LOW IMPACT POST CONSTRUCTION STORMWATER MANAGEMENT

NGAC – October 17, 2019

WHAT IS POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM)?

- The effort to reduce runoff of rainwater or melted snow into streets, lawns and other sites and the improvement of water quality. (USEPA, 2018)

- Generally speaking, it is the effort to plan a development to produce the least amount of runoff, while also mitigating for the runoff which cannot be avoided.

- Two aspects of Stormwater
  - Rate – How quickly runoff leaves a site (slower is better)
  - Volume – How much runoff ultimately leaves the site.

- Two types of stormwater mitigation Best Management Practices (BMPs).
  - Non-structural – Buffers, minimization of impervious surface, protection of natural drainage.
  - Structural – Infiltration berms, basins, trenches ect.

ALTA'S STORMWATER DESIGN PROCESS/PRINCIPLES

- Established the Rate at which stormwater moves through a well pad.
  - Extensive testing of previously built/drilled/frac'ed/producing well pads.

- Evaluate the on-site infiltrative capacity of the soils at the proposed location.
  - Infiltration testing both at surface and sub-surface (only if infiltration trenches proposed).

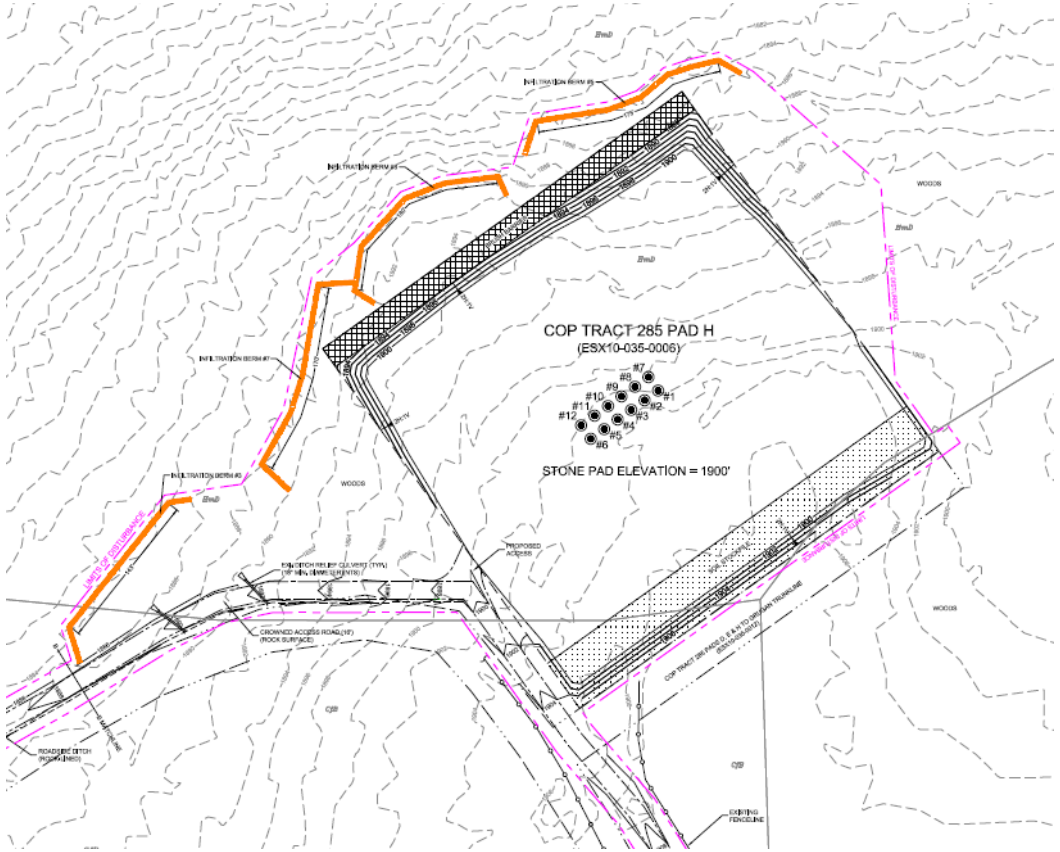
- Focus upon a dispersed stormwater design, rather than concentrating runoff into one or a few BMPs.
  - Alta sites have few ditches or other conveyances and are designed to sheet flow water from the pad surface and roads in all directions.
  - Diversion berms used to direct flows to infiltration berms rather than ditches
    - Easier and less $$ to construct.

ALTA'S STORMWATER DESIGN PROCESS/PRINCIPLES

- Avoid land clearing and extra disturbance for PCSM BMPs.
  - PCSM controls typically take up large portions of a site, by finding ways to incorporate PCSM into the native landscape, Alta can keep footprint small and drive down cost.
  - The areas that Alta operates have ample forest and meadow buffers to control stormwater, however, it is difficult to use these "on paper".
    - Focus on infiltration enhancements within the near-pad buffer areas.

- Focus on use of diversion and infiltration berms.
  - Berms can be quickly built from native material on site with small equipment with no need to import stone for ditches or infiltration basins / infiltration trenches.

DISPERSED STORMWATER DESIGN



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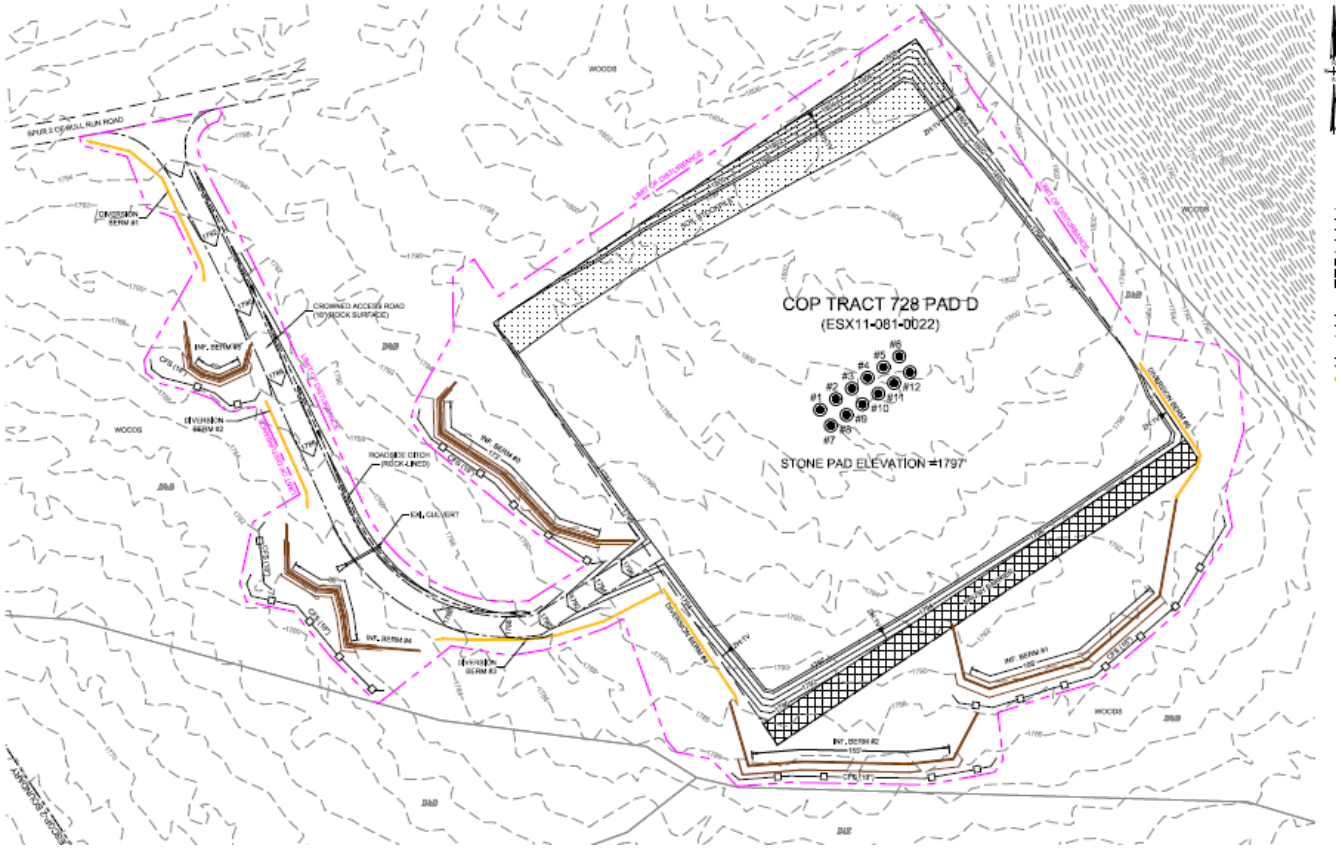

COMPOST SOCK INFILTRATION BERMS

- Mix of compost soil and mushroom soil with seed mixed throughout.

- Using standard silt sock installation equipment and procedures, infiltration sock can be blown into place in difficult terrain.

- Sock is sized larger than intended ponding depth to allow for settling of sock.
  - 24 inch sock used for 18 inch depth.

- Infiltration sock does allow some water to pass through the sock.
  - Cannot be used with all soil types. Some soil types/infiltration rates won't allow sock to be used.

COMPOST SOCK INFILTRATION BERM

EARTHEN INFILTRATION BERMS

- Compacted mound of vegetated soil.

- Generally less than 3 feet high.
  - Dispersed design critical, since very large berms are not practical.

- Maintaining Infiltration rates upslope of berm is critical for success.
  - Minimize excavation and compaction upslope of berm.

GEN 1 EARTHEN INFILTRATION BERMS

- Utilized soil material immediately adjacent to the berm.
- Disturbance width of ~20 feet needed for a berm 2 feet high.
- Mixed success.
  - Often difficult to scrap enough material together to build a berm.
    - If excavated too deep, berm will hold water permanently.
  - Excavation and Compaction of upslope area causes lack of infiltration.
    - Added cost to fix sites with poor infiltration.

GEN 1 EARTHEN INFILTRATION BERMS

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GEN 1 LEARNINGS

- Utilizing soil immediately adjacent to the berm is not practical.
  - Relatively wide disturbance area.
  - Soil compaction of upslope area.
  - Difficult to obtain enough material without excavating too deep.

- Great deal of effort spent forestry mowing the area.
  - Extra equipment, more time = more $$

- Large disturbance area = more seed, mulch and opportunity for seeding failure = more $$.

GEN 2 EARTHEN INFILTRATION BERMS

- Borrow soil from topsoil stockpile of well pad.
  - Generally close to berm site, quick turn-around.
- Haul soil close to berm site with T-tag dump truck.
- Track soil the rest of the way to the berm with a skid steer.
  - Surprisingly efficient.
- Form and shape berm with standard mini-excavator.
  - Disturbance width of ~12 feet for berm height of 2 feet.

GEN 2 EARTHEN INFILTRATION BERMS

GEN 3 EARTHEN INFILTRATION BERMS

- Same process as GEN 2, but added a tilting grade bucket to the mini-excavator.

- Allows the machine to work in parallel on top of the berm.
  - Previously, a great amount of time spent maneuvering the machine into a perpendicular position to shape the berm.
  - Added benefit of less track wear on machine.

- Disturbance width of ~ 6 feet for the same 2 ft high berm!!

- Crew of 3 can build 400 to 500 feet of berm in one day, with small equipment.
  - Quicker and less $$ than infiltration basins.
  - Now Alta's standard for both State Forest and Private lands.

- Upslope area left undisturbed resulting in high infiltration rates.

GEN 3 EARTHEN INFILTRATION BERMS

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QUESTIONS?