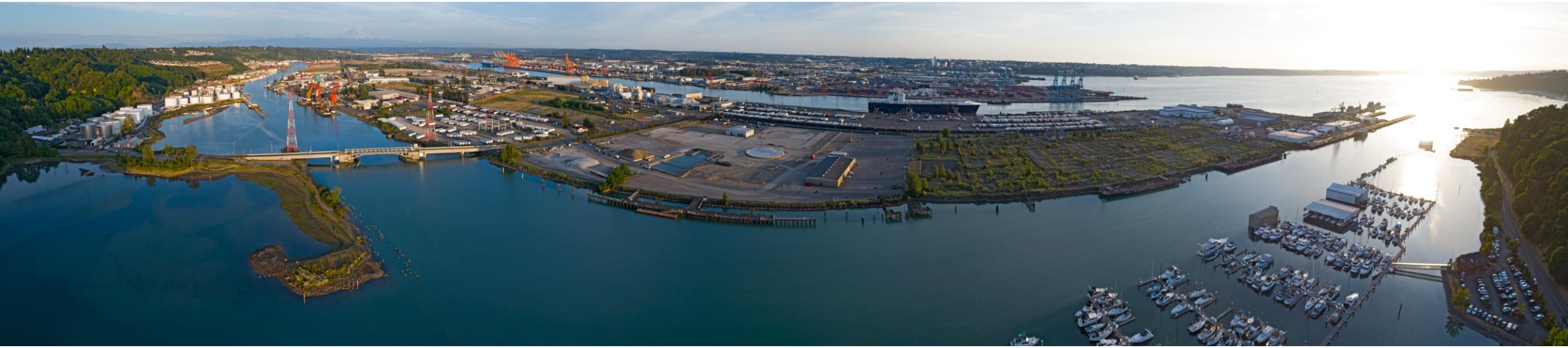
Tacoma Tideflats 5G Network Feasibility Study

Executive Summary

Supporting Partners

Executive Overview



Ports are the lifeblood of many coastal economies around the world, and there is fierce competition to stay ahead. Washington State has a "Blue Economy" strategy in place to help the state create a thriving and sustainable maritime industry through 2050 and beyond. The Tacoma Tideflats area is uniquely poised to insert itself as an early adopter of this economic benefit and set itself as a trailblazer on the path to innovation and sustainability to foster a growing maritime economy. The Tacoma Tideflats would benefit from the digitalization of transportation, such as real-time awareness of the port area, just-in-time arrival of vessels, lower carbon emissions
due to shorter waiting times for port calls. Washington Maritime Blue's goals are to maintain and support the growth of maritime, living-wage jobs as technological innovation and digitalization to support overall growth and safety. It is necessary to enable the industry to manage the transition to new operating models in a just and fair manner.

The following were the key goals of the study (1) engaging core stakeholders to understand the needs and priorities of multiple port companies (2) identifying near-term priorities to establish use cases to test and prove value before committing to a larger effort (3) creating a relevant use case roadmap based on real-world needs across the port partner network (4) creating a Private 5G strategy for both current and future state IT investments (5) exploring potential community impact.

It was imperative to make an in-person connection with all the various partner and stakeholder groups to ensure there was a true voice of the public, port operators, manufacturers and technical solution providers.

Findings and Recommendations

The study shows there is business value in exploring further the creation and use of a private 5G network across the Tacoma Tideflats to modernize the ecosystem including port infrastructure, freight movement, and supply chains. Four key themes emerged with 22 high value scenarios:

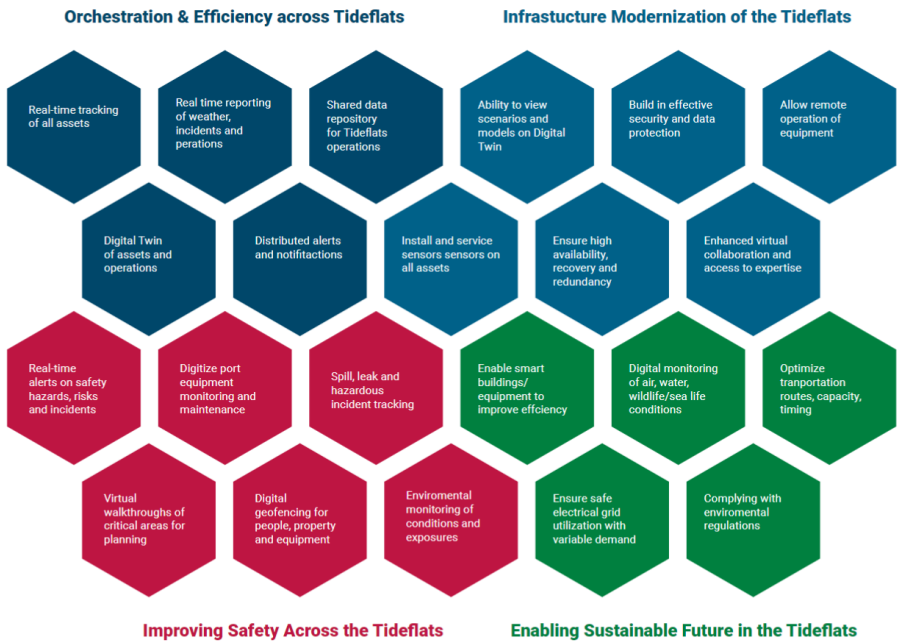
- Orchestration and Efficiency across the Tacoma Tideflats: working together in new ways (enabled by data and technology) to create efficiency and transparency across the Tideflats, offering an end-to-end view of the supply chain.
- Infrastructure Modernization of the Tacoma Tideflats: improve the physical and virtual infrastructure including where equipment is moved and stored, traffic management, connectivity dead zones, siloed data, manual processes and cybersecurity.
- Improving Safety Across the Tacoma Tideflats: concerns for worker and community safety and the desire to consider new ways of operating to put safety first.
- Enabling Sustainable Future in the Tacoma Tideflats: put ecological and community health at the forefront of Tacoma Tideflats operations, technologies and processes.

A common opportunity in all scenarios is a unifying desire for ecosystem data sharing across trucking, rails, ships, and the environment. Data silos is one of the roadblocks to modernizing and realizing increased operational efficiency. This would bring together a more holistic operating view.

The study identified multiple private wireless network designs to reach the entire Tacoma Tideflats for network coverage. The findings would allow for reuse of existing infrastructure, including floodlight and utility poles, to save effort and cost. It is recommended to pilot a private 5G network and create a proof-of-concept zone to test a subset of the key use cases that benefit the stakeholders. Washington Maritime Blue suggests testing out the initial phase of the network with use cases covering the Center for Urban Waters and Husky Terminal.

High Business Value Scenarios

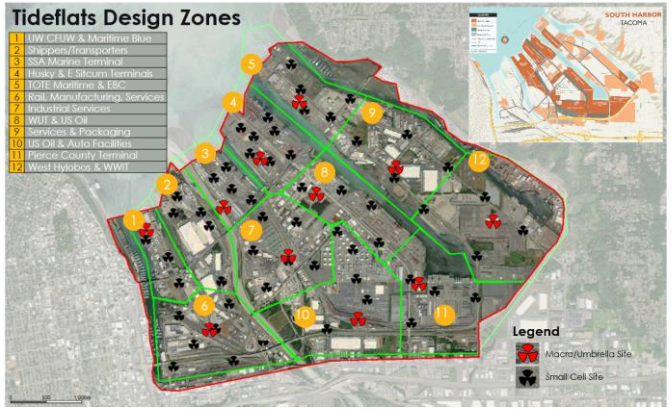
The below graphic reflects the top themes heard from stakeholders and provides an initial view on how the Tacoma Tideflats can begin to bring the parity of applications on high-speed, highly secure infrastructure to create business value.



As an example, one use case discussed to bring immediate value to the Tideflats ecosystem is the notion of pre-staged trailer gate transactions. Today when trucks pull into to pick up cargo, there is delay in matching the truck and the cargo. Imagine applying the concept of pre-flight check-in to the trucks and the terminal to increase efficiency. The process is the same, it's the increased speed of gate transactions that would be realized.

Private 5G Wireless Network

Moving from fixed WiFi to a wireless network unlocks significant flexibility and is an enabler for the leading scenarios identified above. The private 5G network would cover primary data connectivity services and a wide range of additional needs across the enablement of IoT, digitalization, and edge computing. The recommendation is to use Citizens Broadband Radio Service for the network. Umbrella cells provide general coverage supporting a greater number of devices typically with lower information rate requirements, while small cells provide densification around high bandwidth applications requiring localized capacity. For speed of deployment and minimal impact to port operations, repurposing the existing Tideflast's infrastructure including floodlight and utility poles is recommended with a focused build along country right-of-ways for secure backhaul availability (backhaul provides a high-capacity line linking the remote site to a core network).



The focus on enabling use cases in the Tideflats is critical to the long-term uplift and implementation across the zones. Providing a preliminary network as a use case proving ground accelerates the applied innovation for various enterprises across the Tideflats. This early real-world lab type environment potentially drives environmental, sensor, camera, and AR/VR type use case applications. From the Tideflats proving ground, wider scale enablement of lower throughput and reliability supported network may be deployed to maximize potential to the area and determine which zones require additional densification.

Next Steps

Washington Maritime Blue is prepared to further engage with coalition partners to pilot a private 5G network. This allows constituents to see what's possible by establishing a network proof-of-concept (POC) zone and test a subset of key uses cases that benefit a broader group.

Opportunity 1 – Center for Urban Waters & 5G Open Innovation Lab for Ports
In order to meet the use cases laid out by the City of Tacoma, University of Washington - Tacoma, and Washington Maritime Blue's Tacoma Maritime Innovation Incubator, we would ensure that Zone 1 of the above network layout has dense coverage including the location of edge computing hardware. Providing access to a private network to innovators and startups seeking to apply IoT technology to Blue Economy sectors will amplify the Tacoma Tideflats as the prime region in North America for tech development. The Field Lab would also allow Washington Maritime Blue and partners to facilitate and convene specific technology challenges that address key use cases benefiting from shared data and utilization. It would also enable further development of the Northwest Seaport Alliance and Port of Tacoma's vision for a "Port Community System".

Opportunity 2 – Husky Terminal
Building out dense coverage over Zone 4 enables early adoption and pilot use cases for Husky Terminal and allows a broader set of stakeholders to see value in the network for their own operations. It would begin to generate vast data sets that could be used to inform shared data solutions. This also begins to open up markets for current and future solutions providers.

Opportunity 3 – Other interested port operator or manufacturer
If, during early planning, another early adopter is identified and ready to build on a slice of the network, we could provide appropriate coverage based on the details of the proposed use cases.

Through knowledge sharing, collaborative project development, and enabling an ecosystem for innovation, the Tacoma Tideflats will collectively realize a shared vision for a sustainable and equitable economy and port community.

Appendix

Supporting Partners

Partners

The following partners contributed operational use cases and technical expertise to ensure this study was possible and directly applicable to the diverse activity taking place on the Tacoma Tideflats: port operations, advanced manufacturing, and environmental services.

Joint Innovation Project

Tacoma Tideflats Private 5G Network Use case & feasibility study

Core Partners:

Produced by:

Participating Partners:

Approach

Avanade and TTS Wireless (an Amdocs company) took a divide-and-conquer approach using parallel paths to focus their areas of expertise and fast-track findings. Avanade was on point for all of the functional experience portions of the study while Amdocs was tasked with tackling the more technical network surveying. Both paths required talking to a variety of stakeholders in the Tacoma Tideflats, each with a different set of questions and focus.

Over 19 interviews were conducted across a dozen stakeholders.

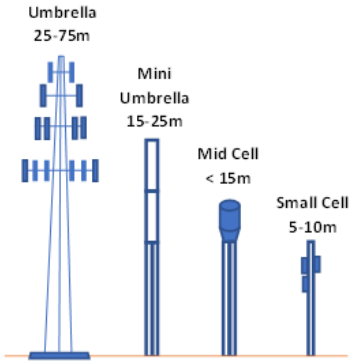
The workshops generated over 160 ideas for leveraging a 5G Network

The Husky Terminal workshop explored the transformation and key business imperatives for a port operator.

All the findings and themes were aligned to and agreed upon in a Collective Stakeholder Coalition in the final workshop.

Technical – Private 5G Network

The overall approach was an iterative design process involving the collection of use case information from various stakeholders and a field survey to gather technical information to map to the various use cases. 5G allows designing the network based on the exclusivity of targeted use cases and covers the primary voice and data services and a wide range of other services from the enablement of IoT, automation, and edge computing.



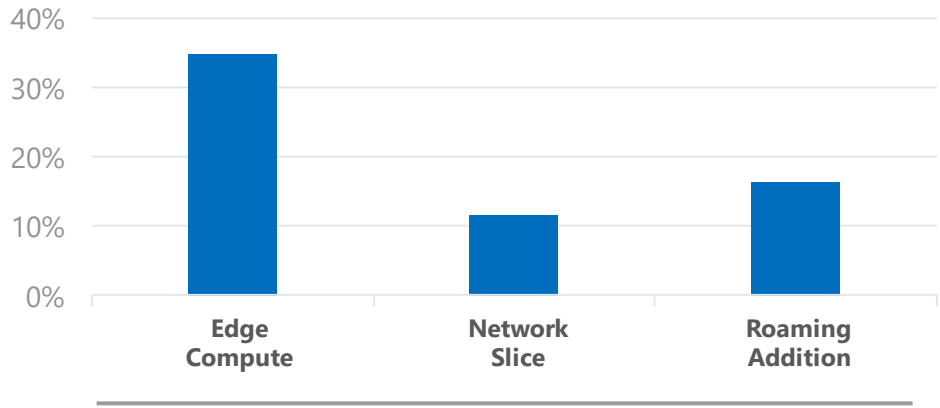
Using the CBRS (Citizens Broadband Radio Service) band (3.5GHz), the proposed network is a combination of umbrella cells and small cells built through a phased deployment. The study identified multiple phased designs to reach the entire Tacoma Tideflats for network coverage. This provides flexibility for a build as required model based on enterprises within the Tacoma Tideflats regions priorities.

Umbrella cells are typically 25-75m in height offer an over-arching coverage for larger scale areas to deliver data services that typically demand lower bandwidth such as IoT sensors and basic messaging. For speed of deployment and minimal impact to port operations, repurposing the existing Tideflat's infrastructure including floodlight and utility poles is recommended.

Small cells range from 5-10m, densifying the network if focused use areas, satisfies the high data rate use cases like UHD camera, AR/VR, and broadband services. These cells can be build-to-suit deployments on specific use case needs. Deployed in greater numbers typically than umbrella cells, reusing utilities poles for this ecosystem. The feasibility usability initial use cases gathered from the Tacoma Tideflats' stakeholders who participated in the discovery sessions with Avanade. The mapped the use cases bring together a varied counts of compute devices, sensors, camera systems, and broadband services expected to fulfill the requirements.

Potential use cases across the tide flats require in most cases connectivity. Connectivity with a 5G network enabling the solutions driving various network design considerations. Edge compute and network slicing implementation for certain use cases will provide additional solution enablement, security and cost efficiencies.

Key Use Case Enablement



Identified Use Case Types