

EXHIBIT A SCOPE OF SERVICES

REGIONAL ROADSIDE TURFGRASS PERFORMANCE TESTING PROGRAM

BACKGROUND

This multi-state research project aims to provide participating departments of transportation with unbiased, up-to-date information about the performance of turfgrass cultivars when used on roadsides in the northern United States. This project has four objectives:

1. Institute a multi-state roadside turf grass testing program.
2. Develop a data collection and reporting system that provides the most recent research results to state DOTs in a timely manner.
3. Increase collaboration between University research programs that work on roadside turf.
4. Demonstrate the usefulness of regional roadside turf grass research in order to increase collaboration between Departments of Transportation in future years.

Failed installations can happen for a number of reasons, and it is the contention based on observation and previous research that failures often are due to using the wrong species for a given site. These failed installations most often result in needing to reseed or even resod. The most basic method for reestablishment of a failed site would be to kill the existing vegetation and reseed which will still have a cost of \$150 to \$530 per acre when using the most popular roadside seed mixtures plus the added cost of labor and resources needed to rectify a failed installation. Sod can cost nearly \$20,000 per acre. The additional cost of re-grading, installation and water can also be significant. Using the right turfgrass species for a specific area will provide the best option for long-term success of roadside turf grass installations.

The University has previously identified species and cultivars that can be utilized on roadsides in Minnesota. There is a need for additional testing on roadsides so that more recently developed cultivars and previously unexplored grass species can be identified for inclusion in DOT recommended mixtures in the northern United States. In previous studies, multiple sites in a single state (Minnesota) were utilized for this type of research; however, year-to-year variability in weather does not allow for sites in a single state to provide information on the tolerances of these grasses to the many stresses found on roadsides. A multi-state approach, whereby roadside turfgrass trials are planted throughout the northern United States, will greatly improve the chance that during any given year, we will be collecting data on important stress tolerances. Additionally, the same cultivars studies in the proposed research will be concurrently tested for stress tolerances in controlled environments (funded by MnDOT).

Taken together, these studies will provide data that improves our knowledge on roadside turfgrass stress tolerances resulting in better recommendations for state DOTs and ultimately financial benefit to public agencies.

SCOPE

Trial design and establishment

In fall 2016, each participating state will establish two roadside trials of individual cultivars submitted by public and private breeders. Depending on interest, there may be a limit on number of entries (species, cultivars) submitted by a single sponsor; the total number of entries would not exceed 50; additionally, 2 mixtures representing current recommendation from each of the four participating states (total would be between 150-180 individual plots) will be included. One of the two locations in each state will be along an urban or suburban street with a curb, having a daily traffic volume of between 10,000 and 15,000 vehicles. The second location will be along a rural highway without a curb having a ditch that slopes away from the road; this location should have a daily traffic volume of at least 30,000 vehicles. The curbed location should be one that is maintained regularly (mowed as needed to maintain turf grass aesthetics) while the rural site should be one that is typically mowed between 1-3 times per year. Plots will be seeded in late summer in order to ensure adequate turf cover prior to winter. A device to monitor rainfall will be placed on each research site (for instance, a tipping rain bucket such as AcuRite, Lacross Technology, Netatmo). Estimates of annual deicing agent applications will be collected by contacting local roadside management personnel. Each trial will be planted as a randomized complete block design with four replications. Individual plots will be at least 5 ft. long (parallel to the road) and at least 3 feet wide (perpendicular to the road). Seeding rate will be 2.0 pure live seeds cm^2 . At seeding, a granular starter fertilizer will be applied and lightly incorporated using typical tillage practices and the plots (providing approximately 1.0 lb. phosphorus 1000 ft) will be covered with a germination blanket (Futerra Environet (Profile) blankets) after seeding (Futerra blankets will not be

removed from the plots at any time). If no rainfall events occur within the first 7 days after seeding, the area will be watered. Plots will be irrigated as needed to ensure establishment (up to 5 more watering events). During fall 2016 and throughout 2017, the plots will be maintained by University researchers (watering during establishment, mowing throughout) and then maintained by the entity typically responsible for the roadside during 2018 and beyond.

Plots will be assessed using the grid intersect method where desirable plant species (planted species) are counted at each intersection of a grid placed over the plot; this will provide more consistent data across locations by eliminating rater bias. This data will be collected in such a way that spatial distribution can also be determined. Plots will be evaluated using this method in the late fall 2016 (October), and then again just after snow melt in the spring (April 2017), and then again at similar dates for the remainder of the project (October 2017 and April 2018). This will allow to accurately determine species composition going into and coming out of each winter stress period. The University will also visually evaluate the plots for percent desirable cover on those dates and also again in late spring and late summer of each year.

All data will be submitted to the University within one month of being taken; the University will be responsible for data analysis. Data will be analyzed and reported on a project website (hosted by the University) that will include both public information and private project information only accessible by project team members (including TAP members). During the study, researchers will hold quarterly conference calls with the Technical Advisory Panel made up of representatives from each of the state DOTs (approximately in January, April, July, October).

Soil chemical and physical property testing

Soils at each site will be tested in order to determine site conditions and assess changes in soil properties during the trial. For chemical property testing, 10 cores (1 inch dia., 3 inch depth) should be taken randomly within each block (replication) at each site, mixed and bulked together in a labeled bag. The samples (one total sample from each block) will be shipped to a designated soil testing lab for determination of plant available P and K, organic matter content, pH, electrical conductivity, CEC via summation of exchangeable cations, and sodium content. Samples should be taken prior to seeding and then each spring when ground thaws or shortly after in order to capture effect of road salt application. For physical property testing, three 3x3 inch cores taken with a core hammer device will be taken from each block (12 per trial location; 24 total per state) prior to seeding and again at the end of the trial. The cores will be oven dried at 105°C for at least 48 hours, then weighed to determine soil bulk density (subtracting the weight of the core itself). This will be done at each cooperating university.

Summary

If successful, this multi-state testing model could be repeated on a regular basis in future years so that state departments of transportation would always be provided with recent, unbiased data upon which to make recommendations. Future trials could look at mixtures based on results from the proposed trial, optimal time of seeding or sodding, or examine other important management practices that are important for survival of turf in these harsh roadside environments.

WORK PLAN

Task Descriptions

Task 1 Methodology and Data Collection Plan

Provide a summary of plot establishment including detailed methods description as well as a plan for data collection.

Task 2 First Year Results and Website Creation

Collect and analyze data. Report of results from the first year of the project including winter survival data from all sites. Create a website to communicate data to participating states.

Task 3 Second Year Results

Collect and analyze data. Report of results from the second year of project.

Task 4 Final Website

Complete the website. The website will provide information to stakeholders about roadside turfgrass research in the participating states. Site will include a nonpublic area for sharing of data and information among project participants.

Task 5 Compile Report, Technical Advisory Panel Review and Revisions

Prepare a draft report, following MnDOT publication guidelines, to document project activities, findings, recommendations, and ideas for implementation. This report will need to be reviewed by the Technical Advisory Panel (TAP), updated by the Principal Investigator to incorporate technical comments, and then approved by Technical Liaison before this task is considered complete. Holding a TAP meeting to discuss the draft report and review comments is strongly encouraged. TAP members may be consulted for clarification or discussion of comments.

Task 6 Editorial Review and Publication of Final Report

During this task the Approved Report will be processed by MnDOT’s Contract Editors. The editors will review the document to ensure it meets the publication standard. This task must be completed within the Contract time because the editors will provide editorial comments and request information from the Principal Investigator.

Task Deliverables

Task:	Deliverables:
1	Report on installation and establishment of research plots.
2	Report of results from the first year; website
3	Research plan detailing methodology, including cultivar list.
4	Final website for information and research results
5	A Draft Report and Final Report Approved for Publication
6	Final Published Report

Key Milestones

Milestone	Target Date
Begin Trials	October 2016
Complete Field Data Collection	September 30,2018
Launch Website	November 30, 2018

PROJECT SCHEDULE

Months:	2016			2017												2018									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Task 1	X	X	X	X	X	X	X	X																	
Task 2									X	X	X	X	X												
Task 3														X	X	X	X	X	X	X	X	X	X	X	X
Task 4																									
Task 5																									
Task 6																									

Months:	2018			2019									
	25	26	27	28	29	30	31	32	33	34	35		
Task 1													
Task 2													
Task 3	X												
Task 4		X	X	X	X	X							
Task 5							X	X	X				
Task 6										X	X		

Task	Draft Deliverable Due Date	Final Task Approval Date
1	March 31, 2017	May 31, 2017
2	August 31, 2017	October 31, 2017
3	August 31, 2018	October 31, 2018
4	January 31, 2019	March 31, 2019
5	April 30, 2019	June 30, 2019
6		August 31, 2019

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