CITY OF YELLOWKNIFE

SMART CITIES CHALLENGE

APPLICATION

A collaborative proposal:

With additional support from:

Question 1

Please provide information on the community that is submitting this application. If this application is being submitted by a group of communities, add each community separately using the button. If this application is being submitted by a regional entity, please include the name of the regional entity with each individual community (e.g. City of Dunn/Smith Region). Do not include the regional entity as a separate, stand-alone community.

Name of community Yellowknife
Province or Territory Northwest Territories
Population based on 19569
Indigenous community No

Question 2

Please select a prize category.
$5 million (population under 30,000 residents)

Problem Definition

Question 3

Please define your Challenge Statement in a single sentence that guides your preliminary proposal. It should describe the outcome (or outcomes) you hope to achieve.

Yellowknife will experience a rise in our community's social and environmental well-being by transforming the simple lamppost into a beacon for sustainability.

Question 4

Please describe the outcome (or outcomes) your proposal seeks to achieve by elaborating on your Challenge Statement.

Through this challenge, the overall principle the City of Yellowknife looks to embrace is allowing our citizens, tourists and all ecosystems to live in meaningful harmony. Though this is a lofty goal and is not very specific, under the umbrella of this ideal, there are several other meaningful and measurable goals we hope to achieve — including economic and environmental targets.

On the economic side, we will endeavour to reduce the City's cost of operations primarily through two methods. First, by reducing the amount of time our streetlights are in use and dimming the lights when possible, we will realize direct savings in terms of power costs. Second, the data tracking technologies should increase efficiency in these areas, allowing our staff to direct their energies to other tasks and resulting in fewer overtime hours required to complete these tasks. Both methods have clear and measurable targets that the project will help us achieve.

The measurable targets on the environmental side include reduced greenhouse gas (GHG) emissions and reduced light pollution. The new network of streetlights will be able to monitor light output levels and duration, information that can be compared to our current lighting set-up to enable us to quantify the overall reduction in lighting that we put out. The GHG emissions reductions will stem from encouraging more residents to purchase electric vehicles (EVs) or use a car share program. Through our corporate partners, we know the current inventory of EVs in Yellowknife, and will be able to monitor both the increase in the number of cars and the usage of our EV charging stations. From there, we can determine the GHG reductions that correspond to EV use.

We will see advantages in the transportation sector as well: the City will have an increased ability to track the number of people who choose active transportation for their community. To date, we have compiled some information on active transportation choices through surveys and counts; however, this technology will afford us a much easier method of tracking this information in key transportation corridors, allowing us to more concretely determine our successes from this project (and others) in encouraging more people to choose active transportation options.

Each of these is a measurable goal that will not only contribute to project success, but also align well with the goals in our Corporate and Community Energy Plan. That plan established targets for renewable energy use and GHG emission reductions for the City of Yellowknife by 2025 on both the corporate and community sides. This project will provide us data and information that will help us achieve these goals — in addition to affording us better data collection to monitor our progress in each target area.

In addition to these clearly measurable targets, we will monitor other indicators in an effort to improve on areas that are less quantifiable, as they depend on several factors. For example, we expect that many of this project's technologies will lead to an increase in tourism in Yellowknife. The reduced lighting levels will benefit the aurora tourism companies while the Wi-Fi hotspots and integrated tourism information will undoubtedly make the City a more attractive destination for tourists. On top of the added tourism, these same technologies will also encourage more of our citizens to get outdoors and enjoy the benefits that they offer, leading to healthier citizens and a community that is more engaged with the natural beauty surrounding our city and the extraordinary skies above it. Combined, we see these factors leading to a greater sense of civic pride and a more engaged and connected community.

Question 5

Please describe how your community residents have shaped your Challenge Statement. Describe your plans for continuing to engage and involve them in your final proposal going forward.

Yellowknife's residents have shaped our challenge statement and, indeed, our entire challenge idea, and they have done so in many direct and indirect ways since the initial stages of our process. Being a relatively small city, the City of Yellowknife and our partner groups are in constant contact with the citizens of Yellowknife, and we hear their issues and concerns on a daily basis. We know the problems that our citizens face because these are the same problems that we face.

One of our main partners, Ecology North, is a non-profit, community organization that maintains collaborative partnerships with several other local community and education organizations. A common thread throughout all their programming is an emphasis on environmental, social and community wellbeing. As such, their day-to-day work keeps them at the forefront of the issues that Yellowknife and our citizens face.

In the developmental portion of our project, Ecology North looked inward to TheIdeasBank.ca, a web portal dedicated to crowdsourcing sustainable development ideas for the North, and chose a theme that would be buoyed by technology and grow to include all the innovative ideas found in this proposal. Ecology North looked at combining various ideas into one, to bring together various partner groups. Electric vehicle charging station, vehicle car share and reduction in light pollution were amongst the favored ideas of northern citizens. Using the lamppost as a beacon for sustainability just made sense. A collaborator on another project, White Arkitekter AB, was brought on board and asked to bring the Scandinavian experience and technology to this idea. They offered their in-kind support, and two architects came to Yellowknife to meet the team, learn about the City and get a feel of the community.

Because of these factors, when it came time to craft our challenge statement, we already had a very good concept of what the key issues would be. However, we still felt that engaging our citizens directly was of the utmost importance and therefore held an open house-style community engagement session for the public to attend. We sent invitations to the session to several community groups, as well as a wide variety of Territorial Government departments, and promoted the event through the City's social media accounts. On top of this, we engaged a local radio station, Cabin Radio, to attend the first hour of our session and broadcast the entire time through Facebook live. Thanks to our varied promotional methods, we saw solid attendance at the engagement session and received feedback that has helped guide our proposal.

Our community engagement format enabled us to bring together participants from all our partner groups, along with their individual expertise. Participants who attended could engage in discussions with all parties in a one-on-one or small-group format. From these discussions, participants could better understand what exactly the Smart Cities Challenge was, some ideas already developed in terms of specific issues the City needed to address and potential ways to address these issues. Participants were invited to ask questions and provide feedback throughout the one-on-one engagement, and then afterwards they had a chance to interact with all the partners as well.

We had displays with a few guiding questions to help facilitate discussion, including:
- What is the biggest problem you face in your day-to-day?
- What words come to your mind when you think about the Yellowknife of the future?
- What are your thoughts on the ideas you have seen today?
- What is your connection to the northern lights and where would you like to see them?
Though we invited attendees to answer these questions directly, we also encouraged them to provide any feedback at all that they might have had. The amount of feedback we received impressed us. We received over 50 individual responses to our request for feedback, and compiled and evaluated this information to help guide us in drafting our proposal. We identified key areas of concern for our citizens, and discovered areas that we had not previously considered, which we incorporated into our project proposal. The community engagement open house was a invaluable tool to understand the issues at the

fore of our residents' minds, and allowed us to develop a project and potential solutions that truly meets the needs of our community.

In addition to our main partners on this proposal and the community engagement session we held, the City has also been in contact with several local tourism companies on a one-on-one basis, and garnered support from them. These companies include Yellowknife Outdoor Adventures and Jose Francisco Salgado, who runs aurora photography tours in Yellowknife. During a meeting with the City, Jose used past photos to demonstrate to us the full extent of the light pollution that even our relatively small community emits. Seeing his gorgeous photos of the northern lights being marred by the unnatural glow from the city really emphasized the detrimental effects of light pollution. Reducing our city's light pollution through innovative technologies like smart streetlighting could mean the difference between being able to provide these tours directly on the outskirts of Yellowknife or forcing tour companies to transport their customers 50 – 100 km outside of town, decreasing some of the benefit to Yellowknife of tourism to our region. Improving opportunities for tourism closer to our city will not only increase the industry's viability, but will also decrease the environmental impacts existing tour companies have by drastically reducing the distance they must travel each night.

Should we be successful in this first proposal stage, we will continue our community engagement going forward. We will continue to work closely with our main partners and intend to continue meeting with a variety of community groups and companies for feedback on the best path to project implementation. We will look to the community as a whole for suggestions of where in our city these various technologies would best be deployed, and from there envision a phased approach to installation. We conceive of this project as an iterative learning process, and will continue to respond to the concerns, suggestions and recommendations of our citizens — the primary beneficiary of our work with this project.

Preliminary proposal details

Question 6

Please describe your preliminary proposal and its activities or projects.

Our proposed concept is to make the lamppost a beacon for sustainability. The sustainability referenced in this challenge statement ranges from ecological to financial to social sustainability, which we will realize by incorporating a variety of technological innovations into the lampposts around our city to improve quality of life for our residents and visitors in several ways.

The first step will be creating a mesh network among our lampposts that allow them to communicate with each other and with a central location. From there, much like apps on a smart phone, a variety of innovative ideas could be incorporated into the lamppost to help us achieve our desired outcomes and to improve the sustainability of Yellowknife. The innovations we are initially looking to deploy, and their ties to our outcomes, are outlined below.

Adjustable Lighting
A cornerstone of this project will be installing "smart" lighting that enables us to adjust the resting level of lighting on our streetlights. These innovative lights will also have motion detectors that enable them to dim when there is no traffic (vehicular or pedestrian) in the area, and to brighten back up when traffic approaches. This technology will benefit a few different areas; for instance, having the lights dim when they are not in use will save energy, which translates into financial and environmental benefits. From a

tourism standpoint, reduced light pollution increase the opportunities to enjoy the fantastic aurora borealis that appears in our skies throughout the night. Indeed, reducing light pollution will make this remarkable light show and symbol of Canada's North readily available to tourists and residents alike, without requiring them to travel kilometers outside the city to fully appreciate the extraordinary display.

Data Collection
Sensors will be added to the lampposts, allowing them to collect a range of data, including traffic counts, time in use and snow levels, and potentially monitoring and communicating information on other city infrastructure, including water, sewer pipes and hydrants. The network of lampposts will allow communication between posts, as well as communication with a central location, enabling the City to monitor data without having to travel to and from site and thereby increasing the efficiency of city services. This data collection could become a valuable part of the new asset management initiatives the City is currently working on.

Electric Vehicle Charging Stations
Yellowknife currently has very little infrastructure to entice potential electric vehicle owners to purchase this greener form of transportation. One key concern potential EV owners have noted is the ability to maintain a charge during the cold winter months our city experiences. Providing EV infrastructure in the downtown core will allow workers to ensure that their vehicle maintains a charge throughout the day while they are at their jobs. By providing the infrastructure to our residents, we will be encouraging the uptake of electric vehicles while at the same time demonstrating their feasibility in our cold, northern climate.

Wi-Fi Hotspots
Our initial plan for internet connectivity is to provide Wi-Fi hotspots in a few localized areas, including some of the parks around town. This technology will encourage more citizens and tourists to get outside and be more active. People of all ages will be more inclined to use our park facilities if they know that they can quickly check in on their devices while socializing at the park. This feature will also encourage tourism, as many tourists do not have mobile plans while travelling and are therefore inclined to stay in areas where free internet access is available. By providing this service in our parks, we not only encourage tourists to visit our community, but we will also entice them to get out and enjoy all of the amenities that our city has to offer once they are here. As the project progresses, this technology has the ability to be expanded to other areas of town and eventually to the entire city.

Tourism Information
Using technology to deliver tourism information can take a variety forms, and we will develop the solution in conjunction with tour operators in town. Some examples of how we envision this component include:
- Mapping apps that provide direction and recommendations to tourists;
- Areas or points of interest that are indicated by specially marked lampposts;
- Tourist scavenger hunts that provide clues for tourists to guide them on a tour of our town, where they learn and have fun;
- Historical information and photos, with a particular focus on the Indigenous history of the area;
- Up-to-the-minute weather forecasts and aurora viewing forecasts for that evening.
These are just a few of the ideas that could be incorporated. We will consult and test the solutions with citizens, tourists and businesses to refine these ideas and develop the most effective solution.

Interactive Tablets
Yellowknife is also assessing the possibility of incorporating tablets into the lamppost design at strategic locations throughout the city. These would serve multiple purposes, including further enhancing many of the previously listed technologies and features. For data collection, the tablets could be used as a survey tool to collect information and opinions from pedestrians; in terms of tourism, they could be used to

enhance other tourist features using maps, historic information and pictures including Indigenous history in the area, providing translation services and serving as a suggestion box — among myriad other possibilities. The tablets would essentially be an in-place tool used to enhance all the other features of the lamppost.

The technologies outlined above are the initial concepts we will incorporate into our project; however, as technology continues to advance, we envision our Smart Cities project advancing hand in hand with it. Much as a smart phone is home to several apps that can be regularly updated, added to or removed, the lamppost would be the hardware platform whose software we will continuously refine and advance. By getting in on the ground floor and creating a city-wide mesh network that can communicate throughout the city, we can continuously upgrade our technologies and introduce new and innovative ideas as they become available. As a result, our project is not only innovative and adaptable, but it is easily scalable both within our city and in other communities around Canada and the world. A mesh network would work the same in a small community or a major international city and, from there, the software chosen to run on that network could be designed to fit the needs of a community of any size. Ours is a project that, though very ambitious, remains easily scalable and adjustable to fit any size of community or budget. The opportunities would be endless.

Question 7

Please describe the ways in which your preliminary proposal supports your community's medium and long-term goals, strategies, and plans.

Yellowknife City Council has adopted five goals and objectives for their term in office. These are:
1. Better Engagement with Stakeholders
2. Downtown Revitalization
3. Strengthen and Diversify the Economy
4. Community Sustainability
5. Stronger Internal Working Relationships and Accountability

This project aligns directly with four of those five goals. From the start, the project has included engagement with several stakeholders throughout the city (goal #1). Implementing these technologies in our downtown core will very likely help in our efforts to revitalize that area (goal #2). The technologies will help to strengthen and diversify our economy by supporting more and varied tourism opportunities (goal #3). And, finally, as mentioned earlier, community sustainability is a driving factor behind this proposal, and each of the technologies involved will contribute to achieving sustainability in a variety of ways (goal #4).

In addition to these overall City Council goals, the City has adopted some plans and strategies that link directly to this project. The recently adopted Corporate and Community Energy Plan has established goals for Yellowknife in regard to greenhouse gas emissions reduction, renewable energy use and increased energy efficiency. This project will help reduce our energy consumption while also promoting the reduction of GHG emissions through electric vehicle use. Both aspects will help us achieve the goals in the Energy Plan.

The project will also encourage citizens to get outside and enjoy all that Yellowknife has to offer. The reduced light pollution that this project will afford will allow both citizens and tourists a better opportunity to enjoy our extraordinary skies and the aurora borealis. If successful, this project would place Yellowknife at the cutting edge of technology, garner us international recognition as a smart city and demonstrate that being a small, northern city does not prohibit us from embracing innovation and technology in an effort to better our lives.

Question 8

Please describe your community's readiness and ability to implement your proposal successfully.

Together with our partners in the project, the City of Yellowknife is ready to implement this project immediately. We have well-positions ourselves to move ahead with the project by aligning ourselves with excellent partners who are themselves ready and able to support this project moving forward.

Ecology North brings significant social capital to the project, and will be at the forefront of its educational and environmental aspects. They have almost 50 years' experience working closely with the citizens and community organizations in Yellowknife to undertake ambitious environmental projects. This experience, as well as their close ties with the community and well-respected sustainability knowledge, will be an integral part of engaging our citizens and receiving buy-in from the community.

White Arkitekter AB and the White Research Lab will bring Swedish sensibility and the technologies that already exist in Scandinavia that make it one of the most innovative, sustainable and respected places on the planet. Their architects and urban designer will help with to make it attractive, approachable and simple. We look forward to learning from their international experiences.

Northland Utilities has offered Yellowknife the knowledge and expertise that resides within the ATCO Smart Cities and Electric Vehicles Centres of Excellence. Their team of electrical and streetlighting experts have the technical knowledge and previous experience needed to implement these innovations once project funding is available. As a major utility incubator in western Canada's renewables space, ATCO's team has executed several comparable projects, including a piloting an LED and intelligent streetlighting system in Lloydminster to evaluate a new streetlight motion sensor and integrated wireless lighting control for harsh Alberta winters. This second and largest intelligent lighting pilot in Canada uses dynamic dimming technology to deliver on-demand lighting to pedestrians, cyclists and cars — netting Lloydminster energy savings of up to 80% on lighting infrastructure while lowering carbon emissions, reducing light pollution and ensuring public safety. ATCO has also implemented Alberta's first EV fast-charging corridor from Edmonton to Calgary, in addition to bringing curbside EV charging to the City of Edmonton and completing a recent project to design a combined solar photovoltaic and battery energy storage installation for the City of Grande Prairie's electric bus charging facility.

Beyond this cutting edge technological knowledge, Northland Utilities also brings their vast experience as the electricity provider in Yellowknife, affording them the knowledge needed to seamlessly integrate the new technologies into the existing electrical infrastructure that has been providing power to Yellowknife's residents for more than 60 years. This expertise will prove an enormous asset when we begin to install the technologies.

The City of Yellowknife has the project experience and track record to coordinate the effort and make this proposal a reality. On a yearly basis the City is responsible for undertaking and managing several multi-million dollar projects involving many partners, consultants, and contractors. This experience will be invaluable as we move forward with the planning and implementation portion of our Smart Cities project.

Question 9

Describe your plan for using the $250,000 grant, should you be selected as a finalist. Provide a high-level breakdown of spending categories and an accompanying rationale

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If chosen as a finalist, Yellowknife's plan for the initial grant money is to further engage our citizens and community, develop a test neighbourhood or neighbourhoods for our proposed technologies and then gather and analyze the information from the testing area to develop a plan for community-wide implementation of the technologies.

Phase 1: 3-day design charrette
Successful projects in built environment sustainability often refer to the initial design charrette as a game-changer to put all parties on the same page. Bringing an extended group of stakeholders in the same room for 3 days will insure the success of the project. Key decisions will be made for the project to move forward. Many options will be explored in terms of what technologies should be deployed and which neighbourhoods they should be placed in. This approach will help us to identify and produce solutions for potential down-the-road hurdles. Main partners Ecology North, White Arkitekter AB, ATCO, and the City of Yellowknife will invite community groups to participate in the drafting of the pilot project.

The main design partners will develop the project narrative and storyline, with contributions from their respective subject matter experts. Another part of the budget will be distributed to contributing community partners that could bring additional expertise on the project, such as, but not limited to, the Northwest Territories Association of Communities, the Pembina Institute, the Yellowknife Chamber of Commerce, the Yellowknives Dene First Nation and others. This engagement and consultation phase is expected to use $50,000 – $75,000 of the budget.

Phase 2: Prototyping
A subsection of Yellowknife will be identified as test neighbourhoods. The lampposts in these areas will be retrofitted to include smart filters, dimmers, sensors, and other technologies like electric vehicle charging stations. One-hundred thousand dollars ($100,000) will be set aside for a project prototype on the chosen neighbourhoods, as suggested to be the most strategic by the design charrette.

Phase 3: Monitoring and public engagement
Feedback on the project will be collected through additional public engagement. The public engagement phase will also serve to extend projects that are being made possible by the integration of various technologies on the lampposts. This final engagement phase will use $25,000 of the budgeted money.

Phase 4: Final Project Planning
The final phase portion of the funding will go towards the analysis of the results from the test neighbourhoods as well as the planning for a city-wide roll out. The design and implementation plan for the full-scale project will be developed in anticipation of being the successful candidate in the Smart Cities Challenge.

Question 10

Describe the partners that are or will be involved in your proposal. Where partners are not yet determined, describe the process for selecting them.

As mentioned throughout the application, we have the three main partners — with whom we are already working hard to draft this proposal.

Ecology North
Ecology North is a charitable, non-profit organization based in Yellowknife. Formed in 1971 to support sound environmental decision-making on individual, community and regional levels, their programs focus on five priorities — namely, climate change, environmental education, water, waste reduction and local food production. A common thread throughout all Ecology North programming is an emphasis on environmental, social and community wellbeing. Ecology North maintains collaborative partnerships with

several other local community and educational organizations to promote public education, sustainable living and climate change adaptation.

White Arkitekter AB
White is an interdisciplinary practice for architecture, urban design, landscape architecture and interior design. Embedded in their work is a commitment to sustainability in all its forms, underpinned by practice-based research. As a collective of 900 employees organized in networks across 14 offices in Sweden, Denmark, Norway and the United Kingdom, they work with clients, communities and consultants to create inclusive, resilient architecture that inspires sustainable ways of life. The White Research Lab is White's way of engaging in practice-based research that supports sustainable ways of living. By sharing their knowledge, they increase the ways in which they can contribute to overcoming societal challenges, as well as attracting collaborators that share the same passion and goals.

Research and development has been a fundamental part of White's working culture since the practice was established in 1951. Today, knowledge and curiosity remain as fundamental business assets; their explorative culture is reflected in their investment; ten percent of their annual turnover is dedicated to R&D. White's employee ownership structure allows them to support R&D activities on a broad basis; from bottom-up initiatives in our assignments, to practice-based research in collaboration with academia. The White Research Lab focuses upon three key themes: equitable architecture, resource efficiency and informed design.

Northland Utilities, an ATCO Company
Northland Utilities has been lighting up the Northwest Territories for more than 60 years. They own, operate and maintain the electrical infrastructure in Yellowknife. As a global energy infrastructure provider, they play a central role in delivering long-term, sustainable solutions. From integrated energy systems to innovative partnerships with communities, they solve customer challenges in a way that balances responsible development with environmental stewardship and the interests of communities and landowners. They conduct their business in a manner that reflects their values of integrity, transparency, entrepreneurship, accountability, collaboration, perseverance and caring; these foundational principles help them deliver on their commitment to sustainability.

As we move forward with this project, the City of Yellowknife intends to continue to engage businesses and organizations from throughout our community in an effort to gather feedback and assistance with our efforts. While the above-mentioned groups will form the nucleus of our project team, there will be room for input from other partners as the project develops and progresses. We look forward to finding new, innovative, and inspiring partners throughout the process.