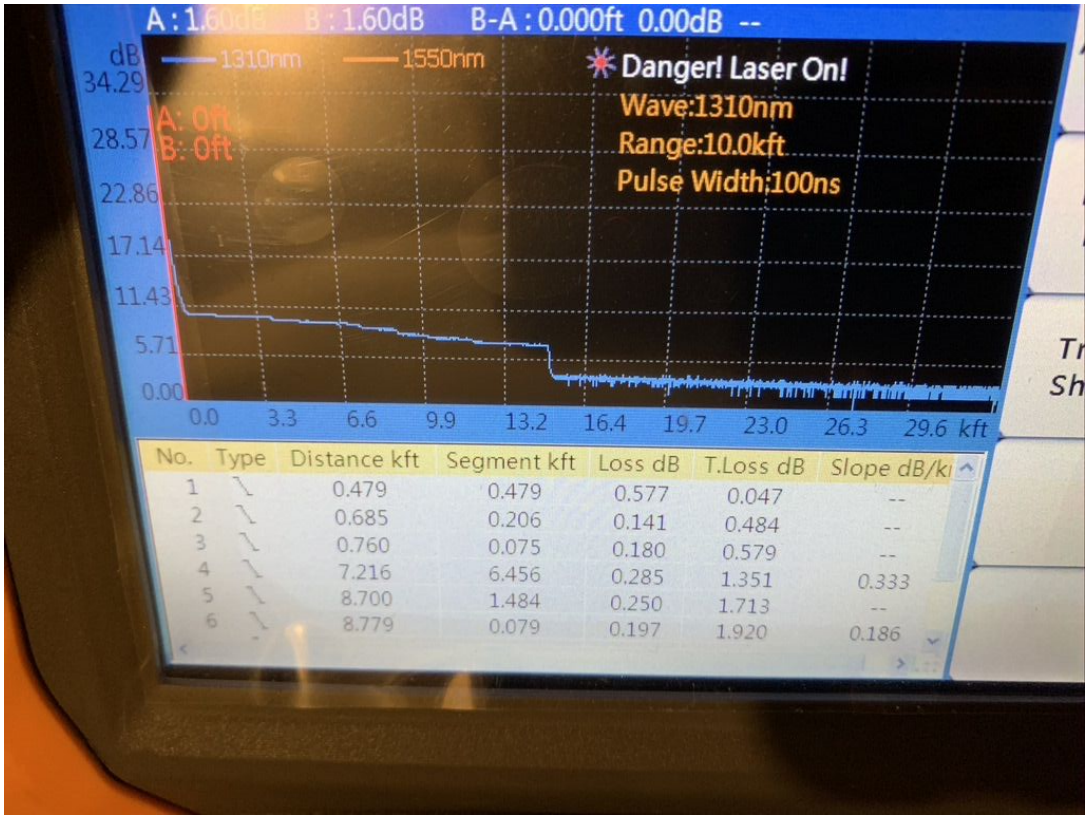
OTDR time!

- Ouch!



Some fixes ...

- Better
- Still need to upgrade splicer
- Need to upgrade OTDR



Scheduled install

- August 27th
- I know what I’m doing, so turn-up should be easy right? RIGHT?
- HAHAHAHAHHAHAHAHAHAHAHAHAHAHAHAHH AHAHAH
- Sorted through a few issues

What sorts of issues do you say?

- Tech had to visit CO to install optic
  - Put CH44 optic in WDM system
  - Turns out it was put in wrong system
- Existing system had 1G DWDM optic + 10dB attenuator
  - Leftover from splicing/preparation

What sorts of issues do you say?

- Tech delivered 10G optic to my house
  - I plugged it in (didn’t look too close at it)
  - It was 10G-LR 10km -- needs to be 80km
- Carrier wanted to provide CPE
  - 6500? No thanks, please no.. it’s my house!
  - Didn’t want to upgrade power, or additional power usage

Quick drive to the ISP HQ

- Many thanks to Sol Brown, Friday night at 7pm
- HQ is 65 mile drive away
- Returned 10G-LR
- Received 1G-80km optic
- Visited friend in Lansing
- Drove home
- Plugged in the optic
- ...

Finally link-up!

Aug 29 01:35:04 arista-7050 Ebra: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet49 (TRANSIT: ACD), changed state to up

Before

jared@Jareds-Desktop-iMac ~ % ping 204.42.254.15

PING 204.42.254.15 (204.42.254.15): 56 data bytes

64 bytes from 204.42.254.15: icmp_seq=0 ttl=54 time=29.590 ms

^C

--- 204.42.254.15 ping statistics ---

1 packets transmitted, 1 packets received, 0.0% packet loss

round-trip min/avg/max/stddev = 29.590/29.590/29.590/0.000 ms

After

arista-7050#ping 204.42.254.15

PING 204.42.254.15 (204.42.254.15) 72(100) bytes of data.

80 bytes from 204.42.254.15: icmp_seq=1 ttl=54 time=8.78 ms

...

--- 204.42.254.15 ping statistics ---

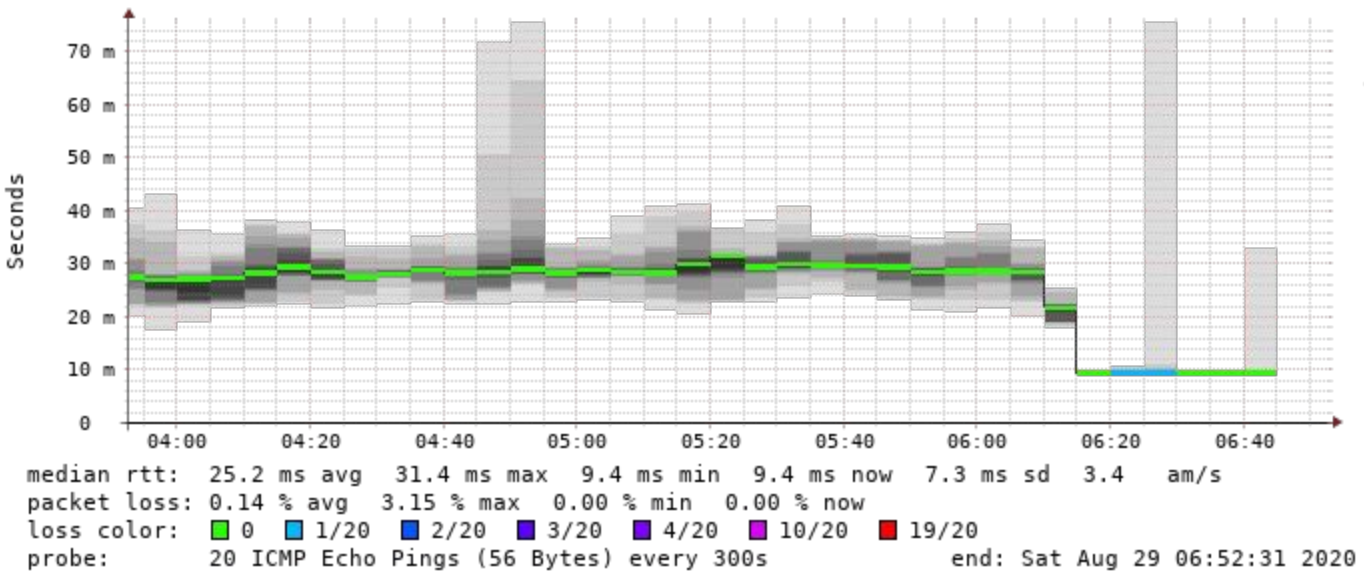
5 packets transmitted, 5 received, 0% packet loss, time 38ms

rtt min/avg/max/mdev = 8.571/8.640/8.784/0.118 ms, ipg/ewma 9.516/8.707 ms

Traceroute

```
arista-7050#traceroute 204.42.254.15
traceroute to 204.42.254.15 (204.42.254.15), 30 hops max, 60 byte packets
 1  207-179-84-221.static.acd.net (207.179.84.221)  0.490 ms  1.263 ms  1.241 ms
 2  gi0-1-0-subint21.router.backbone.jcsnmimn.acd.net (207.179.109.6)  2.662 ms  2.648 ms *
 3  Gi4-1-0-subint21.router.backbone.lnngmimn.acd.net (207.179.109.33)  2.391 ms  2.464 ms
*
 4  gi2-0-0-subint198.level3.acd.net (208.77.128.153)  2.658 ms  2.662 ms  2.640 ms
 5  7-1-19.ear3.Chicago2.Level3.net (4.35.108.129)  7.675 ms  7.676 ms  7.668 ms
 6  * * *
 7  ae-4.r07.chcgil09.us.bb.gin.ntt.net (129.250.8.173)  8.752 ms  8.791 ms  8.859 ms
 8  r204.42.254.15.nether.net (204.42.254.15)  8.589 ms  8.609 ms  8.594 ms
```

Latency reduction



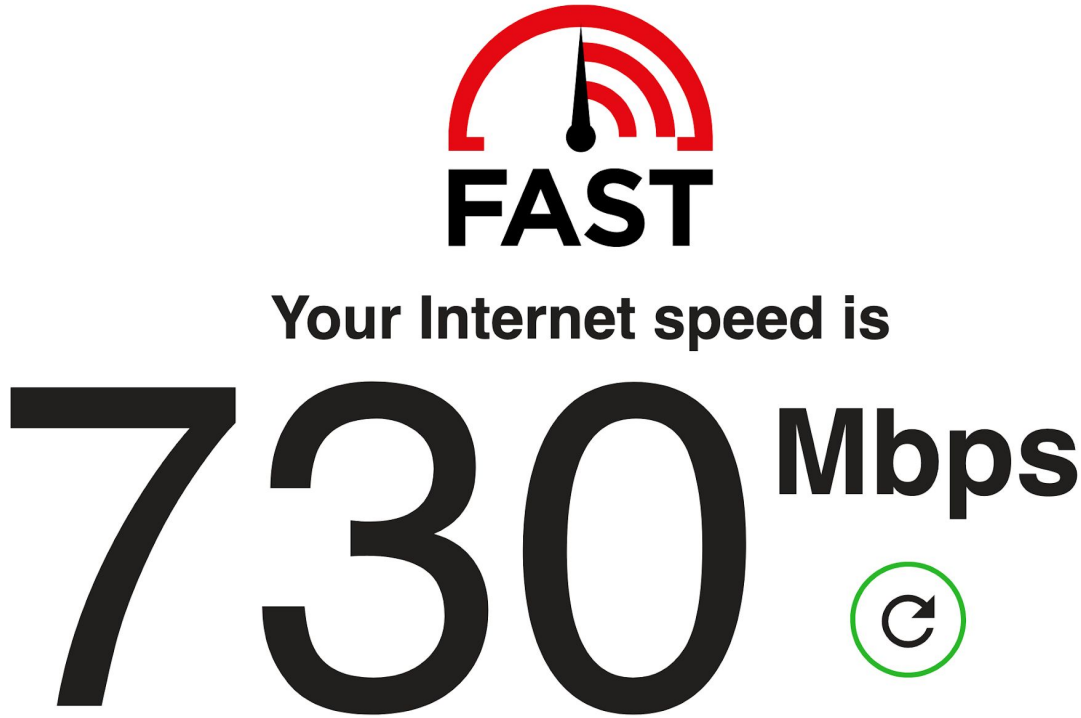
So what to do?

- Well, I was expecting a 10G
- It’s a 1G
- No BGP (yet)...
- Deploy plan B (or is it D or E now?)
- ER-X-SFP to the rescue!
  - Can do NAT
  - Not expecting to do 10G immediately anyways, it’s for future-proofing due to contract term

So what to do?

- Flip over default route to new path
  - NAT to WAN IP!
- Then.. what does everyone else do?

Slide to make Dave happy



So, then you do what?

- I had neighbors pre-wired for fiber due to agreement with WISP
- I removed all the rate-limiters
- Sent them text messages on a Saturday morning
- Response?
  - Yowza!
- Optic swap to 10G w/ attenuator removed done Sept 9th
- BGP up earlier with proper config

Ongoing installations

- Some customers were pre-wired in the Spring
- They were connected in late August or early Sept
- Paused installations for a week and a half due to family needs
- Install takes me 2-4 hours to complete, less than 1 hour if pre-wired from spring
- Many small dependencies that take time

Costs?

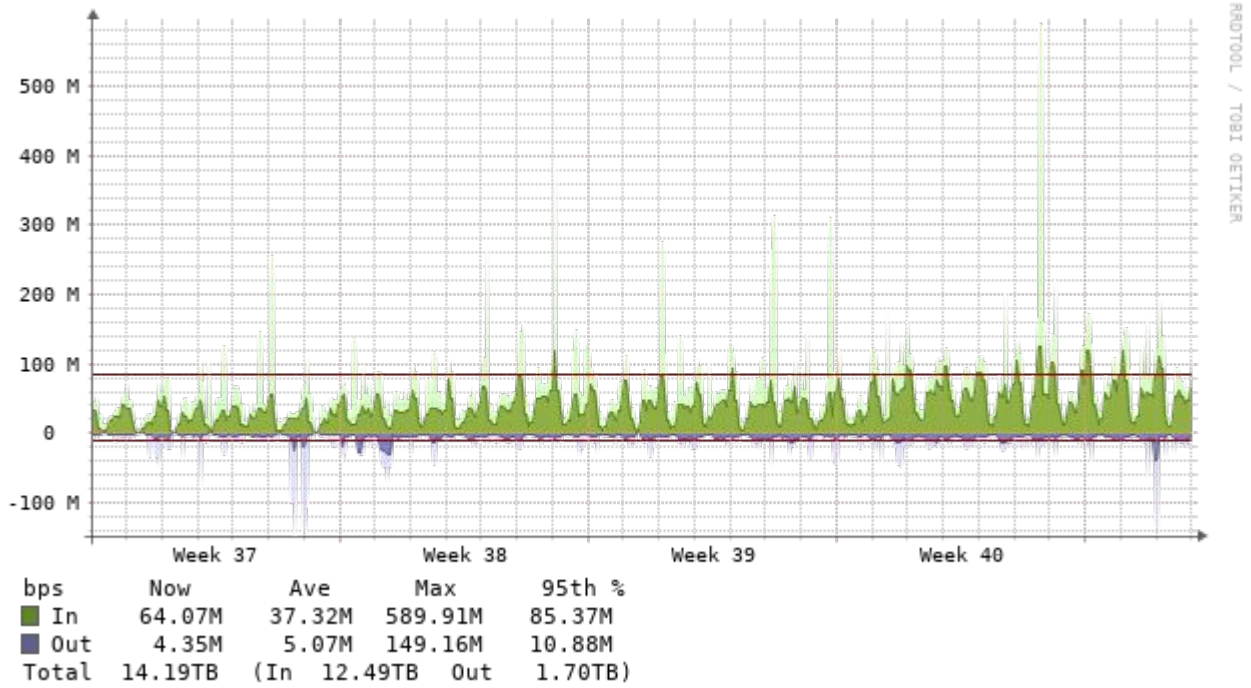
- 2020 had the majority of them
- Major costs breakdown:
  - $126,710
  - $94,866 - Directional boring/conduit installation
  - $31,844 - Misc materials, rentals, equipment
    - $5,000 - Surveying
    - $856 - 185 CFM Air Compressor rental

Maybe still cheaper than moving? And I now have fiber!

Customer status (Oct 6th)

- 23 customers online (includes my house)
- 1 Business customer (previous WISP)
- 13 still being installed
  - 2 more prospects in the service area expressed interest
- 2 people need to convert from wireless -> Fiber still
- Trying to install in the order they signed up
  - Also ordered by all dependencies

Network usage? 5Mb/sub



Thank You!

- Without many people it would not be possible
- Support of many people who have been there and done that
- Ryan Peel @ VBFiber
- Chris Fabien @Lakenet
- Antawn Parks @ Millenium
- Roy Grove @ EZwisp
- My neighbors on Reese Lane, Pinecross Lane, Liberty and Parker Road

Thank You!

- Great Lakes Directional Boring
- Everyone who put up with me and encouraged me along the way
- ACD.Net & 123.net
- My family
- Many friends who helped with physical labor or other support

Resources

- Facebook!
  - https://www.facebook.com/groups/wisptalk/
  - https://www.facebook.com/groups/fispstuff/
  - https://www.facebook.com/groups/305841453429657/

FIN

Time for questions?

twitter - @jaredmauch