

# Technical Bulletin

## Raising the Road Profile



PennState

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Center for Dirt and Gravel Road Studies

### WHY RAISE THE ROAD?

Routine road maintenance practices, such as surface grading, snow removal, and ditch cleaning, combined with the wear and tear of traffic and natural erosive forces have the cumulative effect of lowering the elevation of the road in relation to the surrounding terrain. As the road elevation drops, it often becomes entrenched, and water that drains to the road becomes trapped in the road corridor. This flow concentrates in the road ditches and at times on the road itself. The road now functions as a channel for downslope water flow (see Photo 1).

Entrenched road profiles make installation of crosspipes, turnouts and other drainage outlets intended to shed water from the road increasingly challenging to near impossible. Raising the road can eliminate the persistent maintenance difficulties and costs associated with an entrenched road.

### TYPICAL REQUIREMENTS

- Competent and cost effective fill material. Commonly used fill materials include: native shale, quarry waste, bank run gravel, excavated spoils from construction sites and highway projects. Avoid fill materials such as demolition waste, certain mine spoils, and any material of questionable content.
- A method of hauling the material to the site.
- A grader or bulldozer to place and shape the fill.
- Compaction equipment to compact the fill in 6" to 8" lifts (12" max). A large vibratory roller or sheep's foot roller should be used to thoroughly compact each lift of fill.
- A method of adding moisture if the fill is dry.
- A durable road surfacing material to cap the newly filled road.



**Photo 1:** When the elevation of the road is lower than the surrounding terrain, drainage on the road is trapped. As this drainage flows downhill, it generally increases in both volume and velocity. This results in erosion of road material away and causes more frequent road maintenance.

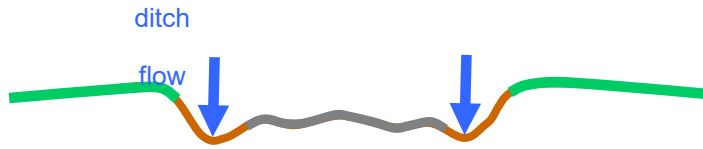
### IMPORTANT CONSIDERATIONS

- Raising the road profile addresses many common road maintenance problems. This practice can reduce or eliminate concentrated road drainage and increase the potential for stormwater infiltration. The process can increase the opportunity for additional ditch outlets and provide the occasion to improve road base stability. Filling the road can shore up unstable road banks and improve motorist visibility.
- Fill material should be selected carefully. Use "competent" sources of fill without excess clay or organic components. Certain construction waste and industrial waste may be suitable, but may need permits or require special handling.
- When adding fill material, the goal should be to elevate the road enough that drainage is restored to a natural condition. In other words, the road is no longer the low point in the surrounding terrain. Ditch flow is eliminated from either the downslope side of the road or both sides of the road (depending on topography). This eliminates at least one road ditch and allows road drainage to sheet flow off the road into the surrounding landscape.
- Raising the road profile coincides well with the installation of underdrain. Please see the *Underdrains* and the *Constructed Stone Underdrains* Technical Bulletins for more information on this drainage practice.



## CONSTRUCTION SEQUENCE

**BEFORE:** An entrenched road traps road drainage in the road corridor. This situation often results in accelerated erosion problems and a need for constant maintenance. Raising the road eliminates the persistent maintenance associated with a road that is lower than the surrounding terrain. (cross-section #1)



### Cross-section #1:

**DURING:** Prep the existing road base with proper crown before adding fill material (4%-6% for unpaved roads and 2% for roads to be paved). Place fill material in the road profile in 6" to 8" lifts. Each lift of material should be placed with the same crown established in the base. Compact each lift of material to ensure a solid road base. Geo-textile fabric can be used to separate the fill from an unstable sub-base or to add strength to the road. When possible, add enough fill material to raise the elevation of the road to restore natural drainage patterns.

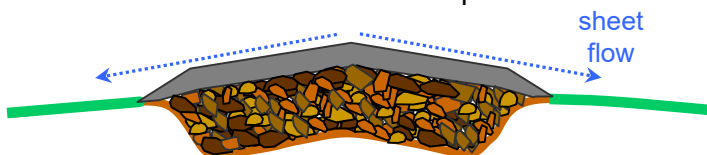


**Cross-section #2:** The existing road base is re-shaped with proper crown. The first lift of fill material is placed, crowned and compacted.



**Cross-section #3:** The second lift of fill material is laid on top of the first lift, crowned and compacted.

**AFTER:** Because the fill depth exceeds the height of the road bank(s) and is shaped to reflect the finished surface, the surface material can be installed at a uniform depth to facilitate sheet flow.



### Cross-section #4



**Filling the road: before, during, and after.** Here native shale was used to fill the road and eliminate both roadside ditches. This extensive fill project involved more than three feet of fill to reach the desired road elevation. Even with proper compaction techniques, additional settling will occur when significant depths of fill are placed. Here the road manager was able to allow time for settling before Driving Surface Aggregate (DSA) was placed over the properly shaped and compacted base. When possible, this additional settling time is recommended on large fill jobs.