Hyperloop

Introduction

High speed transport innovation is advancing around the world and while hyperloop is still in testing and proving phases, AECOM is leading the way to help our clients understand the potential and to support the industry to push boundaries and stretch into uncharted territory.

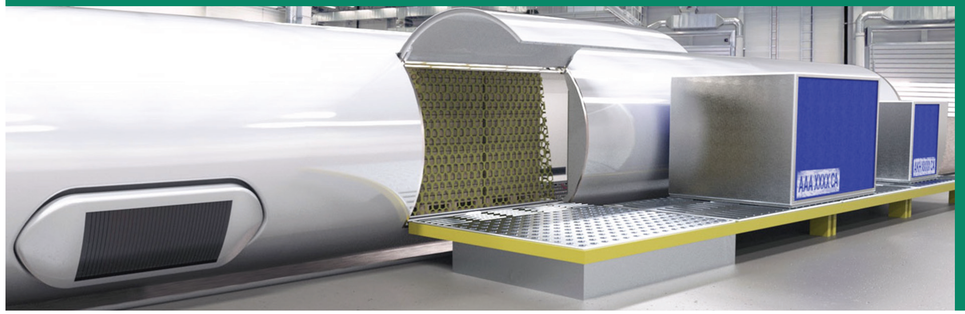
Imagine traveling at airline speeds for the price of a bus ticket. AECOM is the only engineering company in the world to have planned, designed and constructed Hyperloop projects. Now we're studying how the new high-speed transportation technology could efficiently transport goods between the ports, major transit hubs and inland distribution centers around the world.

- High-Valued Goods Movement
- Routes with 20% truck volume
- Linking Air Freight and Passengers
- Point-to-Point Service – Fewer Stops

Hyperloop drivers

CARGO TERMINAL

FRET POD

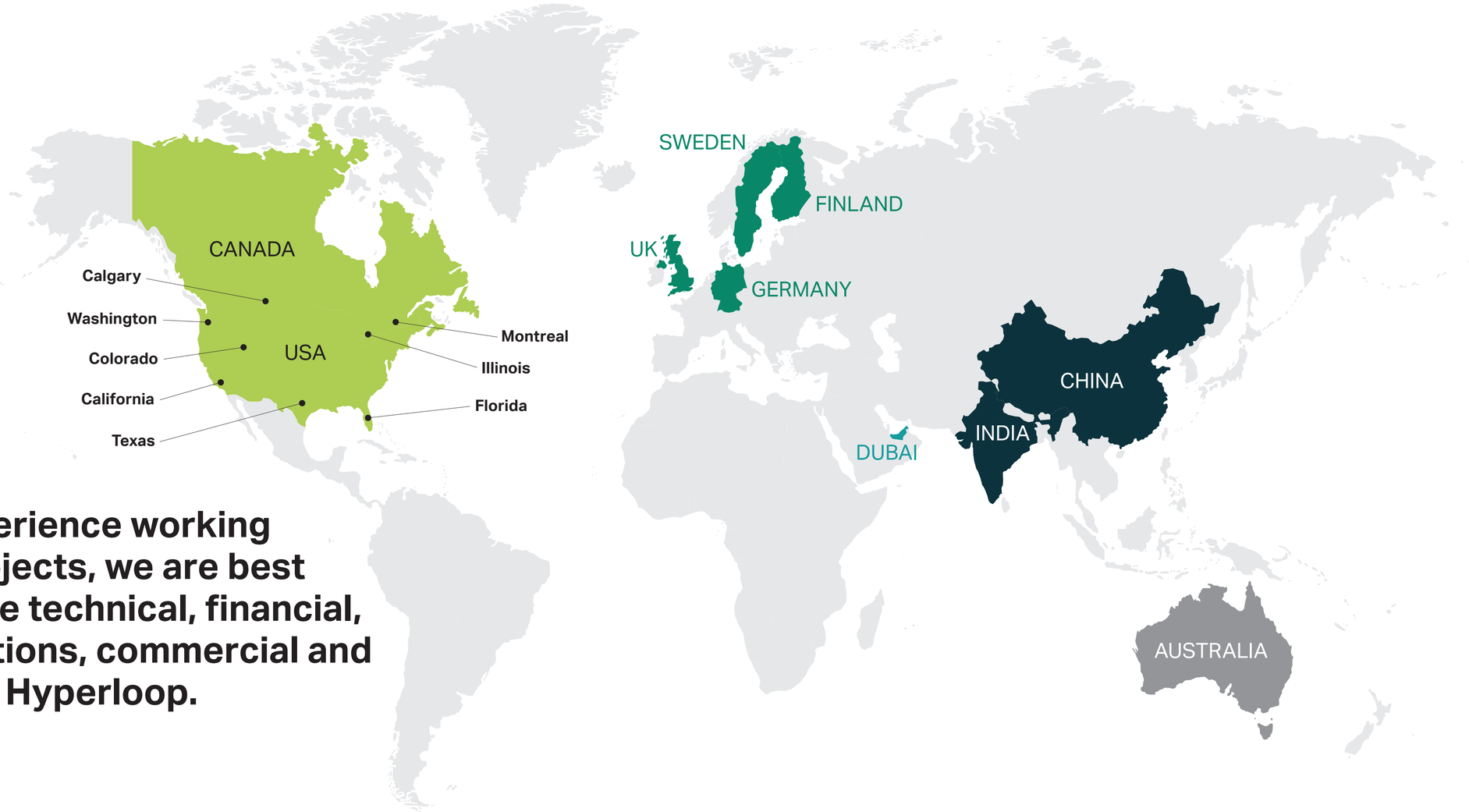


PASSENGER POD

AECOM Hyperloop Projects

- AECOM is the only infrastructure company in the world to have planned, designed and constructed Hyperloop projects
- Elon Musk's SpaceX has selected AECOM, one of the world's largest construction and design firms, to build its Hyperloop test track on 2016
- AECOM served as the overall Program Manager, Design, and Construction Manager for the 4,200 foot long Space-X Test Track in Hawthorne, CA
- Our Global team of engineers and construction management professionals bring world class expertise on a variety of unique and first of xxx??

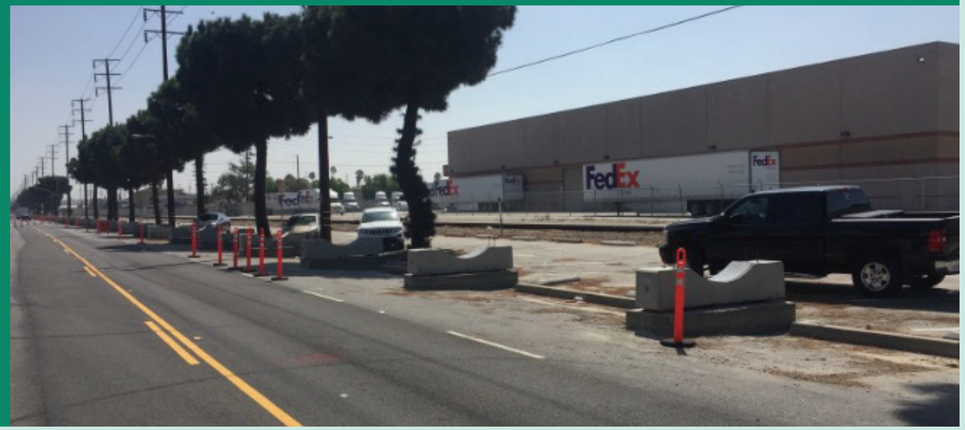
AECOM and Hyperloop



With our team's experience working on 19 Hyperloop projects, we are best positioned to provide technical, financial, construction, operations, commercial and strategic aspects of Hyperloop.

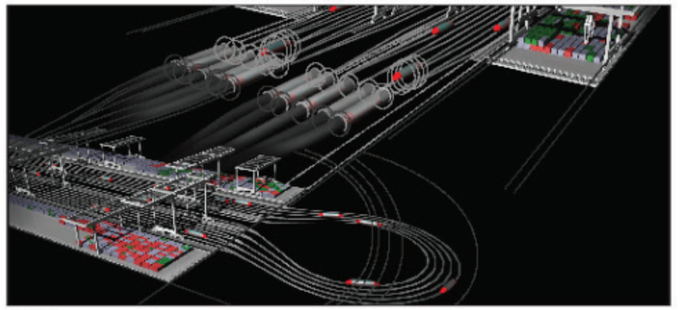
AECOM Hyperloop Projects

AECOM served as the overall Program Manager, Design, and Construction Manager for the 4,200 foot long Space-X Test Track in Hawthorne, California. Our Global team of engineers and construction management professionals bring world class expertise on a variety of unique and first of their kind infrastructure projects like Hyperloop



Connecting Hyperloop and Logistic hubs

Ports of Los Angeles and Long Beach Hyperloop One use hyperloop to transport goods/packages between logistic hubs. Transporting goods in a very quick and relative energy efficient way maybe benefits our major logistic clients already on the shorter term



AECOM

Ports of Los Angeles and Long Beach Hyperloop One Feasibility Study

Los Angeles, CA

Cargo movement in the Southern California region is a critical transportation issue, as much of the cargo leaving the two major ports in the region, the Port of Los Angeles (POLA) and the Port of Long Beach (POLB), travel via freight truck on heavily congested roads. Truck traffic has major impacts to the Southern California transportation system; increasing congestion, accidents, and impacts to infrastructure maintenance. The Hyperloop One (H1) pre-feasibility report studied the opportunities, barriers, and wider economic benefits of integrating Hyperloop for cargo movement to reduce truck traffic in the region.

As the civil infrastructure lead on the project, the AECOM team, led by Philip Hadfield and Andrew Bui, worked with H1 to develop the Hyperloop study, and provided critical input into infrastructure design, freight movement operations, and critical stakeholder engagement to develop a preliminary design for the Hyperloop One cargo system. AECOM led development of this study and completed the following scope of work:

- Development of a VH1 technology overview and operational model, including a basis of design that defines the technology system including system geometric constraints, power requirements, acceleration constraints, equipment and labor requirements, operational requirements, and rough order magnitude cost.
- Cargo logistics for the region, including identification of addressable market for the VH1 and current operational systems that would need to be integrated into the Hyperloop operational model.
- Demand/Market analysis to evaluate and estimate the future demand and market of the VH1 freight system based on market and potential induced demand
- Route evaluation and impact assessment based on VH1 technology requirements and required infrastructure needed for loading/unloading of cargo containers
- Stakeholder identification and engagement plan for strategic stakeholders based on the route analysis and business model
- Implementation plan for integration of the technology
- Value proposition of the corridor deployment including capital expenses, operational expenses, and wider economic benefits the system can bring.

The study was completed on time and on budget, and provided VH1 with a core understanding of infrastructure requirements for their cargo system and analysis and development of integration strategies for Southern California.

Client
Port of Los Angeles

Services
Prelinary feasibility study

Project constraints
Working closely with VH1 to co-develop technology identifying corridor needs, constraints, and opportunities
Co-developing implementation strategy with VH1

Start date
August, 2016

Completion date
November, 2016

Schedule variance
Project delivered on time

Cost management
$412,000
Project delivered on budget

Key contact details
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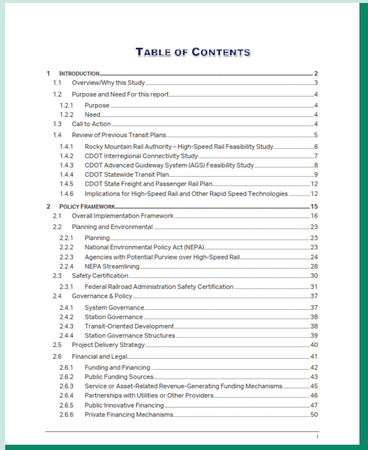
Mark Sisson, PE
Planning, simulation analysis
Phillip Hadfield, PE
Project manager
Ahmad Abdel-Karim, PhD, PE
Structures lead

Sponsor feedback on quality of service
AECOM allowed the team to better quantify opportunities, barriers, and wider economic benefits of the Hyperloop system for freight movement in Southern California.
--Josh Raycroft

CDOT RoadX Program Management, Colorado, USA

AECOM partnered with CDOT to submit a proposal to the Hyperloop Global Challenge in 2016. Later in 2017, the Rocky Mountain Hyperloop proposal was one of ten winning proposals and AECOM led the feasibility study to explore implementation potential for Hyperloop in Colorado



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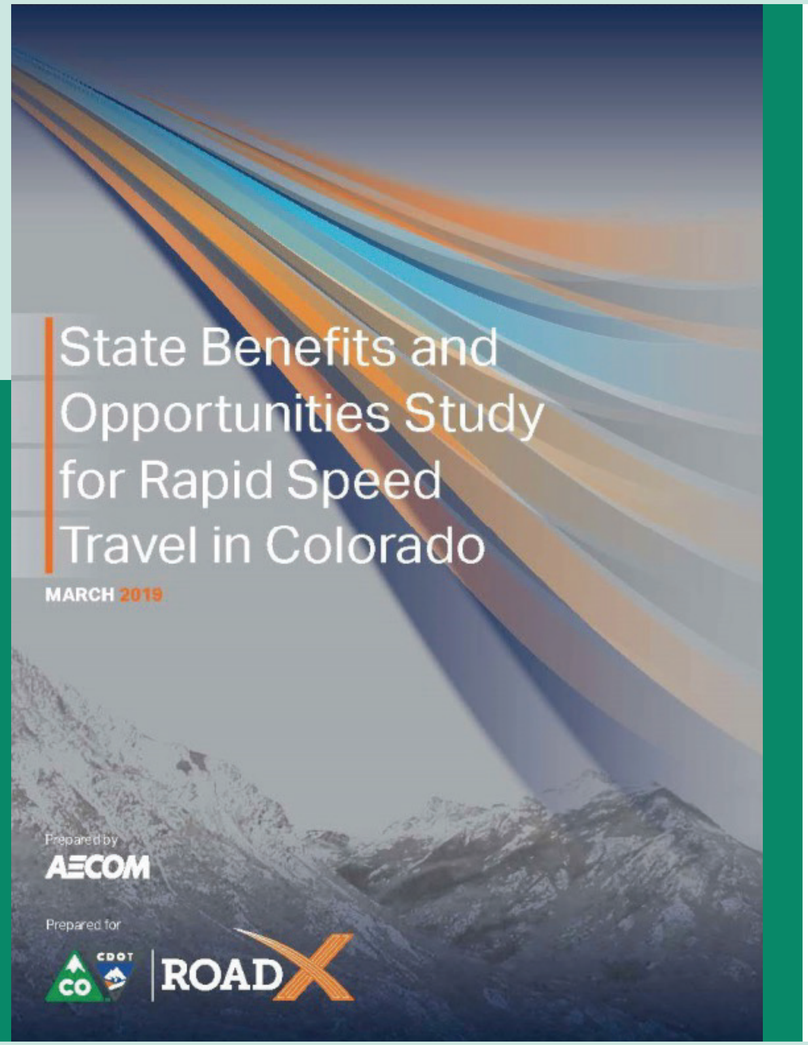


CDOT RoadX Program Management, Colorado, USA

The Colorado Department of Transportation (CDOT) RoadX program recognizes that 21st-century technology and ingenuity are critical to solving modern infrastructure problems. AECOM was selected to serve in a program management role to advance technology and innovations from proof of concept through demonstration and implementation. We helped to incubate ideas, study feasibility, accelerate design, and highlight partnership opportunities for our clients. Through this program we stay in tune with the latest smart technology trends being developed by the private sector and implemented by public agencies.

Summary of Projects:

Hyperloop Feasibility Study

AECOM partnered with CDOT to submit a proposal to the Hyperloop Global Challenge in 2016. Later in 2017, the Rocky Mountain Hyperloop proposal was one of ten winning proposals and AECOM led the feasibility study to explore implementation potential for Hyperloop in Colorado.

Arrivo Feasibility Study

AECOM performed the feasibility study and near-term implementation plan for both a test track and expanded network system to implement the Arrivo automated and high-speed technology for auto, transit, and freight mobility in the Denver metropolitan area.

Smart Powered Lanes

AECOM partnered with SELECT (research center for sustainable electrified transportation) to complete a feasibility study and implementation plan for Wireless Dynamic Electric Charging referred to as Smart Powered Lanes. This study reviewed several use case applications near Denver International Airport.

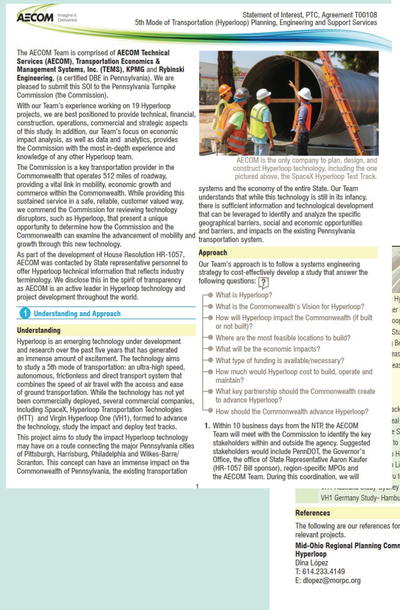
Statewide Rapid Speed Benefits Study

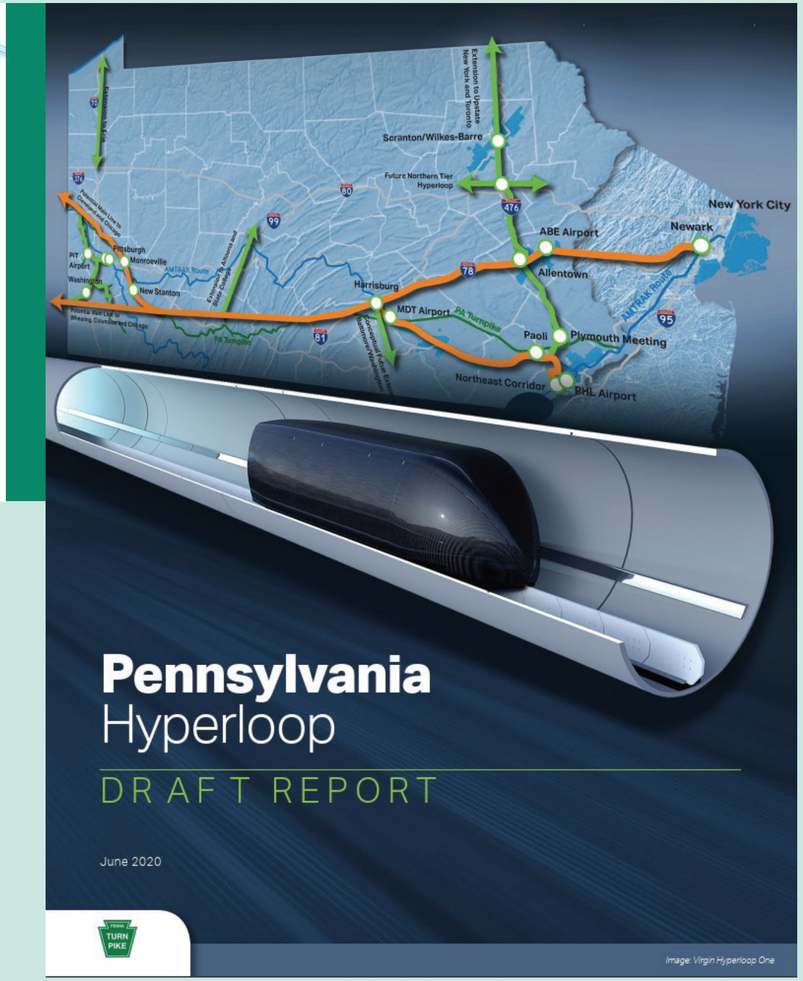
This feasibility study evaluated the various framework elements for implementation of emerging rapid speed technologies and systems in transportation, including NEPA, safety certification, procurement, financial and governance considerations. The study included high level evaluation of new high-speed transit such as Hyperloop, high speed automated highway, underground concepts, and elevated personal rapid transit.

Project	Overall Satisfaction	Technical Expertise	Client Comments	Colorado Department of Transportation Reviewer
CDOT RoadX Program Management	10 of 10	10 of 10	They have provided quality service and have educated us on new items. Innovative approach to things.	Lisa Streisfeld Lisa.streisfeld@state.co.us +1 303.757.9876

Pennsylvania Turnpike Commission (PTC): 5th Mode of Transportation (Hyperloop) Evaluation Study

This project aims to study the impact Hyperloop technology may have on a route connecting the major Pennsylvania cities of Pittsburgh, Harrisburg, Philadelphia and Wilkes-Barre/Scranton





Mid-Ohio Regional Planning Commission (MORPC): Hyperloop Feasibility Study, Chicago-Columbus-Pittsburgh corridor

In 2018, MORPC launched the Rapid Speed Transportation Initiative (RSTI), which is exploring better and faster connections for goods and passengers between Columbus (Ohio), Chicago (Illinois) and Pittsburgh (Pennsylvania). Project value: $300,000

The RSTI has to date has included two studies: the Midwest Connect Hyperloop Feasibility Study (with AECOM as prime consultant) and Environmental Impact Statements (EI5) Elements for passenger rail and hyperloop in the corridor (supported by AECOM). The studies have identified candidate locations for high-capacity passenger multimodal and freight intermodal connectivity throughout the corridor. The Hyperloop Feasibility Study was developed collaboratively with Virgin Hyperloop One (VH0) and assumes the use of proprietary VHO hyperloop technology.

A key RSTI vision is to identify an initial research and demonstration segment within the project corridor meeting the objectives of the project sponsors and VHO. AECOM's role in the study included a technology overview, an analysis of potential alignments, demand and economic analysis, regulatory framework, conclusions regarding feasibility and a framework for NEPA analysis. The analysis concluded that the project can potentially convey goods and passengers throughout the entire 500-mile Chicago-to-Pittsburgh corridor within one hour, increase total corridor travel by more than 50%, and add $300 billion to the regional economy over 30 years. The study concluded in November 2019.

About AECOM

AECOM is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries. As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM had revenue of approximately $18.2 billion during fiscal year 2017. See how we deliver what others can only imagine at aecom.com and @AECOM.

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