

# Broadband Installation/ROW Plan

**Yellowstone National Park**  
Employee Housing & Xanterra Properties  
Updated March 3, 2020



**Trade Secret Confidential – FOIA Exempt**

# Experience



## Solution highlights



Team experience as end-to-end wireless ISP to remote federal property. Now focused exclusively on public lands and surrounding communities



Authorized  
Concessioner

**25+ Mbps**  
Broadband speeds



**1 million+**  
Global hotspots



## Military/government portfolio snapshot



National Park Service



U.S. Marine Corps



Dept. of Homeland Security



FBI



U.S. Air Force



U.S. Army

Experience bringing Broadband to hundreds of remote federal facilities, worldwide

# Proposed Right-of-Way Areas of Coverage

Yellowstone Employee Housing & Xanterra Lodging

# Overview of Backha

West

Mt. W

Old Fa

Grant

Canyo

Fishin

Mam



buildings





Mt. Washburn Verizon Tower; AccessParks Repeater Equipment





Mount Washburn – Wireless Telecommunications Hub for Yellowstone NP  
Tower Coordinates: 44.798N, -110.434W

# AccessParks Antenna Plan

Existing Mt. Washburn Verizon Tower# 27660

## 1. To West Yellowstone

- (1) 3-ft antenna, [REDACTED]-deg azimuth
- Located in West Vault

## 2. To Old Faithful

- (1) 3-ft antenna, [REDACTED]z, 223-deg azimuth
- Located in West Vault

## 3. To Canyon Village

- (1) 2-ft antenna, [REDACTED]. 212-deg azimuth
- Located on lattice, 11-ft AGL, beneath existing 3-ft antenna

## 4. To Grant Village

- (1) 3-ft antenna, [REDACTED] GHz, 191-deg azimuth
- Located on lattice structure, 17-ft CL

## 5. To Fishing Bridge

- (1) 3-ft antenna, [REDACTED] GHz, 162-deg azimuth
- Located in East Vault

## 6. To Gardiner

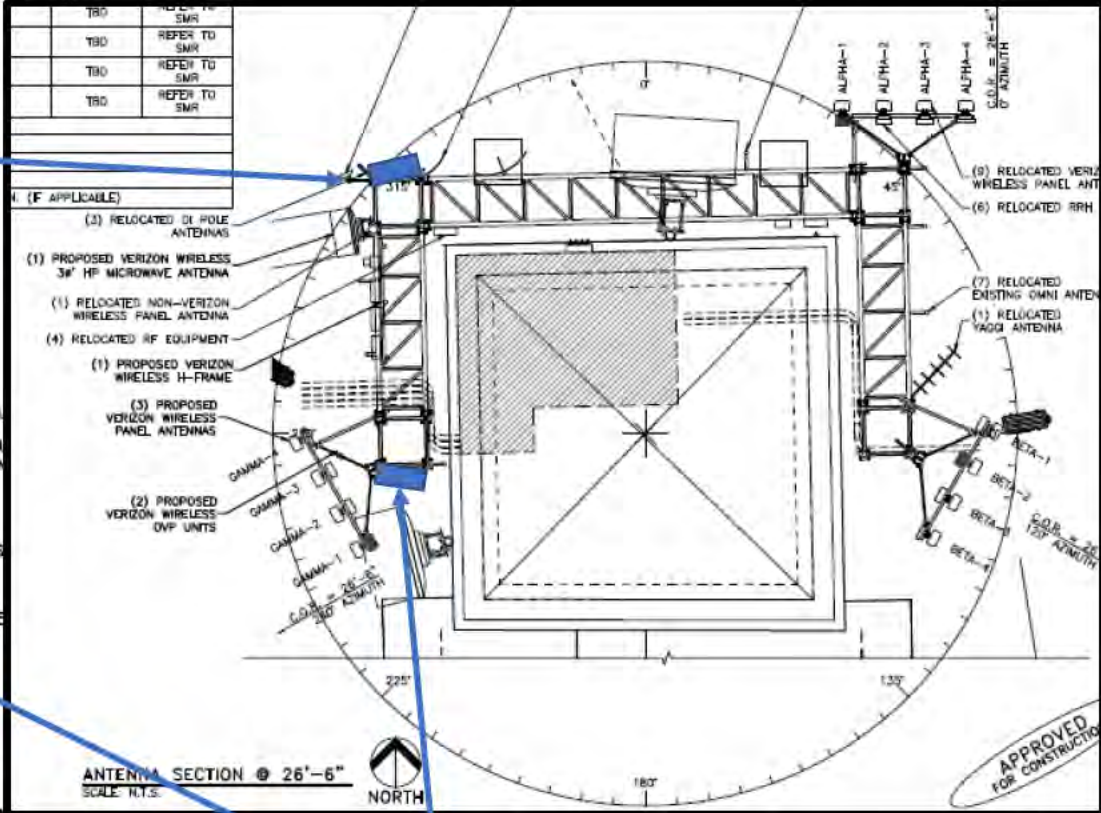
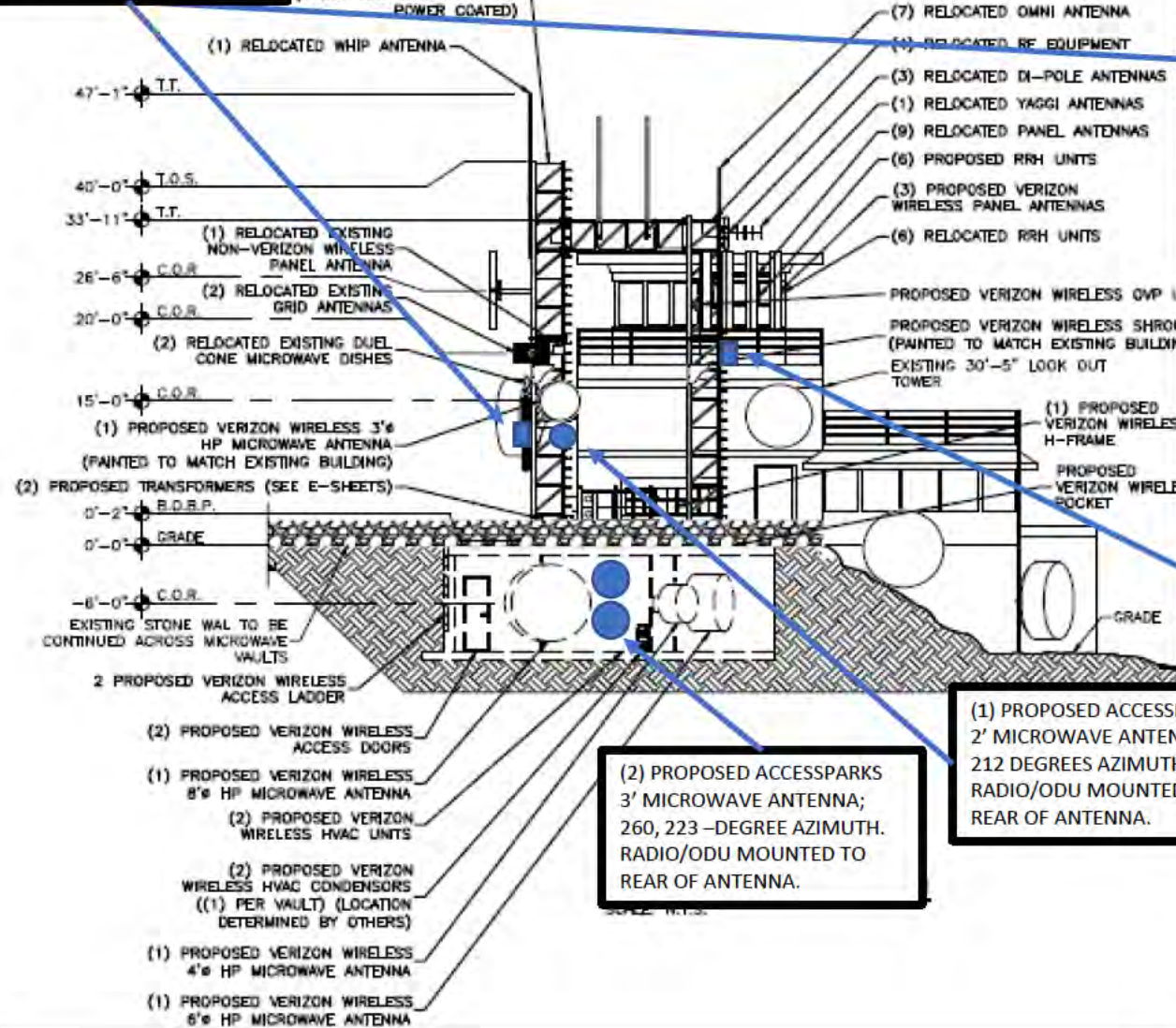
- (1) 3-ft antenna, [REDACTED] GHz, 314-deg azimuth
- Located on lattice structure, 13-ft CL



# Verizon Tower, West View; Proposed AccessParks Antennae

(1) PROPOSED ACCESSPARKS  
3' MICROWAVE ANTENNA;  
314-DEGREES AZIMUTH.  
RADIO/ODU MOUNTED TO  
ANTENNA

PROPOSED VERIZON WIRELESS  
30'-10" LOOKOUT TOWER  
(TOWER AND MOUNTS TO BE  
POWER COATED)



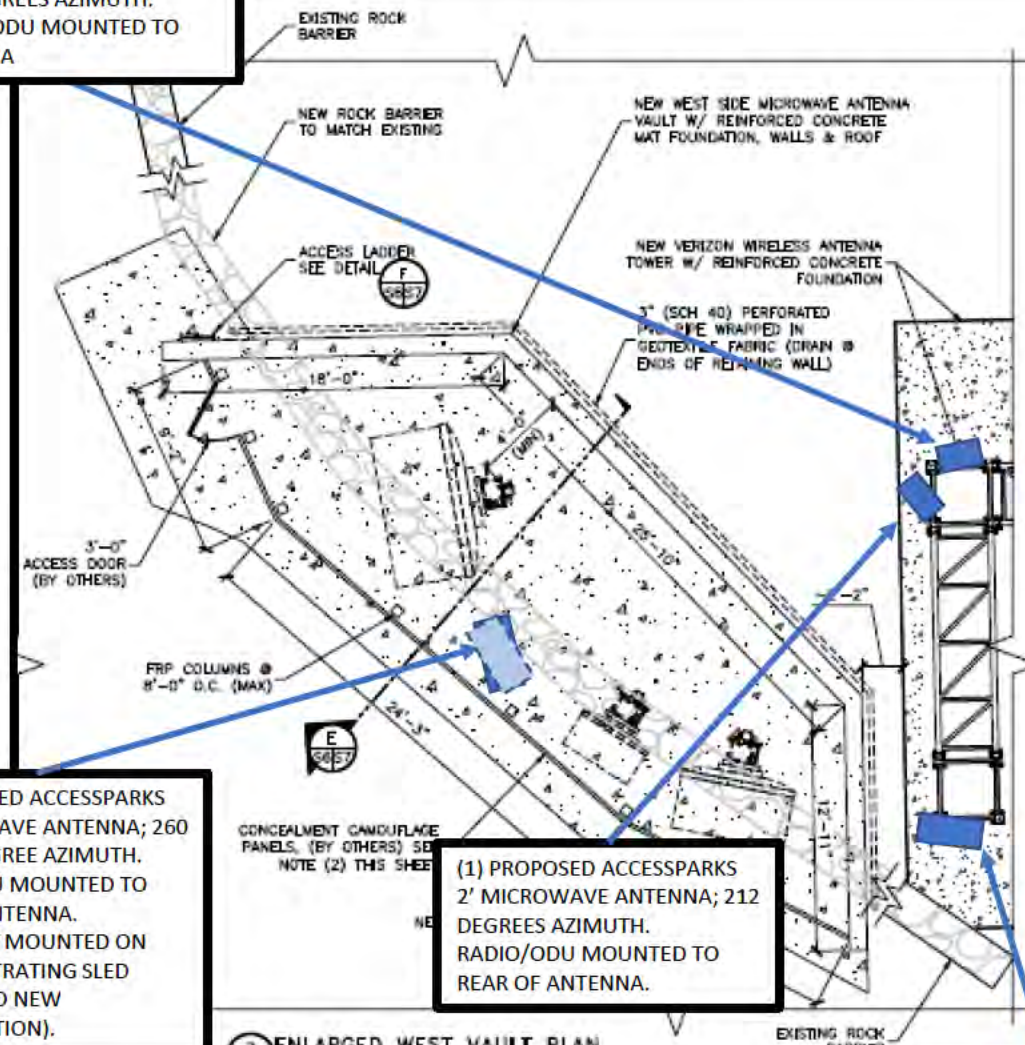
(2) PROPOSED ACCESSPARKS  
3' MICROWAVE ANTENNA;  
260, 223-DEGREE AZIMUTH.  
RADIO/ODU MOUNTED TO  
REAR OF ANTENNA.

(1) PROPOSED ACCESSPARKS  
2' MICROWAVE ANTENNA;  
212 DEGREE AZIMUTH.  
RADIO/ODU MOUNTED TO  
REAR OF ANTENNA.

(1) PROPOSED ACCESSPARKS  
3' MICROWAVE ANTENNA;  
191-DEGREES AZIMUTH.  
RADIO/ODU MOUNTED TO  
ANTENNA



(1) PROPOSED ACCESSPARKS  
3' MICROWAVE ANTENNA;  
314-DEGREES AZIMUTH.  
RADIO/ODU MOUNTED TO  
ANTENNA

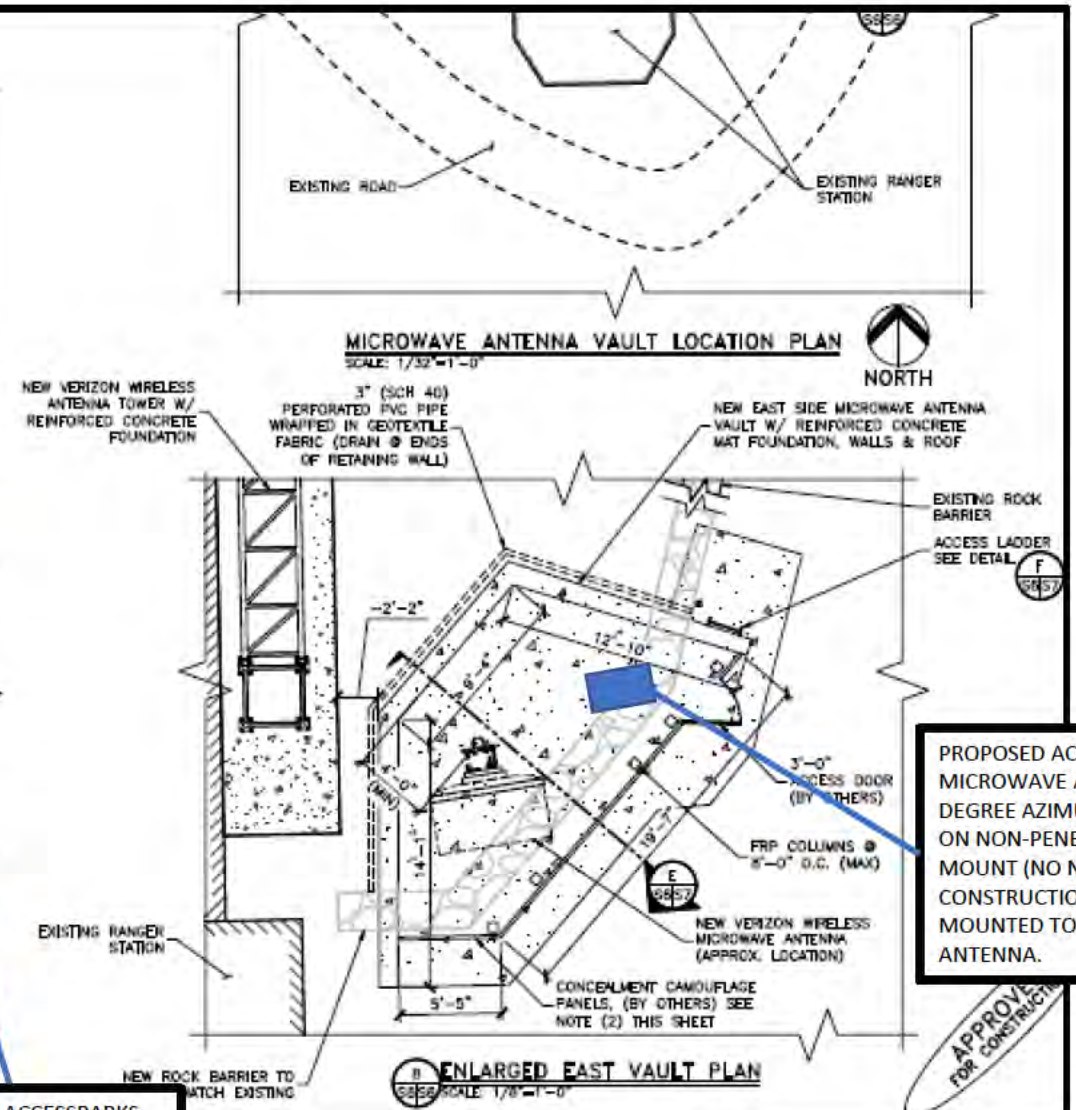


(2) PROPOSED ACCESSPARKS  
3' MICROWAVE ANTENNA; 260 & 223 -DEGREE AZIMUTH.  
RADIO/ODU MOUNTED TO REAR OF ANTENNA.  
VERTICALLY MOUNTED ON NON-PENETRATING SLED MOUNT (NO NEW CONSTRUCTION).

(1) PROPOSED ACCESSPARKS  
2' MICROWAVE ANTENNA; 212 DEGREES AZIMUTH.  
RADIO/ODU MOUNTED TO REAR OF ANTENNA.

7 ENLARGED WEST VAULT PLAN  
SCALE: 1/8" = 1'-0"

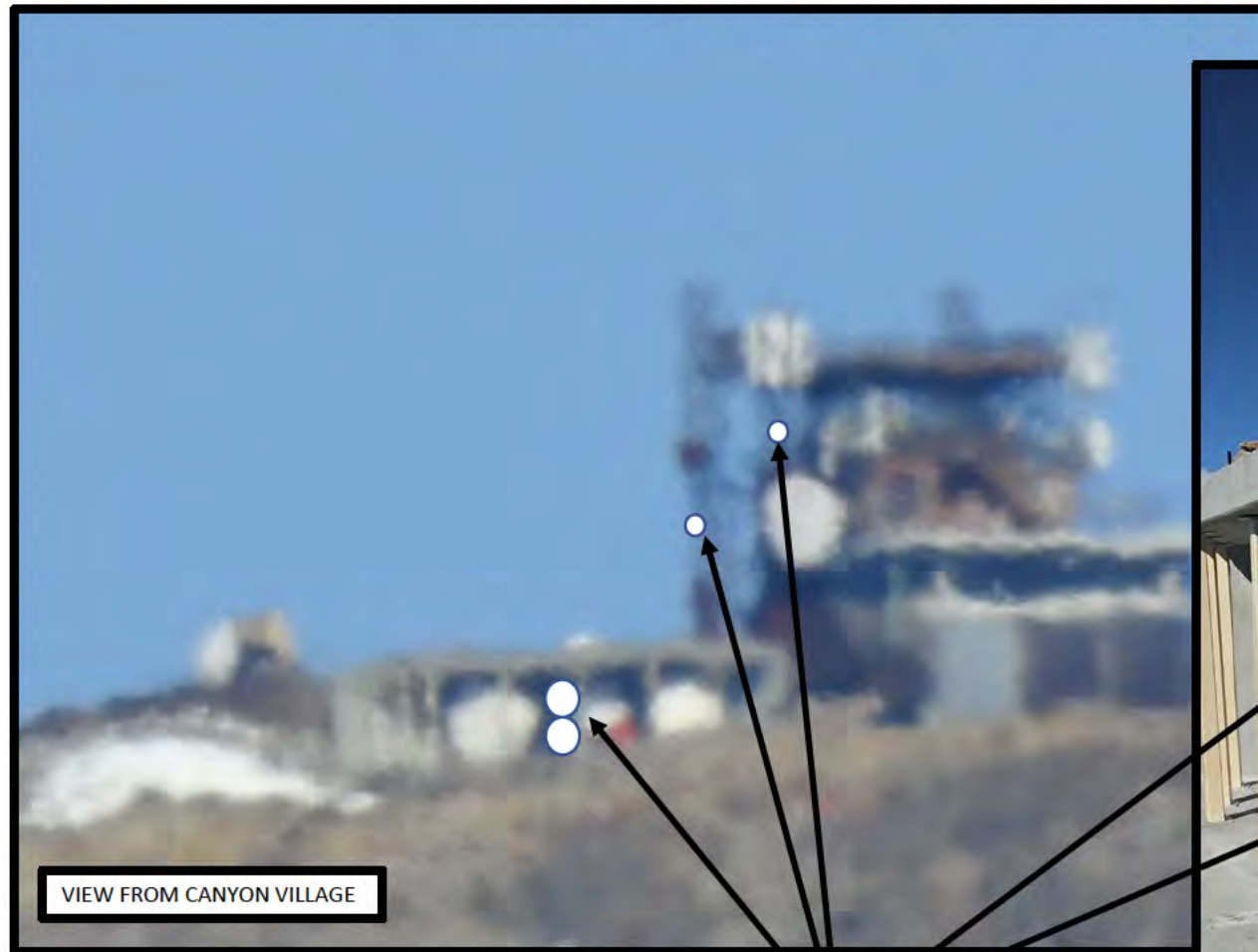
(1) PROPOSED ACCESSPARKS  
3' MICROWAVE ANTENNA;  
191-DEGREE AZIMUTH.  
RADIO/ODU MOUNTED INSIDE SHELTER.



PROPOSED ACCESSPARKS 3' MICROWAVE ANTENNA; 162-DEGREE AZIMUTH. MOUNTED ON NON-PENETRATING SLED MOUNT (NO NEW CONSTRUCTION). RADIO/ODU MOUNTED TO REAR OF ANTENNA.



# Verizon Tower, West View; Proposed AccessParks Antennae



WEST SIDE: PROPOSED FOUR  
(4) ACCESSPARKS MICROWAVE  
ANTENNAE.

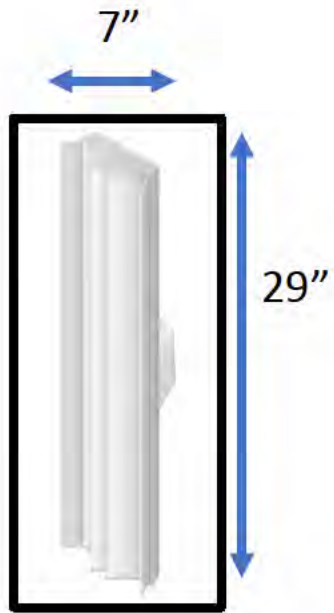
NOTE: TWO (2) EXTERIOR-  
MOUNTED ANTENNAE TO BE  
PAINTED TO MATCH  
BACKGROUND



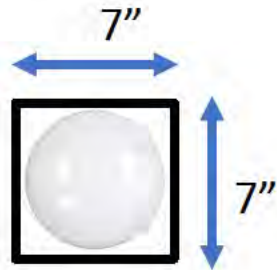
# AccessParks

## Typical Local Wireless Network Architecture

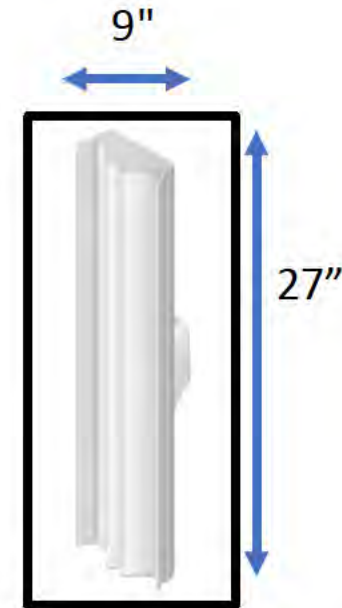
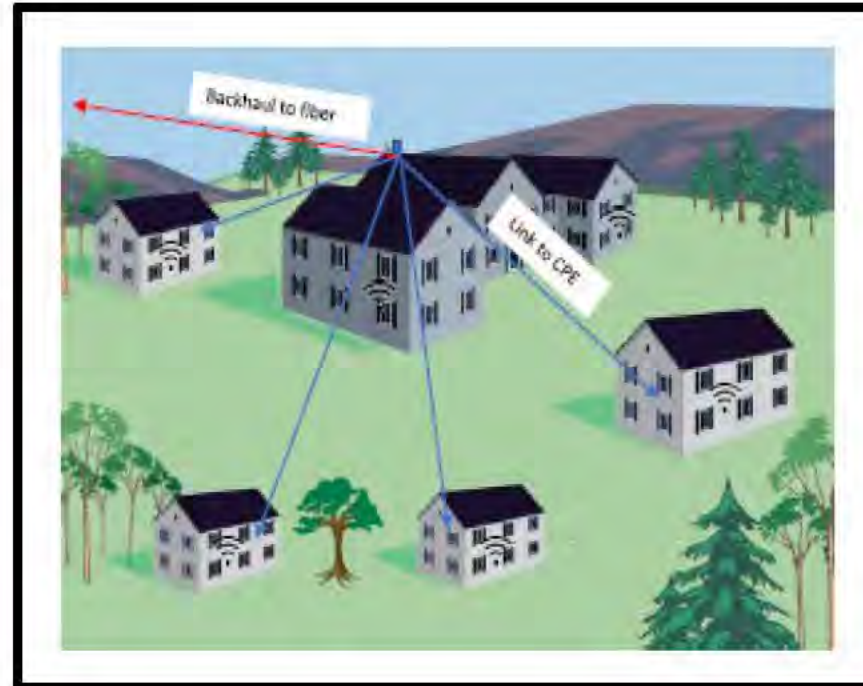
# Point-to-Multipoint; Area Distribution



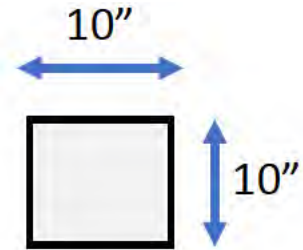
6GHz PMP Access Point; provides connectivity for 100 CPE



6GHz Customer Premises Equipment (CPE); one per building



6GHz PMP Access Point; provides connectivity for 100 CPE



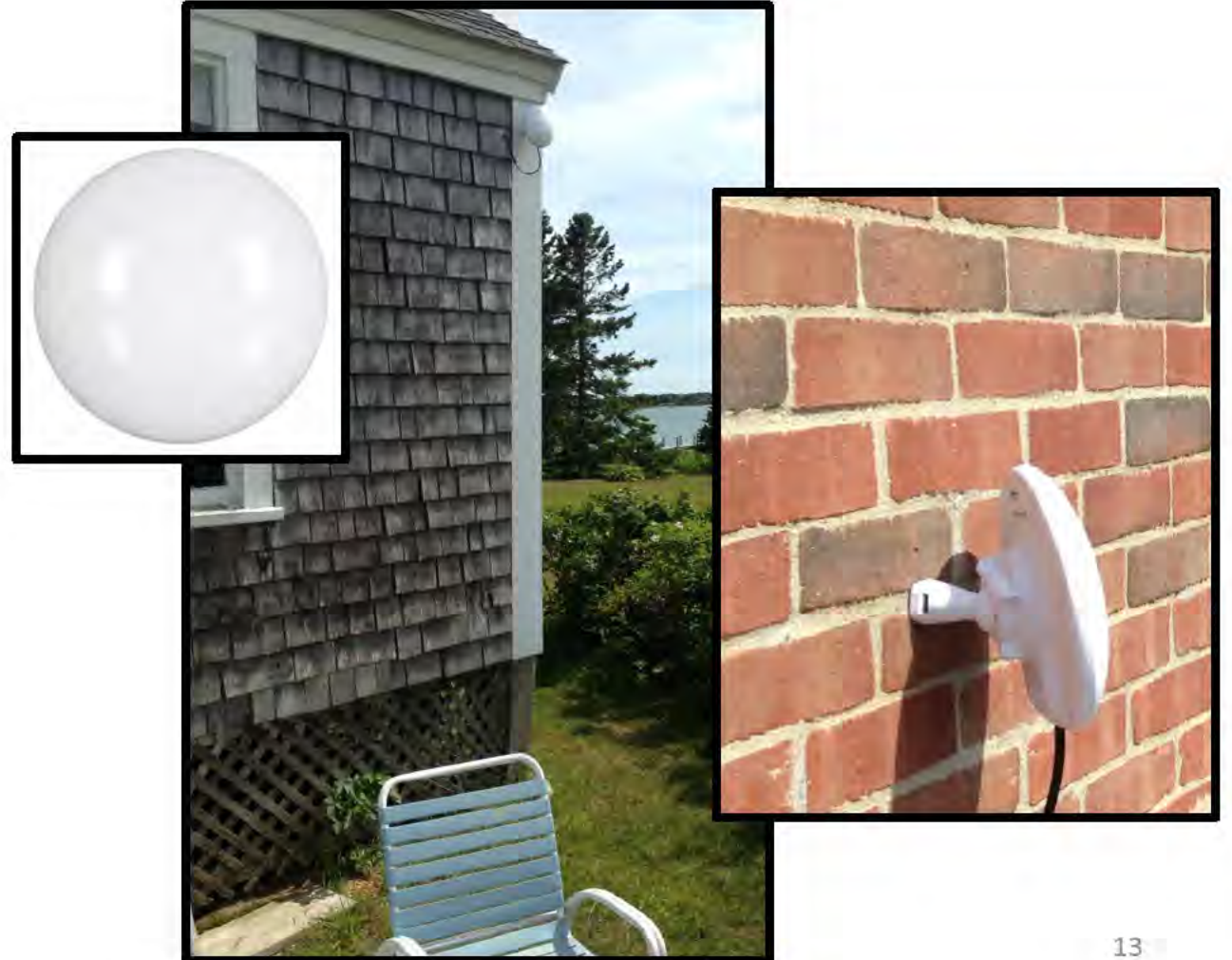
6GHz Customer Premises Equipment (CPE); one per building



# ■ GHz Licensed Point-to-Multipoint; Area Distribution

## Customer Premises Equipment (CPE)

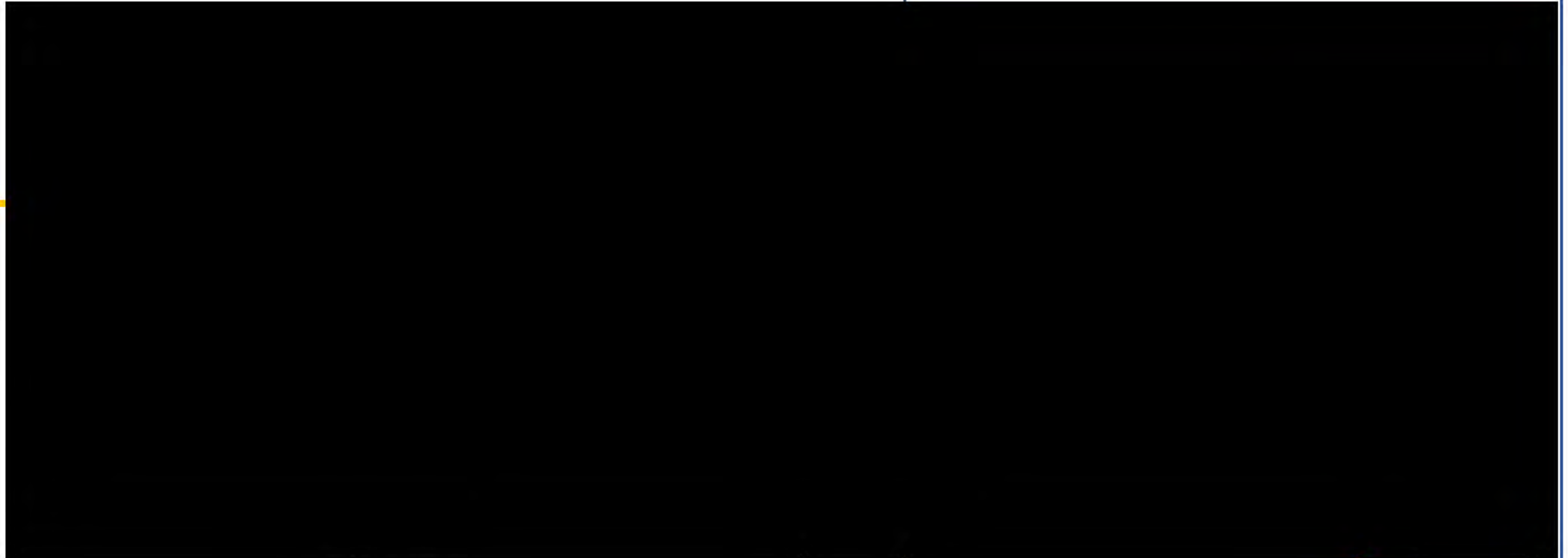
- 7" diameter
- One per building
- Mounted using one screw
- Painted to match wall
- Capacity of up to 500 Mbps
- ■ GHz; FCC Part 15 Compliant
- Powered through Ethernet cable from Wi-Fi router inside building (one cable for data and power). No new electrical service required.
- Ethernet cable to interior using existing wall penetrations



# AccessParks Broadband; Lodge Coverage



Gigabit fiber-optic to Internet



## Cabling Notes:

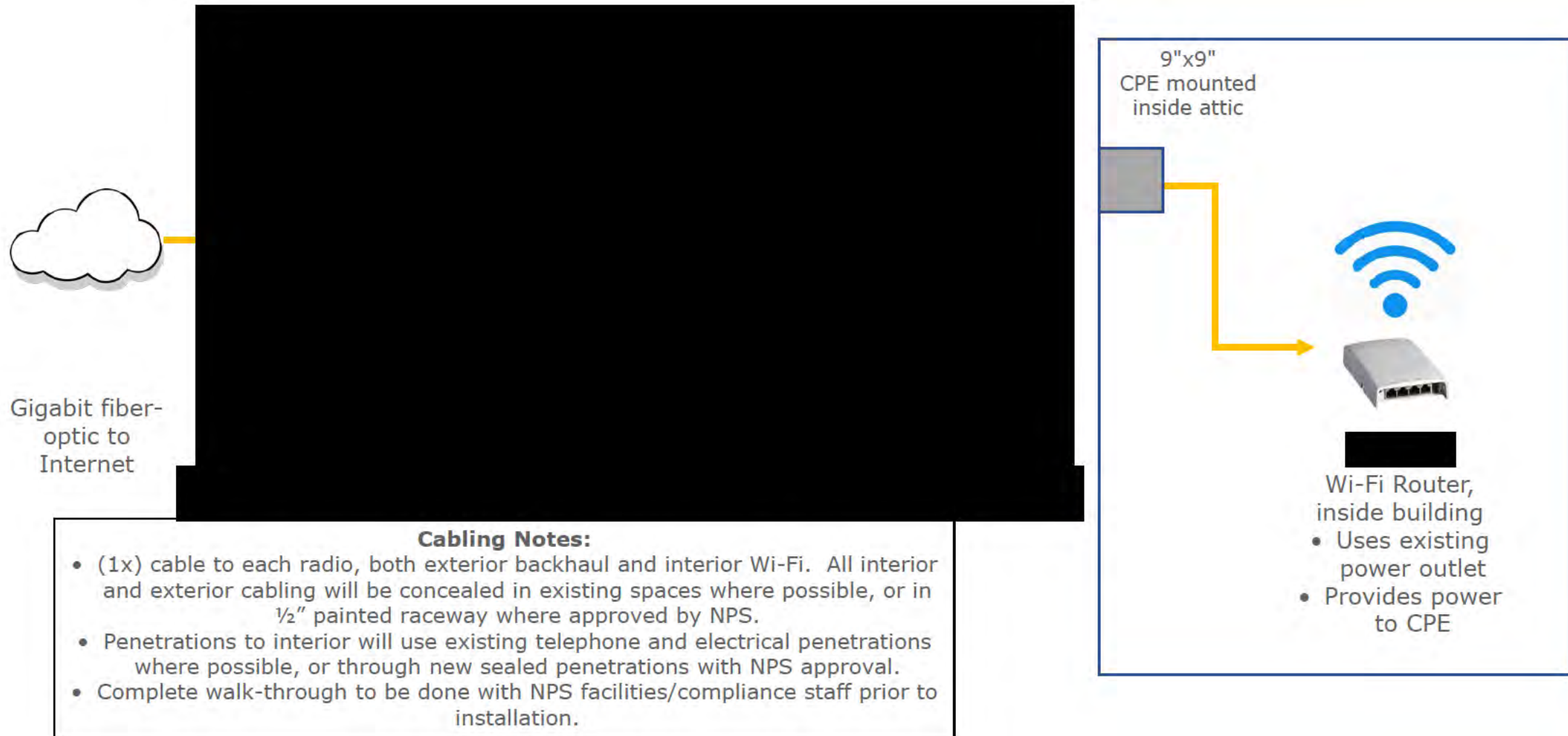
- (1x) cable to each radio, both exterior backhaul and interior Wi-Fi. All interior and exterior cabling will be concealed in existing spaces where possible, or in 1/2" painted raceway where approved by NPS.
- Penetrations to interior will use existing telephone and electrical penetrations where possible, or through new sealed penetrations with NPS approval.
- Complete walk-through to be done with NPS facilities/compliance staff prior to installation.



Wi-Fi radios; mounted in interior or exterior hallways, near guest rooms. Data + power over one Ethernet cable

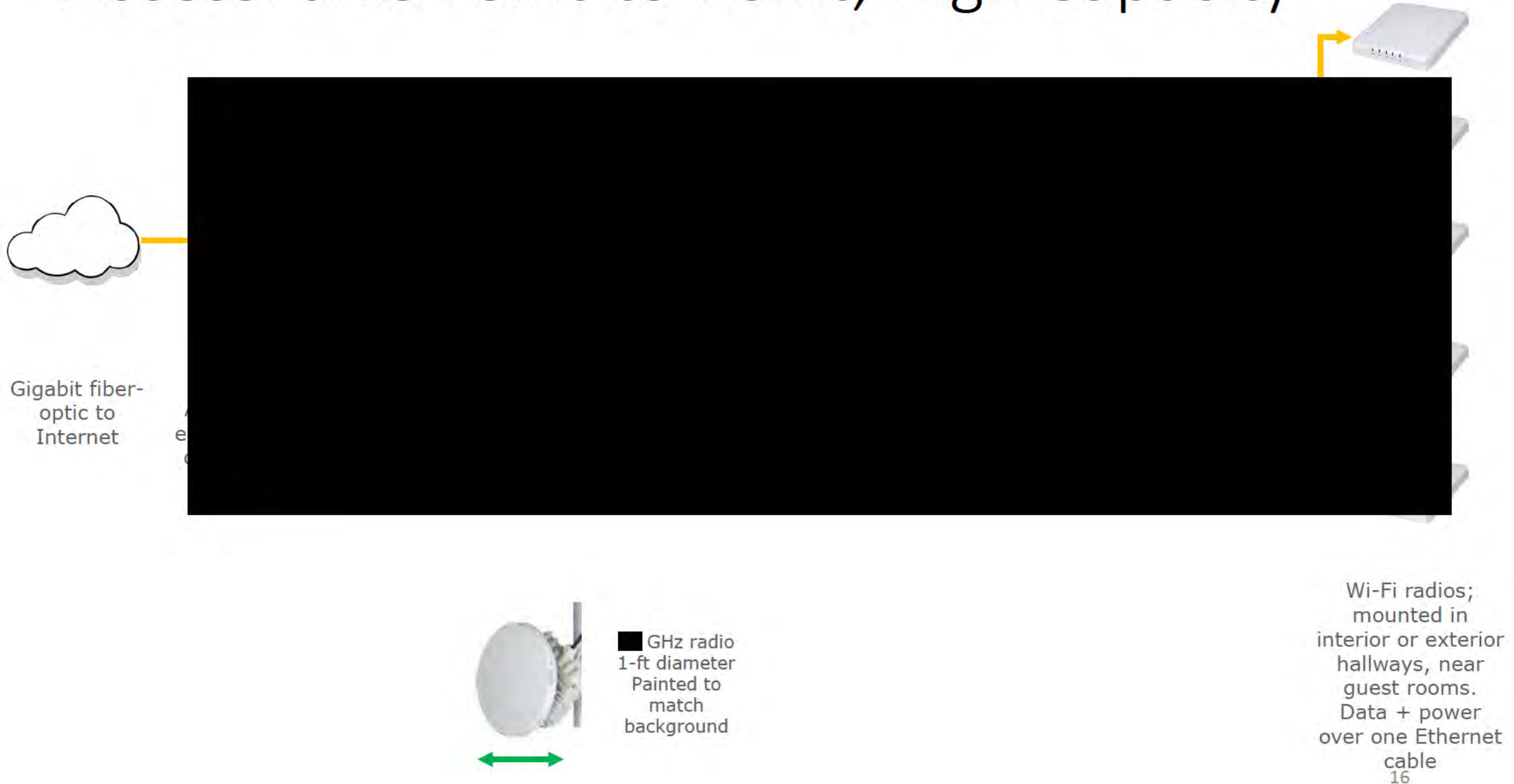
# AccessParks Broadband

Historic Cabin Coverage (no external CPE)





# AccessParks Point-to-Point; High Capacity





# ■ GHz Point-to-Multipoint (PMP)



- CPE is 7"x5"x3"
- Interference-free, due to .9-degree beamwidth
- ■ Mbps (1 Gbps throughput per CPE)
  - ■ -ft range, Line of Sight, LOS
- Used for high-density buildings/lodges

# Wi-Fi Access Points (APs)

## In-Building Wi-Fi Access

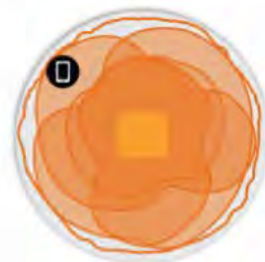


- Ceiling mounted, Power over Ethernet (PoE)
- 6.6"(L) x 6.49"(W) x 1.6"(H)
- 802.11n/ac, 2x2 MIMO beamforming antenna



- Wallplate mounted in lodge room Power over Ethernet (PoE)
- 3.54"(L) x 6.73"(W) x 1.14"(H)
- 802.11n/ac, 2x2 MIMO beamforming antenna

Figure 1. Example of BeamFlex+ pattern



Legend:  
● Client  
● Composite Pattern  
● BeamFlex+

Figure 2. R510 2.4GHz Azimuth Antenna Patterns



Figure 3. R510 5GHz Azimuth Antenna Patterns



Figure 4. R510 2.4GHz Elevation Antenna Patterns



Figure 5. R510 5GHz Elevation Antenna Patterns



# Public Safety – Indoor Localization

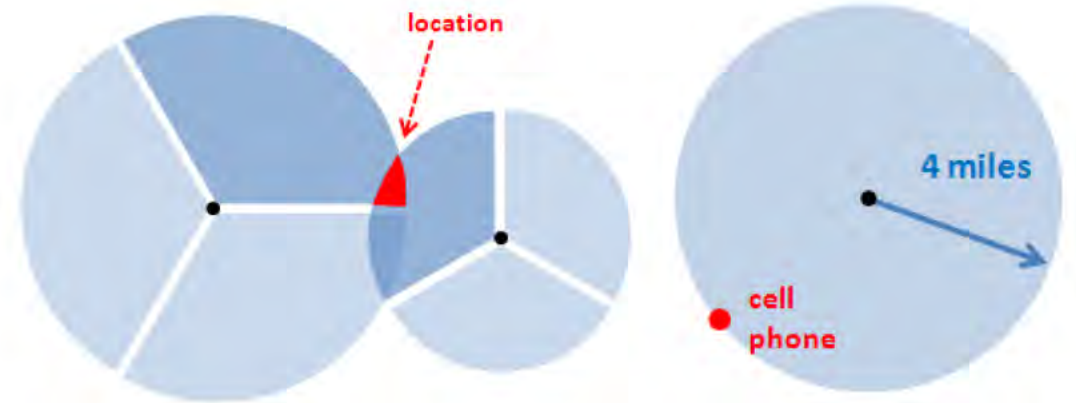
## Problem:

Consumer telecom within national parks is limited to cellular, and usually only Verizon (2% of global devices). Cellular phones within parks only transmit home address to 911. Calls to 911 within the park must be triangulated from cell towers, and have **3/4 –mile accuracy, in two dimensions**. This adds precious minutes to EMS response time.

## Solution:

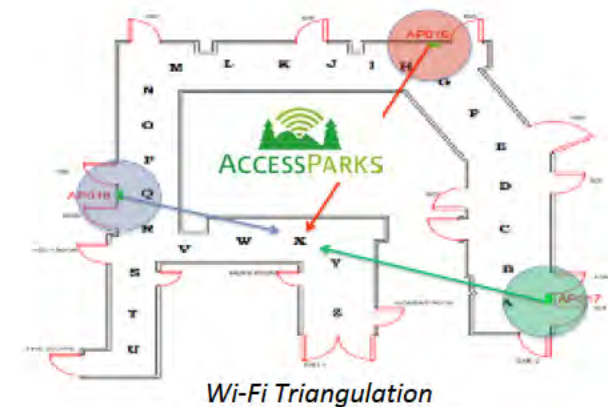
Wi-Fi Positioning System (WiPS) from AccessParks. Next-Generation E911 (NGE911)-compliant, with every Wi-Fi radio as a registered location in national database. Instant geolocation of cellular 911 caller, to within **15 feet and identifying the floor of the caller (z-axis)**. GIS information is automatically sent to the Public Safety Access Point (PSAP) for 100% coverage of visitors.

AccessParks Wi-Fi is Passpoint-enabled for carrier-neutral data and phone offloading to AT&T, Sprint, Verizon, T-Mobile, etc.



*Cell phone detected within a certain distance of two cell towers with directional antennae.*

*Cell phone detected within a certain distance of a single tower.*



AccessParks  
Proposed Network Architecture;  
Yellowstone National Park



## Mammoth Hot Springs – Existing Wireless Coverage (known)

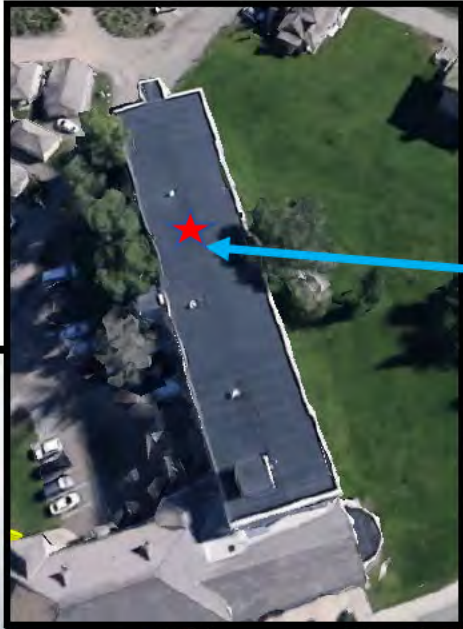




# Mammoth Hot Springs – Proposed Wireless Coverage

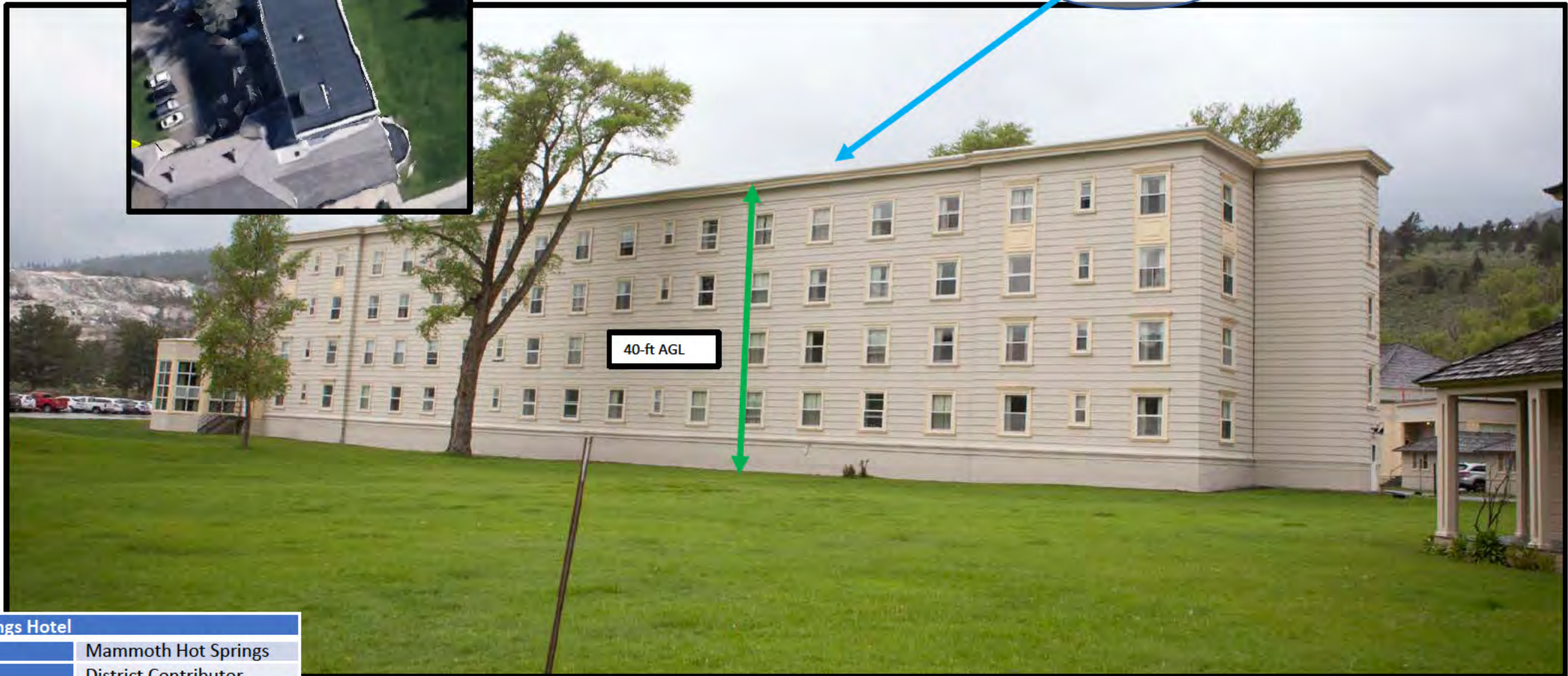






Cylindrical RF-transparent Screenwall

- 36" total height above roof, 24" diameter
- Color matched to background; RGB Color Code: 238, 239, 244

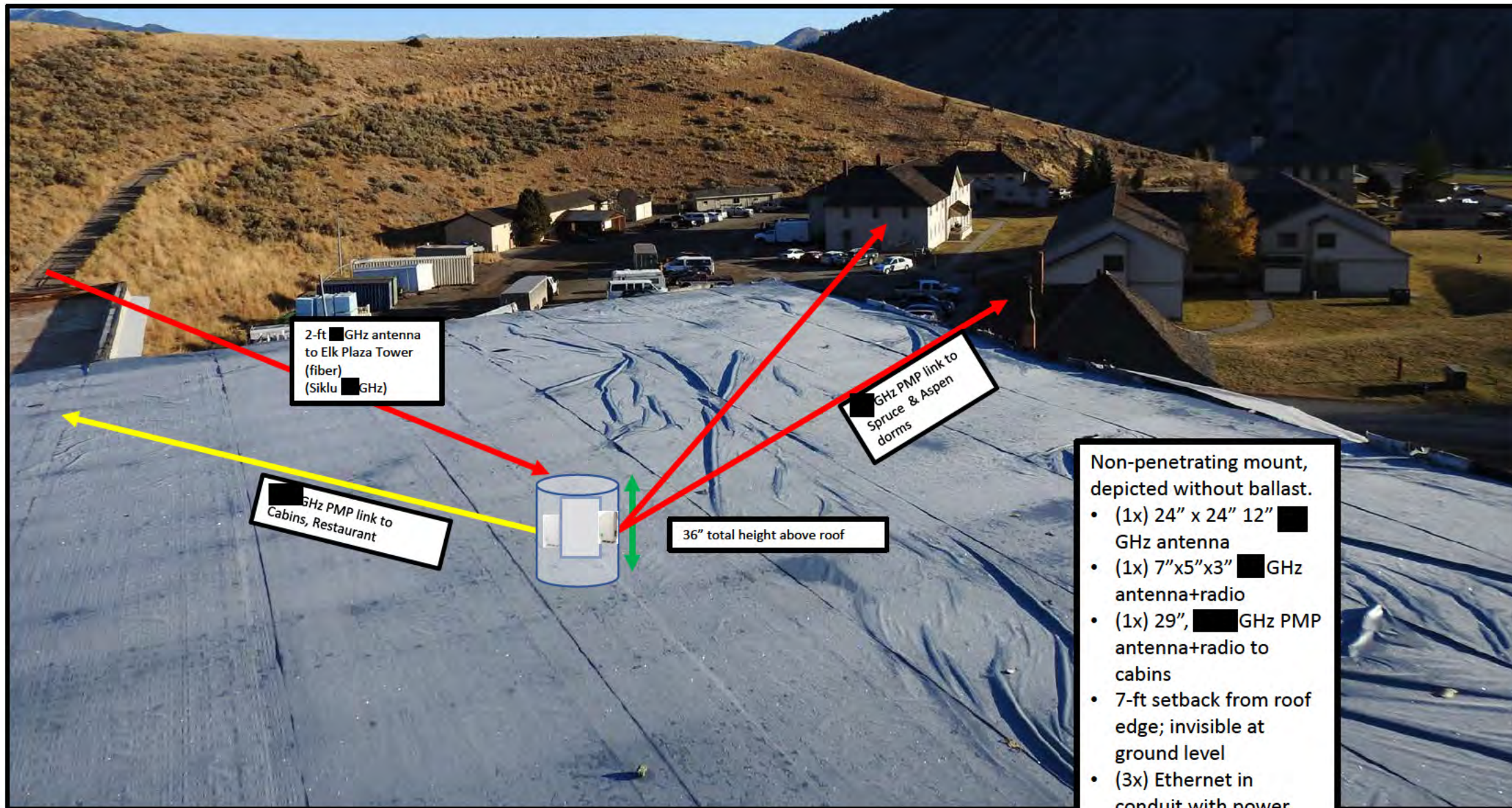


40-ft AGL

Mammoth Hot Springs Hotel	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

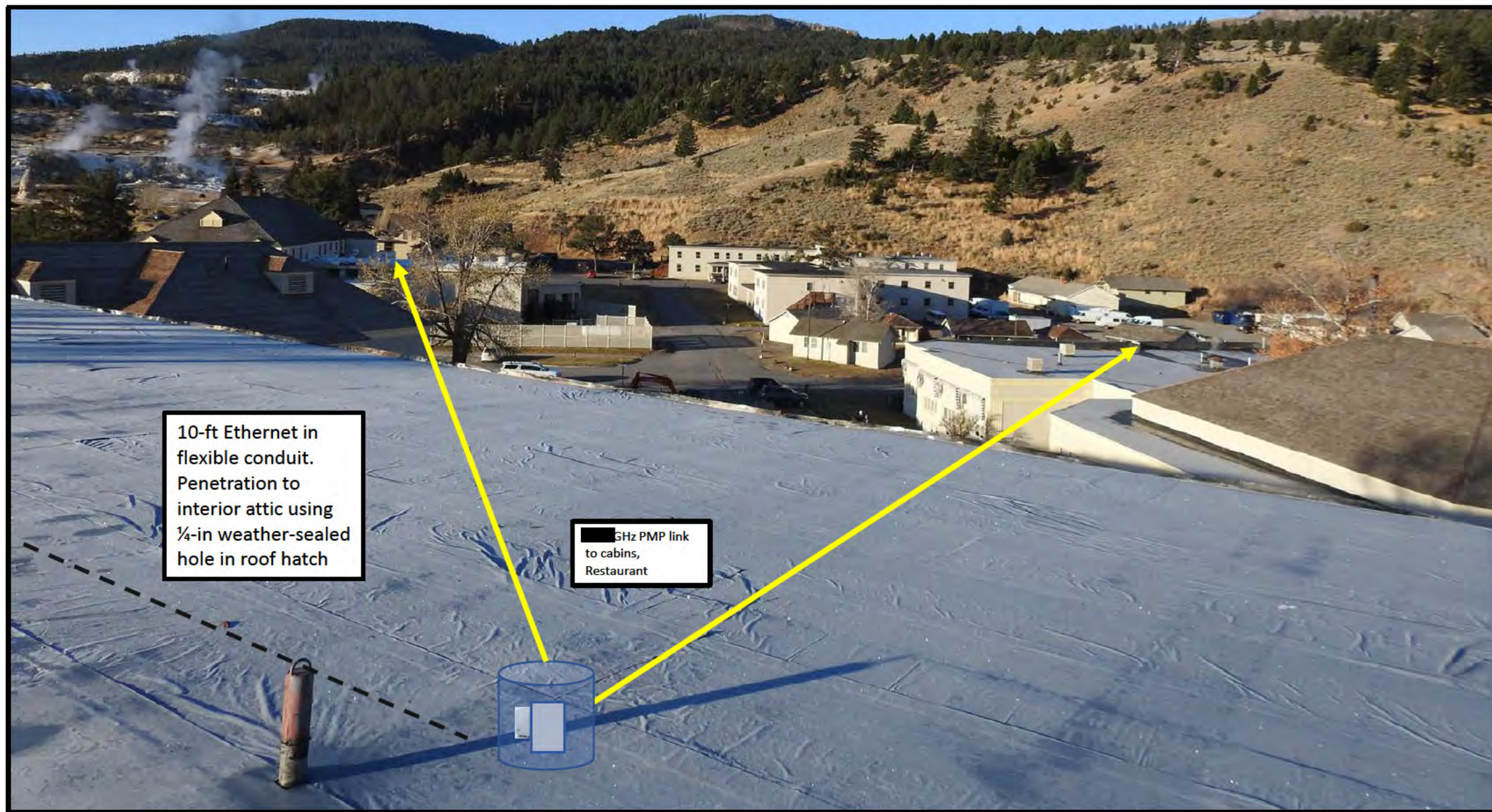
Mammoth Hot Springs Hotel  
Coordinates: Coord: 44.9768N, -110.7014W





Mammoth Hot Springs Hotel





10-ft Ethernet in flexible conduit. Penetration to interior attic using ¼-in weather-sealed hole in roof hatch

5GHz PMP link to cabins, Restaurant

Mammoth Hot Springs Hotel

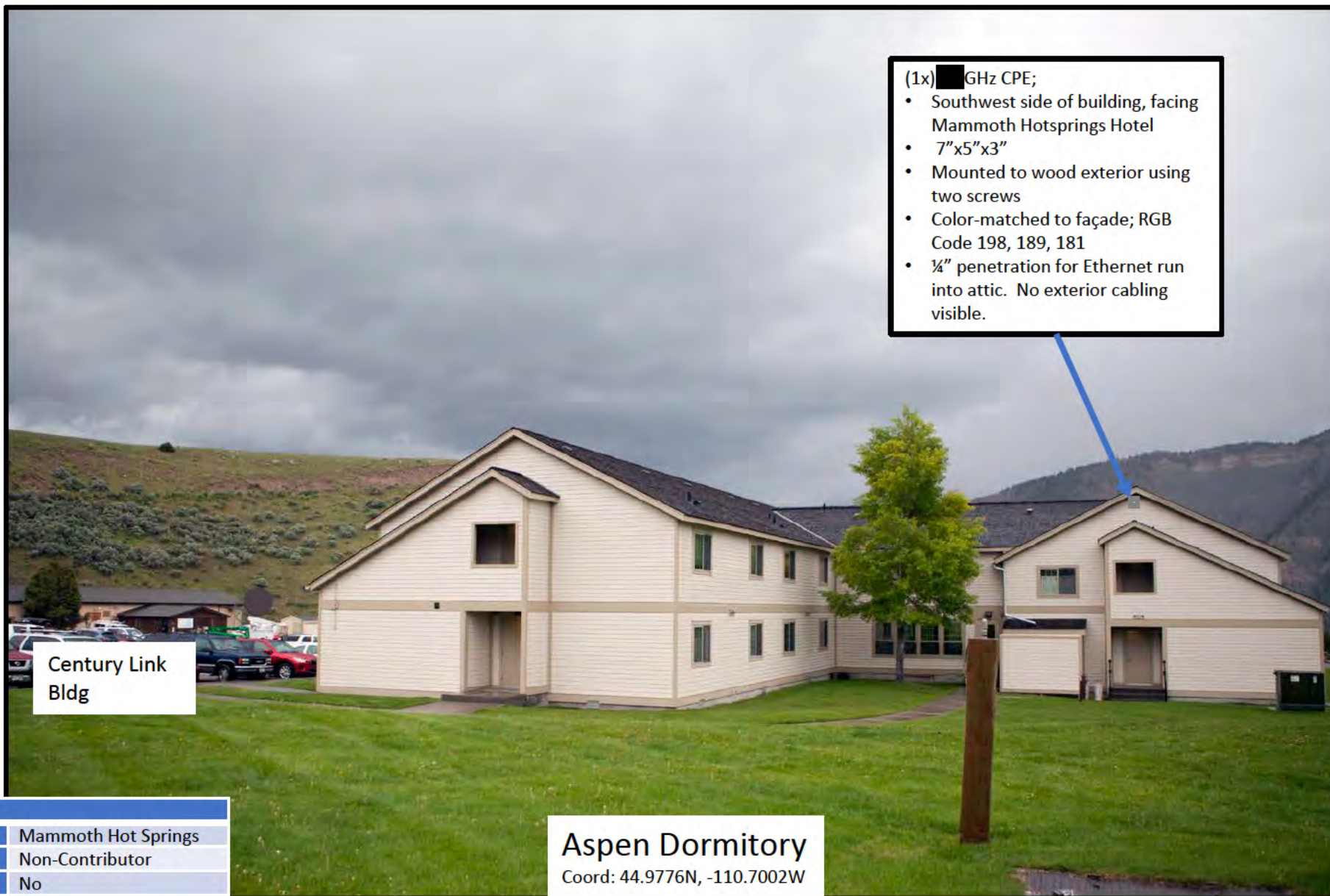




Ethernet in flexible conduit. Penetration to interior attic using 1/4-in weather-sealed hole in roof hatch frame

Mammoth Hot Springs Hotel





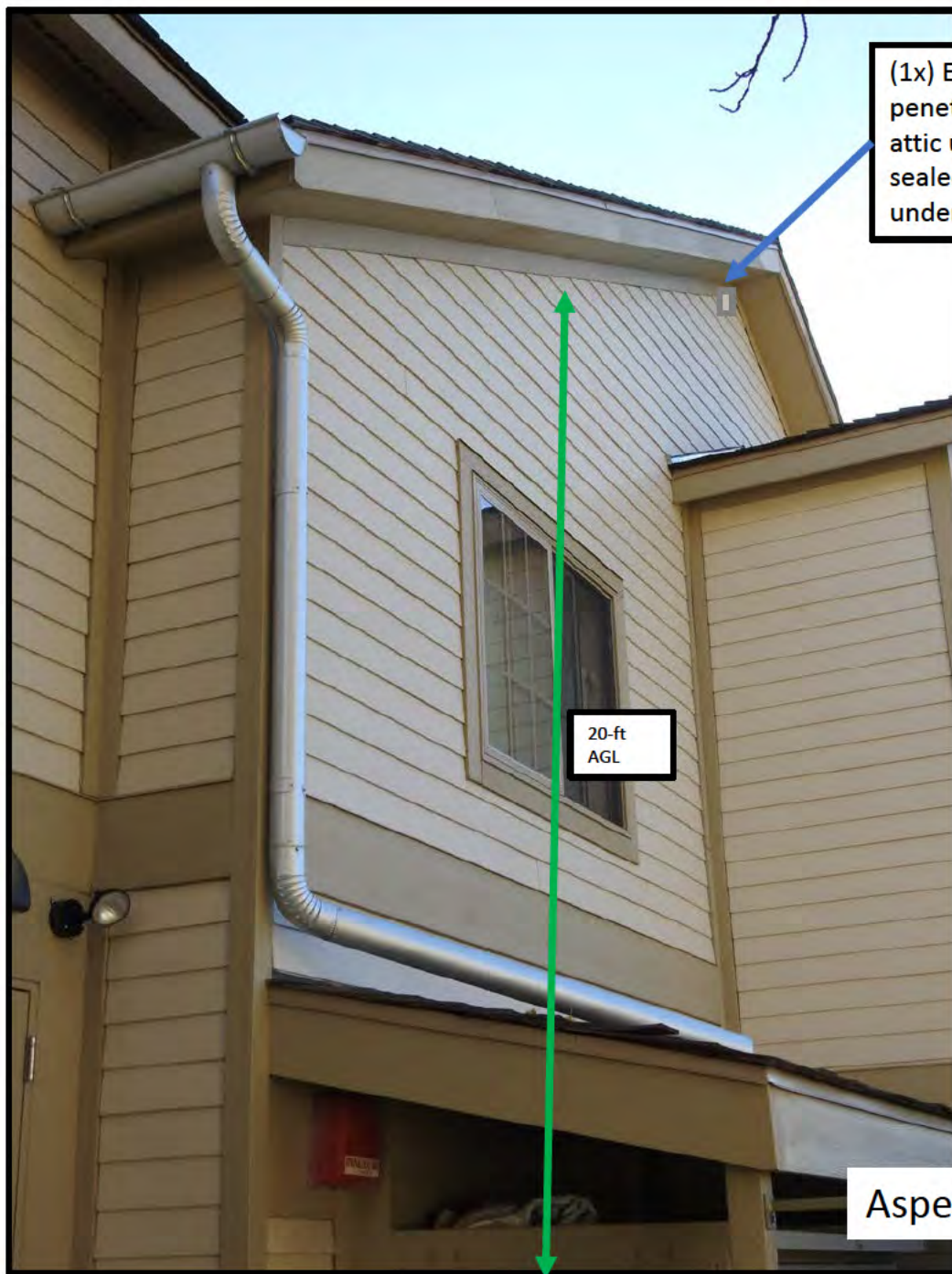
Century Link  
Bldg

- (1x) █ GHz CPE;
- Southwest side of building, facing Mammoth Hotsprings Hotel
  - 7"x5"x3"
  - Mounted to wood exterior using two screws
  - Color-matched to façade; RGB Code 198, 189, 181
  - ¼" penetration for Ethernet run into attic. No exterior cabling visible.

Aspen Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	Non-Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Aspen Dormitory  
Coord: 44.9776N, -110.7002W





Aspen Dormitory

#### Wi-Fi Access Points

- Mounted to metal T-bars
- PoE Ethernet cabling run inside dropped ceiling to switch in closet.







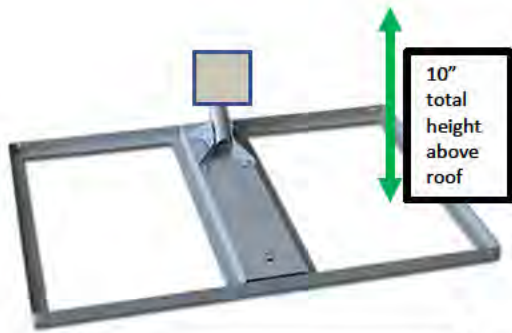
- (1x) [REDACTED] GHz CPE;
- Southwest side of building, facing Mammoth Hotel
  - 7"x5"x3"
  - Mounted to existing metal enclosure using two screws
  - Color-matched to façade; RGB Code 198, 189, 181

## Spruce Dormitory

Coords: 44.9780N, -110.7001W

Spruce Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes





Non-penetrating mount, depicted without ballast.

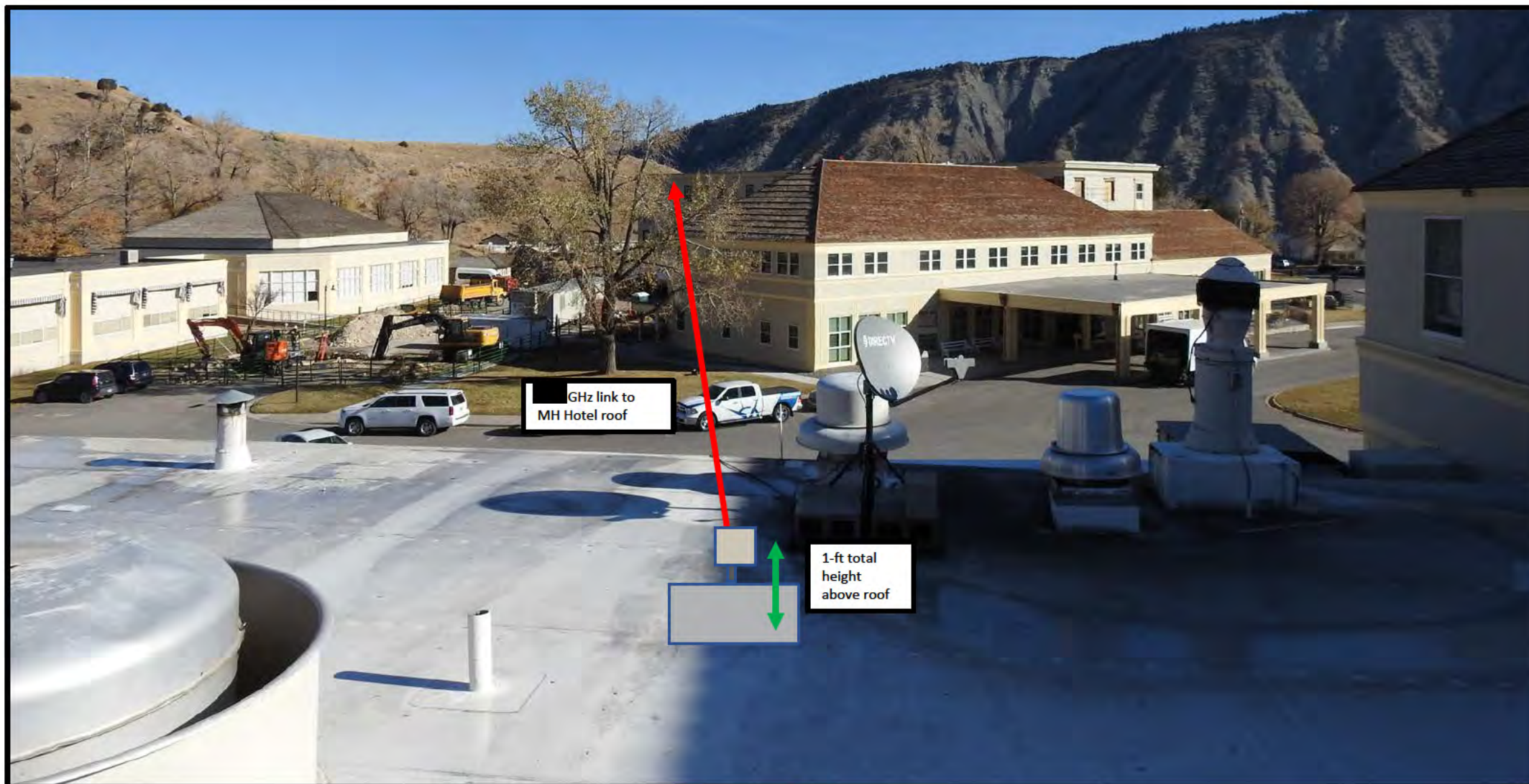
- (1x) 9"x9"x3" XXXX GHz radio
- Setback 10-ft from roof edge; invisible to ground level
- All equipment painted to match background
- Ethernet with power from interior switch



Restaurant Building

Restaurant	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	No





**Restaurant Building**  
Rooftop with existing wireless equipment





**Restaurant Building**



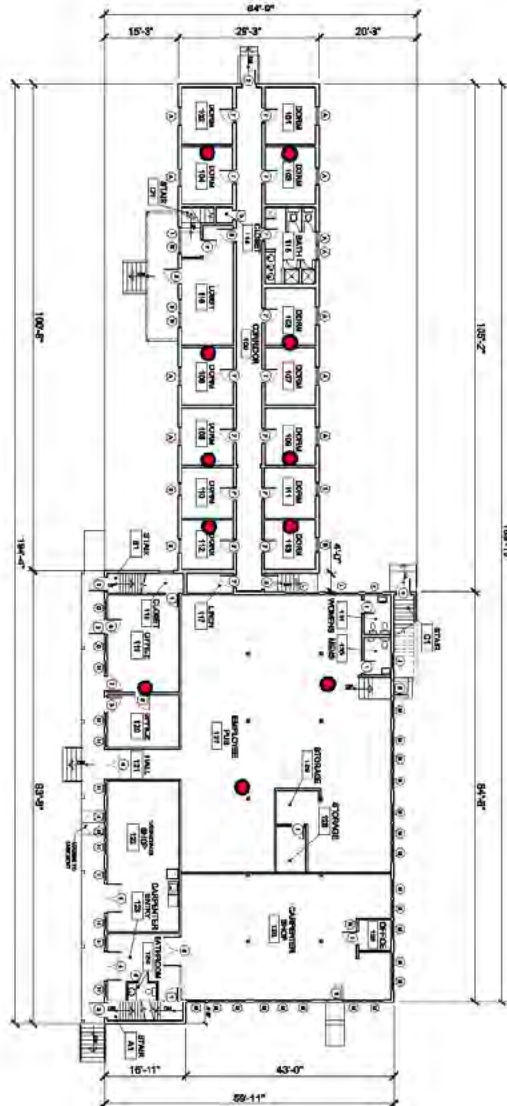


**Lodgepole Dormitory**  
(existing fiber-optic  
backhaul)

Lodgepole Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

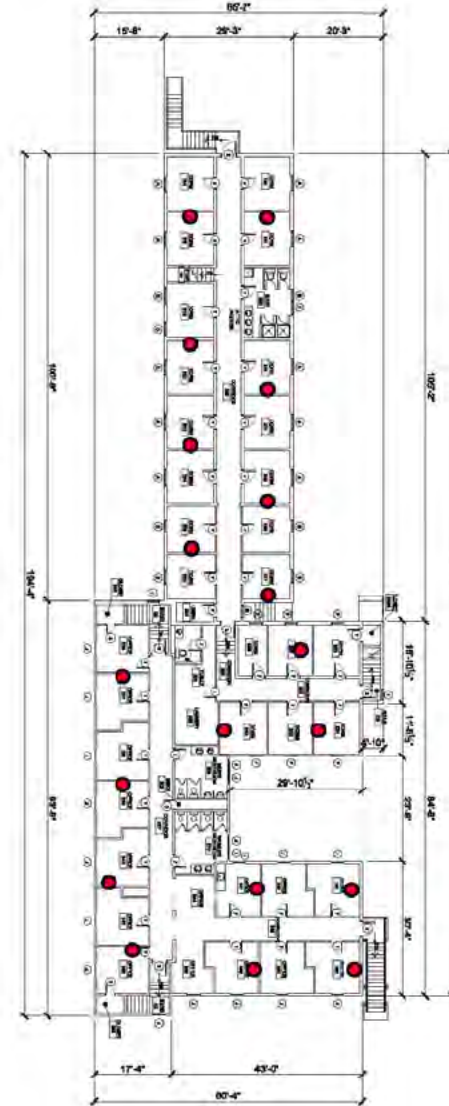
## Lodgepole Dormitory APs – Floor 1

Total Access Points:  
11



## Lodgepole Dormitory APs – Floor 2

Total Access Points:  
19



### Wi-Fi AP Placement

- One AP per two rooms, located in rooms, ceiling mounted
- Ethernet cabling in 2" raceway in hallways

## Lodgepole Dormitory





- Ethernet (x1) in 2" raceway, run in corner on both sides of hallway.
- All equipment painted to match background

**AP Placement:**

- ¼" wall penetration to ceiling AP location Inside rooms
- Ceiling mounted in room, next to wall; no visible raceway
- 2 rooms per AP

**Lodgepole Dormitory**

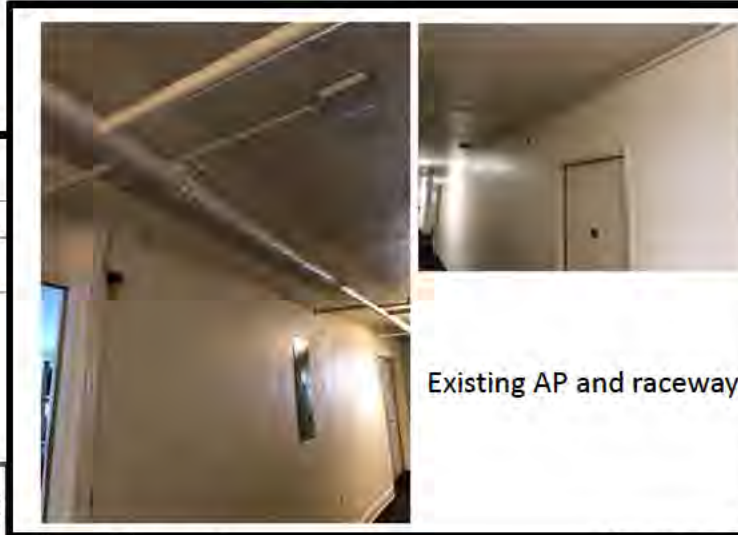
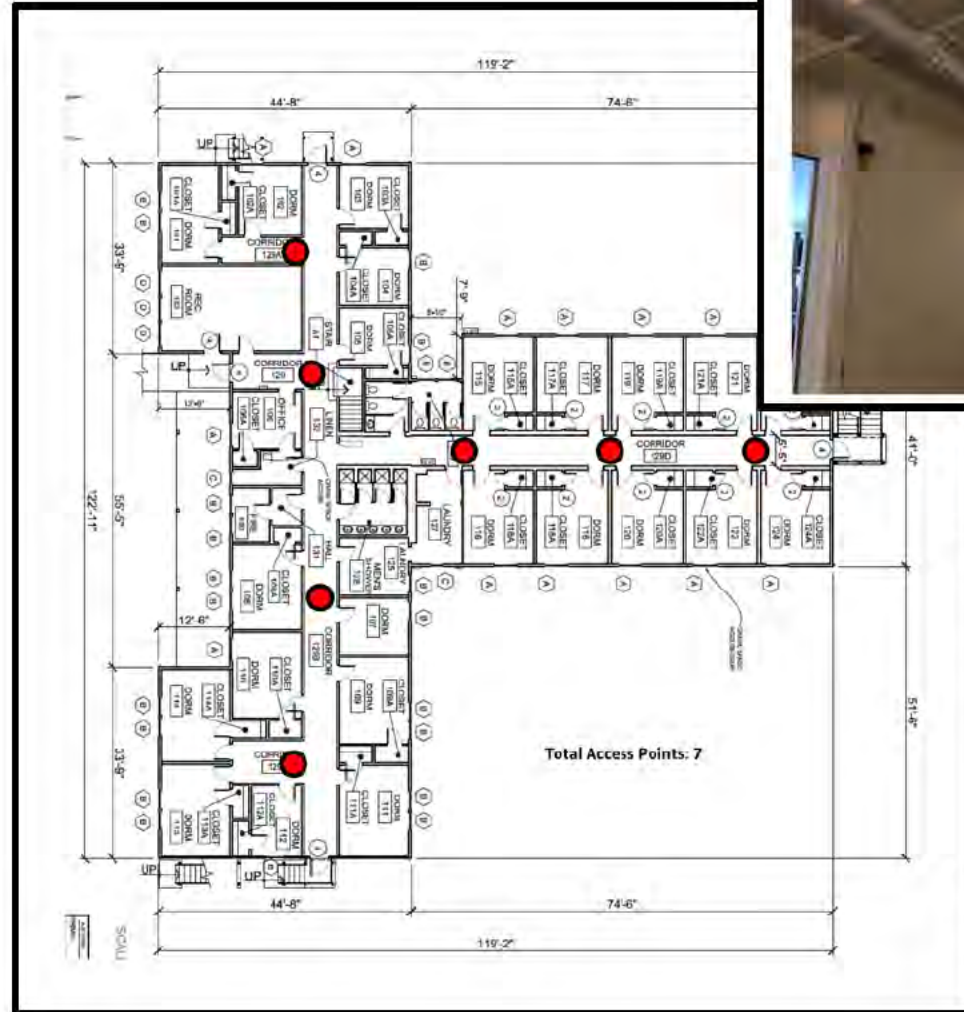




**Juniper Dormitory**  
(existing fiber-optic backhaul)

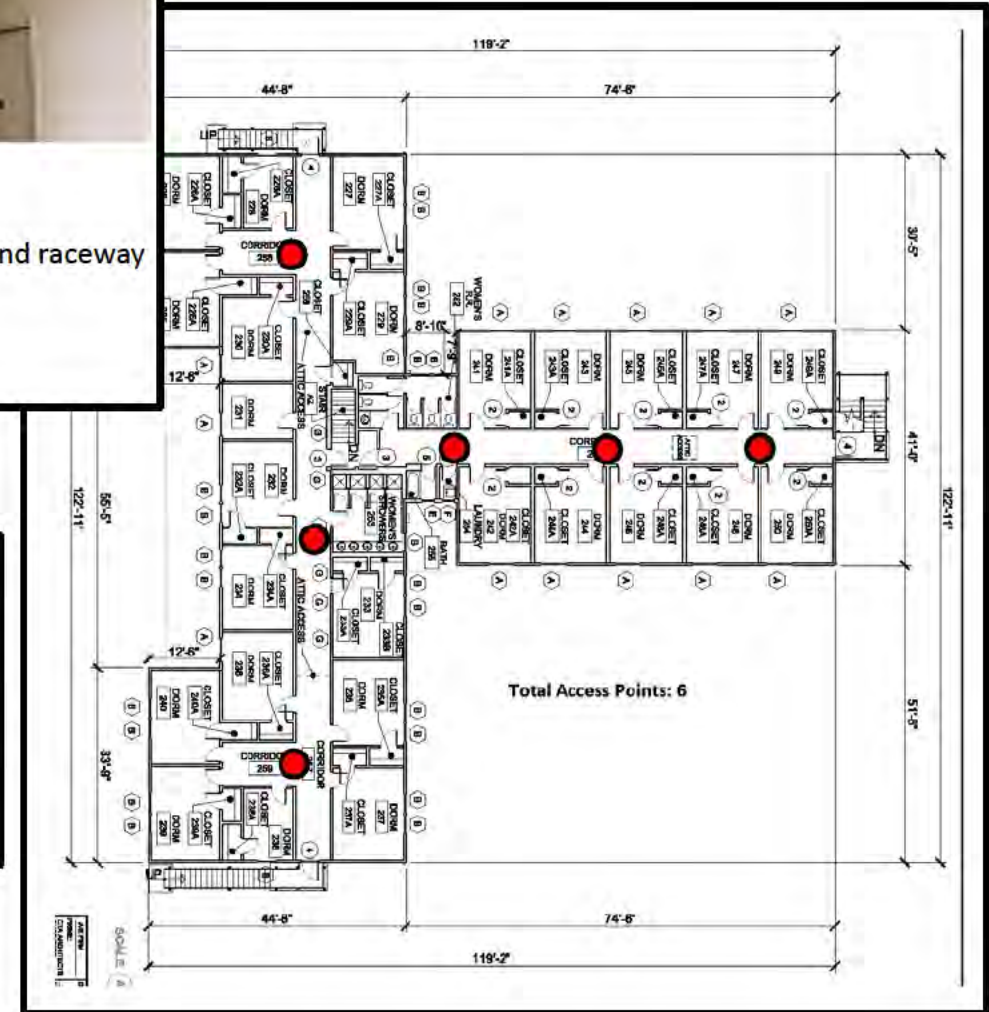
Juniper Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No





#### AP Placement:

- In hallways
- Ceiling mounted
- 4 rooms per AP
- Existing 1" Ethernet in raceway to be extended, color matched



## Juniper Dormitory



## Mammoth Hot Springs Guest Cabins (x97)

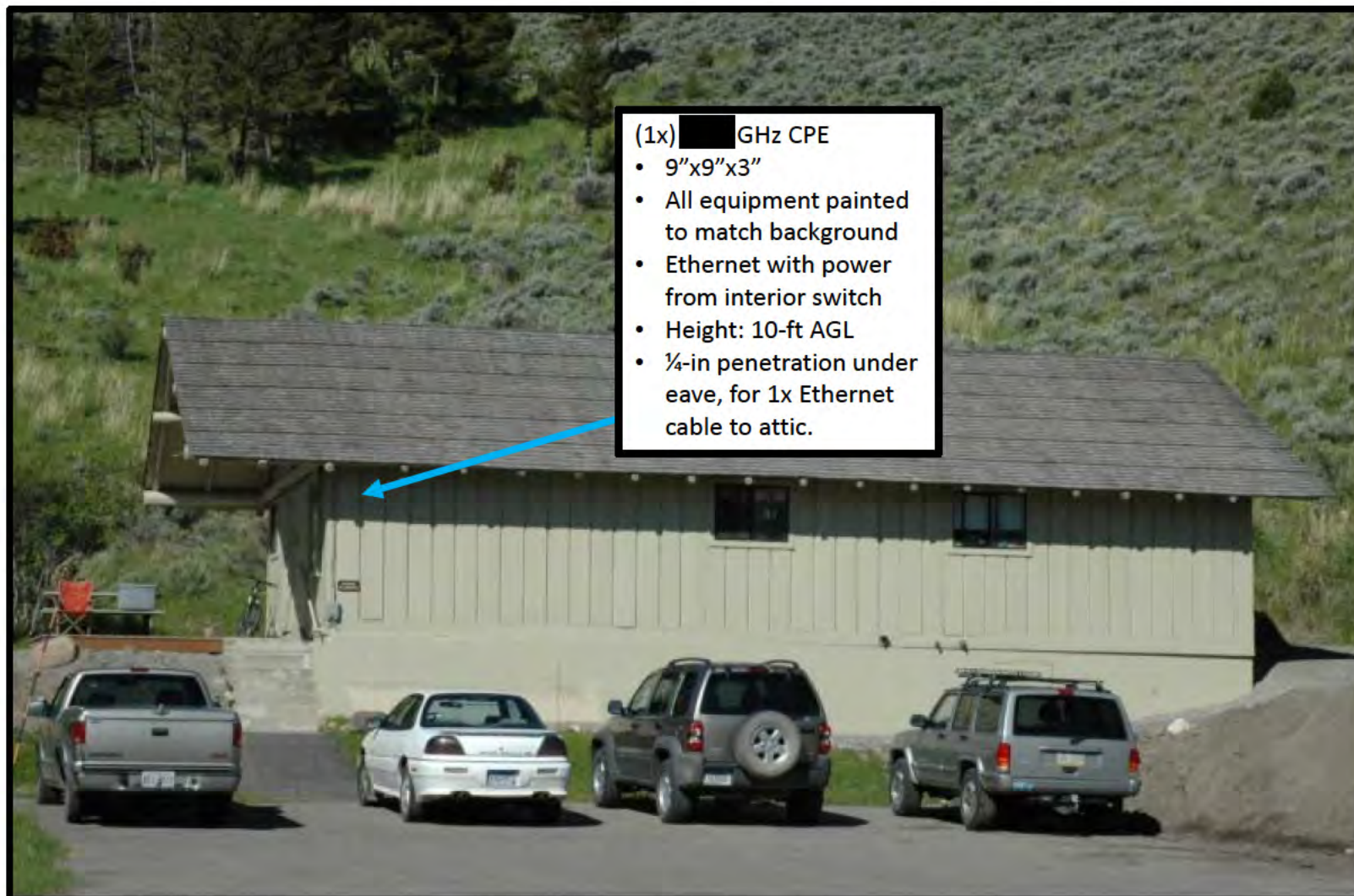
Coordinates: 44.977N, -110.703W

Mammoth Hot Springs Guest Cabins	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributors
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No





Mammoth Hot Springs Hotel; Cabins (typical)  
(x97)



- (1x) [REDACTED] GHz CPE
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch
  - Height: 10-ft AGL
  - ¼-in penetration under eave, for 1x Ethernet cable to attic.

YPSS Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	Non-Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Hamilton Dormitory/YPSS

Coordinates: 44.977N, -110.704W



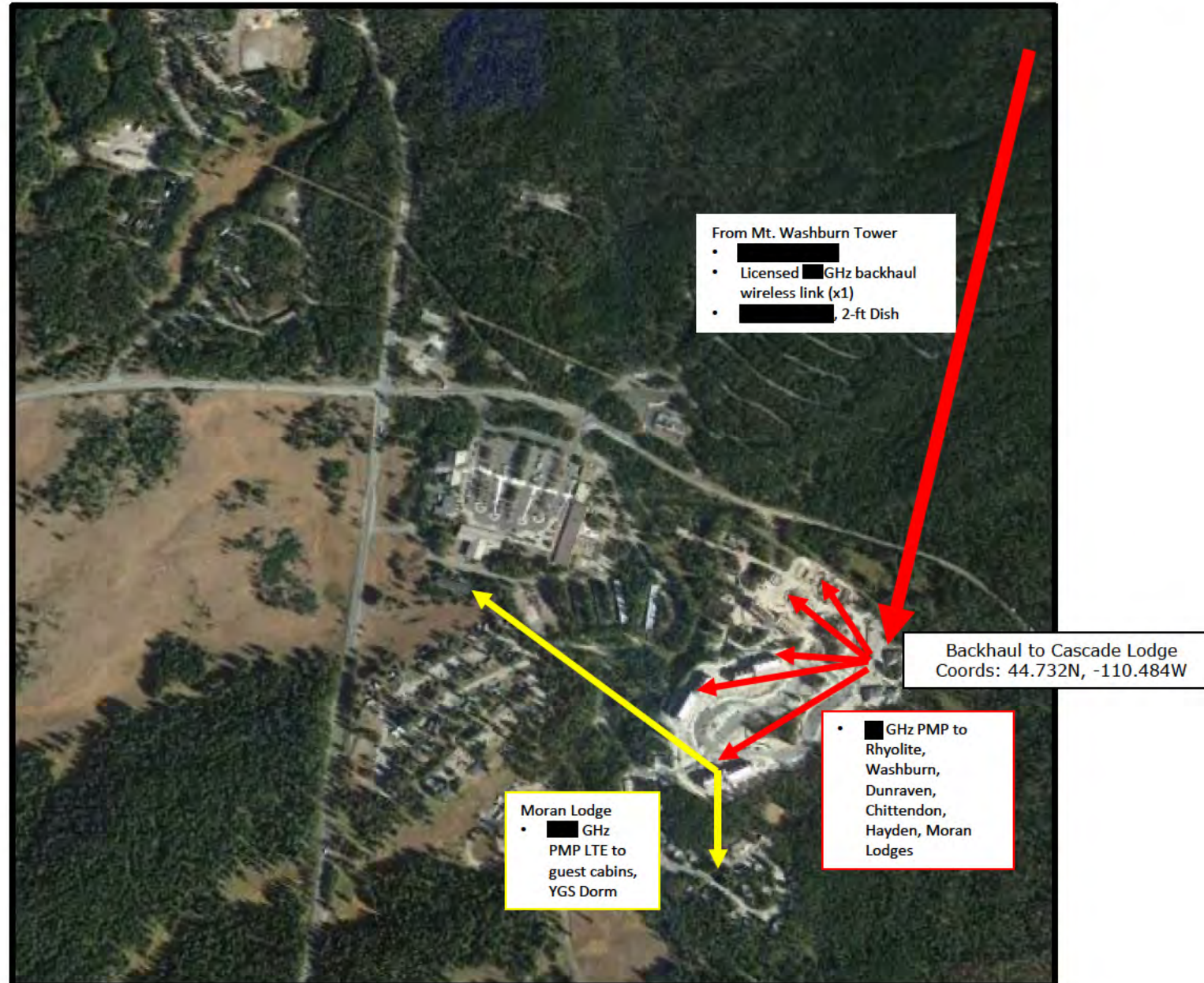
# Canyon Village

# Canyon Village Area Existing Wireless Coverage (known)





# Canyon Village Area; Proposed Wireless Coverage





# Canyon Village Area – Proposed Building Coverage



- Canyon Village Lodge
- YGS Dormitory
- Bighorn Dormitory
- Wapiti Dormitory
- Grizzly Dormitory
- Rhyolite Lodge
- Washburn Lodge
- Bison Dormitory
- Cascade Lodge
- Dunraven Lodge
- Chittendon Lodge
- Hayden Lodge
- Moran Lodge
- Canyon Village Lodge Cabins





## Canyon Lodge

Backhaul using existing fiber

Coords: 44.734, -110.490

Canyon Lodge	
Area	Canyon Village
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

# Canyon Lodge

Existing fiber backhaul to building



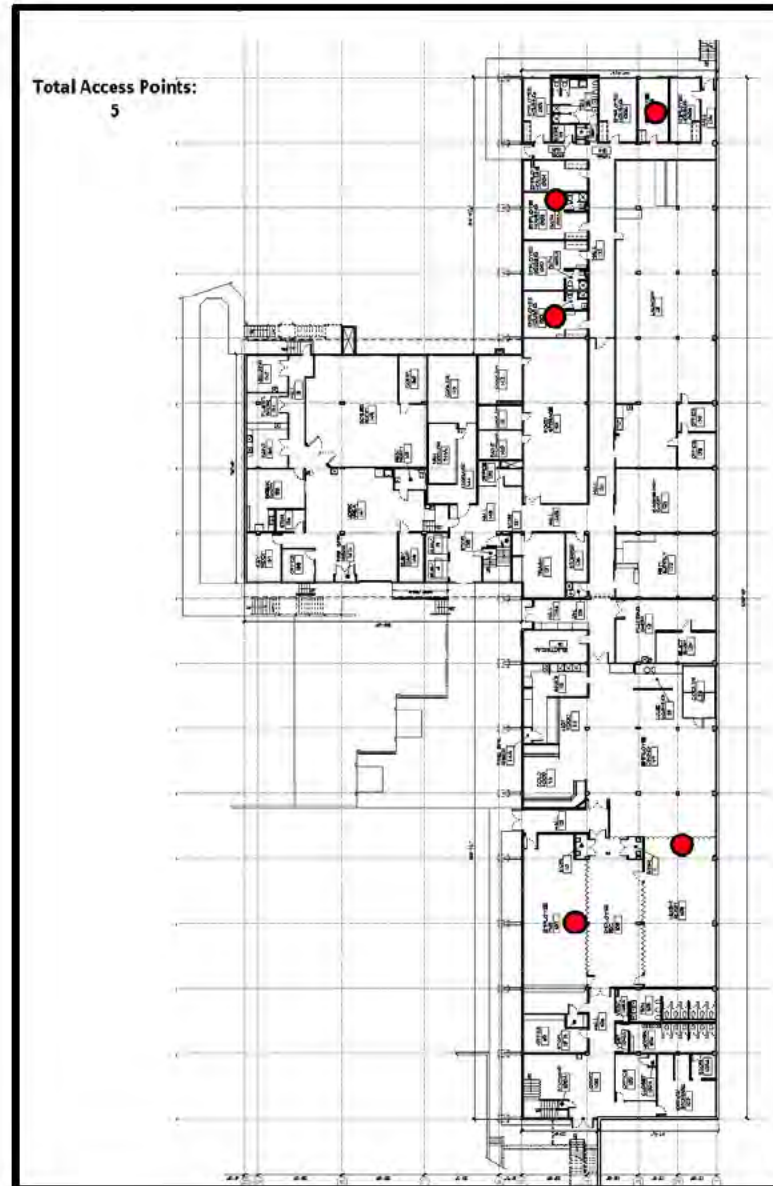
## Wi-Fi radios in hallways

- 6"x6"x2" Wi-Fi AP
- All radios painted to match background
- Ethernet with power from interior switch in crawlspace above
- Cabling secured in crawlspace; no exposed cabling/raceway
- ¼-in penetration in ceiling for Ethernet cable to attic.

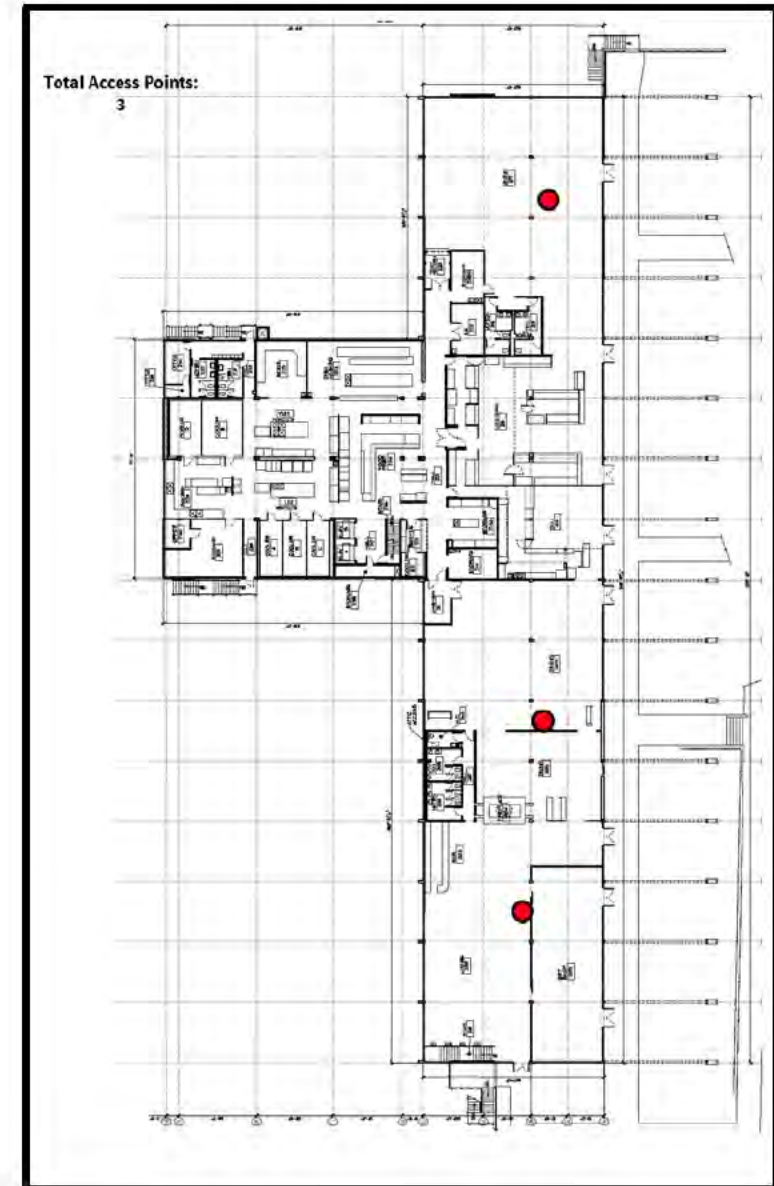




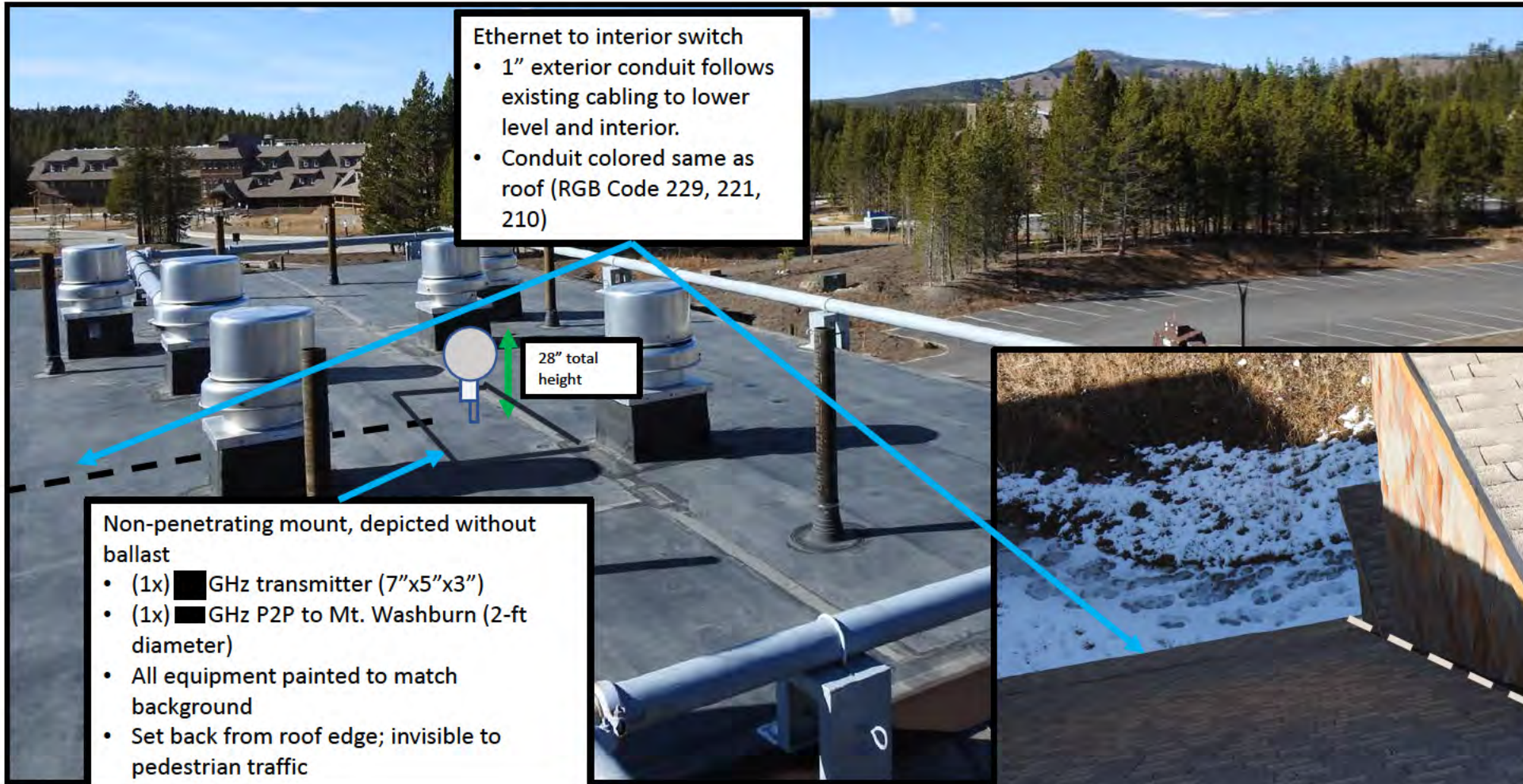
## Canyon Lodge APs – Floor 1



## Canyon Lodge APs – Floor 2



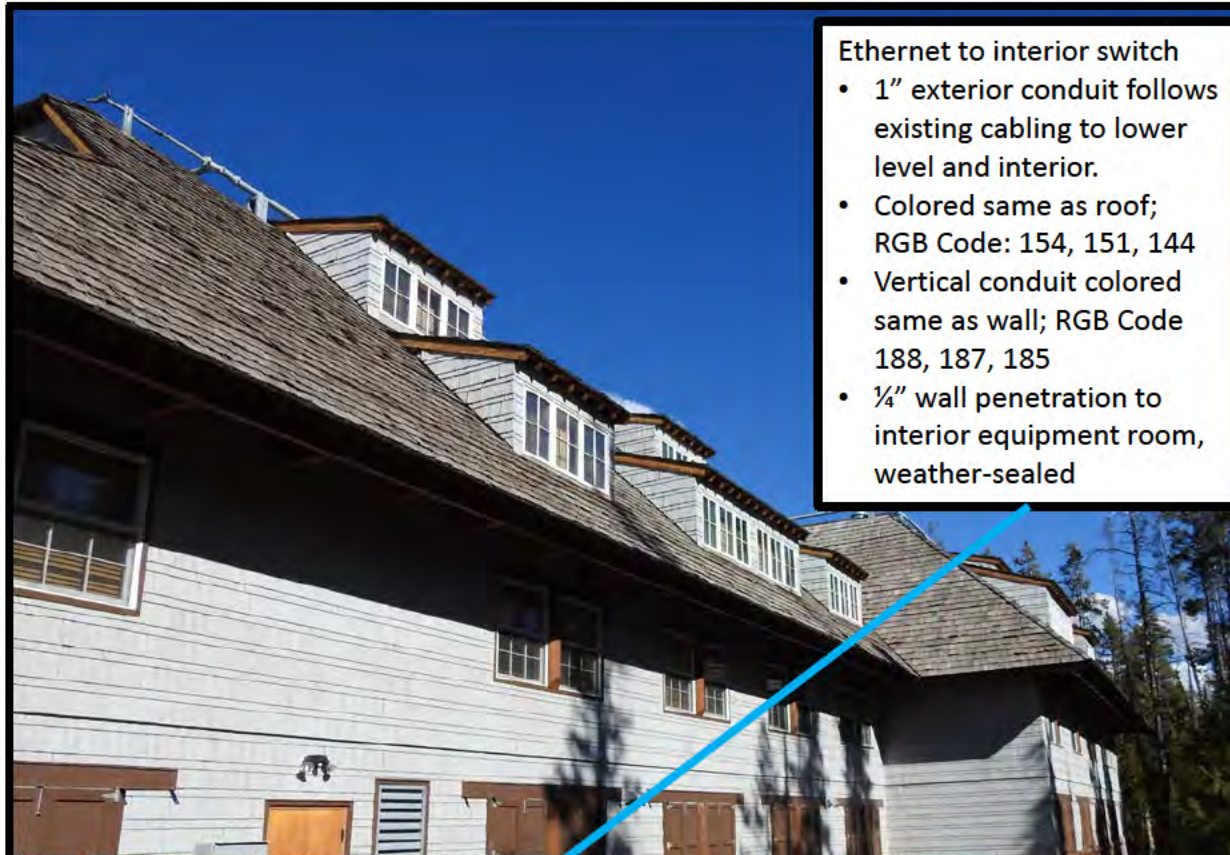




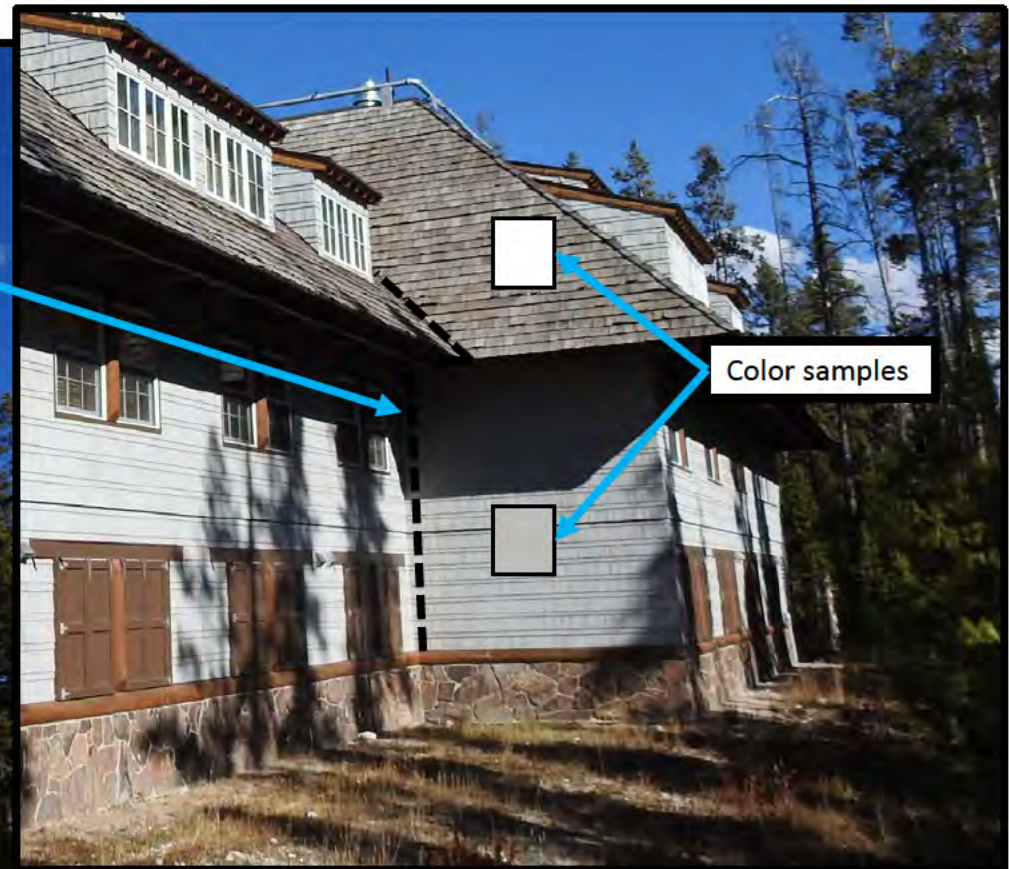
Cascade Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	No

Cascade Lodge  
Wireless backhaul to Canyon Village from Mt.  
Washburn  
Coords: 44.742, -110.484





- Ethernet to interior switch
- 1" exterior conduit follows existing cabling to lower level and interior.
  - Colored same as roof; RGB Code: 154, 151, 144
  - Vertical conduit colored same as wall; RGB Code 188, 187, 185
  - ¼" wall penetration to interior equipment room, weather-sealed



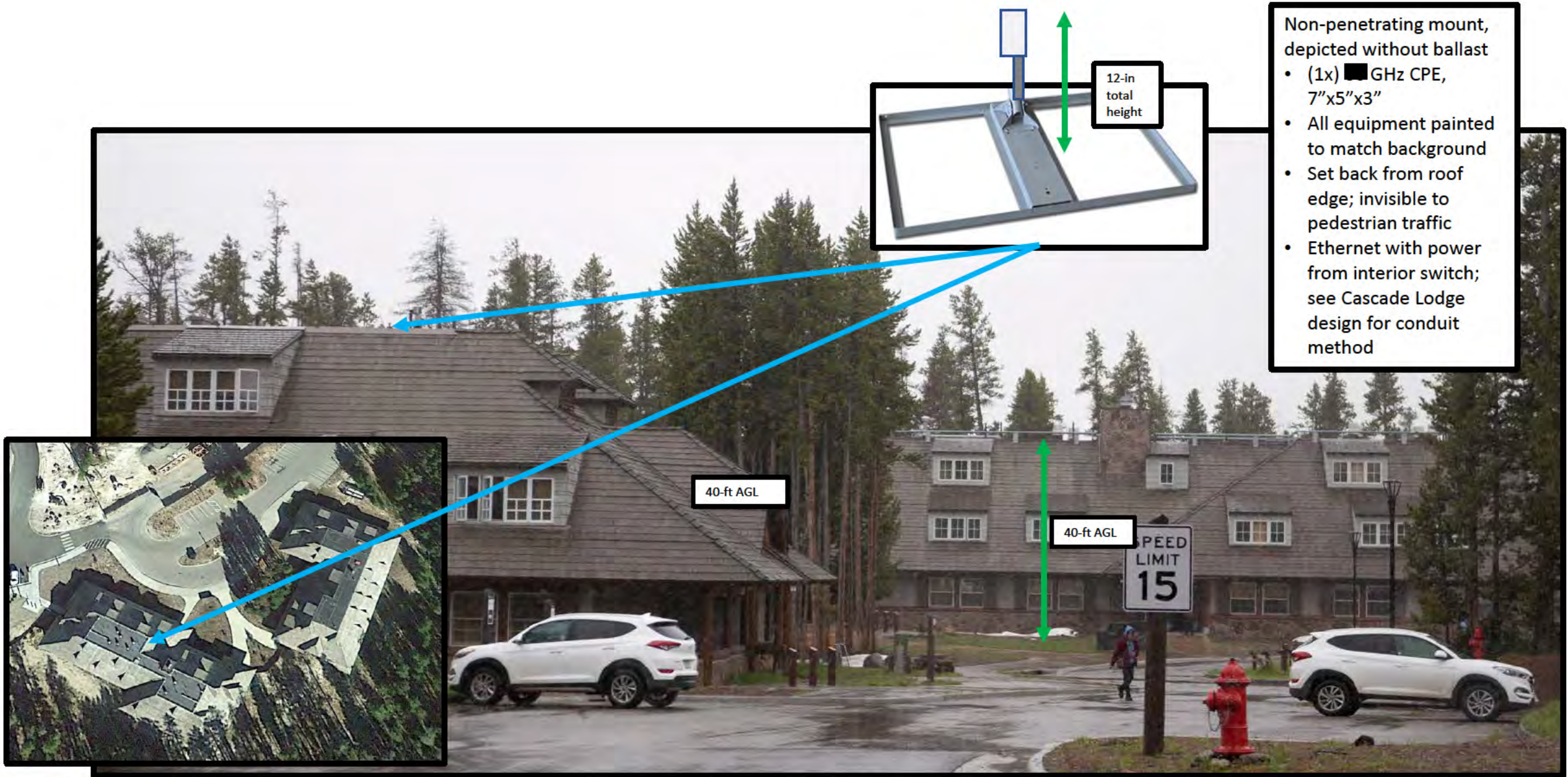
Color samples



## Cascade Lodge

(typical of rear-facing sides of Dunraven, Moran, Hayden, Chittendon, Washburn, Rhyolite Lodges)

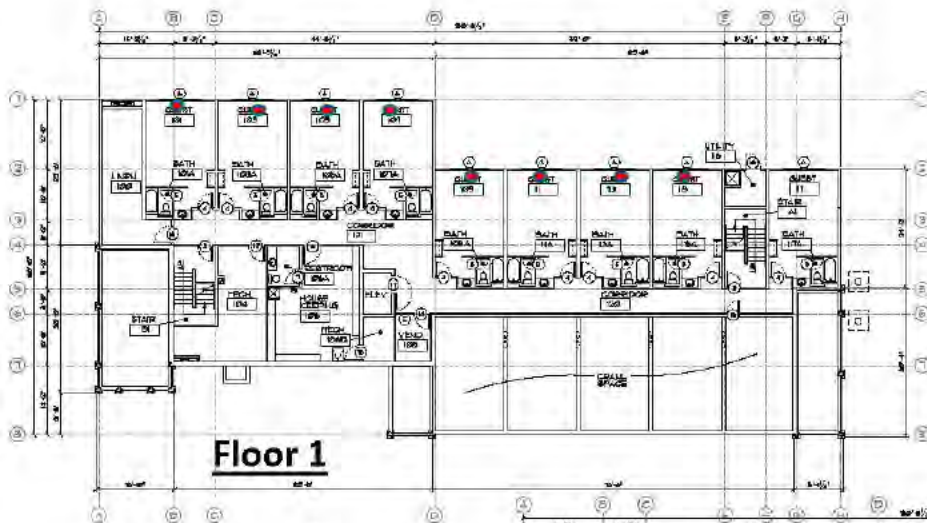




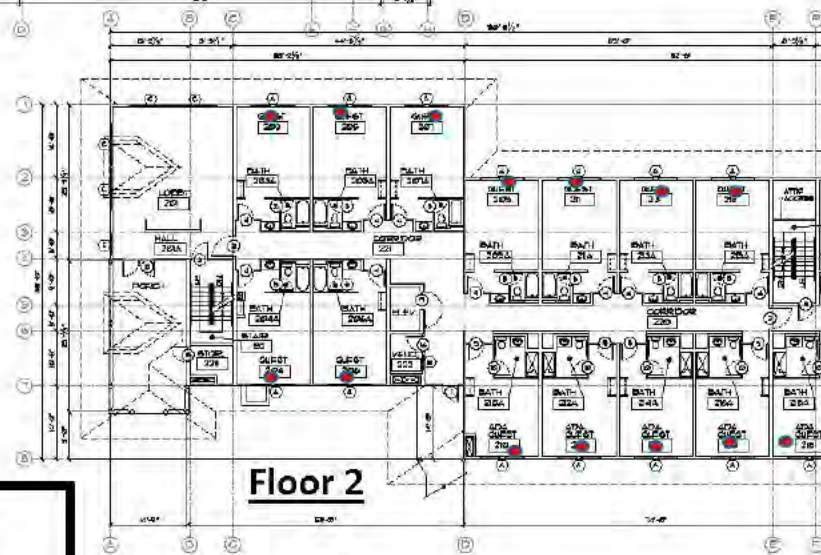
Dunraven Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

**Dunraven Lodge**  
 Coords: 44.742N, -110.484W

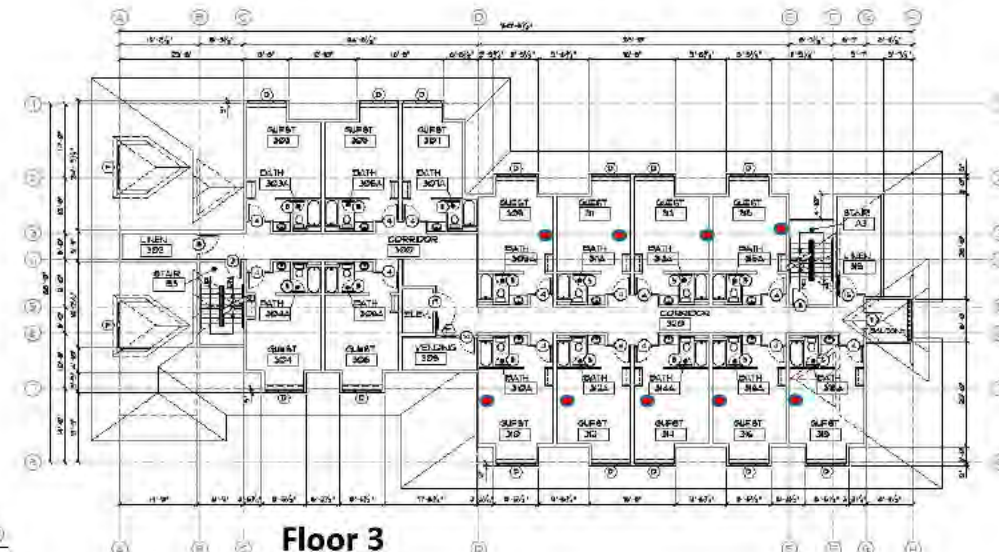




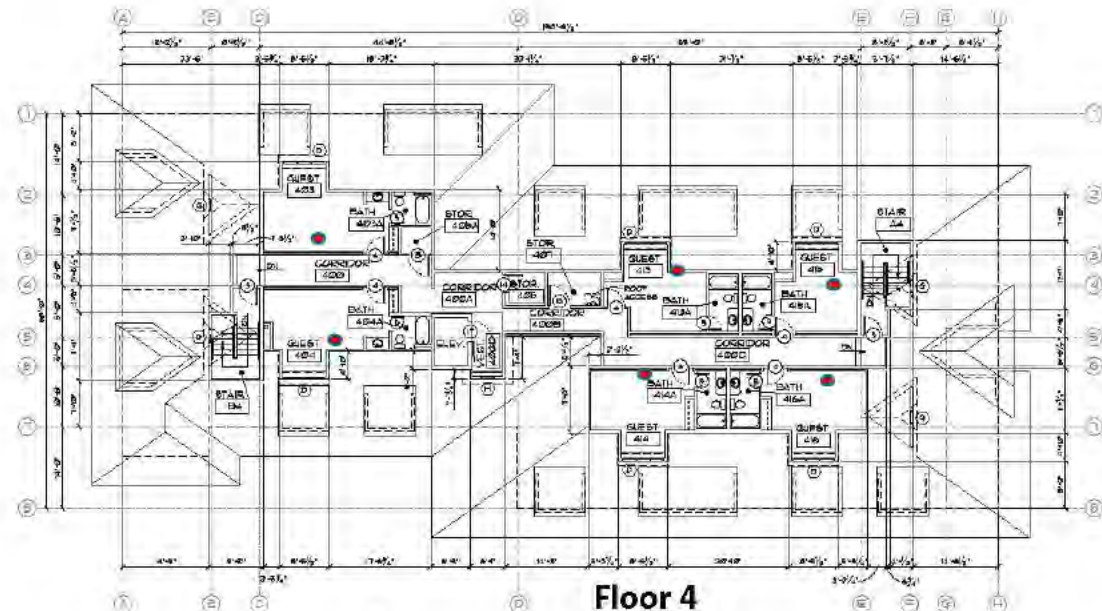
**Floor 1**



**Floor 2**



**Floor 3**

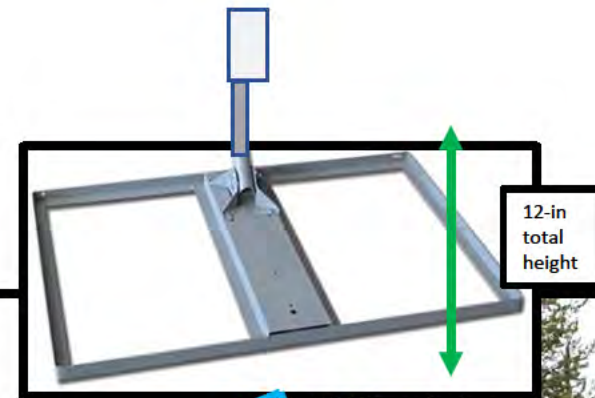


**Floor 4**

- Wi-Fi AP Placement**
- One AP per room, wallplate-mounted
  - Existing data cabling to wall outlets
  - 45 total APs

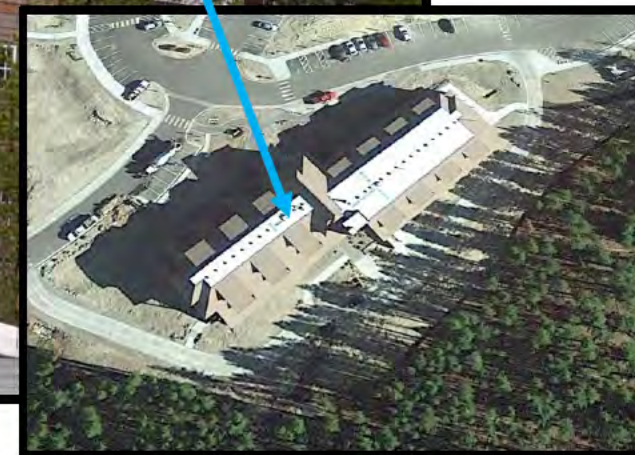
Dunraven Lodge





Non-penetrating mount, depicted without ballast

- (1x) ████ GHz CPE
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch; see Cascade Lodge design for conduit method

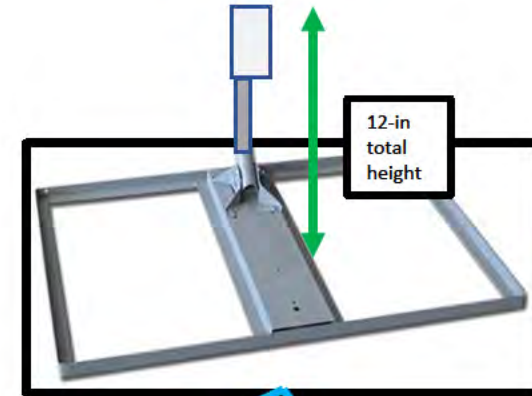


## Moran Lodge

Coords: 44.730N, -110.487W

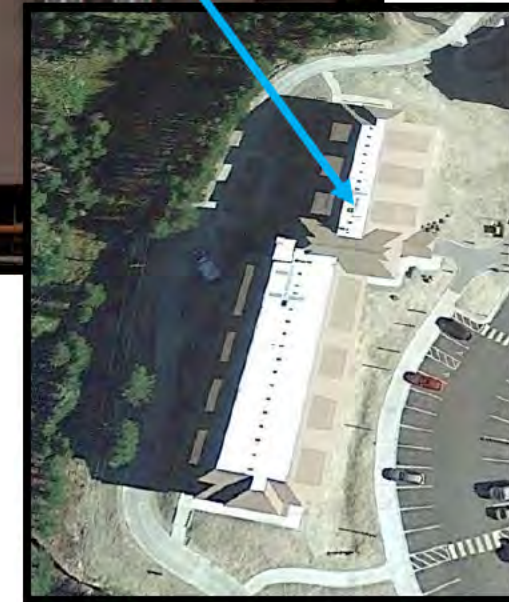
Moran Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes





Non-penetrating mount, depicted without ballast

- (1x) █ GHz CPE, 7"x5"x3"
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch; see Cascade Lodge design for conduit method

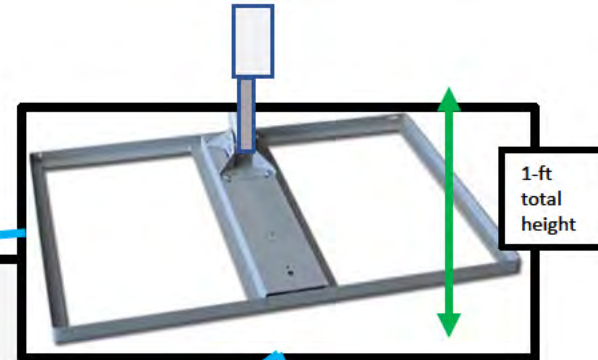


## Hayden Lodge

Coords: 44.732N, -110.488W

Hayden Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes





- Non-penetrating mount, depicted without ballast
- (1x) █ GHz CPE
  - All equipment painted to match background
  - Set back from roof edge; invisible to pedestrian traffic
  - Ethernet with power from interior switch
  - Ethernet with power from interior switch; see Cascade Lodge design for conduit method



40-ft AGL

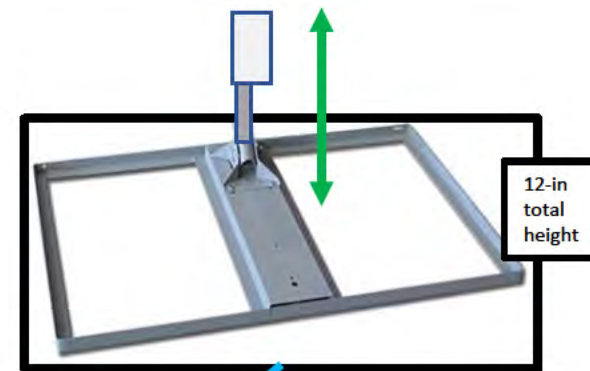


Chittendon Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

## Chittendon Lodge

Coords: 44.732N, -110.487W





- Non-penetrating mount, depicted without ballast
- (1x) 60 GHz CPE, 7"x5"x3"
  - All equipment painted to match background
  - Set back from roof edge; invisible to pedestrian traffic
  - Ethernet with power from interior switch; see Cascade Lodge design for conduit method



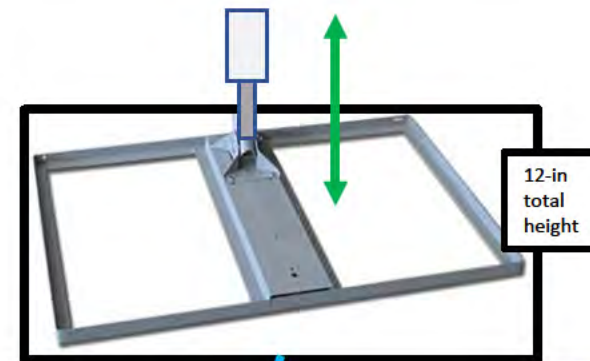
40-ft AGL

## Washburn Lodge

Coords: 44.732N, -110.486W

Washburn Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes





12-in  
total  
height

- Non-penetrating mount, depicted without ballast
- (1x)  GHz CPE
  - Set back from roof edge; invisible to pedestrian traffic
  - Ethernet with power from interior switch; see Cascade Lodge design for conduit method



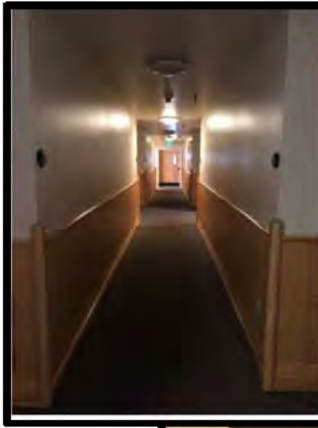
40-ft AGL

Rhyolite Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

## Rhyolite Lodge

Coords: 44.733N, -110.485W





**Wi-Fi Access Points:**

- Existing CAT5e to every room. Install wall-plate AP in each room
- Hidden behind nightstand

**Dunraven, Moran, Hayden, Chittendon, Washburn,  
Rhyolite Lodges**



Bighorn Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

## Bighorn Dormitory

Existing fiber backhaul

Coords: 44.733N, -110.488W





## Wapiti Dormitory

Existing fiber backhaul  
Coords: 44.733N, -110.489W

Wapiti Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No



Grizzly Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

## Grizzly Dormitory

Existing fiber backhaul  
Coords: 44.733N, -110.489W



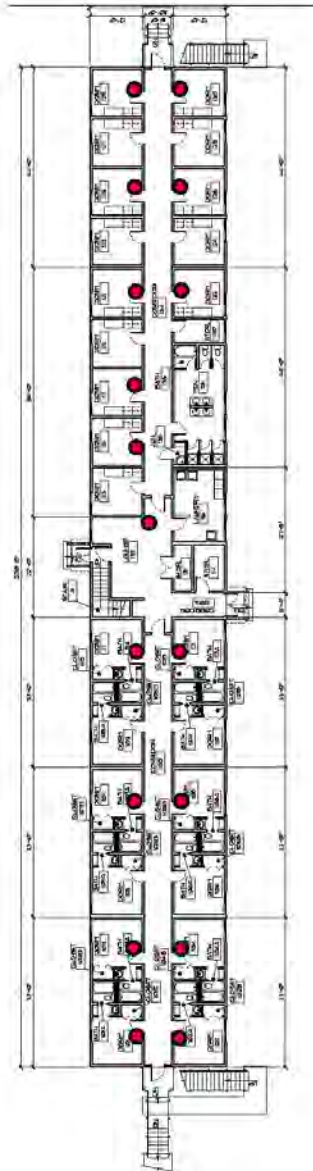


## Bison Dormitory

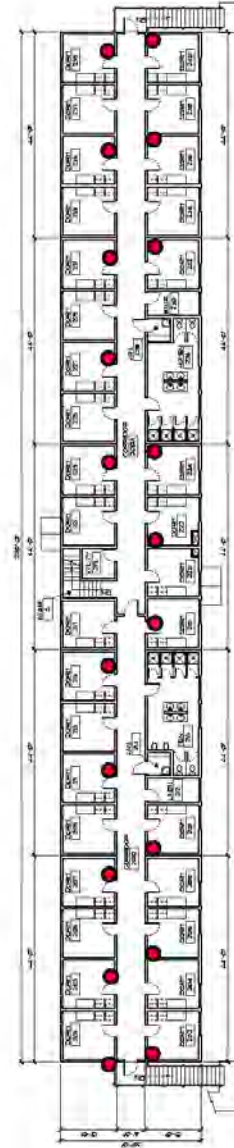
Existing fiber backhaul  
Coords: 44.733, -110.490

Bison Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

Total Access Points: 17



Total Access Points: 19



#### Wi-Fi AP Placement

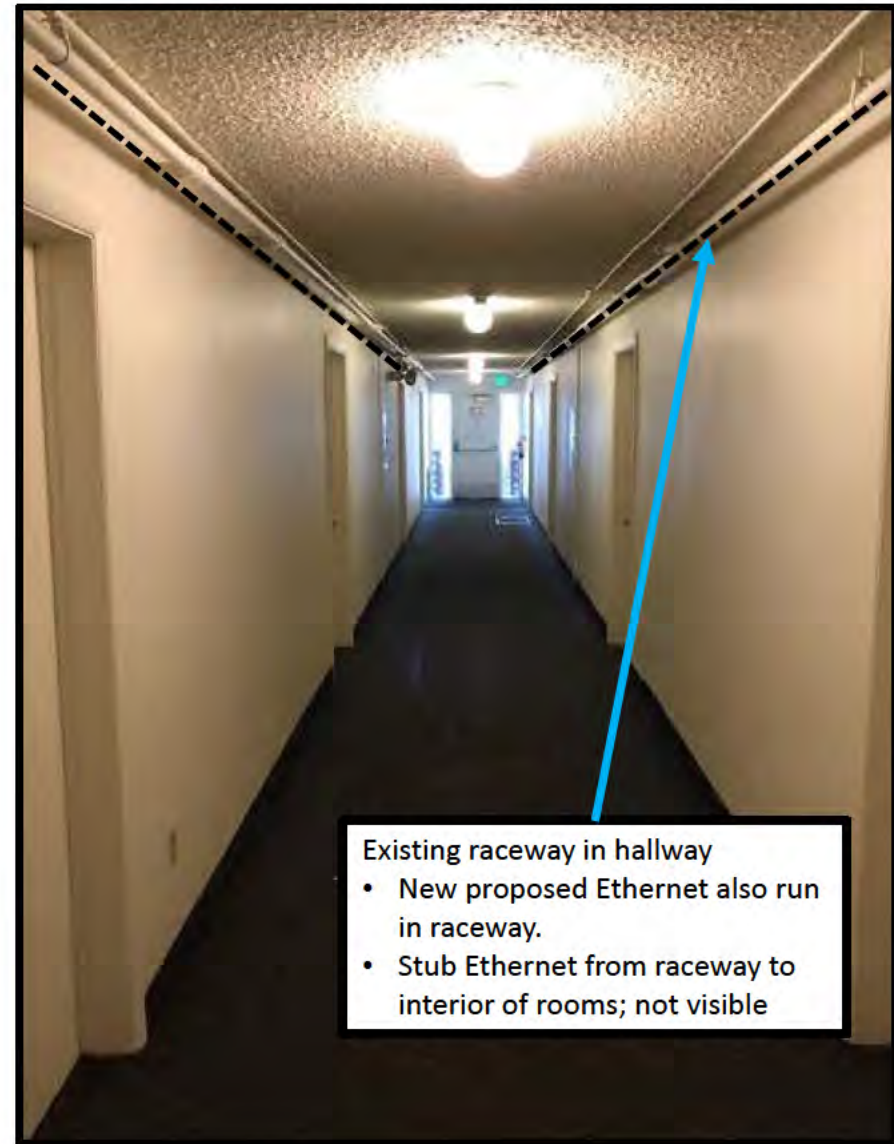
- Four dorms have similar floorplans
- One AP per two (2) rooms, ceiling-mounted inside rooms
- 36 total APs per dorm; 144 total

Bighorn, Bison, Grizzly, Wapiti Dormitories





- Ceiling AP; one per two rooms
- Four dorms have similar floorplans
  - One AP per two (2) rooms, ceiling-mounted inside rooms
  - 6"x6"x2"
  - Attached using bracket with two screws.
  - Ethernet cable (x1) from hallway raceway; no exposed cable/raceway inside room



- Existing raceway in hallway
- New proposed Ethernet also run in raceway.
  - Stub Ethernet from raceway to interior of rooms; not visible

Bighorn, Bison, Grizzly, Wapiti Dormitories  
(Typical)



- (1x) [REDACTED] GHz CPE
- Attached using two (2) screws in wooden facade
- All equipment painted to match background; RGB Color 83, 51, 38
- Ethernet with power from interior switch
- ¼-in penetration under eave, for 1x Ethernet cable to attic; no visible cable/conduit



YGS Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## YGS Dormitory

Coords: 44.733N, -110.492W





Canyon Village Guest Cabins	
Area	Canyon Village
NRHP Eligibility	Non-Contributors
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Canyon Village; Guest Cabins

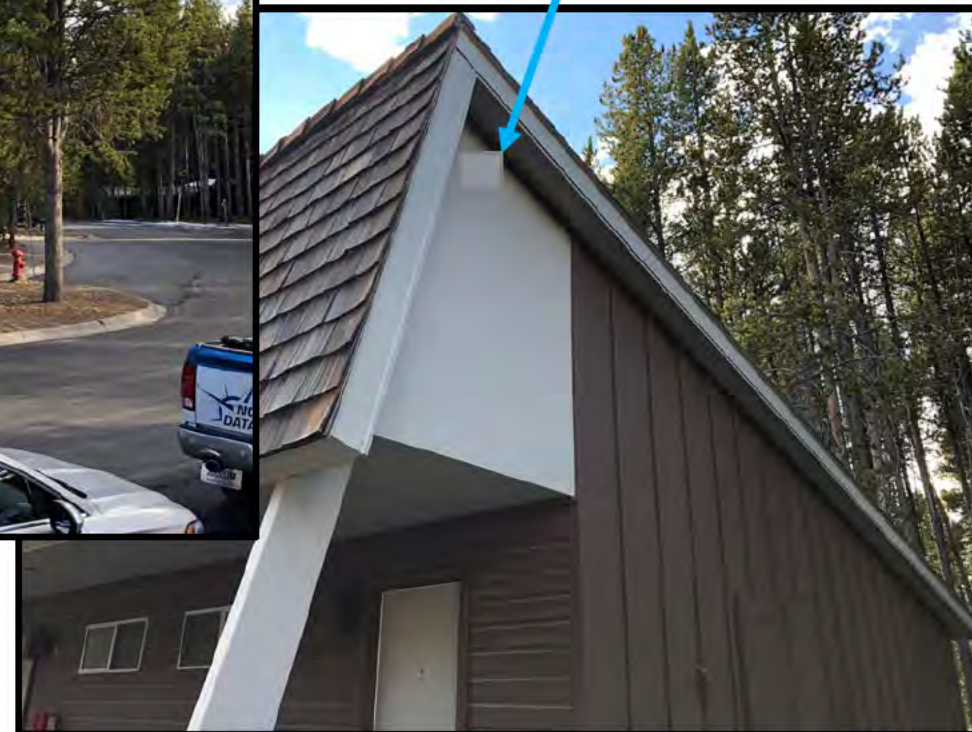
(x26 Buildings)

Coordinates: 44.729N, -110.488W





- (1x) [redacted] GHz CPE
- 9"x9"x3"
  - All equipment painted to match background; RGB Code 141, 148, 156 or 36, 30, 32
  - Ethernet with power from interior switch
  - Height: 10-ft AGL
  - ¼-in penetration under eave, for 1x Ethernet cable to attic.



Canyon Village; Guest Cabins  
(typical)





- (1x) Wi-Fi radio per cabin
- 6"x6"x2"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic. No raceway required
  - ¼-in penetration in ceiling for Ethernet cable to attic. Sealed and painted.

Canyon Village; Guest Cabins  
(typical interior)

# Grant Village Area



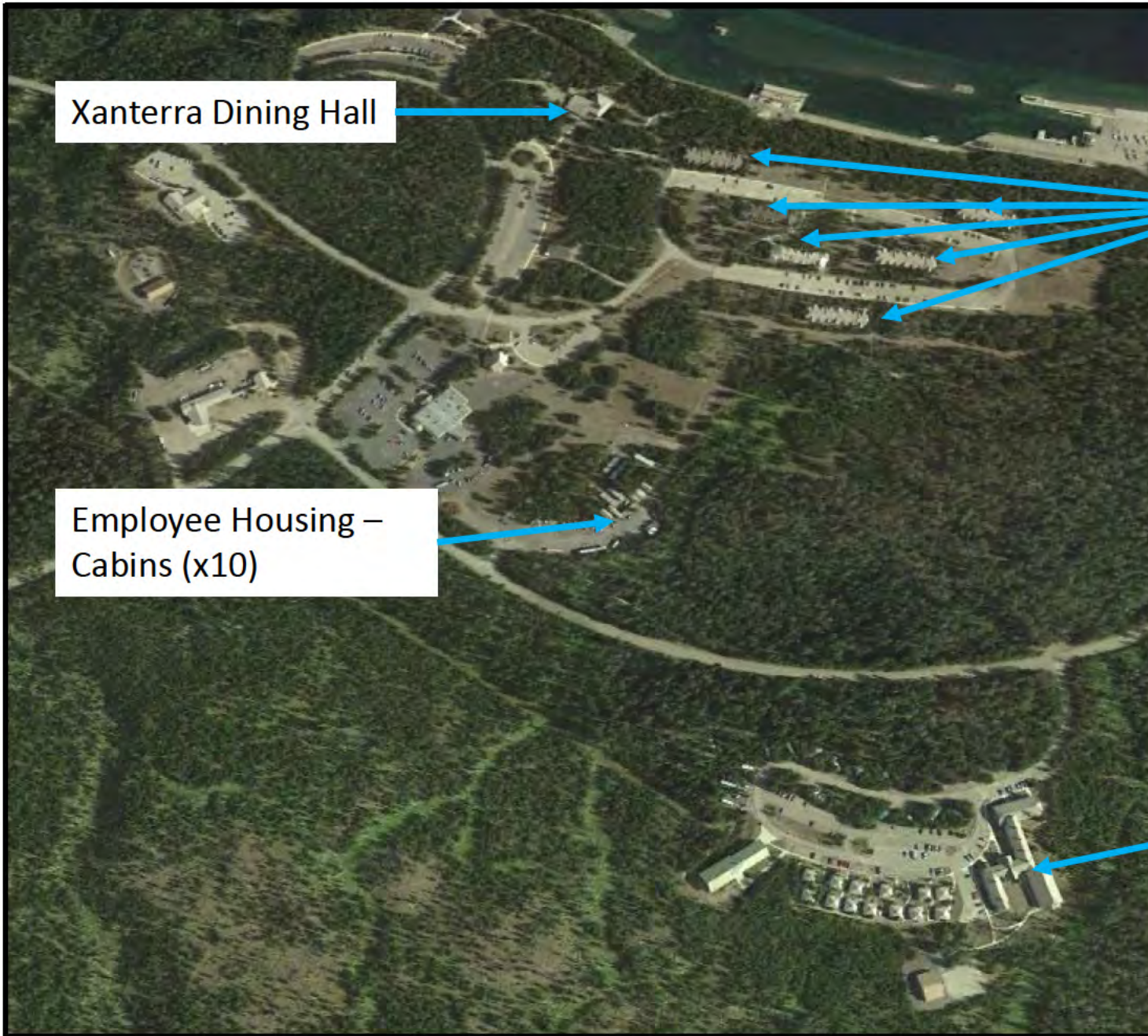
# Grant Village Area Existing Wireless (known)



# Grant Village Area Proposed Wireless







Xanterra Dining Hall

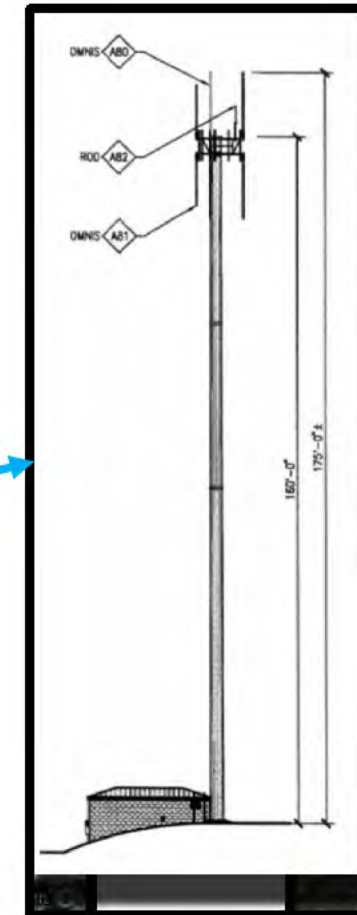
Employee Housing –  
Cabins (x10)

- Xanterra Lodges (x6)
- Antelope
  - Bear
  - Coyote
  - Fox
  - Elk
  - Deer

Employee Housing –  
Grayling Dormitory



# Grant Village Area – Existing Verizon Tower #27658

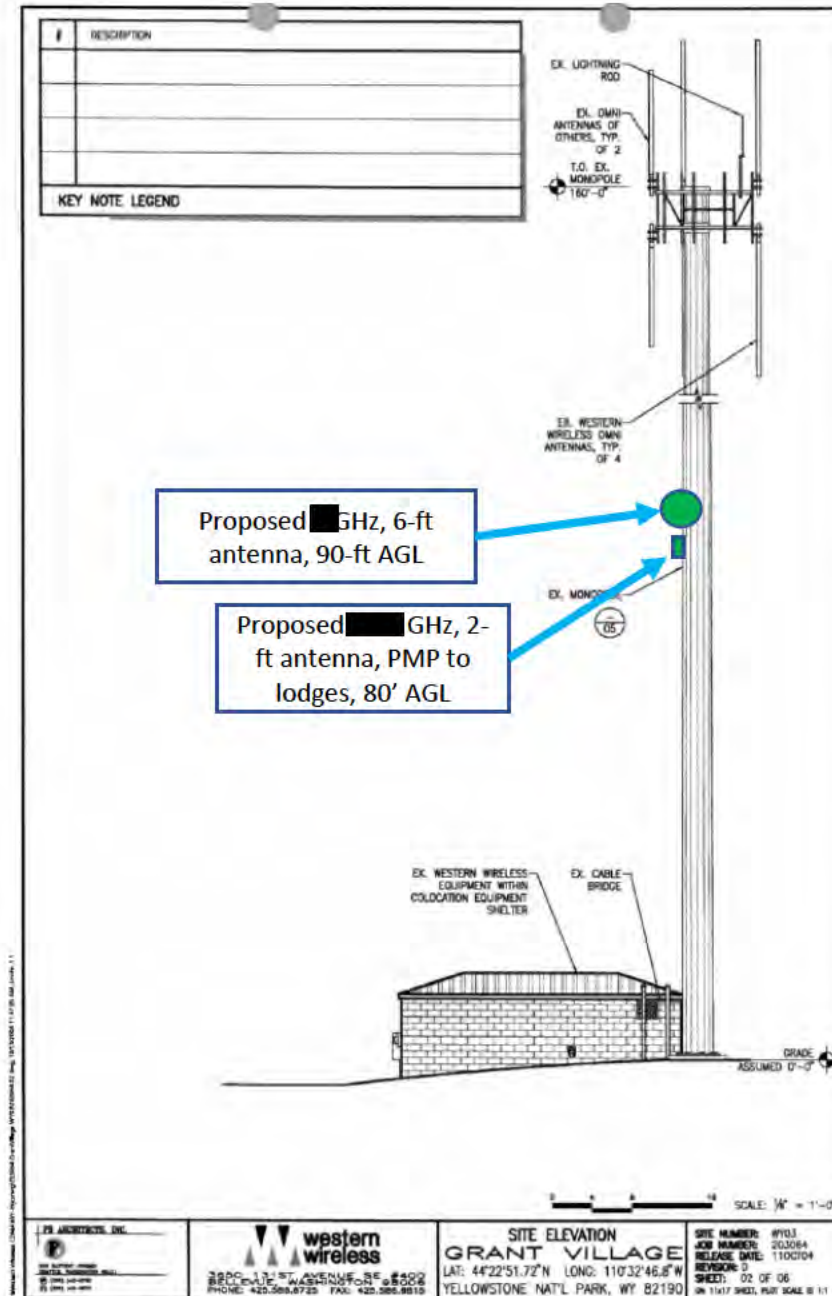


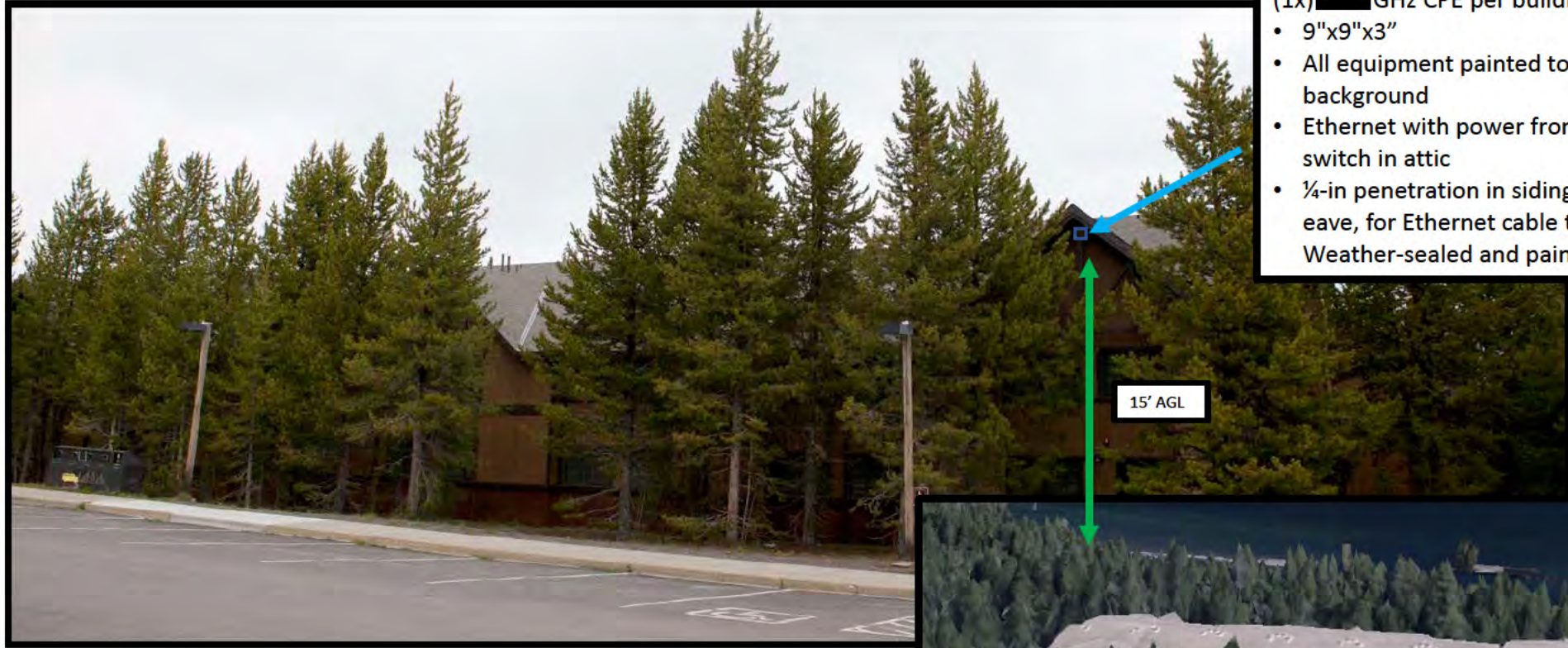


# Grant Village Tower

Proposed colocation on existing Verizon tower #27658

Coordinates: 44.380N, -110.547W





- (1x) [redacted] GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

15' AGL



## Antelope Lodge

Coords: 44.392N, -110.553W

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes





- (1x) XXXX GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Fox Lodge

Coords: 44.391N, -110.550W





- (1x) [redacted] GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.



15' AGL

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Elk Lodge

Coords: 44.391N, -110.551W



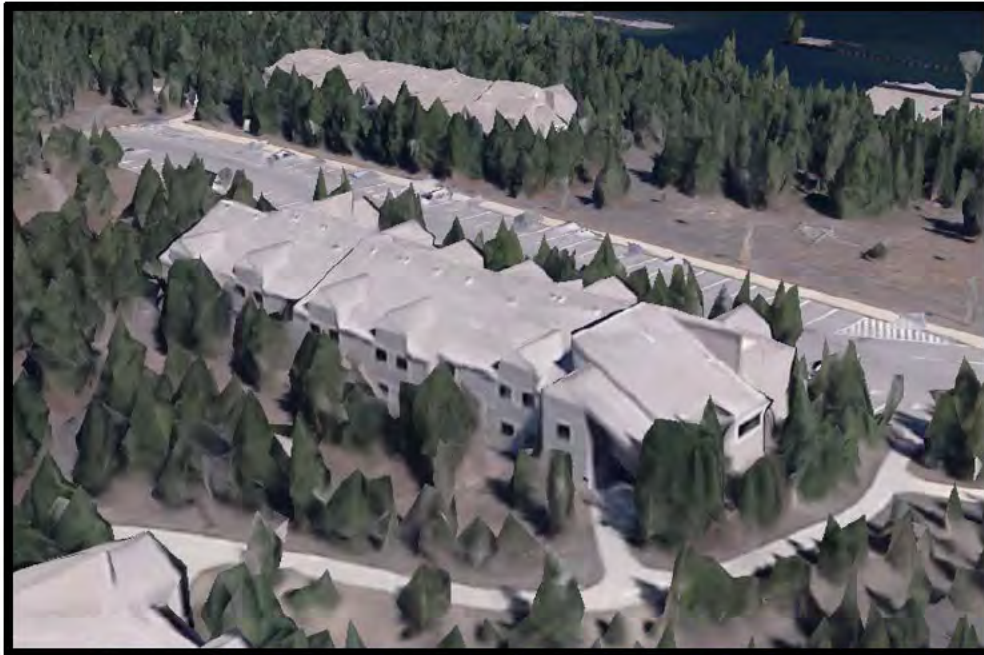


- (1x) [redacted] GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

**Bear Lodge**  
 Coords: 44.391N, -110.552W





- (1x) [redacted] GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.



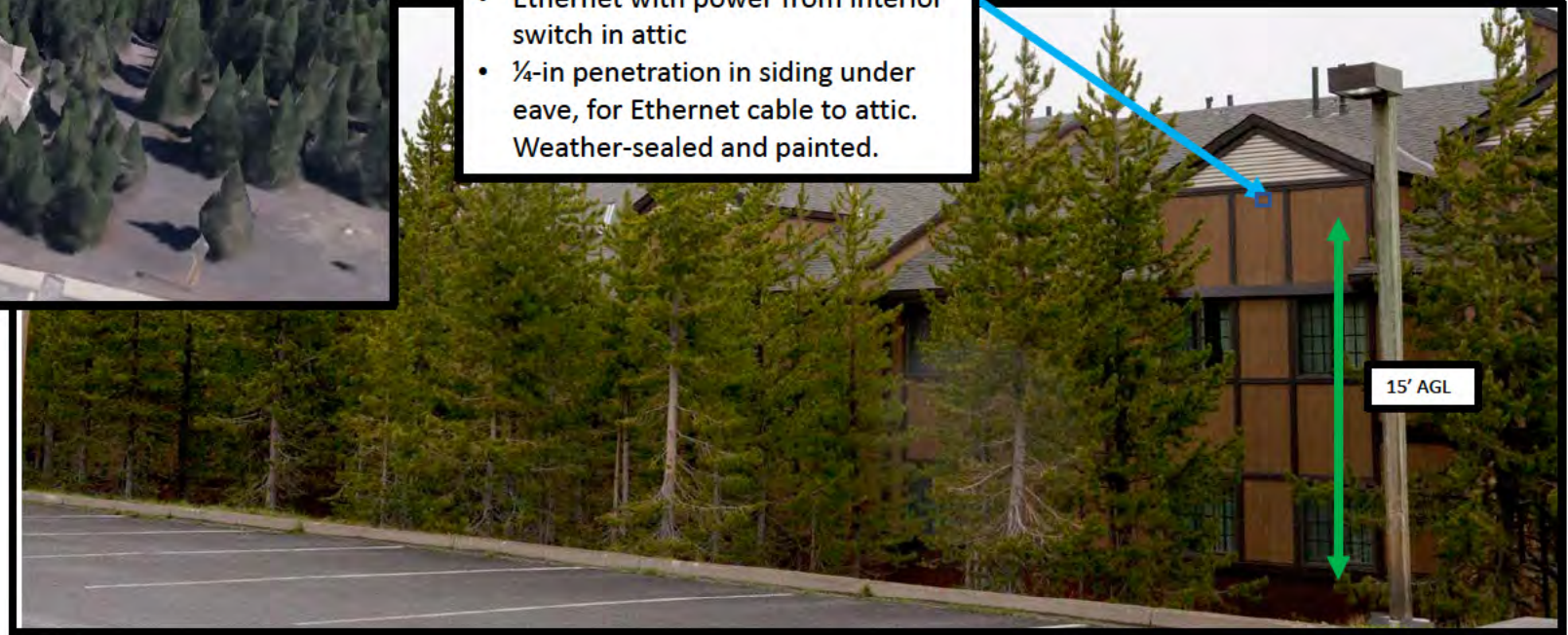
Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

**Coyote Lodge**  
 Coords: 44.391N, -110.552W





- (1x) ███ GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

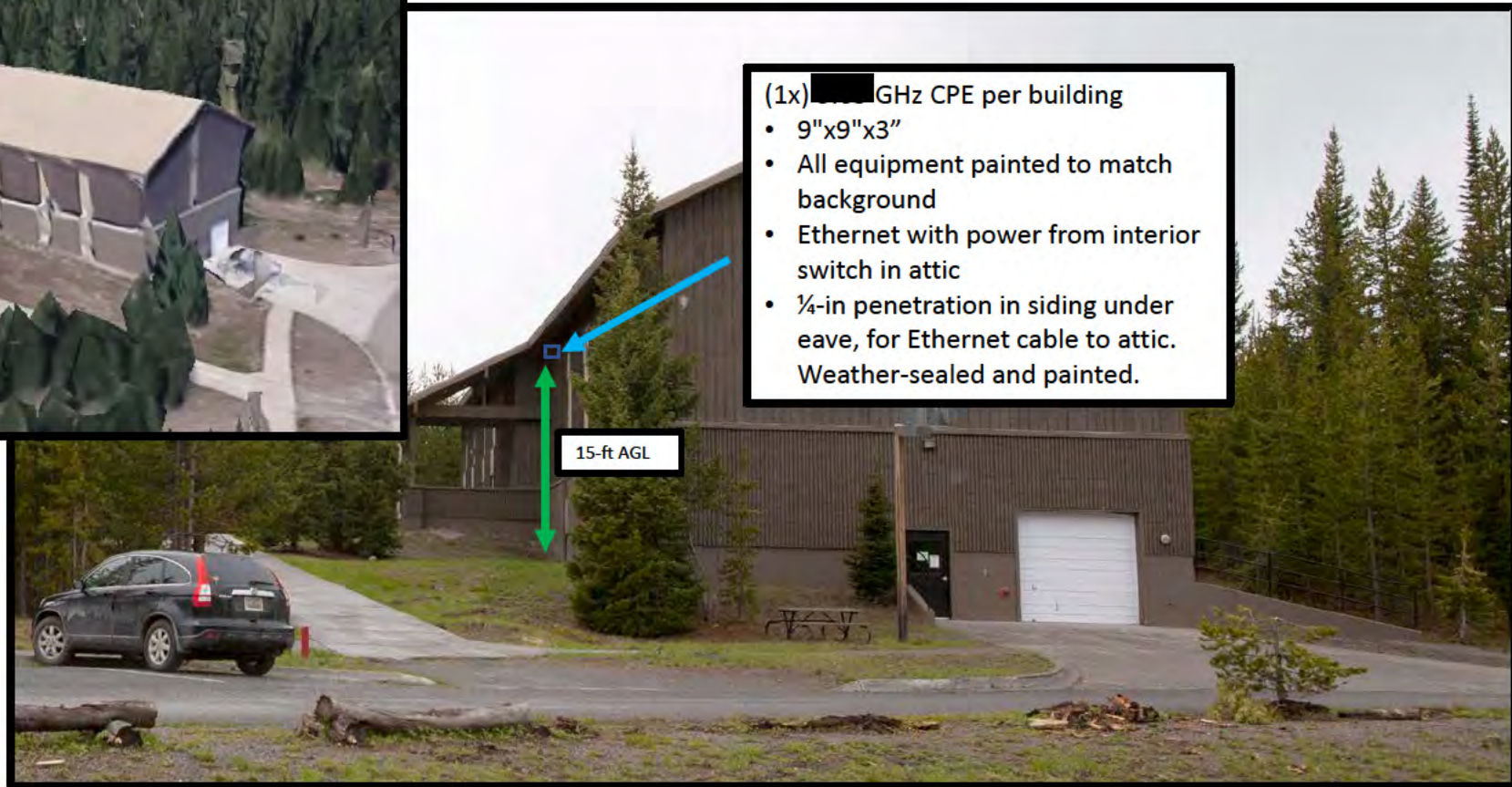


## Deer Lodge

Coords: 44.390N, -110.552W

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes



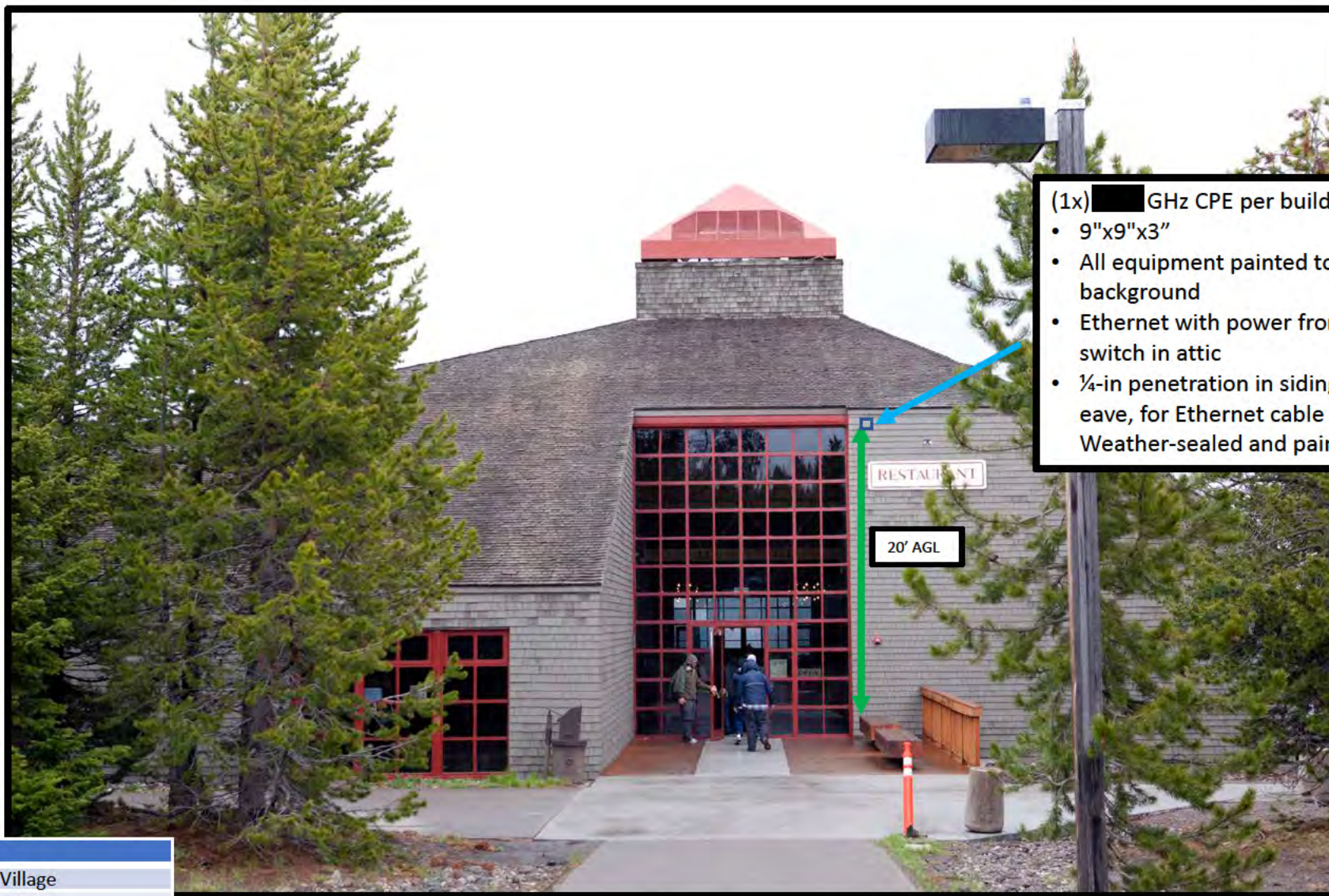


YGS Dormitory	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## YGS Dormitory

Coords: 44.385N, -110.553W





- (1x) [redacted] GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

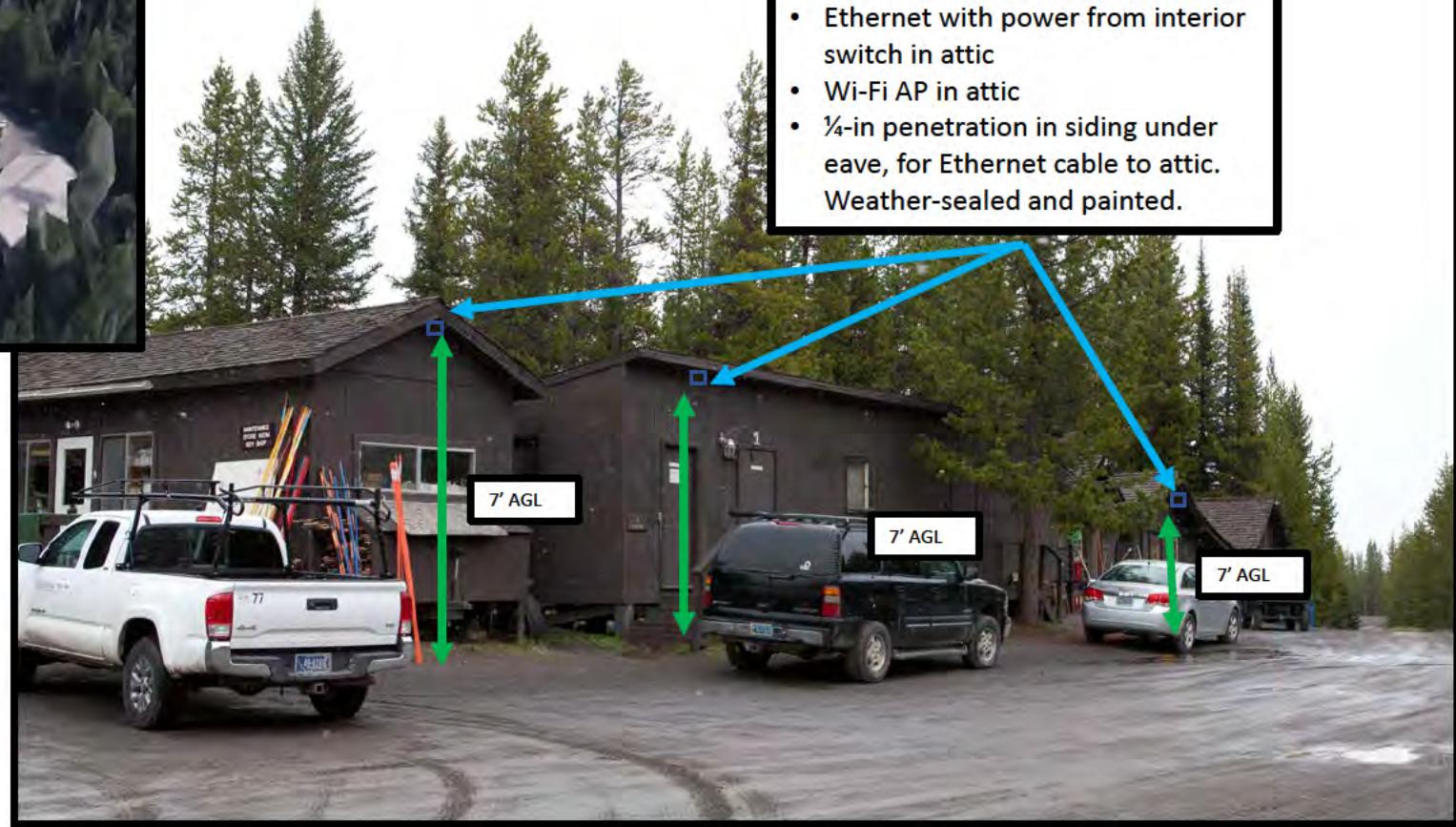
20' AGL

Grant Village Restaurant	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Grant Village Restaurant

Coords: 44.392N, -110.555W





- ██████ GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - Wi-Fi AP in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

Grant Village Employee Housing	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

# Grant Village Employee Housing (typical)

Coords: 44.388N, -110.554W



- ██████████ GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.



Grayling Dormitory  
Coords: 44.385N, -110.550W

Grayling Dormitory	
Area	Grant Village
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Fishing Bridge / Lake Area



# Fishing Bridge

Century Link Tower (WY3 Lake JC; US-WY-8047)

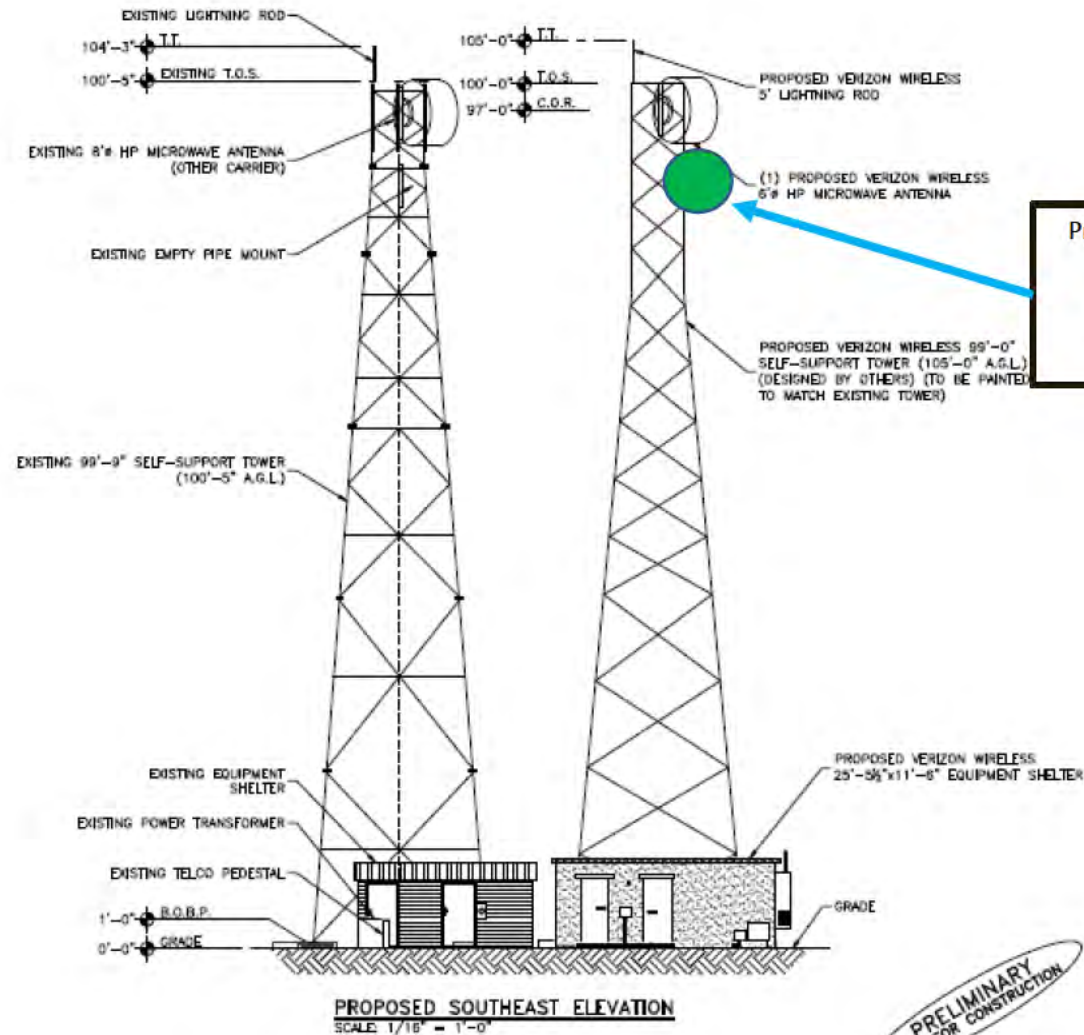


Proposed Wireless Coverage

Coords: 44.574N, -110.384W

# Fishing Bridge

Century Link "WY3 Qwest Lake JC" Tower  
(Constructed)



Proposed antenna from Mt. Washburn Tower  
6-ft 5GHz antenna  
90-ft AGL centerline  
351-deg azimuth



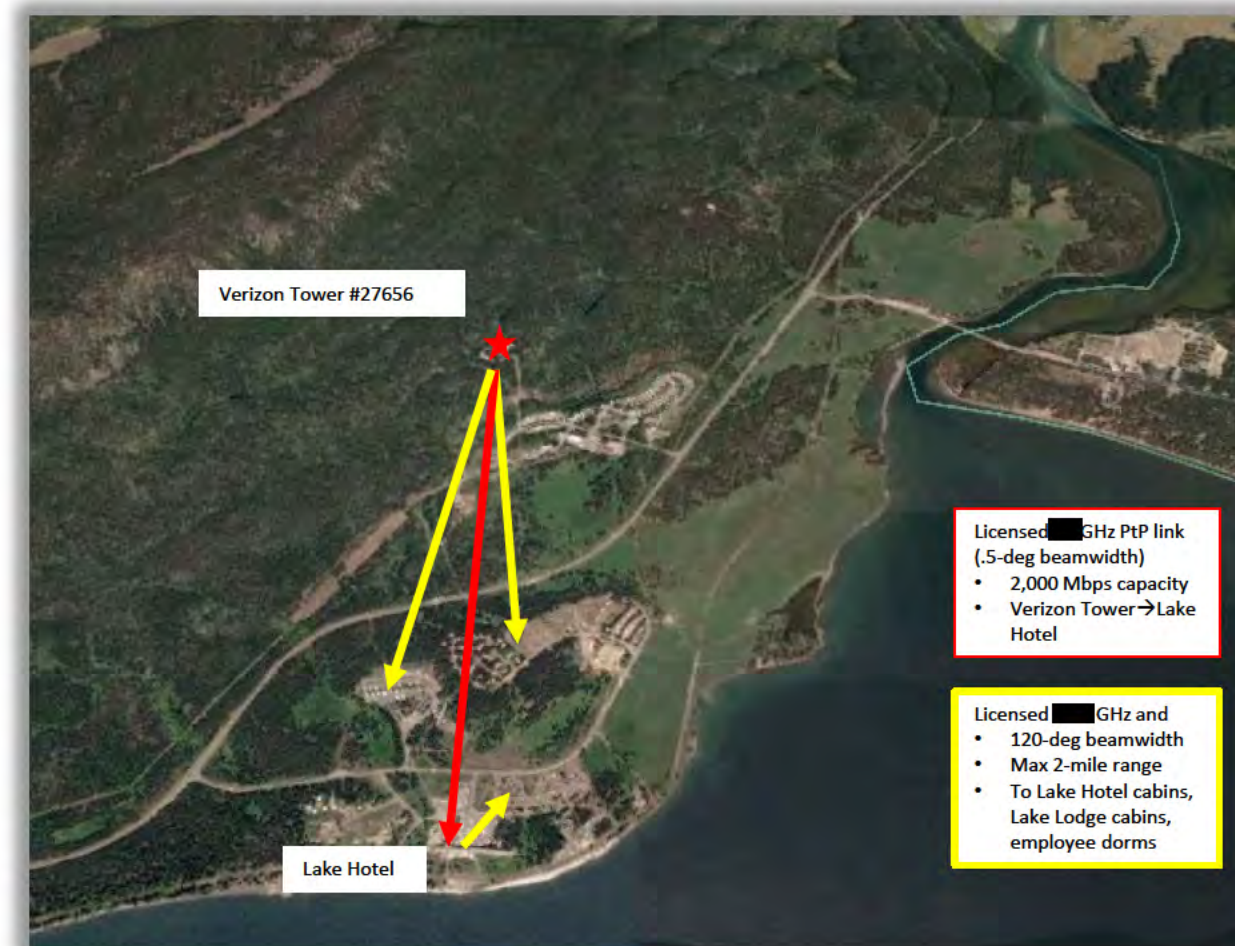


# Lake Area

Existing wireless coverage (known)



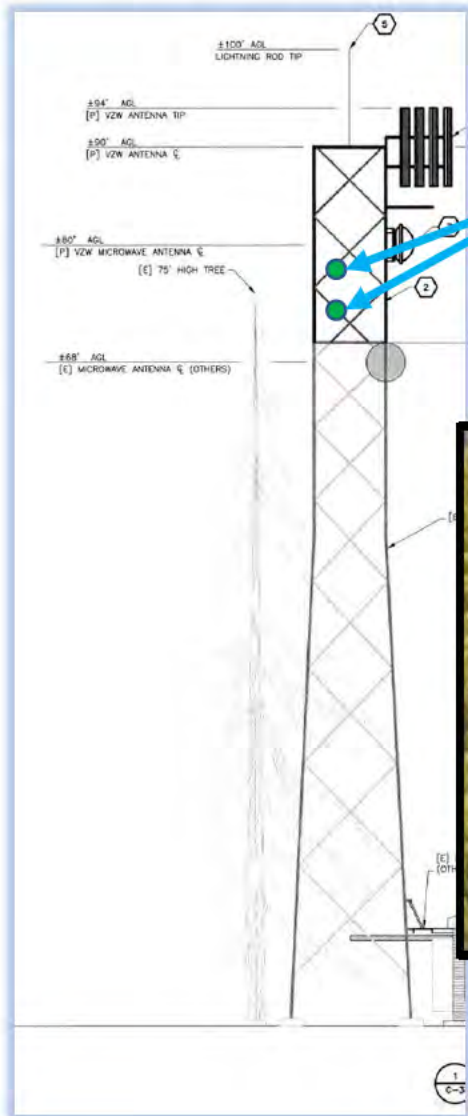
# Lake Area - Proposed Wireless Coverage





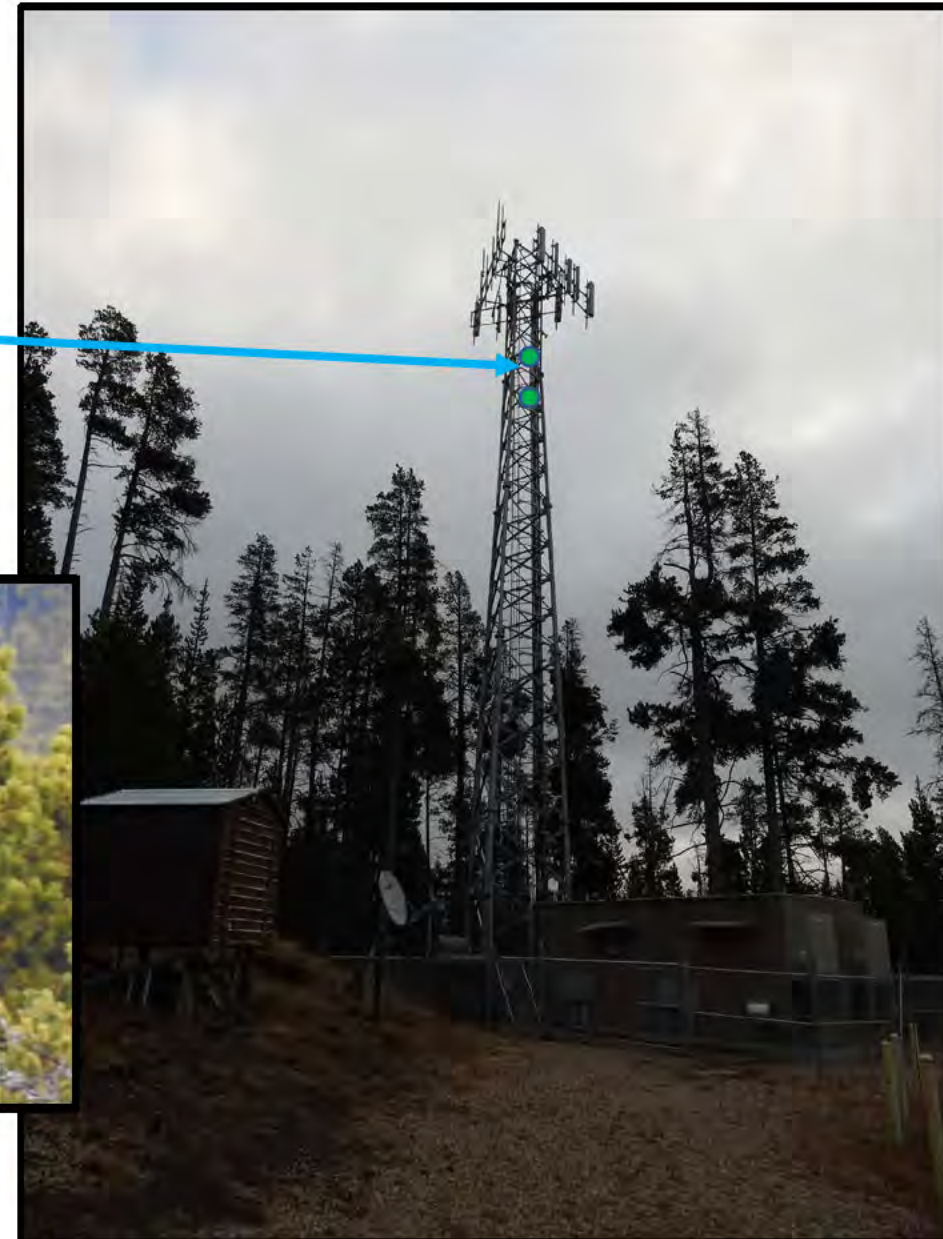
# Lake Area Tower

Verizon Tower #27656 (WY3 Fishing Bridge)



## Proposed antenna

- 2-ft [REDACTED] GHz antenna, 168-deg azimuth, 75-ft AGL centerline
- 2-ft, [REDACTED] GHz antenna, 180-deg azimuth, 70-ft centerline
- Fiber backhaul through existing conduit to "WY3 Lake JC" tower



# Lake Hotel



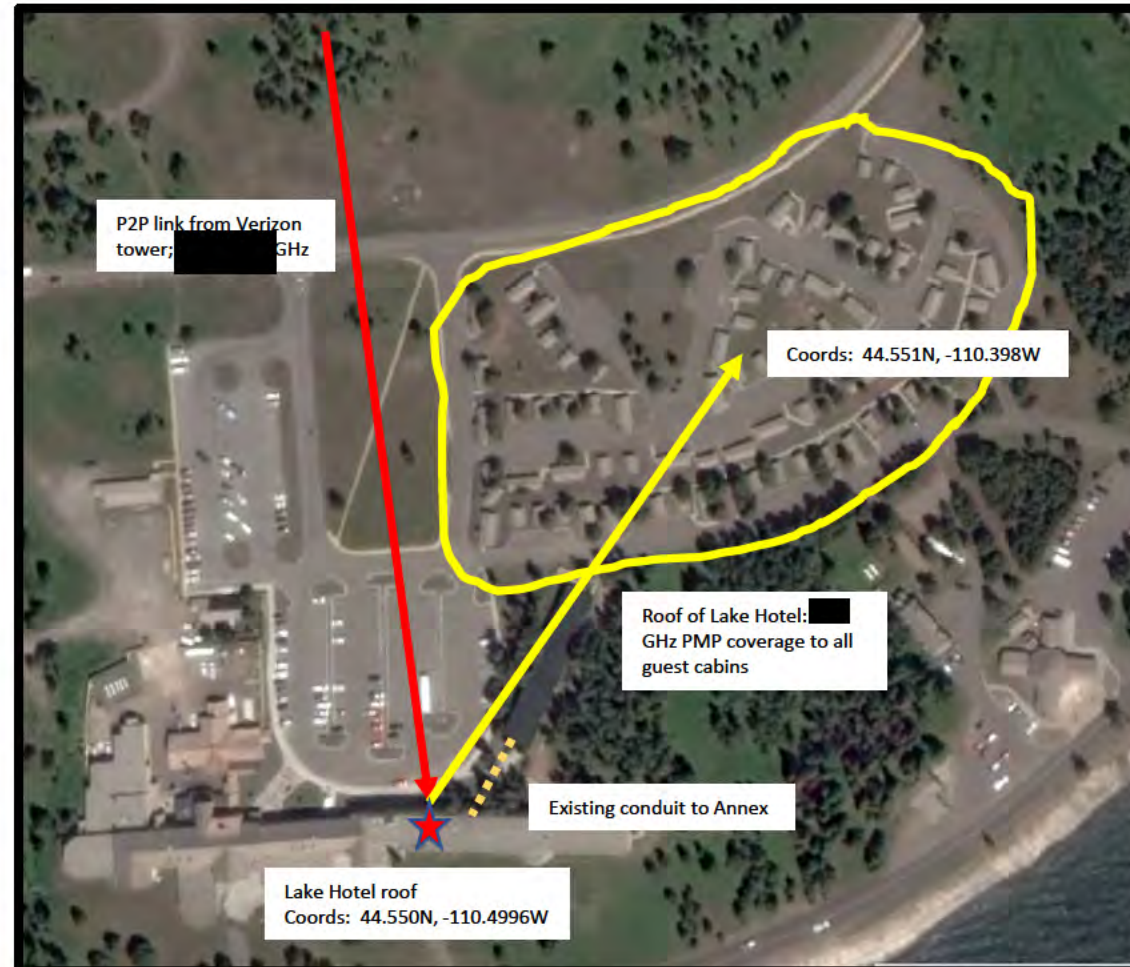
# Lake Hotel Area

Existing wireless coverage (known)

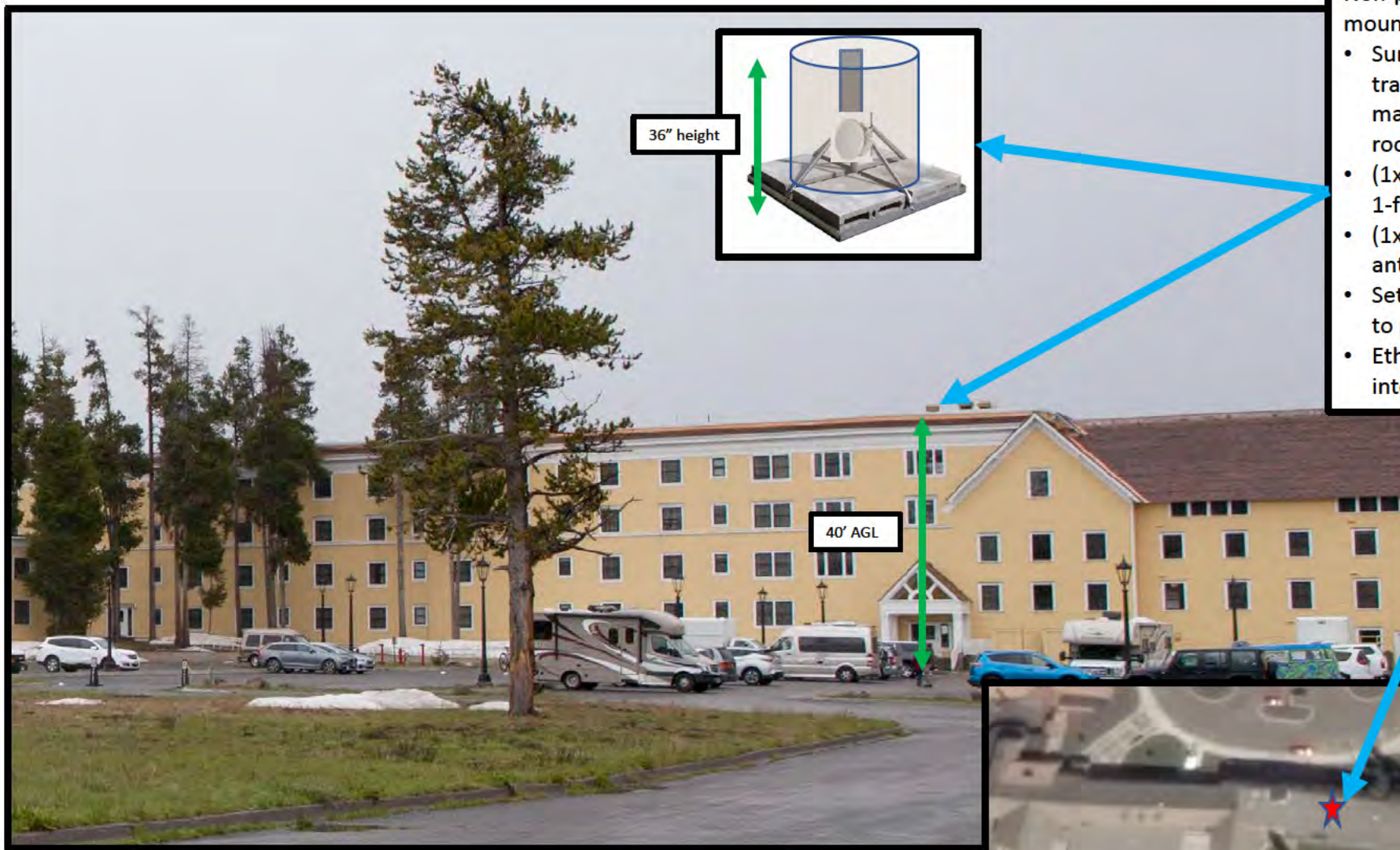


# Yellowstone Lake Hotel Area

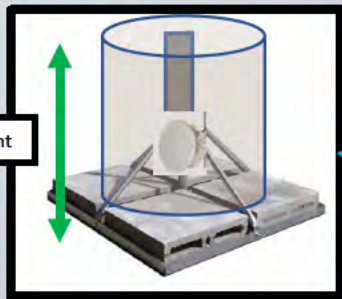
## Proposed wireless coverage







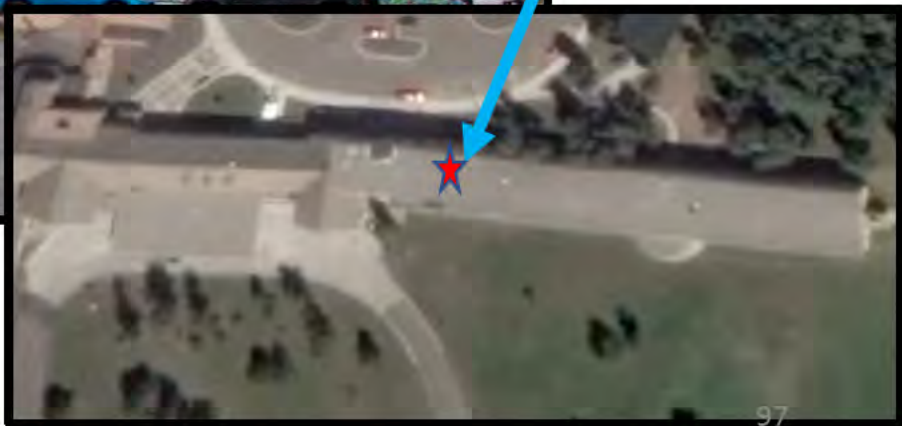
36" height



Non-penetrating, self-ballasted mount

- Surrounded by RF-transparent screen, color matched to existing vents on roof
- (1x) █ GHz station antenna, 1-ft diameter
- (1x) █ GHz Licensed PMP antenna
- Set back from edge; invisible to pedestrian traffic
- Ethernet with power from interior switch

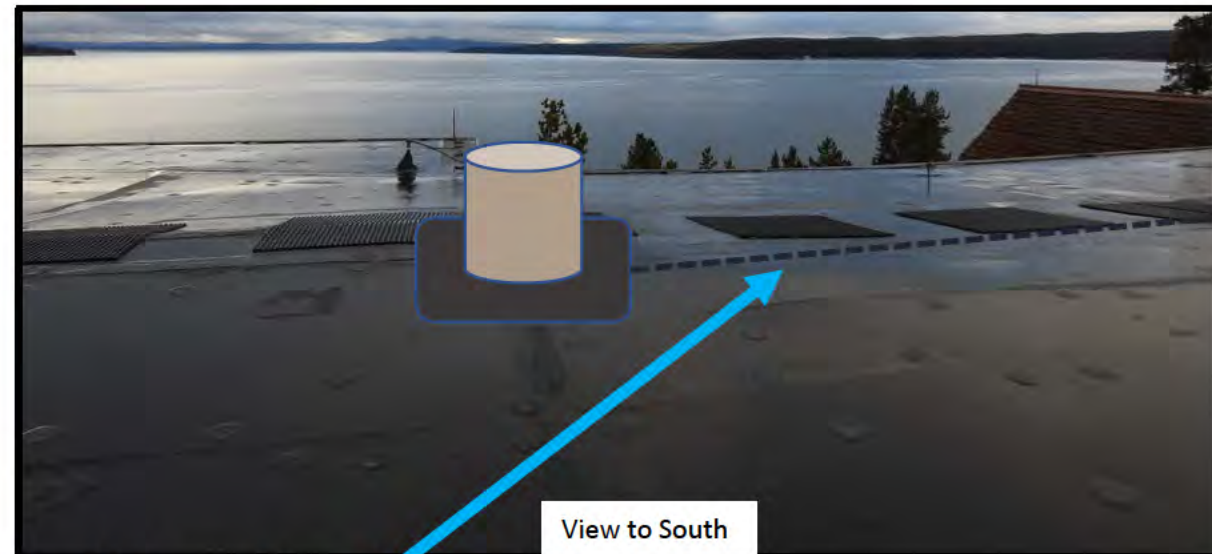
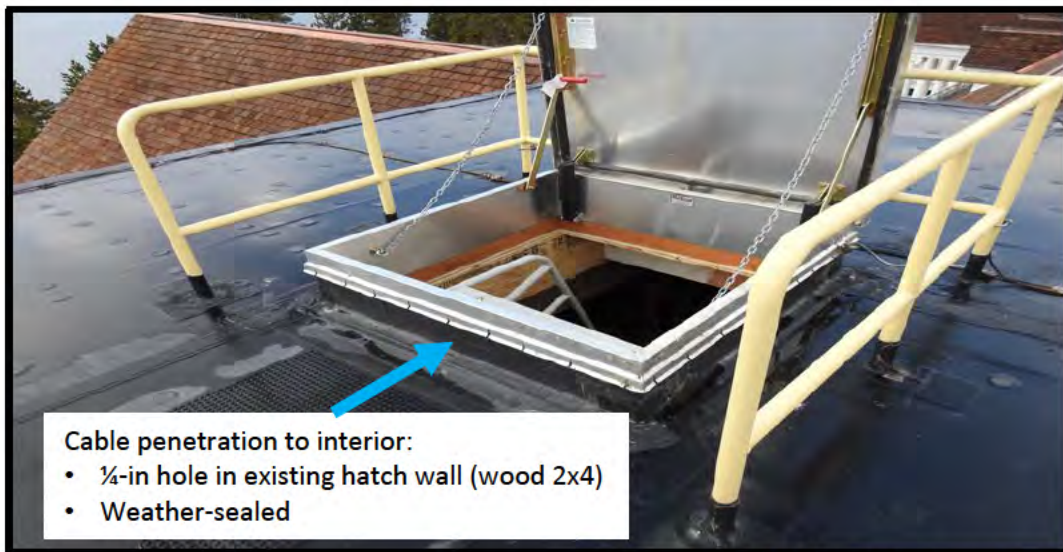
40' AGL



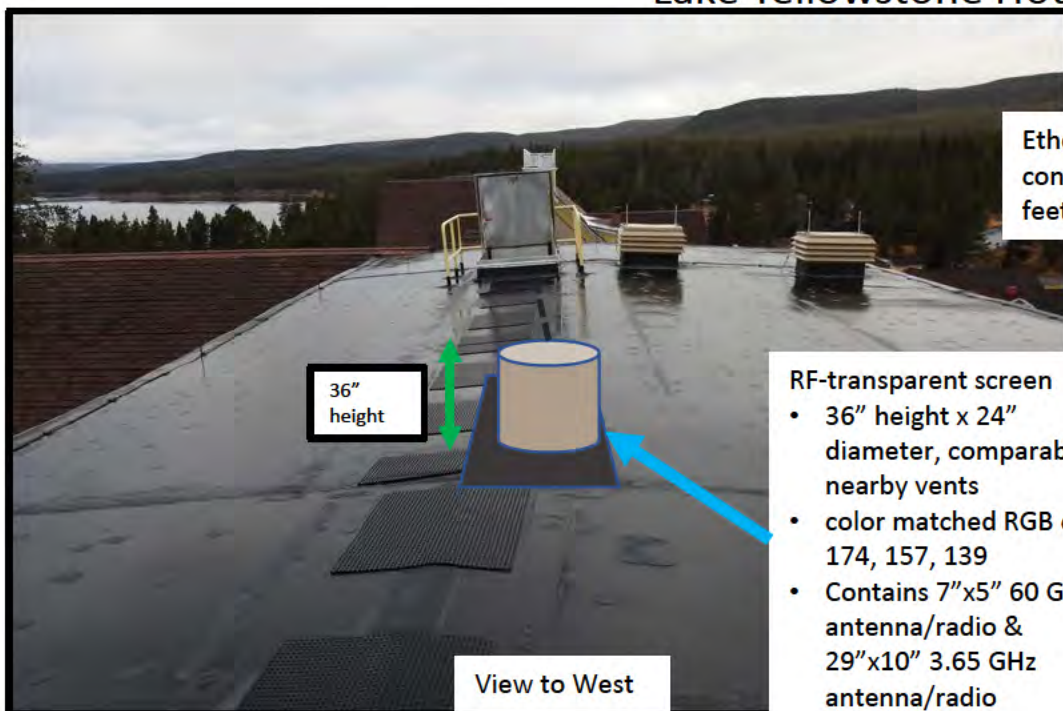
Lake Yellowstone Hotel	
Area	Lake Hotel
NRHP Eligibility	District Contributor
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

**Lake Yellowstone Hotel**  
(Wi-Fi proposed only for Annex)





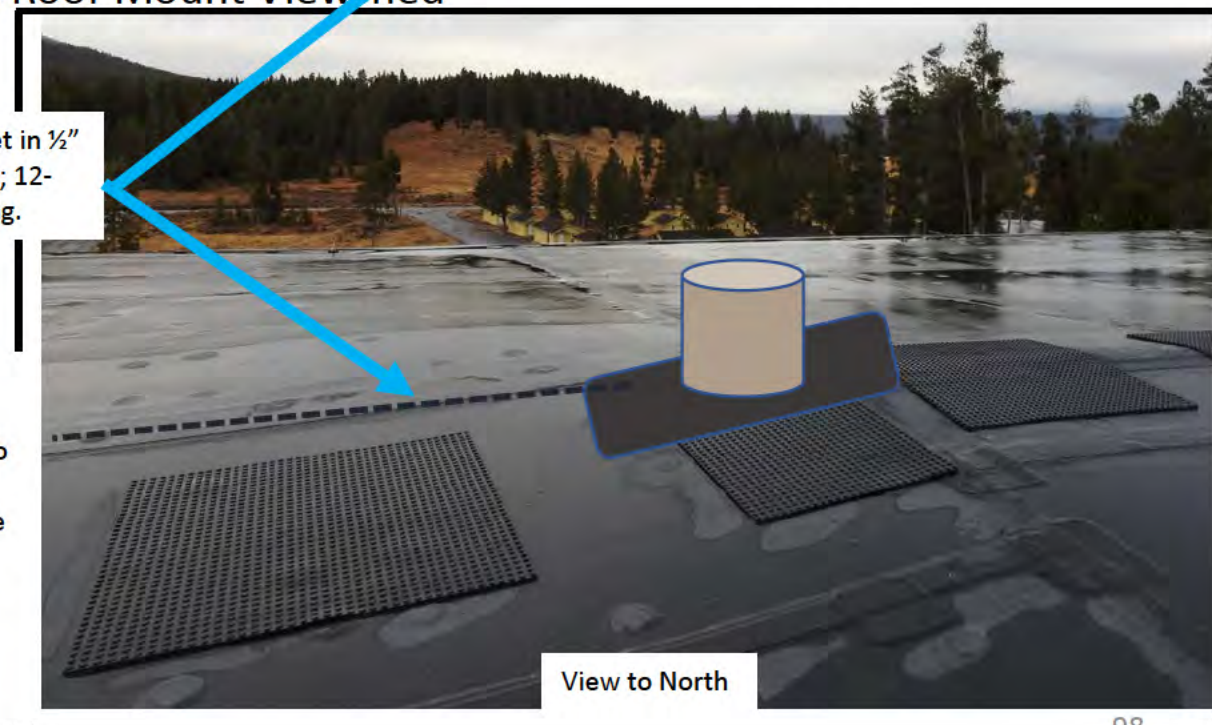
## Lake Yellowstone Hotel; Roof Mount Viewshed



Ethernet in ½" conduit; 12-feet long.

RF-transparent screen

- 36" height x 24" diameter, comparable to nearby vents
- color matched RGB code 174, 157, 139
- Contains 7"x5" 60 GHz antenna/radio & 29"x10" 3.65 GHz antenna/radio







Lake Yellowstone Hotel - Annex	
Area	Lake Hotel
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	No

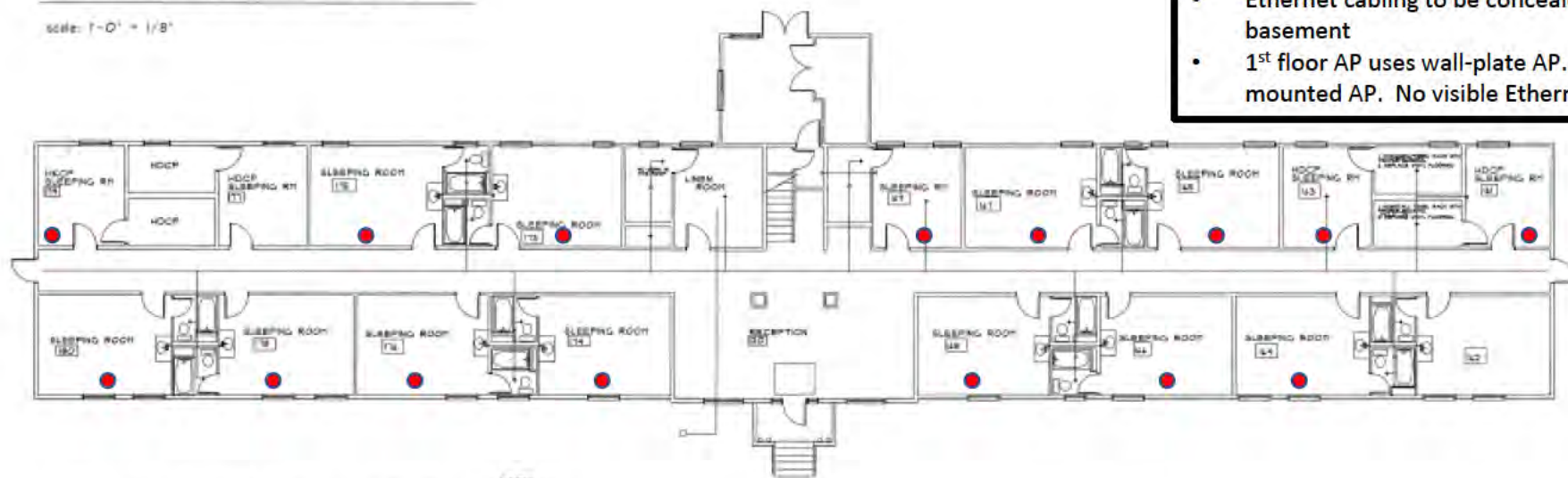
## Lake Yellowstone Hotel – Sandpiper Lodge (“Annex”)

Coordinates: 44.550N, 110.399W



### NEW BATHROOM LAYOUT SECOND FLOOR ROOMS

scale: 1" = 0' = 1/8"



### NEW BATHROOM LAYOUT FIRST FLOOR ROOMS

scale: 1" = 0' = 1/8"

#### NOTES

- ◆ PENDANT
- ◁ GLOBE PENDANT
- UPRIGHT TO ATTIC

#### Wi-Fi AP placement:

- One per room
- Ethernet cabling to be concealed in attic and basement
- 1<sup>st</sup> floor AP uses wall-plate AP. 2<sup>nd</sup> floor is ceiling mounted AP. No visible Ethernet cabling/raceway

NPS DRAWING NO	REVISIONS		sheet no.	Title:
	FEB 5, 2001			FIRST FLOOR

Lake Yellowstone Hotel – Sandpiper Lodge (“Annex”)



CPE

- All [REDACTED] GHz CPEs and Wi-Fi APs mounted in interior of cabin attic (invisible to guests)



Lake Hotel Guest Cabins	
Area	Lake Hotel
NRHP Eligibility	District Contributors
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

**Lake Hotel Guest Cabins (x78)**  
(typical)  
Coordinates: 44.551N, -110.398W





- GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

## YGS Dormitory

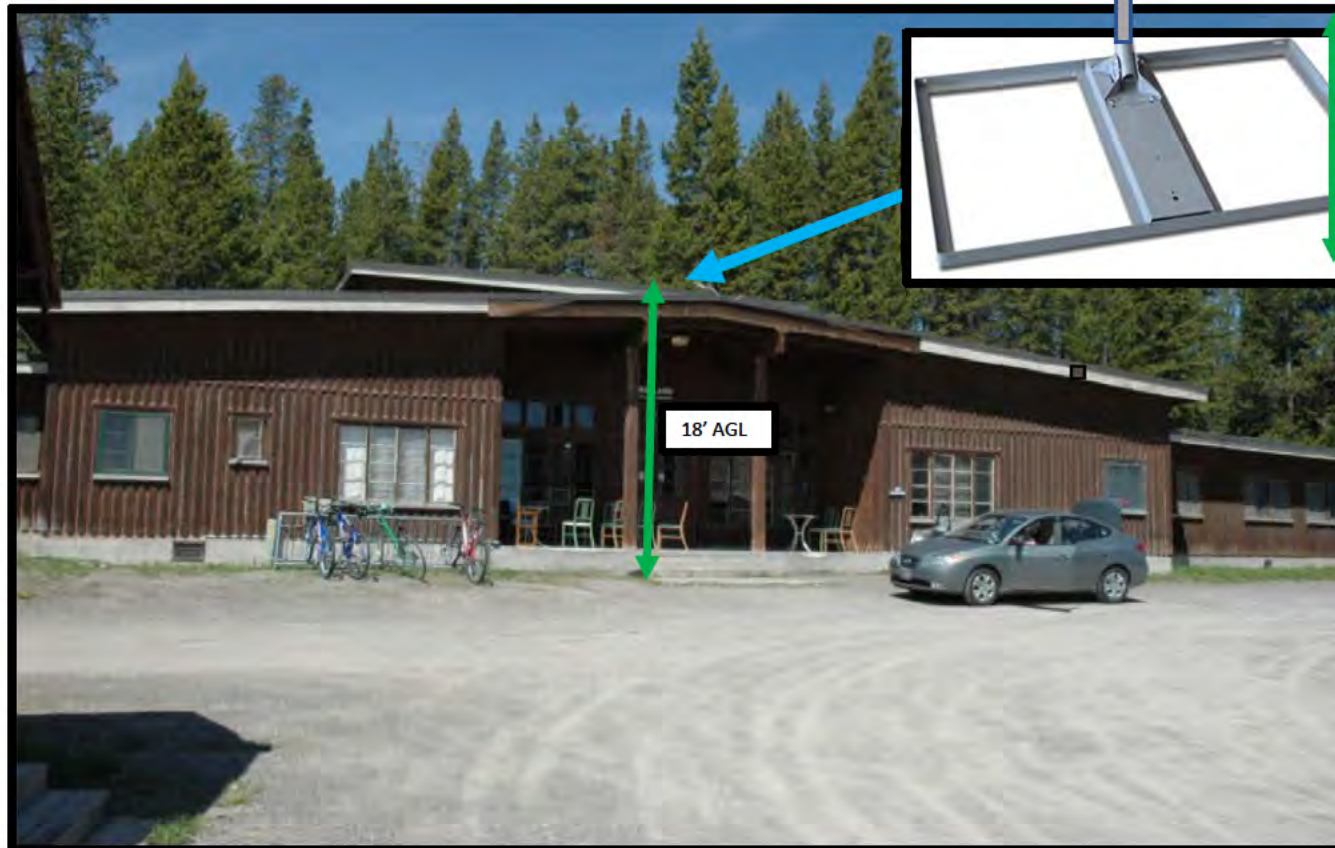
Coords: 44.550N, -110.397W

YGS Dormitory	
Area	Lake Hotel
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes





Lake Lodge Area Dormitories



2-ft  
total  
height

Non-penetrating mount,  
depicted without ballast

- (1x) ████ GHz CPE
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch
- ¼-in wall penetration for Ethernet cable, sealed and painted.

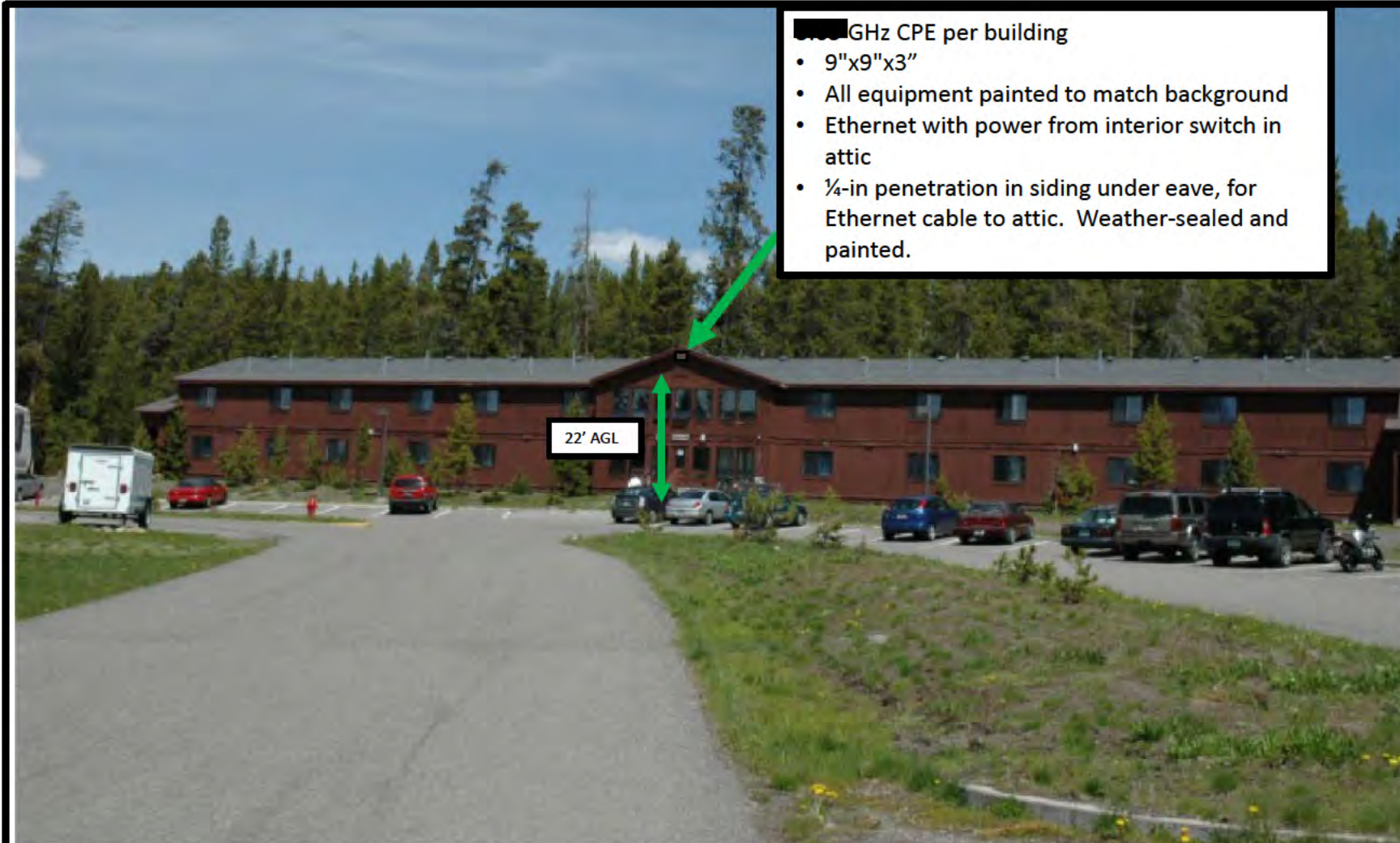


## Mallard Dormitory

Coords: 44.555N, -110.397W

Mallard Dormitory	
Area	Lake Hotel
NRHP Eligibility	Unknown
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes





- ██████ GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

22' AGL

Goldeneye Dormitory

Goldeneye Dormitory	
Area	Lake Hotel
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

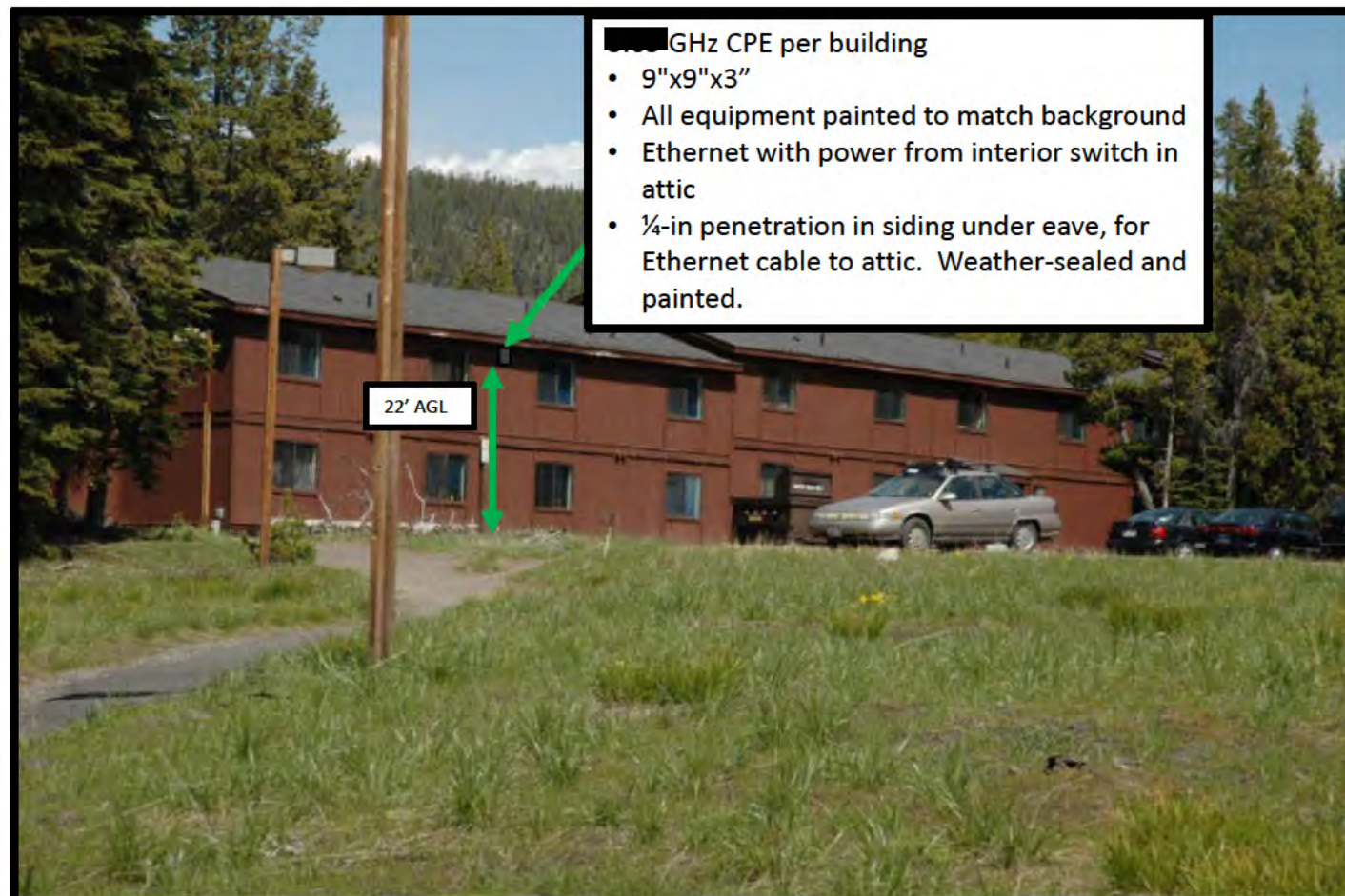


- GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

Teal Dormitory	
Area	Lake Hotel
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

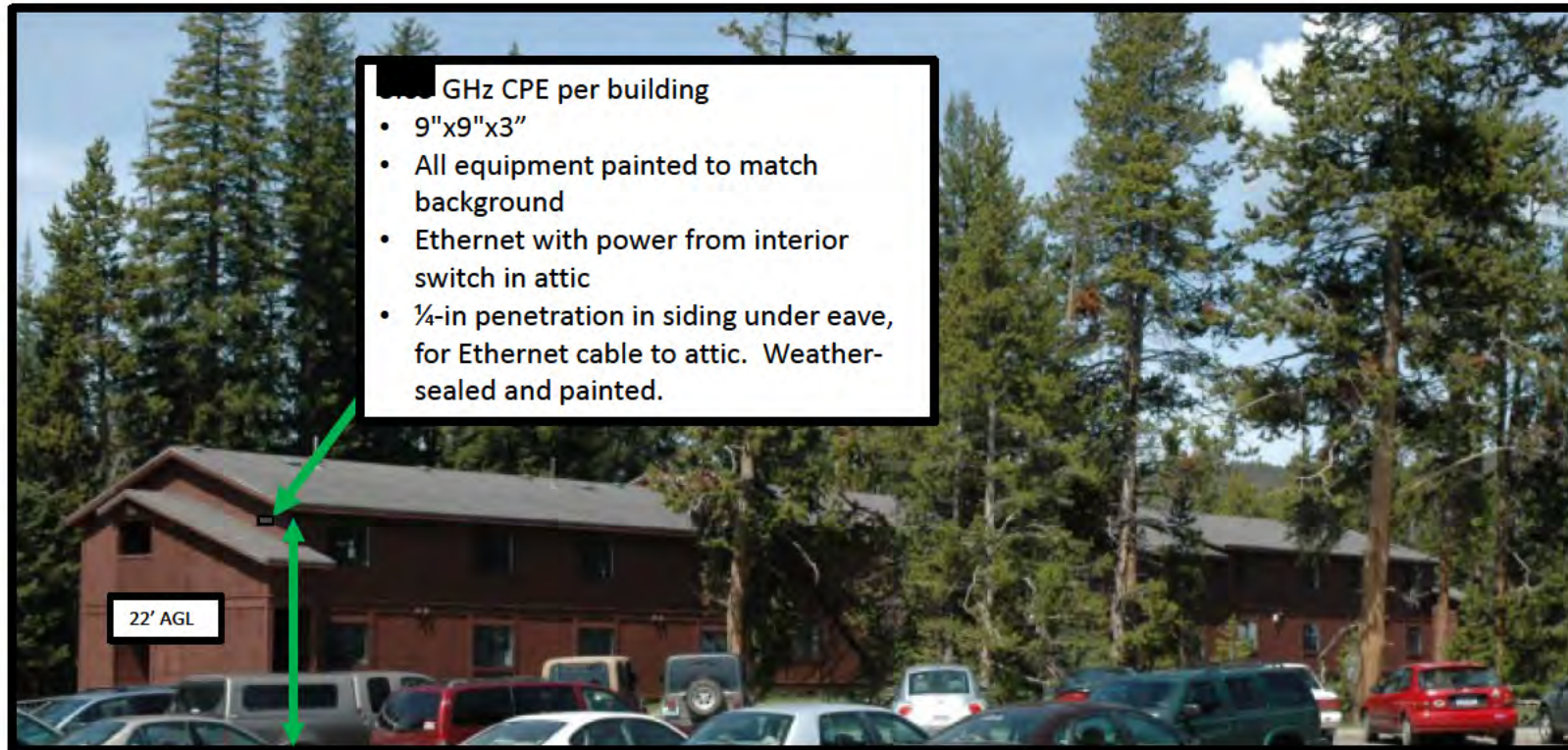
Teal Dormitory  
Coords: 44.555N, -110.403W





Osprey Dormitory

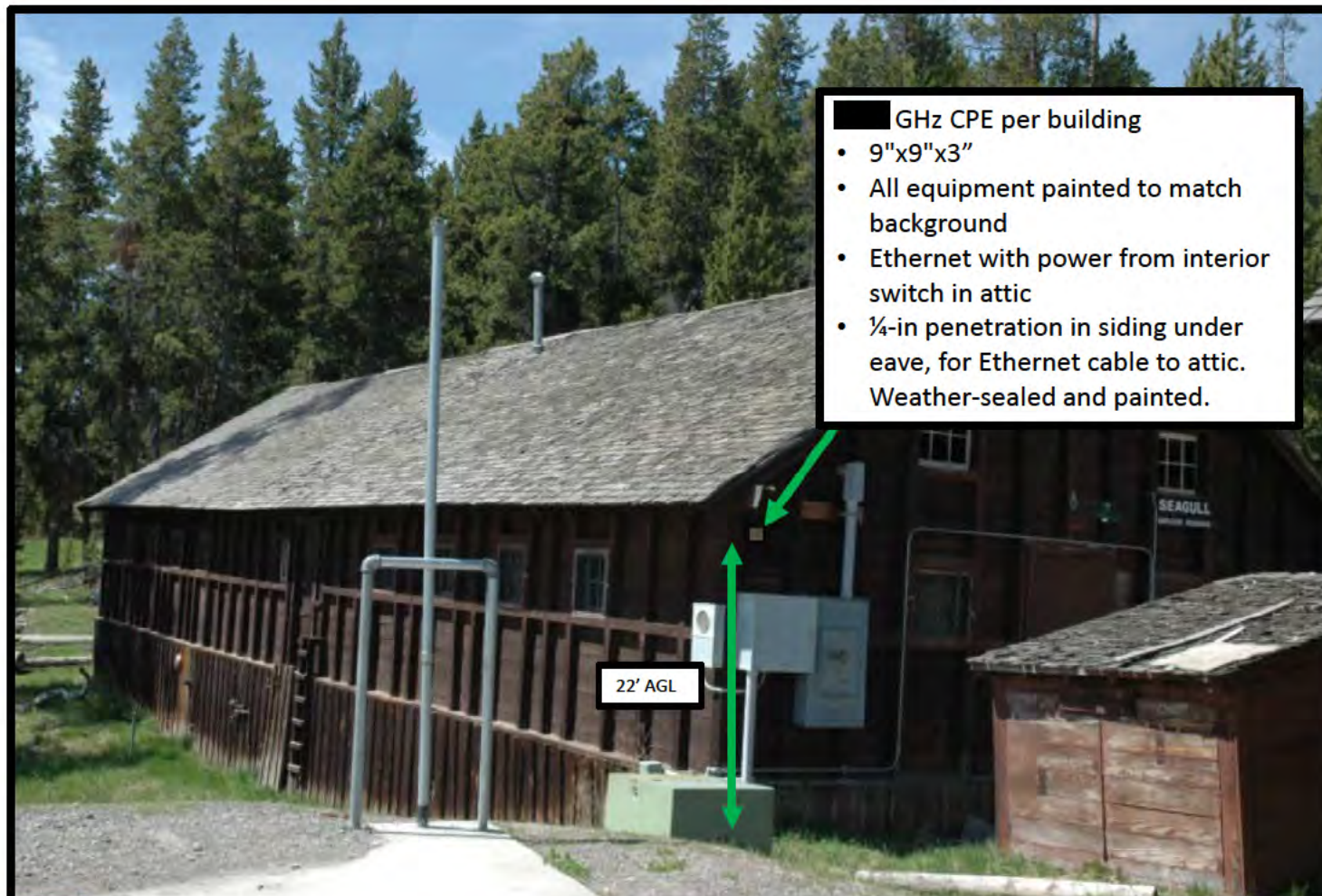
Osprey Dormitory	
Area	Lake Hotel
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes



Pelican Dormitory

Pelican Dormitory	
Area	Lake Hotel
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes





- GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

22' AGL

Seagull Dormitory

Seagull Dormitory	
Area	Lake Hotel
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes



- GHz CPE per building
- 9"x9"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch in attic
  - Ethernet cabling to interior using existing penetrations.
  - CPE at 15-ft AGL

Construction Dormitory ("Man Camp")	
Area	Lake Hotel
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Construction Camp ("Man Camp") Dormitory

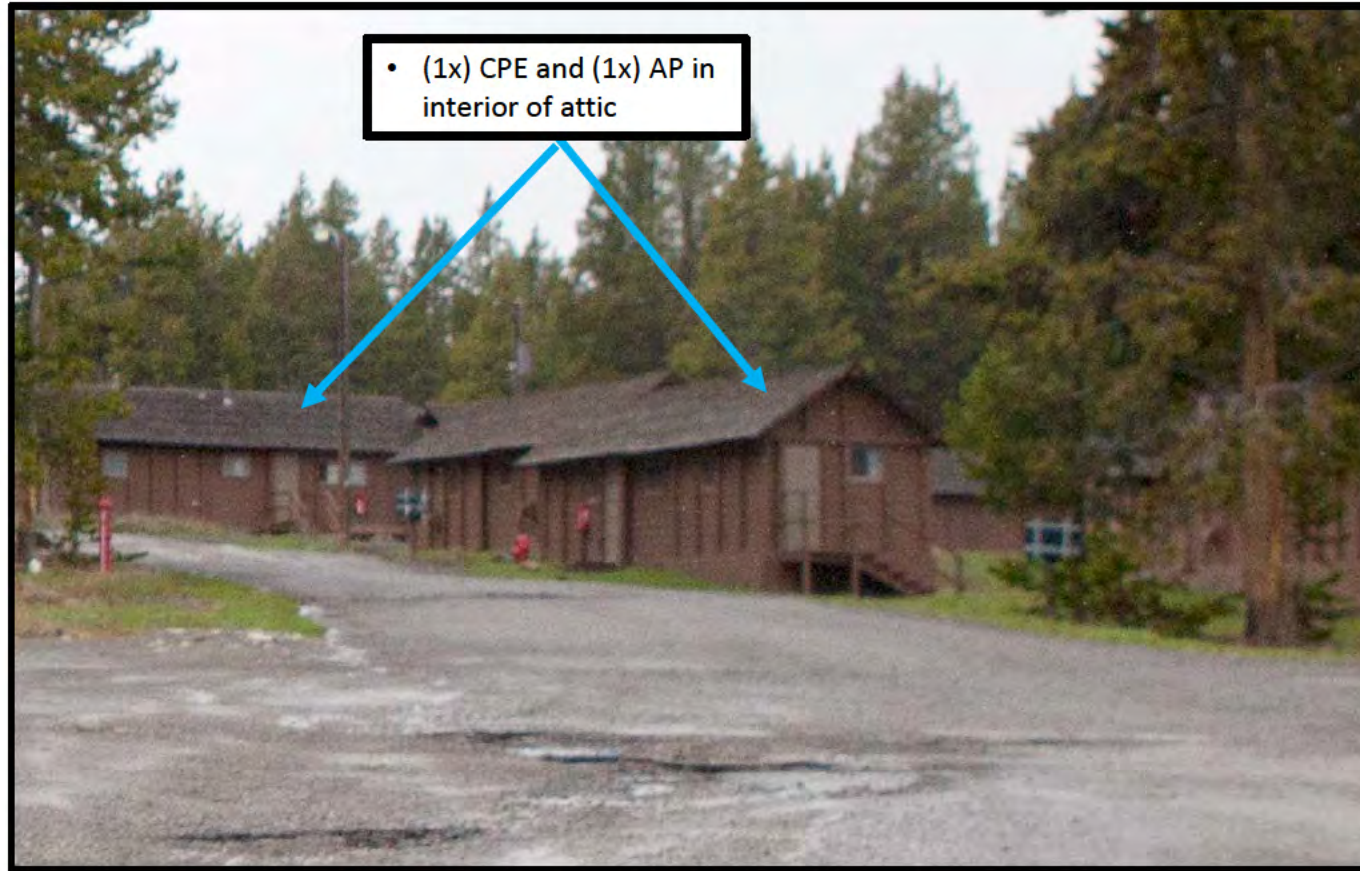


# Proposed Coverage; Lake Lodge Guest Cabins (x64 Units)



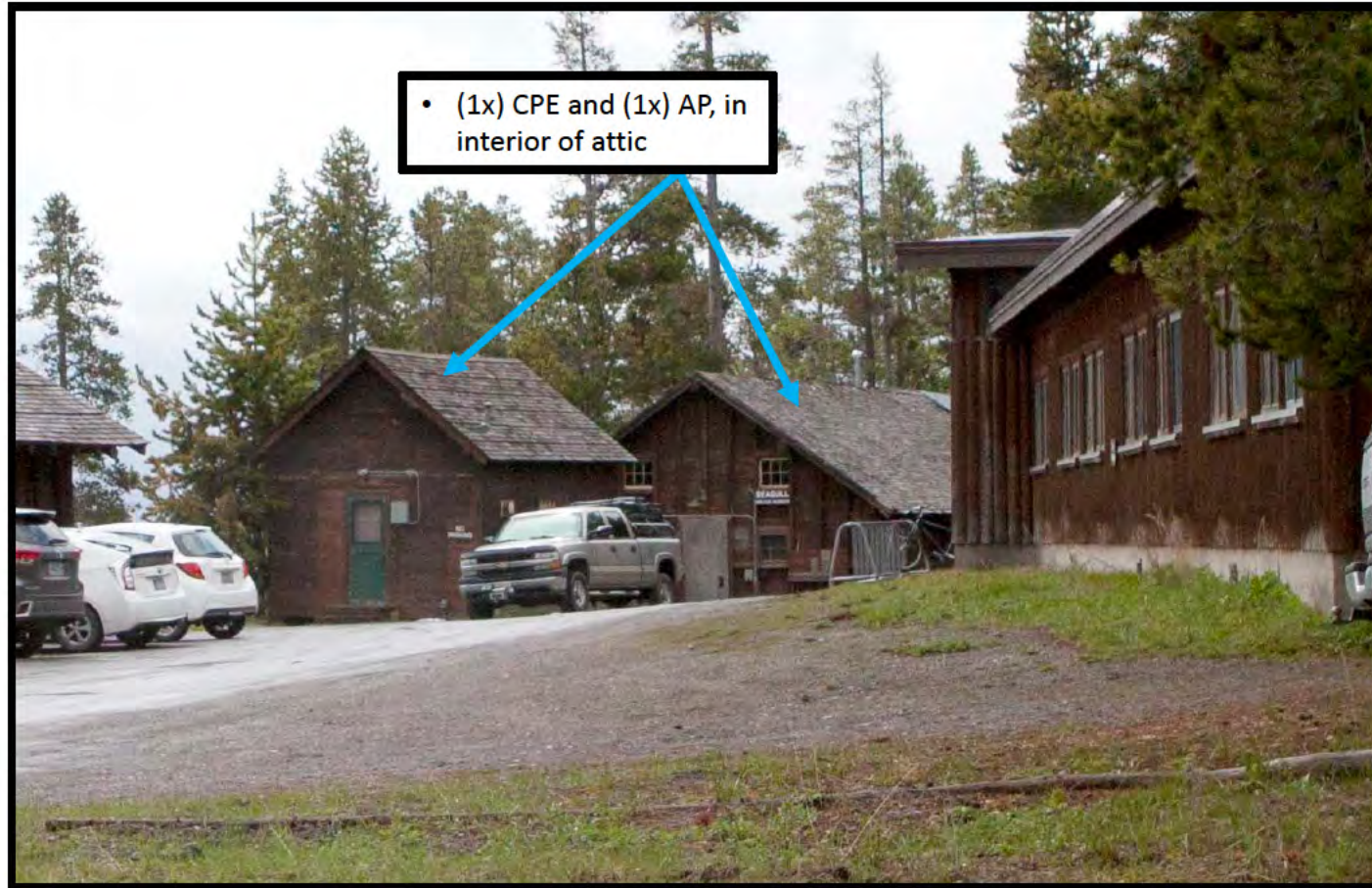
- One (1x) ████ GHz CPE per cabin
- CPE, switch and Wi-Fi AP located in interior of attic.
  - Ethernet with power from interior switch.

Lake Lodge Guest Cabins	
Area	Lake Hotel
NRHP Eligibility	District Contributors
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No



Lake Lodge Guest Cabins  
(typical)





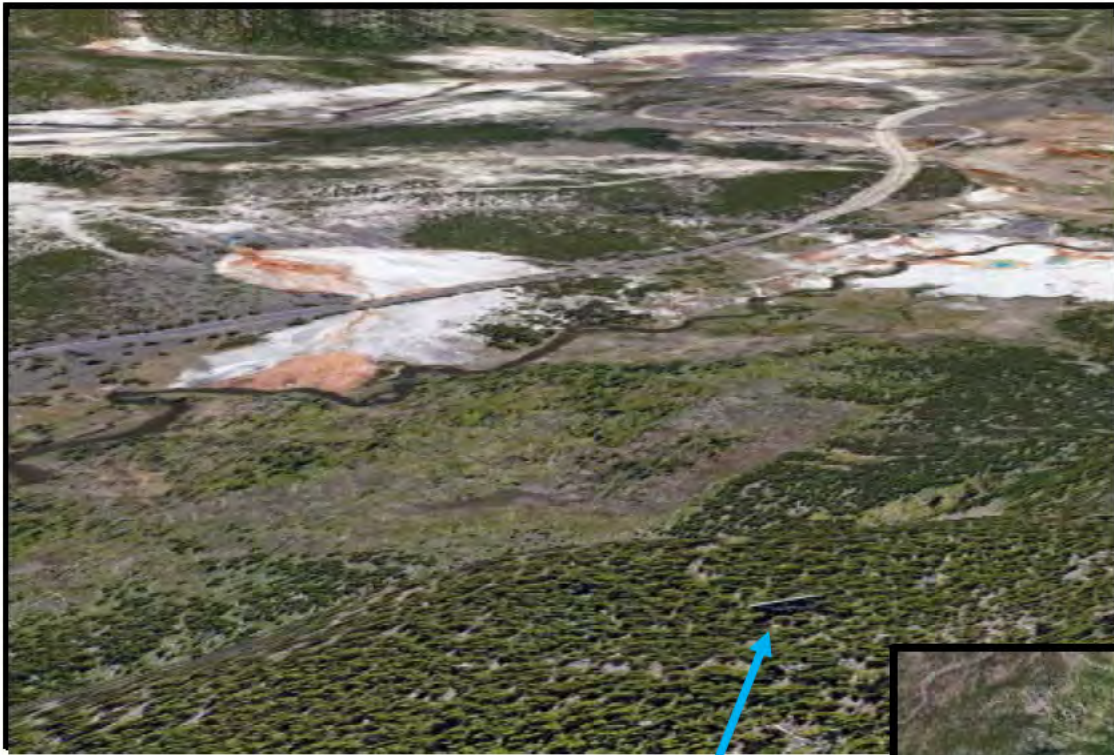
Lake Lodge Guest Cabins  
(typical)

# Old Faithful



# Old Faithful Area

Existing wireless coverage (known)



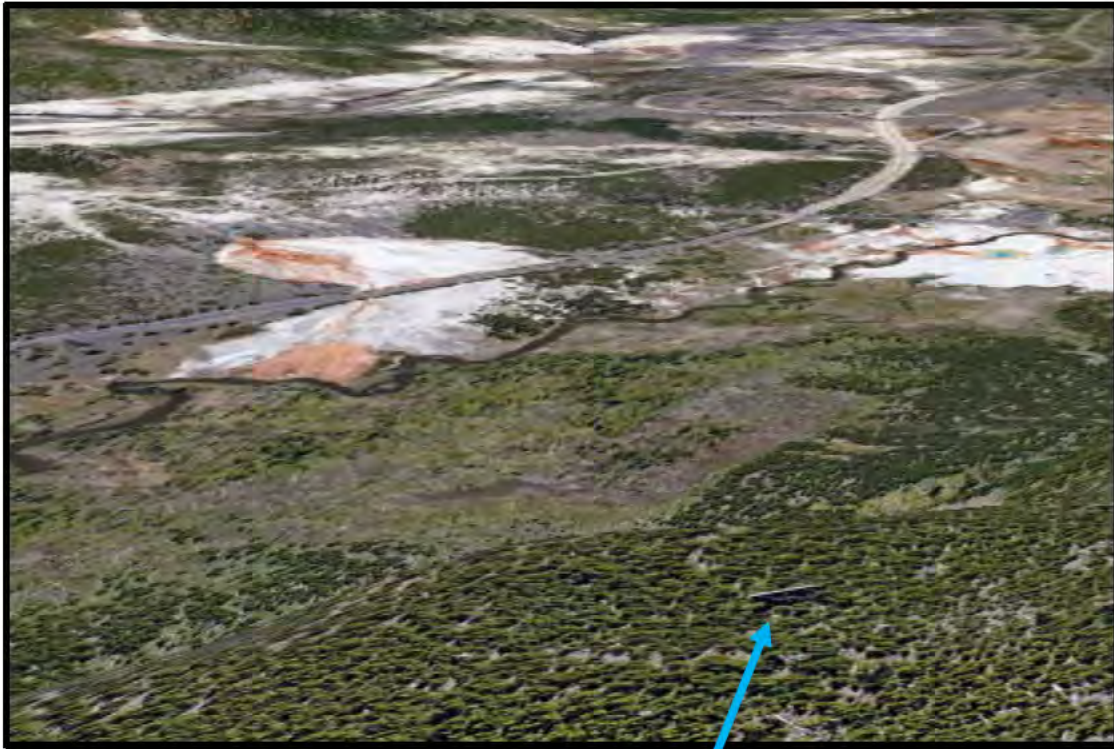
Existing tower (Century Link)  
Coords: 44.457N, -110.831W



Existing passive reflector  
(Century Link)  
Coords: 44.467N, -110.867W



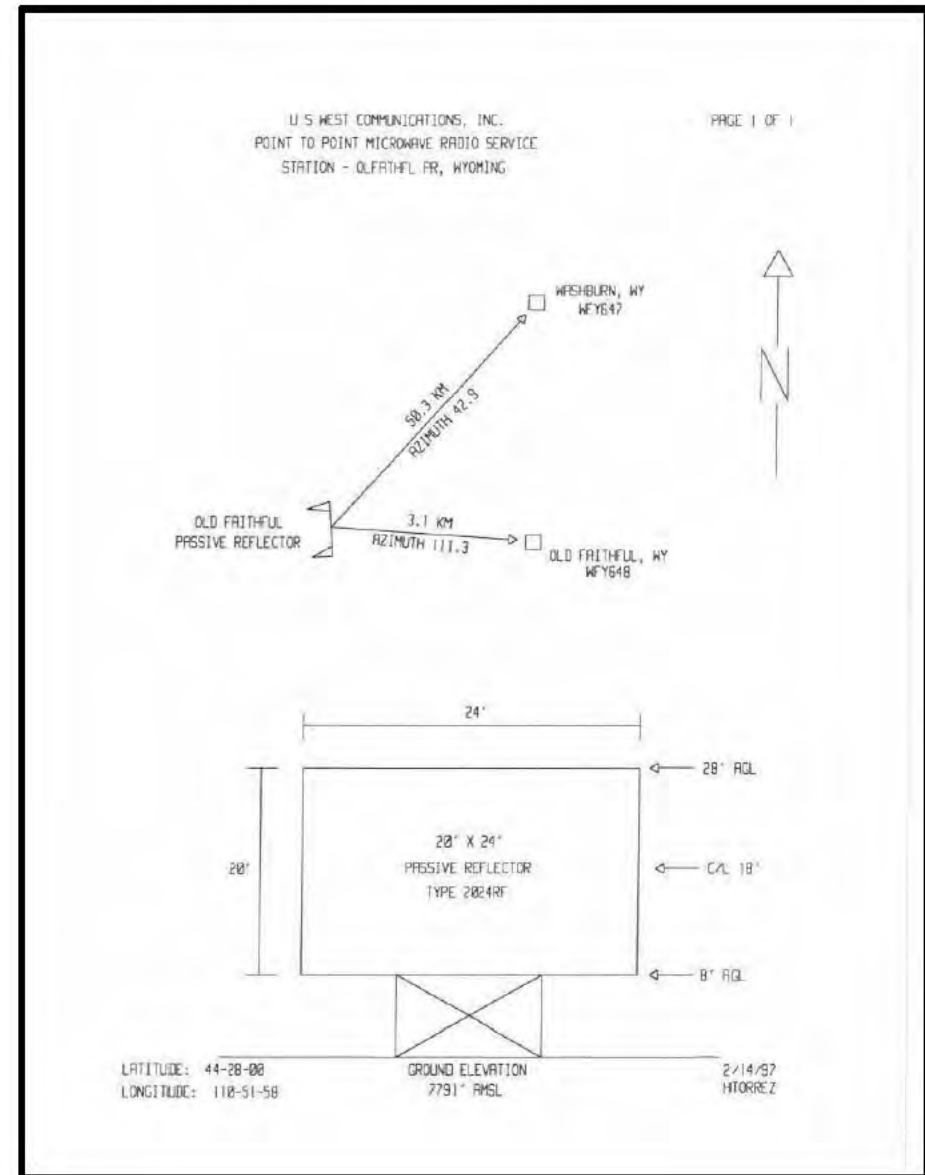




Existing passive reflector  
(Century Link)  
Coords: 44.467N, -110.867W

# Old Faithful Area

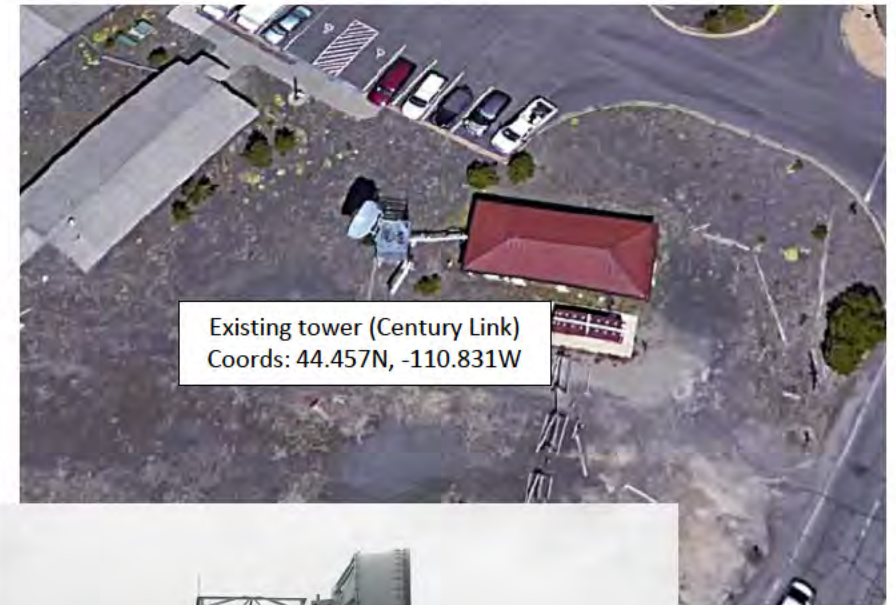
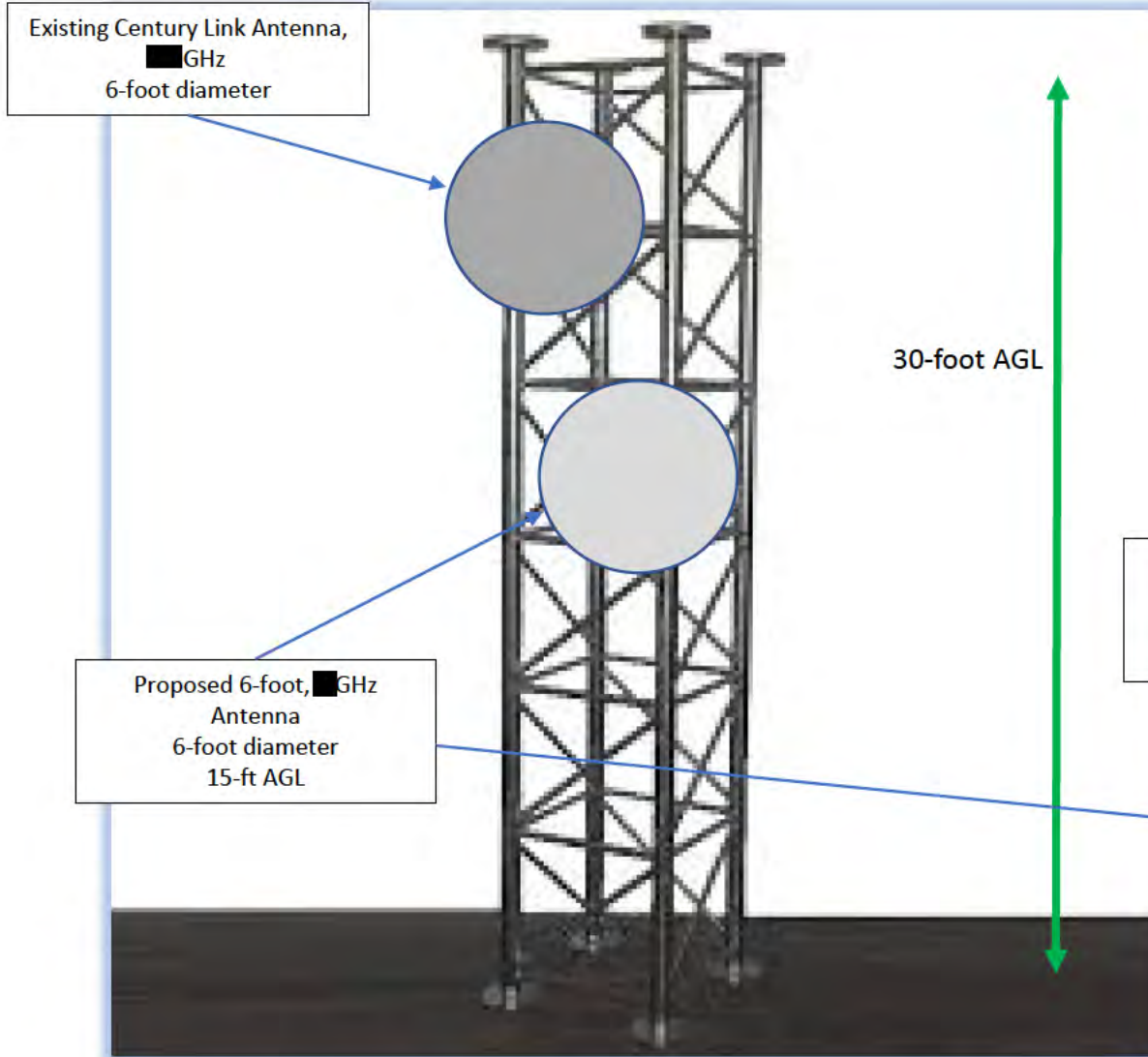
## Existing Century Link Passive Reflector





# Old Faithful Area

## Century Link Tower - Detail



Century Link has no site plan or elevation drawings. Full architectural survey and engineering to be completed prior to installation.



# Old Faithful Area

Proposed wireless coverage





# Old Faithful Area

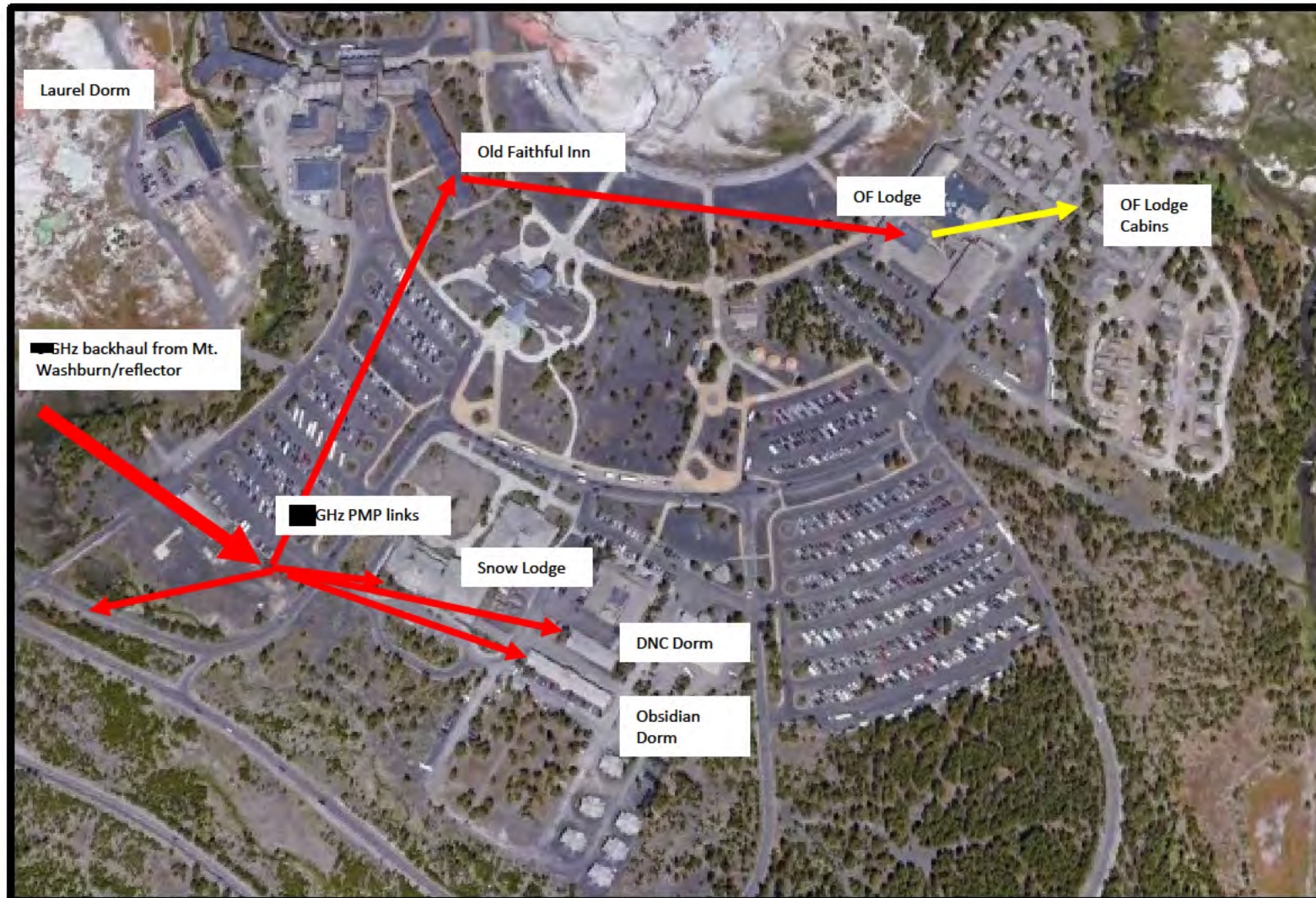
## Existing wireless coverage (known)



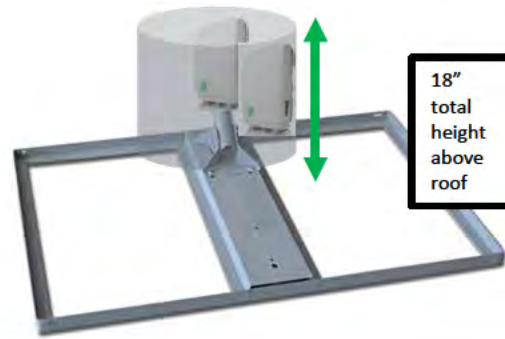


# Old Faithful Area

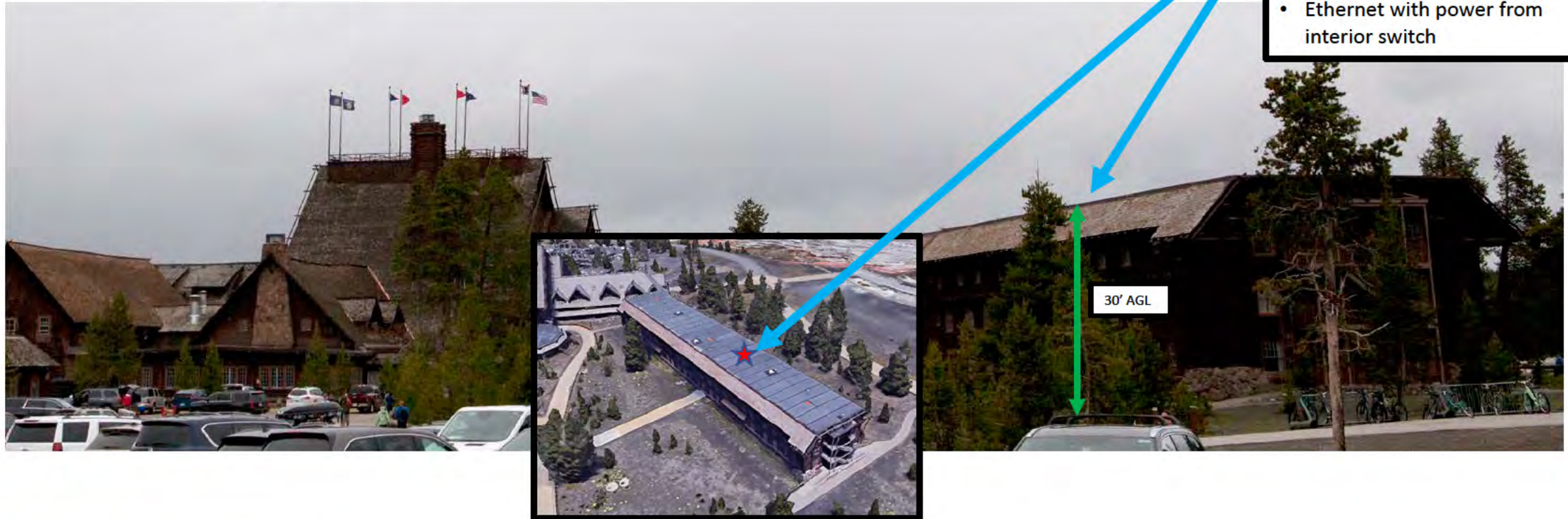
## Proposed wireless coverage







- RF-transparent screen wall
- 18" height, 24" diameter
  - Contains (2x) █ GHz radios, 7"x5"x3"
  - All equipment color-matched to background
  - 10-ft setback from edge; invisible to pedestrian traffic
  - Ethernet with power from interior switch



Old Faithful Inn	
Area	Old Faithful
NRHP Eligibility	National Historic Landmark
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

Old Faithful Inn  
Coords: 44.459N, -110.830W

# Old Faithful Inn – Roof Antenna



- Non-penetrating roof mount
- Enclosed by RF-transparent screen, 18" height, 24" diameter
  - (2x) 7"x5" antenna
  - Ethernet (2x) in conduit to roof hatch; 5-feet length



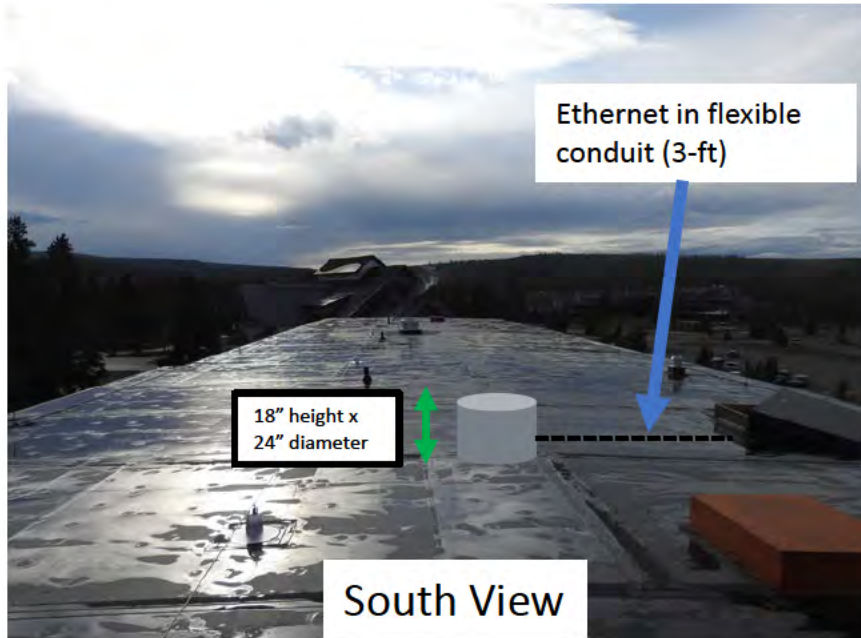
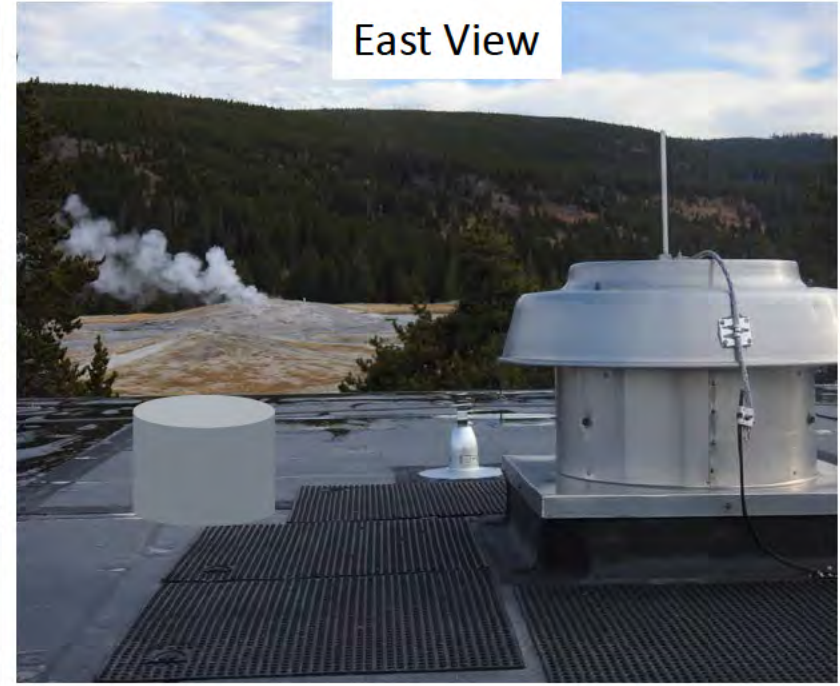
West View



North View



East View



Ethernet in flexible conduit (3-ft)

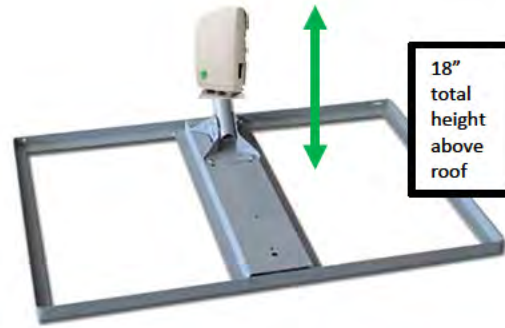
18" height x  
24" diameter

South View



¼" penetration for 2x Ethernet cable, through hatch framing. Weather-sealed and painted





18"  
total  
height  
above  
roof

Non-penetrating, self-ballasted  
mount

- (1x) 6 GHz CPE; 7"x5"x3"
- All equipment painted to match background
- Set back from edge; invisible to pedestrian traffic
- Ethernet with power from interior switch, using existing penetrations



20' AGL

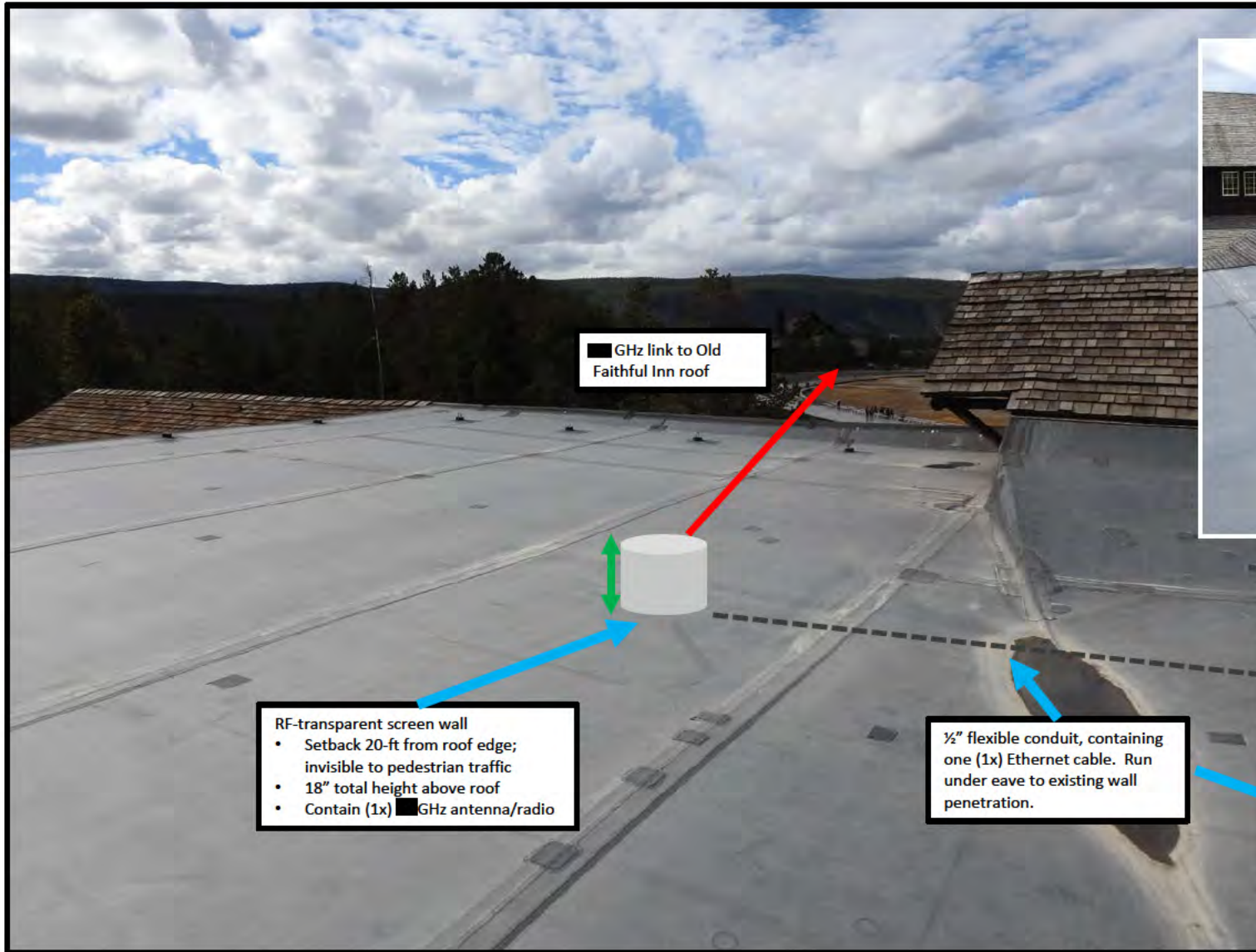


# Old Faithful Lodge

Coords: 44.459N, -110.826W

Old Faithful Lodge	
Area	Old Faithful
NRHP Eligibility	District Contributor
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	No



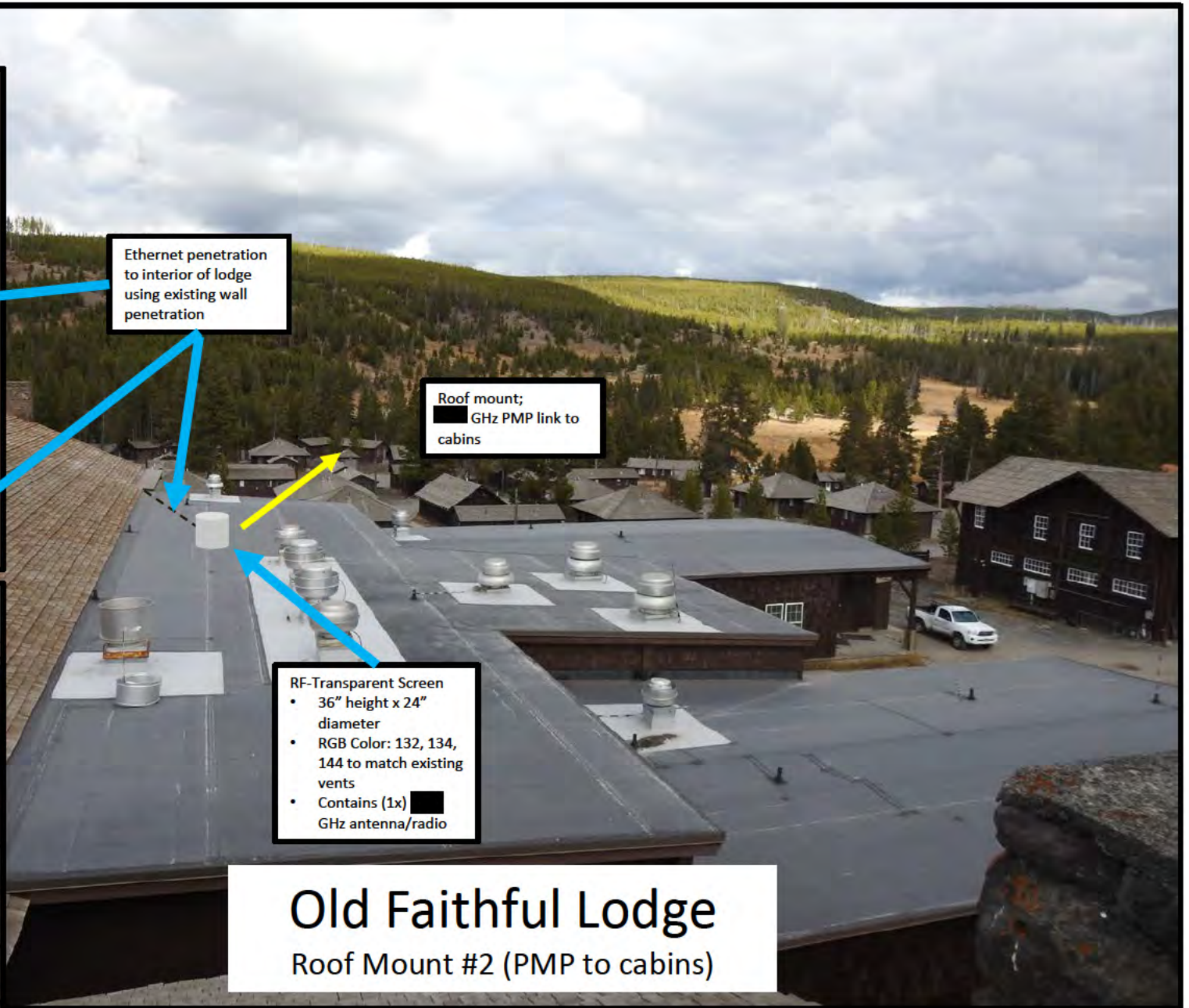


Old Faithful Lodge  
Roof Mount #1 (backhaul)





Ethernet penetration  
to interior of lodge  
using existing wall  
penetration



Roof mount;  
GHz PMP link to  
cabins

RF-Transparent Screen

- 36" height x 24" diameter
- RGB Color: 132, 134, 144 to match existing vents
- Contains (1x) GHz antenna/radio

## Old Faithful Lodge

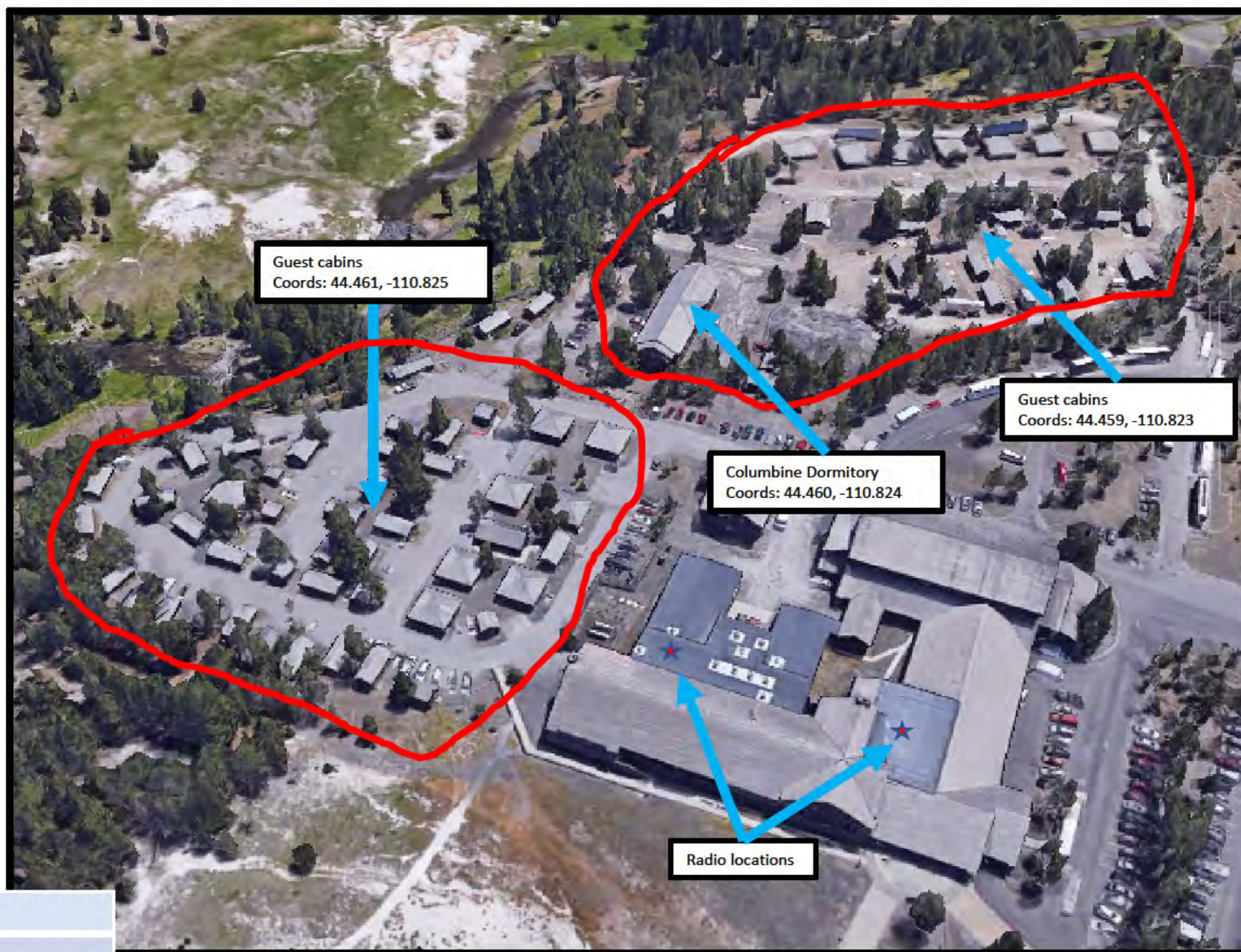
Roof Mount #2 (PMP to cabins)





Views from OF Lodge Cabins

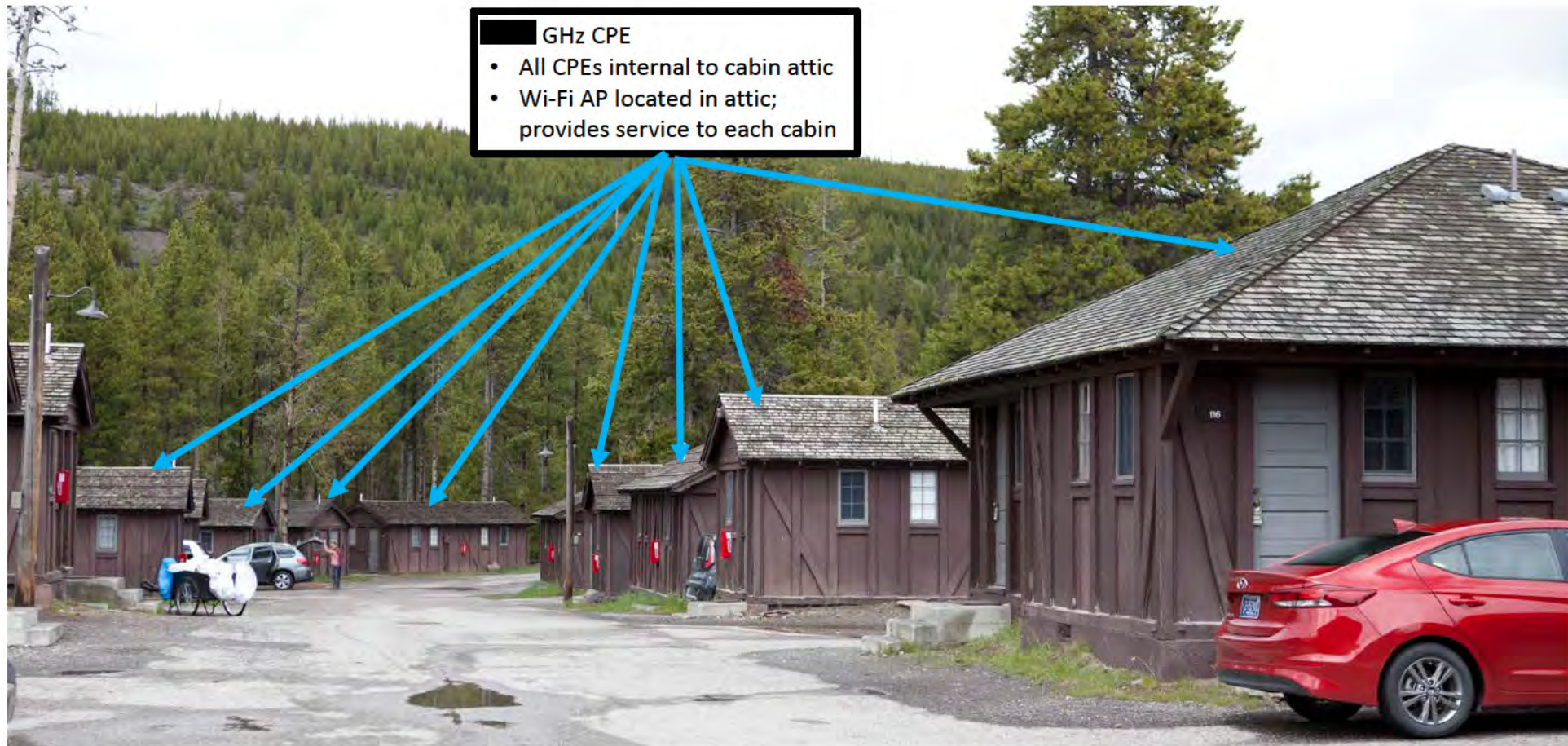




Year Built	Varies
Status	Contributor
ACHP Program Comment Cat.	VII.C.1

Old Faithful Lodge – 161 Guest Cabins





Old Faithful Lodge – Guest Cabins  
(161 units - typical)

Coords: 44.460, -110.825





- GHz CPE
- Equipment painted to match background
  - Ethernet with power from interior switch
  - ¼" wall penetration under eave, for cabling to attic. Weather-proofed and painted



Columbine Dormitory	
Area	Old Faithful
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

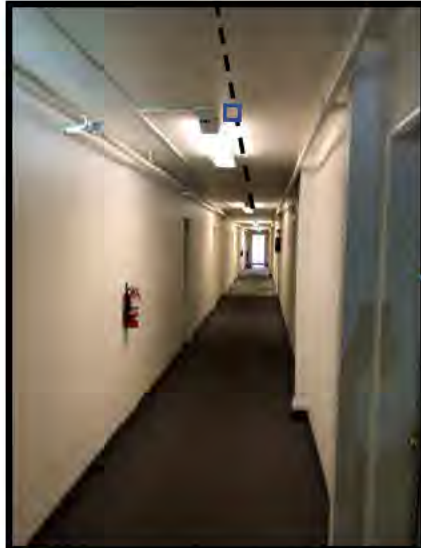
## Columbine Dormitory

Coords: 44.883N, -110.459W

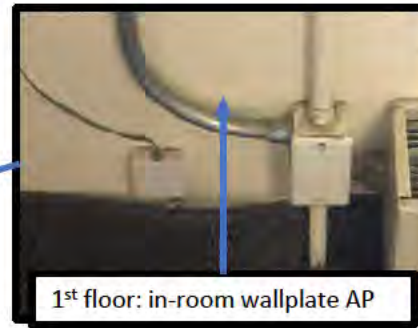
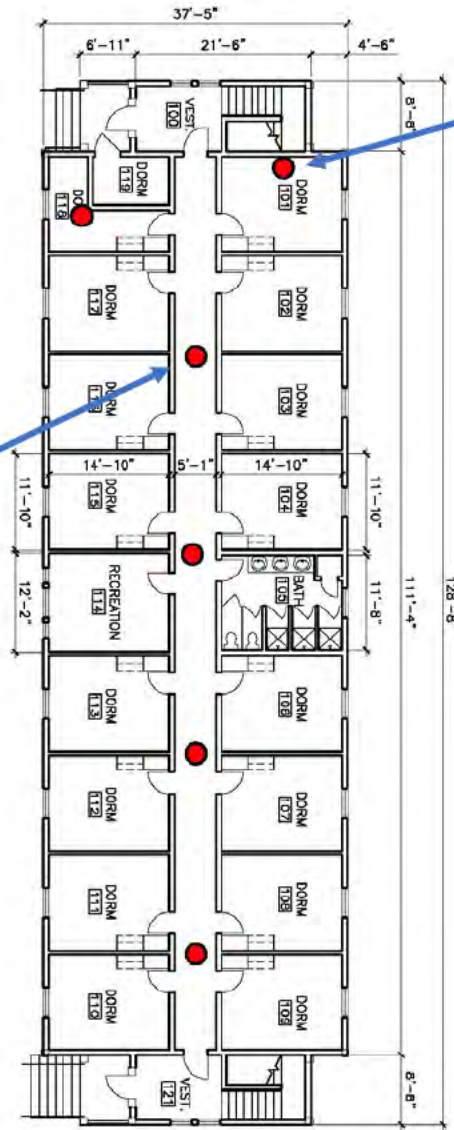


## 1<sup>st</sup> Floor

First Floor: 6  
Second Floor 6  
Total 12 Access Points



1<sup>st</sup> floor: extend existing raceway in hallway



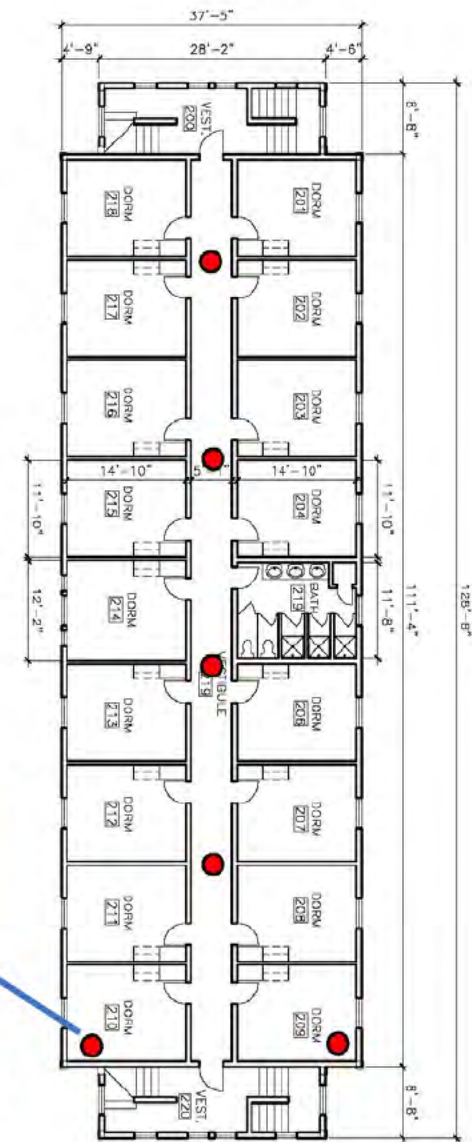
1<sup>st</sup> floor: in-room wallplate AP

### Wi-Fi AP Placement

- Hallway raceway only on 1<sup>st</sup> floor
- 2<sup>nd</sup> floor access/cabling from attic; no exposed raceway/cabling



## 2<sup>nd</sup> Floor



## Columbine Dormitory

(1x) █ GHz CPE at rear of building



Snow Lodge	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Snow Lodge  
Coord: 44.457N, -110.829W





- GHz CPE**
- 7"x5"x3"
  - Equipment painted to match background
  - Ethernet with power from interior switch
  - ¼-in penetration in siding under eave, for Ethernet cable to interior. Weather-sealed and painted.



View from CPE  
to OF Tower





18' AGL

## Laurel Dormitory

Coords: 44.459N, -110.833W

Laurel Dormitory	
Area	Old Faithful
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

### GHz CPE

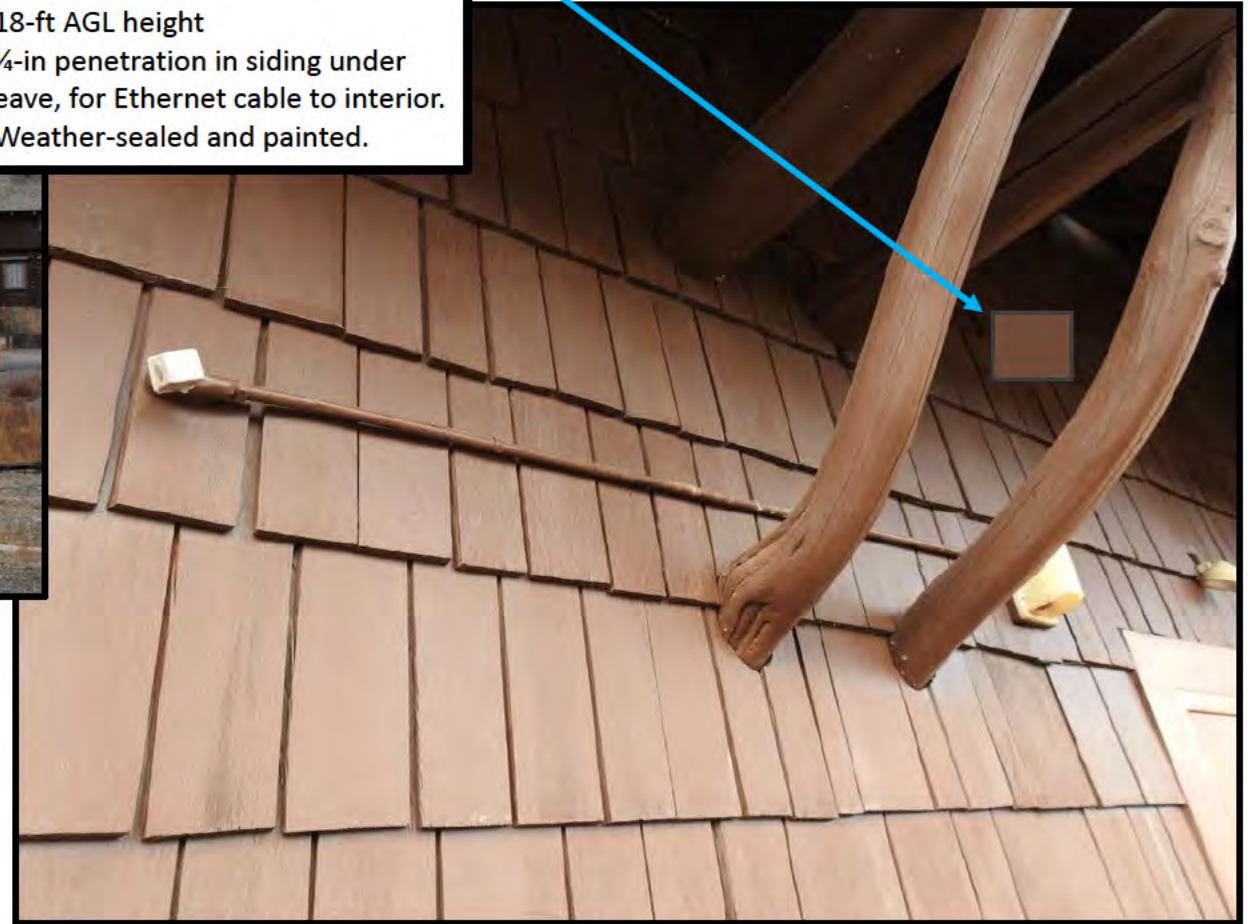
- 7"x5"x3"
- All equipment painted to match background
- Ethernet with power from interior switch
- ¼-in penetration in siding under eave, for Ethernet cable to interior. Weather-sealed and painted.







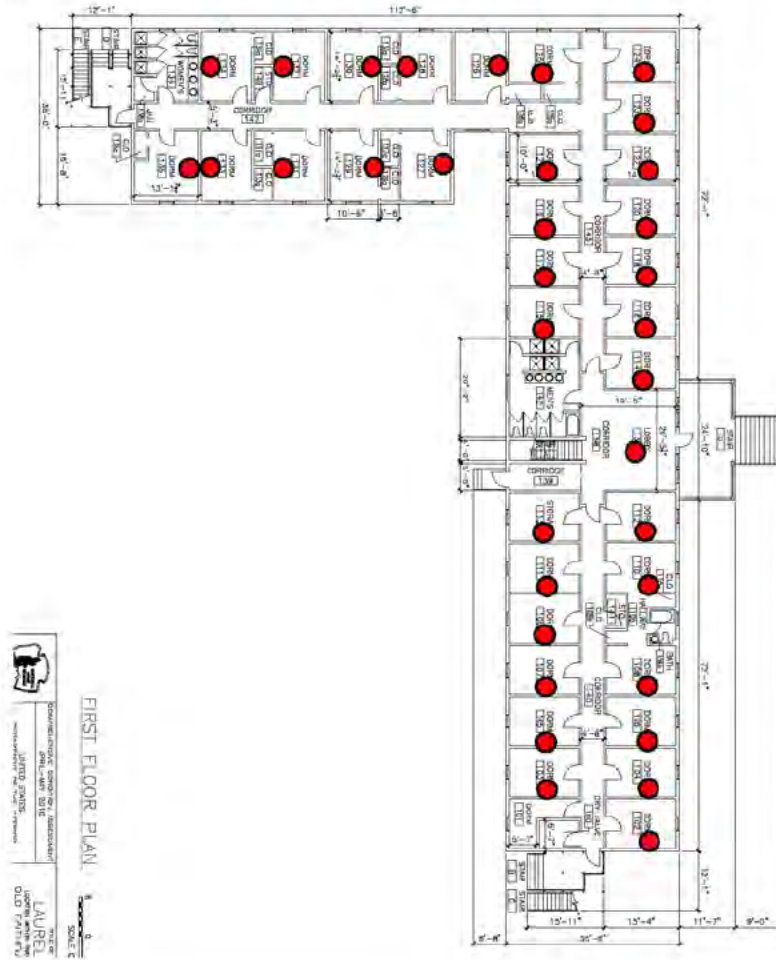
- GHz CPE
- 7"x5"x3"
  - Painted to match façade; RGB code 113, 76, 58
  - All equipment painted to match background
  - Ethernet with power from interior switch
  - 18-ft AGL height
  - ¼-in penetration in siding under eave, for Ethernet cable to interior. Weather-sealed and painted.



**Laurel Dormitory**  
Coords: 44.459N, -110.833W

First Floor: 35  
Second Floor 38

Total 73 Access Points



#### Wi-Fi AP Placement

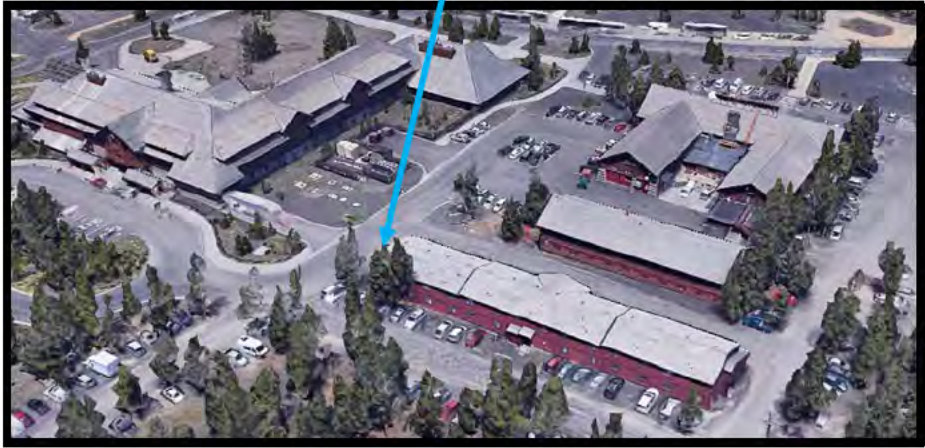
- One AP per room; wallplate mounted
- Access from attic and basement allow for AP placement
- All cable runs hidden inside attic or basement

Laurel Dormitory





- GHz CPE**
- 7"x5"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch
  - ¼-in penetration in siding under eave, for Ethernet cable to interior. Weather-sealed and painted.



Obsidian Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Obsidian Dormitory  
 Coords: 44.456N, -110.828W



- GHz CPE
- 7"x5"x3"
  - All equipment painted to match background
  - Ethernet with power from interior switch
  - Ethernet cabling to interior using existing building penetration for TV antenna

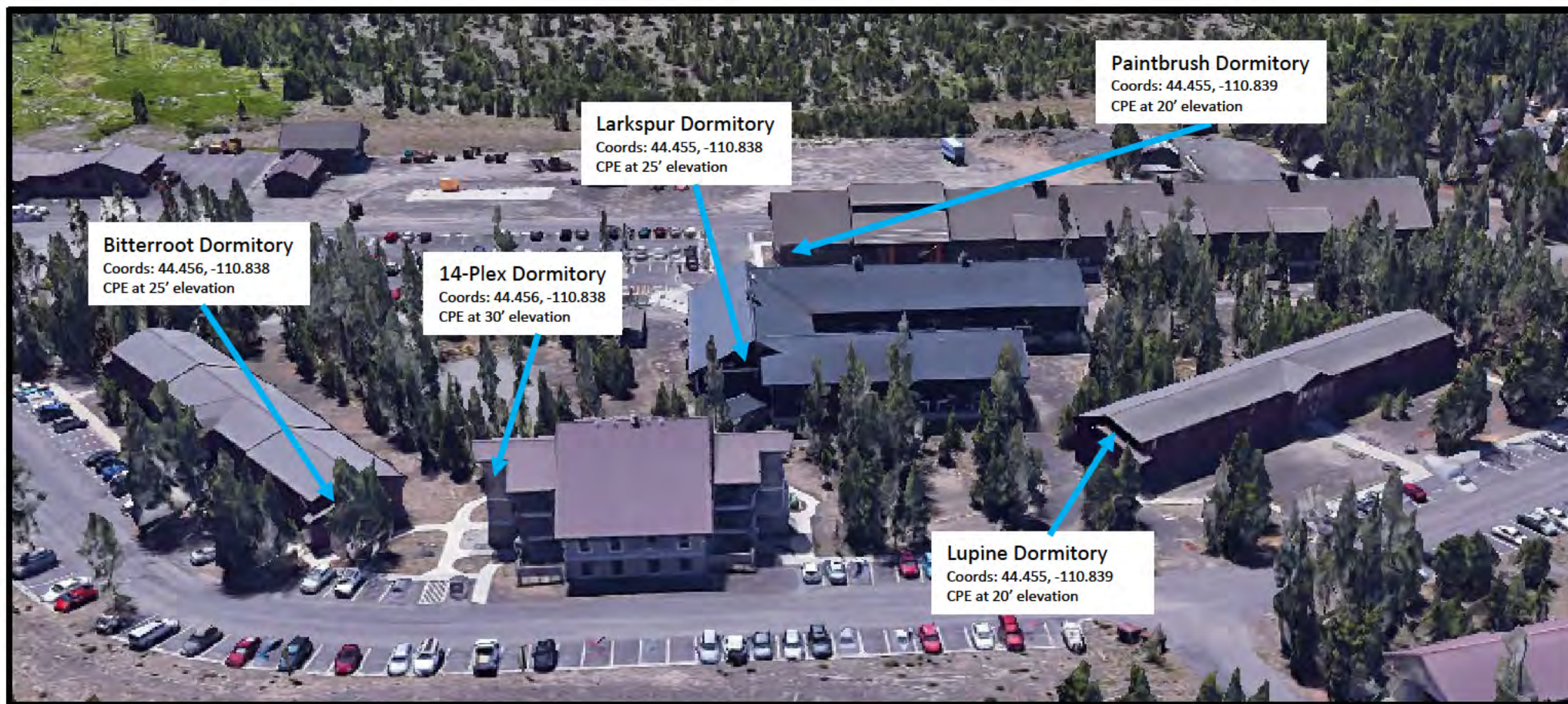
# Delaware North Dormitory

Coords: 44.456N, -110.828W

OF-Delaware North (YGS) Dormitory	
Area	Old Faithful
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	No







Old Faithful Utility Area - Dormitories





#### 3.65 GHz CPE

- 9"x9"x3" 3.65 GHz CPE
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using existing building penetration for TV antenna
- CPE at 20' elevation



#### Wi-Fi AP Placement:

- Attached to dropped ceiling T-bar.
- Cabling run above dropped ceiling

Lupine Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	No

## Lupine Dormitory

Coords: 44.455N, -110.839W





- GHz CPE**
- 9"x9"x3" 3.65 GHz CPE
  - All equipment painted to match background
  - Ethernet with power from interior switch
  - Ethernet cabling to interior using ¼" wall penetration under eave, to interior attic
  - CPE at 30' elevation

14-Plex Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## 14-Plex Dormitory

Coords: 44.456N, -110.838W





- GHz CPE**
- 9"x9"x3" ■ GHz CPE
  - All equipment painted to match background
  - Ethernet with power from interior switch
  - Ethernet cabling to interior using ¼" wall penetration under eave, to interior attic
  - CPE at 20-ft AGL

- Wi-Fi AP Placement**
- One AP per room; ceiling mounted
  - Ethernet run to rooms from within dropped ceiling. No exposed raceway.



Bitterroot Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Bitterroot Dormitory

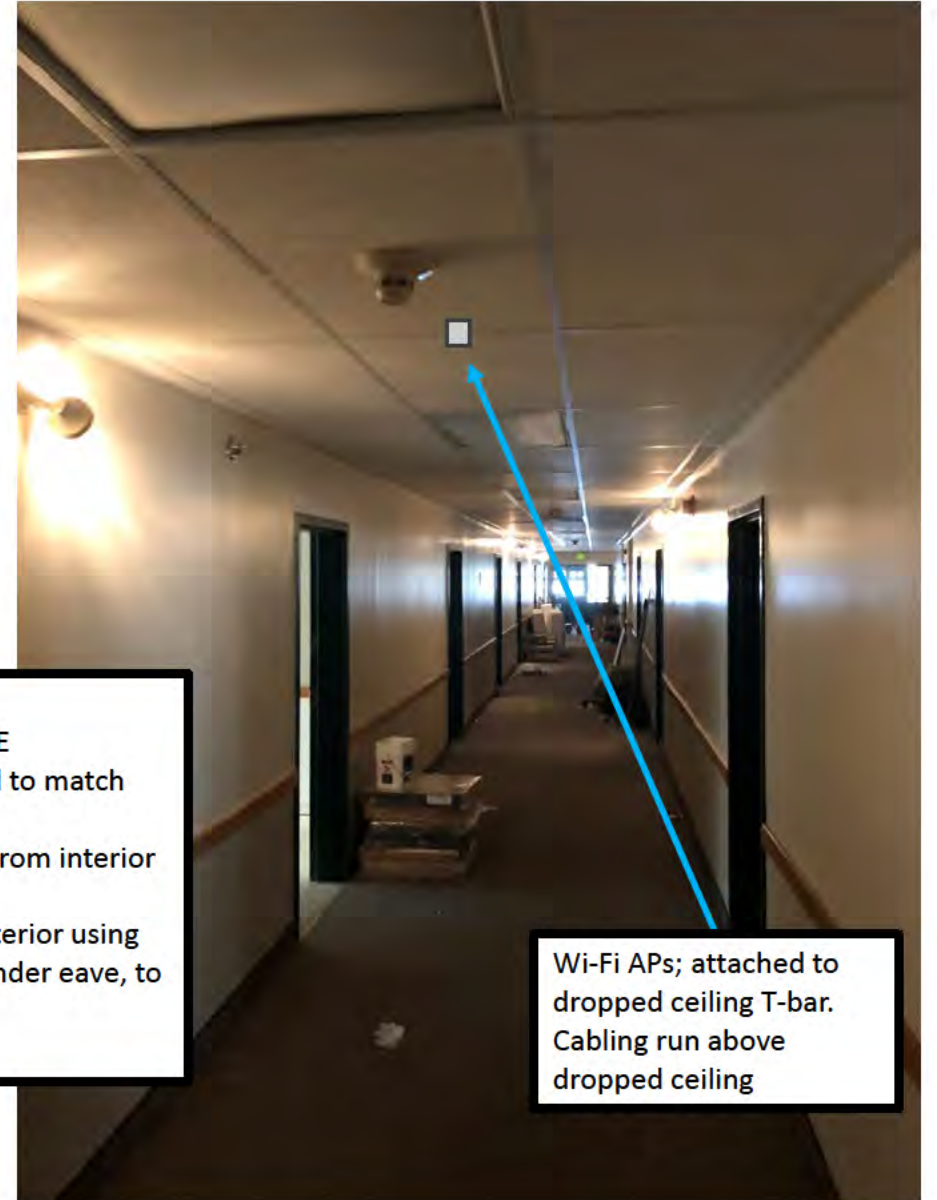
Coords: 44.456N, -110.838W





■ 3.65 GHz CPE

- 9"x9"x3" 3.65 GHz CPE
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using 1/4" wall penetration under eave, to interior attic
- CPE at 25-ft AGL



Wi-Fi APs; attached to dropped ceiling T-bar. Cabling run above dropped ceiling

Larkspur Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Larkspur Dormitory

Coords: 44.455N, -110.838W





#### ■ GHz CPE

- 9"x9"x3" 3.65 GHz CPE
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using ¼" wall penetration under eave, to interior attic
- CPE at 20-ft AGL



Wi-Fi APs; attached using same method as existing APs; cabling run in ceiling soffit

Paintbrush Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

## Paintbrush Dormitory

Coords: 44.455N, -110.839W





# ACCESSPARKS

Broadband as Great as  
the Outdoors