



4G Small Cell Solutions for Sonoma  
Design Packet & Vaulting Analysis

"Sonoma 006"

"Sonoma 007"

"Sonoma 012"

City Council Meeting  
June 15, 2020



Alternative Design Options & Vaulting Analysis  
Verizon Wireless 4G Small Cell  
"Sonoma 006, 007 and 012"

Packet Contents

Sonoma 006:

- Existing Photo and Aerial View Map Location
- Verizon Design - Equipment on New Light Pole shielded by Street Signs and Antenna on top.
- Vault View, Street Impact, Power Disconnect and Antenna on Proposed City Light Pole
- Open Vault of Exposed Equipment and Associated Supporting Infrastructure
- Vault Feasibility Analysis
- Verizon Response to Syndeo's Vault Product (City Proposed Vault Company)

Sonoma 007:

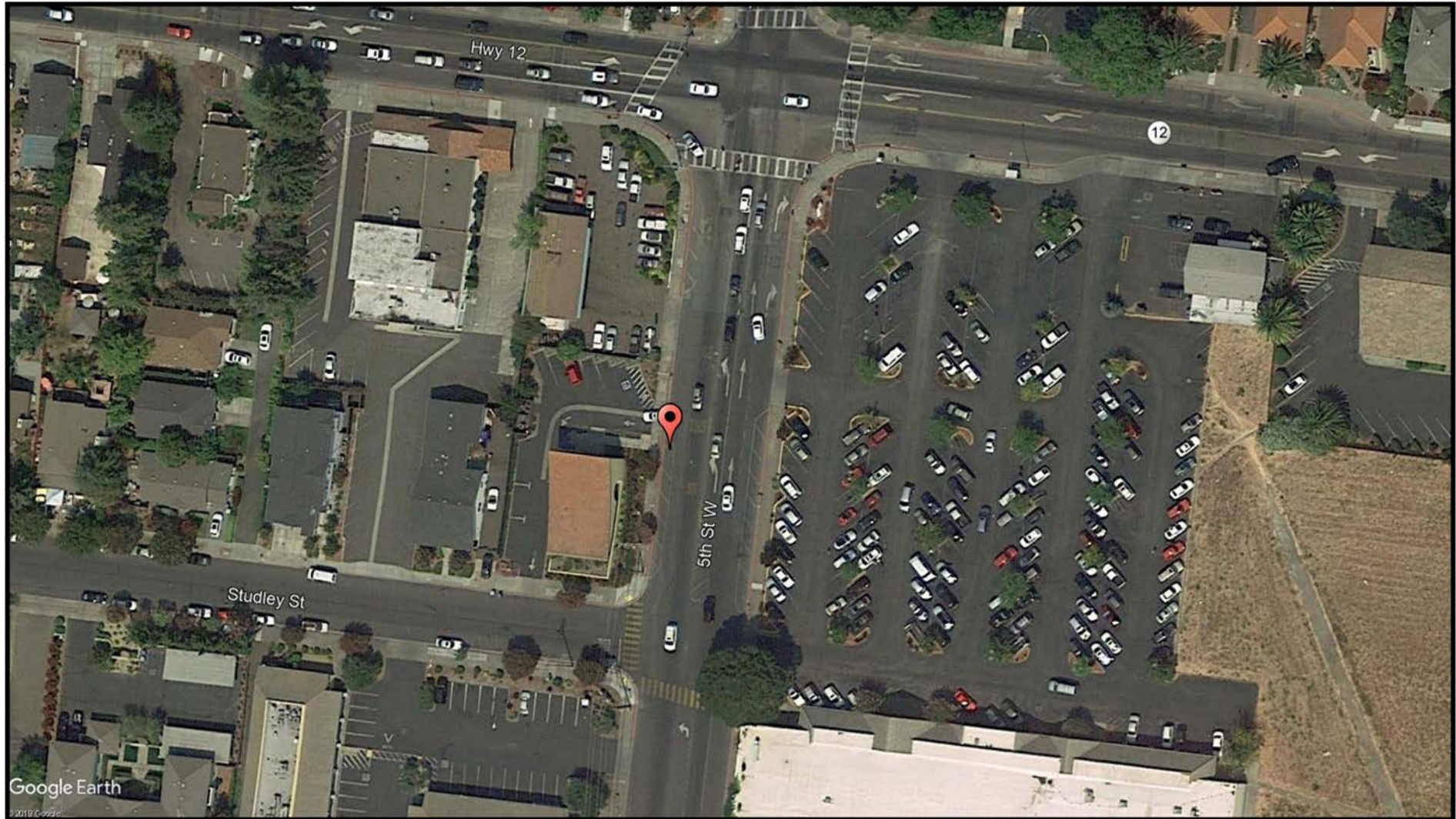
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# SONOMA 006 Street Light Pole Design

531 5th Street West  
Sonoma, CA 95476  
(Adjacent to US Bank)  
Location Code: 425161  
Site Coordinates: 38.292306,-122.468269







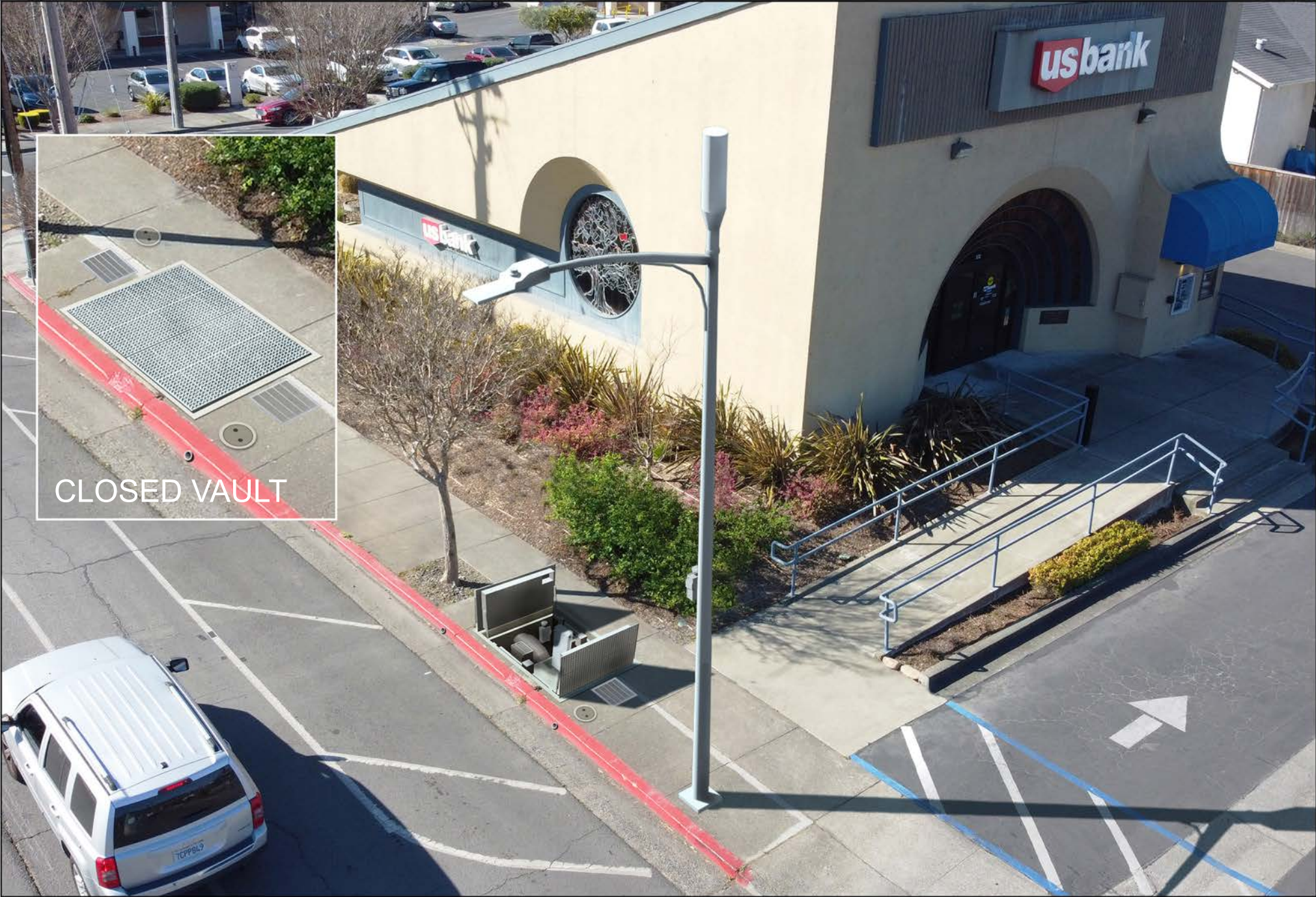






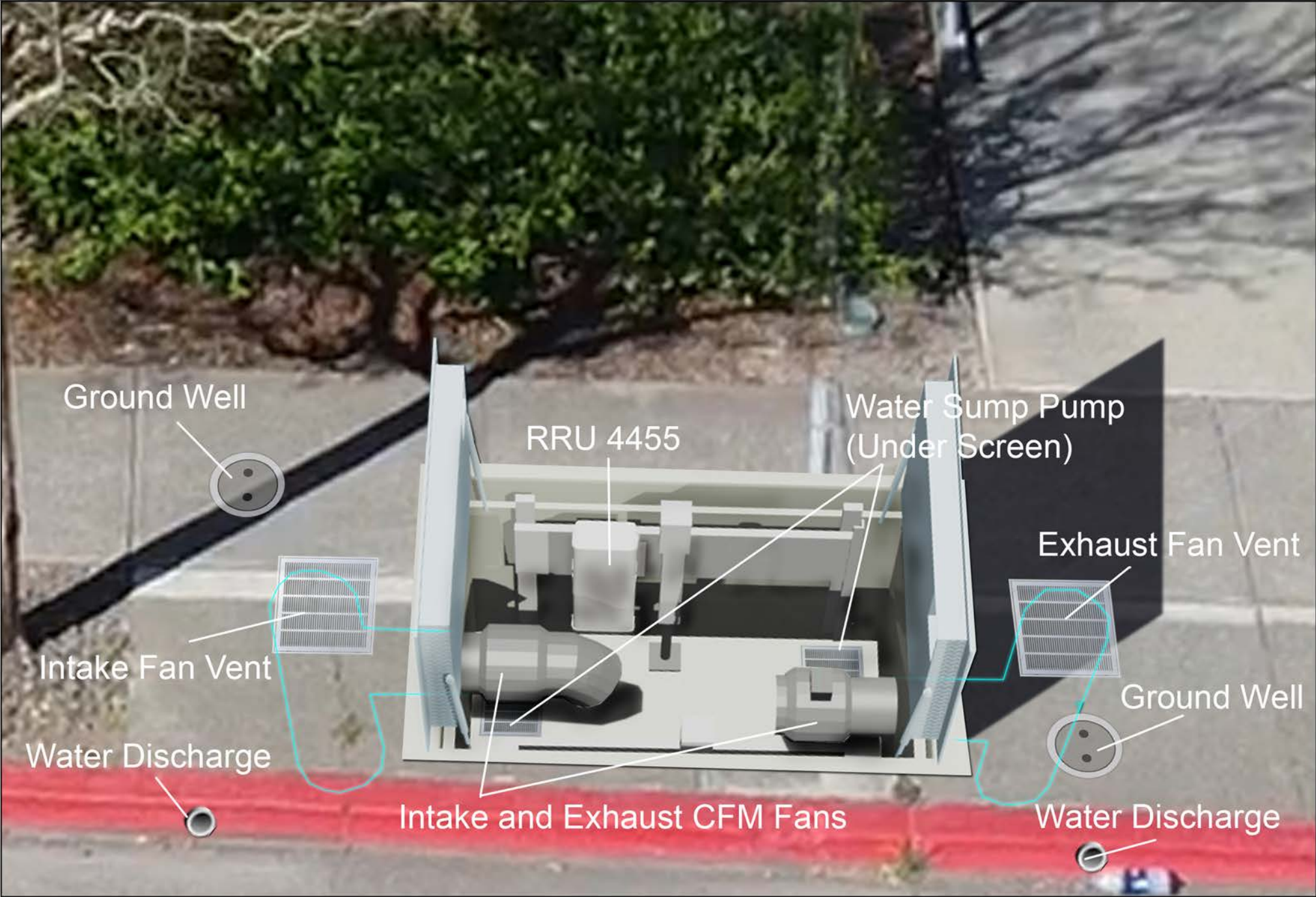






CLOSED VAULT







# Verizon Small Cell Underground Vaulting Feasibility Analysis

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Proposed Utility Pole Location: 500 5<sup>th</sup> Street West Sonoma CA

Verizon Small Cell Reference "Sonoma 006"

Prepared: October 3, 2018



Prepared for:  
City of Sonoma  
Planning Department  
No. 1 The Plaza  
Sonoma, CA 95476-6618



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Site Acquisition. Engineering & Design. Project & Construction Management, Field Services



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## 1. Introduction

In June 2017, Verizon Wireless proposed a small cell wireless facility on an existing wooden utility pole near 500 5<sup>th</sup> Street West in Sonoma, California (the "Project"). The Project includes placing a canister antenna, two remote radio units, and related equipment on a replacement wooden utility pole. On August 9, 2018, the City of Sonoma's Planning Department (the "Planning Department") issued design revision recommendations for the Project, which included undergrounding as much equipment as possible instead of mounting them to the utility pole. Verizon Wireless contracted The CBR Group, Inc. to analyze the feasibility of undergrounding as much of the Project as possible. This report informs the City of Sonoma (the "City") of impacts associated with undergrounding the proposed telecommunication equipment.

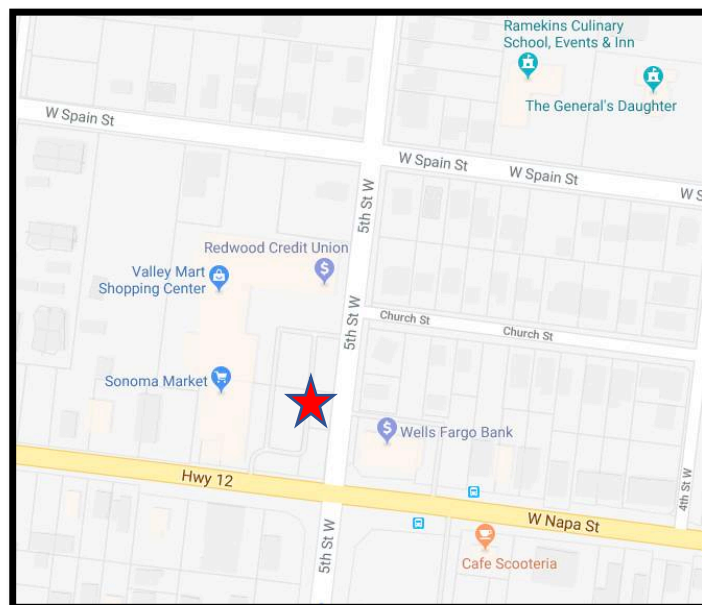
## 2. Executive Summary

The CBR Group has analyzed the feasibility of adding an underground vault to the Project. Due to technological and regulatory limitations, the only equipment that can be undergrounded are the two remote radio units. Consequently, this analysis contemplates the impacts of housing the remote radios units in an underground vault in lieu of mounting the radios on an existing (replacement) utility pole. This Underground Vaulting Feasibility Analysis presents the physical and operational impediments associated with vaulting Verizon Wireless's radio equipment. Weighing the impacts of vaulting the equipment versus any potential aesthetic benefits of vaulting, the analysis concludes that vaulting for this node is infeasible for Verizon Wireless.

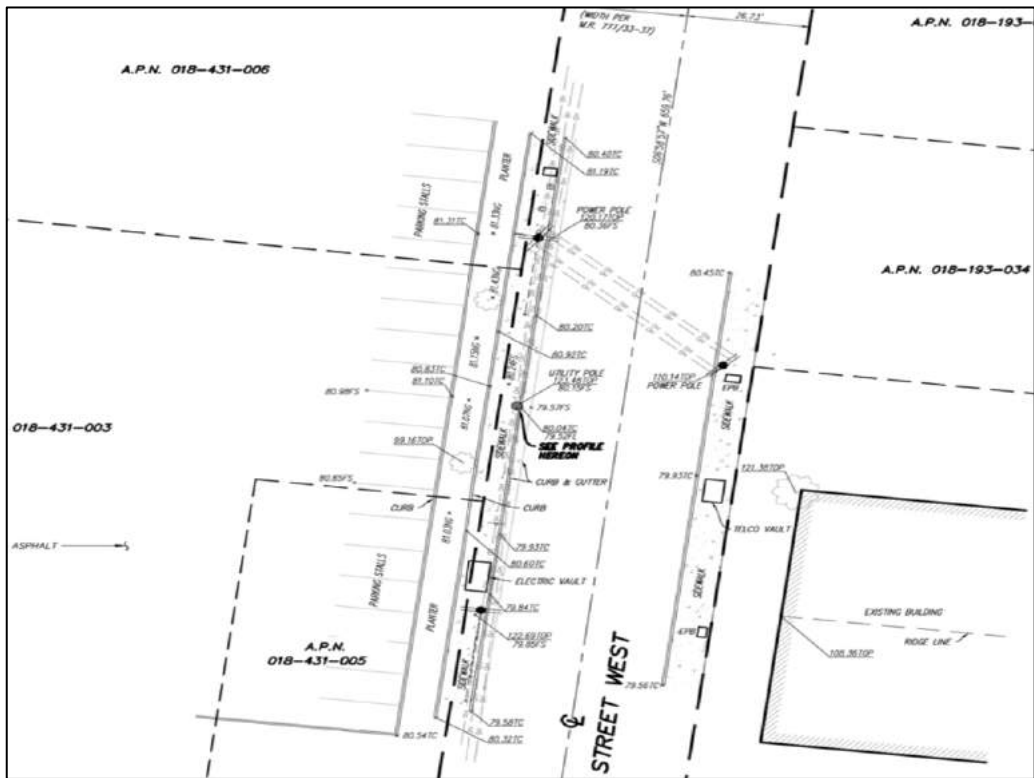
## 3. Project Description

The Project's purpose is to provide enhanced Verizon Wireless service through improved coverage in the vicinity of the Sonoma Marketplace Shopping Center. It will also expand capacity in Verizon Wireless's network in the City. Details of the Verizon Network requirements addressed by these facilities have been provided to the City's independent peer reviewer under a non-disclosure agreement.

Location: Verizon Wireless is proposing to install a small cell node at on existing utility pole near Sonoma Valley Center at 500 5<sup>th</sup> Street West, Sonoma. This location is within a mixed-use area of Sonoma in front of the Sonoma Market parking lot. See location exhibits below:







Map of the Pole location

Survey of Pole in the Public ROW



Photograph of Existing Pole

#### *Equipment Listing:*

The following equipment listed below is proposed to be added to a new 43-ft. above ground level replacement wooden utility pole located in the public right-of-way. See photo above of existing utility pole.

Listed below is all the Verizon equipment proposed to be added to the replacement pole:

- Install (1) canister antenna on mid-section of utility pole
- Install (1) new utility disconnect switch on pole
- Install (1) electrical meter on the pole
- Install appropriate signage, ground rods and buss bar
- Install conduit for power, telco, and coax
- install two (2) new Remote Radio Units (RRUs) on existing utility pole. At the City's request, Verizon Wireless has agreed to reduce the number of RRUs from 3 to 2 in order to minimize aesthetic impacts on the pole. – The RRUs are the only components of the small cell that can be removed from the pole and if it were feasible, placed in a vault.

All equipment, cable and conduit runs planned to be on the pole will be painted brown to match the pole.

#### Antenna:

The antenna is cylindrical in shape, measuring 24 inches high and 14.6 inches in diameter. The antenna would be situated approximately 28 feet high, from the center of the antenna, on the new pole. The antenna mounting bracket is about 12 inches.



Please note, that the Planning Department requested the Verizon reduce the size of the antenna from 48" to 24" to assist with the appearance of the proposed facility. Verizon Wireless has agreed to accommodate that request.

#### Radio Units:

The RRUs will be mounted at a height between 10 and 18 feet on the pole depending upon the screening technique preferred by the city and painted dark brown to match the pole. The two RRUs are each 27.2 inches tall, 12.1 inches wide and 7.0 inches deep.

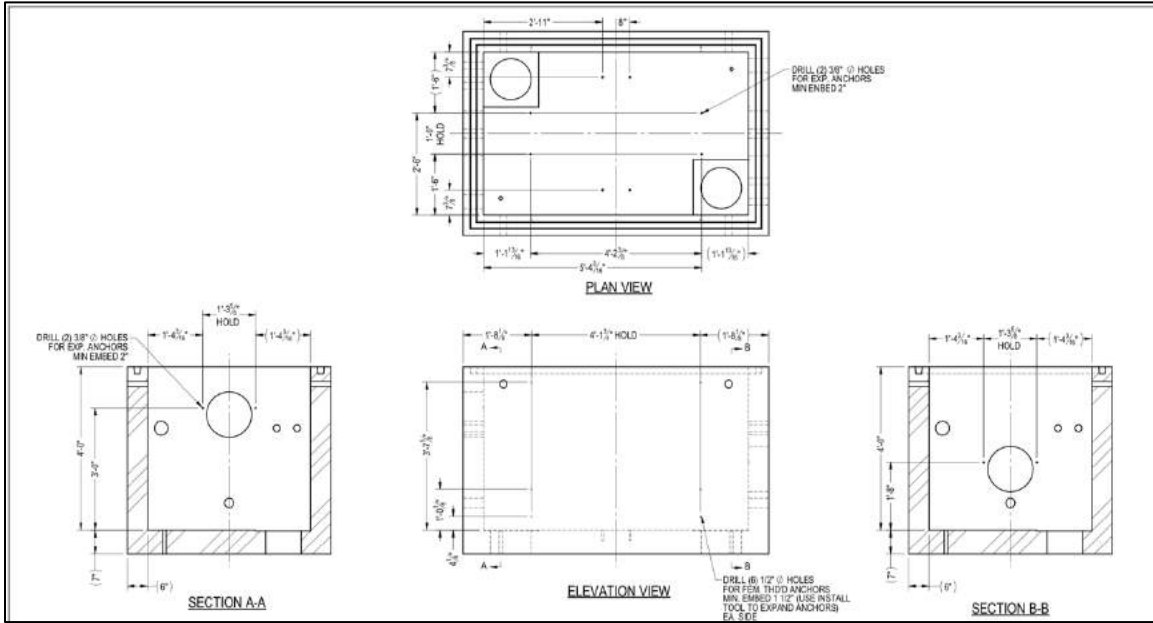
## 4. Vault Specifications

Due to technological and regulatory constraints, very few of the components for the Project can be undergrounded. For example, the antenna cannot effectively operate if its signal is obstructed. As a result, it has to remain mounted on the utility pole with line of sight to end users. The pole itself is regulated by multiple entities, including the California Public Utilities Commission, PG&E, and the Northern California Joint Pole Authority. The rules and regulations promulgated by these bodies closely regulate the size, shape, weight, and location of all the equipment required to install a new small cell wireless facility. The regulations also prohibit undergrounding certain equipment and require equipment placement at certain pole heights. The utility disconnect and PG&E meter must be located at certain heights on the pole so that PG&E can access them quickly and easily, especially in the event of an emergency. See, e.g., California Public Utilities Commission General Order 95, Rules For Overhead Electric Line Construction. Likewise, the warning signage must be located above ground and on the pole below the antennas in order to effectively inform pole workers. The conduit, which connects the radios and other equipment to the antenna, must be located up the pole in order to reach the antenna. As a result of these physical and regulatory limitations, the only two pieces of equipment that may be placed in the vault are the two remote radio units.

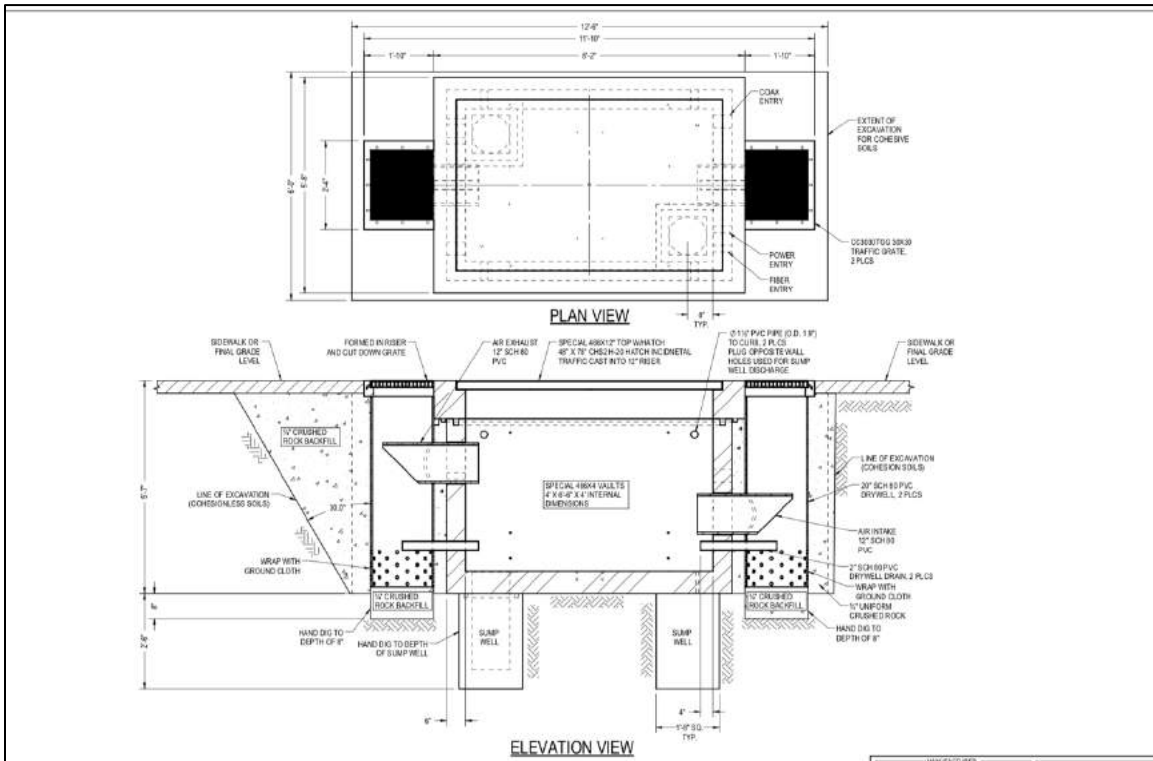
The following three exhibits below show vault specifications and profile of the Western Utility Vault ID-717 recently installed by Verizon Wireless contractor, Crown Castle, for the installation of equivalent radios to those proposed for Sonoma small cells.

These vault specifications show a narrow 4' by 6' interior vault area for radios. The exterior dimensions of the vault are 6' by 8'. In addition two 28-inch square vents are placed at either end of the vault to keep the equipment cool and therefore functional. The excavation pit required for the vault is approximately 10' by 18' by 8' deep. Dewatering pipes lead up to the curb and discharge water through holes to keep water out of the vault in an effort to keep the radio equipment dry. Because the radios are designed to be passively cooled when located on the pole, they require cooling fans for airflow over their exterior heat syncs. In addition, sump pumps are required to dewater the vault in the event of flooding. After the excavation has been completed and shoring installed to OSHA standards, the vault is lowered into the pit by crane. The vault must be near the pole in order to avoid unacceptable line loss between the radios and antennas.

### Vault Dimensions/Layout

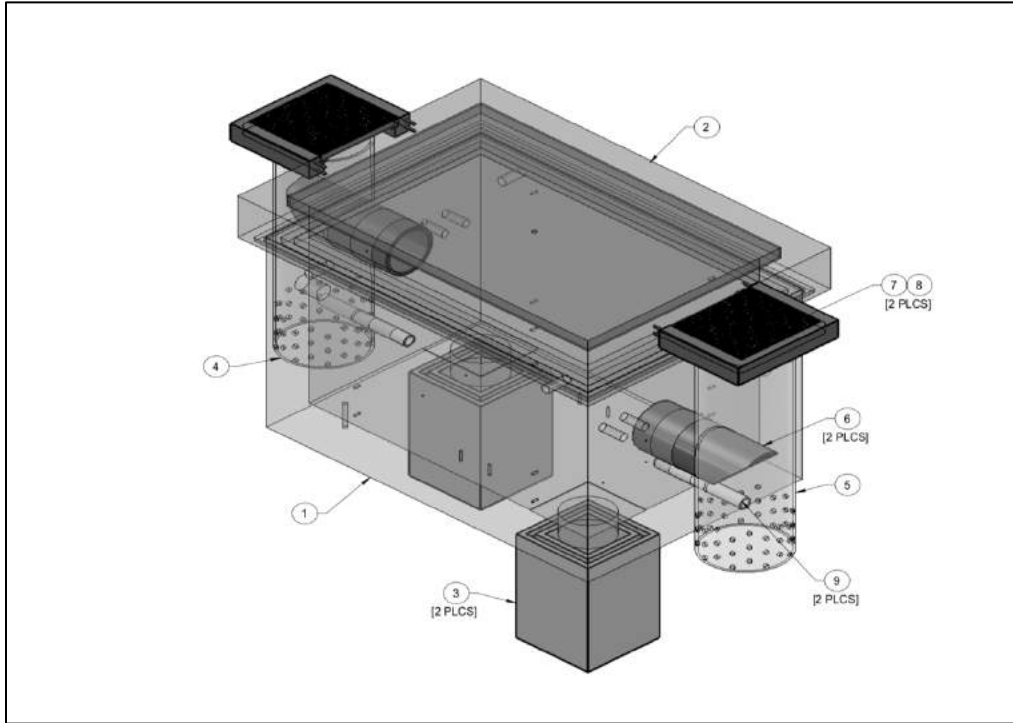


### Vault Elevation View





Vault Cross Sectional View



## 5. Feasibility Considerations

- a. Construction Impacts: Heavy construction will occur near Hwy 12. Excavation of the required 10' by 18' pit will create significant temporary impacts to the street and sidewalk during construction. Vault installation will require approximately 30 days of excavation, delivery, and installation, creating substantial dust and noise impacts for pedestrians and vehicles over an extended period of time. The table below shows the construction timelines comparison with proposed pole mounted radios. Subsequent photographs show vault construction impact from excavation, shoring, and safety requirements.

	Existing Proposal Timeline Impact	Vault Construction Timeline Impact	Impact Comparison
Construction Timeline Impacts	3-5 days	30-45 days	300%-450% more impactful congested near major Hwy 12 thoroughfare

The four photos below show the large pit and construction area required to accommodate the vault including the perimeter spacing requirements for construction workers and equipment. The construction and staging area is several times larger than the vault itself primarily due to OSHA shoring requirements for workers safety.

## Excavation of Hole for Vault



## Construction in Progress - Details



Vault

Venting

Drainage

Shoring Area Surrounding Vault

Ground test well

Additional Trenching from vault to pole – not shown in photo



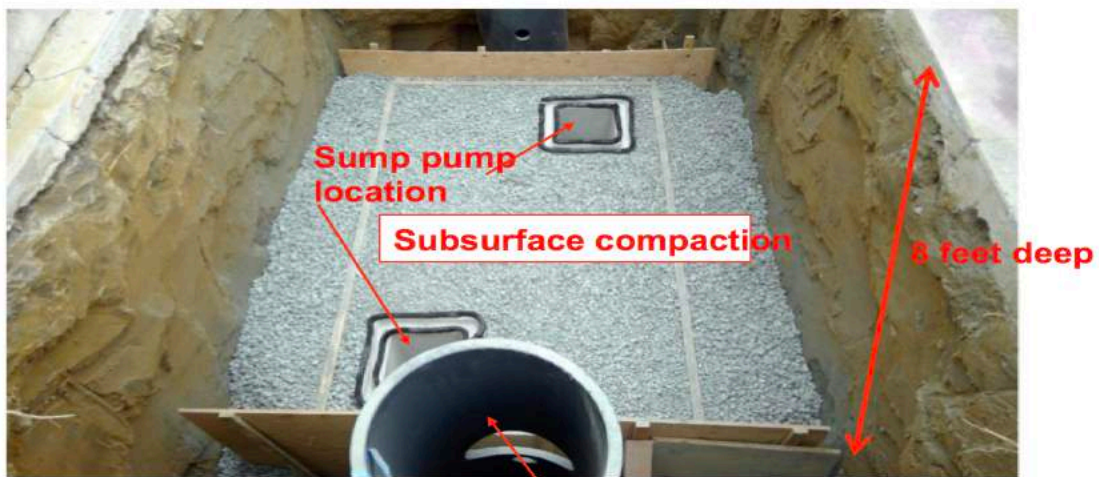
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## Crane Installation (2-3 days)



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## Vault and Venting Area – 900 cu. ft.



Venting Tube (1 of 2)

- b. Traffic/Pedestrian Impacts: During construction, sidewalk closure and lane closure will continue for approximately 30-45 days, impeding pedestrian travel and diminishing the service level of 5th Street West. In contrast, pole mounted antennas will only require 1-2 days for installation. Traffic impacts will also occur during maintenance of the vault, including sidewalk closure approximately once every 6 months and more often during inclement weather.

## Daily Sidewalk Closure, Signs, and Cleanup



## Daily Hole Protection and Safety Practices Installed



Additional traffic hazards risks for this location may arise due to the mislabeling of underground lines, siting errors and/or existing shallow underground conduits. In August 2017, these conditions in this area



led to traffic light outages. Refer to Sonoma Press Democrat news article, dated August 2, 2017 (photo below):

<https://www.sonomanews.com/news/7265882-181/streetlights-fail-at-5th-st?sba=AAS>



Caltrans workers responded swiftly to the report of traffic lights completely nonfunctioning at the Fifth Street West and West Napa intersection. (Phot by Robbi Pengelly/Index-Tribune)

- c. Operational Challenges – Vaulting creates unwarranted operational risks for Verizon Wireless facilities including with respect to reliability, maintenance, and safety.

#### 1. Reliability

Following installation of vaults by Crown Castle, Verizon Wireless has experienced unacceptable reliability risks. Water intrusion into vaults has caused radio failure as sump pumps are unable to dewater the vault during heavy rainstorms when storm water backs up on curbs. Noise generated from venting has prevented continuous cooling and resulted in radio failure due to overheating. Regular power outages have exacerbated both flooding and overheating when pumps and fans are inoperable. Facility reliability has been sufficiently compromised by vaulting in northern California to halt the installation of future vaults by Verizon Wireless pending the development of newer technologies.

#### 2. Maintenance

Maintenance of vaulted radios creates additional unacceptable operational requirements for Verizon Wireless. Maintenance in the vault requires sidewalk closure with signage and safety precautions. Vaulting maintenance may also require lane closure for component replacement. Vaulting maintenance requires a minimum of two maintenance personnel as one individual must remain outside the vault while maintenance is being conducted inside of the vault. All of these requirements delay the response to maintenance requirements and jeopardize the Verizon Wireless network.

#### 3. Safety

Vaulting creates additional safety hazards during maintenance and general operation. Additional maintenance safety requirements are described above. In addition, maintenance personnel are

more susceptible to hazardous working conditions inside the vault due to vermin and bacteria. Permanent placement of the vault creates permanent pedestrian trip hazards and uneven surfaces.

See links below regarding dangers for workers and OSHA's opinion:

<https://incident-prevention.com/ip-articles/underground-electrical-vaults-safety-concerns-and-controls>

<https://www.osha.gov/SLTC/hydrogensulfide/index.html>

- d. Noise Impact: Vaulting requires ventilation fans and vents and a sump pump, both of which produce noise and may not comply with Sonoma's Noise ordinance.
- e. Cost impact: Vaulting of the radios results in a 5-fold increase in construction costs. Maintenance costs for the vault are similarly increased over placement of the radios on the pole. While this may not sound like a meaningful difference, such a large cost increase makes it difficult for Verizon Wireless to ensure that all communities have reliable current generation wireless service in a timely manner.
- f. Aesthetic Considerations / Comparison: Photo simulations provided below show the proposed facility placing all the equipment on the existing utility pole compared to placing the RRUs in the underground vault.
- g. Permanent Impacts:
  - I. Adding an underground utility vault is a permanent impediment to the City's use of the Right of Way. Surface level hatches will always be present.
  - II. Pathway hindrance with future undergrounding of utilities and current and future conduit paths would be blocked that will cause significant challenges if existing overhead utilities are to be undergrounded in the area.
  - III. Vaulting will likely become obsolete for future wireless technologies as antennas and radios are integrated.



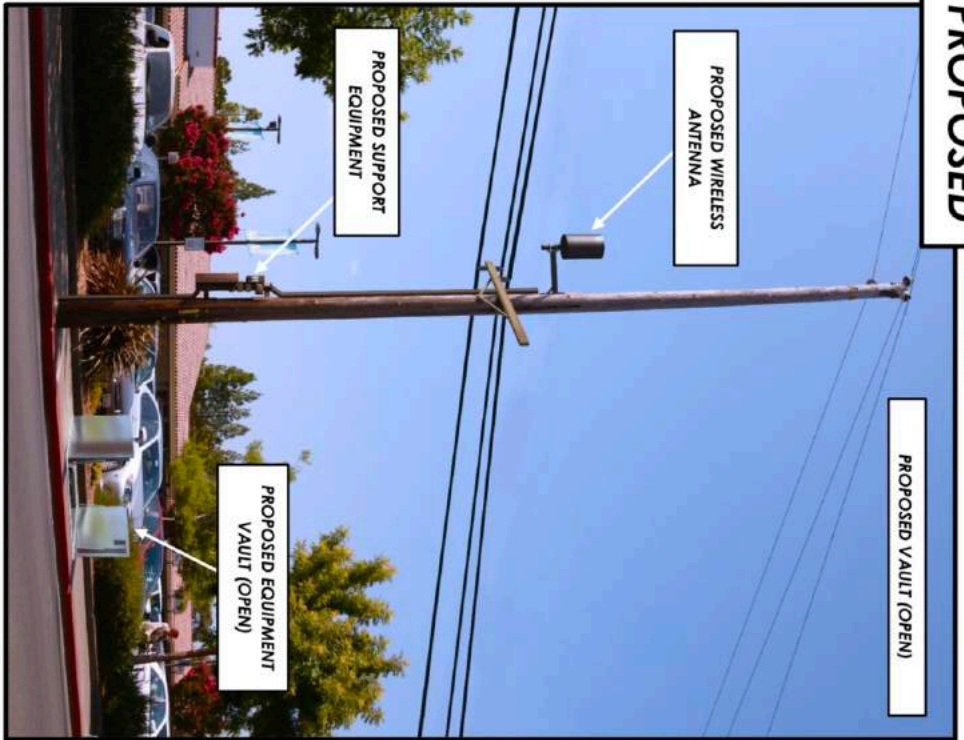
**PROPOSED**



PROPOSED WIRELESS  
ANTENNA

PROPOSED SUPPORT  
EQUIPMENT

**PROPOSED**



PROPOSED WIRELESS  
ANTENNA

PROPOSED SUPPORT  
EQUIPMENT

PROPOSED VAULT (OPEN)

PROPOSED EQUIPMENT  
VAULT (OPEN)

Comparison Photo of Proposed Equipment Planned Placement on Pole as compared to Removal of the RRU's and placed underground utility vault below the sidewalk.

## 6. Summary

Vaulting of Verizon Wireless radios creates significant impacts to Verizon Wireless's network in a manner that unacceptably compromises reliability. Impacts are summarized below.

Feasibility Considerations
<ul style="list-style-type: none"><li>• Construction Impacts: duration and extent of excavation creates excessive and unnecessary soils disturbance</li></ul>
<ul style="list-style-type: none"><li>• Traffic and Pedestrian Impacts: vaulting creates significant impediments to pedestrian and vehicle access during construction and permanent impediments from vault doors during travel and maintenance</li></ul>
<ul style="list-style-type: none"><li>• Operational Challenges: vaulting creates water, heat, and maintenance complications that critically compromise network reliability</li></ul>
<ul style="list-style-type: none"><li>• Noise Impact: venting and pumping likely exceed noise ordinance requirements</li></ul>
<ul style="list-style-type: none"><li>• Cost Impact: excessive initial and ongoing costs</li></ul>
<ul style="list-style-type: none"><li>• Aesthetic Considerations/Comparison: minimal visual impact of radio backpacks on pole are minor compared to permanent impacts of vault</li></ul>
<ul style="list-style-type: none"><li>• Permanent Impacts: vaulting compromises future undergrounding and use of right-of-way</li></ul>

## 7. Conclusion

Vaulting the Verizon Wireless radios creates unwarranted operational challenges that compromise network reliability. Further, vaulting two radios will not achieve the City's desired result of lesser visual impacts. Vaulting results in construction, ongoing noise, traffic, and permanent impacts to the City and its residents and increases the risk of failure and decreases the reliability of the Verizon Wireless network. Only two of the major components of the small cell facility, or approximately 25% can be undergrounded. Relocating the radios from the pole to a vault results in a minimal reduction of bulk from the pole while creating substantial impacts that result from vaulting. The potential negative impacts to Sonoma, including greater risk to operational reliability of the Verizon Wireless network, outweighs any minimal improvement to the appearance of the pole from the removal of the two radios.



**City of Sonoma's Syndeo Vault Recommendation – Verizon Feedback Analysis Below**

**Note the Original Vaulting Analysis is applicable.**

**From:** "Bascom, Jerry" [REDACTED]  
**Date:** Friday, June 7, 2019 at 3:16 PM  
**To:** [REDACTED]  
**Subject:** Fwd: Sonoma Response to Vaulting - Action Required

*I just finished my discussion with Scott here are my findings*

*Pro*

1. *Environmentally controlled*
2. *If the vaults leaks, the equipment contained therein is damaged Syndeo will replace it*
3. *If the water sensor trips Syndeo will send out techs to fix it. Need to set up contractors in CA*
4. *Low Maintenance*
5. *H2O load rated vault lid*

*Cons*

1. *Sites Built So far - As of today they have only built 2 sites in Austin Texas. And five sites being installed in Virginia this summer. So not a very good track record*
2. *TCP - this site will take about 2 weeks to construct with lane and sidewalk closures.*
3. *Could house batteries - All depends on the cooling system. With vents it could but then you would have noise and vents sticking up in the sidewalk. With Geothermal cooling no batteries can be installed.*
4. *Do we have Sufficient Sidewalk Space for the vault and construction? Depends on the width of the side walk. We would need approx 10-20 ft in length and 6-7 ft width. The design that was presented will not work for us as they are not using the correct 4G equipment. The dimensions would need to be increase both width and length and depth.*
5. *Underground Infrastructure interference - this would still need to be avoided*
6. *Tree root interference this would still need to be avoided*
7. *Waterproof - I have seen a lot of vaults that are supposed to be waterproof with water in them. This could be due to many things including the rise in the water table, bad seals, and cracks in the vaults.*
8. *Flooding - Always and issue with equipment on or in the ground.*
9. *Noise - Limited noise with the Geothermal. With the vents we will have some noise. No data at this time.*
10. *Construction impacts - The sites will take longer to build with sidewalk and street closures. Cost will increase. See below*
11. *Limitation on future development both for equipment changes and for subsurface infrastructure for the city*
12. *Disconnect and meter must be on the pole or power pedestal per PG&E*
13. *LAA, CBRS, and future 5G needs to stay on the pole so a vault will not work*
14. *Maintenance - limited so this may be good thing, per Syndeo.*
15. *The drawings - Equipment required for 4G is missing so the vault will need to be larger*
16. *Coax that needs to be installed will be 8 - 1/2" or 7/8" which will cause the foundation to be replaced. We would need to verify if the pole will accept the required Coax. Pole may need to be replaced.*
17. *Geothermal cooling loop is approx 180 feet deep Cost is dependent on local conditions. Could have environmental issues with removal of the soil*
18. *Cost is \$30k as the estimate for Austin and they did not include any pole/foundation work. I was told that the material would be approximately \$20k. New foundation for the pole to run the larger conduit will run around \$20K, GC cost for Austin will be about \$15k, so for the Bay Area, I would increase that to about \$22.5k. So an approximate cost would be about \$60k+Geothermal cost for a steel pole.*
19. *Estimate construction time is 3 weeks with pole and foundation work, vault installation, equipment installation.*

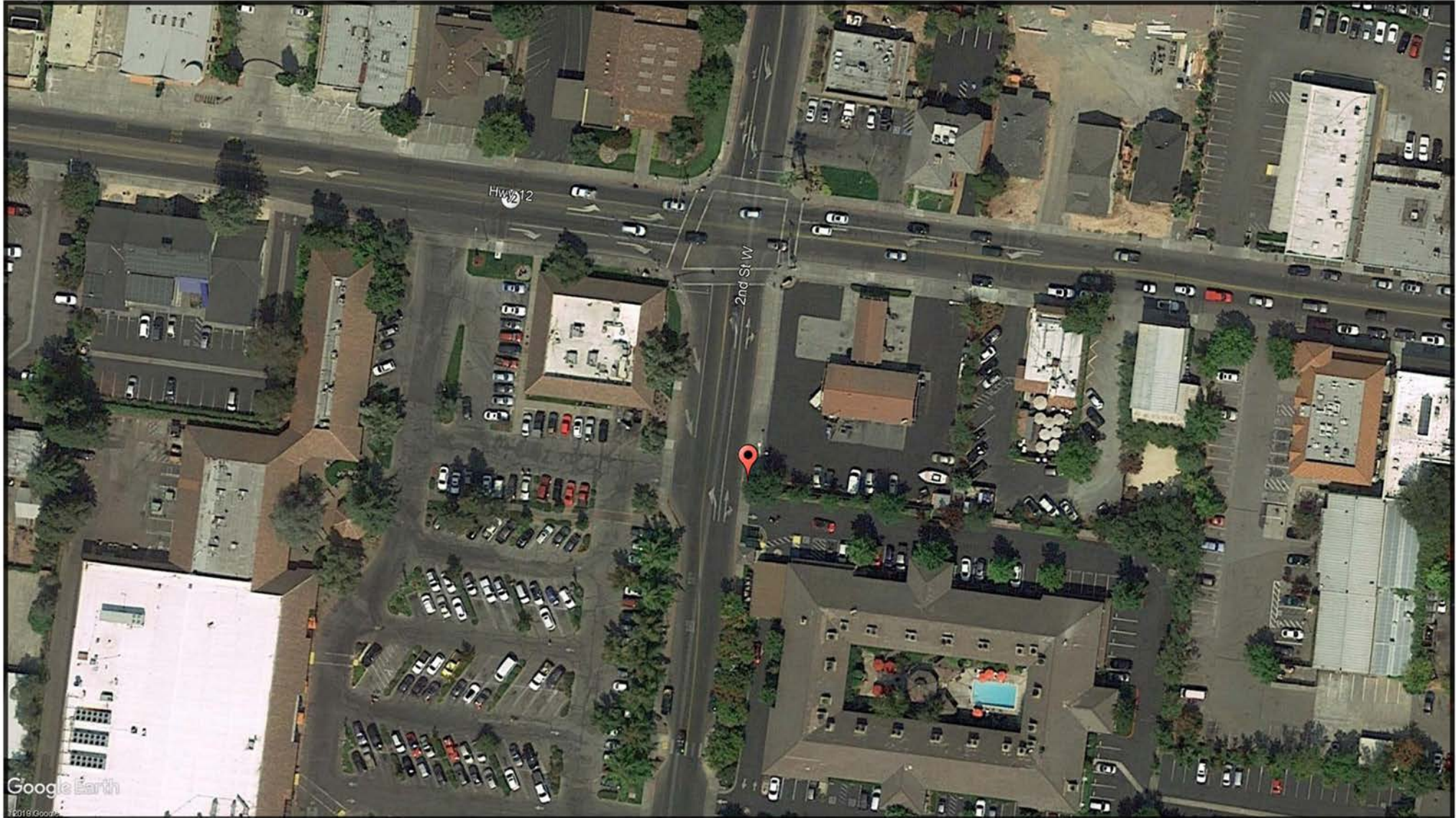
*Please call me if you have any questions,*

*Thanks,*

*Jerry Bascom, P.E.  
Principal Engineer-Construction -- Network  
Verizon Wireless--Northern CA/NV Region*

# SONOMA 007 Street Light Pole Design

550 2nd Street West  
Sonoma, CA 95476  
(near 76 gas station and Sonoma Valley Inn)  
Location Code: 425162  
Site Coordinates: 38.291763, -122.461265







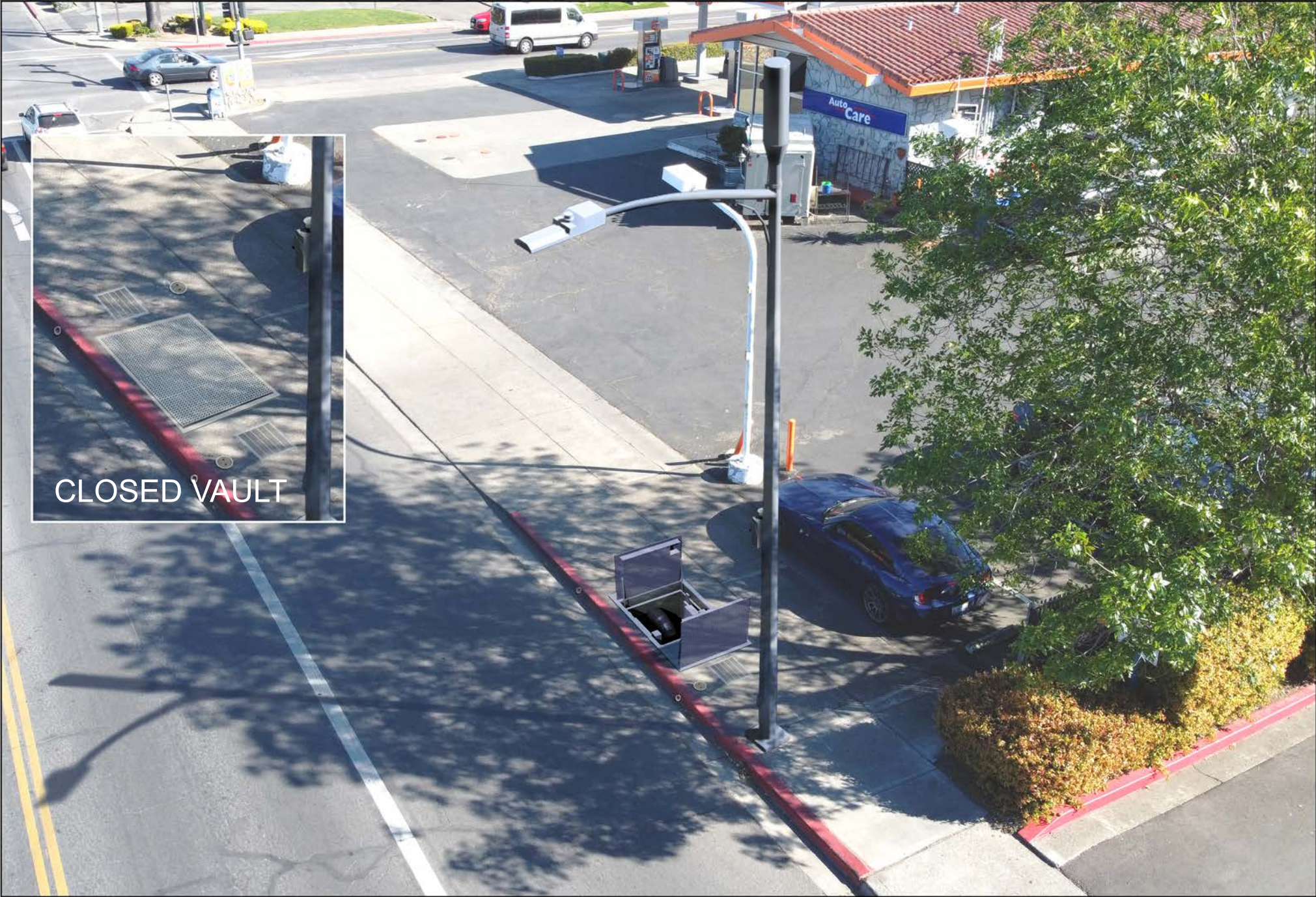




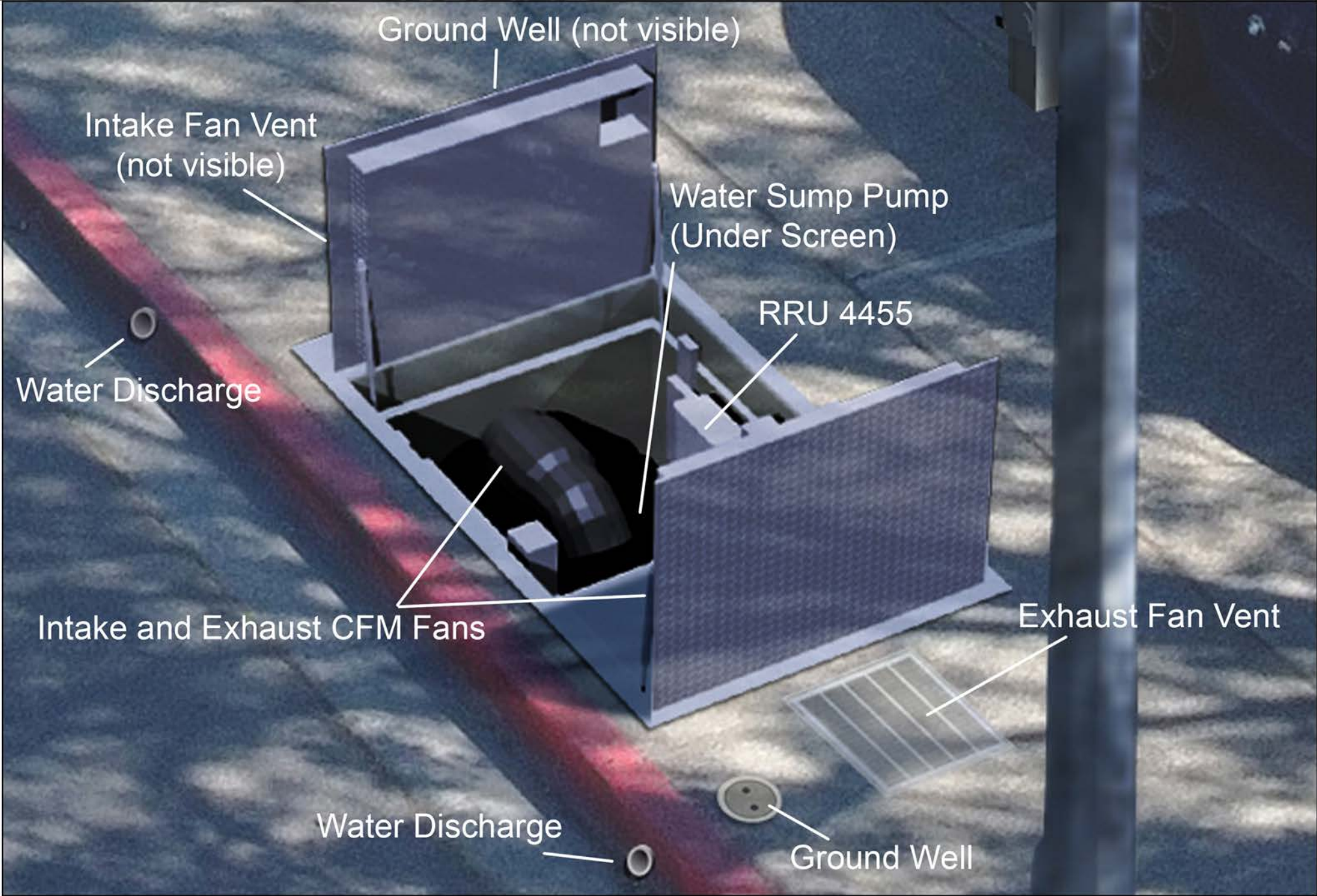












# Verizon Small Cell Underground Vaulting Feasibility Analysis

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Proposed Utility Pole Location: 453 2<sup>nd</sup> St. West Sonoma CA

Verizon Small Cell Reference "Sonoma 007"

Prepared: October 3, 2018



**Prepared for:  
City of Sonoma  
Planning Department  
No. 1 The Plaza  
Sonoma, CA 95476-6618**



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  - e. Cost Impact
  - f. Aesthetic Considerations/Comparison
  - g. Permanent Impacts
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## 1. Introduction

In September 2017, Verizon Wireless proposed a small cell wireless facility on an existing wooden utility pole near 453 2nd Street West in Sonoma, California (the "Project"). The Project includes placing a canister antenna, two remote radio units, and related equipment on a replacement wooden utility pole. On August 9, 2018, the City of Sonoma's Planning Department (the "Planning Department") issued design revision recommendations for the Project, which included undergrounding as much equipment as possible instead of mounting them to the utility pole. Verizon Wireless contracted The CBR Group, Inc. to analyze the feasibility of undergrounding as much of the Project as possible. This report informs the City of Sonoma (the "City") of impacts associated with undergrounding the proposed telecommunication equipment.

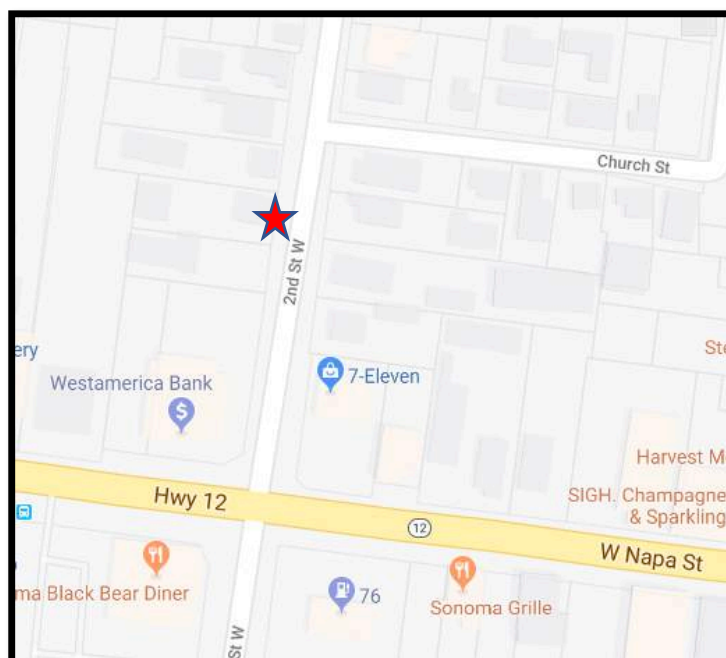
## 2. Executive Summary

The CBR Group has analyzed the feasibility of adding an underground vault to the Project. Due to technological and regulatory limitations, the only equipment that can be undergrounded are the two remote radio units. Consequently, this analysis contemplates the impacts of housing the remote radio units in an underground vault in lieu of mounting the radios on an existing (replacement) utility pole. This Underground Vaulting Feasibility Analysis presents the physical and operational impediments associated with vaulting Verizon Wireless's radio equipment. Weighing the impacts of vaulting the equipment versus any potential aesthetic benefits of vaulting, the analysis concludes that vaulting for this node is infeasible for Verizon Wireless.

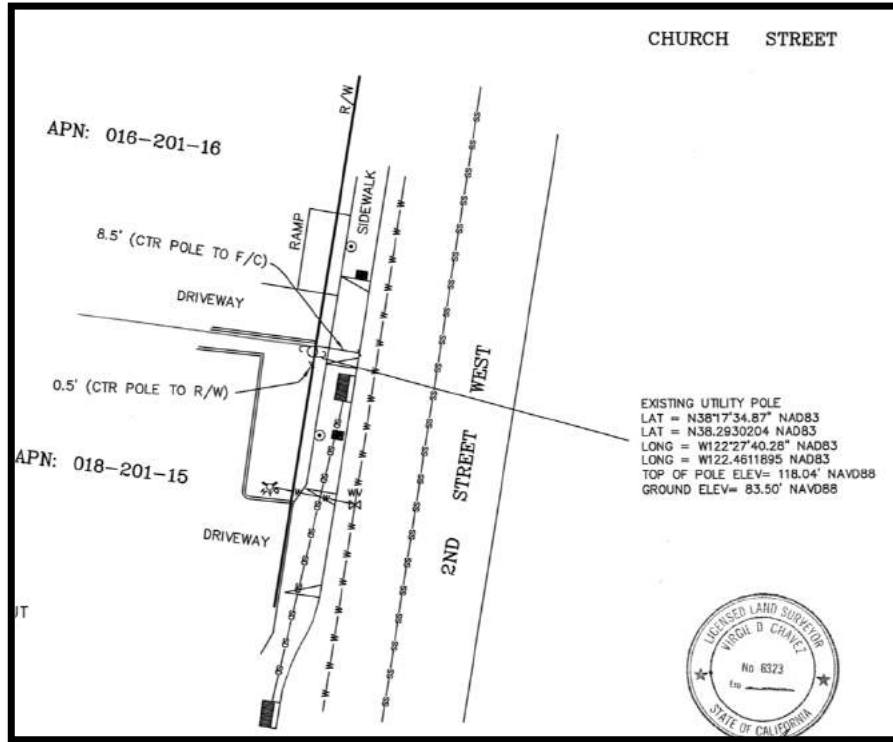
## 3. Project Description

The project's purpose is to provide enhanced Verizon Wireless service through improved coverage in the vicinity of the Sonoma Marketplace Shopping Center and expanded capacity to Verizon Wireless's network in the City of Sonoma. Details of the Verizon Network requirements addressed by these facilities have been provided to the City's independent peer reviewer under a non-disclosure agreement

Location: Verizon Wireless is proposing to install a small cell node on an existing utility pole near Sonoma Marketplace Shopping Center at 453 2nd Street West, Sonoma. This location is within a mixed-use area of Sonoma in between a tax service office and a parking lot. See location exhibits below:



### Map of the Pole location



### Survey of Pole in the Public ROW





## Photograph of Existing Pole

### Equipment Listing:

The following equipment listed below is proposed to be added to a new 43-ft. above ground level replacement wooden utility pole located in the public right-of-way. See photo above of existing utility pole.

Listed below is all the Verizon equipment proposed to be added to the replacement pole\*:

- Install (1) canister antenna on top of utility pole
- Install (1) new utility disconnect switch on pole
- Install (1) electrical meter on the pole
- Install appropriate signage, ground rods and buss bar
- Install conduit for power, telco, and coax
- *install two (2) new Remote Radio Units (RRUs) on existing utility pole. At the City's request, Verizon Wireless has agreed to reduce the number of RRUs from 3 to 2 in order to minimize aesthetic impacts on the pole. – **The RRUs are the only components of the small cell that can be removed from the pole and if it were feasible, placed in a vault.***

*All equipment, cable and conduit runs planned to be on the pole will be painted brown to match the pole.*

#### Antenna:

The antenna is cylindrical in shape, measuring 24 inches high and 14.6 inches in diameter. The antenna would be situated 43 feet from ground level on the pole.

*Please note, that the Planning Department requested the Verizon reduce the size of the antenna from 48" to 24" to assist with the appearance of the proposed facility. Verizon Wireless has agreed to accommodate that request.*

#### Radio Units:

The RRUs will be mounted at a height between 10 and 18 feet on the pole depending upon the screening technique preferred by the city and painted dark brown to match the pole. The two RRUs are each 27.2 inches tall, 12.1 inches wide and 7.0 inches deep.

**The majority of the facilities components will need to remain on the pole per PG&E requirements and cannot be placed in a vault. These components include the *Utility Disconnect, PG&E Meter, Conduit, Antenna, and Warning Signage.***

## 4. Vault Specifications

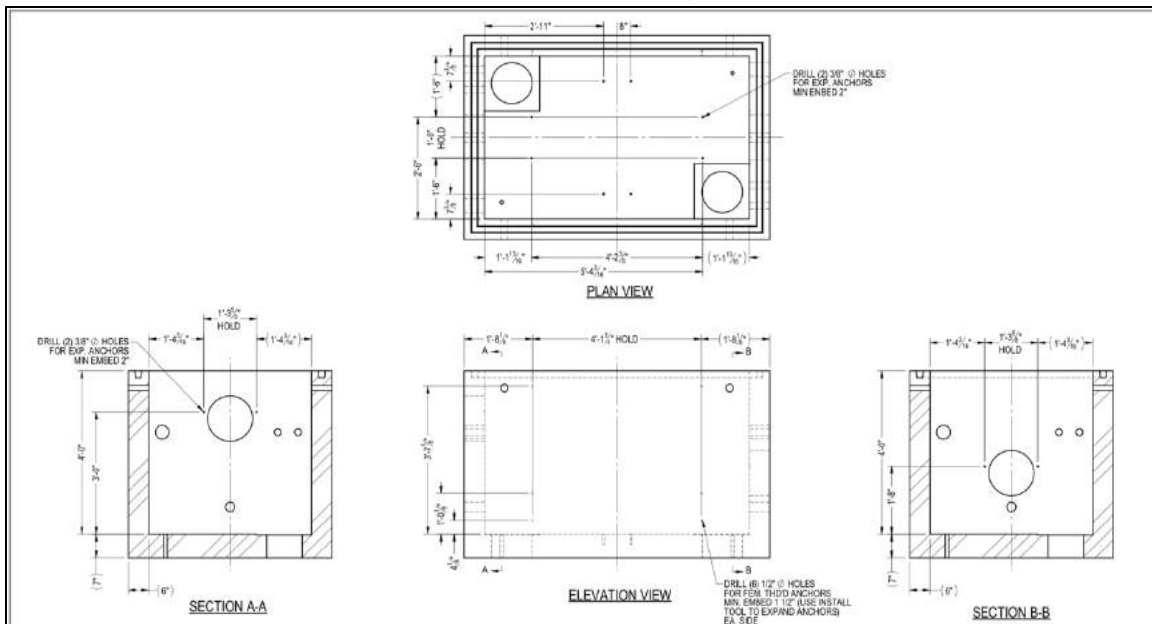
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must be located above ground and on the pole below the antennas in order to effectively inform pole workers. The conduit, which connects the radios and other equipment to the antenna, must be located up the pole in order to reach the antenna. As a result of these physical and regulatory limitations, the only two pieces of equipment that may be placed in the vault are the two remote radio units.

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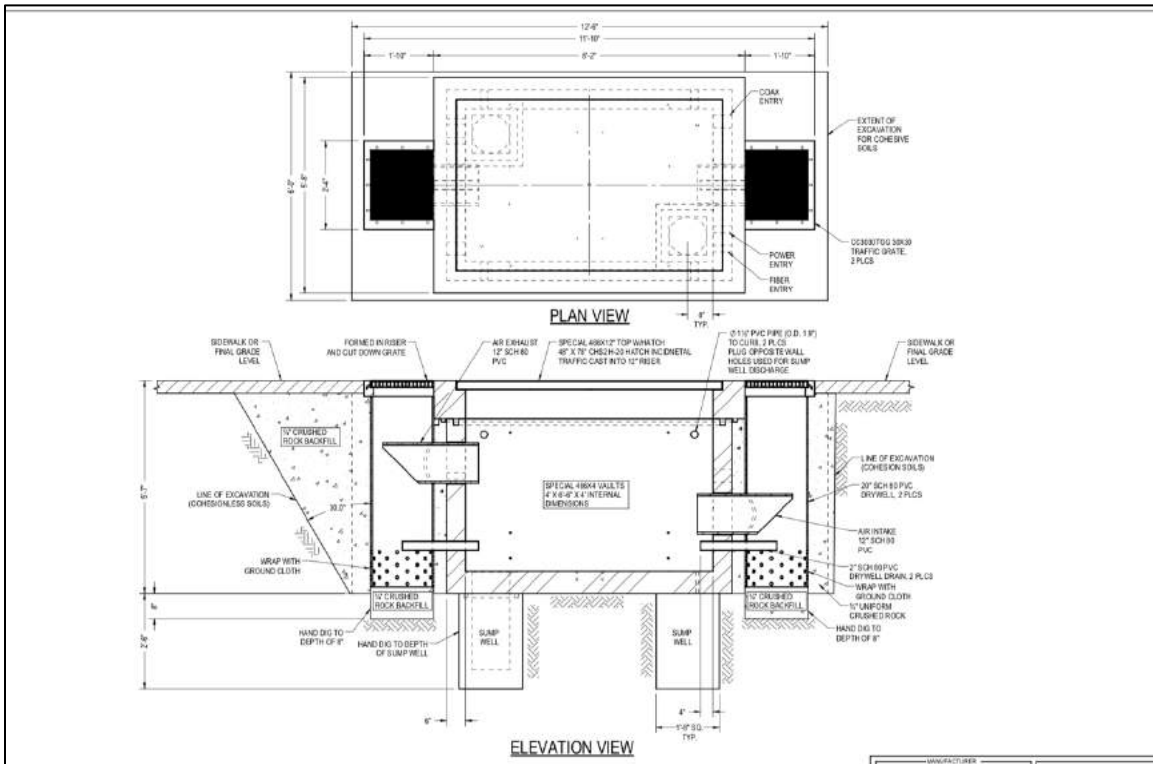
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### Vault Dimensions/Layout

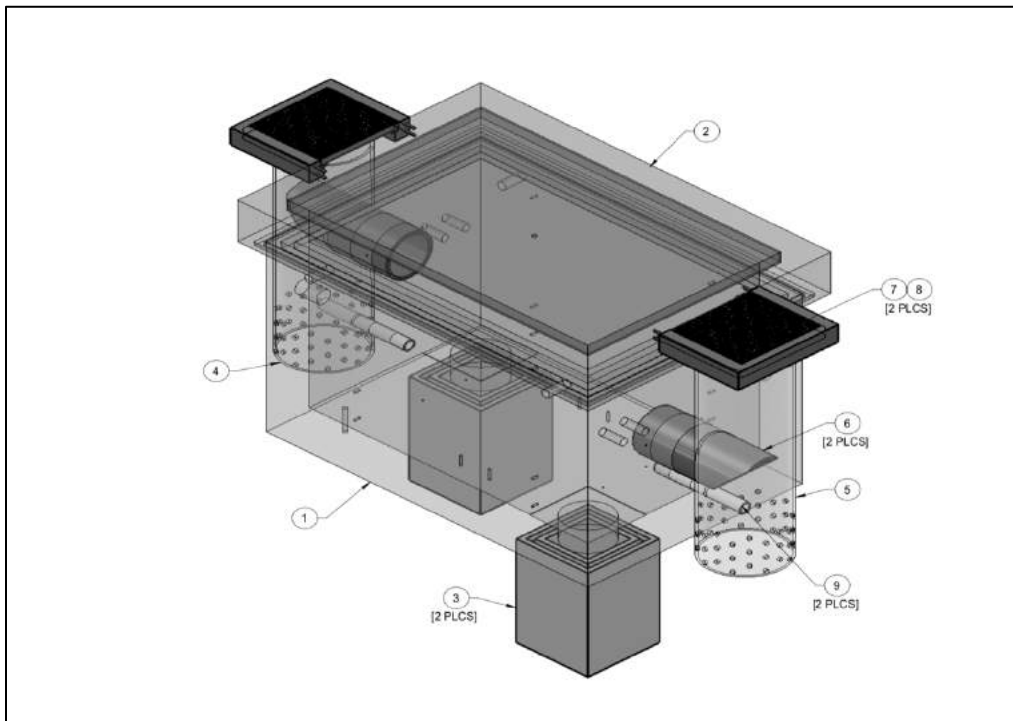




### Vault Elevation View



### Vault Cross Sectional View



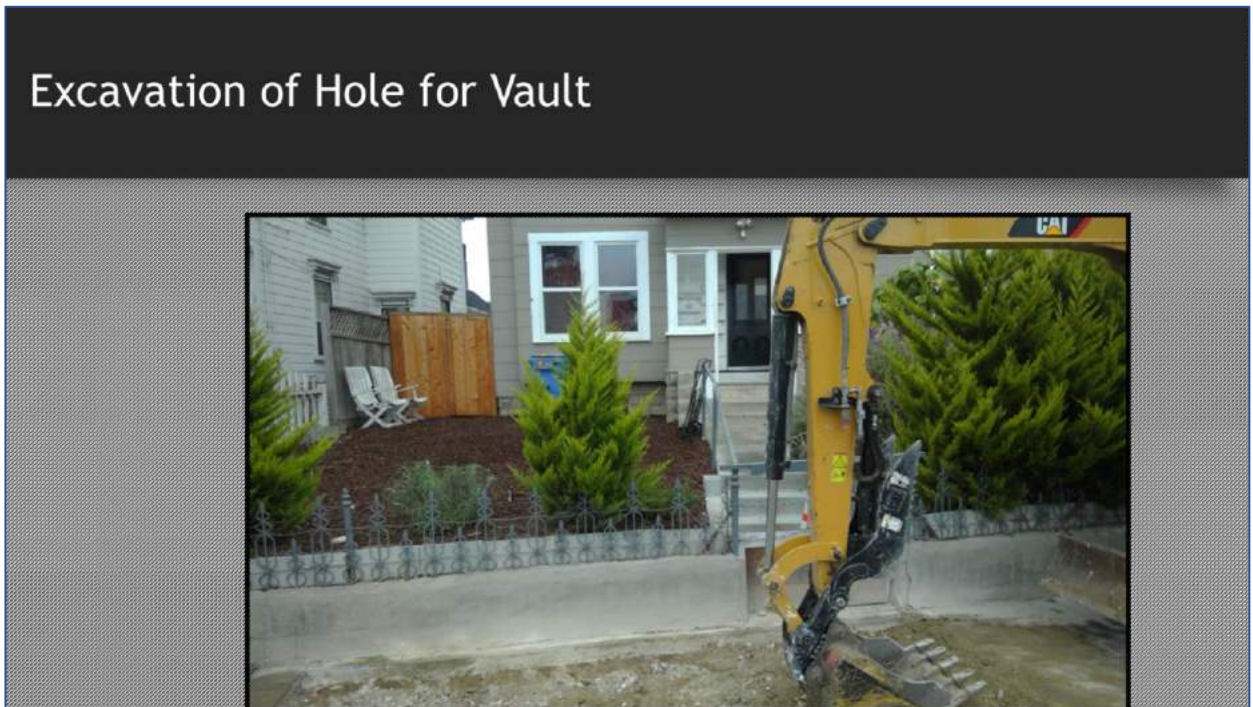
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- a. Construction Impacts: Heavy construction will occur near Hwy 12. Excavation of the required 10' by 18' pit will create significant temporary impacts to the street and sidewalk during construction. Vault installation will require approximately 30 days of excavation, delivery, and installation, creating substantial dust and noise impacts for pedestrians and vehicles over an extended period of time. The table below shows the construction timelines comparison with proposed pole mounted radios. Subsequent photographs show vault construction impact from excavation, shoring and safety requirements.

	<b>Existing Proposal Timeline Impact</b>	<b>Vault Construction Timeline Impact</b>	<b>Impact Comparison</b>
<b>Construction Timeline Impacts</b>	3-5 days	30-45 days	300%-450% more impactful congested near major Hwy 12 thoroughfare

The four photos below show the large pit and construction area required to accommodate the vault including the perimeter spacing requirements for construction workers and equipment. The construction and staging area is several times larger than the vault itself primarily due to OSHA shoring requirements for workers safety.

### Photos of the Vault being Constructed



## Construction in Progress - Details



**Vault**

**Venting**

**Drainage**

**Shoring Area  
Surrounding  
Vault**

**Ground test  
well**

**Additional Trenching from vault  
to pole – not shown in photo**



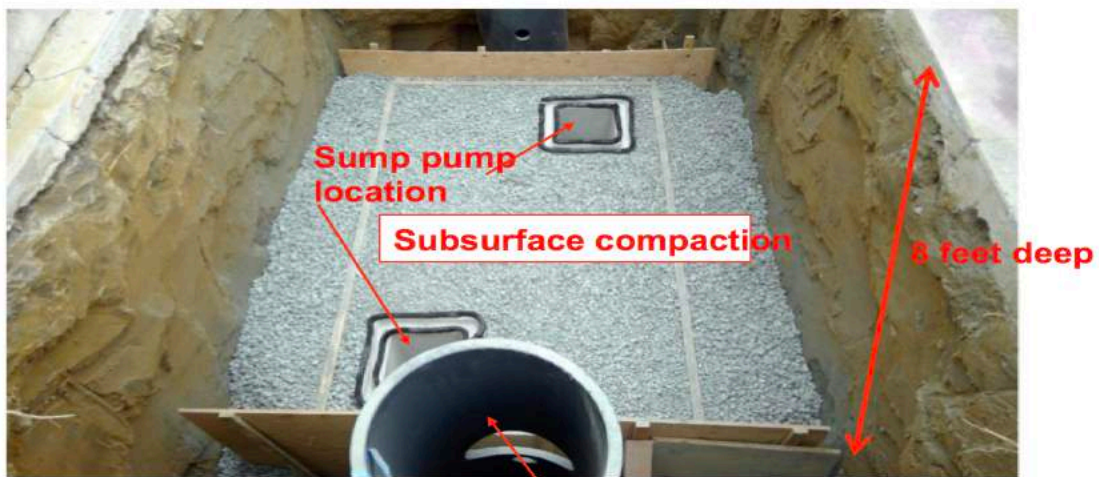
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## Crane Installation (2-3 days)



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## Vault and Venting Area – 900 cu. ft.



Venting Tube (1 of 2)

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## Daily Sidewalk Closure, Signs, and Cleanup



## Daily Hole Protection and Safety Practices Installed



Additional traffic hazards risks for this location may arise due to the mislabeling of underground lines, siting errors and/or existing shallow underground conduits. In August 2017, these conditions in this



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Caltrans workers responded swiftly to the report of traffic lights completely nonfunctioning at the Fifth Street West and West Napa intersection. (Phot by Robbi Pengelly/Index-Tribune)

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#### 1. Reliability

Following installation of vaults by Crown Castle, Verizon Wireless has experienced unacceptable reliability risks. Water intrusion into vaults has caused radio failure as sump pumps are unable to dewater the vault during heavy rainstorms when storm water backs up on curbs. Noise generated from venting has prevented continuous cooling and resulted in radio failure due to overheating. Regular power outages have exacerbated both flooding and overheating when pumps and fans are inoperable. Facility reliability has been sufficiently compromised by vaulting in northern California to halt the installation of future vaults by Verizon Wireless pending the development of newer technologies.

#### 2. Maintenance

Maintenance of vaulted radios creates additional unacceptable operational requirements for Verizon Wireless. Maintenance in the vault requires sidewalk closure with signage and safety precautions. Vaulting maintenance may also require lane closure for component replacement. Vaulting maintenance requires a minimum of two maintenance personnel as one individual must remain outside the vault while maintenance is being conducted inside of the vault. All of these requirements delay the response to maintenance requirements and jeopardize the Verizon Wireless network.

#### 3. Safety

Vaulting creates additional safety hazards during maintenance and general operation. Additional maintenance safety requirements are described above. In addition, maintenance personnel are



more susceptible to hazardous working conditions inside the vault due to vermin and bacteria. Permanent placement of the vault creates permanent pedestrian trip hazards and uneven surfaces.

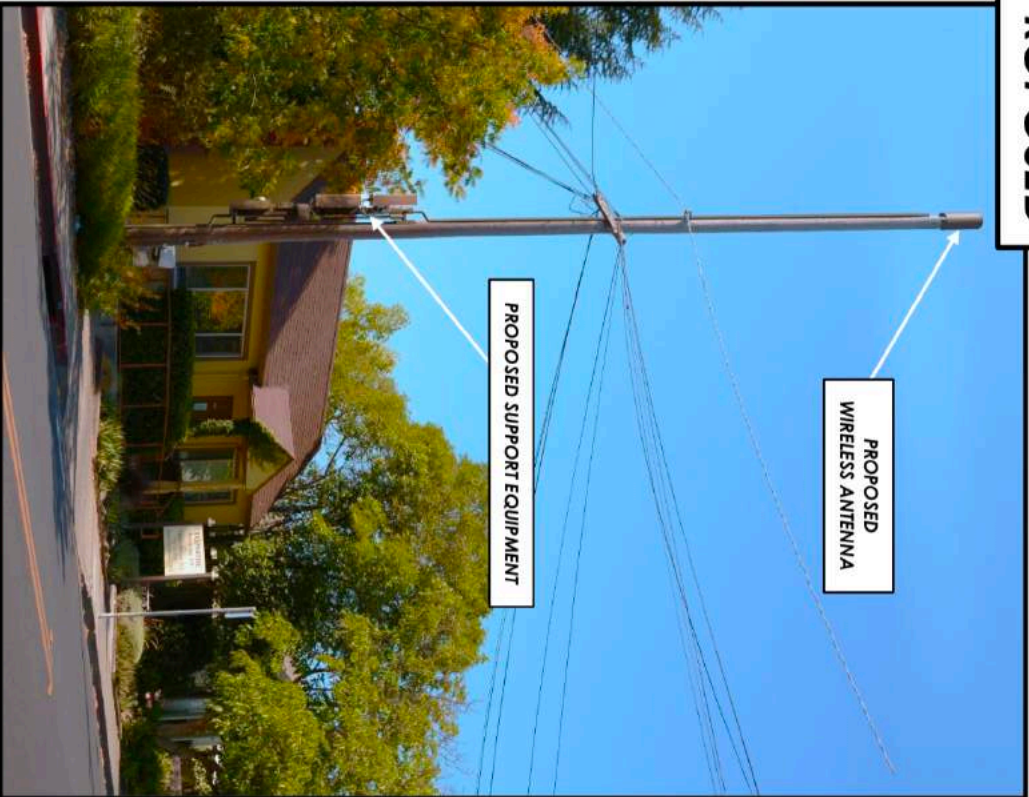
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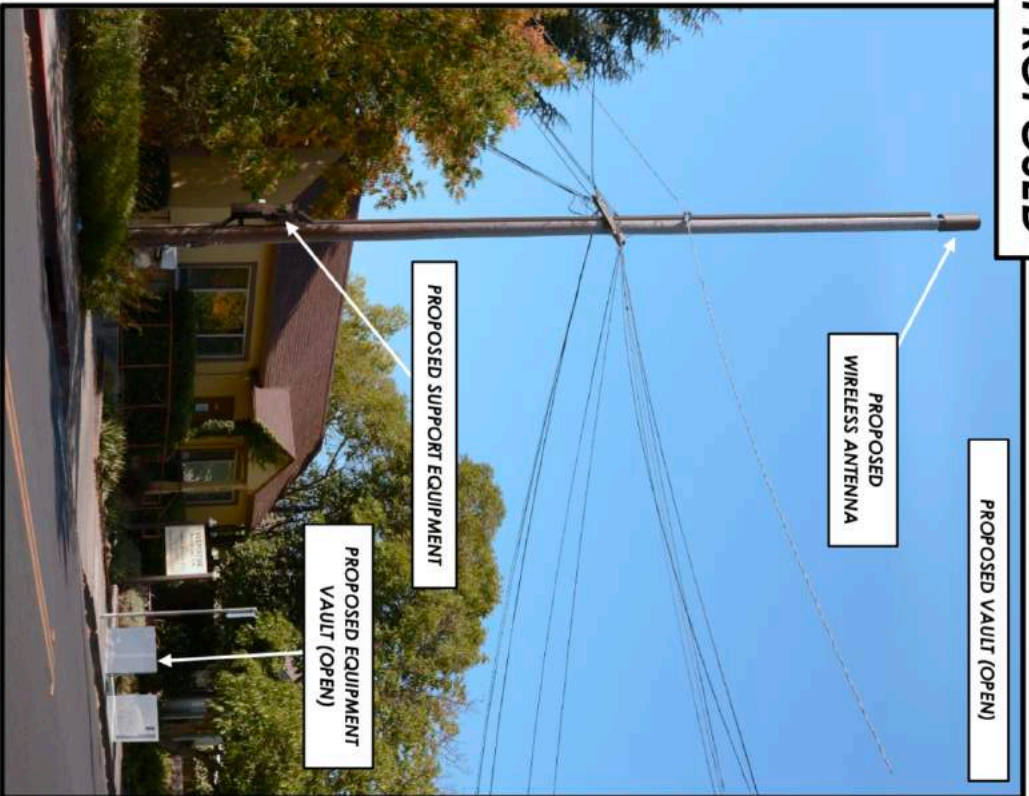
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- f. Aesthetic Considerations / Comparison: Photo simulations provided below show the proposed facility placing all the equipment on the existing utility pole compared to placing the RRUs in the underground vault.
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  - I. Adding an underground utility vault is a permanent impediment to the City's use of the Right of Way. Surface level hatches will always be present.
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  - III. Vaulting will likely become obsolete for future wireless technologies as antennas and radios are integrated.

**PROPOSED**



**PROPOSED**



Comparison Photo of Proposed Equipment Planned Placement on Pole as compared to Removal of the RRU's and placed underground utility vault below the sidewalk.



## 6. Summary

Vaulting of Verizon Wireless radios creates significant impacts to Verizon Wireless's network in a manner that unacceptably compromises reliability. Impacts are summarized below.

<b>Feasibility Considerations</b>
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<ul style="list-style-type: none"><li>• Aesthetic Considerations/Comparison: minimal visual impact of radio backpacks on pole are minor compared to permanent impacts of vault</li></ul>
<ul style="list-style-type: none"><li>• Permanent Impacts: vaulting compromises future undergrounding and use of right-of-way</li></ul>

## 7. Conclusion

Vaulting the Verizon Wireless radios creates unwarranted operational challenges that compromise network reliability. Further, vaulting two radios will not achieve the City's desired result of lesser visual impacts. Vaulting results in construction, ongoing noise, traffic, and permanent impacts to the City and its residents and increases the risk of failure and decreases the reliability of the Verizon Wireless network. Only two of the major components of the small cell facility, or approximately 25% can be undergrounded. Relocating the radios from the pole to a vault results in a minimal reduction of bulk from the pole while creating substantial impacts that result from vaulting. The potential negative impacts to Sonoma, including greater risk to operational reliability of the Verizon Wireless network, outweighs any minimal improvement to the appearance of the pole from the removal of the two radios.

**City of Sonoma's Syndeo Vault Recommendation – Verizon Feedback Analysis Below**

**Note the Original Vaulting Analysis is applicable.**

**From:** "Bascom, Jerry" [REDACTED]  
**Date:** Friday, June 7, 2019 at 3:16 PM  
**To:** [REDACTED]  
**Subject:** Fwd: Sonoma Response to Vaulting - Action Required

*I just finished my discussion with Scott here are my findings*

*Pro*

- 1. Environmentally controlled*
- 2. If the vaults leaks, the equipment contained therein is damaged Syndeo will replace it*
- 3. If the water sensor trips Syndeo will send out techs to fix it. Need to set up contractors in CA*
- 4. Low Maintenance*
- 5. H2O load rated vault lid*

*Cons*

- 1. Sites Built So far - As of today they have only built 2 sites in Austin Texas. And five sites being installed in Virginia this summer. So not a very good track record*
- 2. TCP - this site will take about 2 weeks to construct with lane and sidewalk closures.*
- 3. Could house batteries - All depends on the cooling system. With vents it could but then you would have noise and vents sticking up in the sidewalk. With Geothermal cooling no batteries can be installed.*
- 4. Do we have Sufficient Sidewalk Space for the vault and construction? Depends on the width of the side walk. We would need approx 10-20 ft in length and 6-7 ft width. The design that was presented will not work for us as they are not using the correct 4G equipment. The dimensions would need to be increase both width and length and depth.*
- 5. Underground Infrastructure interference - this would still need to be avoided*
- 6. Tree root interference this would still need to be avoided*
- 7. Waterproof - I have seen a lot of vaults that are supposed to be waterproof with water in them. This could be due to many things including the rise in the water table, bad seals, and cracks in the vaults.*
- 8. Flooding - Always and issue with equipment on or in the ground.*
- 9. Noise - Limited noise with the Geothermal. With the vents we will have some noise. No data at this time.*
- 10. Construction impacts - The sites will take longer to build with sidewalk and street closures. Cost will increase. See below*
- 11. Limitation on future development both for equipment changes and for subsurface infrastructure for the city*
- 12. Disconnect and meter must be on the pole or power pedestal per PG&E*
- 13. LAA, CBRS, and future 5G needs to stay on the pole so a vault will not work*
- 14. Maintenance - limited so this may be good thing, per Syndeo.*
- 15. The drawings - Equipment required for 4G is missing so the vault will need to be larger*
- 16. Coax that needs to be installed will be 8 - 1/2" or 7/8" which will cause the foundation to be replaced. We would need to verify if the pole will accept the required Coax. Pole may need to be replaced.*
- 17. Geothermal cooling loop is approx 180 feet deep Cost is dependent on local conditions. Could have environmental issues with removal of the soil*
- 18. Cost is \$30k as the estimate for Austin and they did not include any pole/foundation work. I was told that the material would be approximately \$20k. New foundation for the pole to run the larger conduit will run around \$20K, GC cost for Austin will be about \$15k, so for the Bay Area, I would increase that to about \$22.5k. So an approximate cost would be about \$60k+Geothermal cost for a steel pole.*
- 19. Estimate construction time is 3 weeks with pole and foundation work, vault installation, equipment installation.*

*Please call me if you have any questions,*

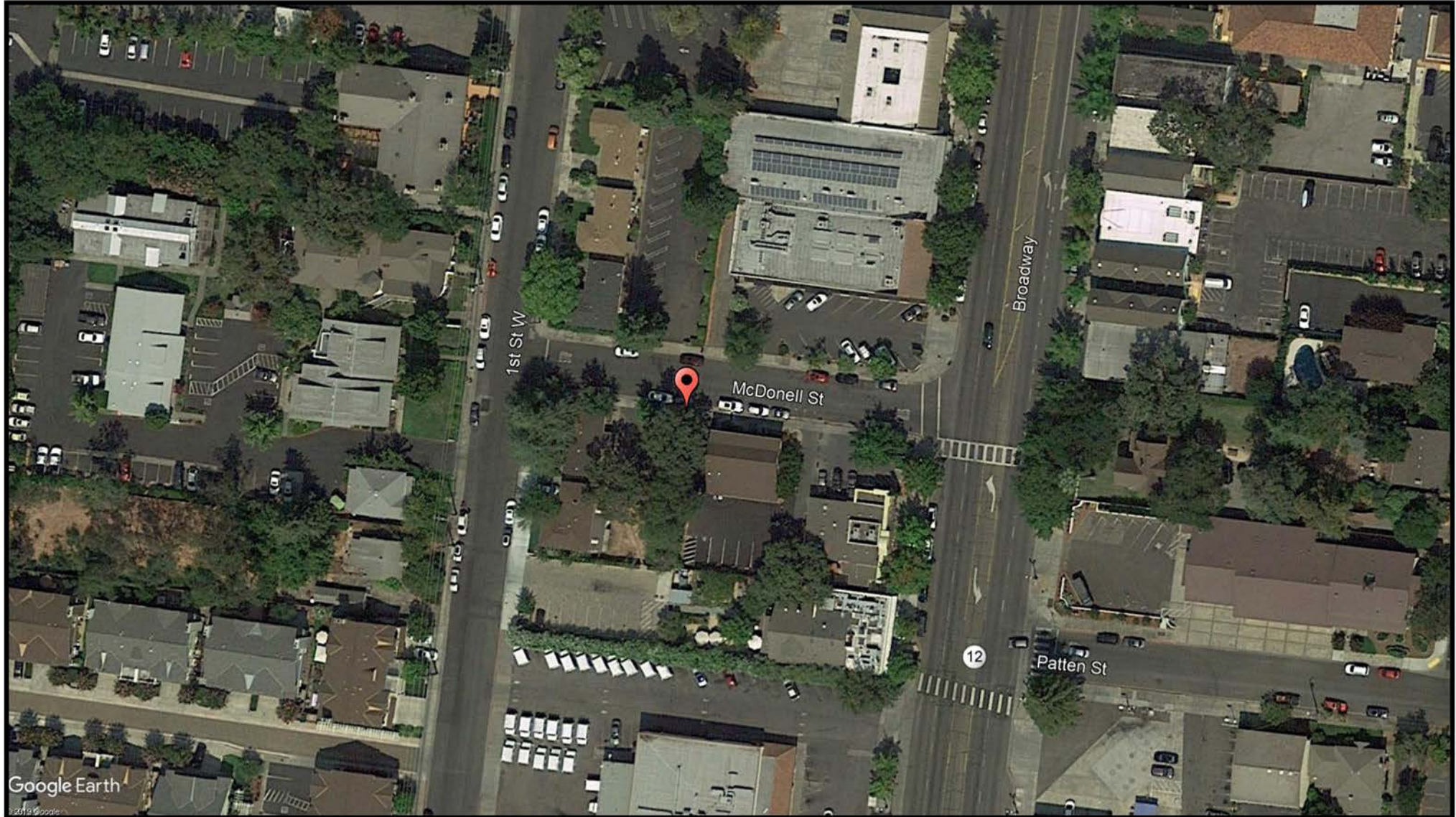
*Thanks,*

*Jerry Bascom, P.E.  
Principal Engineer-Construction -- Network  
Verizon Wireless--Northern CA/NV Region*



# SONOMA 012 Street Light Pole Design

near 25 McDonell Street  
Sonoma, CA 95476  
(Across Peet's Coffee Parking Lot)  
Location Code: 425102  
Site Coordinates: 38.290539,-122.458803







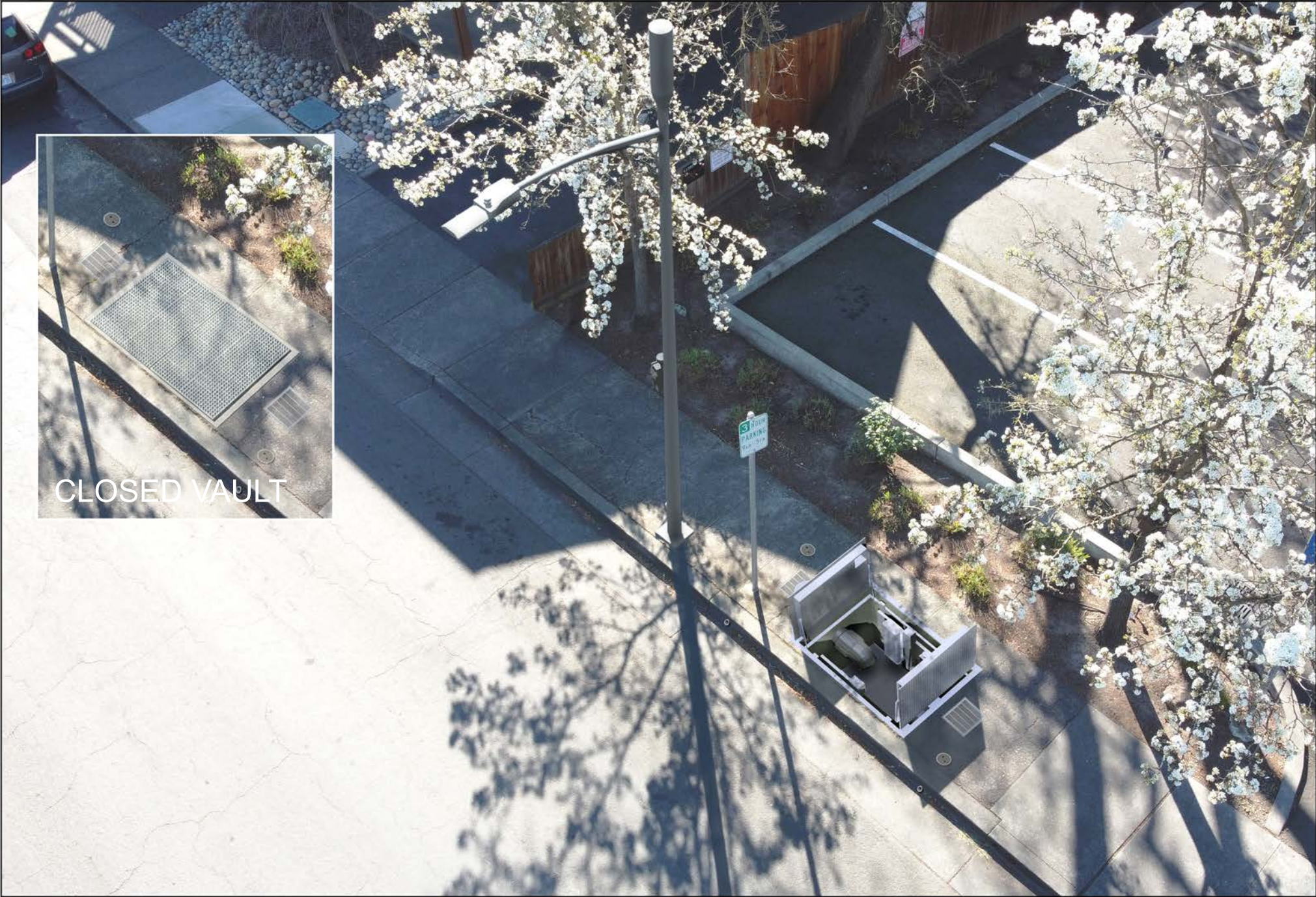






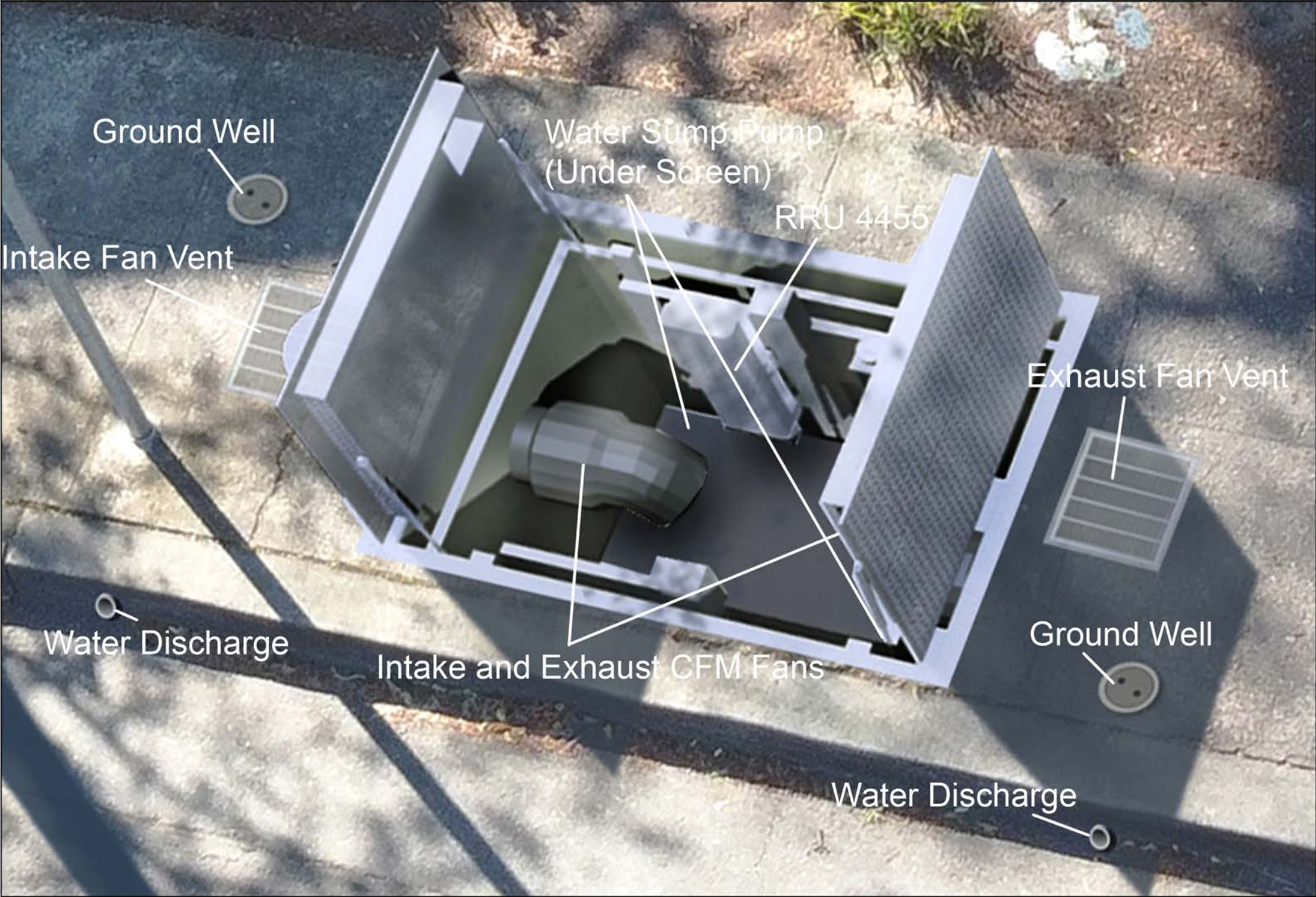






CLOSED VAULT





Ground Well

Water Sump Pump  
(Under Screen)

RRU 4455

Intake Fan Vent

Exhaust Fan Vent

Water Discharge

Intake and Exhaust CFM Fans

Ground Well

Water Discharge



# Verizon Small Cell Underground Vaulting Feasibility Analysis

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Proposed Utility Pole Location: 574 1<sup>st</sup> Street West, Sonoma CA

Verizon Small Cell Reference "Sonoma 012"

October 3, 2018



Prepared for:  
City of Sonoma  
Planning Department  
No. 1 The Plaza  
Sonoma, CA 95476-6618



The CBR Group, Inc.  
841 Arnold Drive, Suite A  
Martinez, CA 94553  
[www.thecbrgroup.com](http://www.thecbrgroup.com)

Site Acquisition. Engineering & Design. Project & Construction Management. Field Services

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4. Vault Specifications
5. Feasibility Considerations:
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  - b. Traffic/Pedestrian Impacts
  - c. Operational Challenges
  - d. Noise Impacts
  - e. Cost Impact
  - f. Aesthetic Considerations/Comparison
  - g. Permanent Impacts
  - h. Tree Impact
6. Summary
7. Conclusion



## 1. Introduction

In September 2017, Verizon Wireless proposed a small cell wireless facility on a replacement wooden utility pole near 574 1st Street West in Sonoma, California (the "Project"). The Project includes placing a canister antenna, two remote radio units, and related equipment on a replacement wooden utility pole. On August 9, 2018, the City of Sonoma's Planning Department (the "Planning Department") issued design revision recommendations for the Project, which included undergrounding as much equipment as possible instead of mounting the equipment to the utility pole. Verizon Wireless contracted The CBR Group, Inc. to analyze the feasibility of undergrounding as much of the Project as possible. This report informs the City of Sonoma (the "City") of impacts associated with undergrounding the proposed telecommunication equipment.

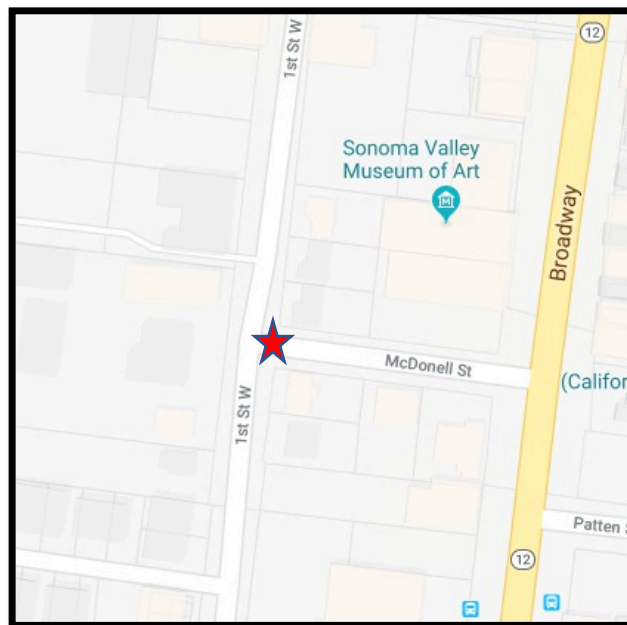
## 2. Executive Summary

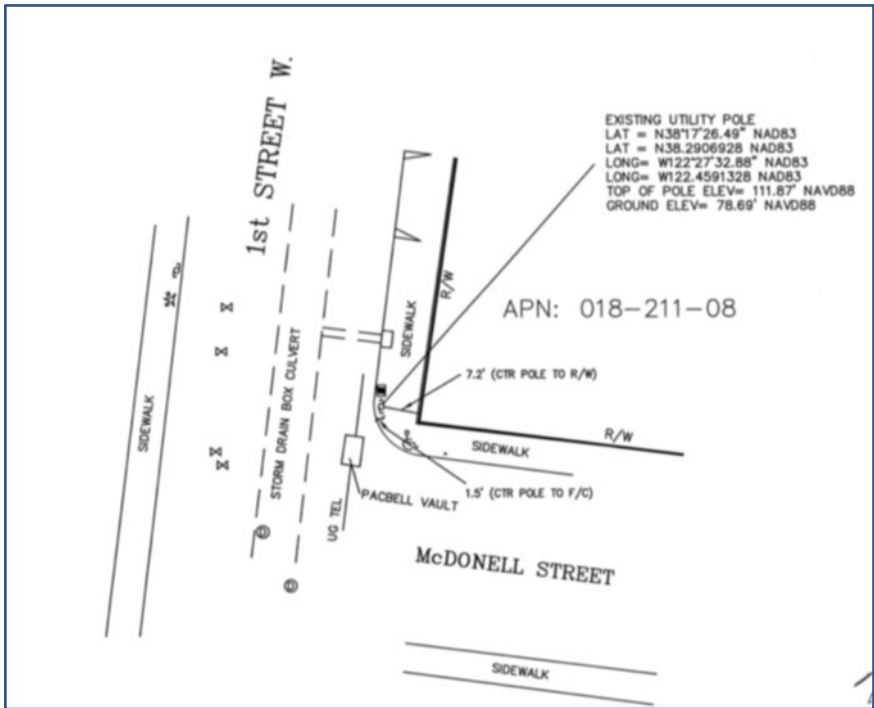
The CBR Group has analyzed the feasibility of adding an underground vault to the Project. Due to technological and regulatory limitations, the only equipment that can be undergrounded are the two remote radio units. Consequently, this analysis contemplates the impacts of housing the remote radio units in an underground vault in lieu of mounting the radios on a replacement utility pole. This Underground Vaulting Feasibility Analysis presents the physical and operational impediments associated with vaulting Verizon Wireless's radio equipment. Weighing the impacts of vaulting the equipment versus any potential aesthetic benefits of vaulting, the analysis concludes that vaulting for this node is infeasible for Verizon Wireless.

## 3. Project Description

The project's purpose is to provide enhanced Verizon Wireless service through improved coverage in the neighborhood commercial district near the Sonoma Valley Museum of Art and expanded capacity to Verizon Wireless's network in the City of Sonoma. Details of the Verizon Network requirements addressed by these facilities have been provided to the City's independent peer reviewer under a non-disclosure agreement.

Location: Verizon Wireless is proposing to install a small cell node at on replacement utility pole near 574 1st Street West, (northeast corner of 1st St. West and McDonnell), Sonoma. This location is within a mixed-use office and residential area of Sonoma. See location exhibits below:





Survey of Pole in the Public ROW



Photograph of Proposed Pole



## Equipment Listing

The following equipment listed below is proposed to be added to the replacement 43 foot-tall wooden utility pole located in the public right-of-way. See photo above of replacement utility pole.

Listed below is all the Verizon equipment proposed to be added to the \*pole:

- Install (1) canister antenna on top of new 43' tall replacement utility pole
- Install (1) new utility disconnect switch on pole
- Install (1) electrical meter on the pole
- Install appropriate signage, ground rods and buss bar
- Install conduit for power, telco, and coax
- install two (2) new Remote Radio Units (RRUs) on replacement utility pole. At the City's request, Verizon Wireless has agreed to reduce the number of RRUs from 3 to 2 in order to minimize aesthetic impacts on the pole. – The RRUs are the only components of the small cell that can be removed from the pole and if it were feasible, placed in a vault.

*\*Note, all equipment planned to be on the pole will be painted brown to match the pole.*

### Antenna:

The antenna is cylindrical in shape, measuring 24 inches high and 14.6 inches in diameter. The antenna would be situated approximately 44 feet high, from the center of the antenna, on the new pole. The antenna mounting bracket is about 12 inches.

Please note, that the Planning Department requested the Verizon reduce the size of the antenna from 48" to 24" to assist with the appearance of the proposed facility. Verizon Wireless has agreed to accommodate that request.

### Radio Units:

The RRUs will be mounted at a height between 10 and 18 feet on the pole depending upon the screening technique preferred by the city and painted dark brown to match the pole. The two RRUs are each 27.2 inches tall, 12.1 inches wide and 7.0 inches deep.

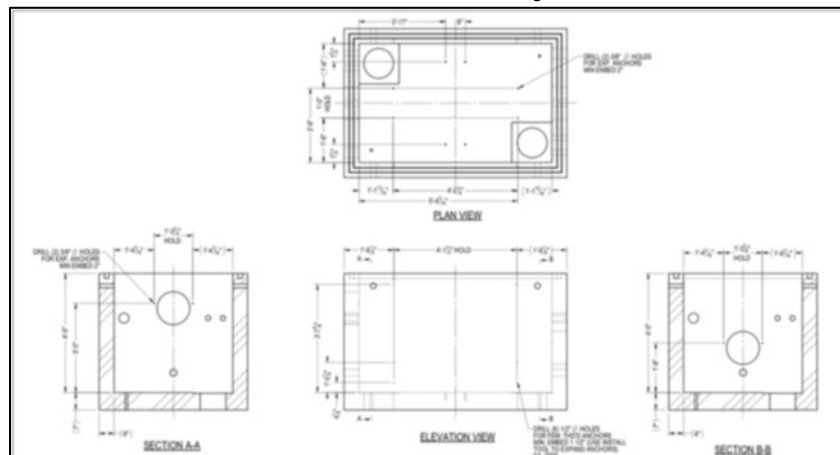
## 4. Vault Specifications

Due to technological and regulatory constraints, very few of the components for the Project can be undergrounded. For example, the antenna cannot effectively operate if its signal is obstructed. As a result, it has to remain mounted on the utility pole with line of sight to end users. The pole itself is regulated by multiple entities, including the California Public Utilities Commission, PG&E, and the Northern California Joint Pole Authority. The rules and regulations promulgated by these bodies closely regulate the size, shape, weight, and location of all the equipment required to install a new small cell wireless facility. The regulations also prohibit undergrounding certain equipment and require equipment placement at certain pole heights. The utility disconnect and PG&E meter must be located at certain heights on the pole so that PG&E can access them quickly and easily, especially in the event of an emergency. See, e.g., California Public Utilities Commission General Order 95, Rules For Overhead Electric Line Construction. Likewise, the warning signage must be located above ground and on the pole below the antennas in order to effectively inform pole workers. The conduit, which connects the radios and other equipment to the antenna, must be located up the pole in order to reach the antenna. As a result of these physical and regulatory limitations, the only two pieces of equipment that may be placed in the vault are the two remote radio units.

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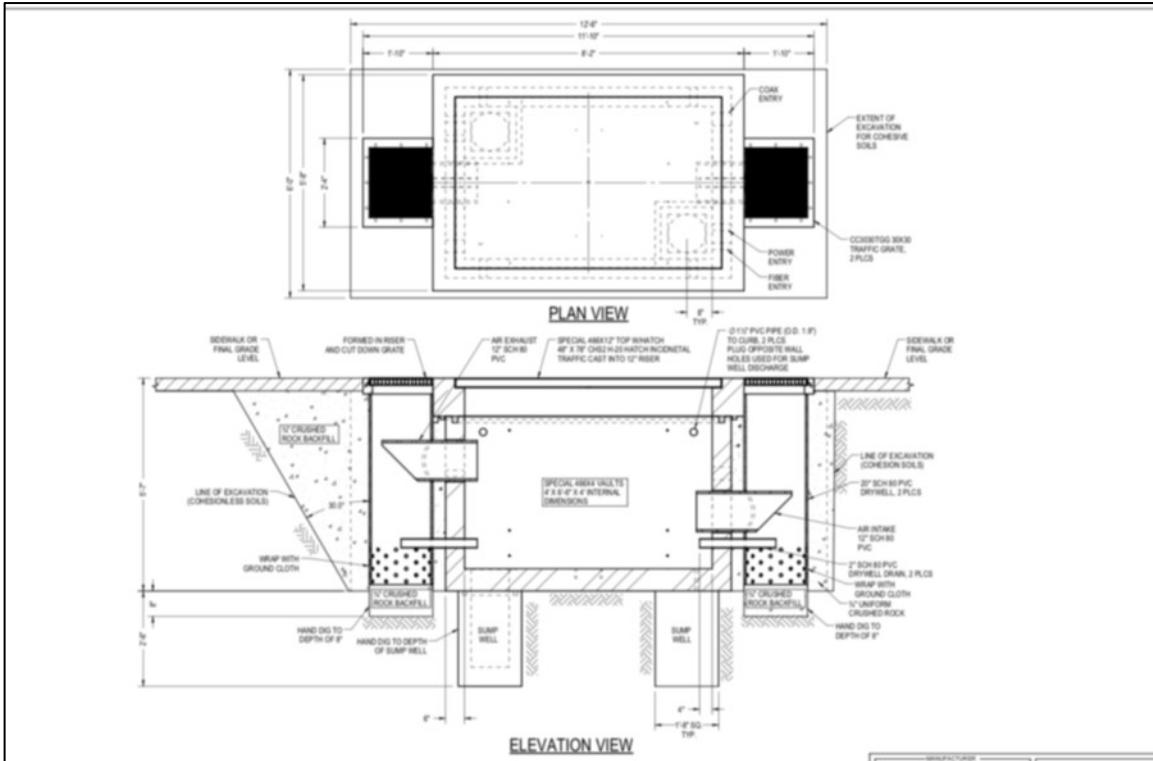
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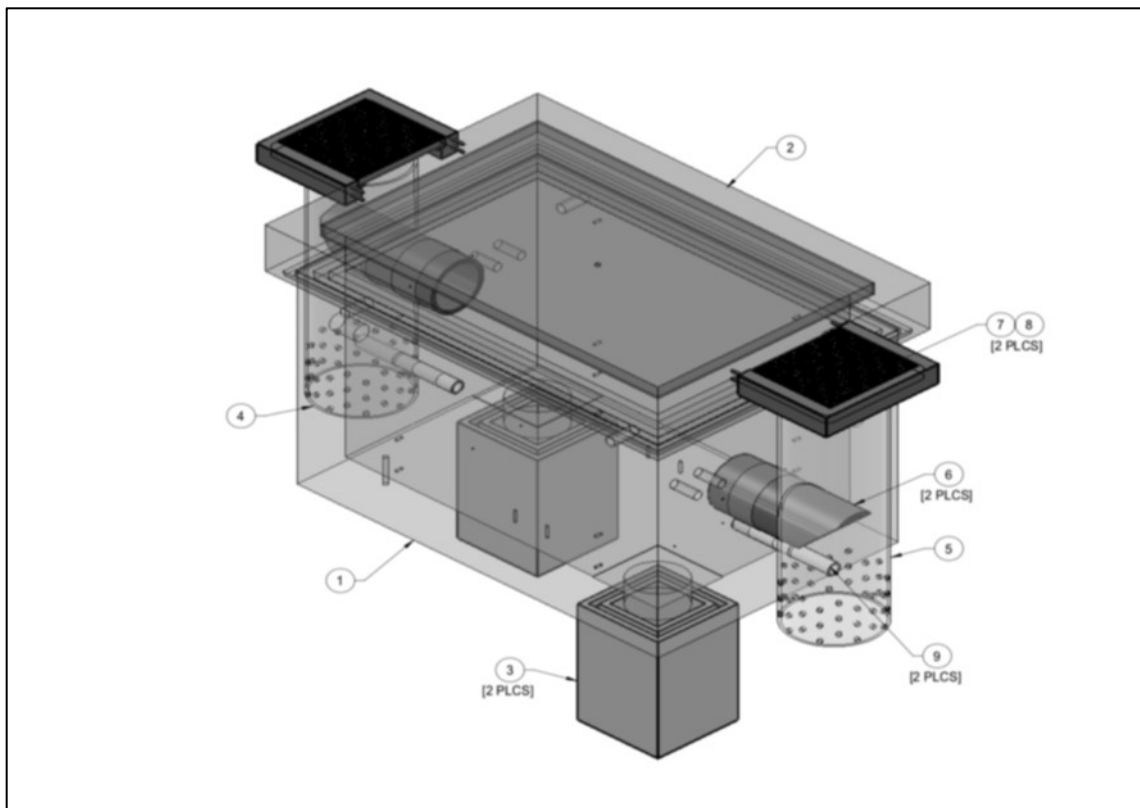




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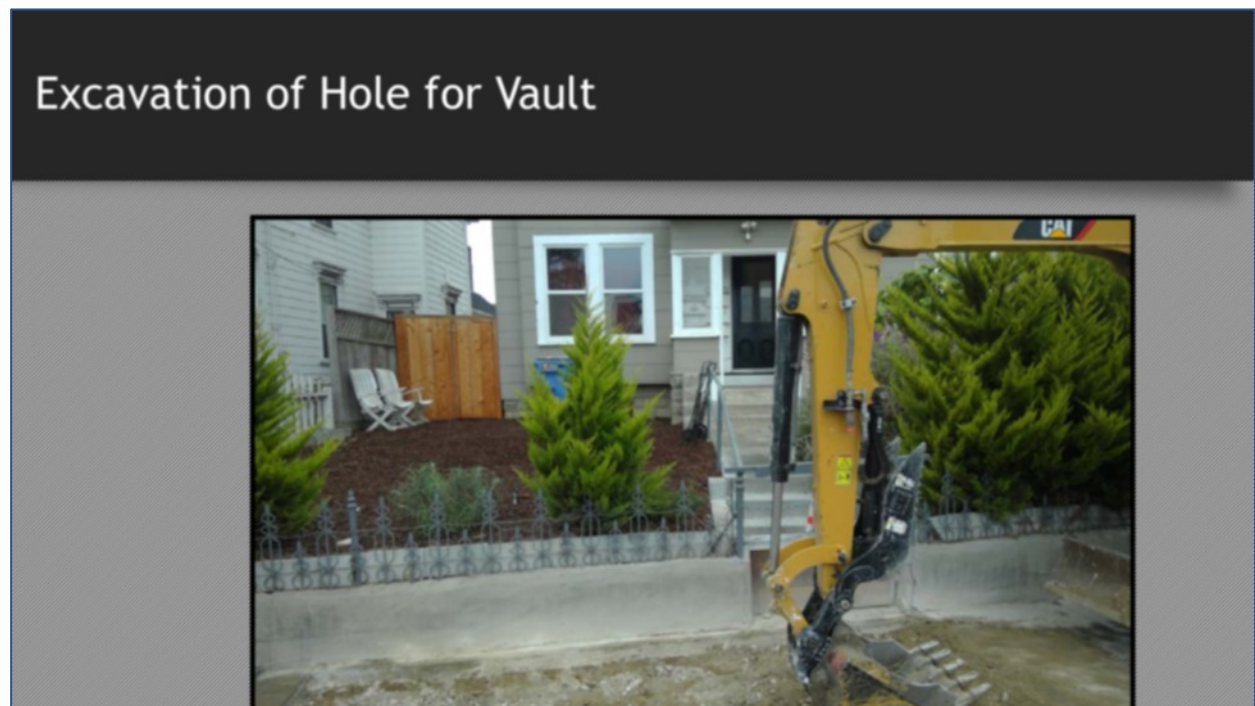
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**Venting**

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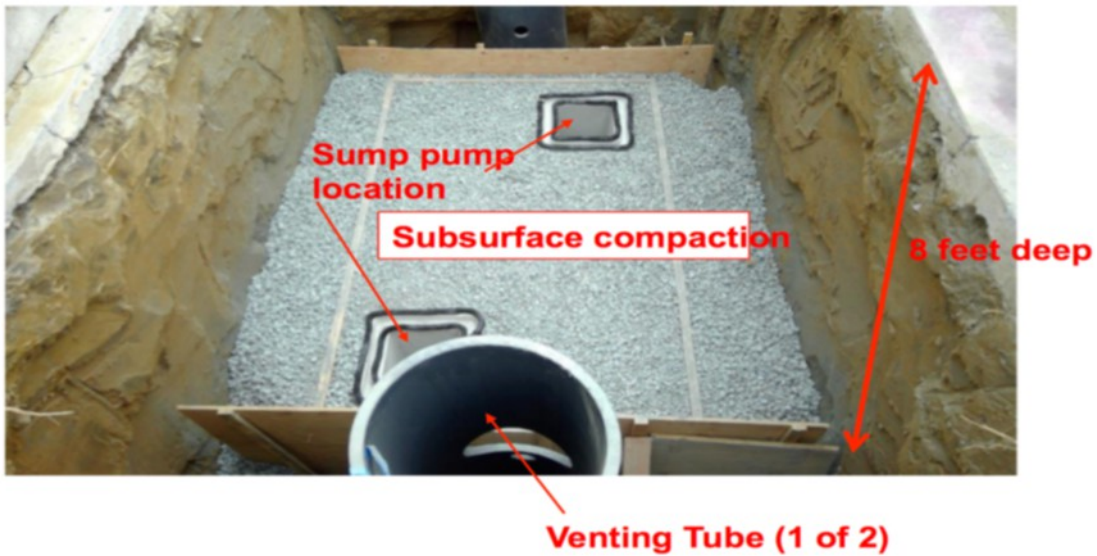
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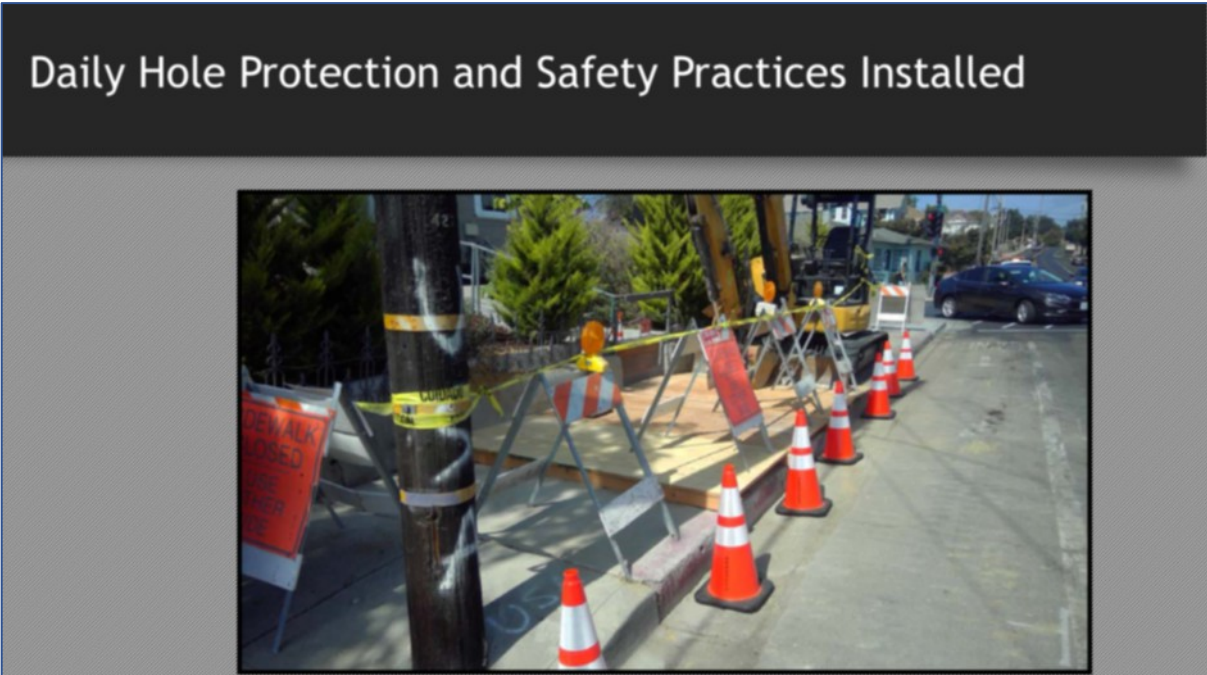
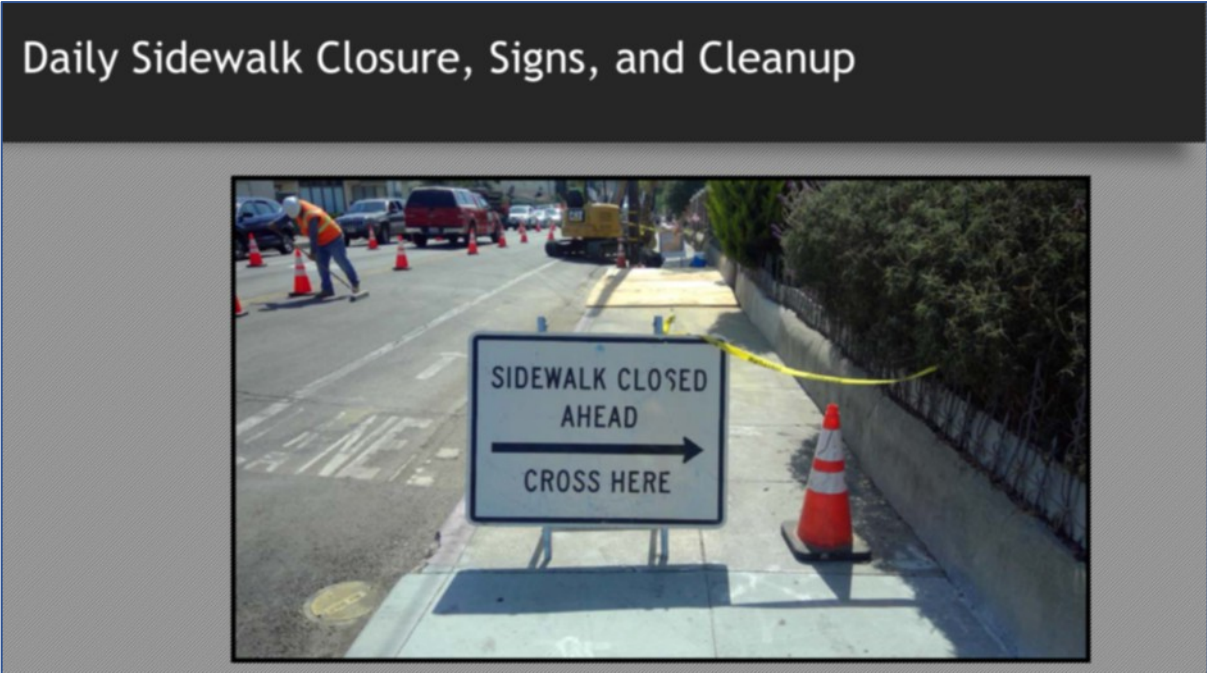
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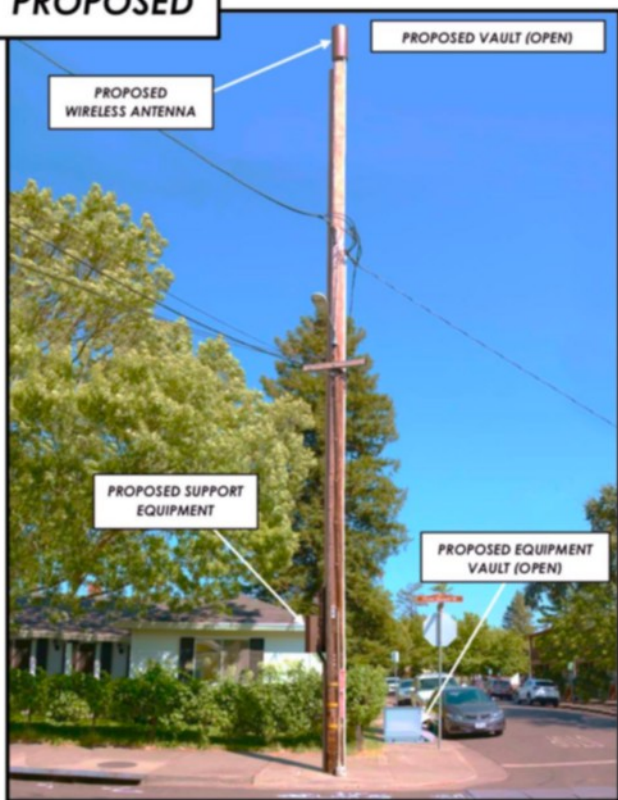
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- III. Vaulting will likely become obsolete for future wireless technologies as antennas and radios are integrated.

h. Tree Impact: There is a very large and mature tree near the existing pole with an expansive root system. Installing a vault in this location would impact the tree. The tree's root system may also create a long term impact to the underground cable, conduit and cabinet surrounding the shoring system of the vault. Arborist recommendations received by CBR indicate root pruning will likely be required for vault installation.

**PROPOSED**



**PROPOSED**



Comparison Photo of Proposed Equipment Planned Placement on Pole as compared to Removal of the RRU's and placed underground utility vault below the sidewalk.



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<ul style="list-style-type: none"><li>• Operational Challenges: vaulting creates water, heat, and maintenance complications that critically compromise network reliability</li></ul>
<ul style="list-style-type: none"><li>• Noise Impact: venting and pumping likely exceed noise ordinance requirements</li></ul>
<ul style="list-style-type: none"><li>• Cost Impact: excessive initial and ongoing costs</li></ul>
<ul style="list-style-type: none"><li>• Aesthetic Considerations/Comparison: minimal visual impact of radio backpacks on pole are minor compared to permanent impacts of vault</li></ul>
<ul style="list-style-type: none"><li>• Permanent Impacts: vaulting compromises future undergrounding and use of right-of-way</li></ul>
<ul style="list-style-type: none"><li>• Tree Impact: excavation may jeopardize adjacent tree and require root pruning</li></ul>

## 7. Conclusion

Vaulting the Verizon Wireless radios creates unwarranted operational challenges that compromise network reliability. Further, vaulting two radios will not achieve the City's desired result of lesser visual impacts. Vaulting results in construction, ongoing noise, traffic, tree, and permanent impacts to the City and its residents and increases the risk of failure and decreases the reliability of the Verizon Wireless network. Only two of the major components of the small cell facility, or approximately 25% can be undergrounded. Relocating the radios from the pole to a vault results in a minimal reduction of bulk from the pole while creating substantial impacts that result from vaulting. The potential negative impacts to Sonoma, including greater risk to operational reliability of the Verizon Wireless network, outweighs any minimal improvement to the appearance of the pole from the removal of the two radios.

**City of Sonoma's Syndeo Vault Recommendation – Verizon Feedback Analysis Below**

**Note the Original Vaulting Analysis is applicable.**

**From:** "Bascom, Jerry" [REDACTED]  
**Date:** Friday, June 7, 2019 at 3:16 PM  
**To:** [REDACTED]  
**Subject:** Fwd: Sonoma Response to Vaulting - Action Required

*I just finished my discussion with Scott here are my findings*

*Pro*

1. *Environmentally controlled*
2. *If the vaults leaks, the equipment contained therein is damaged Syndeo will replace it*
3. *If the water sensor trips Syndeo will send out techs to fix it. Need to set up contractors in CA*
4. *Low Maintenance*
5. *H2O load rated vault lid*

*Cons*

1. *Sites Built So far - As of today they have only built 2 sites in Austin Texas. And five sites being installed in Virginia this summer. So not a very good track record*
2. *TCP - this site will take about 2 weeks to construct with lane and sidewalk closures.*
3. *Could house batteries - All depends on the cooling system. With vents it could but then you would have noise and vents sticking up in the sidewalk. With Geothermal cooling no batteries can be installed.*
4. *Do we have Sufficient Sidewalk Space for the vault and construction? Depends on the width of the side walk. We would need approx 10-20 ft in length and 6-7 ft width. The design that was presented will not work for us as they are not using the correct 4G equipment. The dimensions would need to be increase both width and length and depth.*
5. *Underground Infrastructure interference - this would still need to be avoided*
6. *Tree root interference this would still need to be avoided*
7. *Waterproof - I have seen a lot of vaults that are supposed to be waterproof with water in them. This could be due to many things including the rise in the water table, bad seals, and cracks in the vaults.*
8. *Flooding - Always and issue with equipment on or in the ground.*
9. *Noise - Limited noise with the Geothermal. With the vents we will have some noise. No data at this time.*
10. *Construction impacts - The sites will take longer to build with sidewalk and street closures. Cost will increase. See below*
11. *Limitation on future development both for equipment changes and for subsurface infrastructure for the city*
12. *Disconnect and meter must be on the pole or power pedestal per PG&E*
13. *LAA, CBRS, and future 5G needs to stay on the pole so a vault will not work*
14. *Maintenance - limited so this may be good thing, per Syndeo.*
15. *The drawings - Equipment required for 4G is missing so the vault will need to be larger*
16. *Coax that needs to be installed will be 8 - 1/2" or 7/8" which will cause the foundation to be replaced. We would need to verify if the pole will accept the required Coax. Pole may need to be replaced.*
17. *Geothermal cooling loop is approx 180 feet deep Cost is dependent on local conditions. Could have environmental issues with removal of the soil*
18. *Cost is \$30k as the estimate for Austin and they did not include any pole/foundation work. I was told that the material would be approximately \$20k. New foundation for the pole to run the larger conduit will run around \$20K, GC cost for Austin will be about \$15k, so for the Bay Area, I would increase that to about \$22.5k. So an approximate cost would be about \$60k+Geothermal cost for a steel pole.*
19. *Estimate construction time is 3 weeks with pole and foundation work, vault installation, equipment installation.*

*Please call me if you have any questions,*

*Thanks,*

*Jerry Bascom, P.E.  
Principal Engineer-Construction -- Network  
Verizon Wireless--Northern CA/NV Region*