

## Exhibit A – Summary of Materials and Methods Which Employ Recycled Materials in Fresno County Transportation Projects

Assembly Bill 2355 requires that, by January 1, 2017 a local agency that has jurisdiction over a street or highway shall do either of the following:

- Adopt the standards developed by the California Department of Transportation (Caltrans) pursuant to Section 42700 of the Public Resources Code (PRC § 42700) for recycled paving materials and for recycled base, subbase, and pervious backfill materials.
- Discuss at a regularly scheduled public hearing of the local agency's legislative or other governing body why the standards are not being adopted.

PRC § 42700 requires Caltrans to review and modify all bid specifications relating to the purchase of paving materials, and base, subbase, and pervious backfill materials, using recycled materials. The recycled materials include, but are not limited to:

- recycled asphalt pavement
- crushed concrete subbase,
- foundry slag
- asphalt flux produced from the reprocessing or re-refining of used oil
- crumb rubber from automobile tires,
- ash
- glass and glassy aggregates

These include aggregate subbase, aggregate base, concrete, and asphalt concrete. Typical county roads are surfaced with asphalt concrete which may be underlain by native soil only, by aggregate base over native soil, or by aggregate base over aggregate subbase over native soil.

Aggregate bases and subbases consist of a combination of sand, gravel, crushed stone and recycled material and serve as a support for the surface layer, distributing wheel loads to subgrade material. Aggregate base and subbase may include specified recycled materials. In accordance with the Caltrans 2010 Standard Specifications, processed reclaimed asphalt concrete, Portland cement concrete, lean concrete base, and cement treated base may be used in base materials. These are default provisions which, unless otherwise specified, apply to all contracts that include aggregate base and subbase. In addition, the Caltrans Standard Special Provisions provide specifications which, if included in a project, allow the use of processed waste glass.

The Department of Public Works and Planning (Department) uses Caltrans specifications for aggregate base and subbase materials and does not preclude the use of recycled materials. Aggregate base and subbase typically contain significant quantities of recycled material and may be comprised of up to 100% recycled or reclaimed products.

Another material which typically includes significant quantities of recycled and reclaimed material is asphalt concrete. Asphalt concrete is comprised of aggregate and asphalt. The Department is currently using Caltrans 2010 Standard Specifications as modified by Revised Standard Specifications issued March 21, 2014. These standards allow the use of reclaimed asphalt pavement (RAP) to substitute for virgin aggregate in the asphalt concrete mix, and up to 25% of the aggregate may consist of RAP; however, the Department currently limits the amount of RAP to 15% of the aggregate. This is due to concerns raised by the Federal Highway Administration regarding early cracking that has been observed in some high-RAP pavements.

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Caltrans has issued newer Revised Standard Specifications that provide for significant revisions to the manner in which asphalt concrete mixes are designed and tested. The new method is referred to as “Superpave.” This represents a fundamental change in the design and testing of asphalt concrete. Superpave also allows up to 25% of the aggregate in asphalt concrete to consist of RAP; however, Superpave is not yet being used by the Department. The Department has been monitoring Caltrans’ implementation of Superpave and intends to begin using Superpave as soon as the Department is confident in its reliability and cost effectiveness.

Asphalt concrete may also contain crumb rubber derived, in part, from waste tires. In 2013, an overlay of portions of Manning and Mt. Whitney Avenues that employed rubberized asphalt concrete was constructed. Additionally, another segment of Manning Avenue received a rubberized asphalt concrete overlay in 2015.

Rubberized asphalt concrete is generally about 30% more costly than conventional asphalt concrete, and these projects were performed as pilot projects to enable the Department to ascertain the performance of the rubberized asphalt concrete. The rubberized asphalt concrete is exhibiting minor cracking and wear similar to that which would be expected with non-rubberized asphalt concrete; however, it will be several years until the long-term performance of the rubberized asphalt concrete can be ascertained.

Some agencies believe that the use of rubberized asphalt concrete is more cost effective than conventional asphalt, even though the initial construction cost is higher. Currently, the Department recommends that the County continue to use conventional asphalt concrete while monitoring research by other agencies and the performance of the rubberized overlays which were performed by the County.

There are other forms of road rehabilitation that involve in place reclamation of asphalt concrete or of asphalt concrete and a portion of the underlying base material. All of the recovery, processing, and reuse of these materials associated with these methods occurs at the project site, and they are summarized as follows:

- Cold In-Place Recycling is a method of pavement rehabilitation that consists of milling the existing asphalt concrete pavement to a depth between 2 to 4 inches; mixing the cold milled material with emulsified recycling agent and other additives as needed; spreading and compacting the recycled mixture; and overlaying the recycled surface with a new layer of asphalt concrete.
- Hot In-Place Recycling is a method of pavement surface preservation that consists of softening the existing asphalt pavement with heat, milling or scarifying to a maximum depth of 2 inches, and thoroughly remixing, leveling, and compacting the milled or scarified material.
- Full-depth reclamation is a method of pavement rehabilitation that consists of pulverizing the entire layer of existing asphalt concrete pavement and a portion of the underlying granular base and mixing it with cement or lime, grading and compacting the recycled mixture, and overlaying the recycled surface with a new layer of asphalt concrete.

The Department is currently planning a full-depth reclamation project, and will also consider future projects to employ Cold In-Place or Hot In-Place recycling. If these methods are proven to be cost-effective, they may become a part of the Department’s strategy for maintaining the

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County's roadway system.

Caltrans specifications also provide for the incorporation of fly ash (ash generated during the burning of coal) and silica fume (a byproduct of producing silicon metal or ferrosilicon alloys) in Portland cement concrete. Reclaimed aggregates may also be used in Portland cement concrete. Generally, the Department uses Caltrans standard specifications for concrete.

In summary, the Department employs a variety of Caltrans specifications involving recycling in its transportation projects, and reviews new recycling specifications on a case-by-case basis to ensure that they are cost-effective and technically sound prior to their implementation.