Aggregate Resource Mapping Program
Aggregate Availability

Sand and Gravel
Reclaimed Gravel Pit
Fieldwork

Resource Maps
Three factors affect the local availability of construction aggregates

1. **DEMAND:** Consumption of aggregate
2. **SUPPLY:** Natural distribution of aggregate resources
3. **LAND-USE CONFLICTS:**
   - Encroachment around existing gravel mining areas
   - Development on top of future aggregate resources
   - Difficulty of permitting new mines
   - Competing land uses such as perpetual conservation easements
DEMAND

People use resources in everyday life

Every American Born Will Need . . .

1.71 million lbs. 
Stone, Sand, & Gravel

3,104 lbs. Salt
21,418 lbs. Clays
776 lbs. Zinc
83,296 gallons petroleum
854 lbs. Lead
+66,891 lbs. Other Minerals & Metals
588,906 lbs. Coal
5,975 lbs. Bauxite (Aluminum)
32,980 lbs. Iron Ore
72,994 lbs. Cement
5.78 million cu. ft. Natural Gas
23,435 lbs. Phosphate Rock
1,648 Troy oz. Gold
1,319 lbs. Copper

3.7 million pounds of minerals, metals, and fuels in their lifetime

Source: Minerals Information Institute, 2006; www.mii.org
DEMAND
Aggregate makes up ~80% of concrete

Concrete is used to build.....

Highways

Homes and Buildings

Bridges

Sewer Systems

Sidewalks, Bike Paths, and Trails
DEMAND

Aggregate makes up ~90% of asphalt

Asphalt is used for.....

- Roads
- Bike Paths and Trails
- Parking Areas
- Recreational Developments
**DEMAND**

Long-term pattern of aggregate use in MN

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Category</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>25%</td>
<td>Roads</td>
<td>(building and maintaining 134,000 miles of public roads and bridges)</td>
</tr>
<tr>
<td>25%</td>
<td>Public Works</td>
<td>(i.e. sewer/water systems and other infrastructure)</td>
</tr>
<tr>
<td>25%</td>
<td>Private Residential Construction</td>
<td></td>
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<tr>
<td>25%</td>
<td>Commercial Construction</td>
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</tbody>
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*Approximately 50% of aggregate is consumed with public tax dollars*
## DEMAND

2009 Market conditions of aggregate use in MN

<p>| | |</p>
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<td>1.</td>
<td><strong>Reduced demand for aggregate within the housing and commercial markets</strong></td>
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<tr>
<td>2.</td>
<td><strong>Expected increased demand of aggregate for publicly funded projects</strong></td>
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</table>
DEMAND
Influences on future demand of aggregates

• Population Growth
• Personal Income
• Statewide Economic Growth
• Interest Rates
• State Infrastructure Needs
Aggregate occurs where nature placed it, not where people need it. *

SUPPLY
State distribution of aggregate

This map is a very generalized assessment of the quantity and quality of aggregate resources across the state.

Minnesota’s geologic past has created an unevenly distribution of aggregate throughout the state.

The quality of aggregate resources varies across the state.

Some areas have adequate supply of construction aggregate while other areas have natural scarcities.
SUPPLY

Example of quality issues

Not all sand and gravel deposits meet the specifications for road and bridge construction

- Sand and gravel deposits contain different types of rock
- The abundance of deleterious rock types can weaken and shorten the life span of roads

Effects of iron oxides (a deleterious rock type) in asphalt
SUPPLY
Regional Growth Centers

• Supply of aggregate near populated areas can be limited due land use conflicts
  – STERILIZATION: building over a deposits as cities grow into rural areas
  – ENCROACHMENT: building near existing quarries and gravel pits
  – DEPLETION: extracting the resource in existing mines at a higher rate
On average, for every 10 to 14 miles of haul distance the cost of aggregate doubles in price

- Aggregate is high bulk, low-value commodities (one ton of aggregate cost around 10 dollars)
- Transportation accounts for a considerable amount of the delivered price
- Finding and accessing aggregate close to the market reduces the cost of publicly and privately funded construction projects
Having a local supply of aggregate is an important sustainability issue for maintaining and developing communities of all sizes.