
The S1 Event

Design Manual
Chapter 200
Geotechnical Design
Originally Issued: 01-15-14

The purpose of an S1 Event or work effort is to: 1) review the proposed alignment and grade of a project for potential major soil related (geotechnical) problems affecting design and constructability; and 2) to identify multiple locations as potential borrow sources.

An S1 is typically accomplished by an office review of all available project and reference materials and by a field review, but without exploratory drilling or detailed geotechnical analysis.

Quick Tips:

- Identify major or project stopper geotechnical related concerns.
- Identify multiple potential borrow locations/sites.
- Annotate aerial photographs identifying geotechnical concerns and potential borrow sites.

Note: See the discussion in Section [200A-1](#) concerning the intended use of contractor provided borrow on future DOT projects.

Reference Documents

Project inputs (documents) that may be provided for initiation of an S1 work effort include, but are not limited to:

- Available Environmental Assessment (EA) and Environmental Impact Statement (EIS) reports.
- Proposed corridor limits.
- Documentation on the type of project.
- Aerial photo layout.
- Proposed grades and alignments.
- A general estimate of borrow needs.
- Anticipated project limits (termini).

Reference materials researched as part of the S1 effort also commonly include, but are not limited to:

- Available topographic maps.
- Soil surveys.
- Historical aerial photographs.
- LiDAR imagery.
- Previous project design.
- As-built plan information.

S1 Event Scope

A written S1 submittal (i.e., memo) reports the findings of: 1) the alignment and grade review, noting major or project stopper geotechnical related problems, issues and other observations/concerns; and 2)

documentation of the multiple potential borrow sites. See example [S1 submittal Memo](#) with [aerial photographs](#).

Grade and Alignment Review

A review of the grade and alignment is made to evaluate potential geotechnical issues (i.e., project stoppers) within the proposed corridor that could prevent the project from being completed, require an alignment change, and/or influence borrow selection. The identified geotechnical issues will be explained in detail on how they would affect the proposed project. These geotechnical issues could include, but are not limited to:

- Swampy areas (i.e., potential wetlands).
- Sinkholes.
- Abandoned mines.
- Peat/organic materials.
- Shallow bedrock.
- Faults.
- Alluvial channel fills (floodplains).
- Extreme cuts and/or fills.

Annotated aerial photos identifying the areas where potential geotechnical issue(s) occur should be included with the S1 submittal. As a minimum, include:

- One photo showing an overall view of the potential geotechnical issues, if possible.
- Separate enlargements of the individual geotechnical issue areas.

Potential Borrow Sites

The project borrow need and/or distribution is not always available at the time of the S1 work effort; therefore, to cover all possibilities related to how much borrow material might be needed and where, the number of potential borrow sites considered is almost always in excess of what will possibly be needed and ultimately used. Documentation regarding the borrow sites should include, and explain the reasons for, the number of borrow sites. Documentation should also include sufficient detail for each borrow selection, such as: 1) size of area identified (i.e., parcel or potential area of acquisition); 2) the type of soil material that is potentially available (Select, Class 10, etc.); 3) the probable type of borrow (pond, drainable, backslope, etc.); and 4) parent material (loess, glacial till, alluvium, etc.).

Annotated aerial photos (Figure 1) of the potential borrow sites should be included with the S1 submittal. As a minimum, include:

- One photo showing an overall view of the sites, if possible.
- Separate enlargements of the individual prospective sites.

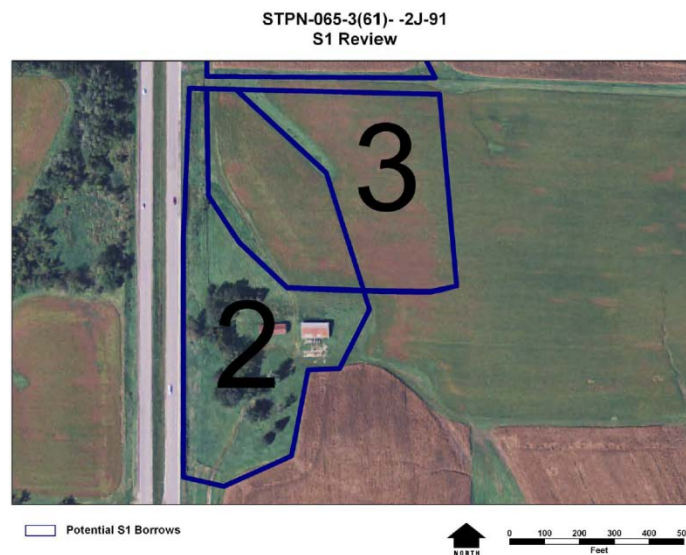


Figure 1: Annotated aerial photograph.

Each photo should be annotated with a north arrow, scale, a general outline of the proposed site or sites, and an identification number assigned to each potential site to facilitate subsequent discussions. Additional information may be appropriate such as road names, dimensions, or distances from easily identifiable land or building features to help S1 submittal recipients locate the potential sites.

Initial Identification: Initial borrow identification is accomplished by reviewing, at a minimum, the following:

- GIS information:
 - Topographic maps.
 - Aerial photographs.
 - Soil survey maps.
 - Wetland maps.
 - Geologic borings.
 - Mining maps.
- LiDAR.
- As-built plans and DOT borings.

A field review is then conducted to further evaluate and select the multiple initial potential borrow sites. An important and mandatory part of this field review is to look for new development (such as new houses) that would eliminate a potential borrow site from consideration.

Selection of Sites: The borrow selection is based on some or all of the following considerations:

- Minimizing the number of borrows and land use impact.
- Total borrow need.
- Hauling distance.
- Hauling barriers (rivers, etc.).
- A borrow site's potential to produce select for subgrade treatment (this is not always accomplished).
- Potential landlocked parcels, irregular shaped parcels.
- Proximity to farmsteads, homesteads, lakes, parks, and other sensitive features.

- Avoidance of environmental/cultural sites and issues (wetlands, historical sites, etc.).
- Restrictions such as the Loess Hills region, Century farms, pipelines, etc.

S1 Event Submittals

Draft S1 Submittal

The draft submittal consists of an email and memo following the S1 Event boiler plate. Use the following boiler plates for submittals: 1) [email](#); and 2) [memo](#). The draft submittal should include all photographs for identifying the geotechnical issues and borrow sites. Each photo should be annotated with a north arrow, scale, a general outline of the proposed site or sites, and an identification number assigned to each potential site to facilitate subsequent discussions. Additional information may be appropriate such as dimensions or distances from easily identifiable land or building features to help with locating the potential sites.

The Draft S1 submittal should first be submitted to the Soils Design Section Engineer for peer review and comment. Comments should be documented, discussed, and addressed in the final submittal. The overall Soils Design Section review team should ultimately include:

- Soils Design Section Engineer.
- Soils Design Section Assistant Engineer.
- Soils Design Section Geologists.

Final S1 Submittal

The [Final S1 Submittal Memo](#) (pdf) is placed in the S1 Submittal folder of the Soils folder of the Project Directory and an email is sent to the recipient list below with links or electronic files of the Final S1 Submittal. For consultants, the Final S1 Submittal is forwarded via email or ftp. The Final S1 submittal should be directed to:

- Project's Design Section Engineer.
- Office of Design Engineer, Assistant Engineer – Development, Assistant Engineer – Support.
- District Engineer, Assistant District Engineer; District Construction Engineer.
- Photogrammetry Engineer and Survey Supervisor.
- Office of Right of Way – Office Director, Right of Way Design Supervisor, Acquisition Team Leader.
- Office of Location and Environment – Office Director, Wetland Section Supervisor, Cultural/Historic Resource Team Leader.
- Design Section Assistant Engineer and Design Section Technician.
- Roadside Development Section Supervisor.
- Soils Design Section Assistant Engineer and Geologists.
- Office of Construction and Materials – Earthwork Field Engineer.

Electronic Files

For internal Iowa DOT use, electronic files are copied to the project directory and links to the files are included in the email. The steps necessary for the development of the electronic files are included in the [S1 file guideline](#).

Consultant generated electronic files will be submitted with final submittal via email or ftp. Electronic files should be developed according to Section [20B-71](#).

Electronic files for the S1 submittal should include and be named:

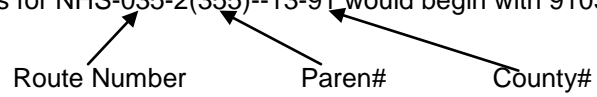
- S1 Submittal Memo: *County# - 2 digits, Route# 3 digits, and Paren # - 3 digits_S1.pdf*
- Google Earth: *County# - 2 digits, Route# 3 digits, and Paren # - 3 digits_S1.kml*

- Microstation: *County# - 2 digits, Route# 3 digits, and Paren # - 3 digits _S1.sol*
- Aerial Photos: *County# - 2 digits, Route# 3 digits, and Paren # - 3 digits _S1borrowXX.jpg*

Note: The Soils Design Section typically uses the grading number of a project.

Example:

The S1 files for NHS-035-2(355)--13-91 would begin with 91035355



The S1 files for NHS-061-3(48)--19-58 would begin with 58061048

Chronology of Changes to Design Manual Section:

200B-001 The S1 Event

1/15/2014

New