City of Winnipeg
Smart Cities Challenge Proposal

Winnipeg

Table of Contents

Question 1: Community

- Name: City of Winnipeg
- Province or Territory: Manitoba
- Population (2016 Census): 705244
- Indigenous Community: No

Question 2: Prize Category

$50 Million (all population sizes)

# Question 3: Challenge Statement

Our community will implement an intelligent, open, and integrated municipal transportation ecosystem, reducing transportation infrastructure costs 10x over five years, while enabling mobility-as-a-service and public safety for all citizens.

Question 4: Outcomes

Citizen & Economic Prosperity through Smart Transportation & Advanced Mobility

For thousands of years, Winnipeg has been a connected trade hub. From the Forks at the intersection of the Red and Assiniboine rivers to the unique home in Canada of three Class 1 rail carriers, Winnipeg has played a key role in connecting Canada east to west. The Conference Board of Canada projects that Winnipeg will be the fastest growing municipality in Canada that is not strongly influenced by oil; as the seventh most populous city in Canada, Winnipeg is an exemplary touchstone of the key needs and issues for mid to large cities in Canada.

2017 marked the first time that the Canadian Census Bureau recorded Winnipeg's population above 750,000. With an over-whelming majority of the growth coming from immigration and the retirement of the substantial Boomer workforce in full swing, there are significant shifts in the demographics of the city and the demands the people and businesses here will place on transportation services and networks. As a river city, Winnipeggers must cross up to three different rivers that wind through the area, creating a reliance on bridges to connect the four corners of the city.

City of Winnipeg Annual Population Change

Annual Population Change (People Per Year)
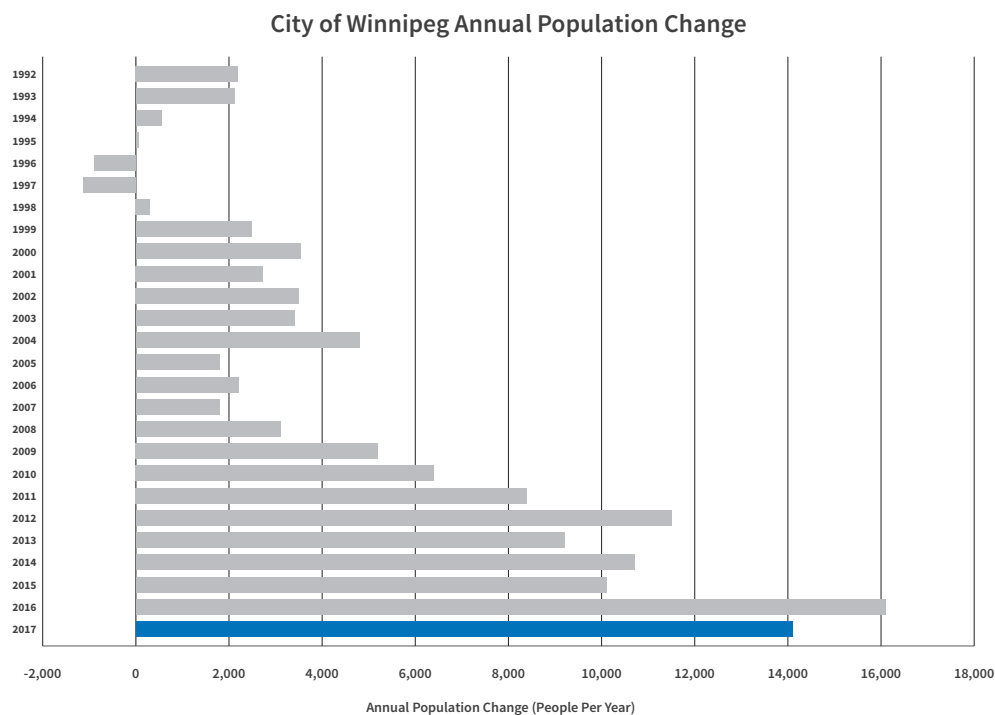
An inland port, Winnipeg acts as an intermodal hub between air, rail, and trucking, Winnipeg depends heavily on effective and efficient signalized intersections to move vehicles around its arterial road network. This reliance on traffic signals is complicated by the highest number of at-grade rail crossings in Canada (236+), more than twice the number of crossings as the next city on the list (ref: Transport Canada).
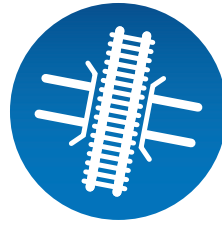
236+

WINNIPEG HAS THE HIGHEST NUMBER OF AT-GRADE RAIL CROSSINGS IN CANADA

Of course, the safety of our citizens is paramount. While Winnipeg continues investments into public safety, safety remains a top concern for many Winnipeggers. By focusing our efforts on delivering holistic solutions that provide benefits far beyond any single outcome, Winnipeg will be able to markedly improve the safety and security in portions of the city that residents feel least safe in. These same systems will allow Winnipeg to dramatically improve the time to respond to non-life-threatening emergencies such as water main breaks, sewer back-up, road safety, and other emergencies that fall outside of the scope of fire, paramedic, and police.

With a changing health care environment, the need to provide emergency responders with complete situational awareness and rapid response abilities is vital to delivering the best possible care and treatment in a timely way. With the mandate of NextGen 9-1-1 set for 2020, Winnipeg is ready to leverage the advanced capabilities that are associated with NG911 to significantly improve the existing systems for emergency response.

> **Winnipeg's proposal is about moving people, goods, services, and data more effectively, sustainably, and safely.**

At its heart, Winnipeg's proposal is about moving people, goods, services, and data more effectively, sustainably, and safely in city that is heavily dependent on traffic signals, rail, and bridge crossings.

Our proposal, the Smart Transportation Evolution and Advanced Mobility (STEAM) program, comprises a cohesive portfolio of initiatives, tied together through an open and intelligent platform called the Advanced Municipal Intelligence System (AMIS). Developed through this challenge, AMIS will deliver meaningful outcomes in the focus areas of mobility as well as safety and security by providing and expanding transportation in ways that keep it efficient, effective, accessible, sustainable, and safe. The immediate direct and significant impact to the city, its residents, and businesses will be followed by Winnipeg providing a blueprint and mentorship for other cities, in and beyond Canada, to follow suit.

The outcomes of our proposal will be:

1. Winnipeg will develop and deploy a world-class Mobility-as-a-Service (MaaS) platform that expands and improves how people, goods, services, and data are transported around the city, ensuring that everyone has access to safe and effective transportation options.

2. Winnipeg will reduce the time taken to respond to emergencies, both life-threatening and non-life-threatening, protecting the citizens, businesses, and infrastructure, ensuring a safe and economically productive city for the future.

3. Winnipeg will improve the safety and security of its citizens and businesses, raising the overall feeling of safeness that is a basic right for all citizens of all cities.

Addressing the needs of our community together

Winnipeg applied a two-track approach while engaging our communities to establish the outcomes that would be most meaningful and achievable as part of our proposal. Considerable effort was made to balance Smart Cities Challenge-specific engagement

COMMUNITY ENGAGEMENT RESULTS SHOW THAT MOBILITY IS IDENTIFIED AS VERY IMPORTANT TO WINNIPEGGERS

with long-running and comprehensive engagement data that the City collects year-over-year and has significant historical records of. Our goal throughout the discovery phase of the Challenge was to ensure that the Challenge-specific engagement provided specificity to enrich the broader statistics that the City measures on a regular basis. This ensured that we developed a more detailed picture of what mattered to the communities in the context of this Challenge.

Throughout the discovery phase, feedback and discussions were solicited from diverse communities including citizens, industry, academic institutions, and associations. This feedback and the outputs of these discussions were taken to subject matter experts within the City to align with capabilities or assets where Winnipeg is best-positioned to deliver on these outcomes.

The results of this engagement and evaluation was that mobility, by nearly a factor of two-to-one, was the most significantly represented outcome identified as meaningful for Winnipeg's communities. This is supported by a comprehensive set of existing data sources:

1. Mobility-as-a-Service (MaaS)
    o   Importance supported by: Winnipeg Community Trends Report (CTR), Municipal Benchmark Network Canada (MBNC), Transport Canada, Smart Cities Challenge (SCC) engagement
    o   Meaningful because:
        •   Citizens clearly indicated in SCC engagement that mobility (transit, infrastructure, services) enables inclusivity and is a priority, and has been a consistent discussion point during all public engagement activities.
        •   Winnipeg is an intermodal hub, a role that is expanding with the addition of CentrePort, resulting in a direct link between transportation within the city and economic indicators.
        •   There is a need for significant infrastructure investments for expansion and renewal to meet demands (ref: Winnipeg State of the Infrastructure Report)

2. Emergency Response
    o   Importance supported by: improvements required to consistently meet Canadian and international standards for emergency response times; the systems supporting emergency dispatch are aging and restrictive
    o   Meaningful because:
        •   A reduction in time to respond results in significant reductions to mortality and morbidity for life-safety events and can significantly reduce the cost to remediate infrastructure damage or failure events.
        •   By reducing the time to address infrastructure emergencies, the cost to maintain a given piece of infrastructure drops, as well as a reduction in the costs of providing health care when the emergency responders arrive earlier and can apply treatment sooner.
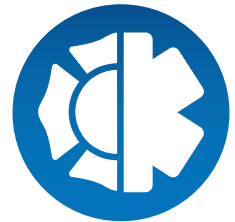
3. Safety and security
    o   Importance supported by: CTR, MBNC, SCC engagement
    o   Meaningful because:
        •   Feeling safe and secure in is a fundamental human right, and ensuring this is true for everyone that lives, works, invests, and plays in Winnipeg is a core part of Winnipeg's vision.
        •   Safe cities are economically viable and prosperous cities (ref: OurWinnipeg), and ensuring that everyone feels safe investing in Winnipeg will continue to bolster our strong small business ecosystem.
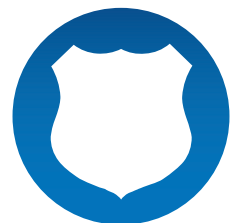
Our Challenge needs a Smart City Approach

Winnipeg's challenges are Canadian challenges; with emergency services, infrastructure renewal and expansion, and public transit the most substantial components of Winnipeg's budget investments. Like all cities in Canada, we face increasing pressures from evolving demographics resulting in new demands on our aging municipal services and infrastructure (ref: Winnipeg State of the Infrastructure Report). Infrastructure and operating budget limitations are driving the need for cities to adopt intelligent, creative, and modern approaches to solving both longstanding and new challenges. Citizens are demanding more from their civic leaders; that they be innovative problem solvers focused on value-for-money when delivering services and long-term vision when deciding on policy and strategy.

WINNIPEG AS BEEN RECOGNIZED AS ONE OF THE WORLD'S TOP 7 INTELLIGENT COMMUNITIES

For the third time in five years Winnipeg has been recognized by the Intelligent Community Forum as one of the world's Top 7 Intelligent Communities. Through the leadership of our Council and Public Service, innovation is a priority with the first Chief Innovation Officer for the City of Winnipeg and associated funding and Council committees.

Contributing value beyond any one outcome

Winnipeg's Smart Cities Challenge (SCC) proposal, the STEAM program, was built from the ground up with the core philosophy that the solution to any one problem can, and indeed must, contribute significant value beyond any one outcome. This mindset has shaped the initiatives within our proposal to include those that aligned with our community and industry engagement (both as part of the Smart Cities Challenge as well as our historical engagement practices) with the most significant collateral benefits when completed together. This has resulted in a proposal that is far greater than the sum of its parts.

Creating fundamentally new capabilities for Canadian Municipalities

The core of our proposal is the Advanced Municipal Intelligence System (AMIS), a modular, Open Architecture based AI Suite, Application and Data bus, which will allow real-time consolidation of data for access by our constituents and partners, contextualization of information for use by City applications and intelligent control automation, enabling new generations of City services. Multiple project team members from the Innovation Office have been responsible for building these types of systems for governments and corporation across the globe. The initial investment required to develop this type of system requires that a minimum amount of each project is realized to achieve the truly transformative potential. This makes this project a unique opportunity for a fundamentally new capability to be developed not just for Winnipeg, but made available for municipalities across Canada.

Leveraging our existing Capabilities for new outcomes

One example of this new generation of service is the city-wide train detection initiative within our proposal that aims to provide detailed actual and predicted information about the times and durations of rail crossings on the road network. The effects of this span multiple outcomes:

- By alerting drivers of crossings on their usual routes, this will naturally reroute traffic and reduce congestion
- When integrated with the Transportation Management Centre (TMC), traffic signal timings can be altered to more efficiently clear congestion once the train has crossed.
- When provided to emergency responders, vehicle routing is simplified, and response times are reduced significantly whenever a train crossing event would have impacted the responders' route.
- ~25% reduction in congestion saving ~2500 tonnes of GHG emission.
- The reduction in congestion alleviates a fundamental problem for a cost of millions, as opposed to the traditional over/under-pass which would cost billions; a 99.9% cost reduction.

Many of the components of our proposal leverage a unique capability in Winnipeg's TMC, a centralized group and asset connecting every signalized intersection in the city (650) and over 120 video cameras providing live streaming video covering half of the City's regional road network. This capability, the complete coverage of all signalized intersections, and the commodity technologies (e.g. cellular networks, video technology) it is built on, provide a flexibility to both ask, and answer, questions that no other Canadian city can. The unique nature of Winnipeg's TMC is not a function of complexity or the difficulty required to implement it, and in fact is attainable by any Canadian city. Winnipeg's TMC was implemented in unprecedented time, with low cost, and with limited resources and has set the table for organization wide transformation of service delivery – it is a catalyst for cross-silo collaboration and data driven decision making.

OVER 120 VIDEO CAMERAS COVERING HALF OF THE CITY'S REGIONAL ROAD NETWORK

Committed to Open Data

Winnipeg is committed to open data and systems and is looking forward to taking this opportunity to share what it has done with other cities as a part of this Challenge process, and to learn from how other cities have solved, and are proposing to address, the problems we are still working on.

The result of this mindset is a proposal which incorporates a number of ground-breaking innovations and capabilities into a single vision, the scope of which coherently and effectively spans two focus areas: mobility and safety and security. The design, mechanisms, and output of our proposal will be available for all to learn from and improve upon.

Ambitious & Achievable: Our proposal

Winnipeg's proposal is ambitious in its vision, focusing on the integration and interaction of the initiatives within the proposal to deliver on our outcomes.

1. Mobility-as-a-Service (MaaS)

   o Ambitious: Our STEAM program is a unified approach to expanding and adopting advanced mobility functionality in all aspects of transportation within Winnipeg. This is an unprecedented capability within Canada, and will revolutionize how many City services are delivered.

   o Achievable: With four distinct phases within the proposal that directly contribute to this outcome, the proposal is structured in such a way that these parts are achievable and build on existing experience, capabilities, and thought-leadership.

2. Emergency Response

   o Ambitious: The proposed emergency responder dashboard will be a first-of-its-kind application that will grant Winnipeg's emergency responders situational awareness from the complete set of rich data sources that the City has available. From traffic cameras to advanced proactive traffic management and train information, responders will arrive at a scene better prepared to act and react. By expanding this benefit to non-life emergency response, service delivery for these activities will have access to the same powerful tools that are currently limited to police, fire, and paramedic response.

   o Achievable: By building on the integration of existing data sources and proven technology and software platforms, and connecting the outputs of four different proposal initiatives, our proposal will deliver on this outcome.
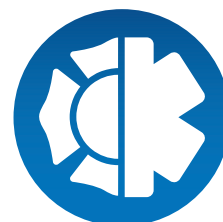
3. Safety and Security

   o Ambitious: Integrating multiple systems and a holistic approach enables new ways of enabling safety and security efforts that have never been possible before, leveraging smart technology and intelligent approaches to build on human intelligence.

   o Achievable: Existing thought leadership and using existing tools and capabilities in new ways by new departments make this outcome achievable given Winnipeg's current position and capacities.

Winnipeg has several initiatives which are truly the first of their kind in Canada, and some on the global stage, which speaks well to the level of ambition inherent in this proposal. By leveraging the existing capability of Winnipeg's TMC, Winnipeg is uniquely able to deliver on our proposal outcomes.

Measuring Success

Measuring the progress toward our outcomes will include measuring specific metrics from service delivery, as well as progress towards both new and existing standardized measurements that Winnipeg already collects and tracks.

1. Mobility-as-a-Service (MaaS)

    o   New and existing service metrics (adoption, efficiency, cost, satisfaction)

    o   Adoption rate of alternative transportation modes

    o   Reduction in transit times on key routes

    o   Reduction in congestion during rail crossing events

    o   Infrastructure spend reduction and obviated projects

2. Emergency Response

    o   Reduction in time to respond to emergencies

    o   Number of actionable data sources available to responders at the scene

3. Safety and Security

    o   Measurement of overall safeness in CTR

    o   Measurements of safety and security in MBNC

    o   Annual citizen surveys and priority of/feedback on safety

Winnipeg's proposal is a unique opportunity to leverage partnerships with local citizens, businesses, and associations as well as other municipalities, provinces, and the Government of Canada to collaborate and work towards a solution to problems faced by all Canadians.

Question 5: Community Engagement

Engagement Strategy

To align our challenge proposal with the needs and values of our citizens and communities, considerable effort was made to engage the community through both new and existing mechanisms. We worked closely with industry associations and academic partners, our Office of Public Engagement (OPE) to engage citizens, and reviewed past public surveys, engagement, and consultation results from engagement mechanisms the City performs year over year.

1. Social Engagement

   o We established a web site specifically for the Smart Cities Challenge in collaboration with our OPE which provided us with a mechanism for sharing information about events, engaging citizens for idea submission and feedback, and building awareness. This was promoted through the City's social media accounts during February 2018 and resulted in over 100 idea submissions and over 1000 feedback responses on those ideas. The ideas and feedback received provided clear direction for aligning our efforts to meaningful focus areas and refining our challenge statement.

2. Public Events

   o We held a public event on March 5 2018 which included a panel discussion featuring the City's Chief Innovation Office and panelists from industry and academia. Each panelist brought a unique understanding and perspective on the opportunities for leveraging the SCC to further develop submitted ideas to refine our challenge statement. This panel discussion was followed by break-out sessions where attendees participated in focus group discussion on four key themes identified up to that point, resulting in a further two-to-one reinforcement of mobility as a key theme. The event was streamed live and made available afterwards on Facebook.

3. Stakeholder Engagement

   o We reached out to a broad range of stakeholders during our engagement process, leveraging industry association partners in Economic Development Winnipeg (EDW) and Information/Communications Technologies Association of Manitoba (ICTAM) to significantly expand our reach. We had direct conversations with over forty organizations and indirect reach to over 150 organizations. Also included were the universities of Manitoba and Winnipeg and Red River College in addition to internal City departments including Indigenous Services, Animal Services, Water and Waste, Public Works, Fire and Paramedics, and Winnipeg Police Service. Our Council was engaged through the Innovation Committee to ensure alignment with Council priorities.

Engagement Validation

As discussions with stakeholders and partners continued, our proposal took shape, and was consistently validated for alignment with our community engagement feedback. The validation efforts confirmed the final proposal addresses the largest cross-section of qualified submissions received. Over and above the Challenge submissions, we used empirical data to ensure we had obtained a broad understanding of community needs. Three key documents were:

1. Community Trends and Performance Report 2018 (CTR): annual report which provides community, demographic, performance metrics, and trend information about the city

2. Municipal Benchmarking Network Canada's (MBNC) annual report: comprehensive benchmarking of key services and statistics; with participating cities (including Winnipeg)

3. City of Winnipeg Annual Citizen Survey 2017 (ACS): statistically-relevant survey quantifying citizens' views of the city and services

4. Winnipeg State of the Infrastructure Report: A first-ever comprehensive review of all City of Winnipeg assets, clearly collecting the state of the assets, value, and cost to repair/replace.

Our two-tiered engagement strategy merged these two sources of data to form our overall Challenge Statement.

Incorporating Community Stakeholder Input

Throughout the community engagement process we progressed from capturing commentary to engaging the community and partners in the Challenge Statement and Project Ideation. Efforts were taken to continually ensure broad participation from a cross-section of citizens, provide on-going awareness of our efforts to gather input, solicit feedback and develop the proposal, while ensuring open accessibility to the project team. As the ideation process progressed, specific efforts were taken to ensure community stakeholder input was considered as a core component for each proposal theme.

Intelligent Mobility: With the introduction of vehicle for hire services in Winnipeg, there was a renewed discussion around accessibility and safety of transportation options including proposed changes to public transit services offered by Winnipeg Transit. During the public idea submission phase, one third of all ideas related to enhanced mobility including transit and transportation. This emphasis was reinforced by the feedback from the public forum event that produced more mobility related items than any other breakout group topic.

After the completion of the public event, subject matter experts within the City's Transit Department confirmed that the departmental MaaS vision incorporated the critical ideas heard through our community engagement. To expand the vision further we engaged industry and academic partners to include additional areas of research and development to create an ambitious proposal component that will satisfy long term transportation demands.

Enterprise Public Safety: Safety is a key concern for many residents of Winnipeg, and this was reinforced during the engagement process as well as the mayor's State of the City address, with empirical and statistically relevant corroboration available in the City's Community Trends Report (CTR).

When compared to other cities in Western Canada, Winnipeg has some of the highest rates of: robbery, violent crimes and sexual assaults, and severity index of violent crimes. These relative rates manifest in the Total Feeling of Safeness metric reported in the CTR, showing a particularly low rating for two specific districts. In the 2017 citizen phone survey only 25% felt safe walking alone downtown in the evening and when asked what actions the City should take to improve quality of life, addressing crime and safety rated in the top three and was ranked the most important when compared with other city services provided.

Winnipeg has made significant progress to rebuild the city's downtown into a vibrant location, and sustaining this improvement and investment requires that it be a safe and secure part of the city. Doing so will reap benefits to the city, its residents, business owners, and ability to bring new investment and opportunities into our City.

Emergency Response (ER) Times: All levels of government gather significant and detailed information related to emergency services and the partnership between the City of Winnipeg and the Province of Manitoba, providing metrics on what response improvements mean to:

- Mortality rates (survivability)
- Hospital care (ICU/hospital stays; health treatment costs)
- Morbidity (quality of life outcomes; productivity)
- Property damage
- Health, Life, and Property Insurance costs

These data sets are statistically relevant for a complete cross-section of populations, and comparable data sets exist for all major cities. This offers perspective and insight into the challenges faced across Canada to meet and exceed Canadian (<420s) and international standards (<384s) for response times. This becomes increasingly challenging as cities grow and call volumes increase disproportionately to associated budgets. Empirical evidence shows that faster ER times result in reduced ICU and hospital stays, an important outcome given the increased demand for ICU resources.

In 2016, City of Winnipeg paramedics arrived on scene in 7:53 minutes 90% of the time after the emergency call was routed to the unit. There is a need for cities to find new, creative ways to improve response times that improve efficiency and do not depend on increasing responder density and counts.

The same data set identified over 75% of 9-1-1 calls now involve smart phones, providing another significant opportunity to expedite 9-1-1 calls through the Public Safety Answering Point, the first touchpoint for an emergency call. Current 9-1-1 systems are costing lives by not integrating these capabilities.

We also know the city's fire responders respond to substantially more fires per capita than comparator cities in Canada (MBNC). Our proposal recognizes the criticality of fire response teams getting to incidents quicker to mitigate damage to property and save lives. The same applies to police responsiveness where the Citizen Survey (2017) reports a significant drop in satisfaction (82% to 74%).

Partner and academic engagement identified that there is an adverse effect on response times due to rail crossing events and associated delays. The ability to proactively route emergency response vehicles around rail delays with real-time and predictive information will improve both average and 90th percentile response times for all response types.

This public engagement resulted in four proposal initiatives to improve response times, and will result in a significant impact, addressing citizen concerns and delivering a positive economic impact.

Sustained Engagement Plan

Consistent with our City-Wide planning activities, including our multi-year Our Winnipeg City Planning Process, we plan to sustain community engagement through development and implementation as follows:

1. Establish Smart Cities Challenge Steering Committee: Citizen, Industry, Academic, City Administration, Council members

2. Publish program delivery plans regularly through our SCC website, with milestones and realization;

3. Using our SCC web site and existing public engagement toolsets to gather public input on implementation and deployments of specific initiatives;

4. Additional forums to continue public dialogue and input so our citizens stay engaged, aware, and participate in deployment activities, accelerating benefits realization

5. Provide regular updates to inform the public on exciting new capabilities, as projects move into implementation phases;

6. Engaging specific industry groups for same (benefits realization).

7. Ongoing channels for live feedback from citizens and businesses on the effectiveness and opportunities as new services are deployed.

Question 6: Preliminary Proposal

Winnipeg's Smart Cities Challenge proposal embodies the key properties that are required in an intelligent long term vision for a municipality of today and tomorrow.

Planned Framework & Projects

With four phases and nine component initiatives, our proposal is built on the founding philosophy that it is the connections and integrations between components that results in the most significant transformative value in a modern interconnected environment.

The overall scope of our proposal is designed to fit within a 48 month timeframe, within the available contribution of the City's staff including; the Innovation team's resources for providing project management, business and technical architecture and design, and communications skills, and within the budgets available to the City of Winnipeg in addition to the awarded funds. The components of the proposal have been broken down into achievable, realistic, and appropriate sizes, ensuring that estimates for completion are more accurate and the risks to success are minimized. Winnipeg's proposal aims to work closely with internal subject matter experts effectively and efficiently integrate the new components and systems with existing elements for maximum benefit early on in each project's lifecycle. Where internal resources are fully allocated or where capabilities are required outside of internal resources, we will leverage partnerships and external resources to augment our own capacity.

Our proposal has nine elements that contribute to our three listed outcomes: Mobility, Emergency Response, and Public Safety.

The components of our proposal are:

- **Smart Sensor Network:** A capability to deploy, connect, monitor, and act through broad arrays of IOT sensors, expanding on Winnipeg's world-class Transportation Management Centre's capabilities in managing existing video cameras and radar detectors. These sensors will be accessible through a shared platform that provides rich data streams and analytics across departments and business units.

  - o   100+ new IOT sensors
  - o   6-12 months, 2FTEs
  - o   Contributes to all outcomes

- **Train Detection:** A city-wide deployment of train detection sensors and predictive analytics, expanding on the success of an initial pilot of the same technology on a subset of the busiest crossings in the city. Included are web and mobile applications that distribute this information to drivers, businesses, and emergency responders.

  - o   250 rail crossings monitored, one mobile application
  - o   18 months, 3FTEs
  - o   Outcome alignment: Mobility, Emergency Response

- **Smart Transit:** Leveraging the backbone of the Smart Sensor Network, Winnipeg Transit will be able to deploy increased intelligence, fog computing, and IOT sensors to the transit fleet enabling new services, improved routing and scheduling, and more accurate information for riders.

  - o   650 buses
  - o   24 months, 6FTEs
  - o   Outcome alignment: Mobility

- **Bike and Ride:** Improving the functionality of active transit within Winnipeg is vital a healthy community, and ensuring that there is safe and secure storage for active transit equipment at public transit locations is a fundamental stepping stone to adoption of active transit.

  - o   13 locker locations
  - o   6 months, 1FTE
  - o   Outcome alignment: Mobility

- **Micro Transit:** With the rise of vehicle-for-hire services, Winnipeg Transit will expand its ability to provide for and service these needs by expanding on existing dynamic routing schedules through mobile applications, automated routing and dispatch, and connected technology. This will supersede the existing Winnipeg Transit DART service by providing automation and applications for riders and drivers.
    - o Two applications, integration with existing system
    - o 12 - 18 months, 3FTEs
    - o Outcome alignment: Mobility, Public Safety

- **Enterprise GPS:** Emergency responders require fast response times, and by integrating two-way vehicle location into Winnipeg's TMC through software, we will be able to provide preemption of signalized intersections for emergency vehicles as well as transit, snow plow, and other vehicles. This initiative will achieve this through mature and accessible technologies and open systems driven by software avoiding vendor lock-in and enabling opportunities for non-City fleet vehicles to receive the benefits of preemption.
    - o 30 intersections with fire/paramedic fleets
    - o 18 months, 6FTEs
    - o Outcome alignment: Emergency Response

- **Smart 9-1-1:** Integration of NextGen 9-1-1 with caller smartphone applications and data sources will provide responders with immediate and precise access to information that currently is either difficult to obtain or imprecise in nature (e.g. exact location).
    - o Mobile app, integration with NG911
    - o 36 - 48 months, 5FTEs
    - o Outcome alignment: Emergency Response

- **Responder Dashboard:** Emergency responders require the best possible situational awareness when arriving at an event, and by using the rich collective data sets available through the Smart Sensor Network and other City services, this will provide them with an at a glance view of where they are going, what the situation is in real time as they travel, advanced routing information to reduce travel times, and detailed access to other information that will inform their ability to make decisions when they arrive.
    - o Mobile application, integration with multiple internal systems
    - o 12 – 16 months, 3FTEs
    - o Outcome alignment: Emergency Response

- **AMIS:** Winnipeg's Advanced Municipal Intelligence System (AMIS) will deliver meaningful outcomes in all areas of service delivery and information contextualization by consolidating, enriching, and using AI to analyze broad data sets to provide actionable insights to City operators, as well as the ability to act directly through existing controls and mechanisms that City has in place (e.g. automated signal timing adjustments through the TMC, Transit vehicle selection and routing, responder dispatch, etc.).
    - o Architecture and design, integration with existing systems, net-new intelligence systems
    - o 12 months, 5 FTEs
    - o Outcome alignment: Contributes to all outcomes

Taking a Smart Cities Approach to Project Delivery

A smart cities approach is a fundamental building block for achieving all of the components of our proposal as they all depend on connected technology and intelligent automation. From the deployment of IOT sensors and predictive analytics for train detection to IOT sensors and AI insights into the health of infrastructure through the Smart Sensor Network and AMIS, smart approaches are the only way to accomplish our outcomes.

Introducing new sources of data will transform how we are able to deliver services and meet our outcome objectives, enabling Winnipeg Transit to fundamentally improve how they optimize routing and scheduling to match rider demand and emergency responders to gain unprecedented situational awareness through a first-in-the-world responder dashboard. Winnipeg has a unique in Canada, but not unique in the world, concern in the number and impact of rail crossings within the City, and our approach to using intelligent technology will alleviate a billion dollar problem that will allow us to stand as a blueprint on the world stage.

Ambitious and Executable

While our proposal is ambitious, often reaching up to first-in-the-world heights, it is built on existing proven technologies and components, instead relying on software, flexible networking elements, and integration with human intelligence and process to achieve our goals. We have successfully piloted the technology and analytics required for city-wide train detection at our busiest crossings, and will expand this through open data and mobile application development to provide new value and outcomes for citizens and industry.

By carefully considering the tools, technologies, and capabilities at our disposal we have put together a proposal that matches scope of the outcome and initiatives to the scope of the meaningful needs of our communities. From train crossings and the economic, environmental, infrastructure, and citizen frustration that precipitate to enabling active transportation by providing larger, more secure bike lockers at more locations throughout the city, we have taken care to ensure that we are aligning magnitude of needs with comprehensiveness of solutions.

From Transit based initiatives in Smart Transit and Micro Transit to the Emergency Responder Dashboard, our proposal will grant these service operators access to new data, actionable insights, and recommendations that have never been available before, resulting in fundamental new abilities to manage and improve service delivery to improve and maintain a new era of alignment with citizen and business needs.

Transformative

Being the first in Canada to deploy municipal coverage with a future-first Smart Sensor Network is only one facet of our proposal that speaks highly to the ambition we have. This is integrated with advanced AVL capabilities to provide Enterprise GPS functionality and vehicle pre-emption as well as smart phone data connectivity to emergency response, both of which are first-in-Canada capabilities for a municipality. The proposed city-wide train detection platform expands on successful pilot projects in North American cities to provide the world's first complete city-wide rail crossing insights platform.

Open Data Approach

In the process of building this proposal, a mindset for open data, open technologies, and interoperability was critical to realizing the core benefits, as they arise from the interactions both between the proposal components and with systems and components outside of this proposal scope. To achieve this, open standards and technologies must be the building blocks of our implementations, and this understanding is well demonstrated in the technologies used to build our Transportation Management Centre. It is the integration and software that binds and enables these components and compounds the value through interconnectivity.

Interoperable Focus

Our proposal focuses on solving problems that expand beyond Winnipeg in ways that expand beyond Winnipeg. The Smart Sensor Network provides a backbone and blueprint for cities to use modern technology to ease and automate monitoring any aspect of their city, and provides fast, actionable insights to staff. With access to hundreds of different types, sizes, and models of IOT sensors available on the market today, the Smart Sensor Network will enrich and expand existing data sets including field reports, video data, and AVL data. When integrated with AVL data and dynamic traffic signal management through a TMC

(such as Winnipeg's) it becomes possible to realized vehicle pre-emption for any AVL equipped vehicle through software alone, avoiding costly and complicated physical assets that many solutions require.

Scalable and Transferable

Scaling of our solutions to cities, larger and smaller, within Canada is critical to the successful transference of these solutions, and we have designed our proposal to consider this. Winnipeg's TMC was built on unprecedented time and budget, required a small number of staff to implement, and was built on technologies available to all modern cities. This makes it an excellent blueprint that can extend the TMCs in cities across Canada and the world. The Smart Sensor Network and train detection systems that augment the TMC are IOT systems by nature, easily scaling from one to one million devices.

Replicable and Adaptable

By building on mature technologies and adopting platforms that are extensible through standardized interfaces, we will build out solutions that provide exceptional value-for-dollar in terms of service delivery effectiveness and service quality for years to come. An intelligent system is a system designed with the understanding that continuous improvement is necessary and unavoidable. The ability to swap out components of architectures with replacements supporting new technologies is the foundation of a forward-thinking and future-first design, and our proposal elements are all built with this in mind.

Fundamental Infrastructure Benefits

In the example of mitigating rail crossings, the smart cities approach at its core enables us to replace a traditional solution that would cost billions with a 100 year lifespan with solutions that cost millions with ten year upgrade cycles.

Planned Approach & Activities

The planned approach ensures that the project is open, interoperable, scalable and replicable throughout, continuously monitoring outcomes and adapting to the changing needs of our citizens. In the final phase of the project our goal is to ensure other municipalities and partners can participate in the development and enhancement of the AMIS framework, systems, data and protocols, laying the groundwork for more advanced solutions in the future. Key phases of the planned approach include:

- **Kick-off Project**
    - o Review Project Charter, Scope, Schedule, Resources, Costs
    - o Kick-off Project Team including, innovation, quality, risk & communication activities
- **Phase 1: AMIS validation through initial pilots**
    - o Standup key projects, test for outcomes and review key output through public / partner engagement
    - o Produce Open Architecture outputs (Open Data / System Information)
    - o Build initial instance of AMIS, link key project outputs, test for outcomes
    - o Review AMIS outcomes through public / partner engagement
    - o Revise AMIS Architecture as required, revise key project requirements
- **Phase 2: Execution**
    - o Execute Mobility/Safety related projects
    - o Integrate projects into AMIS
    - o Assess & Update Outcomes via engagement
    - o Monitor Implementation for outcomes and identify improvements
- **Phase 3: Open Iteration Engagement**
    - o Complete Open Architecture, System and Data projects within AMIS
    - o Initiate partnerships with additional municipalities

Question 7: Medium and Long Term Community Goal Alignment

Winnipeg's SCC proposal is an ambitious extension of our larger Smart Cities 25 year vision as defined by the Innovation Office in 2017, and is well aligned and complementary to our existing City Planning & Strategies including Our Winnipeg, the City of Winnipeg 2018-2025 Strategic Plan and departmental specific service plans, such as The Sustainable Transportation Direction Strategy within Winnipeg Transit.

OurWinnipeg Alignment

In 2011, Council adopted the current version of OurWinnipeg, the City of Winnipeg's definitive long-term planning direction document. It contains several directives specific to the areas our SCC Proposal covers: mobility, transportation, public safety, and security. Included are references to OurWinnipeg which provide evidence of our alignment with the City's goals and vision:

OurWinnipeg™
It's Our City, It's Our Plan, It's Our Time

- **p.33 – (Transportation):** "….provide options for mobility by facilitating a range of transportation alternatives. In many instances, modes of transportation will differ from one part of the city to another based on the area's context. Alternative modes of transportation should be emphasized where they can provide convenient and realistic travel choices."

- **p.41 – (Safety and Security):** "… the quality of life offered by a city depends in many ways on its safety and security. Safety is a basic requirement of a competitive city. When people feel safe, they can fully participate in social and economic life…..can travel and use public spaces without fear."

- **p. 43 – (Safety and Security):** "Safe Communities: Directive 4 – Facilitate safety on streets and sidewalks. Incorporate safety measures into transit operations…"

- **p. 44 – (Safety and Security):** "Directive 7 – Continue to enhance access to safety and law enforcement services through technology…"

Alignment to Existing Plans

Specific to Transportation, an important Council-endorsed accompanying document, The Sustainable Transportation Direction Strategy, provides a vision for transportation in Winnipeg for the next 25 years. Its emphasis is on moving people, goods, and services in a way that is socially, environmentally, and economically sustainable.

This document contains the following strategic goals, each of which our Proposal is aligned with and supports:

- **A transportation system that supports active, accessible and healthy lifestyle options** - Provision of adequately maintained walking, cycling and other forms of active transportation facilities are all part of achieving this goal. A safe and secure transportation system that is universally accessible will help to ensure equitable access to mobility and a high quality of life for all citizens.

- **A safe, efficient and equitable transportation system for people, goods and services** - In order to ensure sustainable economic growth, an efficient, cost effective transportation system for the timely and equitable movement of goods, services and people is essential.

The document identifies opportunities for which our Proposal is aligned and helps enable:

- Minimizing both the number and length of trips people need to make by more fully integrating land use and transportation.

- Effectively integrating rapid transit, active transportation and other transportation system improvements into the future urban structure.

- Ensuring equitable access to mobility for Winnipeggers of all ages and abilities.

- Moving goods and delivering services safely and efficiently within and through Winnipeg to ensure economic competitiveness and prosperity.

Question 8: Readiness and Ability to Implement

Our SCC proposal submission is one which is ambitious and achievable. The proposal represents the launching of a four-year program, Smart Transportation Evolution and Advanced Mobility (STEAM), consisting of nine discrete initiatives, the size and complexity of which is well-defined and contained. Winnipeg is excited and ready to bring this proposal to life.

Rising to the challenge of a complex project

There are several key strengths and capabilities which we believe uniquely position us to deliver successfully on this proposal commitment:

- Centralized Innovation, Business Transformation, Change Management & Asset Management capabilities

    o The City of Winnipeg has invested significantly over the past five years in creating centralized governance and resourcing capabilities to enable large scale organizational change, including the creation of the Innovation Office, which maintains central governance, resourcing and budgeting of Smart Cities projects occurring in any city department. This includes the development and implementation of a city-wide Enterprise Architecture and Innovation Engineering Framework to enable projects of this scale.

- Successful Implementation of Foundational Capabilities & Technologies

    o The thought-leadership of key individuals in our Transportation Management Centre has successfully taken big ideas through to successful, internationally renowned, implementation. This proposal leverages that same vision and subject matter expertise, by actively engaging them in delivering the components of our proposal. Their expertise and participation were instrumental in developing three of the proposal component concepts: Enterprise Smart Sensor Platform, Enterprise GPS (EVP), Live Train!

- Leveraging of Industry Partners

    o Our Enterprise Train Information System and Infrastructure initiative will be led by a key business partner that has successfully piloted and delivered on building blocks which will be re-used to build the city-wide deployment. They have demonstrated leading-edge capabilities in all facets of the deliverables they provide. They fully understand the expanded scope of the city-wide solution being proposed, as they have collaborated extensively and transparently in developing and defining this significant component of our proposal.

- Capacity Strategies to enable City-Wide Service & Technology Development

    o Transit initiatives will engage key resources in Winnipeg Transit that have experience and subject matter expertise in the technologies, delivery processes, and organization to develop and implement key project requirements. We will engage a software vendor in the development of two mobility apps for service users and bus operators. We have a successful track record with our methodology of defining the requirements and functional specifications, with formal review and sign-off prior to commencing development.

Project Architecture Governance: Strategy & Planning, Design, Implementation and Management & Measurement

The City recognizes the complexity of the overall Program it is proposing with cross-department groups, many stakeholders (public and private sector, political, labor), and complex vendor management (with five key strategic business partners among other vendors). Project interdependencies, high levels of public visibility and engagement, and organizational change management contribute to the complexity and scope.

City of Winnipeg is familiar with complex partnerships and service delivery approaches; our community was awarded the Intelligent Community Forum (ICF) Intelligent Community of the Year Award in 2014, 2016, and 2018 supporting the City's approach to innovation and smart cities projects. Additionally, our Innovation team was recently awarded (April 2018) a Project Management Institute award for the successful delivery of our replacement City Wide Public Safety Radio Network.

The need for a defined governance model, and enterprise architecture focused project and change management approach, with the associated measurement and discipline is both recognized and consistent with our current approach to City-wide projects.

We plan to augment our internal project delivery capacity and capability by engaging local and national resources with extensive experience in program and technology development. This will be needed for key service development, systems integration, and product configuration work required to successfully implementing our program components.

The STEAM Program will include an overall governance model which includes active engagement and participation by the various municipal departments, and key business partners. We anticipate both a Program Steering Committee to provide direction at the Program level, and several Project Boards to facilitate project-level cross-organization communication and collaboration.

Assurance that individual project schedules are built and integrated into an overall program plan, with inter-project dependencies well-defined and managed is critical. A program of this size and significance will need issue, risk, and measured change management at both project and program levels, along with communication channels in place to ensure all relevant stake holders are kept informed appropriately. We will ensure the program manager and program support office we put in place will be staffed by resources with the necessary experience and demonstrated capability to work in a larger program context. Professional certifications combined with a proven program/project delivery track record will be sought.

We also recognize good stakeholder management for this program includes both public and political stakeholders. With a solid value proposition resonating with both, we know the critical success factors will be risk mitigation, quality assurance, and new service and capability confirmation before implementation. We recognize the deployment of certain aspects of these new capabilities may require policy discussions and decisions, and will ensure deployments will adhere to organization policy. Working with our Public Engagement / Communications department effectively (as we have done through this preliminary proposal phase) will ensure the public is kept well-informed. This program will deliver many exciting benefits, and ensuring the public is made aware, engaged, and participates is critical to achieving overall program outcomes.

Using industry best practices, including the Innovation Engineering framework and metrics, we will ensure technologies and processes are successfully prototyped and piloted. Fit-for-purpose and fit-for-use validations will be key to the readiness assessments for each project component.

All our Smart Cities initiatives will co-exist in an overall SC Data Ecosystem open architecture, which we refer to as AMIS (Advanced Municipal Intelligence System).

Our biggest gap is one of extending the project delivery capacity in the organization for a program this size. However, we believe our due diligence and experience with past projects has already provided a reasonable sketch of the capacity needs of STEAM which will be fulfilled at project start-up.

Question 9: Finalist Grant Plan

If selected, the following outlines our plans to develop the final proposal:

- STEAM Program will be formally established. The Innovation Department resources, six team members, will lead this project effort, providing necessary skills, knowledge, and capacity as required. External resources will be used to augment the team (starting late August) to define and gather the minimum components required to create a small scale pilot of AMIS, including a Business architect, Data Scientist and industry SMEs for Traffic and 911.

- The City will engage a consultant team and one or more SME teams to join this phase under the direction of the Chief Innovation Officer and the primary, internal project team.

- The City Innovation Department has already created a Standing Offer Purchasing Vehicle to support the acquisition of SME, technical and innovation resources to support this project.

- We anticipate the public being keenly interested in the process, as many outcomes have direct and exciting touchpoints to the public. Our plan includes community engagement activities, provided by the City in the form of the communications member of the Innovation team.

- The team will develop a detailed plan for each initiative, and an overall program blueprint. These will include:

    o Signed off Requirements, Design, and Functional Specifications of the product / services /solution being implemented for each project.

    o Some work will require engagement of business partners/vendors, which we will budget for and cover on a shared basis with the partner. City of Winnipeg's costs will be funded out of the seed money provided, under 25% of total (max: $60k);

    o All due diligence on key product selections are finalized, and firm price figures are in place;

    o Where software vendors are needed, vendor selection will be done, MOU's put in place;

    o Where infrastructure investments are needed, all necessary approvals are in place, and City is ready to proceed;

    o Where a project requires organization change management, processes and structures will be defined, presented and approved includes identifying operational requirements for steady state;

    o All significant product and scope items finalized. No major technical issues/questions are outstanding;

    o Where project dependencies (inter-project or external) exist, risk mitigation strategies in place to minimize undue risk to overall program completion date;

    o Each constituent project's blueprint and project plan will be formally presented to our standing Innovation Committee, and approved.

High-level breakdown of spending by category is as follows:

Use of funds	Value
Staff augmentation / professional services:	$ 160,000
Business Partner/vendor - Design work:	$ 60,000
Pilot / Proof of Concept (hardware):	$ 20,000
Community Engagement; communications:	$ 10,000

Grant money will be focused entirely on the work needed to complete scoping, plans and risk assessments for the actual Build and Deploy Phases of the individual initiatives – finalizing requirements; detail design; planning; organization change management. City will cover the costs of all permanent staff who will be participating in the Program. Also, any incremental permanent staffing level changes anticipated will not be included in any use of grant money (the initial grant, or beyond).

Question 10: Partners

Our partnership development process contributed significantly to the development of our proposal and included engagement with potential partners early on during the Ideation phase of our public engagement. Based on each partner's unique ability and past experience achieving similar projects or directly engaging with Winnipeg on past projects, partners were assessed for appropriateness, overall fit and commitment to the success of the project.

The following breaks down the participation and plan specific to partnering for each constituent initiative with a significant partnering component to it:

- **AMIS:** Our partners for the development include the University of Manitoba and Red River College, Winnipeg-based academia with both applied research and development capabilities within AI, Open Systems Architecture and Open System initiatives. A private industry partner, Socrata, a cloud-based solution provider for government organizations, will be used in part to develop the open data framework and system API in order to align with our current Open Data programs.

- **Live Train!:** Trainfo, a Winnipeg-based technology and consulting company with deep and proven expertise in this area, is an existing partner with whom we have successfully prototyped and piloted various solution components required to now complete the build of an enterprise system. We have worked closely with them on defining the work output of this project, including cost and timelines, and they are committed to the vision of our proposal and working towards the Mobility and Emergency Response outcomes.

- **Micro-Transit (MaaS):** The key Micro-Transit deliverables are a software system including applications for the rider and the vehicle operator to extend and integrate an existing Customer Information System (CIS) to support the new service. The expansion of the CIS would be handled by Transit staff while applications would be completed by external vendors with requirements and design completed by the STEAM delivery team.

- **Smart 9-1-1:** A third-party commercial product will be used, yet to be determined based on a full fit-gap analysis factoring in features, function, and maturity of the products, as well as proven integration with the NG 9-1-1 system selected. A Smart 9-1-1 project delivery team would then work closely with the vendor to implement, integrate, and deploy. The vendor chosen would be viewed as a business partner whom the City would enter into a multi-year agreement with for on-going support and customization.

- **Enterprise GPS:** will include key experts in the City's Transportation Management Centre, working with the STEAM and other departments through product selection, application development and integration, quality assurance, implementation and deployment. Resource capacity requirements would be met through staff augmentation.

- **Emergency Responder Dashboard:** Specifications will be completed by the STEAM with development completed by an external software developer partner.

- **Smart Transit, Enterprise Smart Sensor Platform:** Although both initiatives have significant technology components from key vendors, neither involves a partnering relationship per se.

We have signed Memorandums of Endorsements from our key partners, available upon request, which attest to our partners' willingness and interest in committing to our Proposal.

Question 12: Proposal Summary

Citizen & Economic Prosperity through Smart Transportation & Advanced Mobility

The Smart Transportation Evolution and Advanced Mobility (STEAM) program comprises a cohesive portfolio of initiatives, tied together through an open and intelligent platform called the Advanced Mobility Intelligence System (AMIS). Together these will deliver meaningful outcomes in the focus areas of mobility, safety, and security by providing, expanding, and enabling transportation in new ways that keep it efficient, effective, accessible, sustainable, and safe. The immediate direct and significant impact to the city, its residents and businesses, will be followed by Winnipeg providing a blueprint and mentorship for other cities, in and beyond Canada, to follow suit.

Winnipeg's challenges are Canadian challenges; with emergency services, infrastructure renewal and expansion, and public transit the most substantial components of Winnipeg's budget investments. Like all cities in Canada, we face increasing pressures from aging infrastructure, evolving demographics resulting in new demands on our municipal services, new safety concerns, environmental change, and budget limitations. The need for cities to adopt intelligent, creative, and modern approaches to solving longstanding as well as new challenges has never been greater; Winnipeg will harness the Smart Cities Challenge to fundamentally improve the prosperity of its citizens and economy.

Question 17: Community Information

- Total FTEs (2016): 9205

    o   FTEs dedicated to Innovation: 52

    o   Percentage of FTEs dedicated to Innovation: 0.6%

- Total Operating Budget (2017): 1,079.5 Million

    o   Percentage of Operating Budget dedicated to Innovation: 0.1%

- Total Capital Budget (2017): 432.9 Million

    o   Percentage of Capital Budget dedicated to Innovation: 1.6%

Question 18: Meaningful outcomes

1. Mobility
2. Safety and security

Question 19: Community systems and services

- Economic development
- Emergency services and enforcement
- Environment
- Land use planning and development
- Public health
- Recreation and parks
- Roads and transportation
- Other: Public safety/security

Question 20: Technologies involved

- Artificial intelligence (AI)
- Assistive technology
- Autonomous and connected vehicles
- Big data analytics
- Cloud computing
- Enterprise solutions
- Environmental monitoring
- Geospatial
- Health or Medical technology
- Internet of Things (IoT)
- Mobile applications
- Networks
- Open data platforms
- Payment platforms
- Sensors
- Video analytics
- Wearables
- Other: Vehicle telematics

Prepared by