Repairs Vs. Improvements

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AMC Drainage Seminar
What is a repair? What is an improvement?

§ 103E.701
The term "repair," as used in this section, means to restore all or a part of a drainage system as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved.....

§ 103E.215
In this section "improvement" means the tiling, enlarging, extending, straightening, or deepening of an established and constructed drainage system including construction of ditches to reline or replace tile and construction of tile to replace a ditch.
In a nutshell.....

Repair

VS.

Improvement

Fix at the same size

Fix at bigger / deeper size
§ 103E.701

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§ 103E.215

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### Why is this important?

<table>
<thead>
<tr>
<th></th>
<th>Repair</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initiated by…</strong></td>
<td>Drainage Authority or Petition</td>
<td>Petition</td>
</tr>
<tr>
<td><strong>Petition Standard</strong></td>
<td>1 Landowner</td>
<td>26% of Landowners/Lands</td>
</tr>
<tr>
<td><strong>Proceeding Cost Borne by..</strong></td>
<td>Benefitting Landowners</td>
<td>Initially… Petitioners</td>
</tr>
<tr>
<td><strong>Wetland Impact Exemptions</strong></td>
<td>Many</td>
<td>Few</td>
</tr>
<tr>
<td><strong>DNR Advisory Reviews</strong></td>
<td>None</td>
<td>Two</td>
</tr>
<tr>
<td><strong>Public Hearings Required</strong></td>
<td>0-1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Minimum Time to Completion</strong></td>
<td><strong>1 Day</strong></td>
<td><strong>1 Year</strong></td>
</tr>
</tbody>
</table>
So, how do we tell the difference?

§ 103E.701

The term "repair," as used in this section, means to restore all or a part of a drainage system as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved, including resloping of ditches.....
What if the record is unclear?

M.S. 103E.101 Subd. 4a. If, after investigation of drainage system records, the drainage authority finds that the records are lost, destroyed, or otherwise incomplete, it may, by order, reestablish records defining the alignment; cross-section; profile; hydraulic structure locations, materials, dimensions, and elevations; or right-of-way of the drainage system as originally constructed or subsequently improved.
Major Objectives of Record Reestablishment

1. Process legally defines the public drainage system

2. Establish as-constructed and subsequently improved condition or ACSIC (the drainage system geometry as originally constructed, including all subsequent legal repairs and alterations, such as alignment, cross-section, and profile.)
Record Reestablishment Proceeding

- Order initiation of proceedings, appoint engineer
- Engineer’s Report
- Noticing (all benefitting landowners)
- Public hearing
- Order to reestablish the record
Engineer’s Process

1. Investigate the historical records of the system
2. Field survey
3. Establish the “As-Constructed and Subsequently Improved Condition”
4. Describe the right-of-way of the system
Determination of the As-Constructed Alignment

Original Establishment Plans (As-Designed)
Determination of the As-Constructed Alignment

Current Aerial Photos and Survey
Determination of the As-Constructed Grade

Soil borings and probes identify the bottom of excavated open channel ditch

Soil borings
Determination of the As-Constructed Grade

Surveyed bottom of sediment locations are compared to the historic design grades.
Determination of the As-Constructed Grade

Sometimes design grades don’t fit…ditches weren’t always dug per plan
Why are so many culverts higher than as-built grade?

- Over years, sediment accumulates in the channel
- New or replacement culverts are placed on top of existing sediment
- Culverts also may heave over time
Right-of-Way

- Damages awarded during drainage system establishment for the:
  - Area physically occupied by the ditch
  - Area required to construct and maintain the drainage system
  - Based on channel depths, visible spoil areas, topography

<table>
<thead>
<tr>
<th>Branch</th>
<th>Upstream Station</th>
<th>Downstream Station</th>
<th>Right-of-Way [ft]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Trunk</td>
<td>35+00</td>
<td>0+00</td>
<td>100</td>
</tr>
<tr>
<td>Main Trunk</td>
<td>225+15</td>
<td>35+00</td>
<td>130</td>
</tr>
<tr>
<td>Branch A</td>
<td>2+20</td>
<td>0+00</td>
<td>75</td>
</tr>
<tr>
<td>Branch B</td>
<td>18+11</td>
<td>0+00</td>
<td>80</td>
</tr>
</tbody>
</table>
Right-of-Way

PLANS SHOWING TYPICAL SECTION OF DITCH AND LEVELING BANKS

<table>
<thead>
<tr>
<th>Estimated Cost per Station</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost per Yard</td>
<td></td>
</tr>
<tr>
<td>No. of Cubic Yards in Each Station</td>
<td></td>
</tr>
<tr>
<td>Width of Top</td>
<td></td>
</tr>
<tr>
<td>Width of Bottom</td>
<td></td>
</tr>
<tr>
<td>Depth of cut</td>
<td></td>
</tr>
</tbody>
</table>
When to initiate a Reestablishment of Records

- Missing recent and/or critical documents
- DNR public waters along system
- Lack of consensus on components/extent of system
- Condition of system
- Cost of necessary repairs

Risk

Initial Cost

Cost

Risk
Are all changes to the as-built condition “improvements?”

§ 103E.701
The term "repair," as used in this section, means to restore all or a part of a drainage system as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved, including resloping of ditches and leveling of spoil banks if necessary to prevent further deterioration, realignment to original construction if necessary to restore the effectiveness of the drainage system, and routine operations that may be required to remove obstructions and maintain the efficiency of the drainage system. "Repair" also includes:

(1) incidental straightening of a tile system resulting from the tile-laying technology used to replace tiles; and

(2) replacement of tiles with the next larger size that is readily available, if the original size is not readily available.
How this affects drainage system capacity

**Open Ditches**
- “Capacity” is hard to define
- Many factors in determining “Functional Capacity”
  - Top of bank
  - Cross-section
  - Tile outlets
  - Roadway overtopping
  - Culvert sizing
How this affects drainage system capacity (cont.)

**Tiles**
- Historic Capacity (aka Drainage Coefficient) ~ 1/8 to 1/4 inch per day
- Modern Design = 3/8 to 1/2 inch per day
- Tile repairs affect system function via:
  - Removing obstructions
  - Smoother pipe (sometimes)
  - “Next size pipe” (some cases)
- Capacity is only as good as smallest downstream size
- Landowners should consider all of these factors prior to an improvement petition

<table>
<thead>
<tr>
<th>Branch</th>
<th>Size</th>
<th>Existing Coeff.</th>
<th>Repair Coeff. (in/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>14”</td>
<td>0.30</td>
<td>0.41</td>
</tr>
<tr>
<td>B</td>
<td>10”</td>
<td>0.13</td>
<td>0.15</td>
</tr>
<tr>
<td>C</td>
<td>8”</td>
<td>0.18</td>
<td>0.20</td>
</tr>
</tbody>
</table>
Determining Benefits for Improvements vs. Repairs
CAPACITY GRADING CRITERIA

1/2” Coefficient
100% Total Benefits

3/8” Coefficient
87.5% Total Benefits

1/4” Coefficient
75% Total Benefits

1/8” Coefficient
67.5% Total Benefits

Less than 1/8” Coefficient
50% Total Benefits
CAPACITY GRADING CRITERIA

optimum

less than optimum
CAPACITY GRADING CRITERIA

1/2” Coefficient
100% Total Benefits
Optimum

3/8” Coefficient
87.5% Total Benefits
.1%-2.5% of agricultural acres below optimum

1/4” Coefficient
75% Total Benefits
2.5%-7.5% of agricultural acres below optimum

1/8” Coefficient
67.5% Total Benefits
7.5%-12.5% of agricultural acres below optimum

Less than 1/8” Coefficient
50% Total Benefits
More than 12.5% of agricultural acres below optimum