

**TO:** Honorable Mayor and City Council  
Attention: Jeremy Craig, Interim City Manager

**FROM:** Dawn Leonardini, Administrative Services Director, Kris Concepcion, Fire Chief, and John Carli, Chief of Police  
(Staff Contact: Chief John Carli, (707) 449-5231)

**SUBJECT: REQUEST FOR COUNCIL DIRECTION ON PLACEMENT OF A RADIO TOWER ON DRAKES PEAK**

**DISCUSSION:**

In April 2016, CSI Telecommunications was selected as the consultant firm for the City of Vacaville to help implement the public safety radio system replacement. The current Motorola radio system that is shared between the Cities of Vacaville and Fairfield will reach the manufacturer's end-of-life replacement and maintenance cycle in December 2018. To prepare for its replacement, the project was divided into 3 phases to include a needs assessment, procurement and system implementation.

The needs assessment included the evaluation of the existing system and radio sites, user visits, site visits, conceptual design, and a coverage prediction study. Staff met regularly over the last year and reviewed the findings of the needs assessment in preparation for requests for proposals (RFP).

Coverage, redundancy and interoperability were identified as the most significant factors when preparing this request for proposal.

A 2005 staff report titled "Fire Station 73 Transmitter Relocation" documented the status of the radio system and future plans for city growth and radio coverage. The report identified alternative radio sites based on radio coverage, redundancy and interoperability. The recommendation for the future was to develop Drakes Peak in Vacaville and Cement Hill in Fairfield, which would replace Butcher Hill and Fire Station 73 radio sites. In 2006, Vacaville and Fairfield entered into a cost sharing agreement with Solano County to develop Cement Hill. The report concluded that future development of Drakes Peak would further enhance interoperability for Vacaville and Solano County and allow for migrating the radio site on Butcher Hill to Cement Hill. (See Attachment 1.)

Drakes Peak, also known as Drakes Point or "Old Rocky", was originally proposed as "New Drakes" in 1991 as part of a 2-site solution for Vacaville's public safety radio system, along with the Butcher Hill radio site. At the time, the land was not owned by the city so an alternate site was developed at Fire Station 73. Drakes Peak has always been considered superior to Fire Station 73 as a radio site. The infill radio coverage from Station 73 radio tower has been problematic since it was put into service in 1992.

In 2008, the City of Fairfield replaced its UHF radio system by joining Vacaville and implementing its own 800 MHz radio sites at Cement Hill and Nelson. Cement Hill, which is now fully operational, is a primary site for Fairfield and supports Vacaville's radio equipment as well. This joint radio system, comprised of 4 sites, provides both cities greater range in coverage, and enables full interoperable communication between Fairfield, Vacaville and Suisun City, covering over half of the entire terrain in Solano County. This single-shared network greatly supports interoperability between all departments and cities, as well as providing the technology that currently affords interoperability with Solano County.



Recently, staff analyzed the current radio system coverage maps as part of the radio replacement project to determine if any recommended changes were required. Butcher Hill is elevated along the ridgeline near Butcher Road and provides optimal coverage for about 85-90% of Vacaville. The site was determined to be working effectively with only minor challenges relating to site access and power. The City leases this space from American Tower, currently costing \$24,000 per year.

The secondary radio site located at Fire Station 73 on Eubanks Court is less than ideal. Situated at 60' above the ground, the radio tower provides optimal coverage for only 20-25% of Vacaville. Development in the surrounding area creates interference in the Browns Valley area and has further limited the radio coverage in north Vacaville. Newer neighborhoods, such as Cheyenne, have inadequate reception and will require either a change in the design or an alternative site to ensure proper radio coverage in the future. CSI Telecommunications provided additional analysis in order to determine the benefit of increasing the tower height to 100' to improve coverage with less than ideal results.

**Figure 1. Coverage Prediction Map of new Project25 system with Butcher Hill and Fire Station 73**

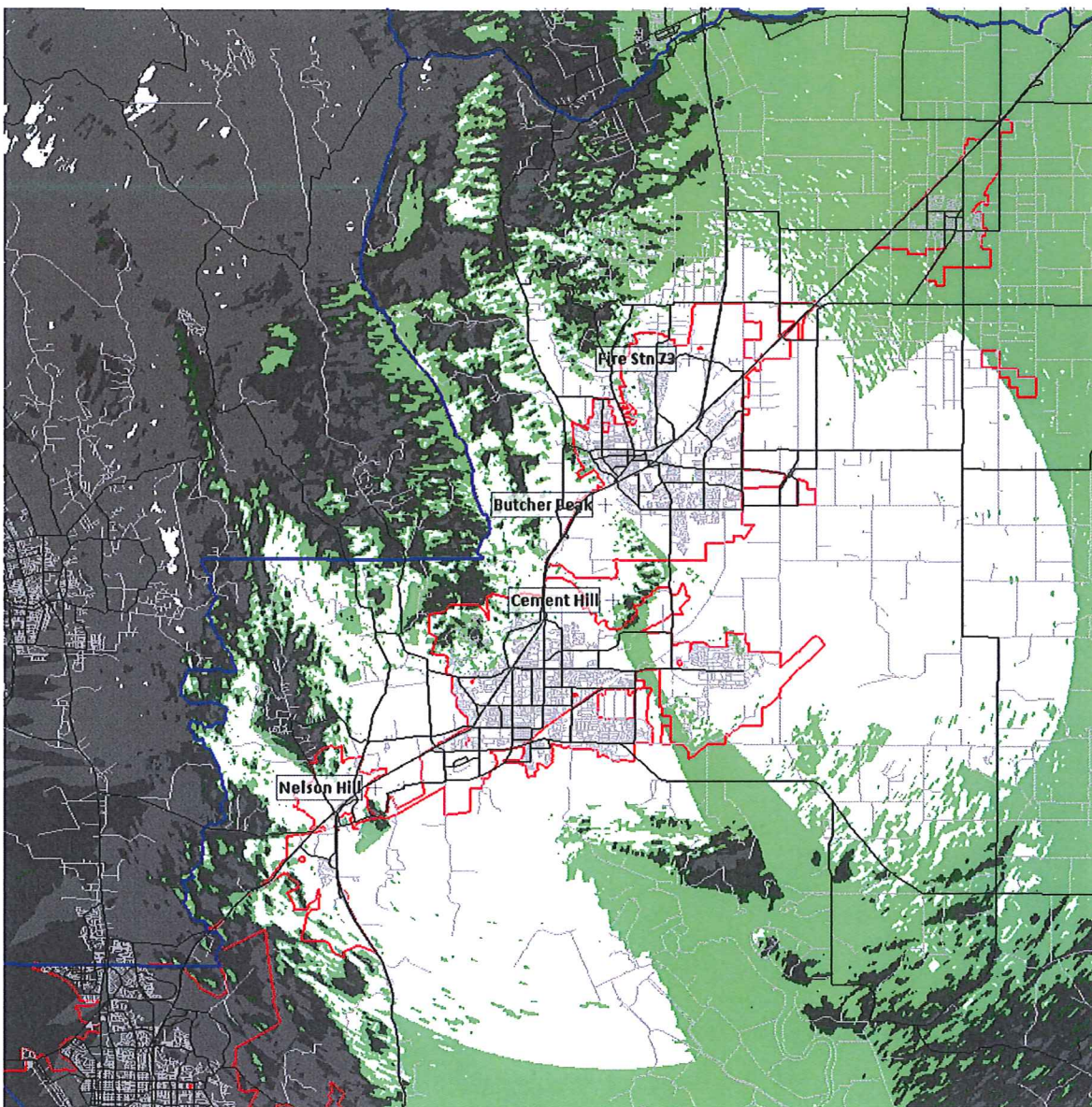


Figure 1. Description:  
95% Reliability to a Portable radio in a police vest or in fire turn-out pocket  
Clear area: Outside and Inside most buildings  
Green area: Outside



**Figure 2. Coverage Prediction Map of new Project25 system with Drakes Peak**

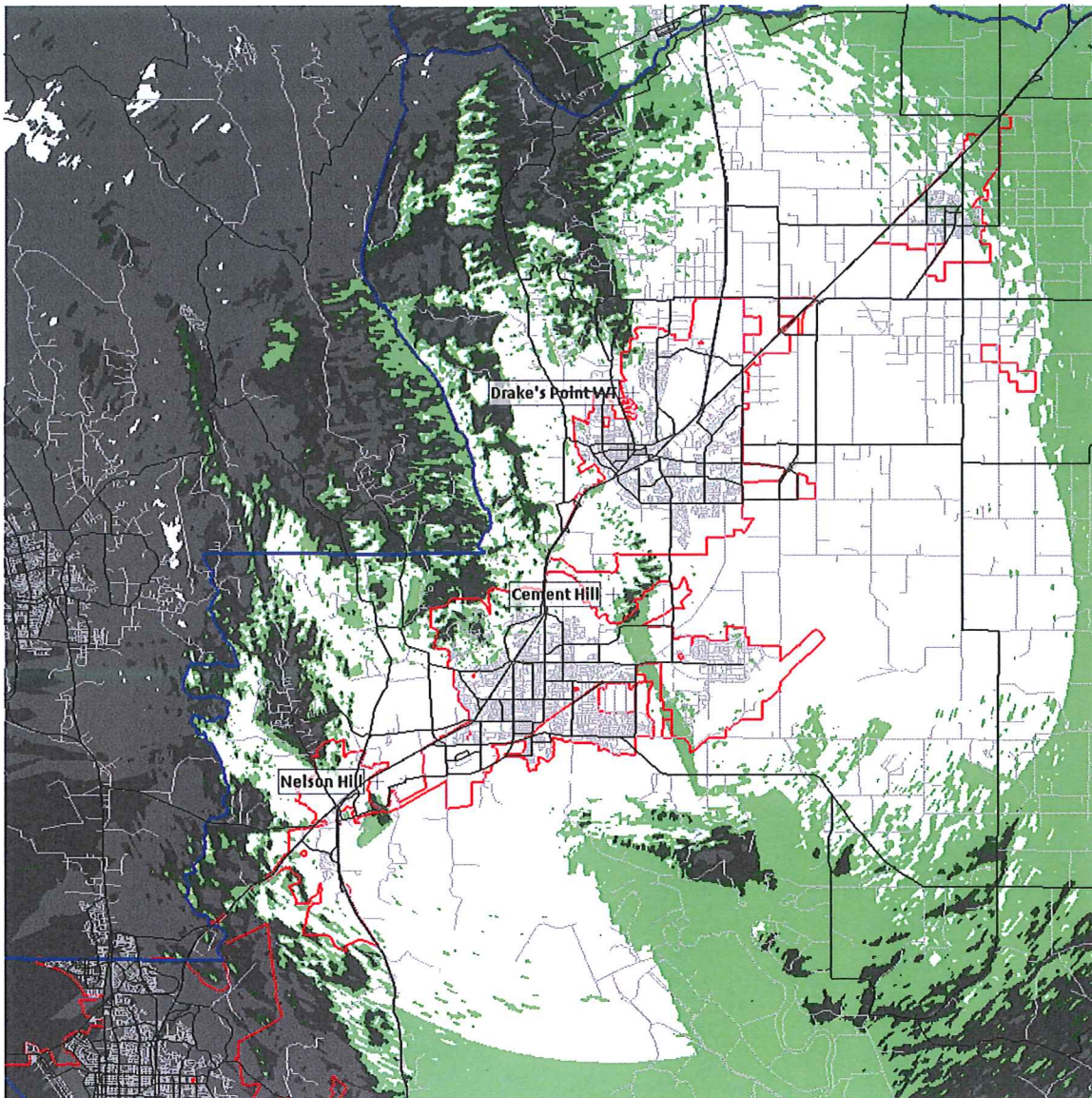


Figure 2. Description:  
95% Reliability to a Portable radio in a police vest or in fire turn-out pocket  
Clear area: Outside and Inside most buildings  
Green area: Outside

Staff researched alternative sites to address the shortcomings of the current configuration, radio tower locations and reliability issues that require redundancy. Mount Vaca and Mix Canyon ridgelines were evaluated and determined to be inadequate alternative tower locations, specifically due to topographical challenges that limit radio coverage in Vacaville. Drakes Peak, also known as Old Rocky, was determined to be an ideal site location, providing improved radio coverage, redundancy and interoperability for the future. This peak is situated on the southern end of the Vine Street ridgeline and is owned by the City of Vacaville.

CSI Telecommunications consultants and city staff made multiple site visits to Drakes Peak, evaluated its significance as proposed in 1991, and confirmed the conclusions presented by staff in the 2005 Fire Station 73 Transmitter Relocation Report. Developing a radio site on Drakes Peak would cover the entire city with the exception of Lagoon Valley, which is now covered by Cement Hill. This means that a single site in Drakes would replace the current 2 sites, and provide radio coverage in areas that currently are problematic in the Browns Valley/Cheyenne residential developments.



Land Use considerations were discussed, and it was determined that the placement of a radio tower for the sole use of providing radio coverage for the City of Vacaville was the best course of action. The most significant challenge in 1991 was that the land was not owned by the City of Vacaville, hindering its ability to develop the radio site. Since that time, it has become city-owned and is considered open space for hiking. By not partnering with commercial ventures, the impact would be limited to city use, thus keeping the site small and less visible than many of the other tower sites already visible on mountain peaks around the Vacaville ridgelines. This course, however, requires the City to incur all costs in developing the access and site.

The proximity to the airport was also considered. The relatively undeveloped peak has a 38' wooden pole with a powered beacon to warn pilots who use the Nut Tree Airport. Staff determined the use of Drakes Peak could be accomplished by replacing the pole with a 50' monopole antenna, about 12' taller than the current pole. This was confirmed by the consultant. Furthermore, the FCC has granted future radio licenses to Vacaville for the use on Drakes Peak if staff is directed to develop this site.

The view of the peak was considered as well. This location is highly visible and attracts hikers and rock climbers. Staff researched the existing access trail and identified an initial plan that would utilize an improved crushed granite path up the eastern slope. The path would utilize a pre-existing path that extends up a significant portion of the hill. An improved path also has a potential benefit of making this open space more accessible for hiking up to the peak, which provides great views from its rocky vista. A camouflaged radio tower and shelter façade could significantly reduce any visual impact, and can be placed as not to interfere with access by visitors who want to enjoy the scenery or walk the existing trails. The position and location of the required 12'x12' shelter would minimize its visual impact, with landscaping that would minimize its visibility.

Staff determined that the cost to develop a site and provide a drivable access would be approximately \$830,000. The Shelter, tower and backup power are estimated at \$220,000. This cost will be required regardless since the shelter, tower and generator at Fire Station 73 would need to be replaced if this alternate site is not approved. This does not include future radio equipment, which will be replaced as part of the radio system project and would occur at any proposed sites.

CSI Telecommunications assisted in the analysis and determined the Drakes Peak site would be the preferred site to replace the site at Fire Station 73 and could either eliminate Butcher Hill since it has equal coverage, or keep Butcher Hill to provide equal redundancy coverage for the City of Vacaville (85-90% from each site). Any alternatives in the design and configuration of the replacement radio system need to be included in the radio replacement RFP, even if the option is determined not suitable at a later date. Therefore, staff is presenting 3 options for consideration and input from the Council:

- Option 1 – Develop Drakes Peak and eliminate Butcher Hill and Fire Station 73
- Option 2 – Develop Drakes Peak and keep Butcher Hill for redundancy
- Option 3 – Keep Butcher Hill and Fire Station 73

#### **FISCAL IMPACT:**

**No General Fund Impact at this time.** The capital Improvement project to replace the radio system will be funded using the General Fund, which will be brought before the Council in the future for approval. Funding is currently being set aside each year in preparation for replacing the radio equipment. Costs associated with the potential development of a new radio site would also come from the General Fund.

#### **RECOMMENDATION:**

Receive the presentation and provide input and direction to staff.

#### **ATTACHMENTS:**

Attachment 1: 2005 Fire Station 73 Transmitter Relocation Report



# ATTACHMENT 1

## City of Vacaville Fire Station #73 Transmitter Relocation

### Background:

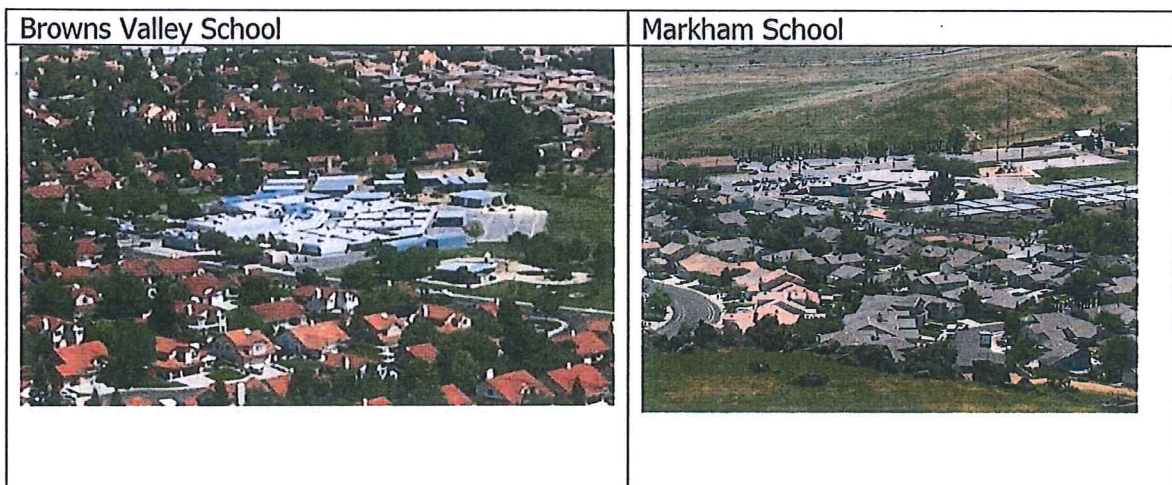
The public radio system was installed during 1992 when the Cities within Solano County developed their own radio systems as an officer safety concern as the County Radio System was unable to meet the needs of the Cities. The original system design called for a minimum of two simulcast sites in order to provide the City of Vacaville's coverage reliability for medium-sized in-building portable coverage required for public safety in the 800 MHz Public Safety NPSPAC frequencies. The two simulcast sites originally proposed were New Drakes Point and Butcher Hill, with Wykoff Hill used for mutual aid VHF.

An alternate site to replace New Drakes Point on City of Vacaville property was Fire Station #3 at 650 Eubanks Court (renamed Fire Station #73) due to difficulties in site development at Drakes Point that was not owned by the City of Vacaville at the time. Fire Station #73 was less desirable from a coverage point of view, but seemed sufficient to cover the City's population bases at the time and some of the foreseen growth into the future. The City is now working on a plan to relocate Fire Station #73, which further reduces the value of this site.

### Current Status

The City's public safety radio system has radio reception problems in the Browns Valley area, in the Markham/ Rocky Hill area, and the strip connecting them along Woodcrest Drive. As the City has grown and service demands have increased in this area the communication problems are becoming more pronounced and severe. These areas of rolling hills that interfere with radio reception and transmissions. One especially critical location is Browns Valley School where we have experienced significant radio problems for years. Until this problem is solved we will have serious communication difficulties at any incident on this campus. The terrain of the Browns Valley School is in essence in a "bowl" and the terrain contours limit the transmission of radio signals mostly out of the bowl. The radios can in some places receive from the transmitter at Fire Station #73, but the radios in the bowl are unable to transmit out and be heard on the receivers at Fire Station #73.

Pictures taken from Drakes Point show the two schools that have practically no coverage from our public safety radio system.





## Current Coverage Map

Recent documentation and modeling reveals that there exist some areas that are without radio coverage. The current radio system coverage with Fire Station #73 substituted for New Drakes Point shows the areas without coverage.



The color green is the coverage from Butcher Hill alone, blue is the coverage by Fire Station #73 alone and yellow is the combined coverage achieved by simulcasting, where the whole is more than the sum of the parts.



One short term solution explored that did not yield promising results was raising the antenna on the tower at Fire Station 73 another 20 feet. Another short term solution that does show some improvement is an optimized receive antenna with multicoupler amplification so that the weak signals from portables would be more reliable. The cost of optimizing the antenna at Fire Station #73 is \$22, 251. This solution increases coverage to the grids that have weak signals, but if an area has no coverage caused by the terrain, adding these improvements, will not create coverage. The long term solution is to relocate the Fire Station #73 site to Drakes Point.

An additional short-term solution that is available and would only be viable if we are going to remain on the analog trunking system for a few more years is to develop a receive-only site at the Browns Valley Reservoir that overlooks the pocket area for the most significant areas without coverage. The transmitters would not be able to be relocated without FCC approval, but the transmitters operate at 100 watts of transmit power compared to the 3 watts from a portable radio. A receive only site at the Browns Valley reservoir could resolve the pocket areas for the two schools for \$300,000 in parts and service. The co-location expenses have not been explored. If the timing of the relocation of the Fire Station site is likely to be lengthy, this option should be exercised.

The City can decide to extend the life of the analog system for another five years by upgrading the radio system the investment of approximately \$1.5 Million. This investment would develop a site, and carry out phases two and three of the radio system upgrade began during 2005 with the replacement of the microwave and transport subsystems. The merits of this option is that the subscriber radios currently in use could continue to be used, which is especially valuable during the mandatory reprogramming of our frequencies by the FCC's Report and Rebidding Order to be funded by Sprint/ Nextel. Many of the radios that the City currently owns will not accept the new frequencies and will need to be replaced with equivalent analog radios. In order to exercise this option the controllers that would be required need to be purchased prior to December 2006. The City of Davis was the last new system that was sold an analog trunking solution, and is available to the City of Vacaville until December 2006 as an upgrade to an existing system. The required MTC 3600 controllers will not be sold after December 2006. If the timing of the site development at Drakes Point and the relocation of the Fire Station site is likely to be lengthy, this option should be exercised in addition to the more short-term receive only site mentioned above.

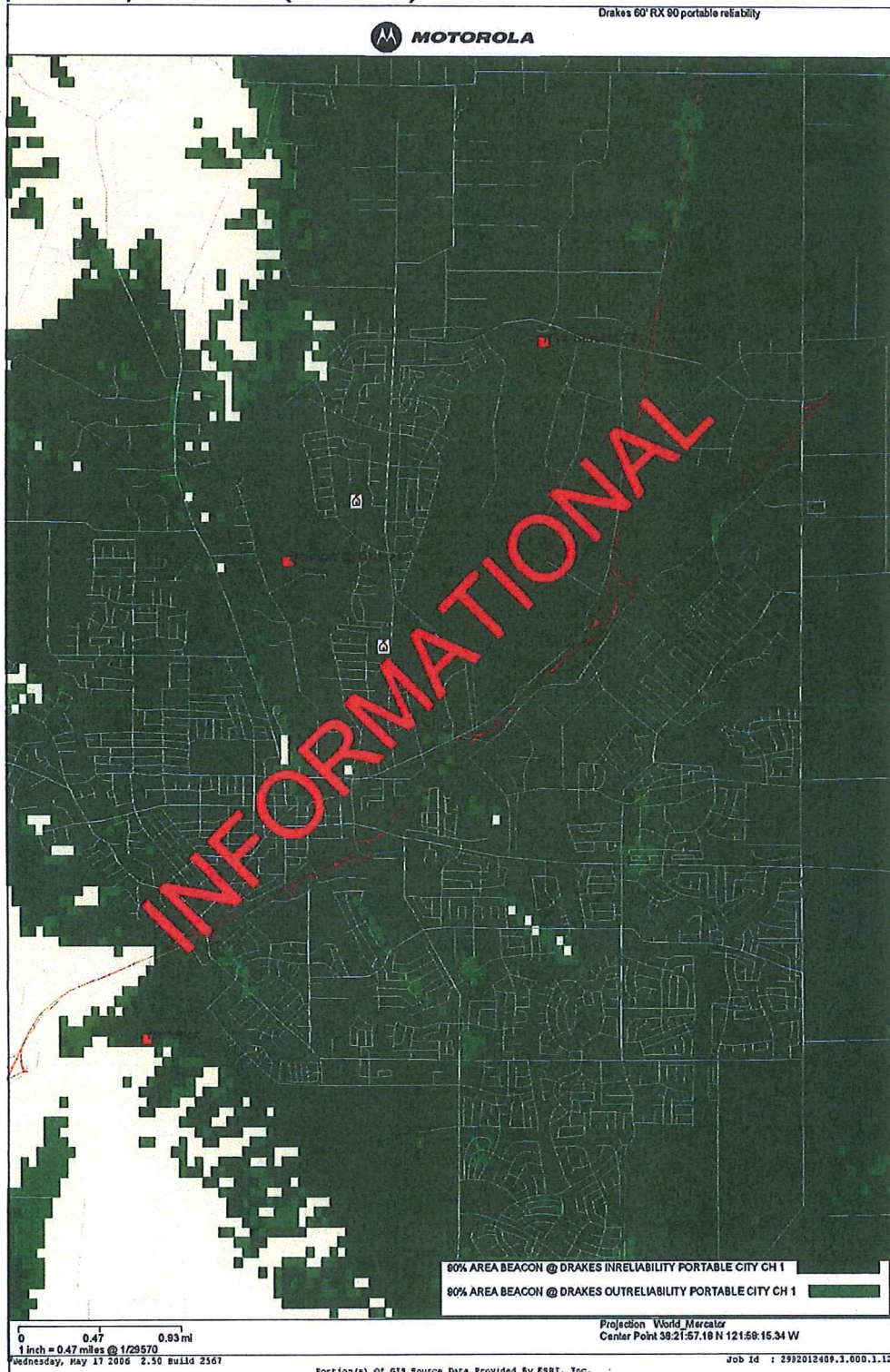
The City may decide to upgrade to the standards-based Project 25 digital and make the technology jump to the direction that radio system are going. The infrastructure upgrade cost is estimated to be \$5 million. The analog subscriber radio would also need to be replaced for \$1.8 million. The cost of the infrastructure could be reduced by joining the Alameda County Project 25 system's master site, thus eliminating the need to have our own master site and the associated \$1.5 million. Funding the required \$9.4 million, along with the site development and relocation is going to be difficult.

In order to optimize the investment of the digital project 25 radio system the timing of the transition would have to occur when the newer linear transmitters are released. Similar to what the cellular industry discovered when they made the transition to digital, the range is not as good with digital as with analog. A new line of linear transmitters are in development that would ensure that the digital coverage, or "footprint" is what our analog system has. Without the linear transmitters, additional sites will be required to adequately cover the City of Vacaville.



## Coverage Provided by Drakes Point

Relocating to Fire Station #73 to Drakes Point would cover practically all of Vacaville East of the Butcher Hill. The predicted radio coverage with 90% reliability from a relocated simulcast site at Drakes Point is illustrated below. The radio coverage to the west and into Lagoon Valley is provided by Butcher Hill (not shown).





## Interoperability

After the September 11, 2001 terrorist attacks in New York, public safety interoperability became a major issue, and on May 22, 2003, a needs assessment was contracted by Solano County with RCC Consultants to bring the dissimilar radio systems in Solano County to a common infrastructure. Unfortunately, the estimated price for a replacement radio system was in excess of \$56 Million.

Grants for a County-Wide Radio Interoperability project were procured from Homeland Security and other sources that totaled \$3 Million under the Joint Solano Emergency Communications Activities ("SECA"), which after an RFP, resulted in a contract award on 10/27/2005 to the winning bid by Apptis Inc. The design of the system resulted in six strategic simulcast sites that would each have two mutual aid frequencies within each of the four frequency spectrums that exist amongst public safety agencies within Solano County that can then be shared and tied together with a SmartLink communications network system.

Part of the Proposal submitted by Apptis/ Smartlink included discussions about the individual jurisdictions:

In the case of both Fairfield and Vacaville, Cement Hill was identified as being a significant part of their respective coverage problems. In the case of Suisun, relocation of the City's public-safety repeaters to this site would provide significant benefit not only in coverage but in connectivity and redundancy. Though there are insufficient funds to perform all of the work involved, there should be sufficient monies and justification to erect a heavy-duty collocation tower and the associated antennae and grounding that would permit its use by all four entities.

Propagation studies showing the recommended reconfiguration of these stakeholder systems as well as Vallejo are included in our response, though as previously stated, the balance of the funds required will need to come from sources outside of the current project scope. Since each of these cities is also home for one of the County's regional dispatch center/PSAP's and their integration is ultimately required, a quick review of the short and long term plan for them is included here as well.

[Portion excluded not pertaining to Vacaville]

Vacaville: The Vacaville Dispatch Center (VADC) is already a drop point on the County's digital microwave backbone thus the installation of a SmartLink advanced dispatch operator position (ADOP) to provide access to the Interoperability system is once again, a fate complete. However, we have come to understand that Vacaville has some rather significant coverage issues and that it intends to replace its aging 23 GHz microwave. An analysis of Vacaville's current system confirms these coverage issues and further indicates that Cement Hill is once again the major contributor. The use of the CCH by Vacaville would help resolve many of its issues and is hereby recommended. As the City has already determined, there is no one site that can address all its coverage issues and this remains true with the use of the CCH site however, none of the existing sites provide an optimum fit for the coverage achieved off the CCH site. This prompted further analysis which ultimately identified a location within Vacaville on City owned land approximately 800' NW of an existing water tank. This is an excellent fit with the CCH site and with dramatically superior coverage. It is highly recommended that the VT3 site be build. The cost associated with building this site could not be included in this phase of the project. The construction is estimated at \$250,000-300,000. Please see further details under Vacaville in the Municipal Aspects of Solano County Part 2. The VT3 site could and should be considered for



development. We have obtained a budgetary quotation on the cost of a 190' tower and associated transmitter building that could be sited at this location (assumes normal soil composition), though the City would also need to extend both the driveway and electrical service from the water tank to the site location. In light of the City's intent to upgrade its aging microwave, we highly recommend consideration of these recommendations as the planned upgrade would provide a unique opportunity to make such a major change while minimizing system downtime. The existing RF simulcast equipment currently in use by the City would merely be relocated and connected to the new microwave links to complete the reconfiguration which, when completed, would effectively replace the Butcher Hill and Fire Station sites although one of these might be more desirable than the current site being used for mobile data and conventional backup.

#### Putting it all together

The Butcher Hill site is located at the top of a very steep ridge. This location is very difficult to access during the winter and is susceptible to fire damage during the summer. Once the Drakes Point site is providing coverage for Vacaville East of Butcher Hill, the logical next step is to relocate the second simulcast site to Cement Hill in Fairfield which overlooks Lagoon Valley to the East and the remaining North Solano County.

One of the six simulcast sites that form the backbone of the SECA radio interoperability project is referred to as Cement Hill and becomes the City of Vacaville's solution to the lack of radio communications while our officers are in the neighboring City of Fairfield.

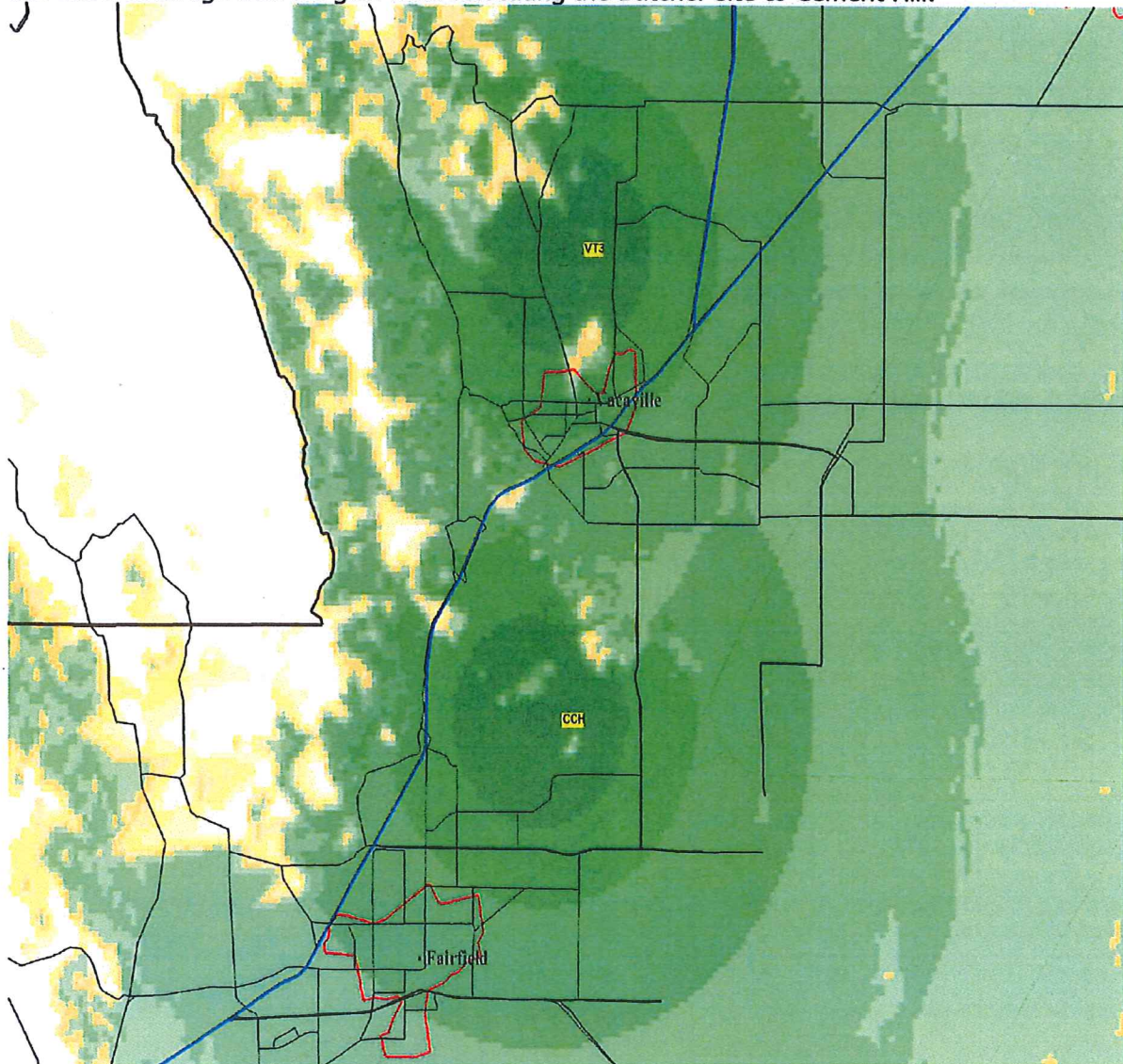
The SECA project is providing for the funding to adequately size the mutual aid site at Cement Hill. This site is also the single site that the City of Fairfield needs for their radio system as well as for the City of Vacaville to cover the Lagoon Valley area to the Northeast, and provides for coverage for Northern Solano County, which would include the County Jail in Fairfield. The Cities of Fairfield and Vacaville will split the incremental cost of \$100,000 to size the communication building for the Cement Hill site such that there will be adequate space for the co-location of the SECA mutual aid equipment, the City of Fairfield's radio system and the City of Vacaville's relocation of the site currently at Butcher Hill. The funding source for the City of Vacaville's share is from the Motorola Microwave and Transport System Replacement remaining budget. The County and the Sheriff's office is currently served by a much higher site on Mount Vaca. They are providing the management of the SECA project and the property for the site, and the electrical and standby power generator system for \$100,000 contribution.

A \$120,000 City of Vacaville contribution towards the SECA project will be needed, although the Vallejo site was moved to a phase 2 implementation which delays that needed contribution.

The City of Vacaville pays Coast Radio approximately \$12,000 per year for a lease of the transmitter site. Once the Drakes Point radio site is operational, the Butcher Hill site can be relocated to the Cement Hill site.



The conceptual coverage picture below predicted coverage from a less desirable site referred to as VT3 (Vacaville Test 3), which had too many areas in the downtown area without radio coverage. Using the Drakes Point coverage from the images above, the picture below shows the extra coverage that we gain from relocating the Butcher site to Cement Hill.



Since the steps outlined will take some time, as soon as the Cement Hill SECA co-location site is developed, the City of Vacaville will install a conventional transmitter on Cement Hill that will transmit the "Fairfield Channel" that will be monitored in Dispatch when the officers in the field switch zones while transporting prisoners into Fairfield. After we relocate the Butcher Hill site to Cement Hill, there will be seamless coverage throughout Northern Solano that would then comprise the new footprint of the City of Vacaville 800 MHz radio system.

The recommended course of action is to develop the site on Drakes Point immediately with either analog equipment upgrades and then eventually relocate Butcher Hill to Cement Hill along with the Drakes Point site, eventually abandoning the three existing sites at Butcher Hill, Fire Station #73, and Wykoff Hill. Negotiation needs to occur to use the Alameda County Master site, thus avoiding the \$1.5 Million expense of our own master site. We should also work with the private sector to avoid the \$0.5 Million site development cost of the Drakes Point site.



## **OPTIONS:**

### **Short-Term:**

#### **Optimize the Fire Station #73 Antennas.**

- Focus the receive antennas to the Browns Valley and Markham area.
- Additional 20' did not show significant improvement in coverage.
- \$22,251 to improve the reception in the fringe areas of coverage. This can be accomplished within 90 days.

Install a receive only receiver on the Browns Valley Reservoir site that looks into the pocket areas of the Browns Valley School, Markham School and Woodcrest Drive.

- Only viable if we are going to remain on the analog trunking system for a few more years
- No FCC permitting is required for a receive only site
- This is the only solution that may corrects the lack of receive coverage in the short term
- \$300,000 for parts and labor. Co-location costs are not included.

Relocate FS #73 simulcast site with Motorola's analog technology Option– Upgrade to the latest analog P-16 technology (\$1.5 Million) until we can budget for the P-25 system (\$5 Million) within six years. This is a costlier option to defer the eventual expense of a P-25 system.

- New Quantar Transmitters and MTC3600 controllers and new site development.
- MTC 3600 controllers would have to be purchased prior to December 2006, otherwise this option will no longer be available.
- This option basically buys the last of the analog technology, and the effort extends the life of the system for another five years.

Relocate FS #73 simulcast site with Motorola P-25 technology.

- \$5 Million for New Infrastructure
- \$1.8 Million for subscriber radios every 5 years
- Financing option.
- Negotiate for an extended 6809 controller coverage from Motorola Field Service maintenance.
- Joining the Alameda County P-25 system the expensive Master Site requirement would allow an expanded networked area of coverage possible. If we loose the link to the Master Site Controller, local trunking would provide us the coverage are and functionality that we have today. The Master Site Controller costs approximately \$1.5 Million

Partner up with the private sector for the development of a co-location site at Drakes Point, since the areas that our public safety radio system does not cover are also not covered by pagers, or any of the cellular phone companies.

- A group from Community Development, City Manager's Office, Public Works, Police and Fire Departments would ensure that all community concerns are addressed. The site development costs of \$500,000 would be avoided by developing a co-location site rather than depending on the City of Vacaville as the exclusive funding source.



	<u>Cost</u>	<u>Years</u>	<u>Annual</u>
Total Radio System Expenses Since 1992	\$5,338,188	14	\$381,299
Maintenance Contract	<u>\$1,820,000</u>	<u>14</u>	<u>\$130,000</u>
14 Year Total	<u>\$7,158,188</u>	<u>14</u>	<u>\$511,299</u>

Site Development for Drakes Point to  
relocate Fire Station #73 (Real Property -  
Life = 30 Years)

\$500,000 10 \$50,000

Phase 2 and 3 of the Smartnet Trunking  
System Upgrade

\$671,878 5 \$134,376

Receive Only Site at Browns Valley

Reservoir

\$270,000 5 \$54,000

Project 25 Infrastructure - Start during

2011 expected life through 2021

\$4,816,000 10 \$481,600

Project 25 Subscribers (reduced due to  
extended life of analog radios - Rebanding  
& attrition)

\$1,800,000 5 \$360,000

Maintenance Contract

\$1,500,000 10 \$150,000

15 Year Total

\$9,557,878 \$1,229,976

Less: 5 Year Extended Life of Project 25

Years 2017 to 2021

(\$2,500,000) 5 (\$500,000)

Total Costs through 2016

\$7,057,878 10 \$705,788

Less: Master Site Controller Sharing with

Alameda County

(\$900,000)

Less: Co-Location of Fire Station #73 to

Drakes Point Cost Sharing

(\$250,000)

Total Equivalent Costs through 2016

\$5,907,878 10 \$590,788

Site Development for Drakes Point to  
relocate Fire Station #73 (Real Property -  
Life = 30 Years)

\$500,000 10 \$50,000

Project 25 Infrastructure - start now  
through 2016

\$4,816,000 10 \$481,600

Project 25 Subscribers

\$3,600,000 10 \$360,000

Maintenance Contract

\$3,050,000 10 \$305,000

10 Year Total

\$11,966,000 10 \$1,196,600

Less: Master Site Controller Sharing with

Alameda County

(\$900,000)

Less: Co-Location of Fire Station #73 to

Drakes Point Cost Sharing

(\$250,000)

Total Costs through 2016

\$10,816,000 10 \$1,081,600



Summary of Range of Magnitude Proposal: Parts		Labor	Total
Phase 2 - Base Stations	\$182,148	\$91,074	\$273,222
Phase 3 Controllers	\$249,160	\$149,496	\$398,656
	\$431,308	\$240,570	\$671,878
Fire Station #73 Antenna Optimization	\$15,000	\$7,251	\$22,251
Receive Only Site (Equipment & Labor Only)	\$195,000	\$75,000	\$270,000
	\$641,308	\$322,821	\$964,129
Drakes Point Site Development	\$400,000	\$100,000	\$500,000
	\$1,041,308	\$422,821	\$1,464,129

#### Time-Line Recap

Fire Station #73 Antenna			
1 Optimization ASAP	\$15,000	\$7,251	\$22,251
Purchase 5 MTC3600 Controllers			
2 by 12/31/2006	\$311,450	\$0	\$311,450
Investments by 12/31/2006	\$326,450	\$7,251	\$333,701
3 Receive Only Site	\$132,710	\$75,000	\$207,710
4 Drakes Point Site Development	\$400,000	\$100,000	\$500,000
5 Phase 2 - Base Stations	\$182,148	\$91,074	\$273,222
6 Phase 3 - Controllers	\$0	\$149,496	\$149,496
	\$1,041,308	\$422,821	\$1,464,129