CONSTRUCTION WASTE MANAGEMENT FOR OREGON’S OTIA III STATE BRIDGE DELIVERY PROGRAM

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ABSTRACT

The OTIA III State Bridge Delivery Program is part of the Oregon Department of Transportation’s 10-year, $3 billion Oregon Transportation Investment Act. OTIA III funds are repairing or replacing hundreds of aging bridges statewide. Managing construction waste helps the bridge program meet its environmental stewardship and sustainability goals, and delivers projects that are sensitive to their communities and landscape, save financial and material resources, and maintain interagency collaboration.

More than 100 bridges include waste determination and reporting requirements unique to the bridge program. The Construction Waste Management reporting process was implemented in 2008 and requires that contractors plan and track reuse, recycling and disposal for a variety of waste streams. The program includes a contract special provision, and estimating and reporting tools for contractors.

To ensure its success, the Construction Waste Management program was developed with the Oregon Department of Environmental Quality and the Association of General Contractors. ODOT has maintained a collaborative approach with regulatory partners and implemented a unique set of environmental performance standards and contract specifications to effectively manage project outcomes. These critical elements contributed to our success capturing data from contractors and enhancing reuse and recycling on projects statewide.

Collaboration between ODOT, resource agencies and contractors has also led to the reuse of large woody debris from several construction sites for restoration and habitat enhancements in local watersheds, including the Sandy River and Umpqua River basins, adding ecological value to projects and providing substantial cost savings to all involved.

Through 2010, the bridge program has successfully accounted for tens of thousands of tons of recycled asphalt paving, clean fill, concrete, metal and wood—all diverted from landfills statewide. More than half of the materials were reused within the projects themselves, providing a dual benefit: On-site reuse reduces the need for raw materials but also cuts down on transport costs and air pollution. Materials cost savings totaled an estimated $9 million in 2010 alone due to reuse and recycling. In addition, contractors reported using more than 200,000 gallons of ultra-low sulfur diesel and more than 30,000 gallons of biodiesel on construction projects in 2010.

The bridge program uses construction waste data not only to inform compliance, but to establish a baseline of results that will help us set achievable targets for the future. We have found that more frequent reporting—quarterly rather than annually—leads to better data capture. ODOT has received high rates of documentation—with all construction projects reporting data in 2010—and are keeping more than 90 percent of construction waste generated out of landfills. Contractors told us planning ahead makes reuse and recycling easier, so we compiled a guide of recyclers in different parts of the state and conduct environmental stewardship training at the start of every project.

ODOT has adaptively managed the construction waste reporting process to better meet the needs of the bridge program, resource agencies and contractors. Lessons learned from the bridge program are being incorporated as new sustainability performance metrics are developed for the broader agency.

BIOGRAPHICAL SKETCH

Geoff Crook is the Environmental Program Manager for ODOT’s OTIA III State Bridge Delivery Program. Geoff has a background in environmental policy and planning, and over 15 years of experience in project and program management. Geoff has worked for ODOT since 2006. Prior to joining ODOT, he worked to implement water quality
improvement projects at Lake Tahoe in Nevada, and did consulting work in rural communities through the Lane Council of Governments in Eugene, Oregon. Geoff holds a B.A. in Environmental Studies from U.C. Santa Cruz, and a Master’s Degree in Community and Regional Planning from the University of Oregon.

An image of this poster, number SUS-P74, is included in the Appendix of the proceedings.
MITIGATION FOR TRANSPORTATION: FORECASTING STATEWIDE NEEDS TO REDUCE PROJECT DELAYS AND COSTS DUE TO MITIGATION REQUIREMENTS

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ABSTRACT

Introduction
Georgia has a substantial number of streams and rivers as well as associated wetlands. Due to the scale of transportation projects, avoiding stream and wetland transportation is practically impossible. Compensation by mitigating for unavoidable impacts caused by projects through on-site and in kind mitigation or through mitigation banks is legally required.

Forecasting stream and wetland mitigation credit needs is important to reduce or eliminate costs associated with project delays due to mitigation requirements. Additionally, forecasting credit needs provides the opportunity to consolidate mitigation projects and capture economies of scale through designing, constructing, and monitoring larger sites.

ARCADIS, under contract to the Georgia Department of Transportation (DOT) developed a model to forecast stream and wetland impacts using geographic information systems (GIS), National Wetlands Inventory (NWI) data, information in the existing Georgia DOT project database (TPRO), and existing Georgia DOT project mapping.

Methods
The first step in the problem approach was data collection. The TPRO database was obtained from Georgia DOT along with the project mapping data. The NWI was downloaded from the U.S. Fish & Wildlife service.

The second step was to sum the wetland and stream impacts in TPRO for projects with known impacts. For the remaining projects, a buffer based on project type was created around each project using the existing project mapping. The NWI was overlaid with the buffer coverage and the number of linear feet of streams impacted and acres of wetlands within the project buffers was added up to determine total impacts.

Buffers were also produced for projects in TPRO with known impacts. For these projects, forecast wetlands were compared to known wetlands to calibrate the forecasting methodology.

Results
Results were the number of linear feet of streams and acres of wetland impacted by hydrological unit code (HUC).

Discussion
A strength of this methodology is the data used is readily available. This methodology is also repeatable and as new projects and additional data are entered into TPRO the forecast can be updated. Finally, the methodology is cost effective.

A key weakness is that this analysis is only as good as the input data. While working with the TPRO database, several inconsistencies were found. One weakness of using the GIS to create buffers by project types is that the project type data is ambiguous with regard to the actual work being performed, for example, a project coded as an interchange could be a complete reconfiguration and rebuilding of the entire interchange or simply adding a left turn bay to one ramp.

This methodology can be used to forecast mitigation credit needs in other locations. North Carolina currently uses a similar methodology to forecast their needs for mitigation credits.

Conclusion
This methodology is effective for estimating future needs for mitigation credits on a broad basis, for example at statewide or watershed levels. More research to refine the methodology and create or locate more accurate data sources is needed.
BIOGRAPHICAL SKETCHES

Olen Daelhousen holds a Masters in Urban Planning from Texas A&M University and has been a practicing planner for 10 years. His areas of expertise include transportation planning, capital and operating cost estimates for roadway and transit projects, project prioritization, and Geographic Information Systems (GIS). Mr. Daelhousen has been a transportation planner with ARCADIS for the last five years.

C. Jordan Myers holds a B.S. in biology from Western Kentucky University, and an M.E.M in Wetland Ecology from The Nicholas School of the Environment at Duke. He has been a practicing ecologist for more than 12 years, during which time he has developed expertise in wetland delineations, stream assessments, in-stream benthic sampling, stream and wetland mitigation implementation and management, Section 404 and stream buffer permitting, and watershed assessments. Mr. Myers has performed environmental and ecological assessments for all aspects of ground transportation projects throughout the southeastern United States. Currently, he serves as the ARCADIS on-site manager for the Georgia Department of Transportation Mitigation Program. This role involves the management, planning and execution of all facets of the Department’s wetland and stream mitigation program. Mr. Myers serves as the co-chair for the Georgia Partnership for Transportation Quality Ecology Committee; sits on the Georgia Environmental Protection Division’s Wetland Advisory Panel; and is a member of the National Association of Environmental Professionals.

An image of this poster, number SUS-P75, is included in the Appendix of the proceedings.
BUILDING a LOW CARBON SOCIETY: APPROACHES FOCUSING on LIFESTYLE and TRANSPORT

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ABSTRACT

Reduction of GHG (GreenHouse Gas) emissions is regarded as one of the most crucial challenges to cope with current global environmental issues. While the industrial sectors are making significant contribution to this challenge, the target to achieve the transition to low carbon society is shifted to individual’s choice and behaviour. Household is the basic unit of energy consumption that is the main factor of GHG emissions—such as housing, appliances, and daily transport. The household’s choice on these factors is based on lifestyle and consumption at a household level. And the lifestyle and consumption are affected by the social and economic circumstances of the individuals. Among the factors that cause GHG emissions, we focus on the impact of household transport choice in this research.

In this research, we focus on households in Nagoya, Japan, known as a ‘city of car industry’ with a unique manufacturing culture and history. A questionnaire survey was conducted in December 2010, to explore daily life such as food, housing, transport choice, the value related to consumption & purchase behavior, demographics of household. Response rate for this survey was 19.1 % (618 respondents returned out of 3,239 Nagoya citizens). By the result of questionnaire survey, we made 8 clusters of the household based on the response to the purchase behavior and consumption behaviors and named by their demographic feature. We identify the linkage with transport behaviour. Especially, we focus on transport choice and emission.

In this survey, transport choice for commuting and amount of CO$_2$ emission are shown and compared the difference between clusters. The results presented that environmentally focused consumption and behavior does not always reflect the actual amount of energy use by journey to work. Based on these results, supply and demand of environmentally friendly products such as bio-diesel fuel and its impact on household energy use are needed for the future tasks.

ACKNOWLEDGEMENT

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BIOGRAPHICAL SKETCH

Dami Moon is a researcher fellow at Nagoya University in Japan. Dami obtained her PhD in environmentology from Nagoya University and also researched there for 2 years. She has published in journals including Journal of Environmental Information Science, Japan Association for Human and Environmental Symbiosis, and Journal of the Japan Society of Material Cycles and Waste Management.

An image of this poster, number SUS-P76, is included in the Appendix of the proceedings.
ECONOMIC EVALUATION OF ENVIRONMENTAL CONDITIONS EARLY IN THE TRANSPORT PLANNING PROCESS

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ABSTRACT

We propose a framework and process flow for valuation of environmental conditions and impacts in the context of regional and corridor scale planning and project development to contribute to a more complete accounting of environmental impacts of transportation early in decision-making. Such accounting could benefit infrastructure construction, modification, or removal. Planning for transportation infrastructure usually involves a long time-span of more than twenty years. Evaluation of environmental conditions is typically carried out relatively late in the transportation planning process. Although the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) requires consideration of environmental impacts and mitigation needs early in the planning process; how to effectively engage in early environmental evaluation often remains unclear. Many decisions related to transportation are based upon economic considerations. The difficulties of evaluating environmental impacts during the economic phase of transportation planning are partly due to the “non-market goods” nature of environmental attributes and services. In order to consider both environmental and economic benefits and costs at the same decision point in transportation planning, it is important to put them on the same scale. One way (but not the only way!) to do this is to convert changes in environmental conditions and processes to monetary values. Fiscal costs associated with environmental mitigation are often used in transportation cost benefit analysis (CBA). Though CBA has been used extensively in the U.S. as a project evaluation method, valuation of affected environmental attributes are not applied in most transportation investment projects.

The proposed framework and process flow follows a series of steps: 1) transportation system impacts are first identified for environmental conditions in a region or corridor. 2) After the impacts are identified, impact screening helps to decide how different types of impacts can be evaluated. For example, would the impact be mitigated? Can the impacts be quantified and monetized? Are the impacts relatively small? 3) Impact quantification involves quantifying the measurable impacts. It requires data on potential risks, geographical and temporal extents of the impacts and severity. 4) If impacts are measurable, the next step is to attribute value to the impacts. Different valuation methods are available to attribute value to non-markets goods and services. 5) The last step in the framework is to incorporate the values of the affected environmental systems and a qualitative analysis of those non-measurable impacts into the overall transportation plan, project or corridor analysis. The valuation of environmental attributes may be used at several points during the transportation planning process: in the regional planning process, in the system planning process, in the project initiation document (PID), at the project development stage, and at the programming stage. It is possible that regional valuation will provide cost-savings for the valuation process itself because of economies of scale. Calculating the total environmental value or cost of transportation may be more feasible at the corridor or project scale. By calculating total environmental value, DOTs and planners can accomplish more accurate accounting of the total benefits and dis-benefits of different projects and project alternatives.

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Atmospheric Administration) for his insights on the implementation of stated preference methods and Joan Sollenberger (Deputy Director, Urban Land Use and Transportation Center, Institute for Transportation Studies, University of California) for her advice on the implementation of valuation information in the planning process.

BIOGRAPHICAL SKETCHES

Jennifer Lee is a graduate student researcher in the Graduate Group in Geography and Information Center for the Environment, UC Davis. Her research includes investigation of environmental aspects of agricultural system economics.

Michael Springborn’s work is primarily in the areas of resource and environmental economics. He is interested in problems involving decision-making under uncertainty, learning, adaptive management and environmental risk. The methods he uses include econometrics with Bayesian inference, Bayesian learning processes, dynamic control and general equilibrium models. Recent and current projects include: combined bioeconomic and quantitative genetic models for salmon biodiversity management; estimating and mitigating invasive species risk from international trade; adaptive management of environmental risk; econometrics for decision-making applied to screening of potentially hazardous imports; analysis of greenhouse gas control policies under uncertainty; voluntary policies for stormwater pollution control; and a spatial analysis of voluntary participation in a green building certification program (USGBC/LEED).

Susan Handy is Director of the UC Davis Sustainable Transportation Center (http://stc.ucdavis.edu). Her research focuses on the relationships between transportation and land use, including the impact of land use on travel behavior and the impact of transportation investments on land development patterns. In addition, her work is directed towards strategies for enhancing accessibility and reducing automobile dependence, including land use policies and telecommunications services. Related interests include the practice of transportation planning and the education of transportation professionals. The Sustainable Transportation Center (STC) was established in 2005 via the federal transportation authorization bill, which established the current system of national university transportation centers. The California Department of Transportation (Caltrans) plays a key role in the Center by facilitating partnerships and providing funds to match the federal support.

James Quinn is Professor of Environmental Science and Policy at the University of California, Davis, co-founder and Director of the Information Center for the Environment (ICE – http://ice.ucdavis.edu), and leader of the California Information Node (CAIN – http://cain.nbii.org) of the National Biological Information Infrastructure (NBII). His program collaborates with multiple public agencies and conservation organizations to develop information systems applied to public environmental policy and ecological research. Current grants and research projects include the using geospatial information systems and models to predict changes in biodiversity, land use, and water quality, in the context of upcoming transportation changes and urban sprawl (with the California Department of Transportation, the California Resources Agency, USEPA, and others), international databases and information sharing on invasive species and species in protected areas (with USGS, the Smithsonian, UNEP, several treaty organizations, and others), watershed and floodplain restoration in the San Francisco Bay – Sacramento Delta ecosystem (supported by CALFED), and environmental applications of Semantic Web technologies (with support from NSF and USGS).

Fraser Shilling is Co-Director of the UC Davis Road Ecology Center (http://roadecology.ucdavis.edu), the only research and education center of its kind in the US devoted to the study of transportation system impacts on natural and human systems. Dr. Shilling’s training is in organismal biology and ecology. He combines that training with 15 years of working with private organizations and agencies to develop inter-disciplinary research that benefits the inclusion of science in sustainable decision-making. He and the Center partner with local, state, national, and international agencies and other collaborators to investigate transportation effects and to develop effective communication of science to inform decision-making. Specific current projects at the Center include development of a road-effect zone model in GIS, modeling and validation of connectivity, field investigations of wildlife movement associated with two California interstates, development of a TRB-funded stewardship model for corridor planning, and organizing of an annual statewide “Connectivity Conference”. Dr. Shilling’s other research relates to trying to improve the involvement of disadvantaged communities in environmental pollution decision-making and developing comprehensive indicator systems for sustainable transportation, water management, and conservation.

An image of this poster, number SUS-P77, is included in the Appendix of the proceedings.
**Road Infrastructure and Wetlands Guidelines**

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**ABSTRACT**

Wetlands – lakes, ponds, lagoons, estuaries, etc. – are reservoirs for biomass and places where the production of living matter is one of the most important. Such areas provide 25% of the global nutrition through fishing, agriculture and hunting. They also are habitats for many protected species (migratory birds, amphibians, etc.). Moreover, wetlands work as an important capacity purification system, by filtering pollutants, reducing erosion, contributing to groundwater feeding, naturally storing carbon, protecting against floods and droughts.

Nevertheless, nearly 67% of wetlands in continental France disappeared since the beginning of the twentieth century, with half of those areas in the last 30 years (1960 – 1990). This figure is also indicative of a global decreasing trend.

In order to reverse this trend, the French government committed itself to maintain and even restore the ecological specificities of wetlands by ratifying the Ramsar Convention (1971) in 1986 and by establishing the preservation of wetlands as a general interest in 1992. More recently, since the 1st of April 2010, a National Action Plan for the Protection of wetlands has come into effect in the context of the Grenelle de l'environnement law.

"Road Infrastructure and Wetlands" is a technical guidebook addressed to the French Ministry for Road Transportation department, and more generally to the linear infrastructure designers. It features an inventory of essential elements to examine when an infrastructure project is coming across wet areas. It also establishes appropriate recommendations to ensure that future infrastructure does not impair the features and the functioning of these environments. It aims to provide practical recommendations to take wetlands into account in every stage of an infrastructure project implementation.

Indeed, the preservation of those sensitive areas requires an accurate knowledge of wetland characteristics and functioning in order to assess correctly the risks caused by the infrastructure implementation, and in order to identify the relevant measures to suppress or, at least, reduce these risks. The guidebook develops some examples to illustrate the integration of wetlands into highway projects involving different types of environments such as alluvial habitats, marshes, ponds, bogs and lagoons. This guidebook is part of the national and European framework for wetland protection and restoration, and is a support for the national strategy in favour of biodiversity.

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Elise Trielli, Environmental Engineer, Ministry of Ecology, and Sustainable Development, SETRA / CSEP / Environment, has been working in the Ministry of Ecology and Sustainable Development (Sétra, transportation department) since 2010 as environmental engineer. She contributed to the following publications : SETRA. Information note - "Impact des fondants routiers sur l'environnement - Etat des connaissances et pistes d'actions" (Environmental impacts of deicing salts - State of art and courses of actions), March 2011. SETRA. Technical guideline - "Eléments d'évaluation des risques écotoxicologiques des infrastructures routières" (Elements of ecotoxicological risk assessment of road
Elise is in charge of organizing and coordinating technical and scientific workgroups about "Waste and transportation" and "Water and transportation" themes.

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An image of this poster, number SUS-P78, is included in the Appendix of the proceedings.
ABSTRACT

Infrastructure allows human and natural systems to move throughout the landscape, and underpins much of the community’s social and cultural vibrancy. With the emerging propensity towards sustainability and efficiency, infrastructure corridors should be evaluated based on use, capacity, and multifunctionality. As underutilized corridors become apparent, communities will have the opportunity to repurpose their existing infrastructure to better meet the needs of human and natural systems.

Ayd Mill Road has the unique opportunity to allow users of its transportation system to function within a complete street that regenerates the open and hidden landscapes of the city into a living part of the community. The history of the landscape tells the story of a mill stream transformed into a transportation corridor designed for rail and automobiles. The prohibition of pedestrians and bicycles have only added to Ayd Mill Road’s image- a forgotten corridor with minimal daily traffic counts and speeding issues. This thesis project works within the constraints of existing infrastructure, a 1.5 mile long transportation corridor in Saint Paul, Minnesota, to create a multifunctional landscape driven by pedestrian connectivity and historic waterways.

This alternative master plan links ecosystem restoration and watershed recovery to transportation planning, and develops a new vision to bridge an important gap in the city’s pedestrian and bicycle infrastructure network. By strengthening connectivity, residents and wildlife alike will have a safer route to reach the Mississippi River’s regional park system and destinations across central Saint Paul. The proposed design standards are based on projections that show future growth can be accommodated within a two-lane parkway and the existing rail right of way. This new configuration presents the opportunity to repurpose two lanes out of the existing four lane road, its 15’ median, access points, and city right of ways to enhance the multimodal and ecological urban form. Surface water is brought to the forefront of people’s attention as it meanders throughout the corridor alongside the pedestrian trails, roadway, and railroad tracks. With a focus on revitalizing ecosystems and function, natural flow patterns are restored through use of vegetative roadside swales, wetlands, and daylighting portions of Cascade Creek. The use of piped infrastructure is limited in order to improve water quality, and planning efforts suggest monitoring to be continued at the existing watershed monitoring station located at the southern terminus of the site. The design provides integration of human and natural systems, safe access, and sustainable recreational elements to highlight the experiential qualities of the landscape’s ecosystems, changing topography, and native plant palette.

Project research and design took place September 2010 - May 2011. Research includes the history of Saint Paul’s landscapes and typologies, innovative techniques regarding green infrastructure, stormwater best management practices to improve water quality, multimodal transportation planning, a review of current literature on road ecology, and interviews with major agency stakeholders.

The project can be viewed and downloaded at: http://colleenkutter.com/

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BIOGRAPHICAL SKETCH

Colleen Finn is a recent graduate of the Master of Landscape Architecture program at the University of Minnesota. She is a dual degree graduate student and will earn her Master of Urban and Regional Planning Degree in December 2011. Currently she is working with Minnesota Brownfields researching legislative issues affecting brownfields and stormwater management on brownfield sites.
IDENTIFYING SUSTAINABLE DUST CONTROL FOR LOW-VOLUME ROADS

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ABSTRACT

Fugitive dust from unpaved roads creates human health concerns from inhalable particulate matter and decreases visibility and driver safety. Dust also indicates loss of fine particles, which causes degradation of road surface integrity. As attention on the negative effects of dust has increased, dust control programs have grown increasingly common—particularly those using chemical suppression. More than 400 products are commercially available for use as dust suppressants, but most of these products lack reliable information on toxicity and environmental fate. Therefore, although many products are billed as “environmentally friendly,” it is difficult to determine the consequences of their widespread introduction into the environment. To address this knowledge gap and identify products with the potential for toxicity to roadside aquatic or terrestrial organisms, we performed a series of standardized toxicity tests with dust suppressants across multiple categories, in partnership with the US Fish and Wildlife Service. Tests included fifteen products and utilized a representative vertebrate (rainbow trout - Oncorhynchus mykiss). Products were tested 1) in the original (as shipped) form and a UV-aged form to simulate weathering in the field, and then 2) under more realistic runoff conditions with a soil substrate. We selected four products of low toxicity for additional tests with an expanded suite of invertebrate, vertebrate, and plant species to determine whether the sensitivity of other species was comparable to that of rainbow trout. Results thus far indicate that the toxicity of products in different categories varies widely for most species, with concentrations required to kill 50% of test organisms (i.e., LC50 values) ranging from <5 mg/L for a sulfonated oil-based product to >5000 mg/L for a cellulose-based product. Simulated weathering under UV-radiation did not appreciably change toxicity, and toxicity values for rainbow trout were generally representative of those for other species. These results identify several products that, under recommended use conditions, should have low risk of adverse environmental impacts. These products will be tested in field applications with subsequent monitoring of roadside biological communities. By comparing toxicity across product categories and test species, these results provide basic environmental data for dust suppressant products, and will facilitate the development of appropriate standardized environmental testing for new products. Overall, these studies will help road managers anticipate and minimize potential environmental consequences of dust control on unpaved roads.

BIOGRAPHICAL SKETCHES

Bethany K. Williams is a Biologist with the Ecology Branch of the USGS Columbia Environmental Research Center. She holds a Ph.D. in Biology from the University of Missouri, with a certificate in Conservation Biology. She is interested in multiple-stressor questions and ecotoxicology, and frequently works on projects involving amphibians and human-influenced aquatic systems. She is currently evaluating environmental impacts of unpaved road maintenance activities such as dust suppression.

Edward E. Little is the Ecology Branch Chief at the USGS Columbia Environmental Research Center. He holds a Ph.D. from the State University of New York at Stony Brook, and has worked on a variety of research questions dealing with contaminants and multiple stressors. Much of his work has been on questions of interest to federal and state resource management agencies. One current project focuses on identifying the environmental impacts of unpaved road maintenance, including dust control.

An image of this poster, number SUS-P80, is included in the Appendix of the proceedings.