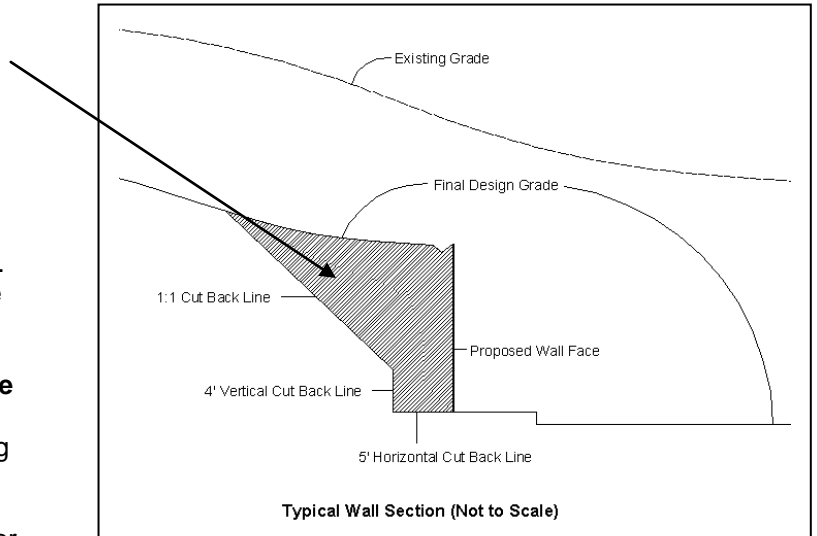# Modeling Vertically-Staged Earthwork
Modeling for Retaining Wall Cut Back

In this exercise we will model and quantify a wall cut back using a combination of the **Lowest Surface** utility and *AGTEK 4D's* **Apply Template** 🔧 utility (*AGTEK 3D* users will substitute the **Stage Over-Ex** 🔧 and **Offset Line** ✏️ utilities for the *Apply Template* utility, which is not available in *AGTEK 3D*) . . .

The shaded area on the typical wall section indicates extra cut required behind a proposed wall. We could model this cut with the "Cut Back Lines" shown in the typical section and then compare that surface to the design surface to calculate a cut volume. That would provide an accurate volume as long as the existing grade did not drop below design grade anywhere along the wall, otherwise it would overestimate the extra cut. A more accurate cut volume can be obtained if we measure it from design grade *or* existing grade, based on whichever grade is lowest at any given location along the wall—AGTEK's **Lowest Surface** utility, which automates the creation of a lowest surface model, can be usefully applied to modeling problems like the one we have in this example.

Typical Wall Section (Not to Scale)

Step 1: Complete all earthwork modeling entries for existing and final design grades, including any required *Stripping Area* and *Sectional Area* entries. For this exercise, open the **Lowest Surface Exercise.esw** job file (see *Appendix C*), which includes these completed entries.

Step 2: Switch to **Planview** 🔧 mode, set *Ref* surface to **Subgrade** and *Diff* surface to **Stripped**.

*[Step 2 specifies the surfaces that will be compared and staged for the resulting lowest surface. AGTEK 4D allows any combination of Ref and Diff surfaces (including **User-Defined** and **Strata** surfaces) in this step. AGTEK 3D is less flexible and some surface combinations in Step 2 may cause the Lowest Surface utility to crash the AGTEK 3D program; if a crash occurs, AGTEK 3D users would need to manually create the desired lowest surface (see Appendix G).]*

Tip: Less editing will be required in Steps 5-7 if the *On-Grade Limit* is set to **0** *[select **Utility > On-Grade Limit** from the menu]* and the *Staged Design* option is disabled *[select **Options > Staged Design** from the menu]* before proceeding with Step 3.

Step 3: Select **Utility > Lowest Surface** from the menu. In the resulting *Lowest Surface Guide* dialog, click the **Generate Fill Areas** checkbox (clicking **Close** would cancel the *Lowest Surface* utility) then see next page ...

Notes: For more examples of the **Lowest Surface** utility see AGTEK's videos at *www.agtek.com/video.html?id=219* (a basic overview of the Lowest Surface utility) and *www.agtek.com/video.html?id=342* (use a Lowest Surface for pipe trench excavation model, includes trench volume calculations with the **Gradework-Materials** program module). Some useful techniques for modeling retaining walls are documented in AGTEK's video at *www.agtek.com/video.html?id=504*.

146