Deloitte.

Winnipeg
Water and Waste Department

Water and Waste Department Business Intelligence and Analytics – Phase 1

Gap Analysis Report (Roadmap and Business Requirements)

February 14, 2019

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Executive Summary

Turning City of Winnipeg Water and Waste Department into a Utility of the Future

WWD can leverage BIA to gather insights regarding services offered and make better fact-based decisions to realize synergies, minimize costs, and deliver greater value for customers.

INCREASED REVENUE & COST REDUCTION

- **Reduced maintenance cost** through greater visibility over assets' net worth, depreciation, and insurance and maintenance costing
- **Lowered cost of meeting water demand** by optimizing water pumping and storage operations based on demand forecasts and known input cost factors
- **Better-managed landfills** though efficient landfill client services, contained revenue losses, and price modelling by leveraging historical landfill transaction information
- **Decreased lost revenue** through optimized water meter management
- **Increased late payment recovery** through prediction and preemptive action

Customers
Improved confidence and satisfaction in utility services, transparency in public reporting, and reduced down-time of services.

Federal, Provincial, & City Governments
Reduced risk of non-compliance, improved performance auditing, data-driven optimized pricing, and safer / more engaged workplaces.

OPTIMIZED PROCESSES

- **Efficient and predictive repair, replacement, and maintenance** of assets
- **Reduced safety incidents** with help of insight-driven front-line staff deployment based on safety risk predictors computed through a multitude of data on work orders, past safety incidents, safety inspections, etc.
- **Easier dissemination of water and wastewater quality measures** to external and internal stakeholders through self-serve capabilities and enhanced data validation
- **Enhanced technology services delivery** through greater visibility over IT assets, data assets, and investments in technology

IMPROVED SERVICE

- **Minimized disruptions** through leveraging asset information and past breakdowns to reduce unplanned maintenance
- **Ability to predict and preempt customer needs** by analyzing past customer inquiries
- **Increased automation of inquiry handling and processing** by analyzing customers interactions with MyUtilityBill portal

Bridging the Gap from Current State

Key recommendations spanning foundational to advanced BIA capabilities have been identified that will enable WWD to realize its Future State.

Foundational Capabilities	BIA Governance Program	Providing a means for balancing efforts while also providing a forum for raising and reconciling roadblocks
	"Hub-and-Spoke" Operating Model	Providing a department-spanning BIA strategic vision, institutionalizing a BIA team (i.e., BIA Hub) supporting the divisions, and directly addressing the present technology and talent gaps
	Organizational Change Management (OCM)	Enabling leadership to own the change and accelerate transformation by involving and engaging stakeholders from the beginning, exposing and planning against challenges, and reinforcing the message of a department committed to its BIA vision
	BIA Reference Architecture	Enabling a quick, coherent, and timely solution design and reducing maintenance overhead
	Agile Processes	Reducing exposure to risks, enabling more efficient delivery of the program and its components, and facilitating support for the BIA program
Intermediate Capabilities	Master/Reference Data for Assets	Equipping WWD with a 360-degree view of its assets for use in analytics, controlling data quality, and reducing data management overhead and risk of poor data quality in general
	Data Governance (DG) and Data Quality (DQ) Program	Enabling the divisions to share their datasets, developing trust in the data and insights, and producing a formal structure to govern the datasets
	Big Data Platform	Laying the foundation for connecting all sources with the end user, promoting self-serve data preparation and reporting, driving greater visibility of data, facilitating data sharing, and enabling analytics capabilities
Advanced Capabilities	Self-Serve Data Preparation and Reporting	Democratizing data and fostering a data-driven culture through open access and exploration of shared data
	Analytics Use Cases	Allowing WWD to derive meaningful and actionable insights about business operations from data and, correspondingly, make better fact-based decisions

Building Towards WWD's Vision

The approach below represents a four year integrated roadmap to establish foundational capabilities immediately and incrementally address intermediate and advanced business and technology capabilities on a prioritized basis.

Wave 1 — "Stand-Up"

Implement foundational capabilities, ingest foundational datasets to enable priority BIA use cases

Wave 2 — "Scale"

Continuously enhance foundational capabilities and deliver additional BIA use cases

Wave 3 — "Establish"

Plan for in-house delivery capability and deliver high complexity BIA use cases

Wave 4 — "Sustain"

Assess and implement master data for "asset" data entity, and deliver BIA use cases by leveraging internal capabilities

OUTCOMES

Experimental Divisional Learning

- BIA strategic direction set through implementations of fundamental components of operating model, program governance, data governance, and data quality
- BIA Hub team established and Hub lead hired
- Big Data Platform, self-serve reporting, and analytics tools installed
- Some major datasets centralized and analytical insights generated and made available for decision-making

Divisional Value

- Foundational capabilities scaled from Wave 1 (i.e., program governance, data governance, and data quality)
- BIA Hub team is expanded and spokes matured further
- Divisional representation and involvement in governance and operating model expanded
- Additional datasets centralized and used by staff through self-serve reporting tools
- Further wins demonstrated through additional BIA use case implementations

Analytics Across WWD

- Internal agile capabilities and peer development formalized through joint execution of last use case in Wave 3
- Agile analytics practices adopted and employed to deliver BIA use cases
- Internal delivery capability established
- Advanced BIA functionality demonstrated through use cases

Sustained Analytics Across WWD

- Agile capability further matured through agile coaching
- Reference architecture refined
- All divisions represented via program governance, data ingestion, and affiliated use cases
- 360-degree view of assets achieved through master and reference data management strategy and implementation
- Key BIA program recommendations applied; department ready for ongoing and continuous BIA development

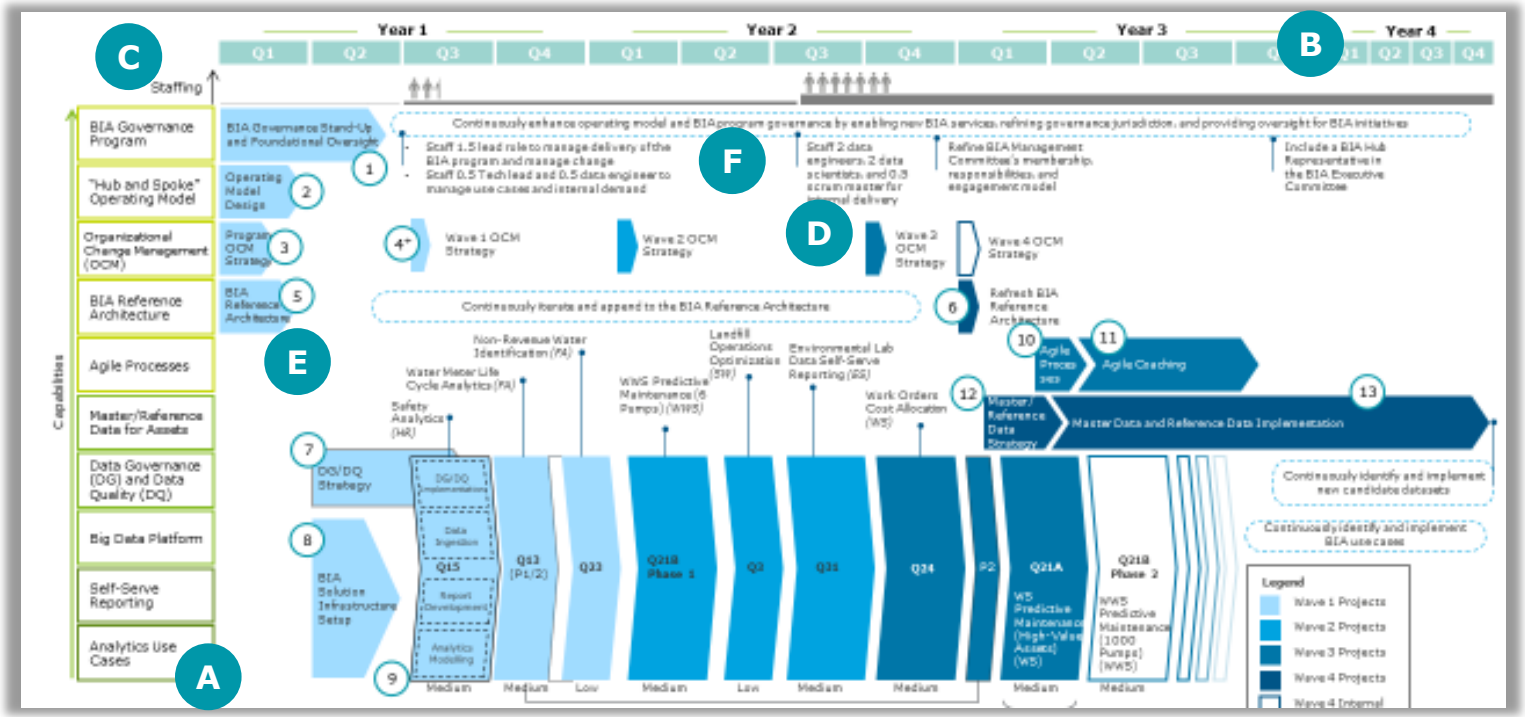
Roadmap Introduction

Implementation of the BIA program is realized over the course of 12 projects and 9 planned use cases, aligned to a particular capability and wave.

A Capabilities span the recommendations defined for the Future State (with Data Governance and Data Quality combined).

B Quarters are the basis for the timeline definition, with projects defined up to year 4 before being fully internalized.

C A summary of staffing/onboarding representation for BIA governance is shown graphically over time above the projects.

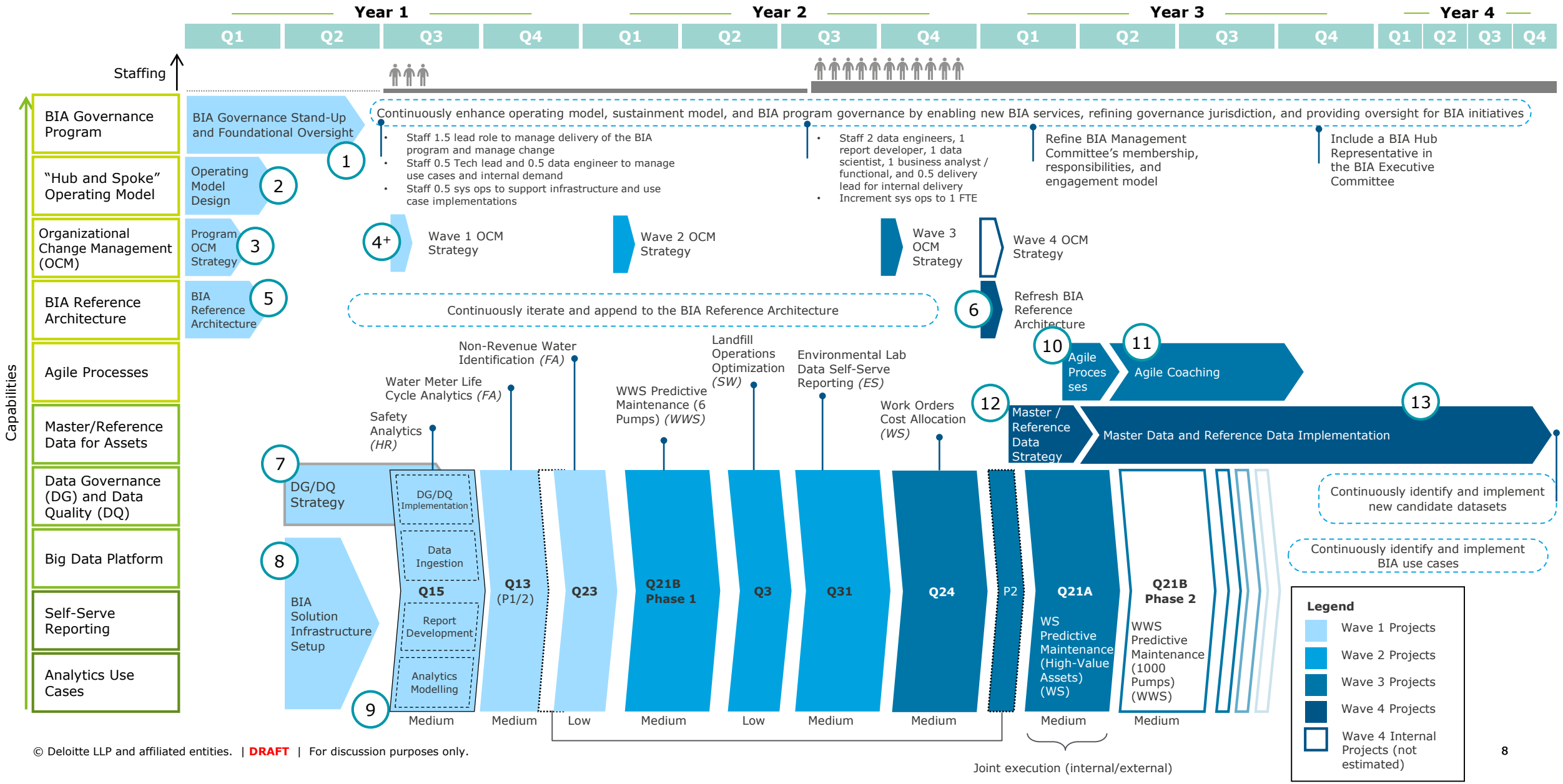


D Waves are denoted by colors (shaded light to dark for waves 1 to 4). Waves overlap as new projects can begin before others finish.

E Projects are identified as chevrons, with a numeric identifier for reference in the project snapshots section.

F Additional non-project details or recurring activity without a snapshot are shown as text directly on the roadmap.

Roadmap Overview



BIA Maturity Growth

By building BIA capabilities incrementally through each of the waves, WWD will mature holistically and be able to drive business outcomes based on data-driven insights.

Wave 1

Emphasis is on strategic definition, foundational technology procurement, and high value use case execution, altogether driving a large leap forward across the strategy, process, and technology dimensions.

Wave 2

Existing capabilities are expanded and enhanced in an agile fashion in support of new use cases, driving additional data ingestion needs.

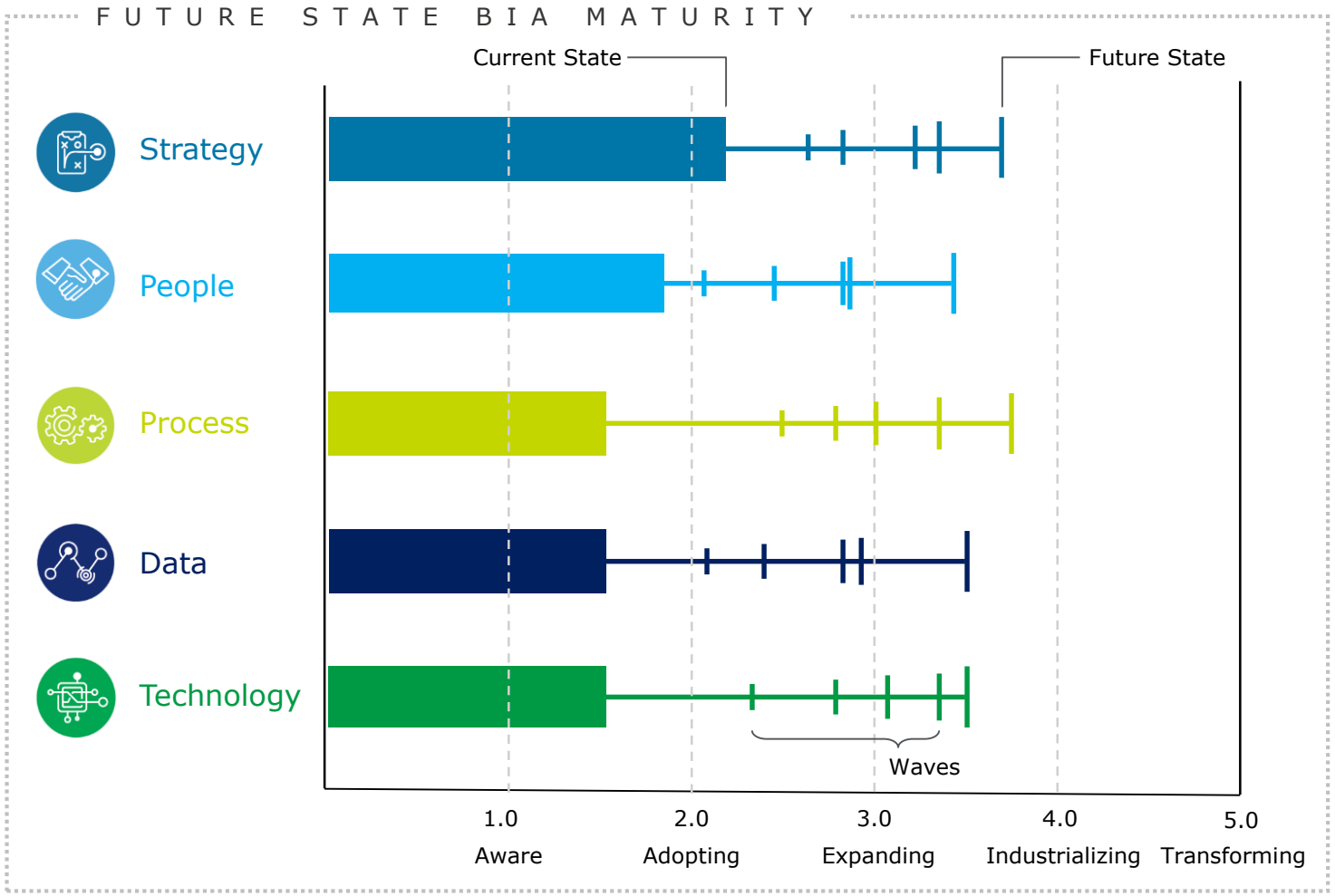
Wave 3

The majority of data ingestion will be complete and in-house delivery capabilities and processes will have been established by wave 3, which will move the needle on data, people, and process dimensions further.

Wave 4

Master and reference data management is deployed and WWD demonstrates the full breadth of BIA capabilities in use cases.

The remainder of maturity at the future state will be achieved over time as the BIA program evolves, matures, and becomes an integral component of WWD.



Effort and Project Summary

The first and fourth waves are expected to incur the greatest effort, though the overall BIA program will be shortened through parallel project execution and overlap of adjacent waves.

TIMELINE

EFFORT

Wave 1		Wave 2		Wave 3		Wave 4	
Projects	**Effort**	**Projects**	**Effort**	**Projects**	**Effort**	**Projects**	**Effort**
BIA Governance Stand-Up and Foundational Oversight	2900 hours	Wave 2 OCM Strategy	350 hours	Wave 3 OCM Strategy	350 hours	Refresh BIA Reference Architecture	325 hours
Operating Model Design	1300 hours	BIA Use Cases	8400 hours	BIA Use Cases	10,500 hours	Master Data and Reference Data Strategy	600 hours
Program-Level OCM Strategy	840 hours			Agile Process Design	275 hours	Master Data and Reference Data Implementation	13,000 hours
Wave 1 OCM Strategy	350 hours			Agile Coaching	475 hours		
BIA Reference Architecture	750 hours						
DG/DQ Strategy	1025 hours						
BIA Solution Infrastructure Setup	875 hours						
BIA Use Cases	7350 hours						
Total	**15,390**		**8750**		**11,600**		**13,925**

Project Breakdown

Corresponding scope of delivery and resource requirements for each project are identified in the table below.

Project	Scope of Delivery	Assumptions	Total Effort *	Total Duration	WWD Resource Requirements	Vendor Requirements
1: BIA Governance Stand-Up and Foundational Oversight	• BIA Management and Executive Committee definition • Meeting cadence and structure • Program progress reporting • Oversight for Wave 1 strategy definition projects • Readiness assessment for implementation of the BIA use cases	• Project will define initial BIA Management and Executive Committee; WWD's BIA Hub lead to assume responsibility for facilitating change in their definitions thereafter • Majority of socialization will be facilitated by IST and supported by the vendor • Responsibility for governance and BIA program oversight to be transitioned to WWD at the end of this project	2900 hours *~3.3 FTE*	5 months	• PM (10-20% FTE) • Managers / Managers' delegates for gathering inputs and socializing deliverables and program progress (2-4 hours/week) • IST Manager (2-4 hours/week)	Vendor has extensive experience with public sector governance stand-up and can facilitate timely delivery aligned to the execution plan by leveraging domain IP, other templates/accelerators, and subject matter expertise. In addition, vendor will meet the requirements of projects 2, 3, 5, 7, and 8 to accommodate the oversight component of project 1.
2: Operating Model Design	• Organizational structure (includes BIA functional model, role profiles, interaction model, etc.) • Talent mapping approach	• Majority of socialization will be facilitated by IST and supported by the vendor • Vendor will design the approach to talent assessment while HR leads the execution • HR to provide dedicated support during execution • Divisional leaders to provide input into design options, role architypes, etc. • Scope of design is limited to Analytics and Data Management resources (i.e., 40 FTE) • Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight	1300 hours *2 FTE*	3 months	• PM (30-50% FTE) • Managers / Managers' delegates for gathering inputs and socializing deliverables (3-6 hours/week) • IST Manager (3-6 hours/week)	Vendor has an understanding of the continuity of centralized versus decentralized operating models with respect to business intelligence and analytics and has experience in implementing operating models for said groups.

**Total Effort doesn't include WWD Effort, which is separately captured in the last column*

Project Breakdown (continued)

Corresponding scope of delivery and resource requirements for each project are identified in the table below.

Project	Scope of Delivery	Assumptions	Total Effort *	Total Duration	WWD Resource Requirements	Vendor Requirements
3: Program-Level OCM Strategy	• Change management strategy • Stakeholder assessment • Change impact assessment and tracker • Engagement and communication plan and tracker • Leadership engagement plan • Change readiness approach • Change network approach • Training strategy • OCM knowledge transfer	• WWD's BIA OCM lead will be the face of change conducting initiatives with the support of vendor change lead (e.g., leading change impact workshops) • WWD will execute change initiatives, produce communications, and send/publish messages • WWD will produce training materials and deliver end user training • Union discussions/negotiations are out of scope for this project; WWD to drive these discussions, if required • Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight	840 hours *3 FTE*	7 weeks	• BIA OCM Lead (15-30% FTE across complete project) • Change Analyst (20-40% FTE across complete project) • Change Network: Managers / Managers' delegates for gathering inputs and socializing deliverables (1-2 hours/week) • IST Manager (3-6 hours/week)	Vendor has experience in delivering change management for organizations within the Canadian public sector and is able to support the organization's existing change management team.
4+: Wave-Specific OCM Strategy	• Updated stakeholder assessment • Updated engagement and communication plan and tracker • Go-live messages and artifacts templates • Go-live readiness plan • Post go-live campaign templates • Post go-live assessment approach	• WWD's BIA OCM lead will be the face of change conducting initiatives with the support of vendor change lead • WWD will execute change initiatives, produce communications, and send/publish messages • WWD will produce training materials and deliver end user training • Union discussions/negotiations are out of scope for this project; WWD to drive these discussions, if required • Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight	350 hours x3 *~2.2 FTE*	4 weeks	• PM (10-20%) • Managers / Managers' delegates from selected divisions for gathering inputs and socializing deliverables (4-8 hours across the project) • IST Manager (2-4 hours a week)	Vendor has experience in developing OCM templates and artifacts for enabling and supporting organizational change management groups for ongoing OCM activity. Vendor has frameworks and/or accelerators for facilitating timely and robust delivery of said templates and artifacts.

**Total Effort doesn't include WWD Effort, which is separately captured in the last column*

Project Breakdown (continued)

Corresponding scope of delivery and resource requirements for each project are identified in the table below.

Project	Scope of Delivery	Assumptions	Total Effort *	Total Duration	WWD Resource Requirements	Vendor Requirements
5: BIA Reference Architecture	• Conceptual reference architecture • Logical reference architecture • Technology-specific reference architecture outlining considerations on use of technologies for BIA implementations • Key architecture patterns	• BIA technologies selected • Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight	750 hours *~2 FTE*	2 months	• PM (15-30% FTE) • Architect (10-20% FTE) • Managers / Managers' delegates for gathering inputs (2-4 hours across the project) • IST Manager (2-4 hours a week)	Vendor has experience across defining BIA architectures, layers therein, and pattern varieties required. Vendor experience is compounded by a variety of templates or standardized approaches to facilitate timely development. The vendor has experience in delivering Big Data implementations for public sector clients.
6: Refresh BIA Reference Architecture	• Appends to conceptual-, logical-, and technology-specific reference architecture • Additional architecture patterns	• Staff augmentation role	325 hours *~1.4 FTE*	6 weeks	• PM (10-20% FTE) • Architect (10-20% FTE) • Managers / Managers' delegates for gathering inputs (2-4 hours across the project) • IST Manager (4-8 hours across the project)	Vendor has experience across defining BIA architectures, layers therein, and pattern varieties required. Vendor experience is compounded by a variety of templates or standardized approaches to facilitate timely development. The vendor has experience in delivering Big Data implementations for public sector clients.

**Total Effort doesn't include WWD Effort, which is separately captured in the last column*

Project Breakdown (continued)

Corresponding scope of delivery and resource requirements for each project are identified in the table below.

Project	Scope of Delivery	Assumptions	Total Effort *	Total Duration	WWD Resource Requirements	Vendor Requirements
7: Data Governance (DG) / Data Quality (DQ) Strategy	• DG operating model • DG processes, policies and metrics • DG/DQ roadmap inline with delivery of identified use cases • DQ approach • DG operating model stand-up • DG/DQ strategy updates based on inputs from implementation of first use case	• Majority of socialization will be facilitated by IST and supported by the vendor • Representatives from divisions will be available for meetings, workshops, and reviews • Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight • Project estimates assume that the scope of data governance is up to 4 data management practices for process design and metrics calculations (namely metadata, data quality, DW/BI, and data modelling and design) and up to 8 practices for policies design (including data storage and operations, data security, data integration and interoperability, and data architecture)	1025 hours *~1.2 FTE*	5 months	• PM (15-30% FTE) • Managers / Managers' delegates for gathering inputs and socializing deliverables (1-2 hours/week) • IST Manager (3-6 hours a week)	Vendor has data governance and data quality strategy and implementation experience and frameworks/templates for timely and robust/validated development of essential strategy components.
8: BIA Solution Infrastructure Setup	• Solution installation and setup • Solution smoke tests	• The solution will be cloud-based • The project team (i.e., as part of the 875 hours of total vendor effort) to include product SME from the product vendor	875 hours *~2.4 FTE*	2 months	• PM (10-20% FTE) • Architect (2-4 hours a week)	Vendor has experience with Big Data platform implementations and the chosen tool/vendors as part of the infrastructure setup.

**Total Effort doesn't include WWD Effort, which is separately captured in the last column*

Project Breakdown (continued)

Corresponding scope of delivery and resource requirements for each project are identified in the table below.

Project	Scope of Delivery	Assumptions	Total Effort*	Total Duration	WWD Resource Requirements	Vendor Requirements
9+: BIA Use Cases *(Realized across DG/DQ Implementation, Data Ingestion, Report Development, and Analytics Modelling)*	**Single instance:** • DG/DQ dashboard deployment • Data ingestion framework **Across use cases:** <u>DG/DQ implementation</u> • DG/DQ requirements definition • DQ rules, business data lineage, and business glossary roll out • DQ assessment • DQ remediation plan <u>Data ingestion</u> • Data source identification and assessment • Target data structure • Data ingestion <u>Report development and analytics modelling</u> • Analytics use case canvas refinement • Initial data exploration • Use case wireframes • Use case prototype • Use case implementation (i.e., build, test, and bug fixes) • Knowledge transfer to BIA Hub and corresponding spoke • End user training	• As part of the use case readiness assessment, the use case has been approved for implementation (see Project 1) • Datasets to be ingested for the use cases will be approved for cloud deployment prior to implementation • Data quality, business data lineage, and business glossary to be developed for critical data elements only • The team delivering the use cases to gain efficiency through re-usable requirements/code and context developed during implementation • Data ingestion frameworks will be reusable for incremental data ingestion • BIA Hub (staffed with WWD's resources) to own the operations of the use cases, once delivered • Management of user acceptance testing (UAT) will be WWD's responsibility • Agile team squad to work with data stewards and product owners to remediate data quality issues identified during the use cases, with the ownership of the remediation residing with data steward	Low - 2100 hours Medium - 3150 hours *~6.6 FTE*	Low - 8 weeks Medium - 12 weeks	• PM (30-50%) • Agile product owner (8-12 hours a week) • Data steward (3-6 hours/week) • Architect (2-4 hours a week) • BA / UAT tester (full-time) • Managers' delegates from selected divisions for gathering inputs, training end users, validating deliverables, and gathering UAT test results (4-6 hours/week) • 1-2 WWD's BIA Hub resources for 2-4 weeks of change management activities • IST Manager (1-2 hours a week)	Vendor has experience in overseeing BIA use cases with parallel delivery across streams. Vendor has delivery teams which are familiar with the agile delivery approach and have experience in BIA implementation. Vendor has templates/standardized approaches/IP and relevant experience for the delivery of each use case defined on the roadmap.

Project Breakdown (continued)

Corresponding scope of delivery and resource requirements for each project are identified in the table below.

Project	Scope of Delivery	Assumptions	Total Effort *	Total Duration	WWD Resource Requirements	Vendor Requirements
10: Agile Process Design	• Agile operating model definition • Agile analytics delivery framework • Training on agile tool	• System integration (SI) vendor delivering BIA use cases will be proficient in the agile methodology, delivering use cases in an agile fashion and providing agile coaching for WWD's product owners and other project team members • Starting in Wave 4, WWD will look to start executing and building agile analytical capabilities internally and reduce dependencies on SI vendor; this will be done through a combination of training and on-the-job peer development	275 hours *~1.7 FTE*	4 weeks	• PM (15-30% FTE) • Managers' delegates for gathering inputs and socializing deliverables (1-2 hours a week) • IST Manager (2-4 hours a week) • BIA delivery squad (4.5 resources)	Beyond familiarity with the agile delivery methodology, the Vendor has experience in enabling agile delivery in other organizations/clients. The vendor has accelerators/frameworks for agile process design.
11: Agile Coaching	• Agile training • Ongoing shadow/reverse-shadow coaching • Delivery success review based on agile metrics, improvement plan, and coaching on improvement plan implementation	• Staff augmentation role • Agile coaching to be provided to newly setup internal BIA delivery team squad	475 hours ~0.5 FTE	6 months	• PM (5-10% FTE) • Agile coach to work directly with the delivery team (i.e., product owner, scrum master, scrum team, etc.)	Vendor has a suitable associate familiar with the agile process and training others in the methodology/approach.

**Total Effort doesn't include WWD Effort, which is separately captured in the last column*

Project Breakdown (continued)

Corresponding scope of delivery and resource requirements for each project are identified in the table below.

Project	Scope of Delivery	Assumptions	Total Effort *	Total Duration	WWD Resource Requirements	Vendor Requirements
12: Master Data and Reference Data Strategy	• Domain scope area established for master data • Domain dependency analysis • Domain risk analysis • Domain profiling • High level conceptual architecture • Master data governance / data quality	• WWD's data governance capability will be mature to assist in designing master data governance policies, processes, metrics, data quality, etc.	600 hours ~1.7 FTE	2 months	• PM (15-30%) • Architect (8-16 hours a week) • BIA Hub resource for data governance (0.5 FTE) • Managers / Managers' delegates from selected divisions for gathering inputs and validating deliverables (2-4 hours/week) • IST Manager (3-6 hours a week)	Vendor has experience in master and/or reference data strategy development, preferably in the Canadian public sector, and has relevant templates, IP, accelerators, and or frameworks for timely and robust delivery.
13: Master Data and Reference Data Implementation	• Infrastructure setup • Domain architecture • DG and DQ implementation • Metadata / reference data implementation • MDM integration and execution	• Effort estimate to be reviewed and validated at completion of Project 12; effort indicated currently is based on similar projects and complexity • WWD will have reusable data quality / data governance implementations • Project will leverage context and documentation developed during data ingestion and use cases implementation	13,000 hours ~3.6 FTE	1 year and 9 months	• PM (30-50%) • BA / UAT tester (full-time) • Managers' delegates from selected divisions for gathering inputs, training end users, validating deliverables, and gathering UAT test results (2-4 hours/week) • 1-2 BIA Hub resources for 8-12 weeks of change management activities • IST Manager (2-4 hours a week)	Vendor has experience in master and/or reference data implementation, and has relevant templates, IP, accelerators, and or frameworks for timely and robust delivery.

**Total Effort doesn't include WWD Effort, which is separately captured in the last column*

BIA Use Case Prioritization

Use case positioning on the roadmap was achieved via optimization of ordering across multiple dimensions.

CONSIDERATIONS

Ordering was based on review with analytics subject matter experts and previous delivery, prioritizing based on:

1. Magnitude of value to WWD
2. Limited risk of unsuccessful delivery of outcomes (from morale and sunk cost perspective)
3. Emphasis on data ingestion in initial use cases (i.e., high volume and high variety)
4. Progressive development of analytics capabilities (from basic reporting through to prescriptive capabilities)
5. Variety of capabilities derived for WWD to leverage in future internal projects
6. Representation across divisions

EFFORT

L Low M Medium H High

Priority Use Cases and Order

Priority use cases are to be implemented towards the beginning of the program. Initial use case (7/9) are implemented through a vendor, while the final two use cases, respectively, are jointly- and fully internally-delivered.

M	15	How do we reduce incidents and injuries to improve health and safety at the workplace? *(Human Resources)*	*Logical next step for data ingestion, leveraging an early win*
M	13	How do we optimize meter population? *(Finance and Administration)*	*Expand on POC to realize high potential financial return*
L	23	How can we identify unaccounted water including its theft (based on factors such as water consumption, meter age, and inspection date)? *(Finance and Administration)*	*Expand on POC to realize high potential financial return*
M	21	How do we go from >50% to 0% unplanned maintenance? *(Wastewater Services,)*	*Save on costly downtime and generate value from wealth of data*
L	3	How do we optimize landfill management by guiding services, controlling revenue loss, and adjusting the pricing model? *(Solid Waste)*	*Based on the Q13 POC portion, Q13 and 23 may be de-prioritized/ changed, after which Q3 will take priority*
M	31	How do we ensure data is sent to end users efficiently in a usable and meaningful format? *(Environmental Standards)*	*Make self-serve reporting a reality with LIMS, save on other potential sunk costs*
M M (2 projects)	21	How do we go from >50% to 0% unplanned maintenance? *(Wastewater Services, and Water Services)*	*Save on costly downtime and generate value from wealth of data*
M	24	What are the collective financial implications of a given work order and how can we leverage this information to forecast future costs/effort? *(Water Services)*	*Leverage BIA to better understand cost structure and attribution for further insights*

Internal Candidates

Use cases ideal for internal-driven implementation

L	36	How do we better predict water revenue in the short term? *(Finance and Administration)*
L L (2 projects)	11	Can we predict customer payment behavior, i.e., which customers will fall in arrears? *(Finance and Administration)*
M	35	How do we ensure we are billing for all services provided? *(Finance and Administration)*

Backlog (Internal or External)

Lower priority use cases that can be internally or externally supported

L	16	How can we predict cart damage and replacement (asset planning)? *(Solid Waste)*

Out-of-Scope

Use cases unsuitable for near-term planning

	10	What proportion of Utility Billing Center calls have been diverted to the MyUtilityBill portal? *(Customer Service)*
	12	How do we prioritize water services crew resources to maximize benefit (i.e., how do we prioritize between meter exchanges and turn-offs for non-payment and water main repair)? *(Water Services)*

Use Case Data Ingestion

By focusing on specific use cases, a significant proportion of WWD's data sources will be ingested through vendor-supported projects.

Priority	Crunchy Question	Division	Description	Part	Estimated Effort (L/M/H)	Sample Manager	Old LIMS	WHIMS/Replacement	PeopleSoft	SCADA	TOKAY	T2 Flex	CCB	Amanda	OWAM	CMS	MANTA	GIS	SmarterU	Wasteworks	Fleetmind	311	REPA	Public Works	Fleetbridge	Winnipeg Fleet Mgmt	DCS	Network Drives	Emails	Office Files	Paper	External
1	15	Human Resources	Safety Analytics	-	M			X										X											X	X	X	
2	13	Finance and Administration	Water Meter Life Cycle Analytics	-	M							X																	X			
3	23	Finance and Administration	Non-Revenue Water Identification	-	L							X																	X			
4	21B	Wastewater Services	WWS Predictive Maintenance (6 Pumps)	1	M									X												X			X			
5 (Alt. 2)	3	Solid Waste	Landfill Operations Optimiz	-	L														X												X	
6	31	Environmental Standards	Environmental Lab Data Self-serve Reporting	-	M	X	X																										
7	24	Water Services	Work Orders Cost Allocation	-	M			X						X									X	X	X	X			X				
8	21A	Water Services	WS Predictive Maintenance (High-value assets)	-	M				X					X															X				
9	21B	Wastewater Services	WWS Predictive Maintenance (1000 pumps)	2	M																												
			Cumulative Sources Ingested			X	X	X	X			X		X					X	X			X	X	X	X	X			X	X	X	

Generic sources; an X represents developing capability/familiarity with ingestion of such sources.

Realized over the course of ~2 years of externally-sourced use cases.

The majority of internal sources will have been partially or completely ingested before use cases begin to be delivered internally. With partial ingestion, WWD will have the framework/capability to continue ingestion from the same source as necessary with future use cases. Similarly, exposure to generic file ingestion and external data source ingestion will reduce the effort for future ingestion of varieties therein.

CCB is no longer applicable and Wasteworks data is ingested earlier if Q13 and Q23 are de-prioritized beyond the scope of the roadmap.

BIA Use Case Requirements Summary

Individual priority crunchy questions and corresponding delivery scope and assumptions are outlined in the table below.

Priority*	Crunchy Question	Division	Description	Part	Effort	Scope of Delivery	Assumptions
1	15	Human Resources	Safety Analytics	-	M	• Productionalize insights and data from the POC delivered during BIA strategy • Add additional insights from data stored in PeopleSoft and SmarterU • Add additional insights from external datasets such as weather data	• External datasets are readily accessible in a consumable format • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context
2	13	Finance and Administration	Water Meter Life Cycle Analytics	-	M	• Productionalize insights and data from the POC delivered during BIA strategy • Include all water meters in the analysis • Include actual meter readings and meter test data in the analysis	• Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context
3	23	Finance and Administration	Non-Revenue Water Identification	-	L	• Identify anomalous/suspect readings to identify volume of non-revenue water for all water meters • Incorporate broken seal data, theft data, and by-pass seal data analysis	• Crunchy question 13 is already implemented and majority of required CCB data is already in the data lake • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context
4	21B	Wastewater Services	WWS Predictive Maintenance (6 Pumps)	1	M	• Determine risk factors for 6 major Wastewater Services pumps • Leverage relevant data stored in DCS (measurements), OWAM (work orders), and files (pump specifications) to create an analytics model that predicts the probability of asset breakdown	• Data from files/manuals can be ingested through simple parsing; if manual effort is required to ingest such data, it has to be time-boxed • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context
5 (Alt. 2)	3	Solid Waste	Landfill Operations Optimization	-	L	• Determine landfill transaction anomalies regarding customers, staff, weights, materials, manual overrides, and transactions • Optimize landfill operations to match customer demand	• Limited to easily-accessible external data sets to fit timeframe • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context

BIA Use Case Requirements Summary (continued)

Individual priority crunchy questions and corresponding delivery scope and assumptions are outlined in the table below.

Priority*	Crunchy Question	Division	Description	Part	Effort	Scope of Delivery	Assumptions
6	31	Environmental Standards	Environmental Lab Data Self-Serve Reporting	-	M	• Ingest Old LIMS and New LIMS (Sample Manager) in the data lake, standardize the data, and create a data dictionary for the data • Link Old LIMS and New LIMS data • Create 2-3 templates for self-serve reporting	• LIMS product SME available to provide context on source schema • Effort for this use case does not include data standardization and collection beyond advisory work
7	24	Water Services	Work Order Cost Allocation	-	M	• Create report on costs incurred in water treatment and distribution work orders by leveraging costs recorded in multiple data sources (e.g., OWAM, Fleetbridge, REPA, etc.) • Leverage existing data and weather information to project work orders for water distribution • Project future work order costs based on historical costs • Simulate future order costs based on manual inputs	• Models to incorporate assumptions provided by WWD's stakeholders for the costs not captured or allocated appropriately • Scope of the use case doesn't include manual data capture • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context
8	21A	Water Services	WS Predictive Maintenance (High-Value Assets)	-	M	• Determine risk factors for 5-10 major Water Services assets • Leverage relevant data stored in SCADA (measurements), OWAM (work orders), and files (pump specifications) to create an analytics model that predicts the probability of asset breakdown	• Scope of the model to be limited to 5-10 major assets from the list of key assets detailed in the requirements • Assets to have variations in make and use (limited to 5) • Data from files/manuals can be ingested through simple parsing; if manual effort is required to ingest such data, it has to be time-boxed • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context

** Please refer to Slide 17 for details.*

BIA Use Case Requirements Summary (continued)

Individual priority crunchy questions and corresponding delivery scope and assumptions are outlined in the table below.

Priority*	Crunchy Question	Division	Description	Part	Effort	Scope of Delivery	Assumptions
9	21B	Wastewater Services	WWS Predictive Maintenance (1000 pumps)	2	M	• Determine risk factors for remaining 1000 Wastewater Services pumps in DCS • Leverage relevant data stored in DCS (measurements), OWAM (work orders), and files (pump specifications) to create an analytics model that predicts the probability of asset breakdown	• The 1000 pumps in scope to have variations in make and use between 6-10 types • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context
Internal	36	Finance and Administration	Unbilled Water Revenue Forecast	-	L	• Forecast unbilled revenue for current quarter and forthcoming year with drill-down ability up to individual water meters	• Relevant CCB data is already ingested in the data lake • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context
Internal	11	Finance and Administration	Customer Payment Behavior	1	L	• Determine risk factors for non-payment and impact of those risk factors on non-payment • Establish customer segments based on identified risk factors	• Source data limited to CCB (not OWAM) and readily accessible open data • Relevant CCB data is already ingested in the data lake • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context • Privacy, security, and ethics concerns to be managed by the product owner and data steward
Internal	11	Finance and Administration	Customer Payment Behavior	2	L	• Estimate ROI for prioritizing shut off • ROI to consider factors such as likelihood of payment, costs involved in turn-off, fees charged, etc.	• Data quality issues in OWAM will necessitate modelling assumptions • Relevant CCB data is already ingested in the data lake • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context

** Please refer to Slide 17 for details.*

BIA Use Case Requirements Summary (continued)

Individual priority crunchy questions and corresponding delivery scope and assumptions are outlined in the table below.

Priority*	Crunchy Question	Division	Description	Part	Effort	Scope of Delivery	Assumptions
Internal	35	Finance and Administration	Billing and Services Reconciliation	-	M	• Reconcile customer billing with services (i.e., Water Services, Wastewater Services, and Solid Waste) provided to customers by sourcing data from CCB, MANTA, CMS, and GIS to determine gaps in billing	• There are no privacy concerns in accessing MANTA data • Addresses across the 4 data sources can be linked and new addresses entered after the implementation of the use cases are consistent (or are standardized manually which is outside of scope of this project) • WWD to reconcile approximately 5000 addresses which do not match across the systems at present.\ • Relevant CCB data is already ingested in the data lake • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context
Backlog	16	Solid Waste	Planning for Cart Repair and Replacement	-	L	• Identify risk factors for cart damage • Determine trends and indicators of cart damage • Develop a basic predictive model	• Photographs of damaged/replaced carts are labeled and organized in a taxonomy • Required data from contractors is available to WWD • Effort for this use case does not include data standardization and collection beyond advisory work • Source data SME available to provide required context • Machine learning techniques for image recognition or classification is not in scope
Out of Scope	12	Finance and Administration	Water Crew Dispatch Optimization	-	N/A	• Define work order prioritization based on cost, work orders backlog, capital planning, and value delivered by those orders for Water Services crew	• N/A
Out of Scope	10	Customer Service	Call Diversion Assessment	-	N/A	• Determine the proportion of calls being diverted from call center to the MyUtilityBill portal • Examine user behavior on the portal	• N/A

** Please refer to Slide 17 for details.*

Project Snapshots

Project Snapshots Canvas Overview

Each project snapshot is summarized across a two-part canvas, indicating the broad range of considerations from high level effort quantifications to breakdowns on activities, dependencies, benefits, and risks.

Complexity describes the overall challenge of the effort on a comparative and subjective basis amongst the projects. Increments are defined as low, medium, high, and very high.

Duration represents the end-to-end time required to realize the project. The length of the pictograph represents one year.

Effort is a measure of the total invested hours required by the vendor across its team. Increments are defined as < 500 hours, < 1000 hours, < 2000 hours, < 3000 hours, and >= 3000 hours.

Sheet **A**

Complexity L/M/H/VH

Duration X months

Effort X hours

Sheet **B**

Scope represents tangible outcomes of the project.

Assumptions are any noteworthy considerations observed for the high level snapshot/estimation.

Internal Resource Requirements are resources that WWD and/or the City will have to contribute to facilitate delivery of the project.

- **Key Activities** are the individual efforts that will be conducted as part of the project.

- **Dependencies** identify any projects or other efforts that must be completed before the project can be started.

- **Benefits** denote how the project will be of value as part of the BIA program and more broadly for WWD.

Considerations/ Risks are items that require caution during the preparation for and/or execution of the project.

Impact is a subjective measure of how severely the item will negatively impact success of the project.

Probability is a subjective measure of the likelihood of the items occurrence.

Mitigations are actions that can be taken to reduce the impact and/or probability of the consideration/risk.

Project 1 | BIA Governance Standup and Foundational Oversight

This initial project will serve as the launch-pad for the BIA program implementation itself.

Sheet **A**

Complexity Medium

Duration 5 months

Effort 2900 hours

Scope of Delivery

- BIA Management and Executive Committee definition
- Meeting cadence and structure
- Program progress reporting
- Oversight for Wave 1 strategy definition projects
- Readiness assessment for implementation of the BIA use cases

Assumptions

- Project will define initial BIA Management and Executive Committee; WWD's BIA Hub lead to assume responsibility for facilitating change in their definitions thereafter
- Majority of socialization will be facilitated by IST and supported by the vendor
- Responsibility for governance and BIA program oversight to be transitioned to WWD at the end of this project

Internal Resource Requirements

- PM (10-20% FTE)
- Managers / Managers' delegates for gathering inputs and socializing deliverables and program progress (2-4 hours/week)
- IST Manager (2-4 hours/week)

Key Activities

- Validate committee sizing and structure
- Develop decision rights and escalation paths
- Define high level interaction model and terms of reference for governance program
- Define KPI(s) for program effectiveness
- Staff resources to minimally-satisfy governance stand-up; this includes representation from all divisions, but with emphasis on those that will be participating in Wave 1 use cases
- Provide oversight for the projects on the BIA roadmap
- Coordinate and ensure alignment of project progress to plan
- Roll-up risks and roadblocks to management
- Conduct readiness assessment of the BIA use cases by profiling data
- Participate in privacy and security assessment activities required to gain approval for required data ingestion in the cloud-based data lake

Project 1 | BIA Governance Standup and Foundational Oversight

This initial project will serve as the launch-pad for the BIA program implementation itself.

Sheet **B**

Complexity Medium

Duration 5 months

Effort 2900 hours

Dependencies

- N/A

Benefits

- Establishes a formal BIA team recognized by all other divisions, as both the guiding group as well as point of contact for all BIA-related efforts
- Motivates and guides first steps in the BIA program implement
- Ensures project alignment to the defined overarching BIA program plan
- Provides high level visibility for management
- Establishes a clear executable process for managing risks and roadblocks to improve project delivery
- Delivers synergies by consolidating oversight

Consideration/Risk	Impact	Probability	Mitigation
Hesitation from management | Initial enthusiasm and representation for the committee may wane as the reality of the magnitude of the overall BIA program sets in over the initial few months	M	M	The governance stand-up and foundational oversight project can provide reports and success stories to keep the committee engaged and proactively involved

Project 2 | Operating Model Design

Project encapsulates the design of the "Hub-and-Spoke" operating model for the BIA program.

Sheet **A**

Complexity Medium

Duration 3 months

Effort 1300 hours

Scope of Delivery

- Organizational structure (includes BIA functional model, role profiles, interaction model, etc.)
- Talent mapping approach

Assumptions

- Majority of socialization will be facilitated by IST and supported by the vendor
- Vendor will design the approach to talent assessment while HR leads the execution
- HR to provide dedicated support during execution
- Divisional leaders to provide input into design options, role architypes, etc.
- Scope of design is limited to Analytics and Data Management resources (i.e., 40 FTE)

Internal Resource Requirements

- PM (30-50% FTE)
- Managers / Managers' delegates for gathering inputs and socializing deliverables (3-6 hours/week)
- IST Manager (3-6 hours/week)

Key Activities

- Define design principles to anchor and evaluate design options
- Develop BIA functional model to guide structure/role requirements for Hub vs. Spoke
- Develop structural options (L1 – L3) to deliver the operating model within given constraints
- Develop high level role archetypes and profiles (3-5) for Hub vs. Spoke
- Design interaction model and high level RACI for Hub vs. Spoke (i.e., owner for data collection, data analysis / visualization vs. business implications)
- Develop approach to talent mapping to drive staffing decisions
- Support HR in mapping of talent to future state roles (i.e., staffing resources to minimally-satisfy execution of governance, such as those who will participate in Wave 1 use cases)

Project 2 | Operating Model Design

Project encapsulates the design of the "Hub-and-Spoke" operating model for the BIA program.

Sheet **B**

Complexity Medium

Duration 3 months

Effort 1300 hours

Dependencies

- Access to and engagement of HR and Divisional leaders to make structural decisions quickly
- Implementation of change management activities to roll out recommendations, equip talent with required skillsets, and ensure broader organization adoption
- Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight

Benefits

- Organizes and fills technology and talent gaps, defining future goals and providing an area and means for growth
- Achieves a platform for raising concerns for roadblocks and cross-division BIA efforts
- Ensures alignment to WWD's BIA vision at a broader level than the BIA Hub itself (i.e., at the highest levels of the department) weighing-in BIA strategy, governance, and investments
- Provides a central forum to establish common guidelines and standards for business case development, execution, measurement, and shared services and reduces duplication of the foundational capabilities across divisions

Consideration/Risk	Impact	Probability	Mitigation
Complexity in operation | Serving a new model, even if introduced with minimal implementation scope, may offer challenges in adoption	H	M	Extensive socialization with key stakeholders and training
Gaps between OpModel and staffing needs | As WWD moves further in the roadmap, the OpModel might not be completely inline with its needs	M	M	BIA Hub should take ownership of updating the OpModel as required

Project 3 | Program-Level OCM Strategy

Encompasses the planning and initial execution of organization change management (OCM) activity

Sheet **A**

Complexity Medium

Duration 7 weeks

Effort 840 hours

Scope of Delivery

- Change management strategy
- Stakeholder assessment
- Change impact assessment and tracker
- Engagement and communication plan and tracker
- Leadership engagement plan
- Change readiness approach
- Change network approach
- Training strategy
- OCM knowledge transfer

Assumptions

- WWD's BIA OCM lead will be the face of change conducting initiatives with the support of vendor change lead (e.g., leading change impact workshops)
- WWD will execute change initiatives, produce communications, and send/publish messages
- WWD will produce training materials and deliver end user training
- Union discussions/negotiations are out of scope for this project; WWD to drive these discussions, if required

Internal Resource Requirements

- BIA OCM Lead (15-30% FTE across complete project)
- Change Analyst (20-40% FTE across complete project)
- Change Network: Managers / Managers' delegates for gathering inputs and socializing deliverables (1-2 hours/week)
- IST Manager (3-6 hours/week)

Key Activities

- Identify gaps in skills and knowledge required before kicking off transformation
- Engage stakeholders to evaluate degree of impact from the new technologies and processes
- Conduct change readiness assessment (interview to assess capacity for change for the stakeholders as well as business operations implications)
- Create stakeholder engagement plan to garner alignment across leadership
- Develop program level communications strategy, establish communication channels / forums, and prepare communication material

Project 3 | Program-Level OCM Strategy

Encompasses the planning and initial execution of organization change management (OCM) activity

Sheet **B**

Complexity Medium

Duration 7 weeks

Effort 840 hours

Dependencies

- Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight

Benefits

- Keeps transparency high as the organization undergoes significant change
- Prevents any sudden shock or unawareness across members of staff
- Through planning, identifies how success will be measured
- Leaders are aligned and empowered to lead the change
- Clear line of sight into who will be impacted, how they will be impacted, and when the change impact will occur
- Relevant stakeholders are engaged at the right time, by delivering the right message using the right channels
- Tools and training are provided to help employees operate successfully in the new environment
- Knowledge is organized, captured, and distributed to operational users and partners to ensure sustainable system support

Consideration/Risk	Impact	Probability	Mitigation
Resistance in engagement | Staff may become overwhelmed and experience 'change fatigue' since changes are being rolled iteratively over three years	H	M	Coordinated execution of change across projects and employees groups with target stakeholder engagement to maintain project momentum and staff support

Project 4+ | Wave-Specific OCM Strategy

Encompasses the planning and successive execution of organization change management (OCM) activity

Sheet **A**

Complexity Low

Duration 4 weeks

Effort 350 hours (each, x3)

Scope of Delivery

- Updated stakeholder assessment
- Updated engagement and communication plan and tracker
- Go-live messages and artifacts templates
- Go-live readiness plan
- Post go-live campaign templates
- Post go-live assessment approach

Assumptions

- WWD's BIA OCM lead will be the face of change conducting initiatives with the support of vendor change lead
- WWD will execute change initiatives, produce communications, and send/publish messages
- WWD will produce training materials and deliver end user training
- Union discussions/negotiations are out of scope for this project; WWD to drive these discussions, if required

Internal Resource Requirements

- PM (10-20%)
- Managers / Managers' delegates from selected divisions for gathering inputs and socializing deliverables (4-8 hours across the project)
- IST Manager (2-4 hours a week)

Key Activities

- Identify user groups and specific impact each group will experience during implementation
- Develop a communication plan, training program, and create knowledge transfer plans; share with relevant stakeholders and incorporate feedback
- Assess readiness for wave release
- Assess effectiveness of release and identify improvements to be embedded into next wave

Project 4+ | Wave-Specific OCM Strategy

Encompasses the planning and successive execution of organization change management (OCM) activity

Sheet **B**

Complexity Low

Duration 4 weeks

Effort 350 hours (each, x3)

Dependencies

- Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight
- (Project 3) Program-Level OCM Strategy completed
- Prioritization of BIA use cases and corresponding data ingestion

Benefits

- Allows WWD to conduct change management in an agile fashion, hence saves upfront costs and ensures tight alignment between change management and the BIA program
- Aligns change management with change in scope of BIA use cases
- Facilitates focused and timely delivery of change management activities (e.g., trainings, communication delivery, etc.)

Consideration/Risk	Impact	Probability	Mitigation
Resistance in engagement | Staff may become overwhelmed and experience 'change fatigue' since changes are being rolled iteratively over three years	H	M	Coordinated execution of change across projects and employees groups with target stakeholder engagement to maintain project momentum and staff support

Project 5 | BIA Reference Architecture

Includes conceptual, logical, and technology specific reference architecture definition for the Big Data platform and constituents

Sheet **A**

Complexity Medium

Duration 2 months

Effort 750 hours

Scope of Delivery

- Conceptual reference architecture
- Logical reference architecture
- Technology-specific reference architecture outlining considerations on use of technologies for BIA implementations
- Key architecture patterns

Assumptions

- BIA technologies selected

Internal Resource Requirements

- PM (15-30% FTE)
- Architect (10-20% FTE)
- Managers / Managers' delegates for gathering inputs (2-4 hours across the project)
- IST Manager (2-4 hours a week)

Key Activities

- Review current state architecture, future state architecture, selected BIA toolset, and the BIA strategy
- Leverage and enhance the BIA conceptual model to refine to the logical and technical level details that align with the roadmap
- Design architecture patterns to support the agile delivery squads in the execution of BIA use cases

Project 5 | BIA Reference Architecture

Includes conceptual, logical, and technology specific reference architecture definition for the Big Data platform and constituents

Sheet **B**

Complexity Medium

Duration 2 months

Effort 750 hours

Dependencies

- Big Data technology has been selected
- BIA use cases for immediate waves have been agreed upon
- Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight

Benefits

- Improves development cycle time by leveraging best practices and established template workflows and by reducing potential duplication of effort
- Simplifies governance, reducing corresponding overhead
- Reduces risk of incompatibility from either a technology or strategy / future state alignment perspective

Consideration/Risk	Impact	Probability	Mitigation
Uncertainty in definition | Some aspects of the reference architecture may be too challenging to accurately define early in the BIA program	L	M	• Make assumptions in planning, recognizing that some adaptation by the BIA Hub may be required in the future when more information is available • Assign ownership for its maintenance

Project 6 | Refresh BIA Reference Architecture

Following extensive BIA development and iterative refinement, an overall reassessment can reveal if more architecture changes are required.

Sheet **A**

Complexity Low

Duration 6 weeks

Effort 325 hours

Scope of Delivery

- Appends to conceptual-, logical-, and technology-specific reference architecture
- Additional architecture patterns

Assumptions

- Staff augmentation role

Internal Resource Requirements

- PM (10-20% FTE)
- Architect (10-20% FTE)
- Managers / Managers' delegates for gathering inputs (2-4 hours across the project)
- IST Manager (4-8 hours across the project)

Key Activities

- Review current progress-to-date to identify opportunities to rationalize and or aggregate analytical needs
- Identify gaps if any with current reference models relative to WWD capabilities and strategic direction
- Revise architecture patterns based on BIA use cases planned for next set of waves
- Review technology requirements for data quality and data governance and, if required, recommend toolset procurement
- Review BIA toolset portfolio and recommend alternate technologies if warranted

Project 6 | Refresh BIA Reference Architecture

Following extensive BIA development and iterative refinement, an overall reassessment can reveal if more architecture changes are required.

Sheet **B**

Complexity Low

Duration 6 weeks

Effort 325 hours

Dependencies

- Completion of Wave 3

Benefits

- Ensures reference architecture is up-to-date with the most recent version of BIA vision
- Incorporates lessons learned and practical application of the reference architecture to help refine it

Consideration/Risk	Impact	Probability	Mitigation
Excessive change required | A reassessment may reveal that an unforeseen number of technologies have been appended to the architecture	L	M	• Ensure that architects in the BIA Hub are continuously engaged in implementations • Continuously engage in technology and utility forums • Regularly remediate architecture-level challenges identified through various channels

Project 7 | Data Governance and Data Quality Strategy

This strategy project establishes a department-holistic data governance and data quality program.

Sheet **A**

Complexity High

Duration 5 months

Effort 1025 hours

Scope of Delivery

- DG operating model
- DG processes, policies and metrics
- DG/DQ roadmap inline with delivery of identified use cases
- DQ approach
- DG operating model stand-up
- DG/DQ strategy updates based on inputs from implementation of first use case

Assumptions

- Majority of socialization will be facilitated by IST and supported by the vendor
- Representatives from divisions will be available for meetings, workshops, and reviews
- Project estimates assume that the scope of data governance is up to 4 data management practices for process design and metrics calculations (namely metadata, data quality, DW/BI, and data modelling and design) and up to 8 practices for policies design (including data storage and operations, data security, data integration and interoperability, and data architecture)

Internal Resource Requirements

- PM (15-30% FTE)
- Managers / Managers' delegates for gathering inputs and socializing deliverables (1-2 hours/week)
- IST Manager (3-6 hours a week)

Key Activities

- Review existing data governance practices and the BIA strategy
- Design data governance operating model
- Identify data management capabilities (in addition to data quality) that needs to be governed under the Data Governance (DG) program
- Develop DG policies, processes, and governance metrics
- Develop high level conceptual data model at subject-area level
- Develop roadmap for DG/DQ design and implementation as needed to support use cases

Project 7 | Data Governance and Data Quality Strategy

This strategy project establishes a department-holistic data governance and data quality program.

Sheet **B**

Complexity High

Duration 5 months

Effort 1025 hours

Dependencies

- (Project 2) Operating Model Design
- Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight

Benefits

- Gathers all inputs and defines department-holistic data governance and data quality
- Streamlines and democratizes access to critical data, improving the process of data and information sharing across divisions
- Enables consistent, central, and governed storage / use of data
- Increased data completeness, accuracy, consistency, and reliability resulting in greater data integrity and trust in datasets
- Reduces risk and cost associated with data quality by enforcing rules and establishing controls to maintaining set quality requirements

Consideration/Risk	Impact	Probability	Mitigation
Additional overhead | Data governance will add responsibilities to staff's roles, adding additional overhead to their existing duties, which could result in resistance to adoption	L	H	• Implement a lean data governance program by ensuring that only necessary data governance components are employed • Extensively communicate benefits of data governance / data quality to the stakeholders

Project 8 | BIA Solution Infrastructure Setup

Encompasses the install and configuration of the Big Data platform, self-serve reporting capabilities, and analytics tools

Sheet **A**

Complexity Medium

Duration 2 months

Effort 875 hours

Scope of Delivery

- Solution installation and setup
- Solution smoke tests

Assumptions

- The solution will be cloud-based
- The project team (i.e., as part of the 875 hours of total vendor effort) to include product SME from the product vendor

Internal Resource Requirements

- PM (10-20% FTE)
- Architect (2-4 hours a week)

Key Activities

- Vendor installs and configures BIA solution infrastructure for WWD (i.e., connection with on-premises databases, WWD's Windows Active Directory, etc.)
- Vendor conducts smoke tests on the platform (i.e., checking for connectivity between systems, bandwidth for data volumes, etc.)
- Vendor remediates any open issues

Project 8 | BIA Solution Infrastructure Setup

Encompasses the install and configuration of the Big Data platform, self-serve reporting capabilities, and analytics tools

Sheet **B**

Complexity Medium

Duration 2 months

Effort 875 hours

Dependencies

- (Project 5) BIA Reference Architecture
- High level approvals (i.e., for procurement in alignment with relevant corporate policies)
- Resource for administration of platform
- Selection of the technology vendor
- Oversight of the project is built into (Project 1) BIA Governance and Foundational Oversight

Benefits

- Central storage and essential systems as per the recommended technologies established for BIA program
- Tool validation ensuring operability within the scope of the reference architecture

Consideration/Risk	Impact	Probability	Mitigation
N/A			

Project 9+ | Analytics Use Cases

Includes the end-to-end scope of delivery of BIA use cases agreed to be included in the BIA roadmap

Sheet **A**

Complexity Low to Medium

Duration 2 to 3 months

Effort variable hours

Scope of Delivery

Single instance:
- DG/DQ dashboard deployment
- Data ingestion framework

Across use cases:

DG/DQ implementation
- DG/DQ requirements definition
- DQ rules, business data lineage, and business glossary roll out
- DQ assessment
- DQ remediation plan

Data ingestion
- Data source identification and assessment
- Target data structure
- Data ingestion

Report development and analytics modelling
- Analytics use case canvas refinement
- Initial data exploration
- Use case wireframes
- Use case prototype
- Use case implementation (i.e., build, test, and bug fixes)
- Knowledge transfer to BIA Hub and corresponding spoke
- End user training

Assumptions

- As part of the use case readiness assessment, the use case has been approved for implementation (see Project 1)
- Datasets to be ingested for the use cases will be approved for cloud deployment prior to implementation
- Data quality, business data lineage, and business glossary to be developed for critical data elements only
- The team delivering the use cases to gain efficiency through re-usable requirements/code and context developed during implementation
- Data ingestion frameworks will be reusable for incremental data ingestion
- BIA Hub (staffed with WWD's resources) to own the operations of the use cases, once delivered
- Management of user acceptance testing (UAT) will be WWD's responsibility
- Agile team squad to work with data stewards and product owners to remediate data quality issues identified during the use cases, with the ownership of the remediation residing with data steward

Internal Resource Requirements

- PM (30-50%)
- Agile product owner (8-12 hours a week)
- Data steward (3-6 hours/week)
- Architect (2-4 hours a week)
- BA / UAT tester (full-time)
- Managers' delegates from selected divisions for gathering inputs, training end users, validating deliverables, and gathering UAT test results (4-6 hours/week)
- 1-2 WWD's BIA Hub resources for 2-4 weeks of change management activities
- IST Manager (1-2 hours a week)

Key Activities

Data Governance and Data Quality:
- Identify critical data elements for business glossary and data quality rules
- Gather requirements for data quality rules, DG/DQ dashboards, business data lineage, data dictionary, and business glossary
- Design data quality rules and business data lineage
- Design wireframes for dashboards, data dictionary, and business glossary
- Implement data quality rules, data dictionary, DG process workflows, business glossary, business data lineage, data governance/data quality KPIs, and dashboard (efficiency gain expected after implementation of 2-3 use cases)
- Conduct initial data quality assessment, log data quality issues, and define implementation plan for remediating data quality issues

Data Ingestion:
- Identify data sources required for the use cases
- Analyze data sources, determine their data quality, volume, and complexity
- Design and document target data structure for identified use cases
- Design and document ingestion frameworks to be leveraged across use cases
- Execute on ingestion ensuring adherence to processes and policies in place, preserving or reinforcing data quality, and enriching data where possible (e.g., as with metadata)

Report Development and Analytics Modelling:
- Reaffirm objective, user story mapping, and data requirements
- Develop wireframes for the reports
- Leverage the sandbox for quick-start analytics, report development, and exploration of the data
- Build and test analytics models and reports within the sandbox
- Leverage the agile methodology to deliver an iteratively refined output
- Productionize and implement external to sandbox as applicable

Project 9+ | Analytics Use Cases

Includes the end-to-end scope of delivery of BIA use cases agreed to be included in roadmap

Sheet **B**

Complexity Low to Medium

Duration 2 to 3 months

Effort variable hours

Dependencies

- (Project 7) Data Quality and Data Governance Strategy
- (Project 8) BIA Solution Infrastructure Setup

Benefits

- Streamlines and democratizes access to critical data, improving the process of data and information sharing across divisions
- Enables consistent, central, and governed storage / use of data
- Increased data completeness, accuracy, consistency, and reliability resulting in greater data integrity and trust in datasets
- Reduces risk and cost associated with data quality by enforcing rules and establishing controls to maintaining set quality requirements
- Data becomes co-located within the Big Data platform and subject to the data governance and quality frameworks to make it robust for BIA
- Tangible, business-valuable insights achieved as production-grade analytics
- BIA capabilities further refined and strengthened for future use cases
- Leverage data to influence behaviors and achieve business outcomes that align with WWD's business strategy

Consideration/Risk	Impact	Probability	Mitigation
Unexpected number of data quality issues | Data quality assessment might reveal higher number of data quality issues than expected	L	M	Prioritize remediation of data quality issues
Need for additional technology | WWD may need additional technology to meet DG/DQ requirements	M	M	Leverage (Project 6) Refresh BIA Reference Architecture to analyze and fulfill technology needs
Insufficient data | The target insight or deliverable cannot be achieved to lack of data or poor quality	H	M	Reduce scope if necessary; leverage external data sources or alternate approaches to satisfy the desired outcome

Project 10 | Agile Process Design

Establishes the process for agile development and implementation of BIA use cases within WWD

Sheet **A**

Complexity Low

Duration 4 weeks

Effort 275 hours

Scope of Delivery

- Agile operating model definition
- Agile analytics delivery framework
- Training on agile tool

Assumptions

- System integration (SI) vendor delivering BIA use cases will be proficient in the agile methodology, delivering use cases in an agile fashion and providing agile coaching for WWD's product owners and other project team members
- Starting in Wave 4, WWD will look to start executing and building agile analytical capabilities internally and reduce dependencies on SI vendor; this will be done through a combination of training and on-the-job peer development

Internal Resource Requirements

- PM (15-30% FTE)
- Managers' delegates for gathering inputs and socializing deliverables (1-2 hours a week)
- IST Manager (2-4 hours a week)
- BIA delivery squad (4.5 resources)

Key Activities

- Review existing agile capabilities across people, process, and technology dimensions
- Develop agile operating model (i.e., interaction model, governance, etc.)
- Define agile analytics delivery framework (i.e., end-to-end process of agile delivery)
- Define agile team structure and align with BIA governance structure
- Provide training on the agile tool
- Select pilot projects for agile coaching and staff the agile coach

Project 10 | Agile Process Design

Establishes the process for agile development and implementation of BIA use cases within WWD

Sheet **B**

Complexity Low

Duration 4 weeks

Effort 275 hours

Dependencies

- WWD has hired internal BIA use cases delivery team

Benefits

- Fosters support through quick wins and demonstration of consistent progress in place of stretched apart milestone deliveries
- Reduces risk and cost as the agile delivery approach improves visibility of potential problems and minimizes sunk costs
- Improves overall delivery time since agile analytics practices offers the ability to let products/methods be used before final completion (i.e., after an interim sprint)

Consideration/Risk	Impact	Probability	Mitigation
Resistance in adoption | Change from waterfall methodology to agile might lead to resistance in adoption due to scale of change required	H	H	• Employ coaching services to streamline adoption • Collaborate with change management experts in the BIA Hub to manage change • Incrementally ramp up agile capabilities

Project 11 | Agile Coaching

Provides support and coaching to agile teams in critical early stages of agile practices implementation

Sheet **A**

Complexity Low

Duration 6 months

Effort 475 hours

Scope of Delivery

- Agile training
- Ongoing shadow/reverse-shadow coaching
- Delivery success review based on agile metrics, improvement plan, and coaching on improvement plan implementation

Assumptions

- Staff augmentation role
- Agile coaching to be provided to newly setup internal BIA delivery team squad

Internal Resource Requirements

- PM (5-10% FTE)
- Agile coach to work directly with the delivery team (i.e., product owner, scrum master, scrum team, etc.)

Key Activities

- Train resources on agile practices
- Drive selected project management activities for initial sprint to coach sprint team
- Shadow project activities in later sprints and create a log of coaching observations
- Measure agile delivery against metrics
- Based on coaching observations and performance metrics define an improvement plan
- Provide coaching on improvement plan

Project 11 | Agile Coaching

Provides support and coaching to agile teams in critical early stages of agile practices implementation

Sheet **B**

Complexity Low

Duration 6 months

Effort 475 hours

Dependencies

- (Project 10) Agile Process Design
- WWD has hired BIA delivery team and the team is tasked with delivering BIA use cases in parallel with agile coaching project

Benefits

- Provides initial support required to standup agile practices
- Allows WWD to receive feedback and corrective action plan for evolving agile practices in critical early stages of the implementation

Consideration/Risk	Impact	Probability	Mitigation
Additional training requirements | As WWD moves further along in the BIA roadmap, it is likely that its internal staff will expand/change and hence WWD will require additional agile training/coaching	H	M	WWD should follow a "train-the-trainer" approach, whereby once WWD receives agile coaching in this initiative and it embeds agile practices in its delivery, it provides further training to suitable staff internally on its own as required
Fallback to waterfall methodology | Due to the degree of change required in adoption of agile practices, WWD may fallback to the waterfall methodology	H	M	Execute additional change management activities and, if required, extend agile coaching

Project 12 | Master Data / Reference Data Strategy

Involves identifying the relevant business needs and thereafter defining the R/MDM components in their entirety

Sheet **A**

Complexity High

Duration 2 months

Effort 600 hours

Scope of Delivery

- Domain scope area established for master data
- Domain dependency analysis
- Domain risk analysis
- Domain profiling
- High level conceptual architecture
- Master data governance / data quality

Assumptions

- WWD's data governance capability will be mature to assist in designing master data governance policies, processes, metrics, data quality, etc.

Internal Resource Requirements

- PM (15-30%)
- Architect (8-16 hours a week)
- BIA Hub resource for data governance (0.5 FTE)
- Managers / Managers' delegates from selected divisions for gathering inputs and validating deliverables (2-4 hours/week)
- IST Manager (3-6 hours a week)

Key Activities

- Identify drivers and requirements for BIA use cases broadly (i.e., holistically across the entire department and its divisions)
- Evaluate and assess the data sources understanding their structure, quality, and the relationships amongst the various sources (including sources already leveraged in existing use cases)
- Define the architecture approach identifying how datasets will be integrated (i.e., whether through multiple systems or via a singular transaction hub)
- Model the reference and master data, explicitly defining relationships to source datasets
- Define the stewardship and maintenance processes for ensuring data quality and ensuring that data is up-to-date with respect to sources
- Define the governance policies and drive the enforcement of their use in lieu of the source data directly

Project 12 | Master Data / Reference Data Strategy

Involves identifying the relevant business needs and thereafter defining the R/MDM components in their entirety

Sheet **B**

Complexity High

Duration 2 months

Effort 600 hours

Dependencies

- N/A

Benefits

- Ensures alignment of R/MDM development with the department's business needs and thereby reduces the risk of end users still using source data
- Provides understanding of the root limitations and considerations for implementation to create robust master and reference data models

Consideration/Risk	Impact	Probability	Mitigation
Source-of-truth reconciliation difficulties | Different perceptions may exist on what data source is the source of truth for a particular entity	H	H	Do a deep-dive when necessary, and follow-through to the system-level; leverage leadership and the committee in an executive decision
Change in business priorities | Business strategies and direction may have shifted or changed such that the value of R/MDM is reevaluated and no longer needed	M	L	Gauge business need / strategic plans to understand the need for R/MDM before embarking upon the project

Project 13 | Master Data / Reference Data Implementation

As a contingent to the assessment, refers to the direct production-grade implementation of master and reference data models and affiliated systems

Sheet **A**

Complexity Very High

Duration 1 year and 9 months

Effort 13,000 hours

Scope of Delivery

- Domain scope area established for master data
- Domain dependency analysis
- Domain risk analysis
- Domain profiling
- High level conceptual architecture
- Master data governance / data quality

Assumptions

- WWD's data governance capability will be mature to assist in designing master data governance policies, processes, metrics, data quality, etc.

Internal Resource Requirements

- PM (15-30%)
- Architect (8-16 hours a week)
- BIA Hub resource for data governance (0.5 FTE)
- Managers / Managers' delegates from selected divisions for gathering inputs and validating deliverables (2-4 hours/week)
- IST Manager (3-6 hours a week)

Key Activities

- Standup the models per the architectural approach and definitions prescribed during the assessment as prioritized by use case
- Implement the technologies and processes for facilitating master and reference data ingestion and management
- Communicate and enforce imperative for the use of the master and reference data models with BIA operatives and end users via stewardship and governance policies defined
- Proactively review use and amend definitions / architectural approach as warranted

Project 13 | Master Data / Reference Data Implementation

As a contingent to the assessment, refers to the direct production-grade implementation of master and reference data models and affiliated systems

Sheet **B**

Complexity Very High

Duration 1 year and 9 months

Effort 13,000 hours

Dependencies

- (Project 12) Master Data / Reference Data Strategy

Benefits

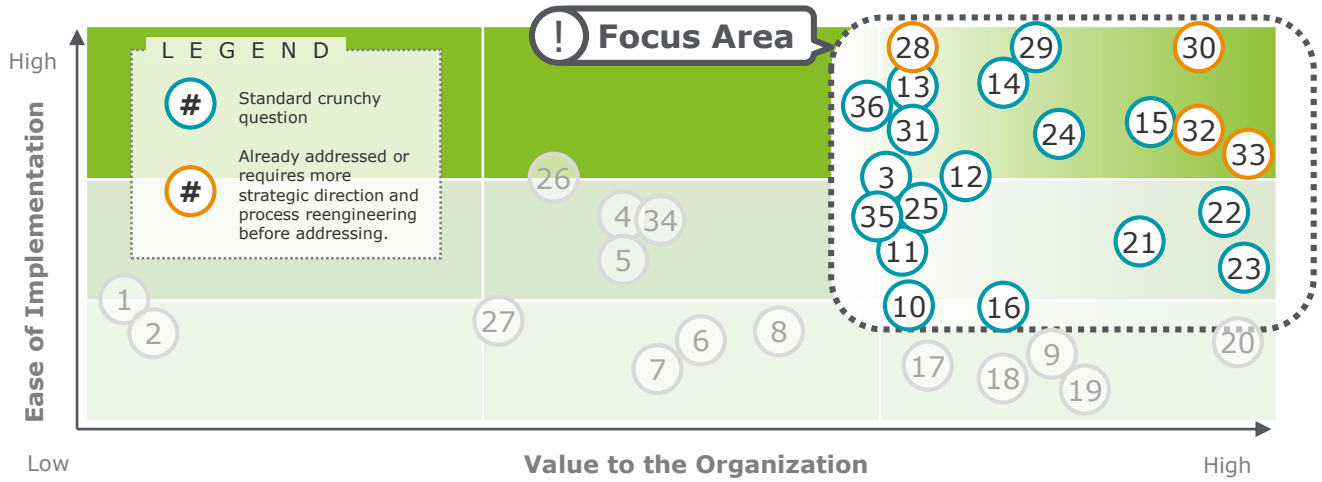
- Improved overall data quality and robustness of a subset of source data for BIA
- Approach defined for master and reference data reduces the effort required for their management

Consideration/Risk	Impact	Probability	Mitigation
Bypassing | Use case development may bypass to source data directly if R/MDM poses difficulty	M	H	Track and capture utilization; direct and instruct specific violators on how to appropriately use the datasets

BIA Use Case Requirements

Use Case Prioritization Map as defined in the Future State

The full range of crunchy questions identified are summarized below. Business requirements gathering targeted crunchy questions in the "Focus Area" of high value and ease of implementation.



1 How can we measure success where success results in less direct data? *(Across WWD)*

2 Are we competitive compared to other utilities? *(Across WWD)*

3 How do we optimize landfill management by guiding services, controlling revenue loss, and adjusting the pricing model? *(Solid Waste)*

4 How can we consistently develop our cost of service rates process (thereby making the process less subjective and less ad hoc)? *(Finance and Administration)*

5 How can we drive innovation and leverage technology trends like the "Internet of Things" (IoT) in our strategy and planning processes? *(Across WWD)*

6 What is the impact of turning off a water-main valve? *(Water Services)*

7 How do we optimize operations of pumping stations and distribution system assets to minimize the impact of transients? *(Water Services)*

8 Can BIA change the service model (i.e., Demand Management / Elastic Supply)? *(Across WWD)*

9 How do we provide a consistent customer experience? *(Engineering)*

10 What proportion of Utility Billing Center calls have been diverted to the MyUtilityBill portal? *(Customer Service)*

11 Can we predict customer payment behavior, i.e., which customers will fall in arrears? *(Finance and Administration)*

12 How do we prioritize water services crew resources to maximize benefit (i.e., how do we prioritize between meter exchanges and turn-offs for non-payment and water main repair)? *(Water Services)*

13 How do we optimize meter population? *(Finance and Administration)*

14 How do we enhance monitoring of compliance? *(Water Services, Wastewater Services, and Environmental Standards)*

15 How do we reduce incidents and injuries to improve health and safety at the workplace? *(Human Resources)*

16 How can we predict cart damage and replacement (asset planning)? *(Solid Waste)*

17 How can BIA insights help with capability planning? *(Information Systems and Technology)*

18 How to use data to drive best practices for council decisions? *(Across WWD)*

19 Are we a service or a business (related to changing level of service, e.g., reduction of work hours)? *(Across WWD)*

20 How can we use asset information (including maintenance) in conjunction with external influences (e.g., climate) to make optimal decisions? *(Wastewater Services)*

21 How do we go from >50% to 0% unplanned maintenance? *(Wastewater Services, Engineering, and Water Services)*

22 How do we optimize asset management practices to maximize efficiency and reduce costs? *(Wastewater Services, Engineering, and Water Services)*

23 How can we identify unaccounted water including its theft (based on factors such as water consumption, meter age, and inspection date)? *(Finance and Administration)*

24 What are the collective financial implications of a given work order and how can we leverage this information to forecast future costs/effort? *(Water Services)*

25 How do we prioritize maintenance efforts? *(Wastewater Services)*

26 How can we predict and avoid dry weather overflows? *(Wastewater Services)*

27 How do we track and prioritize media and councilor requests? *(Wastewater Services)*

28 How can we measure success and feed back actual costs for future estimates? *(Information Systems and Technology)*

29 What is the most cost-effective way to record assets (carts) to ensure accuracy? *(Solid Waste)*

30 How can we improve spending tracking to ensure alignment to budget? *(Wastewater Services)*

31 How do we ensure data is sent to end users efficiently in a usable and meaningful format? *(Environmental Standards)*

32 How can we improve water meter reporting accuracy (consumption)? *(Finance and Administration)*

33 How do we reconcile differences between budgeting, HR planning, collective agreements, and financial resource planning? *(Water Services)*

34 How can we predict water main renewal work required beyond 1 to 2 years? *(Engineering)*

35 How do we ensure we are billing for all services provided? *(Finance and Administration)*

36 How do we better predict water revenue in the short term? *(Finance and Administration)*

Use Case Consolidation and De-Scoping

In-depth review of use cases with stakeholders to breakdown priority questions resulted in partial consolidation and outright dropping of use cases, as summarized below.

Consolidated Use Cases

The following use cases share enough outcomes, sources, and scope such that the use cases are more efficiently realized together, with scope accordingly adjusted across the roadmap.

20 How can we use asset information (including maintenance) in conjunction with external influences (e.g., climate) to make optimal decisions? *(Wastewater Services)*

25 How do we prioritize maintenance efforts? *(Wastewater Services)*

21 How do we go from >50% to 0% unplanned maintenance? *(Wastewater Services, Engineering, and Water Services)*

Consolidation based on commonality of theme, scope of effort, and outcomes

14 How do we enhance monitoring of compliance? *(Water Services, Wastewater Services, and Environmental Standards)*

31 How do we ensure data is sent to end users efficiently in a usable and meaningful format? *(Environmental Standards)*

Consolidation based on sources and outcomes

Dropped Use Cases

The following use cases will not benefit from more detailed requirements gathering or roadmap planning until the BIA program is more mature and more capabilities and experience have been accumulated.

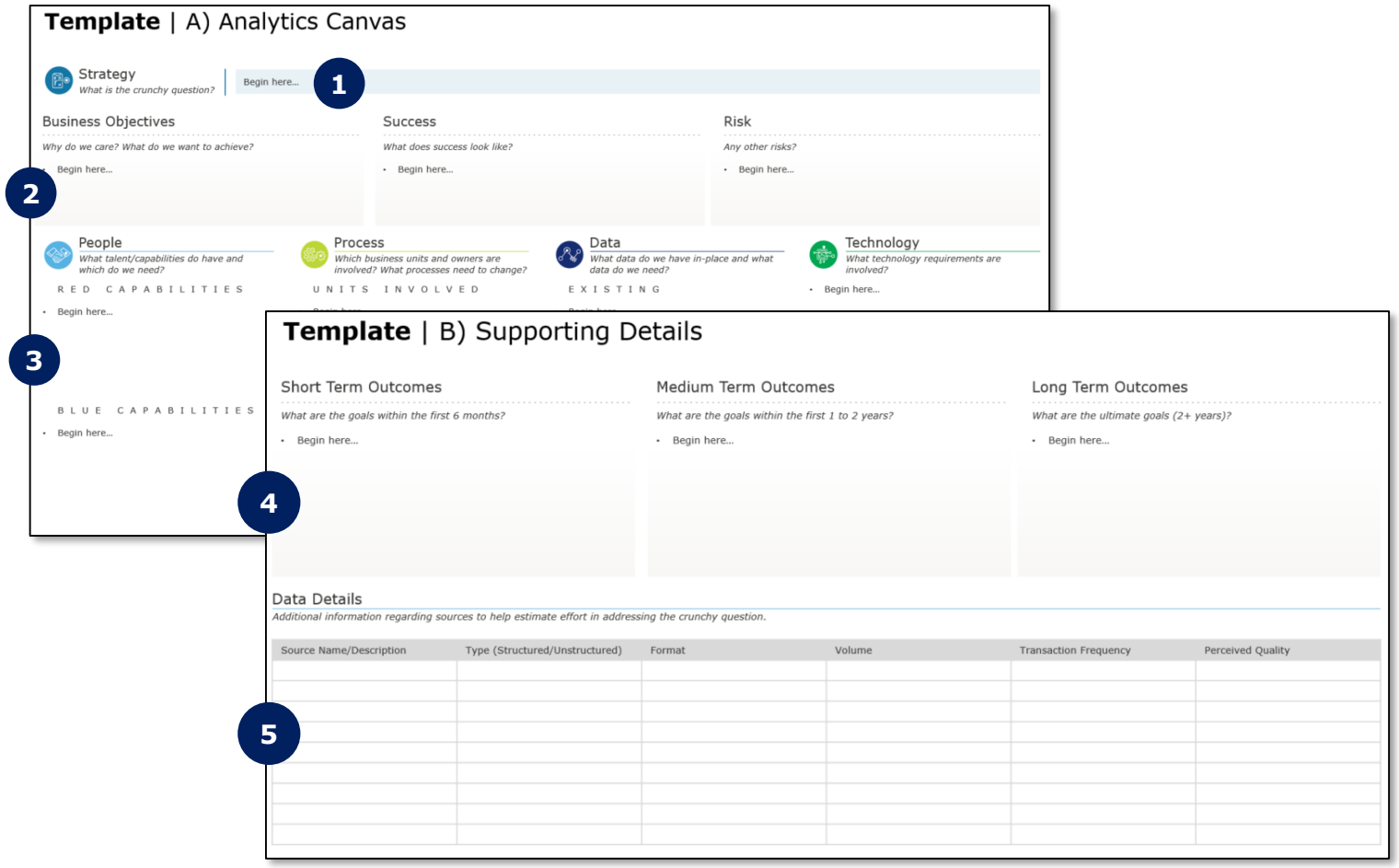
9 How do we provide a consistent customer experience? *(Engineering)* — *Reliant on master data, benefits from a later implementation*

22 How do we optimize asset management practices to maximize efficiency and reduce costs? *(Wastewater Services, Engineering, and Water Services)* — *Similarly better facilitated once master data is implemented*

29 What is the most cost-effective way to record assets (carts) to ensure accuracy? *(Solid Waste)* — *Scope of question changed by stakeholder and not prioritized or explored in-depth*

Use Case Requirements Canvas Overview

Information was gathered for each use case via close interaction with the use case owners and relevant stakeholders, facilitated through a two-part canvas.



B R E A K D O W N

Part A) Analytics Canvas

1. The crunchy question itself is identified at the top, as selected from relevant high-ease of implementation, high-value crunchy questions identified.
2. Contextual items including objectives, success definers, and notable risks are described in this section.
3. Attributes across people, process, data, and technology dimensions – both as present and missing – are elaborated in this section.

Part B:

4. Outcomes are defined as short, medium, or long term priorities. Items are scoped as either having been delivered as part of a POC, to be delivered as a target use case, or to be delivered as a follow-up phase as a two-part use case. Items not highlighted are considered low priority, for WWD to facilitate in the future as seen fit given the success/delivery of roadmap-defined use cases.
5. Details with respect to data are identified below. Together, the outcome priorities and data details establish the relative effort anticipated for the use case.

Crunchy Question 31 – Environmental Standards | Part A) Analytics Canvas

Strategy
What is the crunchy question?

How do we ensure data is sent to end users efficiently in a usable and meaningful format?

Business Objectives

Why do we care? What do we want to achieve?

- Customer services
- Regulatory requirements
- Public health
- Openness of information
- Operational optimization
- Operational efficiencies
- Establish and meet turnaround times requested by customers or expected by the public

Success

What does success look like?

- Decrease customer complaints
- Increase customer satisfaction
- Provide data in requested format in an acceptable time frame
- Less variation in report formatting
- Less time and resources to generate a report
- Less report revisions or versions
- Press one button and report is ready for final review

Risk

Any other risks?

- Unrealistic turn around times
- Data sources integrity
- Insufficient QA/QC automation
- Unplanned absences
- Privacy
- Incorrect end user

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Currently have databases or software tools that store the information for the users
- Not currently setup, created, or performing to meet the capabilities

BLUE CAPABILITIES

- Have people with business knowledge, but don't have the time or training to generate and deliver the information

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Branch Heads and Manager in division
- Any division that generates, uses, or creates reports based off of laboratory data, backflow records and information, or industrial customer waste information
- Single location for all data or databases need to share information; one single data source used by all department employees as a reference
- Creating definitions for each piece of data

DEPENDENCIES

- More information captured in queries or references to definitions
- Single person or area responsible for the source of information for the whole department

Data
What data do we have in-place and what data do we need?

EXISTING

- N/A (no data in-place other than existing systems; can easily extend/add columns to capture more data as needed); please refer to next slide for details

GAPS

- Not knowing what others want us to collect and store (unable to anticipate needs)
- External potential, depending on client needs
  - Namely weather data (stream/feed)

Technology
What technology requirements are involved?

- More automation
- Mobile
- Reporting layers
- Dashboards
- Analytics for program operations
- Useful insights
- More pictures, graphs, and charts

Crunchy Question 31 – Environmental Standards | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Priority of getting lab report process established
- Ability to provide lab data through self-serve capabilities to all of our customers; data includes:
  - New LIMS: 400K tests a year for approximately 60K samples collected
  - Old LIMS: 400k tests a year for last 7 years
  - Both of the systems have a lot of metadata for each sample of data collected as well
- Determine turn-around-time for all reporting and data from the Division and reduce it by automating data quality checks through a user-friendly interface; at present the division is exploring the use of North West Analytics for automating some of these quality checks
- Note: At present, none of these reports have been setup in our self-serve reporting technology called e.RIS.

Medium Term Outcomes

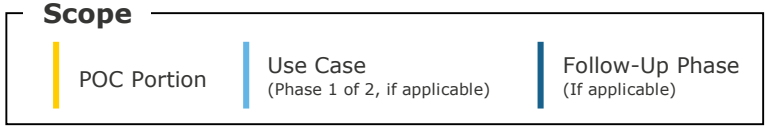
What are the goals within the first 1 to 2 years?

- Support variety in formatting and expand drill-down
- Direct electronic delivery of reports (i.e., upload to City systems and internal customers)
- Ingest Industrial Waste Services Branch data which will be consolidated into iPacs from 4 existing databases including WHIMS. The system at present lacks reporting capabilities.
- ESD (all 3 branches) requires ad hoc reports and dashboards for metrics from old/new LIMS

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Ingest following datasets for varying reporting needs:
  - Old LIMS
  - New LIMS
  - DOC
  - XLS
  - T2 Flex (By-Law Fines extracts)
  - Network drives
- Support Open Data (for public, direct post to website)
- Expand business knowledge for all data
- Complete historical data view
- Expand analytics to department-wide program performance



Crunchy Question 31 – Environmental Standards | B) Supporting Details (continued)

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Sample Manager	Lab data and associated information (sample data, reagents, inventory, etc.)	Database	400K tests a year	Daily and monthly	Depends on status of information shared
Old LIMS	Lab data and associated information	Database	Approximately 400K tests a year for last 7 years worth of data	Daily and monthly	Medium to high (business knowledge is stored outside database)
iPacs (the system to hold data from 4 IWSB databases including WHIMS and replacement WHIMS)	All Industrial Waste Services Branch's customer data - including industries monitored for surcharging, hauled wastewater information, and records of spills and by-law infractions	Database	Unknown at this time as not yet implemented. Estimate of over 10,000 customer profiles with various components to each profile.	Monthly reporting in iPACS, with ad hoc reporting on daily basis	4 (Effort is being spent in implementation to cleanup the system)
Emails	Business knowledge (dates, etc.), and data points at times	Database			2
PeopleSoft (HR & Financial)	Purchase order information	Database	All this data is stored in a couple of tables in Sample Manager (vendors, stock, and personal table); it's stored in very few lines in PeopleSoft	2 to 4 times per week on average	3-5
SCADA (Wastewater Services)	Flows	SCADA	Daily flows x 3 plants	Monthly	5
SCADA (Water Treatment)	• Online turbidity daily max and average, and number of measurements • Online chlorine daily min and average, and number of measurements • UV, daily volumes, reactor flow, UV dose (min/max/average), and lamp status (hours)	SCADA	• Turbidity – 8 filters • Chlorine - 2 branches • UV - 6 reactors	Monthly	5
TOKAY	• Site information, mailing addresses for owners/occupants/management companies, multiple device information for each site, multiple tests for each device, inspection notes, letter templates, letter histories • Tester and company information, test kit information	Database	• 5000+ sites • 23,000+ mailing addresses • 20,000+ devices • 125,000+ tests • 300+ (active) testers • Approximately 300 test kits	Daily and monthly	2

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 31 – Environmental Standards | B) Supporting Details (continued)

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Excel, Word	Excels: • Solid Waste data (monthly diversion summaries, odor complaint logs, etc.) • CRB-Backflow (summary spreadsheets for program stats at certain date, summary of enforcement tracking, summary of CCB meter information – site, meter number, mailing address, etc.) Word: (letter templates, report templates) • IWSB uses word for document templates. The hope is most of these will be included in iPacs but there may still be some document templates that will be outside of the system	Excel and databases	• 10+ excels • Various possible word document templates	Infrequent	2
T2 Flex	WPA database - MBEA Penalty notice information is entered by ESD staff – includes notice number, issuer, recipient's name and address, offence date, issue date, PDFs and JPEGs of evidence, etc.	Database	Currently approximately 30/year but will be expanding – possibly up to 500/year	Monthly	5
CCB	Site addresses, mailing addresses, meter numbers, service connections, meter readings, etc.	Database	20,000+ commercial and multi-unit residential customer accounts	Daily/Weekly	4
AMANDA (Non-WWD Source)	PPD database – property (site) information, owners, contractors, permits, inspection notes, etc.	Database	Approximately 1200 permits/year (accessed by Environmental Standards Division)	Daily/Weekly	5

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 11 – Finance and Administration | A) Analytics Canvas

Strategy
What is the crunchy question?

Can we predict customer payment behavior, i.e., which customers will fall in arrears?

Business Objectives

Why do we care? What do we want to achieve?

- Collection activities require resources of 5-6 FTE (including office and field staff)
- Customer calls regarding collection/non-payment represent x% of calls to Utility Billing Centre
- Unpaid accounts result in bad debts and/or liability being transferred to landlords.

Success

What does success look like?

- We should be able to predict the likelihood of non-payment based on a customer's past behavior and utilize this data to prioritize our collection activity.
- Model should monetize the risk of delaying collection activity.

Risk

Any other risks?

- Limited resources (especially in the field) may limit our ability to respond to data / recommendations
- Inconsistent action may blur the analysis (e.g., periods of time when we are unable to turn off water or add unpaid amounts to property taxes) or when resources have limited our ability to take appropriate actions.

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Technical staff have a limited understanding of how data ties to existing business processes.

BLUE CAPABILITIES

- Finance and Administration staff have some intuitive understanding of what risk factors to consider.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Finance and Administration owns the data in Oracle CCB and completes the majority of the business process.
- Water Services owns data in Oracle WAM and completes the field work required as part of the collections process.
- Customer Service is involved in the process by deciding when to approve pay plans for customers.

DEPENDENCIES

- Linking of data between CCB and OWAM would be beneficial

Data
What data do we have in-place and what data do we need?

EXISTING

- CCB has 10 years of historical data on customer bill and payment history, notices sent to customers, pay plans made (and kept or broken), water turned off, amounts added to property taxes, etc.
- OWAM also contains data on water turn-off/turn-on, however, turn-off data is only from mid-2017.

GAPS

- Customer Service often makes courtesy calls to customers. Although a record is kept in CCB it may not be in a consistent enough format to query easily.
- Although not a major gap, demographics, neighborhood profiles, tax database (reconciliation between landlord vs tenant information), and/or other external datasets on customers can augment the analysis further.

Technology
What technology requirements are involved?

- Database must be robust enough to house millions of records.
- Drilldown capability is critical.
- Visualization tool should include mapping capability.

Crunchy Question 11 – Finance and Administration | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Determine which variables are the strongest indicator of potential non-payment (e.g., number of NSF payments, how long the account has been active, number of times turned off in the past)
- Define the likelihood and impact of those variables on payments, and create customer segments based on those indicators

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Using daily data prioritize water turn-off for customers with the highest risk of default at present and near future
- Develop ROI for cost to disconnect customer, including where additional field work is required (i.e., dig out). The ROI is to consider parameters such as likelihood of payment, costs involved in turn-off, fees charged, etc., and assist in optimizing crew dispatch for water turn-offs.

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Ideally data would feedback to CCB or OWAM to ensure water is turned off without manual intervention

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Oracle CCB	Bill and payment history (including customer information)	Oracle database	Millions records per year (quarterly)	Daily	5
Oracle CCB	Notices sent	Oracle database	200 – 300k per year (they go out daily)		4 (some notices generated are not mailed – this is noted in a log entry)
Oracle CCB	Field activities created by system to request water turn-off. Also indicates whether the request was completed, cancelled by system (due to payment received), or cancelled by a user.	Oracle database	100 – 200k per year	Quarterly	4
Oracle CCB	Pay plans created (and whether kept or broken)	Oracle database	Estimate 250k per year	Quarterly	4 (broken vs kept pay plan indication is not always accurate)
Oracle CCB	Adjustments (debt added to property tax, NSF payments)	Oracle database	10k plus per year	Ad hoc	5
Oracle WAM	Service requests for water on/off	Oracle database	Over 10k per year	Ad hoc	3-4

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 12 – Finance and Administration | A) Analytics Canvas

Strategy
What is the crunchy question?

How do we prioritize water services crew resources to maximize benefit (i.e., how do we prioritize between meter exchanges and turn-offs for non-payment and water main repair)?

Business Objectives

Why do we care? What do we want to achieve?

- Water Services crews complete multiple tasks (e.g., water main cleaning, turn off, meter exchanges) that affect infrastructure as well as individual customer accounts. There are frequently insufficient resources to complete all desired work. How can we systematize setting a priority for this work?

Success

What does success look like?

- Priority for work is clearly defined and agreed to by all divisions.
- Work is automatically assigned based on these agreed priorities.
- Less time is spent assigning/organizing work.
- Data is available to support the number/type of resources required.

Risk

Any other risks?

- Limited resources may limit our ability to respond to data/ recommendations
- Inconsistent data may blur the analysis

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Ability to query Service Request data exists.

BLUE CAPABILITIES

- Division has a good understanding of the issues. Agreement on operational prioritizes is one of the objectives of this question.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Water Services
- Finance and Administration
- Potentially Wastewater Services

DEPENDENCIES

- May depend on improved data capture?

Data
What data do we have in-place and what data do we need?

EXISTING

- Service Request data in OWAM including which crew completed the work.
- Field activities completed directly in CCB (note that as of mid-2017 this information is replicated in OWAM)
- Crew/staff time records stored in OWAM (for each SR?)
- Operating costs maintained in PeopleSoft (i.e., purchasing orders of material used in the work)

GAPS

- Understanding of cost to complete various tasks is often anecdotal rather than based on detailed analysis (e.g., operating costs and hours aren't always available at service levels (work orders))
- Updates to work are recorded in office and may have time delay (i.e., difficult to pinpoint exactly when work is completed)

Technology
What technology requirements are involved?

- Data is primarily in OWAM where most staff do not have the ability to query.
- If looking at historical data, must be able to combine OWAM data with CCB data
- Need live updates to OWAM and CCB in order to prioritize outstanding work

Crunchy Question 12 – Finance and Administration | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Engage the right stakeholders
- Validate user needs with stakeholders
- Identify primary tasks to be prioritized and cost/benefit of completing each task
- Ability to view/analyze current work backlog (i.e., from OWAM and CCB)
- Ability to drill down to specific work requests

Process changes/digital initiative:
- Record operating costs and hours at work order level

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Ability to have work automatically assigned to crews based on established priorities
- Ability to recall work assignments if higher priority work comes up (e.g., emergency water main break)

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Ability to predict resource shortages based on upcoming capital programs (i.e., via PeopleSoft data)

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Oracle WAM	Service Request Data	Oracle database	100k plus per year	Unknown	3
PeopleSoft HR	Timekeeping	Database	70,000 per year	Unknown	4
PeopleSoft Finance	Operating Costs	Database	Against 1000's of work orders per year	Unknown	4
Oracle CCB	Turn off/on requests (note that since mid-2017 this information is duplicated in OWAM)	Database	100 – 200k per year	Unknown	4
PeopleSoft	Capital planning	Database	Yearly planning	Unknown	4

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 13 – Finance and Administration | A) Analytics Canvas

Strategy
What is the crunchy question?

How do we maximize meter population?

Business Objectives

Why do we care? What do we want to achieve?

- Water meters lose accuracy over time, however, not all meters degrade at the same pace (i.e., other factors must be considered).
- How do we determine the optimum time to exchange a meter (i.e., weighing replacement cost against unmetered revenue)?

Success

What does success look like?

- We should be able to identify the optimum time to replace each meter and demonstrate the return on this investment
- We should be able to group these meters by various characteristics

Risk

Any other risks?

- A large number of meter readings are estimated (30%)
- We have limited meter test data (although this is currently being expanded)

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Ability to obtain/query meter read data exists
- Ability to develop data model exists external to CoW

BLUE CAPABILITIES

- FA staff has a good understanding of the factors to be analyzed and how to interpret data.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Finance and Administration (meters) owns the meter read data.

DEPENDENCIES

- Additional meter test data will improve the resulting analytics.
- Increase in number of actual (vs estimated) meter readings will improve analytics.

Data
What data do we have in-place and what data do we need?

EXISTING

- Quarterly meter reading data exists for all water meters (either actual or estimated) in Oracle CCB.
- Meter readings before and after a meter exchange are available as part of total meter reading data.
- Reports include 90 day average data.
- Limited meter accuracy test data from 2011 is available in Excel spreadsheet.

GAPS

- Estimated readings (i.e., infrequent actual meter readings) exist for some water meters.
- More recent meter accuracy test data is planned for 2019.

Technology
What technology requirements are involved?

- Database must be robust enough to house millions of records.
- Drilldown capability is critical.
- Visualization tool should include mapping capability.

Crunchy Question 13 – Finance and Administration | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Develop a model to prioritize meter exchanges for residential water meters utilizing 90 day average data
- Include predictive model to forecast additional revenue gained from exchange of a group of water meters

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Include all water meters
- Include actual meter reading data (including readings on meters which have been exchanged)
- Include additional meter test data
- Add ability to continually add meter test data

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Predict/plan meter exchanges in the future for resource planning

Note: *Use case scope is realized over the course of a year for data-collection purposes; 2/3 of effort is placed at the beginning with the remaining 1/3 of the effort executed after a year.*

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Meter Maintenance Report (CCB)	90 day average	CCB (also in Excel)	210,000 water meters	Ad hoc (can be rerun for any required date)	4
Meter test data	Meter accuracy by age	Excel document	200 records at present	One	4
Oracle CCB	Actual meter reads	Oracle database	Approximately 1 million reads per year	Daily	4 (where records exist)

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 23 – Finance and Administration | A) Analytics Canvas

Strategy
What is the crunchy question?

How can we identify unaccounted water including its theft (based on factors such as water consumption, meter age, and inspection data)? [Note: Synergies with Q13]

Business Objectives

Why do we care? What do we want to achieve?

- We want to reduce Non-Revenue Water (NRW) by identifying specific meter issues for review (e.g., significant change in consumption implying theft or change of occupancy)
- Degrading meter accuracy contributes to NRW

Success

What does success look like?

- We can distinguish between a meter slowly degrading in accuracy versus a sudden change in consumption (could be theft – meter tampering, open by-pass, change of occupancy / process)
- We should be able to group these meters by various characteristics

Risk

Any other risks?

- A large number of meter readings are estimated (30%).
- We have limited meter test data (although this is currently being expanded).
- We only have quarterly read data, not granular
- We do not have occupancy data, only consumption data.
- Ethics and perception

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Ability to obtain/query meter read data exists
- Ability to develop data model exists external to CoW

BLUE CAPABILITIES

- FA Staff has a good understanding of the factors to be analyzed and how to interpret data.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Finance and Administration (meters) division owns the meter read data.
- Customer information also required from Finance and Administration division.

DEPENDENCIES

- Increase in number of actual (versus estimated) meter readings will improve analytics (increase partially anticipated from WSS and recent by-law enforcement)

Data
What data do we have in-place and what data do we need?

EXISTING

- Quarterly meter reading data exists for all water meters (either actual or estimated) in Oracle CCB.
- Reports include 90 day average data (CCB)
- By-law enforcement data (Excels)
- Comparison to water audit (PDF) and total water produced as sanity check (received from Water Services in Excel every month)

GAPS

- Estimated readings (i.e., infrequent actual meter readings) exist for some water meters.
- We do not have household occupancy data.

Technology
What technology requirements are involved?

- Database must be robust enough to house millions of records.
- Drilldown capability is critical.
- Visualization tool should include mapping capability.

Crunchy Question 23 – Finance and Administration | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Identify individual and groups of meters with atypical consumptions and differentiate between suspected meter accuracy issues and other suspected issues including theft
- Limit results to 16mm meters, begin with AMR (4000 in residential area) pilot area data as contains monthly readings (in CCB)

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Include all water meters (210K)
- Incorporate broken seal data (Excel files) and documented theft of service by customer and/or SP
- Incorporate by-pass seal data (CCB data) and history

Long Term Outcomes

What are the ultimate goals (2+ years)

- Correlate broken seal and past theft events (broken seal excel and bypass seal information) to further highlight anomalous consumption
- Incorporate machine learning into analysis combined with Q13
  - Possibly functionality will be built into MDM systems.
  - Determine potential new customers/areas based on past data to profile future/current thefts or areas we don't monitor at present.
- Categorize meters into buckets (i.e., no suspected issues, degrading accuracy, other (includes possible theft, change of occupancy, etc.))

Note: *To be completed after Q13, thus assuming Oracle CCB data is already ingested in the data lake.*

Scope

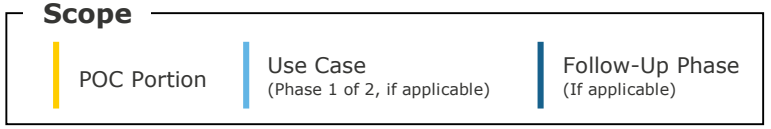
POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 23 – Finance and Administration | B) Supporting Details (cont.)

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Meter Maintenance Report (data originating from CCB)	90 day average (meter readings)	Database (/Excel)	210,000 water meters	Ad hoc (can be rerun for any required date)	4
Oracle CCB	Actual meter reads / seal data	Oracle database	Approximately 1 million reads per year	Daily	4 (where records exist)
CM ERT List (for 16mm AMR meters actual source is CCB)	Actual meter reads (AMR only)	Excel	All ERT equipped meters (~4,600)	Monthly	5
By-law Enforcement Spreadsheet (thefts records)	Infractions	Excel	500 annually – 2000 records	Daily	3
Annual water audit (AWWA – 1 page summary report)	N/A	Document	1 /year	Yearly	Unknown
Pumpage Report (source is water audit report)	Water produced monthly	Excel	N/A	Monthly	4 (if Water Treatment Plant meter utilized)
Excels (broken seal data)	Customer information, meter info, incident code, and address	Excel	500 /year (since 2016)	Unknown	Unknown
CCB	Bypass seal data (commercial customer information, seal number, similar info as meters, etc.)	Database	50 /year	Unknown	Unknown



Crunchy Question 35 – Finance and Administration | A) Analytics Canvas

Strategy
What is the crunchy question?

How do we ensure we are billing for all services provided?

Business Objectives

Why do we care? What do we want to achieve?

WWD bills for multiple services but process to request service is often disjointed from process to bill for the same service. Scenarios include:

- Customer has sewer connection but not water (GIS vs CCB comparison).
- Customer has water and sewer connection and makes a request for Solid Waste (CCB vs CMS vs MANTA (Tax Department)).

Revenue assurance is done on an ad hoc basis and is very labor intensive.

Success

What does success look like?

- WWD is confident we are billing for all services being provided with minimal delay.
- Fewer staff resources are dedicated to revenue assurance.

Risk

Any other risks?

- 5000 plus addresses would require manual reconciliation.
- Limited resources may limit our ability to respond to data/ recommendations.
- Access to current data may not be available.

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Ability to access data may be inconsistent across various systems.
- Ability to link various data sources is known (i.e., limitations are understood)

BLUE CAPABILITIES

- Division has a good understanding of the issues and a common desire to address.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Finance and Administration
- Solid Waste
- Assessment and Taxation
- Engineering
- Water Services

DEPENDENCIES

- Estimated 5% of address are not easily matched between data sources. This has been done manually in the past and can be accessed.

Data
What data do we have in-place and what data do we need?

EXISTING

- CCB – services being billed for each premise
- CMS – Solid Waste services being provided for each address (may not be the same as CCB)
- MANTA – assessment data which includes number of dwelling units
- GIS – service connections for water and sewer
- OWAM – service requests which indicate whether regarding water or sewer

GAPS

Technology
What technology requirements are involved?

- Ability to provide exception reporting when service is being provided but billed by linking various data sources
- Ability to provide alerts or emails when new issues are identified

Crunchy Question 35 – Finance and Administration | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Engage the right stakeholders and validate their needs
- Link addresses from various sources (MANTA, CCB, CMS, GIS)
- Establish process to keep data current without recreating the manual effort to link data sources
- Identify addresses where services appear to be unbilled for further investigation through reconciliation of data sources in the priority below:
  1. CCB vs MANTA
  2. CCB vs CMS (poor data quality could impact the success of this reconciliation)
  3. CCB vs GIS and OWAM

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Ability to quantify potential for unbilled revenue for suspected revenue gaps
- Ability to trigger investigation of possible unbilled service and to track results of investigation (or send to another system)

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Resolution of data errors in other systems (e.g., GIS or CMS) to close items following investigation so that the Department has confidence that all services are being billed.

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
CCB	Service Points (i.e., address (both metered and unmetered))	Oracle database	205,000 premises (plus)	Unknown	5
CMS	Carts deployed (cart ID, addresses, pick-up status)	Database	400,000	Unknown	3
MANTA (Owned by Tax)	Dwelling units assessed, property type (e.g., residential, commercial), address information, customer details	Database	Over 200,000 dwelling units	Unknown	4-5
GIS	Service connections for water and sewer (location, asset, addresses, etc.)	Database	Over 200,000 dwelling units	Unknown	3-4
OWAM	Service requests for water and sewer service	Oracle database	Over 1 million requests	Unknown	4

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 36 – Finance and Administration | A) Analytics Canvas

Strategy
What is the crunchy question?

How do we better predict water revenue in the short term?

Business Objectives

Why do we care? What do we want to achieve?

- Customer Accounts forecasts revenue to meet corporate requirements. Since the utility must balance its budget, it is important to know whether revenue will be above/below budget in a timely manner.

Success

What does success look like?

- WWD is confident in its mid-year revenue forecasts.
- WWD is able to calculate the amount of unbilled revenue at the end of the fiscal year with confidence (could potentially use case around NRW).

Risk

Any other risks?

- Actual unbilled revenue cannot be known for accounts whose last bill was an estimated reading (i.e., addresses from where we didn't get a call, and we put some estimates to bill them).

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Data is readily available and understood.

BLUE CAPABILITIES

- Division has a good understanding of the issues and a common desire to address.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Finance and Administration

DEPENDENCIES

- None

Data
What data do we have in-place and what data do we need?

EXISTING

- CCB contains all meter read data.

GAPS

Technology
What technology requirements are involved?

- Ability to store all meter read data and an indication of which readings have been used for billing. Note that billing often occurs up to two weeks after the meter read, sometimes longer

Crunchy Question 36 – Finance and Administration | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Store all meter read data
- Develop a model to estimate the volume of water used but not billed at a given point in time such as year end (i.e., predict unrealized water revenue since last reading / at present by leveraging datasets on customer, meter read, past bills, etc.)
- Have a date filter to toggle between different periods
- Develop a model to predict the volume of water to be used for the remainder of the year
- Ability to drill / aggregate data

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

Long Term Outcomes

What are the ultimate goals (2+ years)?

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
CCB	Customer, meter read, and bill data	Oracle database	205,000 premises (plus)	Unknown	4

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 15 – Human Resources | A) Analytics Canvas

Strategy
What is the crunchy question?

How do we reduce incidents and injuries to improve health and safety at the workplace?

Business Objectives

Why do we care? What do we want to achieve?

- Safety incidents result in financial losses, which can be reduced.
- There should be a reduction in number and frequency of injuries and other incidents, to create a safer workplace.
- Financial, legal, and reputational liabilities need to be reduced.

Success

What does success look like?

- Supervisors should be able to view safety data to take necessary corrective actions.
- Data should be able to give us factors and predictors of safety incidents.
- Reports should have drill-down capabilities.

Risk

Any other risks?

- Meeting expectations on functionality and timelines.
- Staffing and trends.

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Data manipulation capabilities present, but department is understaffed to do such manipulation and/or take necessary actions.

BLUE CAPABILITIES

- We have these capabilities in our divisions.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- All divisions (branch heads)
- HR takes ownership of data

DEPENDENCIES

- Additional form entries in the future potentially to track more details about incidents.

Data
What data do we have in-place and what data do we need?

EXISTING

- Incident data in PeopleSoft
- Incident reports and corrective action reports
- Information about 'Near-misses'
- Training and certification history
- Corrective action on divisions after audits
- WCB data
- Lost Time Injuries

GAPS

- Demographics for inactive employees
- Incident hazard types

Data not available:
- Weather data
- Mental health data
- Employee satisfaction surveys
- Balance scorecard
- Sick time

Technology
What technology requirements are involved?

Sources of safety data currently are PeopleSoft and Excel spreadsheets.

- A reporting layer, other than excel, on top of the data collected
- Data aggregation for the data collected, to create useful insights.
- Low level of reporting to generate insights that can be used to reduce injuries and other safety incidents.
- A mechanism to track activities of workers who are working alone at any moment to reduce safety issues.

Crunchy Question 15 – Human Resources | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

Priority 1: Productionalize insights delivered in the POC by implementing the ability to pull continuous stream of data from PeopleSoft, Excels, and PDFs

- Engage the right stakeholders
- Validate user needs with stakeholders
- Create dashboards that are available to WWD Supervisors, the Safety Committee, and all WWD staff members for making decisions
- Define KPIs and display them in dashboards and reports
- Implement the ability to drill down on the underlying data in the reports and dashboards
- Identify preliminary high level predictors for safety incidents

Priority 2: Include additional datasets from PeopleSoft to determine:

- How long has the employee been in the position prior to incident?
- How long have they been in the position?
- How has their performance been in the position?
- How long has the employee been with the City of Winnipeg?
- Amount of work done before incident?
- How much sick time/vacation time did employee have before the incident occurred?
- Number of incidents in last year/career?
- Is the incident a reoccurrence? Related to a reoccurrence?

Ongoing: Data quality improvements

On an ongoing basis improve source data quality, specifically where data is missing or is identified as unknown / not applicable

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

Priority 1: Enhance quality of insights by including details from additional internal and 3rd party data sources

- Parse and incorporate unstructured data (from standardized PDFs) regarding incident reports and enhance insights
- External datasets such as weather data, sunlight, etc.
- Additional and standardized datasets that will be available through a web app, which is being developed at the moment with first iteration planned for Feb 2019, and successive iterations in next 2 years

Priority 2: Link HR data with datasets from other WWD and City data sources to determine:

- Was equipment properly maintained before the incident occurred? *(Source data: OWAM data from the Fleet department for vehicles used and WWD's OWAM for WWD assets)*
- Are our employee's credentials or certifications current? *(Source Data: training data from SmarterU)*
- What is the impact of employee's credentials or certifications on incidents? *(Source Data: training data from SmarterU)*

Priority 3: Include emerging datasets from planned digital initiatives to determine:

- What is the effectiveness of preventative measures against incidents and how these measures should be improved? *(Source data: The data around preventative measure, which at present are on paper but will be digitized in next 1-2 years)*

Other digital initiatives:

- Implement digital platforms to capture safety data (e.g., safety data), which is at the moment captured on paper and create reports on them for all divisions.
- Improve existing digital platforms

Long Term Outcomes

What are the ultimate goals (2+ years)?

Priority 1: Implement further safety incident predictors

Priority 2: Digitize datasets to determine

- If WWD has safe work procedures related to incidents?
- Was the employee wearing required PPE? *(Source data: At times this data is captured in PDF incident reports)*
- Were guidelines followed leading up to the incident?
- Did the employee have prior experience/training in activity prior to being hired by City of Winnipeg? *(Source data: The data exists in resumes, it will have to be moved to SmarterU)*
- Was there a job plan for the work prior to the incident? *(Source data: job planning in paper format)*
- Has the employee attended a related safety talk? Was it recently? *(Source data: Safety talk attendance captured on paper going back years; the paper sheets are in 100s)*
- Does the foreman regularly hold safety talks? *(Source data: The data exists on paper in – 100s of documents)*
- Automate generation of prescriptive actions from data collected.

Other digital initiatives:

- Provide all datasets on digital platforms.

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 15 – Human Resources | B) Supporting Details

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
PeopleSoft	Safety incidents data, employee records data, WCB data, incident site data, etc.	Database	1000 employees, 500 inactive employees 150-200 safety incidents a year	Weekly reports	4
SmarterU	Certification history data, due trainings data, etc.	Database	4500 trainings for 10 year period		5
Job Planning	Job's risk assessment data, etc.	Currently on paper, moving to digital platform	Thousands of paper copies, 40 new per day		3
Safe Work Procedures	Instructions on how to properly preform task safely	PDF, Word (standardization of these documents is in progress)	1,580 files		Unknown
Work Observations	• Site inspections, forms filled by supervisors (written and scanned) • Committee site inspections (PeopleSoft)	• PDF • PeopleSoft – Committee inspections • Excel (records of scheduled vs performed inspections)	732 PDF files, P/S records		Unknown
Incident Investigations	• Incident Reports (PeopleSoft and paper) • Root Cause Analysis (PDF) • Near Miss Reports (some in PeopleSoft)	• PDF • Excel (Near Miss Reports) • PeopleSoft (Near Miss Reports)	5.98 GB, 2,988 files		Unknown
Chemical Assessments (not prioritized for ingestion at the moment)	Procedures, inventory lists, protection and equipment lists	PDF, Excel, Word (non standardized files)	26 MB, 76 files		1
Safety Talks	Topics covered, date of talks, attendance lists, training documentation	Scanned sheets of attendance/topic, Excel table	25.3 GB, 5,066 files		Unknown
Equipment Maintenance	Critical equipment inventory	Excel	2 Excel spreadsheets		Unknown
Regulations	• Regulations, assessments (i.e., audit – standardized PDFs) • Incidents (PeopleSoft) • Communications with the Province (emails/letters turned into PDF – they capture non-compliance – they are standardized forms and there are not many so can be manually filled in)	PDF, Excel, pictures	950 MB, 1,930 files		Unknown
Corporate Policy	Guideline, procedures	PDF, Word	35 MB, 81 files		Unknown
Hazard Assessment	Risk assessment, hazard assessment, job planning	PDF, Word, Excel (mix of both standardized and non-standardized)	20 MB, 121 files		Unknown

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 3 – Solid Waste | A) Analytics Canvas

Strategy
What is the crunchy question?

How do we optimize landfill management by guiding services, controlling revenue loss, and adjusting the pricing model?

Business Objectives

Why do we care? What do we want to achieve?

- Ensure that scale transactions are accurate
- Ensure that landfill service levels (i.e., level of staff, hours of operations, etc.) match required service
- Adequate controls are in place to minimize revenue loss by identifying anomalies in landfill transactions

Success

What does success look like?

- No anomalous transactions
- Optimize expenses and revenue

Risk

Any other risks?

- Is Wasteworks the right software platform to capture required data collection fields to support our analytics initiatives?

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Have ability to define types of reports needed, but no time

BLUE CAPABILITIES

- Have business understanding and the ability to provide inputs for use case development

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Solid Waste
- Information Systems and Technology
- Finance and Administration (for scale related tasks)

DEPENDENCIES

- May require changes from software vendor.
- Business need is similar to other municipally-run landfills. Can we cooperate? Is our software compatible?
- Integrate output of this use case into landfill management

Data
What data do we have in-place and what data do we need?

EXISTING

- Wasteworks Database (records material types, transaction time, vehicle weights, user)
- Video cameras at scale house

GAPS

- Unknown at this point as we don't have time to delve deeper into datasets at the moment.
- No third party data sets required.

Technology
What technology requirements are involved?

- Custom reports which look for anomalous patterns
  - Do some clients interact with a specific user more than others?
  - Does a user receive more of a specific material type than others?
  - Does a user use manual overrides more than others?

Crunchy Question 3 – Solid Waste | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

Priority 1: Determine transaction anomalies regarding following subjects:
- Customer
- Staff
- Weights and transactions
- Materials
- Manual overrides

Priority 2: Optimize landfill operations by determining:
- How do we correlate staffing with customer demand (i.e., landfill traffic)?
- How do we adjust our hours of operations to match customer demand?

Other digital initiatives:
Identify additional data collection fields in Wasteworks

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

Change management and Human Resources initiatives
- Staffing resources are optimized for incoming material

Long Term Outcomes

What are the ultimate goals (2+ years)?

- N/A

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Wasteworks	Transactional data (20-30 data attributes which in addition to transactions information include customer information and staff information)	Database	200,000 transactions / year (of last 5-10 years)	Monthly (anomalous transactions), seasonal (staff optimization)	5

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 16 – Solid Waste | A) Analytics Canvas

Strategy
What is the crunchy question?

How can we predict cart damage and replacement (asset planning)?

Business Objectives

Why do we care? What do we want to achieve?

- The City owns ~400,000 garbage and recycling carts which are assigned to properties. This represents a ~$20 million asset that requires management/replacement.
- Ensure that sufficient funds and replacement assets are available to replace carts that are damaged or reach end of life
- Identify causes of damage in order to reduce financial impact

Success

What does success look like?

- Determine indicators of cart damage (e.g., neighborhood, pick route, customer, seasonal events, number of transactions (i.e., how many times it was picked))
- Use these indicators as an input to allocate/budget sufficient funds to replace cart assets
- Number of carts repaired or replaced due to avoidable causes (e.g., contractor damage) decreases

Risk

Any other risks?

- N/A

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Need to create initial parameters – requires ability make analytical determination of patterns in data

BLUE CAPABILITIES

- Have business understanding and the ability to provide inputs for use case development

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Solid Waste
- Information Systems and Technology

DEPENDENCIES

- Would need to get more data from contractors that needs to be determined as we get closer to the use case
- Detailed tracking of how carts are damaged; we do have photographs of damaged carts, but they aren't attributed well

Data
What data do we have in-place and what data do we need?

EXISTING

- Big Data from Fleetmind API which records every time a cart asset is collected (i.e., time, location, collection vehicle) – the data is stored in CMS (a lot of data)
- Age (CMS)

GAPS

- Data quality – cart inventory matches real-world conditions
- Need to assess other factors which may affect cart damage (e.g., operator error, neighborhood typology)
- Determine baseline
- Need to develop a taxonomy of cart damage types

Technology
What technology requirements are involved?

- Need to perform bivariate analysis to identify patterns

Crunchy Question 16 – Solid Waste | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

Discovery phase to define variables (i.e., indicators of damage)
- Some examples include neighborhood, pickup route, truck number, customer, seasonal events, and number of transactions (how many times it was picked)

Dependencies:
- Develop taxonomy of cart damages based on photographs taken while repairing or replacing them (10k - 20k carts / year – in 2017 there were 17k)
- Data sharing agreements from contractors (dependency to get more data possibly)

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Trends and potential corrective actions to decrease cart damages are being identified based on data

Dependencies:
Data gathering protocols are in place and have been collecting good data for 1+ years

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Average lifespan of carts has been determined and replacements are budgeted accordingly
- External variables that affect cart life have been identified and corrected
- New variables which come up can be acted upon quickly

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Fleetmind (API)	Collection information (status code, latitude/longitude, vehicle number, cart details, photos, videos) – 12 to 15 attributes per transactions	Database/API	400,000 transactions per week	Monthly	4-5
CMS	Inventory of carts and services (customer information, cart information, and service information) – 50 attributes	Database	Cart: 400K Customers: 200K Service: types of services provided to the citizens – very static information	Monthly	3
311	Service requests for damaged carts (20-30 attributes including comments, contact information, case number, service request type, address of service request, photographs, detailed case log)	Database	10-20K a year	Monthly	3 (due to unstructured data, but it can be enhanced by requesting them to enter more structured datasets)
Network drive	Photos of cart damages	JPEG	40K+ Files	May not be required for reporting	3

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 24 – Water Services | A) Analytics Canvas

Strategy
What is the crunchy question?

What are the collective financial implications of a given work order and how can we leverage this information to forecast future costs/effort?

Business Objectives

Why do we care? What do we want to achieve?

- Measurement between the actual cost and forecasting model to enable adjustments through the year
- Understand what is the total cost of a work order
- Compare to the GL and forecast model by month
- Breakdown of man hours, hired equipment, outside consultants, supplies, salaries (all cost that are part of work order)
- Able to accurately cost work activities for projection of maintenance costs for budgeting purposes
- Provide cost insights to assist with finding efficiencies/cost savings and make determinations on whether outsourcing some tasks would be cost effective while meeting maintenance needs

Success

What does success look like?

- Easy comparison between forecasted cost and actual cost by work order
- How does this compare to the GL? Have supply costs come out of our accounts and what is still pending for each work order?
- Ability to accurately cost work tasks based on past work and input costs (i.e., labor, materials, equipment)
- Use maintenance cost data to accurately budget for maintenance
- Optimize maintenance activities with respect to cost, allowing better decisions to optimize discretionary maintenance activities

Risk

Any other risks?

- Costs are calculated in several different systems at different stages of the month.
- At times we don't have the right datasets to reflect actual costs (e.g., a general function/work order is used to lump different costs together, or at times some of the costs aren't captured).
- Outside contractors (other city divisions) take money directly from our accounts (not mapped to work order).
- Some systems (e.g., PeopleSoft) don't record our work order number.
- May require a significant level of rigor to collect, cleanse, and produce the data required to cost maintenance if a high level of granularity/detail is required
- May not yield intended benefits/objectives if cost to process data and report exceeds the benefit derived from collecting it

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Data manipulation, testing, and SQL querying skillsets are present in the division.

BLUE CAPABILITIES

- We have these capabilities in our divisions.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Multiple department (Corporate Finance, Public Works, Water Services)
- REPA forecasting model changes
- Work order and asset management changes
- Public Works permit system integration to PeopleSoft
- PeopleSoft change to stop divisions allocating money without a water services work order attached

DEPENDENCIES

- Multiple systems depend on using the same work order which comes from Water Services work management system.

Data
What data do we have in-place and what data do we need?

EXISTING

- Water Services collects some work order cost within the Work Order and Asset Management system.
- Much of the costs are missing or in systems not available.

GAPS

- Currently no communication between REPA, GL, and OWAM
- REPA does not collect work order data
- Public Works Cuts system not communicating with our work order system

Technology
What technology requirements are involved?

- Data for cost to work order inconsistently records cost of materials, hired vehicles, and outside contractors.

Crunchy Question 24 – Water Services | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

DISTRIBUTION

- Define measures to automate all work order cost into OWAM
- Define new processes for other divisions that directly take funds out of our accounts to better allocate cost to each work order
- Framework for Cuts (i.e., Type of Road (P1,P2,P3), condition of road, and size of excavation by Water Services) data to be costing of work order
- Framework to move REPA (Excel-like interface) into database format
- Reporting on work orders, REPA, and GL data for comparison of costs

TREATMENT

- Define measures to automate all work order cost into OWAM
- Framework to move REPA (Excel-like interface) into database format
- Report on costs assigned to work orders by
  - Fleet (source: Fleetbridge, and fleet billing system)
  - Crew (hours in OWAM, PeopleSoft hours including vacation, regular and over time rates)
  - Equipment (e.g., rent and contractors which can be sourced from purchasing order datasets in PeopleSoft Financial and be linked back to Work order)
  - Parts and materials (which can be sourced from purchasing order datasets in PeopleSoft Financial)
- Change in processes to link costs involved with equipment, parts and materials with work orders

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

DISTRIBUTION

- Ability to view work order, REPA, and GL data for projection of future work orders/costs, and historical trending analysis,
- Include external datasets such as weather data to project work orders.
- Optimization of work activities.

TREATMENT:

- Use past data and ability to simulate based on manual inputs to forecast budgets and for REPA forecasting
- Optimization of work activities (i.e., contractor vs internal)

Long Term Outcomes

What are the ultimate goals (2+ years)?

TREATMENT:

- Understanding maintenance vs replacement decisions based on costs

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 24 – Water Services | B) Supporting Details

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

DISTRIBUTION

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Oracle WAM	Work orders	Oracle Database	1000's per year	Unknown	2
PeopleSoft HR	Timekeeping	Oracle	70000 per year	Unknown	5
PeopleSoft Finance	GL cost	Database	1000's per year	Unknown	4
REPA	Forecasting model	Database	1000's per year	Unknown	4
Public Works	Cuts (permit number, cut details, total cost of the cut)	SQL Database	1000's per year	Unknown	4
Fleetbridge (GPS information)	GPS data on vehicle, vehicle details	Database	50 vehicles	Unknown	Unknown
Winnipeg Fleet Management	Billing (capital, lease, insurance costs, fuel purchases, repairs, etc.)	Excel	100's of invoices	Unknown	Unknown

TREATMENT

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
PeopleSoft HR & Financial	Employee salaries (overtime and regular rates, vacations, sick time), part/equipment purchase data (3-4 attributes)	Database	85 People 500-1000 equipment	Daily reporting	4 (information accurate, links to OWAM not always accurate)
OWAM (work orders)	Maintenance records (asset, location, timesheets against work orders, link to PO's, potentially linking to fleet costs)	Database	5-10k work orders per year	Daily/weekly reporting	3 (structure/detail, inaccurate labor and parts not always charged to WOs)
GL Excel (extract from PeopleSoft (above))	Transactions / accounts	Database / Excel	See first row	N/A	N/A
REPA	Forecasting model (multiple accounts – maintenance, fleet, etc.)	Database	Approximately 50 x 3 accounts	Unknown	4 (it is what the user enters)
Fleetbridge Note: majority of WO doesn't require fleet costs	GPS data on vehicle, vehicle details	Database	Total 50-75 vehicles, heavy equipment, locomotives, etc., but only two thirds will have GPS	Unknown	5
Winnipeg Fleet Management	Billing (capital, lease, insurance costs, fuel purchases, repairs, etc.)	Excel	See above	Unknown	3.5 (not always up-to-date)

Scope

- POC Portion
- Use Case (Phase 1 of 2, if applicable)
- Follow-Up Phase (If applicable)

Crunchy Question 21A – Water Services | A) Analytics Canvas

Strategy
What is the crunchy question?

How do we go from >50% to 0% unplanned maintenance? (Water Services)

Business Objectives

Why do we care? What do we want to achieve?

- Able to allocate resources better; optimize maintenance frequency based on true need for maintenance rather than simply time or failure basis; reduce overtime
- Develop analysis tools to support replacement vs continue maintaining/refurbishment business cases
- Meet the requirements of operating license and drinking water guidelines (i.e., treatment)

Success

What does success look like?

- Aspirational: 0% unplanned maintenance
- Incremental improvement in reduction of unplanned maintenance
- Identify top likelihood of failure (e.g., 10%), by criticality
- Able to predict when maintenance is needed, rather than performing maintenance on a set schedule and/or failure

Risk

Any other risks?

- Excessive maintenance; hard to prove model predicted accurately what was "going" to fail
- Current OWAM data on assets may not be accurate or sufficient to yield accurate predictive analysis

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- The division has data manipulation capabilities but lacks advanced data and analytics capabilities.

BLUE CAPABILITIES

- The division has a good understanding of its data and can provide required inputs to execute this analytics use case.

Process
Which divisions and owners are involved? What processes need to change?

UNITS INVOLVED

- Water Services
- Engineering

DEPENDENCIES

- Analytics output needs to be integrated in maintenance process.
- Improvements in the collection of OWAM maintenance data on assets by staff needs to be more strongly enforces to ensure accurate asset data is available to the analytics tools.

Data
What data do we have in-place and what data do we need?

EXISTING

- Refer to next slide

GAPS

- Vibration and integrity data on pipes
- Lack of digital stored information on product specifications and costs (they are stored in paper, random excel sheets, etc., but have capacity to store in OWAM)
- Quality of OWAM asset data in Water Services may be incomplete or inaccurate.

Technology
What technology requirements are involved?

- Reporting layer and analytics modeling required on a centralized dataset

Crunchy Question 21A – Water Services | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Develop predictive capabilities for 5-10 high-cost / high-risk assets from the list at the bottom
  - Establish a risk factor across assets to determine which part of the population has maintenance priority and when failure is anticipated
  - Roll-up and summarize findings in the form of a dashboard
  - Provide descriptive information on maintenance costs for assets (i.e., historic, current, predicted)
- Target to increase sophistication and accuracy of model across sprints
- List of the high value / critical assets include: 6 UV reactors, 17 pumps at regional stations, 4 raw water and 2 backwash pumps at WTP, 12 chemical pumps at WTP, 3 compressors at WTP, 5 pumps at Deacon Pump Station, and 6 chlorination systems at regional stations

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Simulate costs to prescribe replacement or maintenance to minimize expenses
- Develop capability to recommend and optimize when maintenance is required on an asset (i.e., move away from time-based maintenance and reduce maintenance required due to failure) to reduce downtime, reduce maintenance costs, and preserve asset longevity (where maintenance is more cost effective than replacement)
- Develop capability to determine necessary quantities of critical spare parts for assets based on optimized maintenance frequency and predicted failures

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Incorporate real-time data viewing

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
SCADA (holds information on assets)	Flow, pressure, temperatures, vibration, current, alarms, events, etc.	Database	Time series and alarm/event data on approximately 3000-4000 assets on 2 separate SCADA systems (10+ years of data)	Daily reporting (real-time data is available in SCADA)	4 (not all assets monitored in SCADA)
OWAM (work orders, asset maintenance)	Maintenance records, labor, materials/parts costs	Database	Unknown	Daily reporting	3 (structure/detail, inaccurate/missing labor, and maintenance history)
Files (manuals)	Specifications, costs	Mixed (paper, XLS, PDF)	Multiple spec documents and manuals for 3000-4000 assets	Daily reporting	1 (analogue)

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 21B – Wastewater Services | A) Analytics Canvas

Strategy
What is the crunchy question?

How do we go from >50% to 0% unplanned maintenance?

Business Objectives

Why do we care? What do we want to achieve?

- Able to allocate resources better; avoid overtime
- Equipment for process is working, avoid being out of compliance
- Meet the requirements of environmental act (i.e., collection and treatment)

Success

What does success look like?

- Aspirational: 0% unplanned maintenance
- Incremental improvement in reduction of unplanned maintenance
- Identify top likelihood of failure (e.g., 10%), by criticality

Risk

Any other risks?

- Excessive maintenance; hard to prove model predicted accurately what was "going" to fail

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- The division has data manipulation capabilities but lacks advanced data and analytics capabilities.

BLUE CAPABILITIES

- The division has a good understanding of its data and can provide required inputs to create this analytics use case.

Process
Which divisions and owners are involved? What processes need to change?

UNITS INVOLVED

- Wastewater Services
- Engineering

DEPENDENCIES

- Analytics output needs to be integrated in maintenance process.

Data
What data do we have in-place and what data do we need?

EXISTING

- Refer to next slide

GAPS

- Vibration data on pipes
- Detailed datasets such as pressure, temperature, etc., on 1000 plus pumps whose information is stored in SCADA
- Lack of digital stored information on product specifications and costs (they are stored in paper, random excel sheets, etc.)

Technology
What technology requirements are involved?

- Reporting layer, and analytics modeling required on a centralized dataset

Crunchy Question 21B – Wastewater Services | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Develop predictive capabilities for high-cost / high-risk assets (6 main pumps)
  - Establish a risk factor across assets to determine which part of the population has maintenance priority and when failure is anticipated
  - Roll-up and summarize findings in the form of a dashboard
  - Provide descriptive information on maintenance costs for assets (i.e., historic, current, predicted)
- Implement first across 6 main pumps
- Extend to 100 medium priority pumps to expand value
- Target to increase sophistication and accuracy of model across sprints

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Continue to develop capability for blowers and remainder of ~900 pumps within SBR
- Simulate costs to prescribe replacement or maintenance to minimize expenses

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Expand capabilities to 1000+ pumps in SCADA system, acknowledging that much less variety of information is captured relative to DCS assets
- Incorporate real-time data viewing
- Develop capability to anticipate pipe and valve failure (to move past run-to-fail operating model)

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
DCS (holds information on 1000 wastewater treatment pumps and 13 blowers)	Flow, pressure, temperatures, vibration, current	Database	Time series data on the 5 data entities listed since 2013 (6 years) in the live system with potentially history archived	Daily reporting	3 (completeness)
OWAM (work orders)	Maintenance records, labor	Database	Unknown	Daily reporting	3 (structure/detail, inaccurate labor)
Files (manuals)	Specifications, costs	Mixed (paper, XLS, PDF)	Multiple specification documents for the 2000 pumps and 13 blowers	Daily reporting	1 (analogue)
SCADA (holds information on 1000 pumps for collection)	ON/OFF, flow, levels	Database	Unknown	Daily reporting	Unknown

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

Crunchy Question 10 – Customer Service | A) Analytics Canvas

Strategy
What is the crunchy question?

What proportion of Utility Billing Center calls have been diverted to the MyUtilityBill portal?

Business Objectives

Why do we care? What do we want to achieve?

- Divert quick response questions and standard information submission to MUB (MyUtilityBill) to allow customers with complex issues faster access to a Billing Representative (e.g., Did you receive my payment? How much is my bill? I'm moving, what information do you need?)
- Knowing whether our customers get the information they need from MUB will help us determine appropriate resource allocation to improve MUB or other aspects customer service.

Success

What does success look like?

- From diversion point of view we would like to know KPIs that help determine success by Service Level (80/60), Wait Times, interaction volume.

Risk

Any other risks?

- Data accuracy due to a multitude of varying factors that impact KPIs (e.g., staffing levels, billing cycle, growth in customer base, frozen services, etc.)
- Granularity of date (e.g., wrap up codes, CCB contact type, etc.)
- *Dependency:* Wrap up codes aren't granular enough at the moment to allow for meaningful data-driven insight. These codes need to be broken down further and enough data needs to be produced for generating meaningful insights.

People
What talent/capabilities do have and which do we need?

RED CAPABILITIES

- Contact Centre Specialists have access to KPI data but do not have the time and/or expertise to compile, consider variables, and qualify the data.

BLUE CAPABILITIES

- The division has blue capabilities to guide implementation of the use case.

Process
Which business units and owners are involved? What processes need to change?

UNITS INVOLVED

- Customer Service
- Finance and Administration
- Information Systems and Technology

DEPENDENCIES

- Collection and storage of data in CCB related to contact information

Data
What data do we have in-place and what data do we need?

EXISTING

- PureConnect – customer phone number, customer email address, KPI statistics, wrap up codes
- CCB – customer phone number (historical data moved to customer contact), contact type, MUB users
- MUB application – Audit information, web forms

GAPS

- Wrap up code data is difficult to extract from PureConnect
- Demographics data to understand customer's channel preference

Technology
What technology requirements are involved?

- *Dependency:* PureConnect integration with CCB and/or MUB is a challenge. At present, PureConnect identifies conversations based on the phone number from which the call was received but doesn't record customer ID, whereas CCB uses a unique identifier and MUB uses an email id. Such incoherent tracking of client conversations would make it challenging to link the three systems. However, in the near future, MUB and CCB will have the same identifier to identify the customer.

Crunchy Question 10 – Customer Service | B) Supporting Details

Short Term Outcomes

What are the goals within the first 6 months?

- Identify data sources
- Identify and implement processes to collect the required data (i.e., breakdown of wrap up codes)

Medium Term Outcomes

What are the goals within the first 1 to 2 years?

- Understand whether MUB is reducing interactions with the UBC
  - Priority 1: Understanding traffic diversion from the call center to the portal and understand why MUB users are interacting with the UBC
  - Priority 2: Understanding user behavior on the portal

Long Term Outcomes

What are the ultimate goals (2+ years)?

- Continue to enhance MUB in areas that provide value to our customers and diverts interactions to online service

Data Details

Additional information regarding sources to help estimate effort in addressing the crunchy question.

Source Name/Description	Data Type/Data Entity	Format	Volume	Transaction Frequency required for generating reports	Perceived Data Quality (1 low, 5 high)
Genesys PureConnect	Customer phone number or email address, date of interaction, wrap up code	Database	Approximately 800 – 1100 recorded interactions per day (since Dec 2014)		5
CCB	• Identifies MUB users • Customer phone number • Reason for interaction (text field) • Customer contact type • Account number	Database	210k water meters		5 1 3 2 5
MUB	Identifies MUB users, customer email address, site activity, CCB account number, meter number, audit information (i.e., how many users, which page they visited and for how long, etc.)	Database	Active profiles 27,176 (to Jan 4/19) Data since Jan 4 2018		5

Scope

POC Portion | Use Case (Phase 1 of 2, if applicable) | Follow-Up Phase (If applicable)

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