THE CORPORATION OF THE CITY OF COURTENAY

STAFF REPORT

To: Council
From: Chief Administrative Officer
Subject: **Air Quality Monitoring Network**

File No.: 5335-20
Date: February 8, 2023

PURPOSE:

The purpose of this report is to present the proposed design of the air monitoring network in the City of Courtenay.

CAO RECOMMENDATIONS:

THAT based on the February 08, 2023 staff report "**Air Quality Monitoring Network**" Council approve OPTION 1 and direct staff to install air monitoring devices to measure $PM_{2.5}$ concentrations and report them on an online map in real time.

Respectfully submitted,

Geoff Garbutt, M.PL., MCIP, RPP
City Manager (CAO)

BACKGROUND:

A report was presented at the July 25, 2022 council meeting, entitled "Air Quality and Wood Smoke Mitigation", which recommended a number of resolutions to reduce wood smoke in the City of Courtenay. As a result, at the July 25, 2022 council meeting, Council approved the recommendation (among others) to:

> *Design a network of $PM_{2.5}$ air monitoring devices that report the real time $PM_{2.5}$ concentrations on a publically available map. Coordinate with other local governments in the region to ensure new monitoring devices are part of a regional $PM_{2.5}$ monitoring network.*

Currently, data from the provincial air monitoring station is limited because it only records measurements at a single location. This is representative over long periods of time, but it may not be geographically representative over shorter periods of time. A mobile monitoring study conducted in 2017 by an academic from the University of British Columbia found that $PM_{2.5}$ concentrations vary widely between neighbourhoods across the Comox Valley. This variation will be better measured by a network of $PM_{2.5}$ air monitors.

Multiple air monitoring devices will be able to observe how $PM_{2.5}$ concentrations vary throughout the day, and across the city. This data may be used to focus efforts on reducing $PM_{2.5}$ in the areas with the highest

concentration. It may also be used as a public education tool to help residents learn more about air quality in their neighbourhood. Over time, the data collected from multiple locations across the city will more precisely reflect our collective progress to reduce $PM_{2.5}$.

PurpleAir Monitors – Technology Overview

PurpleAir monitors are inexpensive air quality sensors that use laser particle counters to measure $PM_{2.5}$ concentrations in the air. The sensors are powered by a USB power source and require access to wireless internet to upload measurements to an online map in 10-minute intervals.

Staff consulted the BC Ministry of Environment and Climate Change Strategy (MECC) to determine if PurpleAir monitors would be suitable for a local air monitoring network. The MECC endorsed the use of PurpleAir monitors for local $PM_{2.5}$ monitoring, noting the increased reliability of these sensors, and the data management tools developed by University of Northern British Columbia (UNBC) with support from Environment and Climate Change Canada (ECCC).

PurpleAir Monitors are equipped with two laser particle counters, and calibration is verified by comparing the measurements recorded by each counter. This verification is included on the online map, and is reported to the owner of the device in a compilation report generated weekly. Once readings from the monitors are uploaded, the data is managed on servers hosted by ECCC, and it becomes part of the provincial air quality dataset.

Laser particle sensors are sensitive to humidity, which inflates the readings at times of high humidity. For this reason, measurements recorded by the PurpleAir devices cannot be accurately compared to the BC Air Quality Objectives or the measurements from the provincial air monitoring station, unless a correction factor is applied. Dr. Peter Jackson at UNBC has developed a correction factor to account for the influence of humidity on PurpleAir Sensors. This correction factor is automatically applied to the measurements reported on the map hosted by UNBC (available here: https://cyclone.unbc.ca/aqmap). Once a PurpleAir device is registered online, readings will appear on the PurpleAir online map, and the UNBC map with the correction factor applied.

Local governments in Cowichan Valley, Port Alberni, Gabriola island, and Sooke have installed these monitors to better understand the distribution of $PM_{2.5}$. The relatively low cost of the devices and straightforward set up, also makes it accessible to members of the public to purchase and install at their homes, or businesses.

DISCUSSION:

City of Courtenay Network Design

Locations proposed for the installation of a PurpleAir Monitor are shown on the map in Attachment #1 and include:

1. Arden Elementary
2. Ecole Puntledge Park Elementary

3. Georges P. Vanier Secondary
4. Glacier View Secondary
5. Lake Trail Community School
6. Mark R. Isfeld Secondary
7. Queneesh Elementary
8. Bill Moore Park Lawn Bowling Club
9. Martin Park Bathrooms
10. Native Sons Hall

A number of factors were considered in the selection of air monitoring locations, including: city access for installation, availability of power and Wi-Fi, and the distribution of wood smoke.

Installation of air monitoring devices on power poles, lamp standards, sanitary lift stations, water pump stations and other city owned assets were considered. However, gaining access for installation, electrical power and Wi-Fi were found to be factors that limited the feasibility of installation in many of these locations. Buildings with existing access to electrical power and Wi-Fi, were found to be most suitable to host a PurpleAir monitroing device.

Comox Valley School District 71 has expressed support for this project in preliminary discussions with staff. Schools were determined to be ideal monitoring locations, because of their ability to reflect $PM_{2.5}$ exposure of students, and their existing power and Wi-Fi connectivity. To provide relatively uniform coverage across the City of Courtenay, some municipal buildings were selected as monitoring locations. All locations have an existing power connection, but not all locations have an existing Wi-Fi network. In locations without a Wi-Fi connection, Information Systems Services at the City of Courtenay suggested that a hotspot connection be generated by retired cell phones in water proof cases.

If installation is not feasible in a proposed location due to technical challenges or constraints, the PurpleAir monitor will be placed in a secondary location. A variety of secondary locations have been selected, and appear on the map in Attachment #1.

Collaboration in the Region

The installation of air monitoring devices aligns with the recommendations included in the Draft Wood Smoke Reduction Strategy prepared by the Regional Airshed Committee. The City of Courtenay would be the first in the region to implement this recommendation, and can provide guidance to other local governments if they choose to install monitors. The low cost and simple installation of the devices, facilitates collaboration because it is accessible for concerned residents, community groups, businesses and local governments, to expand the network of PurpleAir monitors. The PurpleAir map is already reporting $PM_{2.5}$ readings from three privately purchased and maintained monitors within the City of Courtenay.

FINANCIAL IMPLICATIONS:

The purchase and installation of PurpleAir monitoring devices is estimated to be $7,000. Funds are available in the proposed 2023 Engineering Services Operating Budget. Annual replacement and maintenance costs are anticipated to be $1,500.

ADMINISTRATIVE IMPLICATIONS:

The selection of $PM_{2.5}$ monitoring locations has been led by Engineering Services, with support from Asset Management and Information Systems. The installation and setup of PurpleAir devices will be performed by Information Systems with support from Civic Properties Maintenance where required. PurpleAir monitors require a single screw or zip tie to mount to the side or top of a building roof. An extension cord may be required for electrical connection if the monitroing location is far from an outlet.

Once installed, maintenance and monitoring of the network will be completed by Engineering with support from Information Systems and Civic Properties as required.

ASSET MANAGEMENT IMPLICATIONS:

As a relatively new technology, the expected service life of a PurpleAir monitor is unknown. However, the Ministry of Environment and Climate Change Strategy, noted that the PurpleAir devices first installed by other Vancouver Island municipalities have been operating without issue for approximately 5 years. Sensors will require replacement if calibration has failed or if they become damaged.

STRATEGIC PRIORITIES REFERENCE:

The recommended actions to create an air quality monitoring network in the City of Courtenay align with the strategic priorities listed below.

We proactively plan and invest in our natural and built environment

- ▲ Look for regional infrastructure solutions for shared services
- ▲■ Support actions to address climate change mitigation & adaptation
- ● Make progress on the objectives of the BC Climate Action Charter
- ●▲ Advocate, collaborate and act to reduce air quality contaminants
- ●▲ Support social, economic and environmental sustainability solutions

We continually invest in our key relationships

- ●■ Consider effective ways to engage with and partner for the health and safety of the community
- ▲■ Advocate and cooperate with local and senior governments on regional issues affecting our community

OFFICIAL COMMUNITY PLAN REFERENCE:

The recommended actions to create an air quality monitoring network align with the following policies described in the Official Community Plan.

Natural Environment Objective 3: Courtenay's air, water and soil are clean

NE 13 Strive to meet the BC Air Quality Objectives and Standards, including reducing sources of airbourne fine particulate matter ($PM_{2.5}$) within the City of Courtenay.

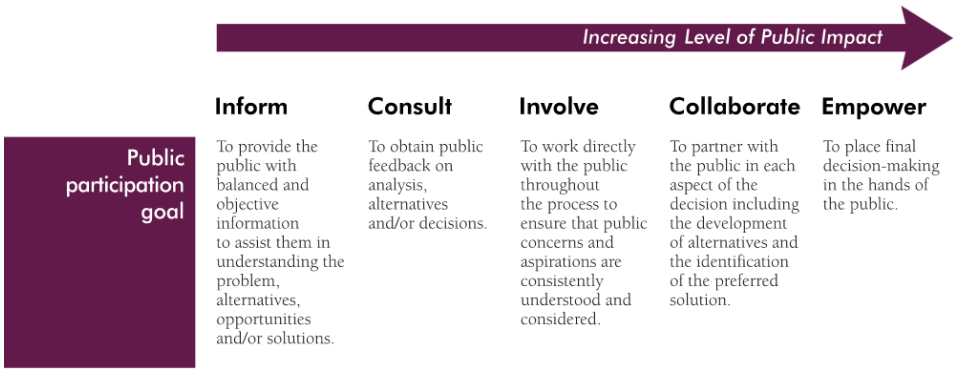
NE 20 Continue to collaborate with the Comox Valley Regional District and regional partners to monitor and take coordinated action to improve local air and water quality.

REGIONAL GROWTH STRATEGY REFERENCE:

The recommended actions to reduce wood smoke in the City of Courtenay is aligned with "Goal 7: Public Health and Safety". The Regional Growth Strategy (RGS) notes that exposure to air pollutants has increased, and with it childhood asthma rates. It also noted that chronic diseases like cardiovascular and respiratory disease, diabetes and cancer, are all on the rise in the CVRD. The RGS speculated that the increase in chronic disease could be related to increasing risk factors, like the lack of physical activity and obesity. The elevated concentrations of fine particulate matter were not listed as a risk factor in the RGS, however medical professionals have established air pollution as a risk factor in the development of chronic cardiovascular and respiratory diseases. No policies supporting Goal 7: Public Health and Safety are provided in the RGS.

CITIZEN/PUBLIC ENGAGEMENT:

Staff will **inform** the public and key stakeholder groups based on the IAP2 Spectrum of Public Participation: https://iap2canada.ca/Resources/Documents/0702-Foundations-Spectrum-MW-rev2%20(1).pdf



OPTIONS:

Given the ease of installation, relatively low cost and effectiveness of the proposed monitors and the ability to engage data staff recommend that based on the February 08, 2023 staff report "**Air Quality Monitoring Network**" Council approve OPTION 1:

Option 1: Direct Staff to install air monitoring devices to measure $PM_{2.5}$ concentrations and report them on an online map in real time. **(Recommended)**

Option 2: Refer back to Staff for further review.

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ATTACHMENTS:

Attachment #1: Map of Proposed Air Monitoring Locations