Ohio Department of Transportation
Office of Innovation Partnerships & Energy
Innovation Research & Implementation Section
Research Request for Proposals
Fiscal Year 2011

RFP Solicitation Number:
PS-2011-02

Research Title:
Green Noise Wall Construction and Evaluation

Problem Statement:
ODOT is required to consider noise abatement for projects funded through FHWA and ODOT has developed a noise abatement policy. ODOT Administration has charged the department with incorporating green alternatives in construction, design, and mitigation of impacts to roadway projects in accordance with ODOT's 2010-2011 Business Plan- Initiative 6 "Go with Green" Initiative. With regard to the environmental mitigation of highway projects, a "Green Noise Wall" was selected for evaluation and assessment as a pilot/experimental option to reduce traffic noise. The project will evaluate the feasibility of construction of this type of wall in terms of noise reduction as well as the cost reasonableness of construction considering ODOT policy. The Green Noise Wall, if successful, will reduce noise levels and blend with the natural environment. The urgency of this project is commensurate with the urgency of the Department's Green Initiative.

Requirements of the Research Team
Due to the nature of this study, the proposed research team must include at least one individual who is an experienced botanist. The proposal must demonstrate that this requirement is met in the "Qualifications of the Research Team" section as well as in the attached resumes.

Proposed Research:
The Green Noise Wall will be located along Carpenter Road, just west of the Tollgate Road overpass at IR70 and adjacent to the IR70 westbound lanes, in Licking County. Project mapping is provided in **Attachment 1.**

Task 1 - An on-site pre-construction meeting will be held between ODOT, the research team, and Deltalok prior to the start of construction of the Green Noise Wall. No drainage issues are anticipated, however, drainage of the area adjacent to the wall shall be discussed and any potential issues resolved during the meeting.

Task 2 - Based on Deltalok's preliminary design drawings (see **Attachment 2**) the researcher shall provide engineered shop drawings and specifications by a qualified Engineer for the construction of the Green Noise Wall per ODOT's Construction Specifications, for review and approval by ODOT prior to construction.

Task 3 - Construction of the Green Noise Wall shall be performed by the researcher. The Green Noise Wall will be 400' in length, 12' in height, and 9' in width. Phased construction is not anticipated. The researcher shall purchase and utilize Deltalok products to construct the Green Noise Wall. A product and price list will be provided to the selected researcher by ODOT for incorporation into the final proposal. Estimated costs for fill and plant materials should be included in the initial proposal's budget estimate; however materials costs associated with the actual construction of the wall should not be included at this point. The Green Noise Wall composition and plantings scheme/scope is provided in **Attachment 3.** Plant mix selected shall require minimal to no maintenance and watering to the maximum extent possible.

Task 4 - The evaluation and monitoring period shall be for two years after construction is completed to fully assess the effect of seasonal change on the noise wall system and plant material. The researcher shall conduct assessments and report bi-monthly on the Green Noise Wall for structural integrity, plant sustainability, acoustic protection, effects of seasonal changes, watering frequency/maintenance issues, and geotechnical issues.

a. Relative to structural integrity, the researcher shall observe and discuss the integrity of the soil bags, bag closures, and engineered connectors.

b. Relative to plant sustainability, the researcher shall follow standard ODOT CMS information on survivability. Roadside grass mix should be 70 percent cover of live grass (Item 659.23). Item 661 can be used for all other plantings. Use item 661.17 for establishment and replacement of dead plantings. These CMS Items are provided in **Attachment 4.**

c. Relative to acoustic protection, the researcher shall perform bi-monthly noise measurements at 50', 100', and 200' distances from the center of the constructed Green Noise Wall. Traffic on IR70 shall be recorded during each measurement. Noise measurements shall be in accordance with ODOT's Noise Standard Procedure. The researcher shall discuss any effects of seasonal changes.

d. Relative to geotechnical issues, the researcher shall observe and discuss any settlement, deflection, bearing capacity, and/or internal wall stability issues.

e. The researcher shall discuss watering frequency and any required maintenance activities/issues. The researcher will be responsible for the watering of the Green Noise Wall as needed and/or at the direction of ODOT and/or utilize procedures as per 659.17 of ODOT's CMS. Item 659.17 of ODOT's CMS is provided in **Attachment 4.** The researcher shall utilize a rain gauge to determine required watering frequency throughout the monitoring period.

Task 5 - The researcher shall review ODOT-provided noise data from similar locations with similar traffic to the Green Noise Wall location to use and compare results to the noise data collected for the Green Noise Wall. The researcher shall make conclusions from the comparison and provide policy recommendations and/or strategies for adoption or policy changes. In addition, the researcher shall perform a cost/benefit analysis of the Green Noise Wall to ODOT's conventional noise wall.

Task 6 - After the Green Noise Wall is constructed, the researcher shall evaluate if this type of the Green Noise Wall is eligible for carbon sequestration credits and outline the milestones to selling the credits and receiving the revenue.

Task 7 - If after 2 years the green noise wall project is determined to be unsuccessful by ODOT, the wall will be removed by the researcher. Estimated costs for potential removal shall be included in the proposed budget as a separate, if-authorized, line item.

Task 8 - If after 2 years the green noise wall project is determined to be a successful project, the researcher shall prepare standard design drawings and ODOT specifications for a Green Noise Wall. Removed materials that compose the noise wall shall be reused or recycled to the greatest extent possible. Estimated costs for this item shall be included in the proposed budget as a separate, if-authorized, line item.

Assistance from the Department:

- ODOT will provide the geotechnical studies.
- ODOT will provide approval of the green noise wall construction plans from Task 2.

- Deltalok will provide outside technical support to the contractor. This will consist of 1 Deltalok representative being present the first 2 days of construction and 1 day/week until all bags are in place.
- ODOT will provide Construction/Maintenance personnel as needed.
- ODOT will review and oversee the construction plans and research/monitoring.
- Links to the FHWA Highway Traffic Noise Analysis and Abatement Policy and Guidance and ODOT's Standard Procedure for Analysis and Abatement of Highway Traffic Noise will be provided by ODOT.
- During the Final Report phase, ODOT will provide to the researcher available noise data from locations similar to the Green Noise Wall location.

Implementation:
Results of the research (if positive) may validate the use of a Green Noise Wall as a feasible highway traffic noise mitigation solution. Positive results from this research could support the use of this form of mitigation across the state as well as other states. Negative research results could result in a discontinuance of the construction of future Green Noise Walls of this kind.

Benefits:
Benefits to the Department would include 1) a structural barrier that blends with the environment that absorbs/reduces noise equal to or greater than a conventional noise wall, 2) a structural barrier that has a construction process that is more environmentally friendly (less disturbance to the earth because of no need for reinforced drilled shafts), 3) a structural barrier that helps block and absorb vehicle air pollutants better than a conventional noise wall. Studies have shown that conventional noise walls protect communities from vehicle air pollutants by lifting and channeling air pollutants away from noise sensitive areas.

Success Criteria:
Success of the project will be based on all objectives being met. Minimal settling of the structure over time, healthy plant life after monitoring period, minimal material defects, acoustic protection, structural integrity maintained, and research completed on schedule and within budget.

Deliverables:
- Bi-monthly technical memos shall be provided showing data results on plant life, materials, structural integrity, maintenance issues, watering frequency, etc. Color photos shall be included in each technical memo.
- A final report with conclusive data results at the end of the 2-year monitoring period that includes 1) policy recommendations and/or strategies for adoption or policy changes, 2) a cost/benefit analysis and recommendations for future development of green noise walls, as appropriate, and 3) standard drawings and construction specifications for the Green Noise Wall if findings are supportive.
- One original and five copies of the draft final report and draft executive summary shall be submitted 120 days prior to the contract completion date.
- 45 copies of an approved final report, 220 color copies of an approved executive summary, and a PDF and MS DOC version of both documents shall be submitted by the contract completion date.
- Prepare an article for the IRIS newsletter (to be provided upon ODOT request).
- Participation in the following meetings: project start-up, pre-construction, research review session (1 per year), and project wrap-up.
- Submission of all project data.

Existing Research:
So far, the only research done on a Green or Living noise wall was done by WisDOT entitled "Living Noise Wall – Final Report dated January 1998. The Wall system incorporated a recycled plastic cribbing that was filled with soil and planted with vegetation. A failure in the plastic cribbing caused a collapse of a

portion (100') of the structure. The structural make-up of that system was quite different from the stacked bag system of the above mentioned green noise wall

Additional Use:
All other State DOT's that have a Green Initiative and a noise wall program would be very interested in this research. Other potential interest or use could come from agencies such as ODA or OEPA.

Duration
29 months

- Construction of Green Wall – 30 days
- Project monitoring – 2 yrs
- Project Start date – 1st Quarter FY 2011
- Project completed by end of 1st Quarter 2013