

Colorado Waste Tire Market Development Plan Implementation



Prepared for:

Colorado Department of Public Health & Environment
Hazardous Materials & Waste Management Division

Prepared by:

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June 2015

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Appendix A: Technical Trainings, Regulators Meeting (Pre-Conference), and Conference Agendas

ACRONYMS AND ABBREVIATIONS

Acronyms/Abbreviations	Definition
CDPHE	Colorado Department of Public Health and Environment
CDOT	Colorado Department of Transportation
EPA	United States Environmental Protection Agency
IEPA	Illinois Environmental Protection Agency
KDHE	Kansas Department of Health and Environment
MDEQ	Michigan Department of Environmental Quality
NDEQ	Nebraska Department of Environmental Quality
NMED	New Mexico Environment Department
ND Department of Health	North Dakota Department of Health
Oklahoma DEQ	Oklahoma Department of Environmental Quality
OTR	Off-the-road
RMA	Rubber Manufacturers Association
RTD	Regional Transportation District
SWANA	Solid Waste Association of North America
TDA	Tire-Derived Aggregate
TDF	Tire-Derived Fuel
Tetra Tech	Tetra Tech, Inc.
Utah DEQ	Utah Department of Environmental Quality
Wyoming DEQ	Wyoming Department of Environmental Quality

1.0 INTRODUCTION

On behalf of Colorado Department of Public Health and Environment (CDPHE), Tetra Tech, Inc. (Tetra Tech) completed a Waste Tire Market Development Plan in May 2013. The Waste Tire Market Development Plan presented an approach for achieving 100 percent reuse or recycling of the state's stockpiled, monofilled, and annually generated waste tires by 2024.

Tetra Tech, located in Denver, was awarded a contract by CDPHE in January 2014 to implement the approach described in the Waste Tire Market Development Plan, with the goal of advancing CDPHE's waste tire market development. As a follow on to the January 1, 2014 to June 30, 2014 contract, this Annual Report summarizes work completed on the project from July 1, 2014 through June 30, 2015. The Tetra Tech team in place for this work includes Terry Gray (TAG Resource Recovery), Mary Sikora (Recycling Research Institute), Dr. Dana Humphrey (University of Maine), Karmen Griffith (Tetra Tech), and Bob Farnes (Tetra Tech).

Priority was placed on tasks that would best advance the waste tire market development goal. Tasks discussed in this Annual Report are expected to carry on into the next fiscal year.

The implementation steps taken thus far under the contract are pursuant to the CDPHE and Tetra Tech contract, and are organized around four main tasks:

- Task 1: Technical Trainings
- Task 2: Technical Assistance and Identification
- Task 3: Annual Statewide Conference on the Use of Tire-Derived Materials
- Task 4: Assistance in the Development of the Waste Tire Fund Programs

The scope, timeframe, details, and results associated with the project tasks are presented in this Annual Report.

2.0 SCHEDULE

The May 2013 Waste Tire Market Development Plan lays out steps leading to the beneficial use of all waste tires produced and stored in the State of Colorado. As the program advances through the steps, it is important to regularly monitor the results that are being gained and take into consideration any existing and new influences. Some steps in the project can lead to new technologies, while others lead to expanded end uses with existing entities. Many of the steps need to be advanced iteratively while monitoring the resulting change in waste tire beneficial use capacity. Some steps may lead to more beneficial use than predicted, other steps may consume less waste tires than intended. Waste tire

market development is a marathon, not a sprint, and requires a thoughtful plan, experience, and perseverance.

The steps presented on the Gantt chart (Figure 1), were used a guideline to connect the organizations, people, information, and funding needed to capitalize on the opportunities presented in the Waste Tire Market Development Plan. All tasks were coordinated with CDPHE and based on the project timeline, priority was placed on those tasks which would have the most impact on advancing waste tire market development.

Each task is discussed in detail in the following sections.

3.0 TECHNICAL TRAININGS

In May 2014, two technical training sessions were conducted. The first focused on highway applications for tire-derived aggregate (TDA) presented to design engineers within Colorado Department of Transportation, Regional Transportation District (RTD), and county agencies. The second was presented to design engineers within the Solid Waste Association of North America (SWANA) and focused on constructive landfill applications. Feedback on the training sessions was positive and additional opportunities for technical education were developed during this contract period.

Tetra Tech continued to work with CDOT on identifying technical training opportunities. A second technical training session was provided on June 4, 2015, with a target audience of primarily geotechnical engineers working in transportation-related arenas where the potential for use of waste tires as TDA exists. Goals of the technical training session were two-fold: overall enhancement of the understanding of TDA usage in civil engineering applications (including highway, bridge, landslide stabilization, and light rail construction); and identification of potential projects where TDA use would offer technical and economic advantages over traditional materials.

The following tasks occurred to support the development and completion of the June 4, 2015 technical training session:

- Tetra Tech worked with CDPHE and CDOT to develop a vision for the training seminars—when and where they would take place, invitees, and the general content of the material that was presented. Tetra Tech developed a program agenda and content based on multiple discussions with CDOT and team members, and included in Appendix A.
- Tetra Tech worked with RTD management to ensure their staff was aware of the training and representatives were able to attend.
- Tetra Tech developed training materials including visual presentations and written materials. These materials included a TDA technical reference book that covers major applications and

basic design data required for TDA usage including lightweight embankment fill, retaining wall backfill, drainage applications, and layers to limit frost penetration.

The TDA technical training session was held on June 4, 2015 at the Hilton Garden Inn – Cherry Creek located at 600 South Colorado Boulevard in Denver, Colorado. This training session had 29 attendees. Tetra Tech team members in attendance included Dr. Dana Humphrey, Terry Gray, Mary Sikora, Karmen Griffith and Bob Farnes. Affiliations of attendees included CDOT, Shannon and Wilson, RTD, Town of Castle Rock, Yeh and Associates Inc., and CDPHE.

During the TDA technical training session, Dr. Humphrey presented a short course that focused on civil engineering design properties of TDA, and specific highway-related applications. The short course covered several topics related to transportation applications of TDA including the following:

- Introduction of TDA; how it is made and why its use can be beneficial depending on the application
- Overview of TDA use in civil engineering
- Engineering properties of TDA
- Lightweight and conventional fill for highway embankments and landslide stabilization
- Retaining wall and bridge abutment backfill
- Drainage and insulation layers in roads
- Use of whole tires in highway applications
- Environmental considerations for use of TDA
- Self-heating reactions in TDA fills

The session was interactive with questions and comments from participants. Training evaluation forms were used to evaluate the opinion of attendees. All of the evaluation forms received had session ratings of 4 or 5 on a scale of 1 to 5, with 5 being the best. Overall, the training session was viewed as a success by the attendees, and the idea of having future sessions was well received by attendees.

Civil engineering applications represent a potentially high volume market for Colorado's waste tires. Development of civil engineering applications for TDA is an evolutionary process that starts with the initial training sessions. Tetra Tech initiated follow-up discussions to identify specific projects for consideration and analysis. These projects may have implementation schedules one to three years in the future and will provide the foundation for additional projects on a continuing basis. Tetra Tech, in coordination with CDPHE, will offer subsequent technical assistance to attendees during their evaluation, development, design and construction of specific applications. The next steps for this task will include reaching out to technical session attendees to identify potential projects for TDA applications.

The potential applicability of TDA in areas with expansive soils was discussed at the TDA training, including some example applications raised by attendees. Based on this initial interest, Tetra Tech will

explore associated technical, market, and economic factors associated with this use. If additional design data is needed, it may be appropriate to develop a cooperatively planned study possibly conducted with assistance from CDPHE's market development fund.

During implementation of these trainings, additional training opportunities were identified. CDPHE, SWANA, and Tetra Tech discussed the possibility of an additional training session for SWANA members. The additional technical training session is planned for SWANA members at their September 2015 Annual Meeting held in Pueblo, Colorado, and represents an opportunity to address a large, diverse group associated with landfill design and operations.

Other potential training opportunities include a subsequent training session tailored for RTD staff in September 2015. An additional short course session encompassing both highway and landfill applications is being developed for county, city and consulting engineers in September.

4.0 TECHNICAL ASSISTANCE AND IDENTIFICATION

In the Waste Tire Market Development Plan, Tetra Tech identified basic characteristics of major waste tire product markets and proposed a plan to define existing and potential waste tire product markets in Colorado and provide technical assistance and tools to accelerate development of multiple segments within each market. The technical training sessions previously discussed represent one component of the coordinated approach. Another part of the plan involved identifying entities for technical assistance in each market segment.

Per CDPHE's request, members of the Tetra Tech team and CDPHE visited the Green Carbon L.L.C. facility in Rome, Georgia. Green Carbon's process focuses primarily on off-the-road (OTR) tires and creates carbon black that can be incorporated into tire manufacturing and used in the production of other non-tire products. The purpose of the visit was to gain a better understanding of Green Carbon's operations and the potential for a facility in Colorado. As a result of this visit, Green Carbon was invited to present its technology and outlook for operations in Colorado at the 2015 Waste Tire Conference. An open dialogue will be maintained moving forward.

The Tetra Tech team visited waste tire processors in Colorado and will continue discussions moving forward into the next fiscal year. Additionally, CDPHE is regularly contacted by companies and individuals interested in promoting products, establishing facilities, and participating in Colorado's waste tire industry. At CDPHE's request, Tetra Tech has held discussions with approximately 20 entities, with the goal of offering assistance, comments, and suggestions. Tetra Tech will continue to assist CDPHE with follow-up and analysis of potential diversification of the Colorado marketplace.

The following sections discuss the major areas of focus with regard to technical assistance and identification.

4.1 TIRE-DERIVED AGGREGATE

The Tetra Tech team continued discussions with Colorado Counties, Inc. and Colorado Municipal League regarding the opportunity for outreach to their members, which include Colorado counties and municipalities. Counties and cities have jurisdiction over many local roads and offer the potential to shorten the lead time for implementing projects and increasing the number of TDA projects. Building upon the foundations established in 2014 and 2015, Tetra Tech plans to conduct additional TDA training sessions for county and city engineers and continue discussions which may lead to presentations and further outreach in fiscal year 2015-16.

TDA was also promoted through the 2015 Waste Tire Conference in a session led by Dr. Humphrey that looked at the versatility of TDA in applications such as thermal insulation, drainage media, lightweight fill, vibration dampening aggregate and retaining wall backfill. The conference helped further expand the market reach for TDA by qualifying the conference for educational credits for SWANA members.

CDPHE and Tetra Tech worked with SWANA to promote the educational value of TDA and identify avenues for including TDA information in SWANA programs and materials.

As previously mentioned, a RTD-specific training session has been initiated and will occur in September 2015, to coincide with the currently scheduled SWANA training.

Economics ultimately dictate the viability of this market. Tetra Tech will continue to focus on identifying projects that use TDA to displace higher cost alternatives. Major challenges include an understanding of the logistics and economics associated with processing, storing, and transporting potentially large quantities of TDA for use in a short period of time for major projects. The inherent lag time associated with these projects requires planning and coordination of resources, materials, and public and private sector project participants locally, regionally, and often statewide. Smaller initial applications can help develop the infrastructure and experience required for larger projects and serve as a baseline for development of this market.

Additional discussions of TDA applications will continue to be explored in the next fiscal year.

4.2 TIRE-DERIVED FUEL

Energy utilization is currently the largest waste tire market in Colorado. Expansion of this market can play an important role in abatement of monofills and stockpiles. The Tetra Tech team visited current and potential waste tire energy users in Colorado. Tetra Tech will continue to assist this market segment with the goal of advancing market development for the beneficial end use of tires.

Tetra Tech has visited all three of Colorado's cement plants and continued discussions with operators of the pyrolysis plant that is not yet operational. Future discussions and site visits are anticipated for the next fiscal year.

Steel mills are considered to be a material recovery application because they use tires primarily for their carbon content required in steel composition, as well as their energy content. Colorado has one steel mill that may represent an opportunity for use of processed tires as a carbon source. Additional discussions and information gathering are expected for the next fiscal year.

4.3 CRUMB RUBBER

The Tetra Tech team visited a crumb rubber manufacturer and a rubber molding facility in June 2015. The visit provided a better understanding of the capabilities and needs for further developing and expanding this emerging market. Tetra Tech also had outreach to entities related to these markets, including but not limited to, processors, manufacturers, end users, compounders, product designers, and testing facilities.

Tetra Tech's outreach and technical assistance resulted in helping Rubberosion, a Colorado recycled rubber products molder, gain access to a molding consultant with expertise in tire-derived products. Working with the consultant, Rubberosion fabricated new molds and refined the mix design for recycled rubber products being developed for CDOT.

A local molder, installer, and end user were featured speakers at the Colorado Waste Tire Conference to increase awareness of ground rubber markets in Colorado.

Tetra Tech identified tools and resources to assist in development of ground rubber markets in the future. These include:

- a. Assisting in the evaluation and documentation of product testing, and appropriate modification of equipment and/or operating procedures.
- b. Defining additional molding or processing equipment needed to initiate commercial production and use.
- c. Exploring tools to enhance acceptance of ground rubber products by public and private purchasers. For instance, some states have evaluated products and applications using ground

rubber, developed written summaries, and recognized the products for procurement under applicable state-wide procurement or subsidy programs.

- d. Identifying and participating in local recycling exhibits or meetings to expose a broad range of commercial products made from scrap tires in Colorado. Notifying Colorado waste tire processors, end users, and product manufacturers of these opportunities.
- e. Assisting product manufacturers in improving product quality to broaden product acceptability. Helping product manufacturers identify which standards or accreditations are needed and how to get their product evaluated.
- f. Featuring markets and products at the Annual Statewide Conference and other venues (i.e. Colorado Recycling Association, Municipal Recycling Groups, etc.).

4.4 OUTLOOK FOR 2015-16

Tetra Tech plans to expand the technical assistance program with alternate approaches including webinars, development of best practices, marketing training sessions, and standards/testing identification training. Tetra Tech began accumulating information on the historical use of waste tires in the electric arc furnace and will continue to conduct research in the next fiscal year.

5.0 STATEWIDE CONFERENCE ON THE USE OF TIRE-DERIVED MATERIALS

This task involved organizing and conducting a second annual statewide conference for the promotion and market development of tire-derived materials. The conference, titled *Colorado's 2015 Waste Tire Conference; Markets, Materials, & More* was held on June 24 and 25, 2015 at the Double Tree Hotel located at 7801 East Orchard Road in Greenwood Village, Colorado. The overarching goal of the conference was to provide a forum for all sectors of the waste tire industry to network while congruently promoting the increased beneficial use of waste tires in Colorado.

Tetra Tech and CDPHE worked to thoroughly develop the vision, scope, location, time, invitees, conference themes, speaker possibilities, content, and schedule for the conference. Entities invited to attend the conference included, but were not limited to, waste tire processors, end users, tire derived product manufacturers, government agencies, and other interested parties approved by CDPHE.

Approximately 110 attendees were present and allowed for ample networking opportunities with the goal of enhancing the rate of beneficial end use for waste tires in Colorado. As part of the conference, 10 sessions involving waste tire market development areas were presented. A program agenda is provided in Appendix A. Conference sessions included the following:

- Colorado's Waste Tire Program
- Versatility of Tire-Derived Aggregate (TDA)

- A Processors Panel
- Marketing Products from Recycled Waste Tires
- The Story of a Monofill
- Recycled Rubber Market Challenges
- The Green Carbon System
- Tire-Derived Fuel, Past, Present, and Future
- Molded Products Marketplace Strategy and Testing
- Regional Update on Waste Tire Management Programs from Colorado, Nebraska, Michigan, and Kansas

In addition to the conference sessions, a testing demonstration was provided to showcase testing procedures typical for the loose fill surfacing industry. Typical applications include playgrounds, pour-in-place surfaces, synthetic turf, recycled rubber mats, and pavers. Rolf Huber of Canadian Playground Advisory Group demonstrated how to use the TRIAX2010 and other testing devices in the field prior to sending material to a testing laboratory for official certification.

Similar to the 2014 conference, the 2015 conference allowed waste tire industry vendors an opportunity to exhibit their abilities, products, services, etc. through 10 exhibitor booths located outside the main conference area. Exhibitors included the following: Columbus McKinnon Corporation, ECO Green Equipment, Eagle International, Front Runner Rubber Mulch, Front Range Tire Recycle, Inc., Granutech-Saturn Systems, Irri-CURB, Power Screening, Rubberosion, Inc., and Scrap Tire News.

Networking opportunities were strategically provided throughout the conference and attendees were able to learn more about key industry players in shredding equipment, informational, waste tire processing, rubber molded products, and professional services for the waste tire industry.

In addition to the main conference, a pre-conference regulatory meeting was held on June 23, 2015 at the Double Tree Hotel. Agencies present for the pre-conference regulatory meeting included:

- Illinois Environmental Protection Agency (IEPA),
- Kansas Department of Health and Environment (KDHE),
- Michigan Department of Environmental Quality (MDEQ),
- Nebraska Department of Environmental Quality (NDEQ),
- North Dakota Department of Health (ND Department of Health),
- New Mexico Environment Department (NMED),
- Oklahoma Department of Environmental Quality (Oklahoma DEQ),
- Utah Department of Environmental Quality (Utah DEQ),
- United States Environmental Protection Agency (EPA).

Additionally, a representative from the Colorado Attorney General's Office and the Rubbers Manufacturers Association attended. Each state was invited to present information on their waste tire

program. The agenda is provided in Appendix A. The forum provided the states an opportunity to discuss successes and challenges within the regulatory framework to continue to understand the regional demands in the waste tire industry. The meeting continued to provide a framework for future meetings and the opportunity to learn and work together was welcomed by all regulators.

6.0 ASSISTANCE IN THE DEVELOPMENT OF WASTE TIRE FUND PROGRAMS

Tetra Tech assisted in the review of previous statutes and regulations, identified alternatives for consideration during development of statutory revisions, and assisted CDPHE during legislative preparation and discussion. The new statutes passed and were signed by Governor Hickenlooper on June 6, 2014.

Tetra Tech was tasked to assist CDPHE in the initial development of regulations required to implement the statutory framework. Under this task, Tetra Tech was charged with research, data collection and analysis, and asked to make recommendations regarding modification of existing programs. Tetra Tech was also tasked to provide input on the development of future programs created under the CDPHE Waste Tire Program.

6.1 ASSIST IN THE DEVELOPMENT OF THE WASTE TIRE CLEANUP FUND

Under the new statutes, CDPHE is charged with developing and implementing a coordinated statewide program. Legislation is in place concerning the cleanup of illegally disposed waste tires. The cleanup program is designed to provide a mechanism for removal of existing stockpiles as well as amnesty events to encourage proper disposal of miscellaneous tires accumulated by local residents. CDPHE is charged with encouraging recycling and constructive reuse of these waste tires. Waste tire funds can be used to pay for the retrieval, transport, and recycling of waste tires at approved storage, disposal, or recycling facilities.

Under this task, Tetra Tech conducted research, then collected and analyzed data to assist CDPHE in developing regulations and procedures for implementation of these new statutes. The tasks include:

- Maintaining an abatement list which has been initiated and will continue to evolve as additional stockpiles are identified and prioritized for cleanup. Coordination and collaboration with statewide entities will assist in identification of stockpiles.
- Characterization of identified waste tire stockpiles is important to forward movement of this task. While characterizing stockpiles, special attention is paid to factors related to their environmental and population impact, as well as practical factors associated with their subsequent stabilization and abatement. Tetra Tech and CDPHE visited Roberts Ranch in Larimer County in September 2014 and June 2015. The stockpile is dispersed and topography makes tire retrieval difficult.

Two stockpiles in Douglas County were visited in late 2014 and two in Logan County were visited in June 2015; characterization of the piles is underway.

- Developing procedures and supporting materials for selecting prequalified stockpile abatement contractors is also an important step in stockpile management. Initial procedures and associated materials have been initiated. Examples of similar programs in other states have been evaluated and representative documents have been obtained to assist in developing specific documents and procedures for Colorado. A suitable Request for Qualifications has been prepared and related contractual documents will be prepared, issued, and evaluated for selection of abatement contractors.
- Development of a statewide communication program is underway. The objective is to establish an interactive communication channel for waste tire related issues.
- Consideration of a community cleanup events program has also been initiated. The objective is to provide a mechanism for proper disposal of small quantities of tires in public hands on a one-time basis while preventing potential abuse. CDPHE participated in a small collection event in May, 2015 as a learning experience, and is exploring additional events in FY 2015-16.

Initial progress has been made on all of these tasks and progress will accelerate in the next fiscal year, including cleanup of existing waste tire stockpiles.

6.2 ASSIST IN THE DEVELOPMENT OF THE WASTE TIRE MARKET DEVELOPMENT FUND

The Waste Tire Market Development Fund was impacted by the new statutes. Tetra Tech conducted activities in support of recommendations, legislative discussions, and possible future fund development. Strengths and weaknesses of programs, as well as their applicability to Colorado's unique conditions and needs, were identified and evaluated in other states including Kentucky, Illinois, Minnesota, California, and Missouri.

Tetra Tech worked with CDPHE in formulating criteria for the Market Development Grant Application and Directions for the market development fund. The Market Development grants will be funded up to \$25,000 per grant and are designed to provide limited funding to end users to assist in the research and development of new and existing waste tire recycling technologies and applications; and to provide limited funding to end users to assist in the incorporation of tire-derived materials into one or more tire-derived products including ground rubber, tire-derived aggregate and tire-derived fuel.

Tetra Tech assisted CDPHE in identifying the first applicant for the 2015 Market Development Grant and reviewing the application for testing of a recycled rubber transportation-related product.

Benefits and drawbacks of a "Loan to Grants" Program were identified and discussed. Additional effort may focus on identifying advantages and practical limitations of these programs in the limited number of states with this experience.

Depending on the future viability and resources of this fund, Tetra Tech may continue to assist CDPHE in the development of grant programs for this fund. The objective is to maximize the long term market development value of the grants. Examples that have been identified include demonstration of innovative products and applications that offer significant potential expansion of waste tire usage in Colorado. Another alternative involves repeated grants for similar installations within a defined period of time to achieve geographic diversity, or create a critical market mass to encourage processor investment to serve the emerging market.

6.3 ASSIST IN THE DEVELOPMENT OF THE LAW ENFORCEMENT GRANT FUND AND WASTE TIRE FIRE PREVENTION FUND

Specific tasks, including the evaluation of the benefits of developing and implementing a training curriculum on law enforcement and fire prevention as it relates to waste tires, were initially envisioned for these two funds; however, the new statutes merged and significantly changed these funds. Tetra Tech will assist CDPHE in reviewing the optimum restructuring of objectives, priorities, and plans. For this fiscal year, these funds were combined with the Waste Tire Cleanup Fund.

6.4 ASSIST IN THE DEVELOPMENT OF THE END USERS FUND

Under this task, Tetra Tech assisted CDPHE in developing regulations and a rebate structure for this Fund. States with rebate programs were identified and their historical performance was assessed. Discussions were conducted to develop a regulatory framework and rebate mechanism for Colorado that avoids the shortcomings experienced by other state programs. A rebate model was developed to assess and demonstrate the viability of program alternatives. This model guidance document was designed to reflect historical experience, allow for significant future market changes, and provide a predictable rebate without exceeding Fund resources.

Tetra Tech will continue to assist CDPHE with this task.

6.5 STATUTORY AND REGULATORY REVIEW OF THE WASTE TIRE PROGRAM

Under this task, Tetra Tech assisted CDPHE in review of statutory and regulatory changes to the Waste Tire Program, to provide input and make recommendations on the administration and implementation of the program.

The Tetra Tech team participated in the stakeholder meetings held on July 30, August 18, September 10 and October 2 (2014). The purpose of the meetings was to incorporate waste tire and end user fund changes into the Solid Waste Regulations (6 CCR 1007-2 Part 1 and Part 4) as the result of the

passage of House Bill (HB) 14-1352. The intention of the stakeholder meetings was to get feedback from stakeholders on the proposed changes to the Regulations.

As a result of the pre-conference regulator meeting held in June 2014, the idea to have periodic teleconference call with waste tire regulators was initiated. Tetra Tech coordinated two regulator teleconference calls held on February 24, 2015 and May 7, 2015. Seven states and 19 attendees participated on the first call. Seven states and 18 attendees participated on the second call. Tetra Tech provided CDPHE meeting notes after each call. It is anticipated that a third call will be scheduled for fall 2015.

7.0 CONCLUSION

The Waste Tire Program operates within the Hazardous Materials & Waste Management Division of CDPHE, to allow the program to streamline and increase efficiency. Through technical trainings, technical assistance and identification, annual educational and networking forums, and further development of the Waste Tire Program funds, substantial progress will continue in the promotion and advancement of the waste tire industry for the beneficial end use of waste tires.

APPENDIX A
TECHNICAL TRAININGS, REGULATORS MEETING (PRE-CONFERENCE), AND
CONFERENCE AGENDAS

(Five Sheets)

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**CIVIL ENGINEERING APPLICATIONS OF
TIRE-DERIVED AGGREGATE (TDA)
Road and Highway Focus
Short Course**

Presented by:

Dana N. Humphrey, Ph.D., P.E.
Professor of Civil Engineering
University of Maine

June 4, 2015

8:30am – 3:30PM

Hilton Garden Inn – Cherry Creek
600 South Colorado Boulevard
Denver, CO 80246

- 8:30 Welcome (by CDOT/CDPHE)
- 8:40 – 10:15 Short Course by Dr. Humphrey
Introduction to TDA
Overview of TDA use in civil engineering
Engineering properties of TDA
- 10:15 – 10:30 Break
- 10:30 – 12:00 Lightweight and conventional fill for highway embankments and landslide stabilization, including discussion of Double Nickel project in Wyoming
Retaining wall and bridge abutment backfill
- 12:00 – 1:00 Lunch (provided)
- 1:00 – 2:15 Retaining wall and bridge abutment backfill (continued)
Drainage and insulation layers in roads
Use of whole tires in highway applications
Environmental Considerations for use of TDA
- 2:15 – 2:30 Break
- 2:30 – 3:15 Self-heating reactions in TDA fills
Summary
- 3:15 – 3:30 Discussion of questions and/or projects
- 3:30 Adjourn



WASTE TIRE REGULATORS MEETING
Doubletree by Hilton
Denver Tech Center
Magenta Room
Denver, Colorado
June 23, 2015
9:00 a.m. - 4:00 p.m.

7:30 a.m. - 9:00 a.m.	Registration/Continental Breakfast (<i>Magenta Room</i>)
9:00 a.m. - 10:30 a.m.	State Waste Tire Program Overviews Each state is invited to give an update of their program, focusing on changes and current issues. For those states that were not in attendance last year, please provide the group a 10 - 15 minute overview (PowerPoint presentation preferred) of your waste tire management program. Typical topics include: <ul style="list-style-type: none">• Program resources• Registration, permitting and financial assurance• Enforcement methods and results• Product markets and any market development efforts• Stockpile abatement status, abatement methods, and control• Any other important program information• Continuing challenges
10:30 a.m. - 10:45 a.m.	Break
10:45 a.m. - Noon	Completion of Program Overviews and Discussions <ul style="list-style-type: none">• Permits and Financial Assurance: Some facilities use a common carriers, others do not. Some require financial assurance, some do not.• Summary of Processing Economics (Terry Gray)
Noon - 1:00 p.m.	Lunch (<i>provided</i>)
1:00 p.m. - 2:15 p.m.	Continue discussion of topics <ul style="list-style-type: none">• What is pyrolysis and its current status? (Terry Gray/Mary Sikora)• Framework of the Industry - (John Sheerin)• Markets: What are they in general? What is the state of the markets?<ul style="list-style-type: none">○ Crumb rubber market status and development (Mary Sikora)○ TDF market segments and development (Terry Gray)○ TDA markets and their development (Dr. Dana Humphrey)
2:15 p.m. - 2:30 p.m.	Break
2:30 p.m. - 4:00 p.m.	Continue discussion of topics
4:00 p.m.	ADJOURN

Colorado's 2015 Waste Tire Conference: *Markets, Materials, and More*

June 24-25 Conference Agenda

Day One: Wednesday, June 24, 2015

7:00 am – 8:00am: Registration / Continental Breakfast

8:00 am – 8:15 am: Welcome and Introduction

- Brian Gaboriau, Waste Tire Grants Administrator, Hazardous Materials & Waste Management Program (Global), Colorado Department of Public Health & Environment (CDPHE)

8:15 am – 8:45 am: Opening Remarks and Colorado's Waste Tire Program

- Moderator: Brian Gaboriau, CDPHE
- Speaker: Charles Johnson, Solid Waste and Materials Management Program Manager, CDPHE

CDPHE's Waste Tire Program continues to evolve and expand. The Solid Waste and Materials Management Program are working to continue to improve the overall management and end use markets of waste tires. In this session, we'll do a quick overview of the accomplishments over the past year and discuss a path forward for this coming year and beyond.

8:45 am – 10:15 am: Tire-Derived Aggregate: Exploring Its Versatility

This session will highlight Colorado's current and potential applications for Tire-Derived Aggregate (TDA) in civil engineering applications. One of the nation's leading experts will talk about the engineering properties and technical/economic benefits of TDA as thermal insulation, drainage media, lightweight fill, vibration dampening aggregate, and retaining wall backfill. You'll hear how TDA is performing in light rail applications in Colorado and what highway and transportation opportunities for using TDA lie ahead.

- Moderator: Anna Rice, CDPHE
- Speakers: Dr. Dana Humphrey, University of Maine
Bill Schiebel, Colorado Department of Transportation
Jerry Nery, Regional Transportation District

10:15 am – 10:30 am: Break

10:30 am – 11:45am: Processors Panel - Challenges, Opportunities & Strategies Going Forward

Tire processors are the backbone of the tire recycling industry. They collect tires, process them, and seek ways to recycle waste tires in sustainable, profitable markets. In this session, regional tire processors will discuss their processing operations, challenges they face, their successes and outlook for the future. Processors will also discuss current industry trends and discuss what's needed to open the opportunities to innovate and build markets for Colorado's waste tires.

- Moderator: Terry Gray, TAG Resource Recovery
- Processors: Rick Welle Sr. & David Goldschmidt, Front Range Tire Recycle
Joe Collard, Geocycle LLC
Ryan Curtis, Liberty Tire Recycling
Keith Mautz, 3XM Grinding and Compost

11:45am – 1:30 pm: Lunch

A complimentary lunch selection will be served in the dining room adjacent to the conference room.



Colorado's 2015 Waste Tire Conference: *Markets, Materials, and More*

June 24-25 Conference Agenda

12:30 pm – 1:30 pm: Testing Demonstration - Injury Prevention on Playground and Sports Surfaces

CDPHE has planned a series of demonstrations that include injury prevention testing of loose fill surfacing for playgrounds, pour-in-place surfaces, synthetic turf, recycled rubber mats, and pavers. Rolf Huber of Canadian Playground Advisory Group will demonstrate how to use the TRIAX2010 and other testing devices in the field prior to sending material to a testing lab for official certification. You won't want to miss this opportunity to learn what testing professionals look for in a product to meet safety and environmental compliance.

1:30 pm – 2:00 pm: Marketing Products from Recycled Waste Tires in a Competitive Environment

In today's competitive environment it is more important than ever to have a well-designed and well executed marketing plan to assure success in selling any product. To be successful, the products need to meet customer or consumer needs and not just be a green alternative to existing established products. This session will look at what tire-derived product manufacturers can do to better understand their markets and align themselves with established tire distribution networks for access to the best recyclable tires and the best distribution channels for tire- derived products.

- Moderator: Anna Rice, CDPHE
- Speaker: Don Baldwin, True Course Consulting

2:00 pm – 2:30 pm: The Story of a Monofill

This session will explore how a Colorado monofill owner is moving forward with processing innovations to efficiently produce TDF from its monofill inventory and ongoing generation tires, as well as advanced materials handling systems to constructively use TDF in its cement manufacturing facilities.

- Moderator: Terry Gray, TAG Resource Recovery
- Speaker: Trent Peterson, GCC Energy LLC

2:30 pm – 2:45 pm: Break

2:45 pm – 4:15 pm: Recycled Rubber Market Challenges and Successes

This session will explore issues important to playground and turf markets. It includes an overview of the ADA Accessibility Design Regulation as it relates to playgrounds and synthetic turf and highlights the role of tire- derived product manufacturers, owner operators and other stakeholders in ADA compliance. This session presents an update on the status of the recent media reports questioning the health risks and safety of crumb rubber in synthetic turf fields and playgrounds and how the tire recycling industry is responding. This session also explores the current use and market potential of crumb rubber in synthetic turf and other recreational surfaces in Colorado.

- Moderator: Mary Sikora, Recycling Research Institute, Inc.
- Speakers: Rolf Huber, Canadian Playground Advisory Inc.
Terry Leveille, TL & Associates
Todd Smith, Academy Sports Turf LLC.

4:15 pm– 4:30 pm: Daily Wrap-Up

4:30 pm – 5:00 pm: Injury Prevention Testing Demonstration

5:00 pm – 7:00 pm: Networking Reception – Hotel Atrium



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Day Two: Thursday, June 25, 2015

7:30 am – 8:30 am: Continental Breakfast

8:00 am – 8:30 am: Injury Prevention Testing Demonstration

8:30 am – 9:00 am: Green Carbon TVR System

This presentation will discuss Green Carbon's approach to recycling tires—from small passenger tires to mining OTR tires, conveyor belting and other rubber scrap into useable products using their Thermal Vacuum Recovery process.

- Moderator: Brian Gaboriau, CDPHE
- Speaker: Fred Taylor, Green Carbon, Inc.

9:00am – 9:30am: Tire-Derived Fuel – Past, Present, and Future Market

Today, tire derived fuel is the oldest and largest waste tire market, but it is constantly changing based on global economics and regulatory changes. The evolution of this major market, its current status, and its projected future role in the industry and in Colorado will be discussed.

- Moderator: Shana Baker, CDPHE
- Speaker: Terry Gray, TAG Resource Recovery

9:30 am – 9:45 am: Break

9:45 am – 11:00 am: Molded Products – Marketplace Strategy and Testing

This session will present a case study of how one Colorado tire derived product manufacturer is developing new products and a better understanding of how to deliver what the customer wants. In this session, we'll learn what it takes to sell tire-derived products to state agencies and how Colorado product manufacturers can navigate the state purchasing system. This session will highlight the importance of testing in tire-derived product development and provide valuable insight and tips for defining customer needs, testing requirements, material specifications and standards for qualifying your product.

- Moderator: Shana Baker, CDPHE
- Speakers: Rick Welle, Rubberosion, Inc.
David Musgrave, State of Colorado, State Purchasing Office
Cathy Kramer, Connect2DOT

11:00 am – 12:30pm: Regulators Panel – Update on Waste Tire Management Programs

A panel of experienced regulators from nearby states will address issues of common interest, alternatives that have been used to address these issues, and new challenges facing the industry and its regulators.

- Moderator: John Sheerin, Rubber Manufacturers Association
- Regulators: Brian Gaboriau, Colorado Department of Public Health & Environment
Ruth Johnson, Nebraska Department of Environmental Quality
Rhonda Oyer, Michigan Department of Environmental Quality
Ken Powell, Kansas Department of Health & Environment

12:30pm: Conference Wrap-Up

* Times and speakers subject to change