



Orchards Drainage Study



Overview

- General Approach
- Key Observations
- Recommended Improvements
- Opinion of Probable Cost
- Options not Recommended
- Future Maintenance Recommendations
- Closing



General Approach

- Known Areas of Concern Identified by City
 - Water entering basements (at least 15 known / observed as highly likely)
 - Water staging in yards
 - Water staging in streets (including Fairway Dr., Pro Tour Dr., Ben Hogan Ct., and Jack Nicklaus Dr.)
 - Erosion issues
- Resident input (30+ submittals received)
- Surveyed existing conditions & drainage patterns
- Develop conceptual recommendations to address each area of concern (approximately 20)

Key Observations – Pro Tour Drive Lake

- Outfall Structure
 - Overflow elevation is 1.5' higher than design (measured by GPS)
 - Decreases storage capacity
 - Increases risk of overtopping roadway



Key Observations – Maintenance Concerns



Debris and Sedimentation in/near Culverts

Key Observations – Maintenance Concerns

- Swale obstructions
 - Landscaping
 - Basketball hoops
 - Swing sets
 - Putting greens
- Typically in drainage easements
- Reduces effectiveness



Key Observations– Permitted Detention

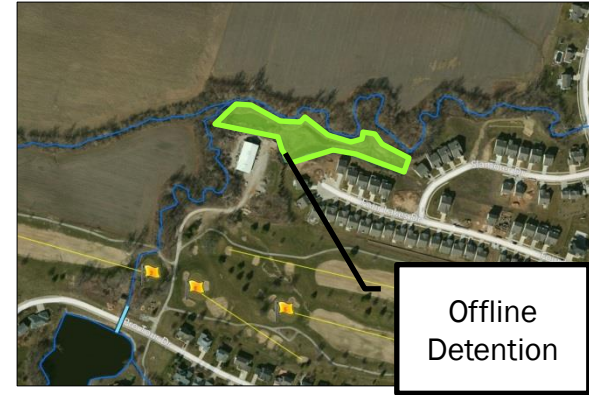
- Inline detention near Ben Hogan Court
 - Clearing and re-grading required by IDNR permit
 - Never constructed
 - Impacts areas along Ben Hogan Ct. & Bobby Jones Ct.



Inline
Detention

Key Observations– Permitted Detention

- Off-line detention near Four Lakes Drive
 - Does not appear to have been maintained
 - Breach reduces storage functionality
 - Impacts areas near creek at Fairway Dr. and downstream



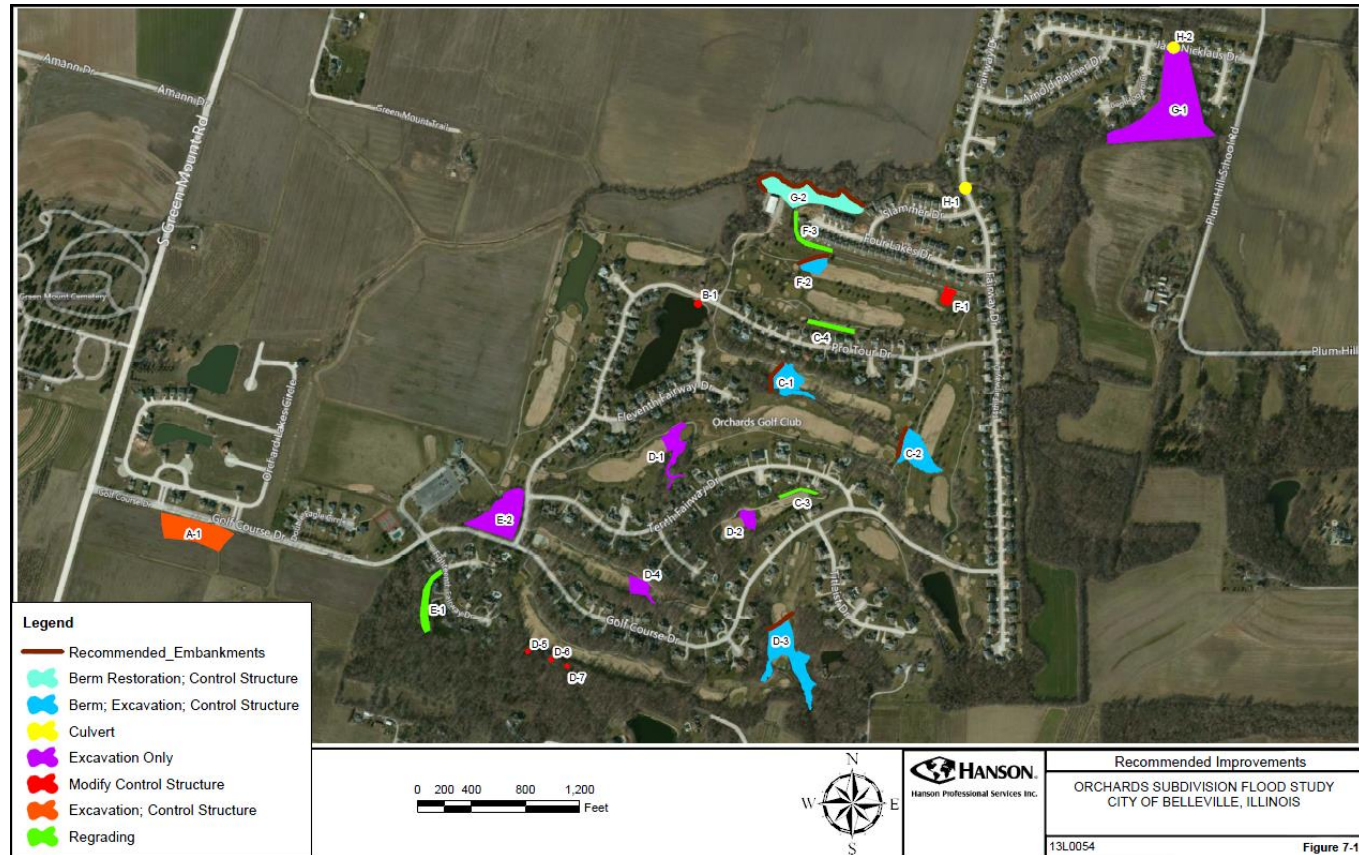
Breach Location

Key Observations– Walkout Basements

- Issues with basements near creek
- Development plans
 - Stated requirement for separate drainage study if exposed basement desired
 - Unknown if any were ever performed
- Many residents have constructed flood protection improvements such as retaining walls and berms



Recommended Improvements



Recommended Improvements – Storage

- Dry Detention
 - Reduces peak flows through development
 - Drains down after peak of the storm passes
 - Proposed away from homes
 - **Provides benefit to all areas located downstream**
- Locations
 - Orchard Lakes (A-1)
 - Upstream of 11th Fairway and Pro Tour (E-2, D-5, D-6, & D-7)



Recommended Improvements – Storage

- Locations (Continued)
 - Upstream of 11th Fairway Drive (middle) (D-1, D-2, D-3 & D-4)
 - Upstream of 11th Fairway Court & Pro Tour Drive near 7th Hole (C-1 & C-2)
 - Four Lakes Drive near 4th Tee (F-2)
 - Properties located along creek and downstream of Fairway Drive (G-1, G-2, and each previously mentioned detention location)



Location	10-year Flow Reduction (%)	100-year Flow Reduction (%)
1. Orchard Lakes	76%	62%
2. Lake Inflow (west)	46%	49%
3. Lake Inflow (central)	36%	28%
4. Lake Inflow (east)	77%	77%
5. Lake Outflow	38%	40%
6. Fairway Drive	20%	32%
7. Jack Nicklaus Drive	20%	16%

Recommended Improvements – Storage



After

Before

Recommended Improvements – Structures

- Pro Tour Drive Lake (B-1)
 - Lower structure overflow to match design plans
 - Added storage and reduces risk of overtopping
 - Affects residents directly upstream and those downstream of the lake
- Four Lakes Drive (F-1)
 - Convert lake to dry detention
 - Size structure to reduce risk of overtopping cart path
 - Affects properties on Four Lakes Drive

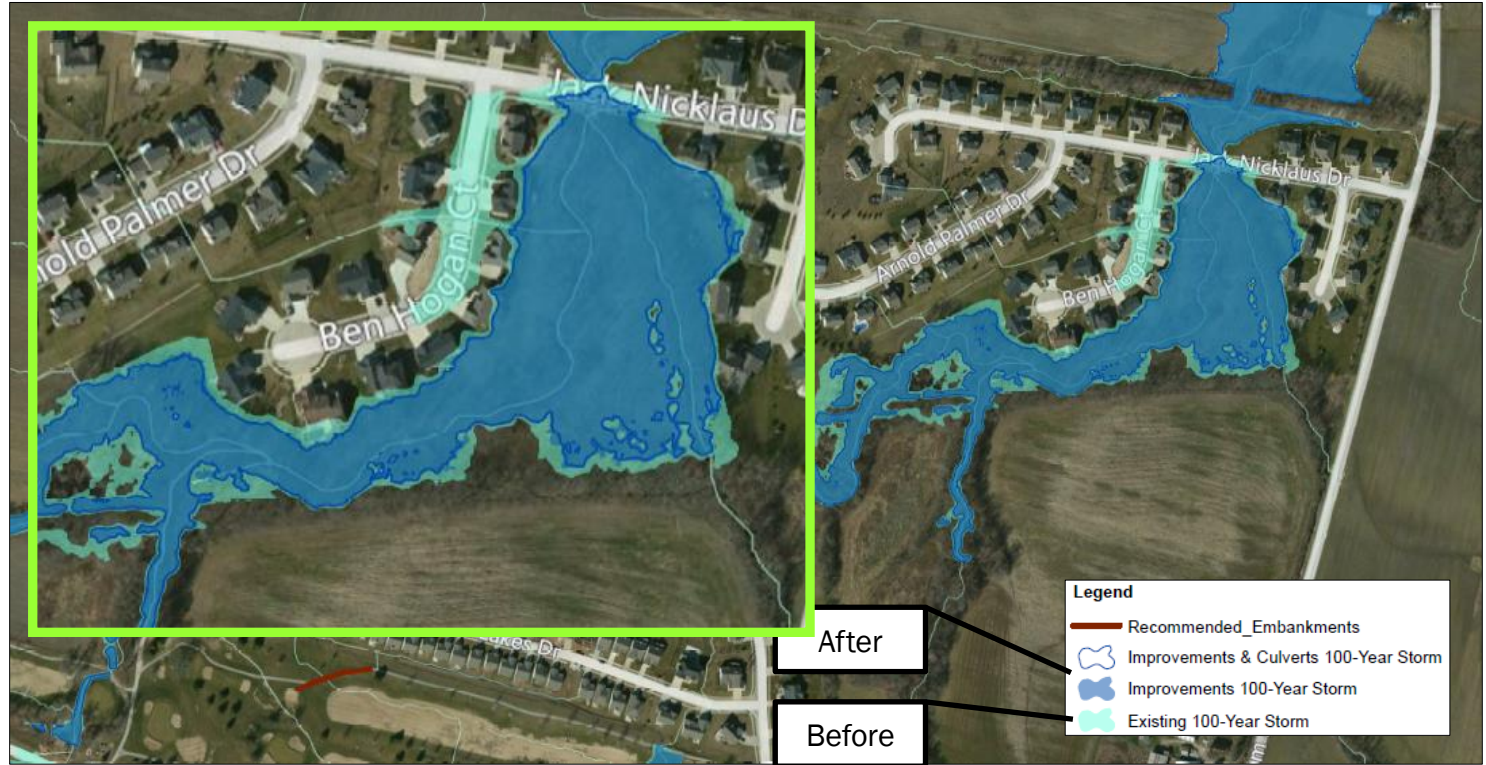


Recommended Improvements – Culverts

- Fairway Drive (H-1) & Jack Nicklaus Drive (H-2)
 - Add a secondary 6-ft diameter culvert at each location to increase flow capacity at each crossing
 - Reduce creek stage in area
 - Reduce frequency of overtopping of roadways
 - Affects properties along creek between Fairway Drive and Jack Nicklaus Drive



Recommended Improvements – 100yr



Recommended Improvements – 10yr



Recommended Improvements – Grading

- Recommend grading improvements to minimize nuisance drainage issues
 - Remove obstructions from existing swales
 - Construct berms / swales at rear or side of yards to direct flow away from homes
 - Ensure yards are sloped away from homes
- Known Locations
 - Four Lakes Drive (F-3)
 - Pro Tour Drive (C-4)
 - Tenth Fairway Drive (C-3)
 - Eighteenth Fairway Drive (E-1)
- Applies to other locations not provided to project team



Suggested Priority Ranking

- Priority was placed on:
 - Reducing risk of stormwater entering homes
 - Maximizing the amount of residents benefitting from the recommendation
 - Hazard Factor – a catastrophic failure would put downstream homes at risk
- Cost was not considered in the ranking

Opinion of Probable Cost

- Estimated cost of 23 improvements recommended in the report: \$1.94 million
- Conservative estimate considering:
 - Each improvement would be constructed as its own project – **grouping improvements should reduce costs**
 - All excavation has to be hauled off-site – **if excavation could remain on-site, cost should be reduced**

Future Maintenance Recommendations

- Remove obstructions from swales and drainage easements
- Perform regular maintenance / cleaning of culverts in development
- Construct berms for protection of homes in areas prone to flooding, especially walk-outs and exposed basements
- Ensure future development contributing to Orchards is per regulations and does not increase potential for increased flows through subdivision

Options not Recommended

- Remove railroad trestle north of Jack Nicklaus Drive
 - Removal would have little to no impact to upstream properties
 - Water surface along creek between Fairway Drive and Jack Nicklaus is controlled by existing culvert capacity



Options not Recommended

- Increase culvert sizes upstream of Pro Tour Drive Lake
 - Existing pipes are 36" to 66" diameter
 - **Transfers problems with flow rates downstream**
 - Still prone to debris and clogging



Questions?

