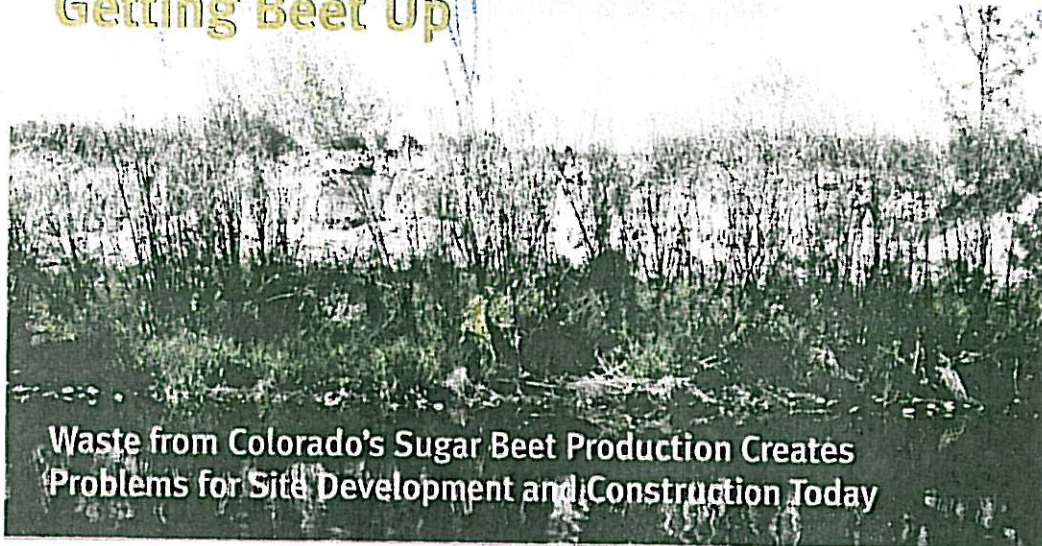


# Colorado Construction

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## Getting Beet Up



### Waste from Colorado's Sugar Beet Production Creates Problems for Site Development and Construction Today

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It's been said that sweet is good and sweeter is better, but it's what's left over on the other side of Sugartop Mountain that can create a problem.

First, a little history.

A slowed Colorado economy in the 1890s brought one of the largest agricultural upturns in Colorado's history. This sweet growth in the farming economy came from the expansion of sugar beet production, which left behind something less desired—beet waste.

Sugar beets thrive in high clay content and coarse sandy soils, making Colorado an ideal place to grow and farm them.

In 1899 a familiar local name, Charles Boettcher, co-funded the creation of the Colorado Sugar Manufacturing Co., a beet sugar processing plant in Grand Junction, and in 1901 he co-founded the Great Western Sugar Co., with its familiar GW logo, which soon became the largest producer of beet sugar in the country.

By the early part of the 20th Century, Colorado became the leading producer of beet sugar in the nation, with the Western Sugar Beet Co. being the largest of the sugar beet producers. The farms and production plants spanned the Colorado Front Range, reaching through the South Platte River Valley—Eaton, Greeley, Windsor, Fort Collins, Denver, Sterling, Fort Morgan, Brush, Brighton, Fort Lupton, Ovid and Johnstown.

Currently, The Western Sugar Cooperative grows sugar beets in Greeley, Sterling, Longmont, Fort Morgan and Rocky Ford and manufactures sugar in Fort Morgan.

#### What does beet waste look like?

If you ever wondered about the white piles frequently spotted along the Front Range, you now know—they're sugar beet waste.

The waste piles can be seen above ground in mounds. They can also cover larger areas with up to 15 ft of material and are not easily noticeable. These materials pack an undetected punch for those unaware of their chemical and engineering characteristics, and until recently, little was known about these harmful traits.

#### What does this mean for construction today?

Modern sugar beet production plants have environmentally friendly ways of disposing of the waste, but problems exist because of old disposal methods that left acres of materials behind in the 1950s and '60s. The waste can have a negative effect on construction, especially in northeastern Colorado where sugar beet processing plants were abundant.

Structures constructed over beet waste are now experiencing failures. New developments in these desirable areas of available



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Sugar beet waste can create caves and sink holes that impact soil stability, causing foundation movement and differential settlement of buildings.

land may also have problems if the beet waste is not identified and mitigated during development. While it's not considered a contaminant, beet waste can have the following effects on new construction or existing buildings.

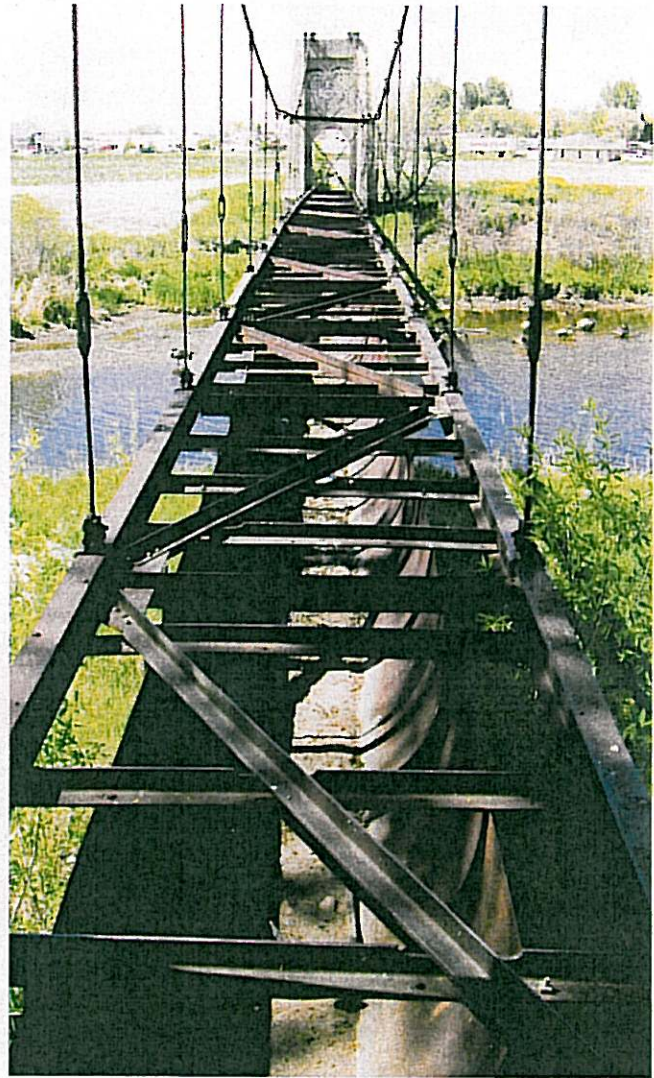
- Caves and sink holes. Beet waste deposits can contain long pipes (caves) and form sink holes, which impact the stability of soil. These features can cause movement of a foundation and differential settlement of a building, resulting in distress. These damages may lead to unlevel floor slabs and cause significant damage from foundation movement.

Building movement and settlement can be particularly harmful to industrial companies, where unlevel floors and cracking can disrupt sensitive machinery set directly on the floor. Beet waste can also cause poor pavement performance, sinkholes in roadways and the consolidation of pavement subgrade.

- Soluble sulfates. The beet waste is often high in soluble sulfates, which react negatively with concrete and chemically treated pavement subgrade, causing deterioration and other failures. The presence of beet waste in soil can lead to the formation of the expansive mineral ettringite. This mineral is formed by the combination of water, soil, soluble sulfates and calcium. Calcium is usually found in subgrade stabilizing products such as lime, fly ash and Portland cement. Formation of ettringite can cause severe damage to pavement and foundations.

### What can be done?

By conducting thorough geological and geotechnical investigation before site development, engineers can identify the presence of beet waste and develop mitigation alternatives. This could mean modifying the construction materials used, adding stabilizers to the soil, creating a more suitable subgrade or removal of the beet waste and replacement with fill. Possible repairs to existing buildings could include replacing the foundation or underpinning the building with a new foundation that extends well below



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the affected soil. Roadways constructed in areas of beet waste may need continued maintenance.

Conducting geological and geotechnical investigations before site development can also save time and money in the long run. In fact, depending on the repairs needed, costs to amend existing construction can range from thousands to hundreds of thousands of dollars.

Colorado's rich history in beet sugar production brought growth to Colorado's economy. However, it is important to remember the development and construction hazards the boom left behind.

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