Part 2

FILL SLOPES

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- The embankment retaining Lake Chesterfield near St. Louis is typical of many across the humid Midwest, which employ mowed grass and shrubbery for erosion protection.

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- In most cases, grass cover is not mowed on the largest embankments. This view shows the downstream face Alpine Dam at Innsbrook, west of suburban St. Louis

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- **Early fill slopes were typically inclined at about 1.5:1 (33.6 degrees). This shows a sidehill fill slope supporting a newly constructed road along the crest of the hills above Berkeley, CA in late 1934.**

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- **Rill erosion is common in low cohesion fill materials, like sands and silts. This photo shows the impact of a single series of storms on an unprotected fill slope**

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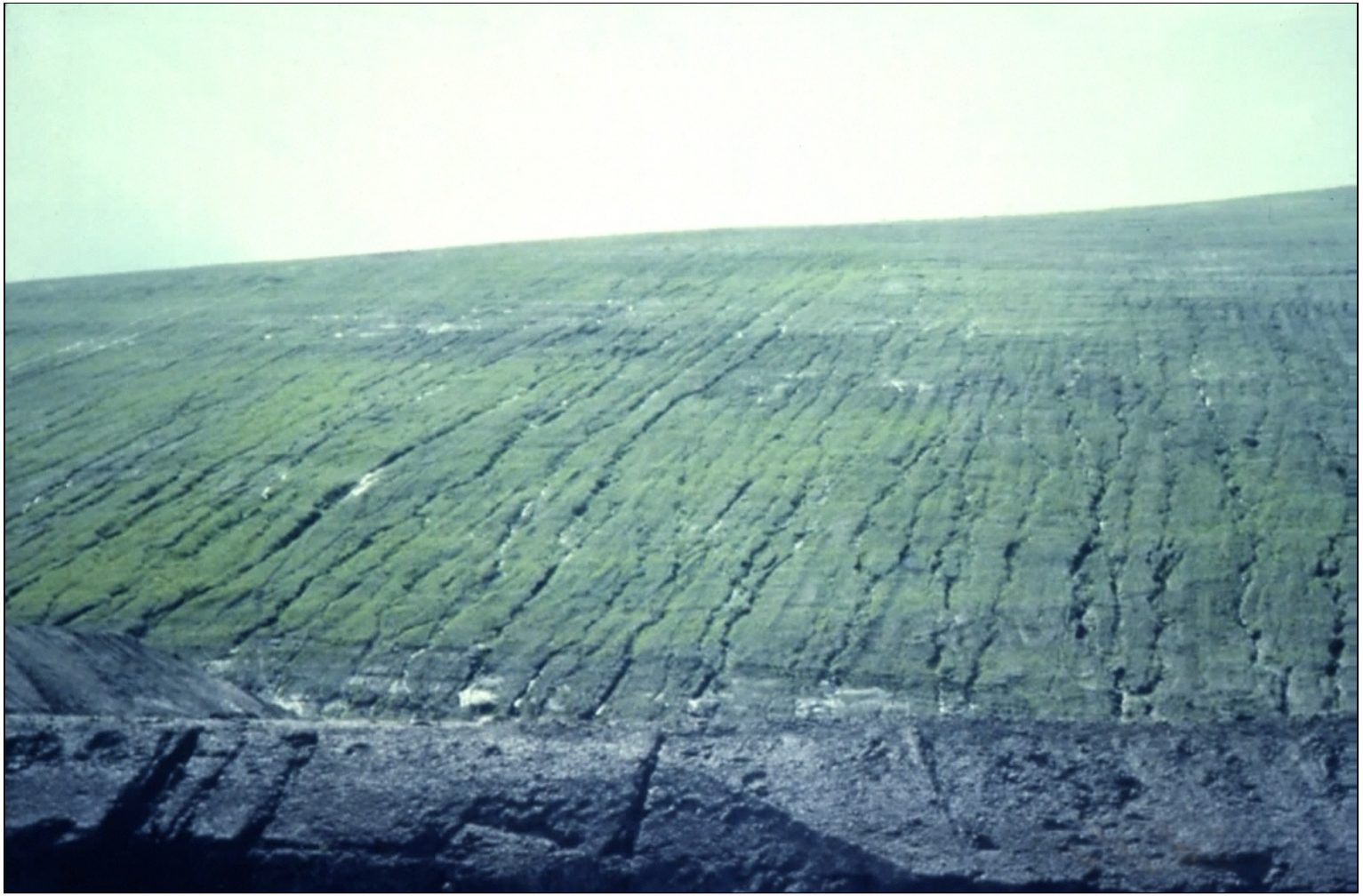

- In the 1988 UBC the decision was made to waive the requirement for terrace drains if fill slopes were inclined at 3:1 or flatter. This view shows rill erosion developed on such a slope, despite a healthy grass cover.

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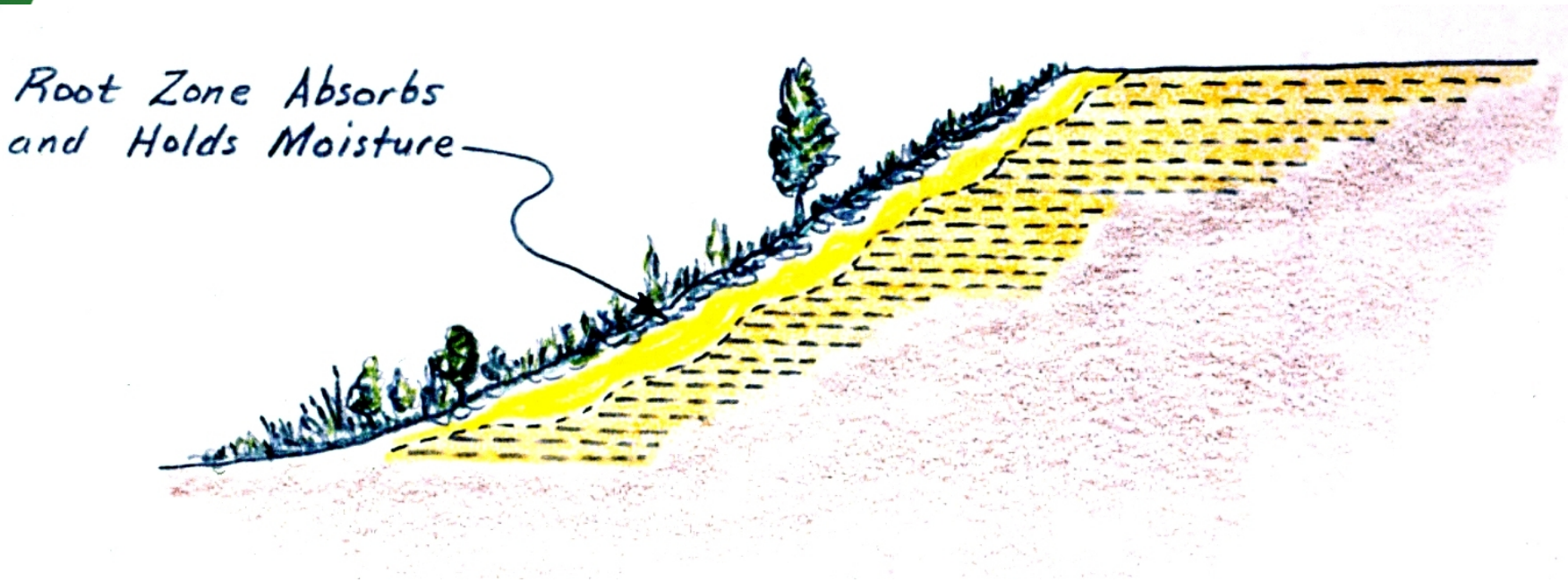

- The face of an inclined embankment cannot be compacted as densely as the interior fill because the slope ***deforms*** more elastically under load. This low density zone tends to foster plant growth
- Unfortunately, a heavy mat of vegetation is often formed, with greater permeability than the underlying fill

- When this mat of vegetation is subjected to sustained intense precipitation, it tends to separate like a rug falling off a polished floor, as shown above.

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- Cut slopes failures are usually shallow, involving a wet mat of organic material, which often detaches at the root line, within 1 to 3 feet of the ground surface

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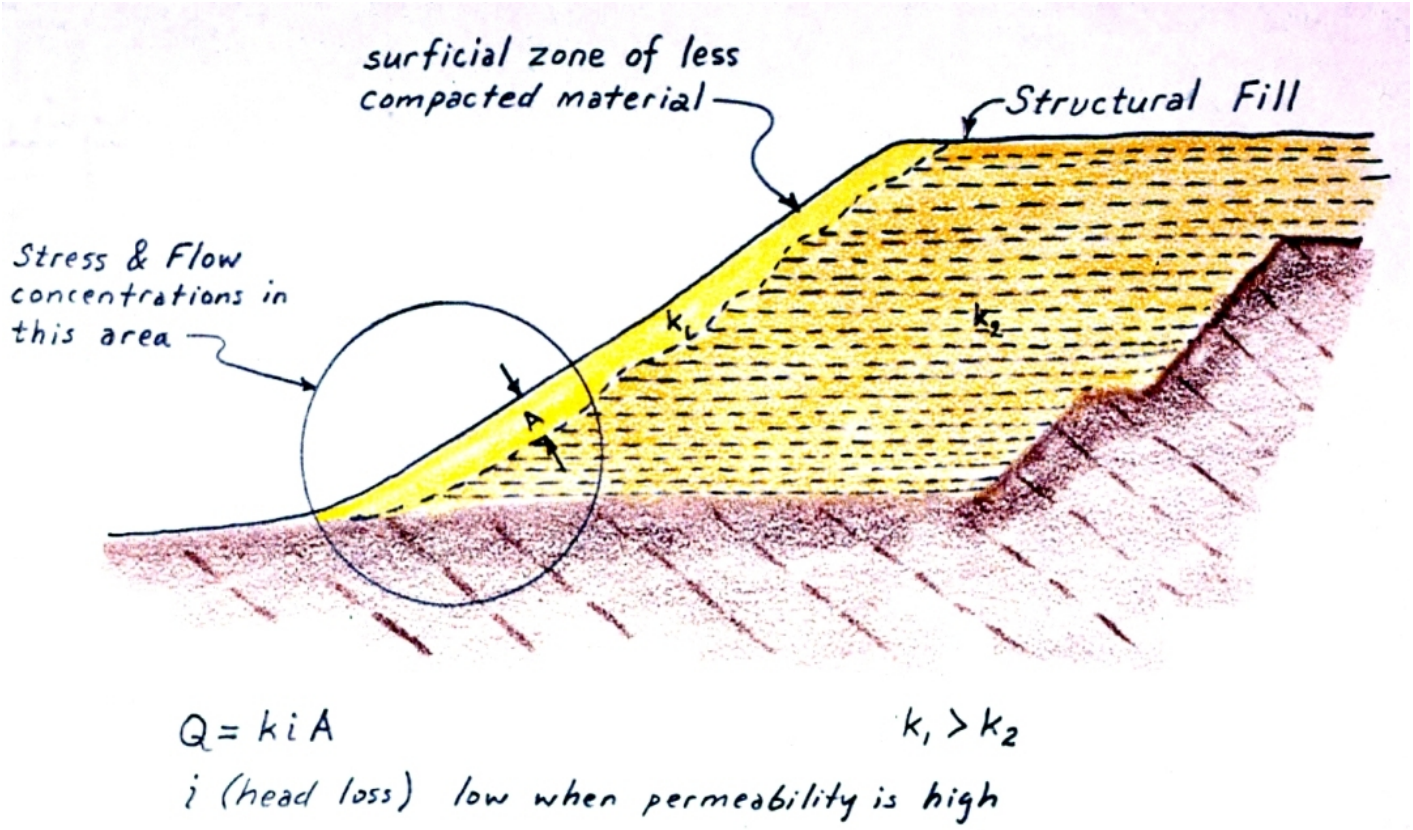

- **The low density zone along the face of a fill slope can be mitigated by: 1) trimming; 2) embedment of geotextiles, or 3) by emplacement of deep-rooting woody vegetation**

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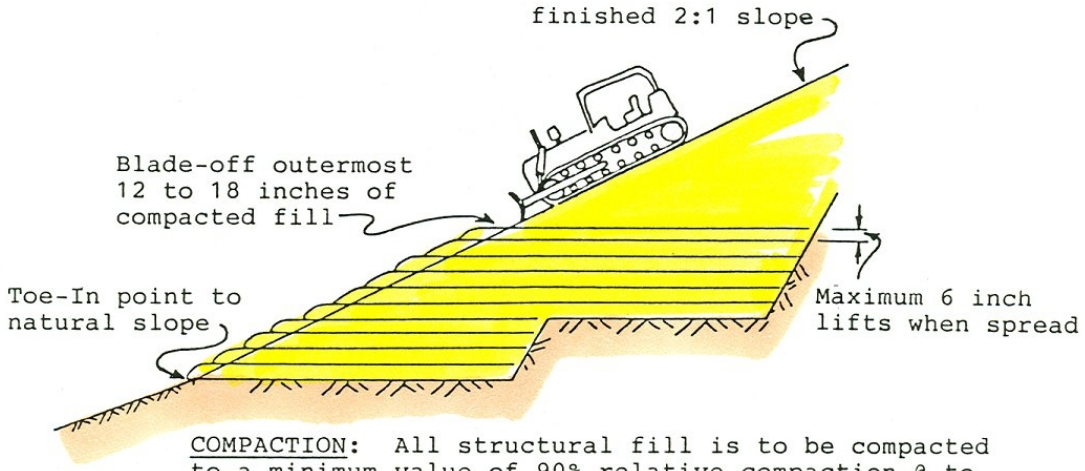

COMPACTION: All structural fill is to be compacted to a minimum value of 90% relative compaction @ to ASTM D1557-79.

NOTES:

1. Grub & scarify slope prior to earthwork activities. Minimum organic content 2% (by weight) in structural fill.
2. Benches/Excavation to extend a minimum of 0.50 feet beneath soil or regolith horizon at all locations. Bench widths are at the discretion of the contractor. The required depth of excavation is to be confirmed in the field during construction by either the soils engineer or the engineering geologist.
3. The maximum finish slope is to be 2:1 (horizontal to vertical).

- **Trimming involves drifting of the upper 1.5 feet by a tracked dozer, removing loose material. Unfortunately, it is much more difficult to plant a trimmed slope, and “tree pits” may be required to plant bushes or trees so that their roots can tap successfully.**

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- **Dressing a fill slope is the process by which the slope is trimmed to its final inclination, as shown here. Note construction staking.**

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- A “dressed slope” is usually walked by a tracked dozer, leaving the track marks. This serrated surface provides superior catchment for hyrdroseeding of most grasses

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- **Track walking a fill slope will not compact it appreciably because the track contact pressures are usually between 5 and 10 psi; well below those imparted by a mechanical compactor (>135 psi for pad rollers)**

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- Rolling a fill slope with a pad roller imparts between 135 and 175 psi contact pressure beneath the roller teeth

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- The contact pressure is the roller weight on the teeth multiplied by the cosine of the slope inclination. This results on about an 11% reduction on a 2:1 slope.

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