

**STATE OF OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY**  
**CONTRACT AMENDMENT**  
Improving Recycling Systems in Oregon

- A. This is Amendment No. **5** to Contract No. **057-19** (as amended from time to time the “Contract”) dated 2/12/2019 between the State of Oregon acting by and through its Department of Environmental Quality hereafter called DEQ or Agency, and **Cascadia Consulting Group, Inc.**, hereafter called Contractor.

CONTRACT AMOUNT TO DATE	AMENDMENT AMOUNT	TOTAL AMENDED AMOUNT OF CONTRACT
\$150,000	\$146,290	\$296,290

- B. The Contract is hereby amended as follows (deleted language is indicated by [ ~~brackets and stricken text~~ ] and new language is indicated by **bold underlining**):

Agency’s Contract Administrator for this Contract is:

[~~Brian Staffki~~] **Peter Spendelow**

Materials Management

700 NE Multomah Street

Portland, OR 97232

Phone: (503) [~~229-5492~~] **229-5253**

[~~staffki.brian@deq.state.or.us~~] **spendelow.peter@deq.state.or.us**

4.1 Not to Exceed Compensation. The maximum, not-to-exceed compensation payable to Contractor under this Contract, which includes any allowable expenses, is [~~\$150,000~~] **\$296,290**.

**EXHIBIT A, PART III–BUDGET, DELIVERABLES AND SCHEDULE**

Tasks	Deliverables	Schedule <sup>1</sup>	Budget <sup>2</sup>
Phase 2 – Collections and Processing Research			
Task 1. Develop Recycling Collection Systems Case Studies	• Final research plan	Due 1 week after DEQ and Partner feedback	
	• Draft case studies and summary memo	Due 4 weeks after executing Amendment 2	
	• Revised case studies and summary memo	Due 2 weeks after DEQ and Partners feedback	
	• Presentation to DEQ and Partners	Due 1 week after revised case studies and summary memo	
	• <b><u>Final case studies and summary memo</u></b>	<b><u>Due 4 weeks after execution of Amendment 5</u></b>	

Tasks	Deliverables	Schedule <sup>1</sup>	Budget <sup>2</sup>
Total for Task 1			<del>[\$18,280]</del> <b>\$19,700</b>
Task 2. Assess Potential Recycling Sorting and Processing Systems	<ul style="list-style-type: none"> <li>Final research plan</li> </ul>	Due 1 week after DEQ and Partner feedback	
	<ul style="list-style-type: none"> <li>Draft case studies and summary memo</li> </ul>	Due 6 weeks after executing Amendment 2	
	<ul style="list-style-type: none"> <li>Revised case studies and summary memo</li> </ul>	Due 2 weeks after DEQ and Partners feedback	
	<ul style="list-style-type: none"> <li>Presentation to DEQ and Partners</li> </ul>	Due 1 week after revised case studies and summary memo	
	<ul style="list-style-type: none"> <li><b><u>Final case studies and summary memo</u></b></li> </ul>	<b><u>Due 5 weeks after DEQ and Partner feedback</u></b>	
Total for Task 2			<del>[\$36,435]</del> <b>\$38,995</b>
Task 3 — Public Engagement, Compliance and Incentive Alternatives	<ul style="list-style-type: none"> <li>Draft research plan and sample template</li> </ul>	Due 1 week after execution of Amendment 3 (not including Federal holidays)	
	<ul style="list-style-type: none"> <li>Final research plan and sample template</li> </ul>	Due 1 week after receiving DEQ and Partner feedback	
	<ul style="list-style-type: none"> <li>Draft case studies and summary memo</li> </ul>	Due 8 weeks after finalized research plan	
	<ul style="list-style-type: none"> <li>Revised case studies and summary memo; Presentation to DEQ and Partners</li> </ul>	Due 2 weeks after receiving DEQ technical review; presentation due 1 week after revised research case studies and summary memo	
	<ul style="list-style-type: none"> <li><b><u>Final case studies and summary memo</u></b></li> </ul>	<b><u>Due 6 weeks after DEQ and Partner feedback</u></b>	
Total for Task 3			<del>[\$13,600]</del> <b>\$14,980</b>
Task 4 — Model Design and Base Case Scenario Development	<ul style="list-style-type: none"> <li>Draft research plan and model description</li> </ul>	Due 2 weeks after execution of Amendment 3 (not including Federal holidays)	
	<ul style="list-style-type: none"> <li>Revised research plan and model description</li> </ul>	Due 1 week after DEQ and Partner feedback	
	<ul style="list-style-type: none"> <li>Base-case data collection and draft model; review meetings with DEQ</li> </ul>	Due 9 weeks after finalized research plan and model description	
	<ul style="list-style-type: none"> <li><b><u>Revised model and base-case modeling</u></b></li> </ul>	<b><u>Due 1 week after DEQ technical review</u></b>	
	<ul style="list-style-type: none"> <li><b><u>Presentation of model and base-case modeling to DEQ and Partners</u></b></li> </ul>	<b><u>Due March 12, 2020</u></b>	

Tasks	Deliverables	Schedule <sup>1</sup>	Budget <sup>2</sup>
	<ul style="list-style-type: none"> <li><u>Final model and base-case modeling</u></li> </ul>	<u>Due 4 weeks after DEQ and Partner feedback on revised model and base-case modeling</u>	
Total for Task 4			<del>[\$33,070]</del> <b>\$52,015</b>
Task 5 — Initial Scenario Selection and Analysis	<ul style="list-style-type: none"> <li>Check-in call with DEQ and Partners</li> <li><u>Draft memo with four scenario definitions</u></li> <li><u>Revised scenario definition memo</u></li> <li><u>Presentation of draft scenario definitions to DEQ and Partners; final scenario definitions</u></li> <li><u>Draft scenario modeling results</u></li> <li><u>Revised scenario modeling results</u></li> </ul>	<p>Due <del>[March 13]</del> <b>February 13, 2020</b></p> <p><u>Due February 17, 2020</u></p> <p><u>Due February 25, 2020</u></p> <p><u>Due February 28, 2020</u></p> <p><u>Due seven weeks after final scenario definitions</u></p> <p><u>Due May 7, 2020</u></p>	
Total for Task 5			<del>[\$8,615]</del> <b>\$77,390</b>
<u>Task 6 — Secondary Scenario Selection and Analysis</u>	<ul style="list-style-type: none"> <li><u>Presentation of Task 5 scenario modeling results to DEQ and Partners; definitions of two additional scenarios</u></li> <li><u>Results of second revision of Task 5 scenario modeling with revised inputs from DEQ and Partner feedback</u></li> <li><u>Draft scenario modeling results of two additional scenarios</u></li> <li><u>Revised scenario modeling results of two additional scenarios</u></li> <li><u>Presentation of all revised scenario modeling results to DEQ and Partners</u></li> <li><u>Final modeling and results of all scenarios</u></li> </ul>	<p><u>Due May 15, 2020</u></p> <p><u>Due two weeks after DEQ and Partner feedback on modeling results</u></p> <p><u>Due five weeks after finalized definitions for two additional scenarios</u></p> <p><u>Due one week after receiving DEQ technical review</u></p> <p><u>Due one week after two additional scenario revised modeling</u></p> <p><u>Due three weeks after receiving DEQ and Partner feedback on revised scenario results</u></p>	

Tasks	Deliverables	Schedule <sup>1</sup>	Budget <sup>2</sup>
<b>Total for Task 6</b>			<b>\$53,210</b>
Total For Phase 2			[\$110,000]
			<b>\$256,290</b>

<sup>1</sup>Deliverable due dates may only be modified by written amendment. Schedule excludes Federal holidays.

<sup>2</sup>Shifts between task budgets may be authorized with prior written approval of the DEQ Contract Administrator.

#### EXHIBIT A, PART IV—ACCEPTANCE CRITERIA AND PROCESS

Phase 2 Tasks 1, 2, 3, 4, ~~and~~ 5 **and 6**

Task 1 final case studies and summary memo — Receipt and DEQ approval of final case studies and summary memo

Task 2 final case studies and summary memo — Receipt and DEQ approval of final case studies and summary memo

Task 3 final case studies and summary memo — Receipt and DEQ approval of final case studies and summary memo

Task 4 revised model and base-case modeling — Receipt and DEQ approval of revised model and base-case modeling

Task 4 presentation of model and base-case modeling to DEQ and Partners — Receipt and DEQ approval of presentation of model and base-case modeling to DEQ and Partners

Task 4 final model and base-case modeling — Receipt and DEQ approval of final model and base-case modeling

Task 5 draft memo with four scenario definitions — Receipt and DEQ approval of draft memo with four scenario definitions

Task 5 revised scenario definition memo — Receipt and DEQ approval of revised scenario definition memo

Task 5 presentation of draft scenario definitions to DEQ and Partners; final scenario definitions — Receipt and DEQ approval of presentation of draft scenario definitions to DEQ and Partners; final scenario definitions

Task 5 draft scenario modeling results — Receipt and DEQ approval of draft scenario modeling results

Task 5 revised scenario modeling results — Receipt and DEQ approval of revised scenario modeling results

Task 6 presentation of Task 5 scenario modeling results to DEQ and Partners; definitions of two additional scenarios — Receipt and DEQ approval of presentation of Task 5 scenario modeling results to DEQ and Partners

Task 6 results of second revision of Task 5 scenario modeling — Receipt and DEQ approval of revised results of Task 5 scenario modeling

Task 6 draft scenario modeling results of two additional scenarios — Receipt and DEQ approval of draft scenario modeling results of two additional scenarios

Task 6 revised scenario modeling results of two additional scenarios — Receipt and DEQ approval of revised scenario modeling results of two additional scenarios

Task 6 presentation of all revised scenario modeling results to DEQ and Partners — Receipt and DEQ approval of presentation of all revised scenario modeling results to DEQ and Partners



- Paper:
  - Corrugated boxes
  - Newsprint
  - Other boxes and paperboards
  - Printing and writing paper — divided into four sub categories
- Plastics:
  - PET bottles and jars
  - HDPE bottles and jars
  - PET Thermoforms
  - PP bottles, containers, and other small rigid PP
  - PS form and non-foam containers and packaging
  - PE Film
  - Pouches
- Other:
  - Cartons
  - Polycoated containers (e.g., cups)

Materials for baseline and forecasting using population or employment growth factors only include:

- Glass
- Metals

Research into industry trends will include interviewing production industry experts and reviewing available proprietary paper and plastic industry databases.

Research could consider factors such as:

- Industry-specific consumption projections.
- Consumption patterns in the Pacific Northwest compared to the United States.
- Trends in consumer preferences.
- Trends in packaging types.
- Impending federal, state and local legislation.
- China's Blue Sky Policies.
- Supply and demand for recycled content.
- Costs of feedstock materials.
- Impact of tariffs or other trade barriers.

Contractor will then quantify the expected changes in baseline projections for each of the materials selected from Subtask 1.1. Contractor will adjust each targeted material within their forecasting model by increasing or decreasing the forecasted change by material in 2025. Contractor will conduct a sensitivity analysis to assess impacts in conservative versus extreme-change cases. Contractor will use results to project the quantity of targeted materials generated in Oregon and Washington in urban and rural areas and by generator group, depending on data availability in the baseline provided by Oregon DEQ.

#### Task 2. Recommend Targeted Recyclable Material List

Contractor will use findings from Task 1 regarding projected quantities of targeted materials generated in Oregon in 2025 to propose recommended materials to be analyzed in Phase 2.

Contractor will start this task by developing a proposed list of evaluation criteria for targeted materials. Criteria for recommended changes will likely include:

- Projected quantities of each material generated in 2025 and emerging recyclable and contaminant materials (from Task 1).
- Anticipated long-term local, regional, and international markets and values (based on our team's expertise and research in Task 1).
- Environmental impact of materials (based on DEQ's pioneering lifecycle research and analysis).

Based on the results of Contractor's evaluation, Contractor will provide initial recommendations to DEQ and Partners regarding the materials to be addressed in Phase 2. Contractor will then work with DEQ to agree on a final list of materials to be addressed in Phase 2.

## PHASE 2 – COLLECTIONS AND PROCESSING RESEARCH

This research will be conducted to help DEQ and Partners make informed decisions about which collection and processing infrastructure improvements to pursue. Phase 2 research will analyze options and examine their capabilities, costs and other factors relevant to making decisions for Oregon's future system. Depending on the results of Phase 2 infrastructure research and decisions about future legal and relational frameworks, DEQ and Partners may decide to add new infrastructure or program elements, improve existing ones, make some substitutions for existing infrastructure or combination of these. DEQ may consider future Amendment(s) to help identify several optimal scenarios for a future system, narrow them down, and investigate key aspects helpful with implementing one scenario.

Minor adjustments to the Services performed by Contractor in Phase 2 may be authorized by a written Change Order Form (Exhibit E – Change Order Form) signed by the Contractor Contract Administrator and the DEQ Contract Administrator. A written Change Order may authorize only minor changes to the Services. Changes to deliverables, deliverable dates and the budget must be authorized by written amendment to this Contract.

### Phase 2, Task 1 – Collection Alternatives

#### Task Goal

The goal of this task is to provide DEQ and Partners with information on alternative collection methods that will be used to inform which collection methods to include in developing scenarios and conducting analysis.

#### Scope

Contractor will develop four to six (4-6) case studies of jurisdictions that use agreed-on collection methods. Case studies will address key characteristics agreed on in the research plan. Case studies will include jurisdictions in the United States and Canada.

Contractor will also develop a 1- to 2-page high-level memorandum summarizing the benefits, drawbacks, and other relevant considerations of the collection methods included in case studies. The memorandum will include recommendations on which, if any, of these collection methods to include in scenario analysis.

At the start of this task, Contractor will develop a draft research plan that includes the types of collection methods to be researched and types of data to be collected. Contractor will revise the draft research plan based on comments from DEQ.

During the course of research, Contractor will confirm with DEQ the specific jurisdictions to be researched and summary memo outline.

Contractor will share the draft case studies and summary memo with DEQ for initial review. Upon receipt of feedback from DEQ, Contractor will incorporate the feedback and revise the case studies and summary memo. Contractor will share the revised results in a presentation with DEQ and Partners.

Based on additional feedback provided by DEQ and Partners, contractor will revise and provide final versions of the case studies and summary memo.


### Phase 2, Task 2 – Processing Alternatives

**Task 6 final modeling and results of all scenarios — Receipt and DEQ approval of final modeling and results of all scenarios**


- C. Exhibit A – Statement of Work is replaced in its entirety with the Revised Attachment 1 to this Amendment 5. This Attachment 1 replaces reference to Exhibit A-1 in Amendment 1, Attachment 1 in Amendment 2, Attachment 1 in Amendment 3, and Attachment 1 in Amendment 4.
- D. Counterparts. This Amendment may be executed in several counterparts (facsimile or otherwise) all of which when taken together shall constitute one agreement binding on all Parties, notwithstanding that all Parties are not signatories to the same counterpart. Each copy of this Amendment shall constitute an original.
- E. Except as expressly amended above, all other terms and conditions of original contract are still in full force and effect. Contractor certifies that the representations, warranties and certifications contained in the original Contract are true and correct as of the effective date of this Amendment and with the same effect as though made at the time of this Amendment.


Certification: The individual signing on behalf of Contractor hereby certifies and swears under penalty of perjury that: (a) Contractor is not subject to backup withholding because (i) Contractor is exempt from backup withholding, (ii) Contractor has not been notified by the IRS that Contractor is subject to backup withholding as a result of a failure to report all interest or dividends, or (iii) the IRS has notified Contractor that Contractor is no longer subject to backup withholding; (c) s/he is authorized to act on behalf of Contractor, s/he has authority and knowledge regarding Contractor's payment of taxes, and to the best of her/his knowledge, Contractor is not in violation of any Oregon tax laws (including, without limitation, the following pursuant to OAR 150-305.385(6)(B): "Oregon Tax Laws" means a state tax imposed by ORS 320.005 to 320.150 (Amusement Device Taxes), 403.200 to 403.250 (Tax For Emergency Communications), 118 (Inheritance Tax), 314 (Income Tax), 316 (Personal Income Tax), 317 (Corporation Excise Tax), 318 (Corporation Income Tax), 320 (Amusement Device and Transient Lodging Taxes), 321 (Timber and Forest Land Taxation) and 323 (Cigarettes And Tobacco Products) and the elderly rental assistance program under ORS 310.657 and any local taxes administered by the Department of Revenue under ORS 305.620.; (d) Contractor is an independent contractor as defined in ORS 670.600; and (e) the supplied Contractor data is true and accurate.

CONTRACTOR

  
Amity Lumper, Co-President/Stephanie Thomas, Co-Owner  
2/14/2020  
Date

STATE OF OREGON by and through its  
Department of Environmental Quality

  
Leah Feldon, Deputy Director  
2/14/2020  
Date

  
Brian Boling, Central Services Administrator – DPO  
2-14-2020  
Date

13310-30253 N30223-00  
Index/PCA/Project

**APPROVED FOR LEGAL SUFFICIENCY By State of Oregon Department of Justice by Erin Donald via separate email dated: 2/14/2020.**



## ATTACHMENT 1

### EXHIBIT A, PART II-STATEMENT OF WORK

Contractor will conduct research on materials, recycling collection, and sorting and processing infrastructure for DEQ and Oregon's Recycling Steering Committee (Partners) as part of a statewide process to reset Oregon's recycling systems. The research will be iterative with results from early tasks informing the services provided by Contractor in later tasks. Contractor will present draft results from each task, either in person or by using conferencing technology, to DEQ and Partners. DEQ and Partners will provide Contractor with feedback on draft results and written direction on how to proceed with the Phase 1 Tasks 1 and 2. Each task will include a draft report with a presentation followed by a final report. Where possible, Contractor will consolidate presentations for multiple tasks that are interrelated and conducted in parallel. Contractor will compile all results from all tasks into one report.

### PHASE 1 — MATERIALS EVALUATION RESEARCH

#### Task 1. Project Future Material Types and Volumes

##### *Subtask 1.0. Develop shared understanding of materials collected, processed and marketed*

DEQ will convene and facilitate a conference call to discuss materials for potential focus of research and ensure there is a common understanding of materials and their definitions used by the recycling industry. DEQ will invite:

- Interested Oregon and Washington recycling sorting and processing facility owners and operators.
- Other interested Partners.

Contractor will invite and coordinate with key persons on Contractor's team who will be researching materials.

On the conference call, DEQ will review materials DEQ plans to provide Contractor as part of Subtask 1.1 and provide any clarification of definitions. Contractor and key persons will review materials for consideration for Subtask 1.2 and their common definitions. Facility owners and operators will clarify the materials they are handling and marketing including clarification of definitions. Contractor will update material list with commonly-shared definitions for use with further tasks.

##### *Subtask 1.1. Develop baseline material projections*

Using feedback and shared understanding from Subtask 1.0, Contractor will analyze current generation and projecting baseline generation of materials disposed and recovered in Oregon and Washington. DEQ will support this task by providing available data regarding baseline quantities of materials by material type, material stream, geographic location, generator, and year using a template provided by Contractor. DEQ will also provide baseline growth factors such as population, household, and employment projections.

This analysis will include the recyclable and contaminant materials currently collected on-route in the commingled systems around the state and at depots. Contractor will summarize current generation and project 5- to 7-year generation of all overall quantities and targeted recyclable materials in particular, for urban and rural areas and for residential, commercial, and self-haul generators (depending on data availability). Contractor will propose an initial list of focus materials by email including groups of materials, specific materials or both to DEQ and Partners for feedback. Contractor and DEQ will agree on the final list for projecting future changes prior to conducting Subtask 1.2.

##### *Subtask 1.2. Project future changes in material generation*

To project future changes in types and volumes of targeted materials generated in Oregon in 2025, Contractor will combine research and analysis with industry expertise to identify anticipated changes in targeted materials agreed on with DEQ.

Materials for baseline and forecasting with industry-trend adjustments could include, but are not limited to:



### Task Goal

The goal of this task is to provide DEQ and Partners with information on alternative processing systems that will be used to inform which processing systems to include in developing scenarios and conducting analysis.

### Scope

Contractor will develop six to ten (6-10) case studies of facilities that use agreed-on processing systems. Case studies will address key characteristics agreed on in the research plan. Case studies will include facilities in the United States and Canada. To obtain the best data possible from private facilities that may have confidentiality concerns, Contractor may redact facility names and other identifying information from case studies provided to DEQ or aggregate information from similar facilities.

At the start of this task, Contractor will develop a draft research plan that includes the types of processing systems to be researched and type of data to be collected. Contractor will revise the draft research plan based on comments from DEQ.

Contractor will also develop a 3- to 5-page high-level memorandum summarizing the benefits, drawbacks, and other relevant considerations of the processing systems included in case studies. During the course of research, Contractor will confirm with DEQ the outline for the summary memo. The memorandum will include recommendations on which processing systems to include in scenario analysis.

Contractor will share the draft case studies and summary memo with DEQ for initial review. Upon receipt of feedback from DEQ, Contractor will incorporate the feedback and revise the case studies and summary memo. Contractor will share the revised results in a presentation with DEQ and Partners.

Based on additional feedback provided by DEQ and partners, contractor will revise and provide final case studies and summary memo.

### Phase 2, Task 3 — Public Engagement, Compliance and Incentive Alternatives

### Task Goal

The goal of this task is to provide DEQ and Partners with information on the state of knowledge regarding the use and effectiveness of alternative public engagement and incentive programs that are aimed primarily at reducing contamination in set-out recyclables. This information will inform education, incentive, and compliance methods included in scenario analysis.

### Scope

Contractor will conduct up to 60 hours of research on the cost and effectiveness of education, incentive, and compliance alternatives. Research will include literature reviews, web-based research, and phone interviews with program implementers in the United States and Canada.

Contractor will document findings on each program in a case study template developed as part of the research plan. The research is anticipated to seek information on:

- Education, incentive, or compliance elements
- Costs, staffing, and other resource requirements
- Program effectiveness (e.g., participation rates, capture rates, contamination — both absolute and changes resulting from implementation of elements)
- Consumer acceptance
- Program context (such as collection method, accepted materials, companion programs, and relevant recycling regulations)

At the start of this task, Contractor will provide a research plan that includes a phone check-in partway through research to provide an update regarding availability of data and to allow DEQ and Contractor to adaptively manage research as needed. The research plan will also include a list of potential alternatives to research, methods of investigation, sources of information and a case study template for reporting. Contractor will revise the draft research plan based on comments from DEQ. Contractor will share draft case studies and a summary memo with DEQ for initial review. The summary memo will be a 5- to 10-page report summarizing the available data (and data limitations) on benefits, drawbacks and other relevant considerations of the education, incentives, and compliance alternatives included in the research. It shall also include recommendations on which education, incentive and compliance alternatives to include in scenario analysis. Upon receipt of feedback from DEQ, Contractor will incorporate the feedback and revise the case studies and summary memo. Contractor

will share the revised results in a presentation with DEQ and Partners. Based on additional feedback provided by DEQ and Partners, contractor will revise and provide final case studies and summary memo.

## Phase 2, Task 4 — Model Design and Base-Case Scenario Development

### Task Goal

Develop a model to analyze the cost and performance of Oregon's collection, education, and processing system, and populate this model to analyze the current ("base case") situation. The model will be used in future tasks to compare alternative future scenarios against the base-case scenario. The base case model will represent the current system, inflated to handle projections of material tonnages in 2025.

Refine and finalize a model to analyze the cost and performance of Oregon's collection, education, and processing system, and populate this model to analyze the current ("base case") situation. The model will be used in future tasks to compare alternative future scenarios against the base-case scenario. The base case model will represent the current system, inflated to handle projections of material tonnages in 2025.

### Scope

Contractor will develop an Excel-based model of the statewide recycling system in Oregon using a simplified model of Oregon with three or four groupings provided by DEQ that include factors related to service level, geography (transportation to markets), population density and amounts of commercial activity. Potential groupings (to be finalized in the research plan) may include:

- Urban areas with high service levels near recycling markets (e.g., Metro)
- Moderately urban areas with fairly high service levels a bit more distant from markets (e.g., Eugene, Bend, Salem, Willamette Valley, Corvallis)
- Less urban areas with more restricted collection service levels that are distant from markets (e.g., Medford, Prineville, Roseburg, Grants Pass)
- Mostly drop-off (other rural, including rural parts of counties where curbside collection is provided only in the larger cities and surrounding areas of the county)

The model will focus on recyclables covered in Phase 1 (excluding organics, C&D debris, and HHW). The scope includes recyclables collected through drop-off (not bottle bill) and "on-route" residential and commercial collection, that is, the types of collection services that are largely provided by franchised and licensed waste collectors. For each grouping, DEQ will provide generation tonnages by sector and desired materials to be analyzed. Current capture rates will be based on either Phase 1 outputs or alternative capture rates provide by DEQ.

The model will include cost and tonnage flow modules for the following stages of the recycling process:

- Customer engagement methods to increase quantities of recyclables and reduce contamination, such as education, incentives, and compliance programs.
- Collection methods for single-family residential pick-up, multifamily pick-up, commercial pick-up, and drop-off.
- Consolidation and transport transfer between collection and sortation.
- Sortation methods such as various types and arrangements of MRFs, PRFs, and CRFs
- Marketing including transport costs to ports or domestic mills and market price for first sale post-sortation.

Base case model inputs will be developed using a combination of available data (Phase 2 Task 1, 2, and 3 research plus additional research as budget allows), consultant expertise, and input from DEQ and Partners. Contractor will work with DEQ and Partners (e.g. MRF operators) to agree on acceptable questions for sortation that will protect competitive information. The model will be designed to balance transparency regarding inputs and assumptions with the potential need for confidentiality to be able to obtain actual operating data from sortation facilities. The model will also be designed to provide transparency in calculations and ranges for sensitivity analysis.



Model outputs will be finalized through the research plan but are likely to include the following factors (presented at the grouping level):

- Summary scenario total system costs by stage
- Tons by type of materials: collected (inbound) and marketed (outbound)
- Average in-bound contamination rates
- Average processing residue rate (as information is available or presented as a scenario input assumption)
- Average bale contamination levels (as information is available or presented as a scenario input assumption)
- Summary system costs per ton marketed
- Summary number of FTEs required for the customer engagement, collection, and sortation stages

Model outputs regarding tonnages by material will allow DEQ to assess environmental benefits/costs.

In this task, Contractor will collect and input base-case inputs to develop the base-case scenario for Oregon's current collection, education, and processing systems.

At the start of this task, Contractor will develop a draft research plan that will confirm the service-level grouping provided by DEQ, modules to include in the model, model input and output categories, research methods, and types of data to be collected. Contractor will revise the draft research plan based on comments from DEQ and Partners.

Contractor will design Excel-based model layout and functions. Contractor will collect and input base-case inputs to develop the base-case scenario for Oregon's current collection, education, and processing systems. DEQ will provide tonnage and composition data by grouping and generator type. Contractor will run the Oregon base-case scenario through the model and provide the draft model and modeling results to DEQ. Contractor will work with DEQ to review model and base-case modeling, and answer questions.

Upon receipt of feedback on the model from DEQ, Contractor will incorporate the feedback and revise the model and base-case modeling, making as many revisions as can be implemented within the project schedule, and flagging other revisions as changes to be made in a subsequent version. Contractor will share the revised model and base-case modeling at an in-person meeting with DEQ and Partners. Upon receipt of feedback on the revised model and base-case modeling from DEQ and Partners, Contractor will produce a final version of the model and base-case scenario. Data sources and assumptions will be documented within the model.

The model structure and approach developed in Phase 2 Task 4 and defined in the Phase 2 Task 4 Research Plan will be used as the basis for modeling Phase 2 Tasks 5 and 6.

#### Phase 2, Task 5 — Initial Scenario Selection and Analysis

##### Task Goal

Define and conduct initial analysis on a first round of four comprehensive infrastructure scenarios using the model developed in Phase 2 Task 4, comparing modeling results for alternatives against the base-case scenario. For the purpose of Phase 2 Tasks 5 and 6, "scenario" refers to a defined and discrete recycling system that consists of:

- A list of materials targeted for inclusion by sector.
- Customer (generator) engagement approach to increase the quantity and quality of set-out recyclables.
- Collection methods and collection frequency to collect those materials from different sectors of generators. Specific collection equipment used will be identified during modeling.
- Approach to transfer materials to processing. Specific equipment and process used will be identified during modeling.
- Processing approach used to sort and prepare collected materials for markets and remove contaminant materials. Specific technologies and systems used will be identified during modeling.
- The geographic configuration of those processing systems.
- Condition of marketed materials e.g. bales, pellets, etc.
- Type of end-market processed materials are sent to for recycling (e.g., mechanical recycling vs. chemical).

- Likely location of end markets e.g. domestic Pacific Northwest, Asian markets, other international or other domestic markets.
- Description of any variations by groups (as described in the Phase 2 Task 4 research plan)

#### Scope

Building on the base-case model developed in Phase 2 Task 4, Contractor will work with DEQ to define four initial alternative scenarios. Contractor will propose up to four scenario definitions for DEQ and Partners to consider and provide feedback on.

Contractor will participate in check-in call with DEQ and Partners on February 13, 2020 to discuss considerations for defining four preliminary alternative scenarios and ask focused questions of trade-offs that will be helpful in refining the scenario definitions.

Scenarios will use the groupings, sectors, and material generation from the base case and include assumptions to inform cost and tonnage flow modules for the following stages of the recycling process:

- Customer engagement methods to increase quantities of recyclables and reduce contamination, such as education, incentives, and compliance programs.
- Collection methods for single-family residential pick-up, multifamily pick-up, on-route non-residential pick-up, and drop-off.
- Consolidation and transport including transfer between collection and sortation.
- Sortation methods such as various types and arrangements of material recovery facilities, plastics recovery facilities, and container recovery facilities.
- Marketing including transport costs to ports or domestic mills and market price for first sale post-sortation.

Alternative scenario inputs will be developed using a combination of available data (Phase 2 Tasks 1, 2, 3 and 4 research plus additional research as budget allows), consultant expertise, and input from DEQ and Partners. In modeling alternative scenarios, Contractor will seek to balance transparency regarding inputs and assumptions with the potential need for confidentiality to be able to obtain actual operating data from sortation facilities. Modeling will also provide transparency in calculations and include ranges for uncertainty and sensitivity analysis. Model outputs are anticipated to mimic those in Phase 2 Task 4, allowing for comparison between the base case and alternative scenarios.

At the start of the task, DEQ will specify important elements to consider from previous research and the current system, based on DEQ and Partner feedback. DEQ will also confirm any themes Contractor might use in developing scenarios, such as a scenario that focuses on customer-facing improvements, a scenario that faces on processing-side improvements, and scenarios that represent a spectrum of improvements between those two.

Contractor will propose four alternative scenario definitions to DEQ for initial feedback. Contractor will revise four scenarios with DEQ's initial feedback. Contractor will then present up to four initial proposed scenarios to DEQ and Partners that represent a spectrum of services in customer-facing interventions, collection infrastructure and processing as well as variability in variety of materials targeted for recycling and associated end-markets. DEQ and Partners, with the facilitation of DEQ's Contractor, Oregon Consensus, may refine, add to, or replace scenarios proposed by Contractor in determining the final four scenarios for this round of evaluation. In the event that DEQ and Contractor decide not to share all four of Contractor's proposed scenarios initially, and if DEQ and Partners do not have additional scenarios agreed upon for evaluation, Contractor will present the additional scenarios for consideration by DEQ and Partners. Upon receipt of feedback on the revised scenarios from DEQ and Partners, Contractor will produce a final version of the four scenario definitions.

Contractor will collect and enter inputs to develop and evaluate the four alternative scenarios for Oregon's customer engagement, collection, and processing systems. Contractor will run the alternative scenarios through the model and compare the alternative scenarios to the base-case using the criteria provided by DEQ and Partners. Criteria may include but are not necessarily limited to:

- Transactional costs (including administration, operations and facilities and equipment)
- Environmental outcomes and social costs of those outcomes
- Generator participation and acceptance
- Access to recycling opportunities



- Quantity of materials to reach markets
- Quality of materials to reach markets
- Resiliency/adaptability
- Potential for stranded assets
- Employment impacts (number and type of jobs)

Following modeling, Contractor will provide the draft model and modeling results to DEQ for technical review. Modeling results will include sensitivity analysis and a comparison to Oregon's base-case current scenario. Data sources and assumptions will be documented within the model. Upon receipt of feedback on the alternative modeling from DEQ, Contractor will incorporate the feedback and revise alternatives modeling.

DEQ will perform modeling of environmental outcomes and social costs, using the draft material tonnage outputs of Contractor's modeling. Following Contractor's first draft model and modeling results, DEQ will provide Contractor the results of DEQ's modeling for the purposes of inclusion in subsequent models. For all subsequent rounds of modeling, Contractor will submit to DEQ the results of its modeling and maintain a placeholder in the presentation of results for environmental outcomes and social costs. DEQ will, as rapidly as possible, send Contractor the results of DEQ's evaluation of those criteria, and Contractor will incorporate the results into its comprehensive model as model outputs.

Contractor will share the revised alternatives modeling with DEQ and Partners.

#### Phase 2 Task 6 — Secondary Scenario Selection and Analysis

##### Task Goal

Identify any adjustments to inputs and assumptions from initial four scenario modeling and define up to two additional scenarios. Conduct revised analysis on four initial comprehensive scenarios and conduct analysis on two additional scenarios, comparing results to the base-case scenario.

##### Scope

Contractor will present the revised scenario modeling results (including model inputs and outputs) from Phase 2 Task 5 to DEQ and Partners at a meeting facilitated by Oregon Consensus. The goals of the meeting will be to:

- Identify adjustments to inputs/assumptions for the initial four scenarios using additional data or assumptions provided by DEQ and Partners.
- Work with DEQ and Partners to define up to two additional scenarios for analysis.

DEQ and Oregon Consensus will consolidate feedback on adjustments where there is agreement and highlight areas where there are not for Contractor to consider. Upon receipt of feedback on the Phase 2 Task 5 scenario modeling results, Contractor will revise inputs for the four initial scenarios and rerun modeling.

On May 15, Contractor will work with DEQ and Partners to help them refine and confirm two additional scenario definitions, ensuring Contractor has adequate level of information by the end of the meeting to begin analysis. After agreement of definitions for the two additional alternative scenarios, Contractor will collect and enter inputs to develop and evaluate the alternative scenarios for Oregon's collection, education, and processing systems. Contractor will run the additional alternative scenarios through the model and provide the draft model and modeling results to DEQ for technical review. Modeling results will include sensitivity analysis and a comparison to Oregon's base-case current scenario. Data sources and assumptions will be documented within the model. Upon receipt of feedback on the model from DEQ, Contractor will incorporate the feedback and revise the alternative modeling, making as many revisions as can be implemented within the project schedule and budget, and flagging other revisions as changes to be made in a subsequent version.

Contractor will share the revised alternatives modeling with DEQ and Partners. Contractor will present the revised modeling (including model inputs and outputs) at a meeting facilitated by Oregon Consensus. The goal of the meeting will be to understand results and provide feedback from DEQ and Partners as well as identify one to two preferred scenarios for Oregon to pursue.

Upon receipt of feedback on the scenario modeling results from this Task, Contractor will revise the two additional scenarios and finalize analysis for all six scenarios.