Draft Tech Memo from December 12, 2013 Meeting

I. Background

Sustainability goals for the Department of Public Works (DPW) are part of a broader plan for *Sustainable DC* that includes a series of integrated goals encompassing job growth, economic development; city-wide health improvements from clean air and water along with healthier food supplies and lifestyles; diversity and improved social access to needed services; and protection of local environmental assets for citizens, wildlife, and future generations.

Among the goals directed at current waste management operations by Mayor Gray's *Sustainable DC* Plan is zero waste in 2032. Reductions in waste generated and value capture through reuse, recycling, composting and energy production are both considered integral to achieving this goal. For success, the District must develop an integrated solid waste management system that redefines solid waste from a burden that needs to disappear to a resource with economic, environmental and social value.

The inherent definition of sustainability is the wise and efficient use of natural and financial assets by current generations to assure viability for those in the future. The DC Department of Public Works (DCDPW) Strategy Roadmap is a planning tool to achieve that sustainability. It will provide identification and assessment of natural and financial capital investments relative to technology and process options that, in turn, provides an evidence-based guide for implementing future policies and programs to develop and sustain critical systems, as well as optimize outcomes that will meet the planned sustainability goals.

The Strategy Roadmap (SR) is evaluating alternative integrated solid waste management scenarios (including the current state) that can maximize the embedded value of DPW assets and management processes to meet *Sustainable DC* goals; develop an evaluation strategy and framework to quantitatively compare the investments necessary for each of these alternatives; and to evaluate the results. By quantifying and comparing investments needed to optimize baseline waste management operations for the future, the District will be in a better position to identify impact mitigation, cost savings, value creation and positive environmental justice outcomes that contribute to a *Sustainable DC* while making informed management choices regarding its future operations.

The SR study will map strategic and process options needed to achieve the spectrum of goals established in the *Sustainable DC* plan by more specifically evaluating whether and how to:

- Increase the District's recycling diversion rate
- Recapture the embedded energy and economic value of its waste (or residual material assets)
- Optimize the value of the waste (residual) stream while providing economic sustainability over the long term
- Interact with jurisdictional partners in operating a solid waste (residual material) management system
- Make the most efficient use of constrained air, land, and water assets within DC and in the surrounding jurisdictions to enable both conservation and future growth.

II. Study Design and Structure

The design basis of this strategic evaluation study includes depiction of the current system for use as a baseline, and compare future operational scenarios that meet *Sustainable DC* goals, improve operational efficiency, and optimize services. To develop these scenarios, the Arcadis Team met in workshops with DC

DPW representatives and experts to:

a) confirm the component elements of the DC system to be addressed in the study,
b) establish the Sustainable DC goals achievable or affected by DC DPW processes, and
c) identify scenario designs that compare best practice structural and technical process alternatives to identify design and investment strategies best able to meet Sustainable DC goals.

This technical memo incorporates findings and direction developed in these workshops. Additional design and scenario development will occur as part of a public scoping process scheduled in 2014.

A. DPW Operational System Components

1. *Locations and Participants*

Solid residual material treated as "trash" or "garbage" in DC is a dual public/private system with both local and extra-territorial natural capital parameters to the system. Both DPW and private hauling companies carry out collection and storage processes within the DC geographic/natural capital scope, but full-cycle handling of residual material assets include natural capital of other jurisdictions. A simplified matrix of Arcadis' current understanding of the system would be thus:

	Intra-borders	Regional
DPW/DC Government	Collection; Diversion (Water, Reuse), Sorting, Transfer	Sorting; Recycling, Fuel, Landfill
Private Haulers	Collection; Diversion (Reuse), Sorting, Transfer	Sorting, Recycling, Fuel, Landfill

2. *Overview Data of System Loads*

- 900,000 tons Residual Material managed in the District,

500,000 tons through its two transfer stations, 100,000 additional tons are reported as recycled by commercial haulers, and 300,000 tons of municipal solid wastes (MSW) are processed through private sector transfer stations.

- 135,000 tons per year DC DPW collected
  25,000 tons of recyclables and 8,000 tons of leaves from residential properties. DPW collects an additional 50,000 tons of materials through its street and alley cleaning program and citizen drop-off services;
  42,000 tons from District government agencies and contractors servicing government building at the transfer stations
- 225,000 tons of solid waste exported to the Fairfax County Energy Resource Recovery Facility in Lorton
- Recyclables and organics (tonnage TBD) go to Maryland and Virginia facilities for processing.

3. *Volume/Flow Throughput Process Phases*

The DPW system for material processing is comprised of four main operational activity phases:

- **Generation** - Residual material discarded by DC homes, businesses, and government entities; litter and street accumulation
- **Collection** - Vehicles and processes used to accumulate, transport, and deposit discarded materials for further management
- **Diversion** - Sorting, separation, and transfer of materials for a variety of follow-on options that can include, reuse, bio-reuse (compost), recycling, refining (energy production), or other options
- **Disposition** - final disposal of discarded material with no further use intended

4. *Opportunity Linkages between Sustainable DC Goals and DPW Operational Phases*

The following chart depicts the foundational mapping of the phases of the DPW processes to the *Sustainable DC* goals, thereby identifying the potential gains and contributions that process improvements in those phases could contribute to the Plan.

Sustainable DC/**DPW Goal Map**

DPW Phase	DC Sustainability Goal	Best or Available Practice Options	Natural Capital Capacity Affected (DC and Regional)
Phase I: Residual Material Generation	15% Reduction in Residual Material (RM) Generation Recast Materials as Reusable 20% reuse of Construction/Demolition Material Styrofoam Elimination	a. Bans b. Content Regulations c. FAR	DC A/L/W Regional A/L/W Banked Capacity/ Credits
Phase II: Collection	Reduce Greenhouse Gases by 50% (truck fuel)	a. Combined Collections b. Fuel Switch c. Shrink distances	DC A/L/W Regional A/L/W Banked Capacity/ Credits
Phase III: Diversion	80% Diversion of RM from landfills 50% reduction in GHG (methane leakage) 50% increase in renewable energy Ensure Capacity/Capability for Population Growth Grow DC Economy	a. DC-based Energy Refining b. Increased regional Energy Refining b. DC-based increased recycling c. Increased Regional recycling	DC A/L/W Regional A/L/W Banked Capacity/ Credits
Phase IV: Final Disposition	Zero RM to Landfill	See Phase III	DC A/L/W Regional A/L/W Banked Capacity/Credits

B. Scenario Development Parameters

Project workshop meetings held with DCDPW client representatives confirmed the strategic directions of the DCDPW, the linkages to the Sustainable DC goals, and preliminary scope of the comparative scenario structure:

1. *Overarching Strategic Goals/Direction*

The combination of future growth planning and sustainability planning/goals provides opportunities and economies of scale to the District to:

- Restructure and green its flow and management of solid materials
- Design and operate the system to bring greater value and return to the DC economy and its citizens in the form of jobs, renewable energy, local control, energy resiliency, natural capital capacity, and technological advancement

Key aspects of the analysis will be informed by the following precepts:

- Residual solid materials should be viewed as usable, recoverable, or refinable assets, and
- Geographically internalized management can be a potential positive economic and environmental activity for a municipality (this concept has already informed successful solid material management programs in Seattle, San Francisco, Chicago, New York and San Jose)

2. *Goal and Future Practice Elements*

As previously identified, the DCDPW solid materials management system consists of four phases (Generation, Collection, Diversion, and Disposition) each with possible location, technology, and process options that can optimize operations in conjunction with DC economic and sustainability goals. As a result of the mapping correlation between goals and process phases, the Generation and Diversion Phases provided the widest filed of opportunity for meeting sustainability goals, and will be a primary focus of the scenarios. Using research, workshop discussions and reviews, and subject matter expert input, planned scenarios will be based on the following core concepts:

A. A "Baseline" Scenario comprised of air, land, water and cost elements of the current system (including both internal/DC and regional system elements such as landfills, transfer stations, collection processes), and "throw" rates.
B. A source reduction in "throw rate" equal to the planned Sustainable DC goal of 15% will be included in the Generation phase of each alternative scenario
C. "Alternative" scenarios will use a matrix format to assess location, technology, and process options that best implement the overarching strategic goals for economic and sustainability optimization aligned with Sustainable DC goals and will include:
    - An 80% diversion rate under the DC Sustainability Plan from optimized recycling and recovery with assets in the DC tax base
    - An 80% diversion rate under the DC Sustainability Plan from optimized recycling and recovery with assets in the metropolitan area
    - An 80% conversion rate under the DC Sustainability Plan from optimized fuel/energy production with assets in the DC tax base
    - An 80% conversion rate under the DC Sustainability Plan from optimized recycling and recovery with assets in the metropolitan area

D. The scenarios will also take into account District sustainability/economic goals including (but not limited to) job creation, renewable energy, water savings, greenhouse gas reductions, density, and population increase.

As a result of the system analysis and workshop activities, a scenario design has been developed as depicted in the following chart:

Alternative Scenarios Matrix

Scenario/Process Activity	Phase 1 Load Production	Phase 2 Load Collection	Phase 3 Load Diversion	Phase 4 Load Disposition
Baseline	Baseline	Baseline	Baseline	Baseline
Optimization A1	15% Source Reduction	TBD	80% Diversion through Recycling with DC Built and Natural Infrastructure	Landfill Minimization/Elimination
Optimization A2	15% Source Reduction	TBD	80% Diversion through Recycling with Regional Built and Natural Infrastructure	Landfill Minimization/Elimination
Optimization B1	15% Source Reduction	TBD	80% Diversion through Refining with DC Built and Natural Infrastructure	Landfill Minimization/Elimination
Optimization B2	15% Source Reduction	TBD	80% Diversion through Refining with Regional Built and Natural Infrastructure	Landfill Minimization/Elimination

C. Scenario Comparison Parameters

The District of Columbia's material management system must be capable of meeting the Mayor's Sustainable DC plan goals, achieving an economical increase in the District's waste diversion rate, capturing embedded waste stream economic value, and optimizing system component choices among jurisdictional entities in order to provide sustainable economic growth over the long term. To do so, DCDPW will assess solid residual management process from the perspective of achieving sustainability goals, and develop factual, quantity-based, empirical data, info and knowledge to inform residual handling decisions with evidence-based alternatives analysis.

To structure a materials management system with these capabilities, DCDPW must develop program, process, and technology options to sustainably use natural and financial asset capacity. For purposes of this study, actual levels of air, land, and water consumption or other permanent use of natural infrastructure asset capacity available and accessible under regulatory and supply restrictions are considered primary sustainability criteria to evaluate system operation and future management strategy.

1. *Capacity to Capability Analysis*

Arcadis is providing the requested project evaluation using a *Capacity to Capability* analytic method that allows client decision-makers to build capability-based, sustainable system design strategies by first identifying and measuring capital asset capacity needed to meet capability goals, then developing scenario options that efficiently reduce or minimize capacity needed to generate the highest levels of system performance at the lowest capital use rates. The analysis captures reduced asset capacity use as equity value that can be made available to other system capability needs, economic development, or recorded as credits for future use.

Capability-based scenarios as further refined in public scoping meetings will include various technology and process elements whose natural, physical, and financial infrastructure capacity is sustainably available, accessible, and affordable to operate a system capable of attaining the project goals. Each scenario element will be inventoried for its use levels of natural, physical, and financial capital assets, whether available to the system or necessary to acquire. The evaluation process will address overall governance requirements, including siting, regulatory, legal, institutional and other requirements applicable or contingent to each scenario alternative. In addition, project analytics will includes jurisdictional and operational partnering opportunities within the residual asset management system region-wide. Facilitated public participation activities will be included at key steps to provide review and input on the project progress and deliverables.

2. Natural Capital Asset Management (NCAM)™

By focusing on the measurable volumes of natural, physical, and financial capital that are, or might be used to avoid, reduce, or handle materials managed by the residuals/waste system, this evaluation quantitatively identifies needed technology and processes capable of providing system-wide capability for handling residual materials at the lowest asset capacity use levels. As part of its analysis, Arcadis will use Natural Capital Asset Management (NCAM)™ to provide the framework for completing this work. NCAM™ is a relational database tool that has been developed to allow for the comparison of alternative solutions to complex problems and give decision-makers information they need to select solutions which uses the lowest or most efficient volumes of capital assets to achieve the greatest system capability performance, as well as consider other key capital factors.

An NCAM™ measures deeds, leases, permits, and other natural element access rights as natural infrastructure--an essential category of working capital to physical, financial, and workforce assets--whose usable and affordable capacity generally define the upper limits of operational capability for enterprise activities. NCAM™ records inventory levels, utilization rates, and cost/value elements for natural assets using analytic modalities comparable to these other enterprise capital elements. Operational alternatives under consideration by an enterprise system are measured and compared for the total amount of capital assets used in key categories indexed against the units of productivity achieved. Project and operational activities are thus evaluated for their sustainability, allowing decision-makers to optimize enterprise capability and output by selecting alternatives with the lowest capital use for greatest output.

The data elements are based on direct, or algorithmically or arithmetically derived, units of affected air, land, and water elements and sub elements thereof or thereupon, that are used or conserved by the client enterprise for economic or social goals both internal and external to its operations. Standard and client-specific configuration protocols are developed and used during

analysis phases to evaluate data source, availability, consistency, time and spatial factors, units of measure, and other data parameters needed for quality control and assurance in both design and operation phases. The NCAM™ activities in this Strategy/Roadmap project will use primary data correlations between the actual use rate of natural infrastructure assets (as informed by financial costs) and the waste materials avoided or managed to map a strategy for investment in environmentally preferable technologies and procedures that **meet Sustainability DC goals**

3. Affected DC Natural Capital Assets

DPW process phases use Natural Infrastructure Asset capacity in both Operational (OPS) and Residual Material Management (RMM) activities**.** Each DCDPW Process Phase uses a definable volume of air, land, and water that can be determined through actual measurement or formulaic calculation. The likely affected asset capacity is charted below.

Anticipated Natural Capital Asset Use Categories in DPW Systems

Air Asset Capacity (RMM)	**Land Asset Capacity (OPS, RMM)**	**Water Asset Capacity (OPS, RMM)**
Criteria Pollutants	Built Infrastructure (Stationary, Transport)	Process
Greenhouse Gases	Storage	NPDES
Hazardous Pollutants	Safety/Setback	Sanitary/Sewer
	Fill/Burial	

III. Implementation Activities

Tasks are underway as part of the project plan to collect data on the baseline activity phases and operational activity likely under the scenarios developed.

In articular, the prposed scenarios will be made available for review, comment, and revision in public meetings planned in the early art of 2014.