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| ITEM | 06 |
| MANAGER'S REPORT # | 13 |
| COUNCIL MEETING | 96/05/06 |

**TO:** CITY MANAGER 1996 May 01

**FROM:** DIRECTOR PLANNING AND BUILDING

**SUBJECT:** **REZONING REFERENCE #37/95**
**REZONING REFERENCE #50/95**
**HEALTH CONCERNS REGARDING CELLULAR ANTENNAE**

**PURPOSE:** To provide Council with a response to questions about the health effects of cellular antennae which were raised at the Public Hearing for these rezonings.

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**RECOMMENDATION:**

1. **THAT** this report be received for information purposes.

**R E P O R T**

## 1.0 BACKGROUND:

1.1 On 1996 February 20, the Public Hearing was held for the two subject rezonings, both of which involve requests to establish cellular antennae as a principal permitted use. Questions and concerns were raised at the Public Hearing, specifically for the rezoning request for a portion of 5287 Penzance Drive (Rezoning Reference #37/95) regarding the health effects of cellular antennae. At Second Reading of the zoning bylaw amendment for both applications, Council directed staff to report back on the questions raised at the Public Hearing.

This report is in response to that request.

## 2.0 GENERAL DISCUSSION:

2.1 The Department of Industry, commonly called Industry Canada, is the federal government department generally responsible for radio communications in Canada. Under the authority of the Radio Communications Act, the Minister has the power to approve where each antenna system may be located. Industry Canada's policy is that it will consider environmental effects and conformance to Safety Code 6, described below, and will

ensure that land-use authority consultation has been taken into consideration before issuing such authorizations. With respect to health effects, the Bureau of Radiation and Medical Devices of Health and Welfare Canada has published limits to exposure to radio frequency fields. These limits are contained in the document *Safety Code 6, Limits of Exposure to Radio Frequency Fields at frequencies from 10 KHz - 300 GHz*. It is the intent of Industry Canada to ensure that their clients are aware of, and abide by, the standards set by this code.

2.2 A wide variety of electrical devices emit RF radiation, including radio and TV transmitting systems, radar, various medical and industrial devices, communications equipment such as cellular or cordless telephones and consumer products such as microwave ovens. The area around an RF antenna source is generally divided into two regions: the near-field region and the far-field region. In general, the near-field region is of interest and importance principally for RF workers (for example, persons working in the immediate area of the emitting equipment itself), whereas the far-field region is more relevant for the general population (members of the public beyond a few meters from the antenna).

Electromagnetic radiation is propagated over large areas when generated by communication, broadcasting and radar devices, and urban areas or locations near broadcast transmitters typically are within the fields of numerous different types of RF sources at all times. Exposure to excessive levels of RF energy over prolonged periods can cause adverse health effects, and studies have shown that there is a need for controls.

The aim of Safety Code 6 is to set forth safety requirements for the installation and use of RF devices that operate in the range of 10 KHz to 300 GHz. The controls set out relate to three determinable characteristics of an installation: electromagnetic field strengths, specific absorption rate (SAR) limits, and contact-current limits. The levels specified as the maximum safe levels take the form of two sets of limits - the first (for occupational exposures, RF workers) and the other for persons other than RF workers (these are more restrictive; i.e. lower permissible levels). Except in special circumstances, members of the general population are not allowed access to areas where levels exceed those specified in the latter set of limits. In instances where such levels could be exceeded, warning signs of a special design would be required by Safety Code 6 for the demarcation of areas subject to RF radiation.

2.3 For the purposes of addressing the Public Hearing questions, we will utilize the more restrictive limits - field strength limits for persons other than RF workers.

To establish the context for the specific installations being examined, it is useful to describe the type of electromagnetic radiation produced by the cellular and microwave antenna proposed, and convey a sense of scale or proportion relative to other RF sources.

Cellular communication networks utilize very low power installations providing a radio signal to a limited geographic area called a "cell:" to prevent interference with signals being utilized in other cells nearby, the power of the signal in each cell is kept as low as possible. In urban areas where the cellular system use is growing and due to the limited number of available assigned frequencies, there is a tendency to progressively reduce the geographic size of the cells, and consequently the operating power within each cell.

To provide a sense of the place cellular antennas occupy in the family of RF devices, it is useful to note that the maximum allowable power levels in the U.S. (from FCC information) for television transmission antenna is 5 million watts, for FM radio antenna 100,000 watts, AM radio stations 50,000 watts, typical police, taxi, and fire station antenna 500 watts, and cellular antenna 500 watts.

In reality, in urban and suburban areas, the actual power of cellular system antenna is 10 to 100 watts or less. The system uses radio waves in the UHF band to transmit voice and data communications, similar to the radio waves used to transmit television channels higher than channel 13.

RF energy is a form of electromagnetic energy known as "non-ionizing", the same as ordinary light and television signals. It should not be confused with ionizing radiation, such as X-rays, which can cause damage to biological tissue.

As with all forms of electromagnetic energy, the power density due to a cellular transmitter decreases rapidly with distance (according to what is known as the inverse square law) as one moves away from the source. This means, for example, that if there was a level of 4 watts per square meter measured at a distance of 10 meters, the level would be only 1 watt per square meter at a distance of 20 meters, and so on.

With respect to a potential microwave link in connection with cellular installations, it is noted that microwave dishes do not broadcast, but rather "beam" their signal across to the next fixed site in a grid. Cellsite microwave transmitters generate a minuscule signal of only a few watts per square meter at the dish face, and beyond a distance of a few meters even this density falls off gradually. By comparison, a new microwave oven is permitted to "leak" up to 10 watts per square meter outside the oven door.

2.4 For the frequencies used in the cellsites proposed in the two current rezoning applications, the following exposure limits are set out in Safety Code 6, for persons other than RF workers:

a) for the array of directional-type "wand" antenna used for cellular telephone signals, the maximum level of exposure is 6 watts per square meter.

b) for a small diameter microwave dish used in association with a cellsite, the corresponding maximum exposure level is 10 watts per square meter.

2.5 Based on information supplied by BC Tel Mobility, their installations will satisfy Safety Code 6 limits, by a considerable margin.

a) For the cellular antenna, BC Tel advises that the 6 watts per square meter level would be satisfied beyond a distance of only 8.9 meters in front of the antenna even in the hypothetical case of 20 transmitters operating simultaneously at their highest power setting, and the ground-level energy density would be only 2.36 milliwatts (0.00236 watts) per square meter. In reality, they advise that the field strength values will be lower than this; at the Capitol Hill site, the transmit power will be set for a lower setting, and only 15 transmitters are proposed at that site. Additionally, they note that most of the time, fewer than 15 transmitters will be in use, as their designs call for only enough transmitters to handle calls at the busiest time of day. Accordingly, they calculate that the site would actually produce only about 0.3 milliwatts (0.0003 watts) per square meter at the base.

b) For a microwave link (to date it has not been established whether or not such a link will be employed at the Capitol Hill site), B.C. Tel advises that the 10 watts per square meter limit will also be adhered to; using their typical installations as an example, they indicate that a 2-foot diameter dish fed with one-quarter watt produces an energy density of 3.4 watts per square meter at the face of the dish. This level remains fairly constant out along the antenna's axis to a distance of roughly 7 meters. Beyond this, the energy density falls off gradually. According to their calculations the energy density only a few feet off the axis of the beam would be approximately 0.0034 watts per square meter.

The information provided in this section of the report has been provided by B.C. Tel. Upon receipt of the radio station application by Industry Canada, a preliminary evaluation of the station relative to Safety Code 6 is done. Based on the results of the preliminary evaluation, a further in-depth analysis is performed when warranted.

For information, the cellsite tower in the Penzance Drive installation is setback approximately 15 meters from the nearest property line, and located approximately 190 meters from the nearest residence at Penzance and Gamma and approximately 220 meters from the nearest residence on the top of Capitol Hill. The cellular antenna array proposed for the top of the equipment penthouse of the apartment building at 6595 Willingdon Avenue is approximately 44 meters from the nearest neighbouring apartment site.

2.6 Planning staff also consulted the Chief Environmental Health Officer for input on this matter, who contacted a Radiation Protection Officer with the Provincial Ministry of Health, and he provided the following information:

> "Communication antennae and dishes are considered Low Power Devices and emit a "pencil" beam. They generally do not pose a human health risk to the general public at large. The only segment of the public at potential risk are the workers who come in very close proximity of these devices."

## 3.0 CONCLUSION:

3.1 Antennae structures for site specific radio communication are authorized by Industry Canada, who apply the limits of exposure to radio frequency fields contained in Safety Code 6, which is published by Health and Welfare Canada. Safety Code 6 is intended to address health concerns from radio frequency (RF) fields. Based on the design information provided by B.C. Tel, the installations will operate well within the maximum field strength levels set out in Safety Code 6. The low operating power levels inherent in cellular communications networks, together with the low power, directed line-of-site transmission inherent in microwave dish transmission, produce values that are many times lower than the maximum field strength limits of the Safety Code. The actual application for radio station operation must be made to Industry Canada, who conduct the formal and scientific evaluation relative to the pertinent federal standards, and the Radiation Protection Officer of the Provincial Ministry of Health advises that communication antenna generally do not pose a human health risk to the public at large.

This is for the information of Council.

D. G. Stenson
Director of Planning and Building

BW:gk

cc: Chief Environmental Health Officer