

## Middlefield Wireless Broadband Project Costs

|                                    |           |                |
|------------------------------------|-----------|----------------|
| <b>Towers &amp; poles</b>          | \$        | 103,400        |
| <b>Network equipment</b>           | \$        | 146,550        |
| <b>Customer Premises Equipment</b> | \$        | 78,675         |
| <b>Network Infrastructure</b>      | \$        | 11,662         |
| <b>Professional Services</b>       | \$        | 79,000         |
| <b>Total</b>                       | <b>\$</b> | <b>419,287</b> |

|                             |           |                |
|-----------------------------|-----------|----------------|
| <b>(Initial Pilot cost)</b> | <b>\$</b> | <b>127,995</b> |
|-----------------------------|-----------|----------------|

## Middlefield Wireless Broadband Capital Budget

|   | Material price | Labor price | Class | Quantity  | Materials | Labor    | Total            | Notes                                 |
|---|----------------|-------------|-------|-----------|-----------|----------|------------------|---------------------------------------|
| Total number of 50' wood pole (42' up)    | \$1,400        | \$1,400     | t     | 5         | \$7,000   | \$7,000  | \$14,000         | Class 1 wood                          |
| Total number of 55-60' wood p (47-51 up)  | \$2,400        | \$2,300     | t     | 3         | \$7,200   | \$6,900  | \$14,100         |                                       |
| Total number of 70-80' wood p (56-65' up) | \$4,700        | \$2,800     | t     | 4         | \$18,800  | \$11,200 | \$30,000         |                                       |
| Total number of 90' tower                 | \$10,400       | \$10,400    | t     | 1         | \$10,400  | \$10,400 | \$20,800         | 90' tower with all material           |
| Engineering drawing                       | \$             | \$750       | t     | 1         | \$        | \$750    | \$750            | MA certified                          |
| Equipment slab                            | \$             | \$2,000     | t     | 1         | \$        | \$2,000  | \$2,000          | Concrete slab & fencing               |
| Tower geotechnical analysis               | \$             | \$5,350     | t     | 1         | \$        | \$5,350  | \$5,350          |                                       |
| Total number of lit sites/cabinets        | \$2,500        | \$1,000     | e     | 14        | \$35,000  | \$14,000 | \$49,000         | for box, switch, batteries, etc.      |
| Sites needing power installed             | \$200          | \$600       | t     | 13        | \$2,600   | \$7,800  | \$10,400         | short trench to metered pole          |
| Total number of sites w/5GHz if A5        | \$             | \$          | e     | 7         | \$        | \$       | \$               | A5-360 lights all directions, if used |
| Total number of sites w/TVWS              | \$5,000        | \$300       | e     | 7         | \$35,000  | \$2,100  | \$37,100         | if multi-sector APs are used          |
| Total number of 5 GHz sectors             | \$600          | \$250       | e     | 15        | \$9,000   | \$3,750  | \$12,750         | ePMP 2000 (most Lite)                 |
| Total number of 2.4 GHz sectors           | \$600          | \$250       | e     | 16        | \$9,600   | \$4,000  | \$13,600         | ePMP 1000 sync                        |
| Total number of 900 PMPi sectors          | \$2,700        | \$250       | e     | 1         | \$2,700   | \$250    | \$2,950          |                                       |
| Total number of TVWS unisectors           | \$             | \$          | e     | 10        | \$        | \$       | \$               | if single sector APs are used         |
| Total TVWS sector antennas                | \$300          | \$125       | e     | 10        | \$3,000   | \$1,250  | \$4,250          | with either type of AP                |
| Total number of backhaul radios           | \$600          | \$250       | e     | 26        | \$15,600  | \$6,500  | \$22,100         | point to point, used in pairs         |
| Total number of miniPOPs                  | \$950          | \$650       | e     | 3         | \$2,850   | \$1,950  | \$4,800          | fill in using CPE backhaul            |
| fiber on CWR to River                     |                |             | t     |           | \$        | \$       | \$               | only if no fire tower                 |
| Fiber extension to transfer station       | \$2,000        | \$4,000     | t     | 1         | \$2,000   | \$4,000  | \$6,000          | omit if only microwave to lbSP        |
| <b>Total</b>                              |                |             |       |           | \$160,750 | \$89,200 | <b>\$249,950</b> |                                       |
|   |                |             |       | t total   | \$48,000  | \$55,400 | \$103,400        | Towers                                |
|   |                |             |       | e network | \$112,750 | \$33,800 | \$146,550        | Field network equipment               |
|   |                |             |       | e total   | \$157,775 | \$74,450 | \$225,225        | Network+CPE eq. total                 |

true or false

|                           |       |  |
|---------------------------|-------|--|
| Use Mimosa A5-360?        | FALSE | one box, four sectors, antennas (vs. ePMP) |
| Use multi-sector TVWS AP? | TRUE  | one box, enough sectors                    |
| Use PMP450 for 2.4 GHz?   | FALSE | (vs. ePMP)                                 |
| Supply home Wi-Fi?        | TRUE  | additional indoor box                      |

total APs: 32

### Budgetary equipment; not final choices

|                        | Material | Installation |                         |                                 |
|------------------------|----------|--------------|-------------------------|---------------------------------|
| Mimosa A5-360 AP       | \$1,000  | \$250        | includes antennas       | Price of Mimosa A5-360 AP       |
| ePMP 2 GHz sync sector | \$600    | \$250        | includes antenna        | Price of ePMP 2 GHz sync sector |
| Cambium PMP450i AP     | \$1,350  | \$250        | includes antenna        | Price of Cambium PMP450 AP      |
| ePMP2000 5GHz sector   | \$500    | \$250        | includes antenna        | Price of 5GHz ePMP2000 sector   |
| Single sector TVWS     | \$3,500  | \$300        | includes antenna        | Price of single sector TVWS     |
| Multi-sector TVWS      | \$5,000  | \$300        | antennas extra          | Price of multi-sector TVWS      |
| TVWS sector antenna    | \$250    | \$125        | (installed w/sector)    | Price of TVWS sector antenna    |
| Backhaul radio         | \$600    | \$250        | average                 | Price of backhaul radio         |
| 5G eForce200 SM        | \$150    | \$200        | inc. mounting h/w       | Price of 5GHz Force 200 SM      |
| 2.4G eForce 200 SM     | \$150    | \$200        | inc. mounting h/w       | Price of 2.4GHz Force 200 SM    |
| PMP450 SM              | \$375    | \$250        | connectorized + antenna | Price of PMP450i -900 MHz SM    |

|           |       |       |
|-----------|-------|-------|
| TVWS SM   | \$300 | \$250 |
| Home WiFi | \$25  | \$25  |

includes external antenna Price of TVWS SM  
Price of home Wi-Fi demarc box  
Price of TVWS SM  
Price of 900 MHz PMP450i SM  
Tower climber fees man/day

Note: Subscriber Module installation is average of low-cost "standard" and some high-cost "customized" efforts

**Planned locations**

|            |     |
|------------|-----|
| Locations  | 266 |
| Take rate  | 60% |
| Total take | 160 |

| CPE by band (estimates) | CPEs |      | Sub per seas. Adj. |      | Spare SMs | SM cost  | Install  | Total           |
|-------------------------|------|------|--------------------|------|-----------|----------|----------|-----------------|
|                         |      |      | sector             | subs |           |          |          |                 |
| Subscribers on 5G       | 51   | 32%  | 3.4                | 47   | 3         | \$8,100  | \$10,200 | \$18,300        |
| Subscribers on 2G       | 45   | 28%  | 2.8                | 41   | 3         | \$7,200  | \$9,000  | \$16,200        |
| Subscribers on 900 MHz  | 12   | 8%   | 12.0               | 11   | 1         | \$4,875  | \$3,000  | \$7,875         |
| Subscribers using TVWS  | 50   | 32%  | 5.0                | 46   | 3         | \$15,900 | \$12,500 | \$28,400        |
| Home WiFi               |      |      |                    |      |           | \$3,950  | \$3,950  | \$7,900         |
| <b>Total</b>            | 158  | 100% | 3.9                | 145  | 10        | \$40,025 | \$38,650 | <b>\$78,675</b> |

**Network Infrastructure**

|                        |    | h/w     | labor   | total           |
|------------------------|----|---------|---------|-----------------|
| Core routing/switching |    | \$5,000 | \$2,000 | \$7,000         |
| Spare common equipment | 4% | \$4,662 |         | \$4,662         |
| <b>Total</b>           |    |         |         | <b>\$11,662</b> |

**Professional Services**

|                                |                 |
|--------------------------------|-----------------|
| Design/engineering/integration | \$25,000        |
| Administrative[1]              | \$50,000        |
| Upstream ISP installation      | \$4,000         |
| <b>Total</b>                   | <b>\$79,000</b> |

[1] Includes oversight, RFPs, MLP operation, project management, tower siting paperwork, marketing, etc.

|                                       |                  |
|---------------------------------------|------------------|
| Total initial project including pilot | <b>\$419,287</b> |
| Total CapEx/subscriber                | \$2,654          |

## Middlefield Wireless Broadband Monthly Operating Costs

| Operator subscriber fees @ \$25 | Quantity | Total |
|---------------------------------|----------|-------|
| 40% take                        | 98 \$    | 2,450 |
| 50% take                        | 122 \$   | 3,050 |
| 60% take                        | 146 \$   | 3,650 |
| 70% take                        | 171 \$   | 4,275 |

| Operator AP fees @\$25: |           | Total        |
|-------------------------|-----------|--------------|
| Per access point        | 28 \$     | 700          |
| Per backhaul link       | 13 \$     | 325          |
| <b>Total</b>            | <b>\$</b> | <b>1,025</b> |

### Other Expenses

|                        |                |            |
|------------------------|----------------|------------|
| Insurance              | \$500          |            |
| Upstream ISP           | \$1,290        | (150 Mbps) |
| MLP Manager            | \$1,000        |            |
| Electricity            | \$250          |            |
| Break/fix replacements | \$657          |            |
| <b>Total</b>           | <b>\$3,697</b> |            |

### Depreciation

|              |           |              |
|--------------|-----------|--------------|
| Electronics  | \$        | 2,630        |
| Tower/pole   | \$        | 133          |
| <b>Total</b> | <b>\$</b> | <b>2,763</b> |

| Phone Revenue @60% of subs * \$10 | Quantity | Total |
|-----------------------------------|----------|-------|
| 40% take                          | 59 \$    | 590   |
| 50% take                          | 73 \$    | 730   |
| 60% take                          | 88 \$    | 880   |
| 70% take                          | 103 \$   | 1,030 |

### Net Operating Expenses

|          | Cash     | Fiscal    |
|----------|----------|-----------|
| 40% take | \$ 6,582 | \$ 9,345  |
| 50% take | \$ 7,042 | \$ 8,780  |
| 60% take | \$ 7,492 | \$ 10,255 |
| 70% take | \$ 7,967 | \$ 10,730 |

### Subscribers (% of seasonally adj)

|                              | 40%     | 50%     | 60%     | 70%     |
|------------------------------|---------|---------|---------|---------|
|                              | 98      | 122     | 146     | 171     |
| "Cash" internet break even   | \$67.17 | \$57.72 | \$51.32 | \$46.59 |
| "Fiscal" internet break even | \$95.36 | \$71.97 | \$70.24 | \$62.75 |

### Number of Premises

|                               |     |
|-------------------------------|-----|
| Total premises                | 273 |
| Habitable premises            | 266 |
| Seasonal premises (6 mo avg)  | 44  |
| Seasonally adjusted habitable | 244 |

|                                    |     |
|------------------------------------|-----|
| Electronics depreciation months    | 60  |
| Infrastructure depreciation months | 360 |
| Break/fix % per year of capex      | 5%  |

| Middlefield Wireless Broadband Itemized Pilot Budget |                  |  |
|--|------------------|--|
| Infrastructure                                       | Est. Cost        | Notes  |
| <b>Tower</b>   |                  |  |
| Tower  | \$9,900          | Rohn 55G guyed steel tower, 55G110R90, with TA55 Torque Arm Stabilizer Assemblies for dual guy wire attachments  |
| Engineering drawings                                 | \$750            | MA certified engineering drawing   |
| Tower erection                                       | \$9,900          | Including 3 anchors & guy wires  |
| Equipment slab                                       | \$2,000          | Concrete 4' x 8' slab + fencing at tower base for equipment cabinet  |
| Tower base equipment                                 | \$3,450          | AmProd 36RU modular enclosure (\$2552) 68"H 25"D 26"W with fan (\$370), insulation (\$152), 4" mounting base (\$141), interior light (\$92), tray (\$143). |
| Batteries  | \$950            | 4 12V 75AH AGM batteries   |
| Rectifier set  | \$2,000          | Redundant 54V 10A rectifiers, shelf, breakers.   |
| Install base equipment                               | \$1,000          |  |
| Geotechnical analysis                                | \$5,350          |  |
| <b>Fiber &amp; power</b>                             |                  |  |
| Fiber  | \$0              | No longer need for pilot - utilizing AccessPlus from Washington tower  |
| Power  | \$2,000          | 15A circuit from transfer station to tower   |
| <b>Tower radio gear</b>                              |                  |  |
| 5GHz connectorized                                   | \$1,560          | 3X Cambium ePMP 2000 (\$520 each)  |
| 5GHz 90 degree sector                                | \$660            | 3x Cambium ePMP 2000 sectors 90/120 (\$220 each)   |
| 5GHz installation                                    | \$750            | 3 x \$250  |
| Integrated 5GHz AP                                   | \$911            | Mimosa A5-360-18 integrated access point system.   |
| Mimosa installation                                  | \$250            |  |
| 2.4GHz connectorized                                 | \$1,290          | 3x Cambium C024900A011A - ePMP 1000 2.4GHz Connectorized Radio GPS Sync (FCC, US/CA version) (\$430 each).   |
| 2.4GHz sector antennas                               | \$783            | 3x Cambium C024900D004A - ePMP 1000 2.4GHz 90/120-deg Dual-Pol Sector Antenna (\$261 each).  |
| 2.4Ghz installation                                  | \$750            |  |
| 3G TVWS AP   | \$5,000          | 1 Carlson Wireless 3G TVWS access point prototype. (Production price around \$5000.)   |
| TVWS sector antennas                                 | \$800            | 2 Carlson Wireless TVWS sector antennas (to be specified by Carlson).  |
| TVWS installation                                    | \$550            |  |
| <b>Cabinet electronics</b>                           |                  |  |
| PoE  | \$398            | Netonix WS-12-250-DC 12-port 250-watt power over Ethernet / switch (\$380) with RMK-250 rack ears (\$18).  |
| Installation   | \$150            | Including software   |
| <b>5 GHZ CPE</b>                                     |                  |  |
| Cambium dish   | \$565            | 5x Cambium C058900C062A - ePMP Force 200 5GHz Dish Antenna w Integrated High Gain Radio (FCC, US version). (\$113 each).                                   |
| Cambium radio  | \$255            | 3x ePMP Force 180 5GHz Integrated Radio (FCC, US version) (\$85 each)  |
| Mimosa C5  | \$400            | 4 x \$100  |
| Mimosa C5c   | \$480            | 4 x \$120  |
| Antennas   | \$480            | 4x 5 GHz dish antennas to be identified for the Mimosa C5c's (around \$120 each installed)   |
| 5 GHz installation                                   | \$2,200          | 11 x \$200   |
| <b>2 GHz CPE</b>                                     |                  |  |
| Cambium dish   | \$1,350          | 9x Cambium C024900C161A - ePMP Force 200 2.4GHz Dish Antenna w Integrated High Gain Radio (FC9C, US version) (\$150 ea.)                                   |
| Cambium dish   | \$300            | 2x Cambium C024900C031A - ePMP 1000 2.4GHz Integrated Radio (FCC, US/CA version) (\$150 ea.)   |
| 2GHz installation                                    | \$2,200          | 11 x \$200   |
| <b>TVWS</b>  |                  |  |
| CPE  | \$2,500          | Up to 10 TVWS "3G" CPE prototypes, retail price est. around \$250; may be divided between indoor and outdoor versions.                                     |
| CPE antennas   | \$1,000          | Up to 10 matching CPE antennas to be determined by Carlson, retail price est. around \$100 each.   |
| TVWS installation                                    | \$2,500          | 10 x \$250   |
| <b>Arthur Pease</b>                                  |                  |  |
| 46' pole   | \$4,700          | 55' class 1  |
| Cabinet & contents                                   | \$3,000          |  |
| Install cabinet                                      | \$1,500          |  |
| Power to cabinet                                     | \$800            |  |
| 5 GHz AP radios                                      | \$550            | ePMP 2000 Lite   |
| 5 GHz antennas                                       | \$440            |  |
| 2 GHz APs  | \$1,290          |  |
| 2 GHz antennas                                       | \$783            |  |
| 2 GHz install  | \$750            |  |
| 5 GHz install  | \$500            |  |
| 5 GHz CPEs installed                                 | \$1,860          | 6 @ \$110 + \$200 install for each   |
| 2.4 GHz CPEs installed                               | \$2,720          | 8 @ \$140+ \$200 install for each  |
| <b>Network Infrastructure</b>                        |                  |  |
| Core routing   | \$1,500          | Most is for expert installation configuration (\$400 for the box)  |
| Spare  | \$0              |  |
| <b>Professional Services</b>                         |                  |  |
| Design/engineering                                   | \$12,000         |  |
| Administration                                       | \$25,000         |  |
| <b>CapEx Total</b>                                   |                  |  |
|  | <b>\$122,775</b> |  |
| <b>OpEx</b>  |                  |  |
| Subscriber fees                                      | \$1,600          | 32 x \$25 x 2 mo   |
| AP fees  | \$450            | 9 x \$25 x 2 mo  |
| Upsteram ISP   | \$3,100          | \$550 x 2 mo (50 Mbps) + \$2,000 installation  |
| Electricity  | \$70             | \$35 x 2 mo  |
| <b>OpEx Total</b>                                    | <b>\$5,220</b>   |  |
| <b>Total Pilot</b>                                   | <b>\$127,995</b> |  |

## Middlefield Wireless Pilot Monthly Operating Expenses

| <b>Operator fees:</b> |                | <b>Fee</b> | <b>Quantity</b> | <b>Total</b> |
|-----------------------|----------------|------------|-----------------|--------------|
| Per subscriber        |                | \$25       | 32              | \$800        |
| Per access point      |                | \$25       | 9               | \$225        |
| <b>Total</b>          | \$1,025        |            |                 |              |
| <b>Upstream ISP</b>   | \$550          | 50 Mbps    |                 |              |
| <b>Electricity</b>    | \$35           |            |                 |              |
| <b>Total</b>          | <b>\$1,610</b> |            |                 |              |

## Middlefield Wireless Broadband Access Sectors

| Enabled sites                 | Lat (°)  | Long (°) | Ht (ft)  | Access sectors |       |      |         |        | Total | Notes               |
|-------------------------------|----------|----------|----------|----------------|-------|------|---------|--------|-------|---------------------|
|                               |          |          |          | 5 GHz          | 2 GHz | TVWS | 900 MHz | Bkhaul |       |                     |
| Transfer Station              | 42.34972 | -73.0119 | 90       | 1              | 2     | 3    |         | 5      | 11    | Primary access site |
| Arthur Pease                  | 42.34861 | -72.9986 | 47       | 3              | 3     | 2    |         | 3      | 11    |                     |
| BCKT:Surriner W               | 42.31    | -73.0411 | 42       |                | 1     |      |         | 1      | 2     | Relay to Bancroft   |
| Blush Hollow (THR)            | 42.33611 | -73.0306 | 42       |                | 1     | 1    |         | 1      | 3     |                     |
| Chester Rd.                   | 42.32778 | -72.9989 | 65       |                | 2     |      |         | 1      | 3     | Below Alderman      |
| Chipman N of Root             | 42.36333 | -72.9953 | 51       | 2              | 2     | 2    |         | 1      | 7     |                     |
| CHST:Holcomb Hill FT          | 42.32472 | -72.9575 | existing | 1              |       |      |         | 1      | 4     | 6                   |
| East River bend               | 42.37111 | -72.9664 | 56       | 2              |       |      |         | 1      | 3     |                     |
| HPease&TownHill               | 42.34806 | -73.0233 | 42       |                | 2     |      |         | 1      | 3     |                     |
| Reservoir Rd                  | 42.35694 | -73.0525 | 51       | 2              |       |      |         | 1      | 3     |                     |
| River S of 149                | 42.35611 | -72.9639 | 42       | 2              |       |      |         | 1      | 3     |                     |
| Skyline                       | 42.36194 | -73.0319 | 56       |                | 1     | 1    |         | 3      | 5     |                     |
| Smith Hollow                  | 42.38028 | -72.9778 | 65       | 2              | 1     |      |         | 1      | 4     |                     |
| [Contingency pole for budget] |          |          | 42       |                | 1     | 1    |         | 2      | 4     |                     |

### Relay-only sites:

WRTH: Old North@River                      42.42355 -72.9864                      Redundant MBI access

|                             |           |           |           |           |          |           |           |
|-----------------------------|-----------|-----------|-----------|-----------|----------|-----------|-----------|
| <b>Total Sectors</b>        |           | <b>15</b> | <b>16</b> | <b>10</b> | <b>1</b> | <b>26</b> | <b>68</b> |
| <b>(Subscriber sectors)</b> | <b>41</b> |           |           |           |          |           |           |

### Pole descriptions:

42/47-foot wood utility poles are 50/55-foot poles, planted 8'. A mast can raise a small antenna to the 52-55 foot level.

65-foot wood utility poles are 80-foot poles, planted 15'.

90-foot (above ground) monopole. Antennas generally attach to mounting hardware offset from the sides, below the top.