PERVIOUS PAVEMENT: HOW’S IT WORKING?

Bloomington’s Experiences with Pervious Bituminous and Concrete Parking Lots

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City Engineers Association of Minnesota, Jan. 25, 2012
WHAT WE BUILT: PERVERIOUS BITUMINOUS HARRISON PARK PARKING LOT, 2008
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W. Old Shakopee Rd.

W. 100th St.

James Ave. S.
WHAT we BUILT: PERVERIOUS CONCRETE
PUBLIC WORKS, JAMES AVE. EAST LOT, 2010
WHAT WE BUILT: PERVERIOUS CONCRETE PUBLIC WORKS, JAMES AVE. EAST LOT, 2010

W. 98th St.

James Ave. S.
CITY OF BLOOMINGTON: PROJECT LOCATIONS
Why pervious pavements instead of conventional pavements?

- Aging, failed pavements
- Drainage problems
- Erosion concerns
- Non-degradation goals (MS4 Permit)
  - Increased Infiltration
  - Reduce peak runoff
  - Reduce stormwater pollution
- Direct runoff to Nine Mile Creek
- Sustainable Bloomington commitment
- Education of City employees, citizens, developers, etc.
- Close proximity to monitor performance
HARRISON PARK: DESIGN & CONSTRUCTION

- Soil boring, sand (SP) down to 11’
- Sized for 2” runoff from contributing area (1.75ac)
- 5% grade, benched sub-grade at 1’ contours
HARRISON PARK: DESIGN & CONSTRUCTION

- Subgrade compaction, use tracked equipment
- Granite recharge bed, higher cost, $31/ton
- Non-woven fabric
HARRISON PARK: DESIGN & CONSTRUCTION

- Redi-mix trucks, no problems on crushed granite
- Choker course, fine grading, some pickup and rutting
- Used front-end loader to feed paver
HARRISON PARK: DESIGN & CONSTRUCTION

- Pervious pavement paving is exciting!
- Tried several compaction techniques, let it cool
- Two passes with steel drum, roller marks
HARRISON PARK: DESIGN & CONSTRUCTION

- Two raingardens
- Wet plant species – Accepts runoff from neighboring apartment parking lot & overflow from Park
- Drought tolerant – Parking lot median
HARRISON PARK: DESIGN & CONSTRUCTION

- More care during plant & turf restoration
- Protect pavement with tarps, fabric or plywood
- Construction phasing
**Harrison Park: Maintenance**

- Fall and Spring – Sweep with regenerative air sweeper
  - Contracted for first two seasons
  - City purchased regenerative air sweeper in 2010
  - Leaf blowers work to get debris in corners & tight spots
  - City sweeps streets twice annually, pick up Pelicans with curb brooms, followed by regenerative air sweeper
HARRISON PARK: MAINTENANCE

- Winter – Plow only, alternating yearly plowing only one half of lot, with 1 ton plow truck. Access drive is salted and sanded at entrance.
- Summer – Pick up trash & debris, refuse container is serviced with 1 ton truck. Mower discharge away from pavement.
HARRISON PARK: MAINTENANCE/OBSERVATIONS

- In-house training of Maintenance Crews
- Seasonal observation/monitoring
  - Winter for ice, plow damage, solar de-icing
  - Spring for refreeze and plow damage
  - Summer, during rain events and raingarden weeding
  - Fall, leaf debris, weeding and sweeping review
  - Low volume and light vehicles, little damage or distress
HARRISON PARK: OBSERVATIONS

- Refreeze, spring thaw, March 26, 2009
- Note some plow abrasion on pervious lot

Pervious Pavement

Regular Pavement
HARRISON PARK: OBSERVATIONS

- Rain event, August 19, 2009
- >1” in 15 minutes peak intensity
HARRISON PARK: OBSERVATIONS

- Rain event, August 19, 2009
- >1” in 15 minutes peak intensity

Impervious access driveway onto pervious parking lot

Shared raingarden full from neighboring apartment parking lot
HARRISON PARK: OBSERVATIONS

- Rain event, October 6, 2009
- 1.4” for the day, no intensity data

Surface plugging from impervious driveway pavement runoff
HARRISON PARK: OBSERVATIONS

- Rain event, May 13, 2010
- 0.60” rain

Similar surface plugging from impervious driveway pavement runoff

Good performing pervious pavement, “matte” texture
PUBLIC WORKS EMPLOYEE PARKING LOT: DESIGN & CONSTRUCTION

- Sandy soil, no soil boring, staff experience
- 0.25 ac contributing area, match existing lot
- 5% grade, benched subgrade at 1’ contours
- Safety, ice from roof runoff and irregular pavement
PUBLIC WORKS EMPLOYEE PARKING LOT: DESIGN & CONSTRUCTION

- Displaced, inconvenienced & concerned employees
- Subgrade compaction
- Non-woven fabric
PUBLIC WORKS EMPLOYEE PARKING LOT: DESIGN & CONSTRUCTION

- Crushed limestone, locally sourced, high quality, $27/ton
- No choker course; some rutting, but fixable
- Tight quarters
PUBLIC WORKS EMPLOYEE PARKING LOT: DESIGN & CONSTRUCTION

- Redi-mix Assoc. certifications for pervious concrete
- Planned test panel, but time was getting tight
- Mix design, testing were a little unknown
- Very stiff mix: mix design, 2” slump, 0.30 w/c ratio, aggregate size 3/8” to #8, pervious admixture
PUBLIC WORKS EMPLOYEE PARKING LOT: DESIGN & CONSTRUCTION

- Roller screed on forms, hand finished edges
- Four passes, on two consecutive days
- Minimal hand work, preserve surface voids
PUBLIC WORKS EMPLOYEE PARKING LOT: DESIGN & CONSTRUCTION

- Tooled joints @ 40’
- Used skid loader to haul on last pass, rutting
- Seven days wet cured
Public Works Employee Parking Lot: Design & Construction

- Thin clear poly under coated burlap curing blankets, Burlene, preserves surface w/c ratio
- Saturated curing blankets on-site
- Secured with rebar, problems w/ windy conditions
PUBLIC WORKS EMPLOYEE PARKING LOT: DESIGN & CONSTRUCTION

- Saw cut @ 10’, approved isolation joint spacing plan
- Wet saw creates slurry, washed off surface
PUBLIC WORKS EMPLOYEE PARKING LOT: DESIGN & CONSTRUCTION

- Raingarden sized to fit existing turf area, not sized for runoff volume
- Saved a nice shade tree
- Worked around existing gas and fiber optic
Public Works Employee Parking Lot: Design & Construction

- Raingarden and overflow to ex. storm sewer for roof drains
- 0.35 ac contributing area, roof drains
PUBLIC WORKS EMPLOYEE PARKING LOT: MAINTENANCE

- Fall and Spring – Sweep with regenerative air sweeper
- Winter
  - Plowing with rotary broom, reduced damage, but inefficient in bigger snow events as occurred in 2010/11
  - Switched to conventional plows in 2011/12
  - No sanding or granular salt
  - Brine solution used when icy, not effective for pretreatment or residual effect
- Summer – Avoid contamination during landscaping projects, mowing, etc.
PUBLIC WORKS EMPLOYEE PARKING LOT: OBSERVATIONS

- It drains, some clogging of surface from grit off impervious surfaces
PUBLIC WORKS EMPLOYEE PARKING LOT: OBSERVATIONS

- Estimated 90% reduction in annual runoff for entire project, 0.6 acres total project area
PUBLIC WORKS EMPLOYEE PARKING LOT: OBSERVATIONS

- November 30, 2010 – Extremely icy, temperature drop during AM caused freezing of precipitation on the surface of pervious concrete, but regular pavements stayed wet. Brine truck to the rescue.
PUBLIC WORKS EMPLOYEE PARKING LOT: OBSERVATIONS

- Spalling at tooled and hand finished edges
  - Early salt application or increased w/c ratio?
  - <1” deep, 2-3” wide
  - Patching or ?
PERVIOUS PAVEMENT: EDUCATION

- Nine Mile Creek Watershed District Annual Tour
- Minnesota Association of Watershed Districts Tour
- Bloomington Website
- Bloomington Cable TV
- Briefing Newspaper
- Bloomington Home Improvement Fair
Pervious Pavement: Education

- Harrison Park Interpretive Sign, on-site and events
HARRISON PARK: FLUSH TESTS!

250 gallons on pervious asphalt, September 2008
HARRISON PARK: FLUSH TESTS!

250 gallons on impervious asphalt draining onto pervious asphalt, September 2008
Pervious Pavement: Sustainability

Bloomington Today, Cable TV News, Fall 2011
Questions ???

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