Maintain and Enhance Travel Demand Forecasting Models in Ohio
Scope of Services

The Department and Ohio's seventeen Metropolitan Planning Organizations (MPOs) maintain travel demand forecasting models for use in project planning, long-range plan development and other analyses including air quality conformity. The Department seeks a qualified firm to provide In-House Consultant Staff Support for twenty-four (24) months to augment ODOT staff and perform tasks related to the maintenance and enhancement of the statewide travel demand forecasting model (SW Model), Ohio Medium/Small Modeling System (OMS) models used in the small and medium sized MPOs, the 3C model used in the large sized MPOs, the TransModeler C10 model in Columbus, Cincinnati and Lima, the Economic Impact Model (EIM), Simulation Demand Estimator (SDE) tool, and various utilities used for pre- or post-processing.

The SW Model is an integrated econometric/land use/transport model employing tour-based microsimulation for the transport model components. The size and scope of the model require that it be run on one of ODOT's nine dedicated computers containing 72 microprocessors. Because this model represents a dramatic paradigm shift from traditional travel demand forecasting models, its various components were custom built for ODOT. As such, ODOT requires consultant support to keep the model software operable for use in transportation project analysis. A 35k zone network and trip tables are being developed. A roadmap for the 2020 Base Year SW Model is expected by December 2024. This contract will work on developing components so that estimation can begin after completion of the statewide Household Behavior Inventory/Travel Survey. New models are expected to be implemented in Agent/OpenPaths software.

Data collection is ongoing for the next generation of the OSWM. The Department is making a concerted effort to update the various input datasets to these models, including highway and transit networks in TransCAD and Cube/OpenPaths, and base year land use inventories, including land coverage, land use/development, water/sewer service areas, and base and future year employment and population for all models.

The 3C Model is a state-of-the-art Activity Based Model based on the Coordinated Travel-Regional Activity-Based Modeling Platform 2 (CT-RAMP 2). Travel demand is microsimulated at the Micro Analysis Zone (MAZ) level using various leading-edge behavioral model formulations far beyond the simple aggregate statistical models of the four-step model era. Traffic microsimulation was added through the SHRP2 C10 project using Dynus-T, and later TransModeler. The 3C model is implemented for Cleveland/Akron, Columbus/Newark, and Cincinnati and Dayton. There is also a Lima version that is maintained for testing purposes and is available for research. The TransModeler C10 model is in development for Columbus/Newark, Cincinnati and Lima. Additionally, there is a Toledo ActivitySim model that is implemented in TransCAD/TransModeler that may require support. A roadmap for the 2020

3C models is expected in December 2024. New models are expected to be implemented in Agent/OpenPaths software. The 2020 Toledo model may be implemented in ActivitySim/TransModeler at TMACOG's discretion.

In addition to these advanced models, traditional four-step models are maintained for the small and medium metropolitan areas in Ohio and the consultant may be tasked with providing enhancements or other on-call services related to their upcoming 2020 update, including the implementation of the 2020 OMS roadmap, which is expected by December 2024. Finally, the consultant may also be tasked with updates and maintenance of the Economic Impact Model (EIM), developed to quantify economic impacts of projects using travel model results and which is implemented in Cube and TREDIS, and with the Simulation Demand Estimator (SDE) tool, which is implemented in Cube and TransModeler. Pre- and post-processors are written in Cube, FORTRAN, GISDK and python and use Cube, TransCad, TransModeler, R, PowerBI and Synchro. These utilities include network calculators, CMAQ calculators, and utilities to convert networks and demand between Cube and TransModeler, among others.

The consultant selected for this contract must at a minimum be able to demonstrate detailed knowledge of the following:

- Land use modeling systems
- Activity allocation models to convert large scale econometrics to small scale travel flows
- Activity and agent-based microsimulation travel demand forecasting models
- Aggregate trip-based travel demand forecasting models
- Population and firm synthesis models
- Commodity driven freight models
- Quick Response freight models
- Project level modeling
- Bentley Cube/OpenPaths and Agent modeling software
- Caliper TransCAD and TransModeler software
- TREDIS
- Github
- Python
- Java

It is preferred that the consultant also have thorough knowledge of the following:
- Bentley DYNAMEQ modeling software
- ActivitySim
- Origin-Destination Matrix Estimation procedures and implementation in modeling software, including Analyst Drive
- Synchro
- FORTRAN
- R
- PowerBI

Detailed knowledge of the SW Model, OMS, 3C, C10 and/or EIM models will be considered a plus.

As mentioned previously, the SW model, 3C, C10 and EIM will be run on one of ODOT's computers. ODOT will provide remote access to the computers but the consultant should

anticipate possible time on site. OMS models can be run on any standard computer with a Cube license. The consultant's possession of a computer able to run the SW, 3C, and C10 models will be considered a plus. All models and tools will be placed on ODOT's github account so that they can easily be transferred between ODOT, MPOs and Consultants.

Possible enhancements to the statewide model could include, but are not limited to:

- New 2020 OSWM procedures moved from Cube 6.5 to OpenPaths.
- Design and implementation of the 2024 roadmap in Agent/OpenPaths.
- Consolidation and reconciliation of parameter and data sources to ensure changes made by users are reflected consistently throughout the models.
- Updates to model documentation and user interfaces as needed to make models more usable.
- Relocating and/or renaming of input and output files as needed to make the model easier to use.
- Improvements to the travel model interface with Tredis and its distribution of impacts through time
- Configuration of the software to run on different computer configurations, including Cloud configurations.
- Addition of a supply chain logistics/distribution layer and firm synthesis to the current freight models to provide linkage between long distance freight hauling (ACOM) and local goods distribution models (DCOM) explicitly modeling the locations and attributes of intermodal, warehousing and distribution centers.
- Additional enhancements to the long-distance freight model (ACOM) such as an establishment synthesis model to allow freight generation by establishment rather than aggregate zonal employment, use of agricultural acreage and livestock sales data for disaggregating agricultural flows and use of gravity formulations to inform disaggregation from FAF to TAZ level in addition to employment levels currently used.
- Update of ACOM and/or DCOM with new VIUS.
- Evaluation and enhancement of simplified land use/activity allocation models to improve models' policy sensitivity and geographic response capabilities, including updates from new data.
- Evaluation and consideration of intra-year feedback looping in statewide model.
- Evaluation and implementation of alternate assignment GC equations. Test and implement new path or origin-based assignment methods as they become available
- Evaluation of sampling strategies in destination choice models, including filtering by establishment type.
- Addition of policy sensitive models of air and maritime transportation modes.
- Additional reporting capabilities, including standardized reports in Cube/OpenPaths, python, PowerBI or R and a GUI for additional reporting.
- Addition of feedback from the economic models (EIM) to the travel models.
- Update of the EIM with integration of current Tredis software.
- Begin work for update of model base year to 2020 eventually leading to estimation/calibration of alternative specific constants and other parameters as necessary to meet ODOT validation specifications.
- Overhaul SPG to incorporate population evolution functionality.
- Streamline user ability to influence demographic inputs.
- Update 3C, C10 and OMS models from Cube 6.5 to OpenPaths.

- Develop/update/refine a network management tool for use with Ohio standard network formats (including statewide and MPO networks) that allows projects to be coded to a base network in order to create various alternative networks. This tool will also provide for MPO networks to be swapped in and out of the statewide network.
- Develop a 3C model in Agent/OpenPaths using the 2024 roadmap.
- Estimate new 3C models using the new HTS survey data. This could be in whole or in part.
- Support for the 3C SHRP2 C10 implementations including the completion of the MORPC and OKI TransModeler implementations.
- 3C/OMS/C10 model validation work.
- Convert OMS demand models in Cube to Agent/OpenPaths.
- Update of TMACOG ActivitySim/TransModeler model to 2020 base year including estimation/calibration. Coordinate ActivitySim model with SEMCOG.

Additional tasks could include:

- Update SDE Tool from Cube 6.5 to OpenPaths. This includes possible use of DYNAMEQ as Avenue will no longer be supported. It is expected that Analyst Drive will still be supported. Update other ODOT Cube applications from Cube 6.5 to OpenPaths.
- Project level modeling in support of Certified Design Traffic, which is also being advertised.
- Advisement for the Statewide Household Travel Survey, including the weighting and expansion of the data using NCHRP RRD 400 and the update of NCHRP RRD 400 with Ohio survey data.
- 3C modal enhancements for transit and non-motorized.
- MPO On-Call Modeling Support.
- Additional reporting capabilities for 3C/OMS/C10, including standardized reports in python, OpenPaths, PowerBI or R and a GUI for additional reporting.

All models and tools will be maintained on github.

All work shall be performed on an actual cost basis. The consultant shall maintain a project cost accounting system that will segregate costs for individual task orders.