C007 : Development of Emergency Radio Communications Facilities in the City of Surrey

Corporate Report NO: C007

COUNCIL DATE: June 12, 2000_

COUNCIL-IN-COMMITTEE

TO: **Mayor & Council** DATE: **June 22, 2000**

FROM: **Fire Chief** FILE: **0566-009**

SUBJECT: **Development of Emergency Radio Communications Facilities in the City of Surrey**

RECOMMENDATION

For reasons set out in the following sections of this report, we seek Council's approval to:

a) Initiate public consultation on locating antennas support structures having heights up to 76.2 m [250 ft] at the two specific locations identified in this report for the City's 800 MHz trunked radio communications system; and

b) Authorize staff to process Development Variance Permit applications for properties on which the structures will be located (agreement and consent of the owners of the properties having already been obtained).

c) Authorize staff to proceed to tender of Phase 2 of the City Radio System.

The sites for which we seek Development Variance Permits are:

- Fraser Heights Park, east of 160th Street, near 107th Avenue; and
- 15753 Fraser Highway.

BACKGROUND

The City of Surrey undertook construction of an 800-MHz trunked radio system in 1996. For budgetary purposes, the radio system was planned for implementation in two or more phases. The first phase (completed in 1997) provides about 90% outdoor communication coverage of the City for mobile radios, and provides several necessary additional radio channels for emergency services that were not available under the previous radio system. Nor does the system provide the additional traffic handling capacity needed to serve the City's public works departments.

As reported to Council September 7,1999, the City has received proposals from E-Comm to join the E-Comm Wide Area Radio System being constructed by E-Comm. The RCMP is mandated by the Attorney General of B.C. to utilize

E-Comm radio technology, as is the B.C. Ambulance Service. However, Engineering economic analyses performed by a consultant engaged by the City have shown that E-Comm's proposals thus far do not make it attractive for the City's Fire Service and Engineering Department to join the E-Comm system. Discussions with E-Comm are ongoing, but financially sensitive. For details, please refer to the attached background report.

The City now proposes to go to tender and to undertake the planned Phase 2 upgrade of the radio system. The upgrade will provide necessary portable radio communication coverage to the interior of buildings in the northern part of the City (approximately, north of the Nicomekl River). In addition, Phase 2 will enable more efficient use of radio channels throughout the City. This second phase has been budgeted and was approved by Council in 1999 @ 2.3 million and the detailed design is complete.

Phase 3 now will provide necessary portable radio communication coverage to the interior of buildings in the southern part of the City (approximately, south of the Nicomekl River). This phase also will provide additional traffic-handling capacity and mobile radio equipment for City Engineering radio users. The third-phase development needs have been considered in the design of Phase 2, although detailed design will not be undertaken until a system design is completed and budget approval has been received from Council.

NEED FOR ADDITIONAL TRANSMITTER/RECEIVER SITES

The existing 800 MHz radio system (Phase 1) uses three radio transmitter/receiver (repeater) sites, only one of which is within the City of Surrey. The Phase 1 sites were selected for reasons of economy and for wide-area coverage. One of the sites is in Coquitlam, one is in west Surrey (in the Newton area), and the third site is in Langley on Zero Avenue just east of the Surrey-Langley boundary. These sites are 15 to 20 km and apart, and radio signals to and from these sites are too weak to provide radio coverage to the interior of buildings. Because of terrain and other obstructions, these sites also do not provide consistent coverage in some areas of the City.

To overcome building penetration losses and provide 800 MHz radio coverage to the interior of buildings, the radio system's main transmitter/receiver sites need to be located relatively close to the buildings in which (low-powered) portable radios will be used. Typically, that means somewhat less than 5 km from the buildings. To achieve that goal, the second and third phases of the City's radio system require more transmitter/receiver sites than were provided in the first phase. As well, 800 MHz radio signals tend to follow a ‘line-of-sight' path, and are severely obstructed by the hilly nature of the City's topography and the by large amount of forest. Thus, the antennas must be relatively high so the antennas can ‘see' over obstructing hills (and trees and buildings) into the low areas.

The antenna support structures at the two locations which are the subject of this report are required to be 76.2 m [250 ft] tall, higher than the 12 m [40 ft] allowed under the Zoning By-law 12000.

PROPOSAL FOR NEW ANTENNA SUPPORT STRUCTURES

The City has had careful and detailed radio engineering studies performed to determine the minimum number of locations, and to identify the optimum locations, necessary to provide ‘in-building' communication coverage of the entire City. The studies have identified four locations necessary to serve the north parts of the City (Phase 2), two of which are the subject of the present proposal.

The City proposes to construct new radio facilities at the four locations. Two of the locations will make use of existing equipment shelters and roof-top or free-standing antenna support structures. The City will co-locate with E-Comm at one location (the roof of an office tower in the City Centre area) and with Telus Mobility at an existing radio tower in the Newton area. However, two new facilities are needed: one in the Fraser Heights area near 160th Street and 107th Avenue, and one in the Fleetwood area on the north side of the Fraser Highway near 158th Street. A suitable location for the first of these facilities has been determined to be within the Fraser Heights Park, and for the second facility a

tentative lease has been arranged for property at 15753 Fraser Highway subject to approval of Council.

Each new facility will consist of a relatively small (3.7 m [12 ft.] wide by up to 7.9 m [25 ft.] long) equipment shelter, together with an associated antenna support structure (free-standing lattice tower). To minimize the number of locations at which facilities must be constructed, the antenna support structures at these new facilities must be relatively high (to avoid having the radio signals obstructed by trees and buildings, and to "see over" nearby hills and into low areas). For both Fraser Heights and Fleetwood, the antenna supporting structures must be 76 m (250 ft) tall.

The September, 1999, report to Council identified a third new site in the north for potential development. That site, in Newton Athletic Park, would have had the main benefit of providing excellent indoor radio coverage of Surrey Memorial Hospital, the Strawberry Hill shopping area, and adjacent areas; however, there would have been some loss of coverage to the south until the Phase 3 upgrade was completed. Ongoing engineering studies have indicated that, pending the undertaking of the Phase 3 upgrade in the south, it will be possible to achieve an acceptable comprise in coverage in both north and south by upgrading the City's current facility at the existing Telus antenna tower near 128th Street and 63rd Avenue. As a result, the City has decided to eliminate the Newton Athletic Park site from its Phase 2 plans.

ALTERNATIVES, INCLUDING CO-LOCATION

As an alternative to the two new "high" sites, the City did consider using three or more new lower sites. However, that alternative was determined to be not feasible for both technical and financial reasons.

Technically, the system design provides that when Phases 2 and 3 are completed there will be a total of eight radio sites to cover the City. The complete radio system will have nine channels and two operating systems north and south.

Financially this is because of the basic capital cost for developing and equipping a transmitter/receiver site, there is a relatively small incremental cost related to the height of the antenna support structure. Increasing the number of sites by 50% would result in increasing the system cost by nearly 50%, so there is an economic imperative to minimize the total number of transmitter/ receiver sites.

In addition, the City is having Systek Engineering conduct a review of the Engineering Radio system. The City has exchanged information with the E-Comm organization, and with cellular radio carriers who are interested in providing radio communications for their users in throughout Surrey. E-Comm's needs are almost identical to Surrey's, since E-Comm is contracted to provide emergency radio communication throughout Surrey for the RCMP and for BC Ambulance Service. From the information exchange, the City and E-Comm have determined that they have a common need for a site in the City Centre area and in the Fleetwood area. Rather than build two large structures at Fleetwood, the City and E-Comm have agreed to co-locate on one structure. Cellular companies have expressed some interest in using the same structure, which would allow them to avoid the need for them to construct more sites.

Further, E-Comm has come to the same conclusion as has the City's' radio system consultant: four sites are needed to serve most of the north part of the City, and support structure height of 76 m [250 ft] at the Fleetwood location is necessary to overcome terrain, foliage and building obstructions.

As has the City, E-Comm has identified a need for radio coverage in the Guildford/Fraser Heights area and in the lower areas to the north and east along the Fraser foreshore. In this regard, E-Comm has an option not available to the City: E-Comm has elected to cover the Guildford/Fraser Heights area from antennas placed on the Sheraton Hotel, and to cover the Fraser foreshore using other channels and antennas in other municipalities. Surrey does not have the necessary radio channels and other facilities to exercise such an option. Therefore, the City must proceed alone to construct the equipment shelter and antenna support structure at Fraser Heights. If cellular companies are interested in

providing facilities in the area, they would be able to co-locate with the City rather than having to build additional structures in the area.

BY-LAW COMPLIANCE

The City is proposing to construct and operate wireless (radio telecommunication) facilities as contemplated in the *City of Surrey Zoning By-law*. Telecommunication towers are permitted in all zones pursuant to Part 4, A.1.(a) of the By-law *Zoning 12000*, subject to certain restrictions. The proposed site at Fraser Heights is zoned RA (One-Acre Residential), and the proposed site at Fleetwood is zoned RF (Single Family Residential).

COMPLIANCE WITH SPECIFIC REQUIREMENTS FOR INSTALLATION OF TELECOMMUNICATION FACILITIES

The proposed facilities meet the requirements of the City of Surrey By-law *Zoning 12000* as a permitted use. Telecommunication towers are permitted in all zones, subject to the following conditions for free-standing towers:

(a) all such towers shall comply with all setback regulations applicable to principal buildings for the zone in whch the said tower is located; and

(b) in the case of towers that are free-standing (affixed directly onto the ground, rather than on a building) the height shall not exceed 12 metres (40 feet).

It is with regard to the latter condition that we now apply for a Variance Permit. The proposed towers under this application will be free-standing and will be 76.2 metres [250 ft] high.

SPECIFIC CONCERNS

Environmental

To our knowledge, there is no environmental issue with regard to the construction of either of the proposed antenna supporting structures. However, because of their height, both structures require Transport Canada “Aeronautical Obstruction Clearance” and may require obstruction markings either by painting, or by addition of clearance lights, or both. Application has been made to Transport Canada for the necessary clearances.

Structural

The antennas support structures and their foundations will be designed by registered professional engineers and constructed by contractors experienced in this type of construction. Appropriate design details and certificates will be submitted to the City's Planning Department prior to and following construction.

Radiation

Questions may be raised with regard to microwave and radiowave radiation (rf radiation) from the sites. First, it must be understood that rf radiation is similar to light, in that it is *non-ionizing* radiation. Like light, its primary biological effect is thermal (that is, at sufficiently high power levels, it can cause heating of biological tissue). It is not known to cause alteration of cell structures, therefore it is non-carcinogenic and does not have genetic effects. (X-rays and some ultra-violet (UV) radiation, which is present in sunlight *but not in radio waves*, is a form of ionizing radiation and can be carcinogenic.)

In Canada, radio transmitter sites are subject to the limitations of Safety Code 6, which sets permissible levels for rf radiation field strengths well below those at which biological heating can occur. Safety Code 6 has been reviewed by a panel of experts appointed by the Royal Society of Canada[i]. The panel found that the radiation limits imposed by the Code serve to protect both workers and the general public from adverse health effects associated with whole body thermal exposures to rf fields. The panel noted that there are a number of observed biological effects of exposure of cells or animals to non-thermal levels of rf fields; however, the panel found no evidence of documented adverse health effects in animals or humans exposed to non-thermals levels of rf fields.

The transmitted rf power levels, and the antenna radiation patterns, used at both the Fraser Heights and the Fleetwood sites will produce rf radiation field strengths much less than those allowed by Safety Code 6 (typically much less than 1% of allowable levels) at any location accessible to the public.

Property Value

With regard to possible negative impact on property values, studies carried out over the past several years both in the USA and in Canada have shown no discernible negative impact on property values that can be directly attributed to the construction of antenna support structures on property adjacent to existing residential properties.

Aesthetic and other Concerns

If aesthetic and other concerns are raised regarding high antenna supporting structures after reasonable steps have been taken to minimize the impact of the structures on the environment and the citizens of Surrey, those other concerns must be weighed against the concerns raised by emergency services for public safety and personnel safety.

The City clearly will want to consider issues of siting of the proposed structures on properties to minimize the visual impact of the structures. The City may also want to impose conditions regarding security (access control) of the sites for safety and to prevent defacement of the sites, and landscaping or other treatments to enhance the appearance of the sites or to partially disguise the structures.

BENEFITS

If the City approves the application for Development Variance Permits, the citizens of Surrey will benefit from improved ability of emergency service forces to deliver public safety services. The employees of the City will benefit from improved radio system reliability and improved personnel safety. Engineering departments will benefit from improved radio communication throughout the City.

Representatives from the City's Fire Service, Engineering, and the RCMP are available to address this request for approval to initiate public consultation and process Development Variance Permit applications, and to answer questions and address issues put to them by Council.

CONCLUSION

To provide necessary in-building radio communication coverage for emergency and engineering throughout the City of Surrey. It is necessary to implement Phase 2 (in 2000-2001) and Phase 3 projected to proceed (with Council approval) in 2002 or beyond[1] of the City's radio system. In-building coverage is essential as a matter of safety for fire fighters and police officers, to improve the effectiveness and efficiency of fire-fighting efforts and police activities for public safety and assist engineering agencies in carrying out their responsibilities for care and maintenance of public property.

Improved in-building radio communication coverage will be achieved by reducing radio path losses between portable

radios and the radio system repeaters. Reduction of path losses requires moving existing repeaters closer to the areas requiring radio coverage, adding repeaters to the system, and providing radio repeater antennas mounted at heights of up to 76 m (250 feet) above ground level to overcome the effects of topographical, structural and foliage path losses.

The existing zoning bylaw (B/L 12000) allows telecommunication towers in any Zone, subject to the conditions:

> "a. all such towers shall comply with all setback regulations applicable to principal buildings for the Zone in which the said tower is located;
>
> b. in the case of towers that are free-standing (affixed directly onto the ground, rather than on a building) the height shall not exceed 12 metres [40 ft.];"

Therefore, the necessary upgrading of the City's radio system can be achieved only if relief from the bylaw can be obtained through Development Variance Permits allowing construction of two new antenna-support structures at heights up to 76.2 m (250 feet) at the locations in north Surrey previously listed under 'Recommendation'. (Development Variance Permits for other sites in the south part of Surrey will be necessary to implement Phase 3, but will be the subject of a later report to Council at an appropriate time.)

Comments from T. Smith, Chief Superintendent, OIC Surrey Detachment RCMP

The necessary repeater sites identified in this report will serve to support not only Fire Department communications but those of Surrey R.C.M.P. Detachment. I have recently forwarded correspondence from the Commanding Officer "E" Division , on behalf of our Communications Unit urging that we get on with the establishment of these critical sites. That correspondence was forwarded to the City Manager for his attention. Our fast-failing radio/communications infrastructure is due to be replaced in the fall of this year. In order to accomplish this very necessary task, it is absolutely essential that the repeater sites are up and operational. In their absence, our replacement program will be brough to a halt. This in turn, will jeopardize effective operational police communications which places public and police safety in serious question.

I fully support this proposal and would urge a resolution at the very earliest opportunity. It is my understanding that replacement is due for October or November, 2000 or in the early part of 2001.

Comments From G. McKinnon - Manager, Engineering Operations Division

Based on the information provided the Operations Division of the Engineering Department agrees with the proposed implementation of the phasing of the Fire Department's radio system. The proposal will provide service required for day to day Operations as well as emergency services at a lower cost to the City than a proposal received from E-Comm for that same service. Impact of this report does not directly affect current operations, as the Engineering Department will receive service implementation in future phases of the project.

Comments From D. Hunter, General Manager Parks, Recreation & Culture

We support the recommendation and look forward to the feedback from the residents.

Comments From U. Mital, City Manager

The City Manager is in support of this report.

J.G. Bale, C.F.O.

Fire Chief

LG/JGB/add