RULES COMMITTEE: 4-12-06
ITEM: G(1)

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Memorandum

TO: RULES COMMITTEE **FROM:** Randall Murphy, Interim Chief Information Officer

SUBJECT: CELLULAR REINFORCEMENT **DATE:** 4-06-06
[Rules Committee Referral No. 10-05-05G(2)]

Approved Deanna Santana Date 4/7/06

RECOMMENDATION

1) Rules Committee review this additional information on the assessment for cellular communication reinforcement at City Hall; and
2) the Information Technology Department work with Finance to release an RFP for the procurement of a carrier-neutral system to provide a scalable wireless infrastructure for the improvement of cellular phone reception quality at City Hall.

BACKGROUND

On November 4, 2004, bids for the New City Hall In-Building Reinforcement of Wireless Radio, Cellular and Wireless Fidelity (WiFi) Coverage Project were opened. This project provided reinforcement for cellular and public safety radio along with WiFi coverage for the site. The sole proposal received was approximately $1.6 million greater than the initial $1 million budgetary estimate, and was rejected by Council action in February 2005.

Subsequent work continued to implement each of these three technologies concurrently. Public safety radio reinforcement for critical areas of the New City Hall was completed prior to full occupancy, and WiFi installation in the public spaces was completed in October 2005. Staff from the Information Technology Department (ITD) analyzed cellular reception to identify issues and possible solutions.

At the December 7, 2005 Rules Committee meeting, staff was directed to respond to additional questions concerning the cellular communication workload assessment presented at that meeting. In response to this directive, ITD conducted studies to understand cellular phone coverage quality at City Hall for major cellular providers (Verizon, Cingular, Sprint/Nextel, and T-Mobile). Using the results from the studies, ITD then worked with the carriers individually to determine our options in improving cellular reception at City Hall. In January and February 2006, three of the carriers conducted walk-throughs and technical measurements at City Hall as part of their analyses. Also in February, ITD worked with Finance and issued a Request for Information (RFI) for relevant products; the results are discussed in the Analysis section below.

At the February 22, 2006 Rules Committee meeting, ITD presented the following:

- Summary of the cellular phone coverage studies
- Summary of the improvement plans from each carrier
- Preliminary recommendations

Staff was directed to report back to the Rules Committee with a final conclusion on cellular improvements at City Hall.

ANALYSIS

Work completed since the February 22 Rules Committee meeting

The Information Technology Department has completed the exploration of free and low cost alternatives that carriers would provide to the City in order to improve cellular phone reception at City Hall. Improvement plans carried out by the vendors did not yield significant improvement in overall cellular reception quality at City Hall, particularly in pursuit of our goal to increase coverage for the benefit of the public as well as City employees. In summary, the City's most desirable option of improving cell phone reception at little or no cost to the City is not a viable alternative. In-building equipment would be needed to realize noticeable improvements in cellular phone coverage.

Request for Information (RFI)

In early February, ITD worked in coordination with Finance to issue a Request for Information (RFI) for relevant products that may be utilized to improve cellular reception at City Hall. As of April 6, six responses have been received. The information received includes products that range from carrier specific to carrier neutral (i.e. equipment and systems that can work signals from all the cellular providers) alternatives. One example of a carrier neutral solution is a Distributed Antenna System (DAS). A DAS solution essentially receives wireless signals from outside a building structure, brings the signals into the structure, and then distributes the signals throughout the structure using a common backbone consisting of cables and small low profile antennas that are installed in the ceilings. Additionally, this solution is modular. By using plug-in equipment, the system can support many different signal frequencies; a DAS solution eliminates the need for multiple pieces of equipment to handle multiple signals from multiple wireless carriers. Many solutions are expandable and have the ability to support Public Safety Radio reinforcement as well as new technologies currently being introduced in the marketplace.

In addition to information about specific products, the RFI responses yielded information pertaining to design and integration services. ITD has gained a fuller understanding of the costs and technology options that are needed to improve cellular reception quality at City Hall.

Alternatives

There are several alternatives that can be pursued to improve cellular reception at City Hall.

1. Continue with the current coverage. This is the no cost option; however, cell phone reception quality at City Hall will remain inconsistent.

2. Localized solutions. This option would improve cell phone coverage at specific City Hall locations by installing commercially available hardware designed and tuned for specific carriers. For example, low-profile interior antennas that are connected to an amplifier and external antenna tuned to Verizon/Cingular frequencies would only benefit reception of that particular provider. Additional antennas and equipment would be required to improve reception for other carriers. A localized solution also has limited range and would most likely require multiple instances (i.e. multiple antennas and amplifiers) to cover a large area, such as an entire floor at City Hall. In summary, a localized solution can be effective if the area to be addressed is relatively small and improvement is required for only one or two carriers.

3. City to install and maintain a carrier-neutral solution. This option would improve cell phone reception for City cell phones as well as those used by the public, by implementing an in-building solution (such as a Distributed Antenna System) that will provide improved coverage for all cell phone providers, as well as supporting a number of wireless services including Public Safety Radio. This option offers a comprehensive solution that is flexible, expandable, and scalable. While this option is initially more expensive for the City, it provides an infrastructure that supports the wireless technology needs of the building as we move into the future.

A detailed assessment of pros and cons of each alternative is attached as Appendix A.

COST IMPLICATIONS

Funding for this project is included in the appropriated Technology, Furniture, Equipment and Relocation at the New City Hall in the Civic Center Improvement Fund. In the Workplan for T, F, E and R Procurements, $1,000,000 was identified for Radio/Cellular/WiFi Equipment, and the cellular reinforcement solution recommended below will be paid through funding already appropriated for this project.

RECOMMENDATIONS

Following the exploration of free and low cost alternatives to improve cell phone reception quality at City Hall, it was determined that these solutions would not accomplish desired results. The remaining options are to implement localized solutions to address specific areas, or the City would install an in-building carrier-neutral solution. Although the carrier-neutral solution represents a significant investment in cost, there are distinct advantages in terms of flexibility,

scalability, and expandability. Therefore, ITD recommends that an RFP be developed in conjunction with Finance to procure an in-building carrier neutral solution to improve cell phone and radio reception at City Hall using funding identified in the Technology, Furniture and Equipment Budget that was identified for this purpose.

Randall Murphy
Interim Chief Information Officer

Appendix A – Analysis of Alternatives

Alternative 1 – Continue with current coverage

Pros	Cons
• No additional cost to City.	• Continued inconsistent cell phone coverage at City Hall. • Weak or no cellular coverage in critical portions of the building. • Employees and visitors may be unable to place and receive calls periodically.

Alternative 2 – Provide localized solution targeting specific areas at City Hall

Pros	Cons
• Minimal investment if there are only a few specific target areas that require a solution (rough estimate is $3,500 to $7,000 for improvement of reception for two cellular carriers per floor). • Localized solution can be installed by in-house staff without the need for 3rd party experts or consultants.	• Requires redundant equipment (external and ceiling antennas and amplifiers) for those areas that require improved reception for more than two cellular carriers. • Becomes unwieldy if the localized solution is applied to more than a few floors at City Hall. For example, a minimum of two external antennas is required per floor; providing this localized solution for 10 floors requires the deployment of at least 20 external antennas. • There could be issues with locating suitable mounting locations for large numbers of external antennas. • A localized solution will only address current cellular technologies; it will most likely not work with new and future wireless technologies.

Alternative 3 – City to install and maintain a carrier-neutral system (such as a Distributed Antenna System – DAS)

Pros	Cons
• A carrier-neutral system will improve reception quality for all cell phone carriers. • A carrier-neutral system (such as a DAS) is functionally expandable. Components can be added as required to implement additional wireless services like Public Safety radio frequencies, and data services such as EVDO Wireless Broadband. • An in-building system is flexible and can be easily adapted (by plugging in new modules) to incorporate future wireless technologies. • An in-building system such as DAS is scalable in terms of coverage. Components can be added to address the most critical areas of a building, and additional components can be later added to other areas as requirements and available funds dictate. • An in-building system such as DAS can leverage in-place fiber network capabilities as a "conduit" to carry wireless signals to different parts of a building structure. • An in-building carrier-neutral system is scalable, and not all components for the system need to be installed from the start. The system will require installation of a "backbone" that will serve as the baseline infrastructure for the other components that follow. This means the initial implementation cost can be significantly reduced if the City adopts such a modular approach. For example, the "backbone" for an in-building carrier neutral system can be installed first, along with components to address only those areas at City Hall with the lowest coverage. This approach should provide a baseline system with an initial implementation cost that is significantly less than the anticipated project cost.	• The City will need to fund the installation and on-going maintenance of a carrier-neutral system. The implementation cost is estimated to cost from $.50 to $2.00 per square foot of coverage. Based on estimates to cover the entire site, (550,000 square feet of coverage at $1.25 per square foot) the implementation cost at City Hall is expected to be approximately $687,000 (see comment of potential cost savings in column at left).