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Briefing Paper:

**INNOVATIONS IN
TRANSPORTATION
PROJECT DELIVERY
METHODS**

Prepared for:

**Chittenden County Metropolitan
Planning Organization**

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1.0 PURPOSE & BACKGROUND

1.1 PURPOSE

The purpose of this briefing paper is to provide an overview of methods and options that may hold promise for expediting transportation project delivery in Vermont. It is one of a series of four papers that explore dimensions of innovative transportation finance for Chittenden County, Northwestern Vermont and Vermont as a whole.

1.2 BACKGROUND

The amount of time and resources involved in moving a transportation project from the initial planning stages to the completion of construction is significant. According to the Government Accountability Office (GAO), while the time required varies with the size of the project, its complexity, and the public interest in the project, some projects may take as few as 3 years or as many as 20 years or more to complete. As illustrated in Figure 1, projects take this long to complete because there can be as many as 200 major steps requiring actions, approvals or input from a number of federal, state, and other stakeholders. Projects with significant environmental impacts also face high levels of controversy that often results in a lack of sustained support from stakeholders. The American Association of State Highway and Transportation Officials (AASHTO) recently stated that the three most important causes of delay in the highway building process are environmental review, right-of-way acquisition and utility relocation¹.

Completing a new, major highway construction project takes a number of years because of the many tasks, requirements, approvals, and stakeholders involved. Smaller projects (such as new lane striping) as well as larger projects (such as constructing a new highway) must go through many steps that require multiple stakeholder reviews and approvals. Because most federally funded highway construction projects are minor rehabilitation or reconstruction projects rather than major new road construction projects, these projects generally will not require extensive planning studies and will not have significant environmental impacts. As a result, according to GAO, most federally funded highway construction projects advance from planning to construction within 1 year but may take up to 4–6 years, depending on the individual project's characteristics.

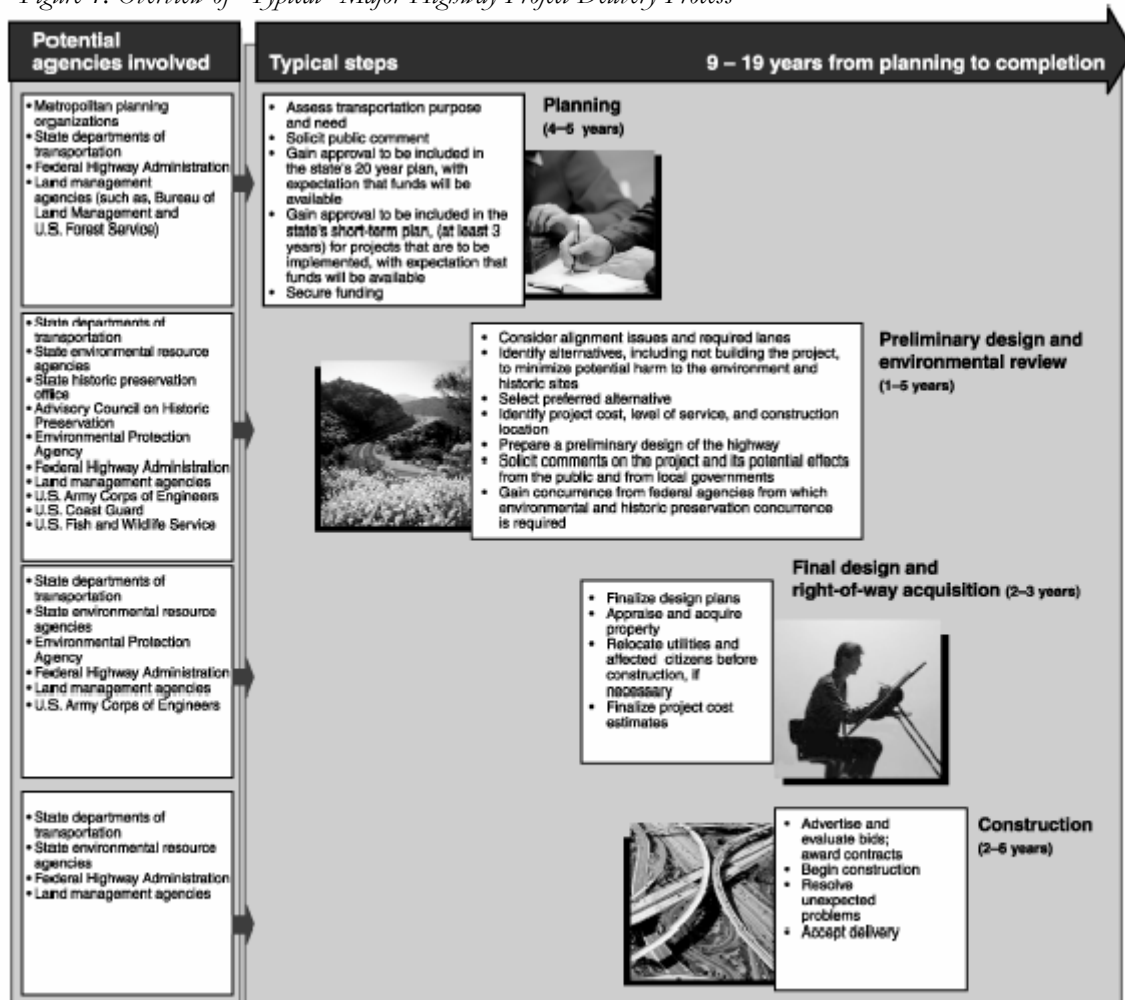
In recent years, state departments of transportation (DOT), the federal government and others have recognized that the slow pace of project delivery leads to increased costs, inefficient resource allocation and risks to overall economic vitality and quality of life. Implementing innovative methods for project delivery has also become more important because many transportation agencies have significant backlogs of needed projects but little financial means to advance them to the next step, all with construction costs increasing at rates higher than inflation.

¹ http://downloads.transportation.org/Quality-FinalReport_Partnering.pdf



This need exists not only from the bureaucratic perspective; our nation’s aging infrastructure is in disrepair, with much of our freeway infrastructure needing replacement in the next 20 years. As congestion and related costs increase, there is growing nationwide interest in evaluating options and opportunities for both maximizing the utility of our current infrastructure and decreasing the time and costs associated with implementing new transportation facilities.

Figure 1: Overview of “Typical” Major Highway Project Delivery Process



Note: The durations of the phases are approximate. The preliminary design/environmental review steps and the final design/right-of-way acquisition steps often overlap.

Source: FHWA.



2.0 OPTIONS AND OPPORTUNITIES

State DOTs and other agencies have been evaluating these leading causes of delay and additional cost. Several have changed philosophical viewpoints on project delivery while also taking advantage of changes in federal transportation funding laws that allow increased flexibility in construction materials and contracting arrangements. State-led efforts to reform the project delivery process focus on creating new planning perspectives, formal adoption of new contracting methods, the flexibility to use alternative construction materials, and a team-based value engineering process to identify innovative ways to reduce overall cost.

2.1 INNOVATIONS IN MANAGEMENT OF THE PROJECT DELIVERY PROCESS

Among the changes being employed across the country are more innovative approaches to managing the overall project delivery process, ranging from initial design states through actual construction and operation. Notable examples include:

- **New Jersey's HyperBuild** integrates innovative contracting, accelerated construction and the community-inclusive input known as "context-sensitive design" into a finished road or bridge. Under the initiative, all projects in the state's construction priority list are reviewed to search for innovative, cost-cutting approaches, timesaving design and construction methods, and non-traditional contracting that can lead to saving both time and money.
- **Indiana's Hyperfix** initiative was developed to address the challenges associated with implementing major improvements along a substantial section of the combined I-65 and I-70 arteries in downtown Indianapolis. INDOT's approach to the undertaking's key challenges was simple, if not easy: close down the entire affected stretch of highway and design the project in such a way that the many contractors and subcontractors would be on the job every day, 24/7. That produced a need to provide 175,000 displaced daily drivers with the means to negotiate the commute without turning alternative routes into parking lots. The project team supplied places for commuters to park, provided special shuttle buses so they could ride in relaxation, and planned routes for the buses to get commuters to their destinations. In addition, INDOT and contractors' representatives met with as many community stakeholders as possible before construction began. The entire project, including 33 bridges, was completed in just 55 days.
- **North Carolina DOT's Alternative Delivery Unit** was created to develop and provide the DOT with alternative contracting methods for delivery of transportation projects. The Unit also investigates and implements value-added processes and products. The Alternative Delivery Unit is comprised of three sections: Design-Build, Value Management, and Alternative Contracts. Its 30-member staff team examines each pending or current state road project to see if these methods can be applied in manner that expedites project delivery and/or reduces costs.



In addition to formal changes in process management, many state DOTs are increasing transparency and open communication among project developers, review agencies, and the general public. For example, the California and Virginia DOTs have established web-based databases where stakeholders and the public can track a project's status and progress through the development process. Virginia's new web-based system has been credited with helping improve the timeliness of project delivery.

2.2 INNOVATION IN CONTRACTING METHODS

Nationally, two broad concepts in transportation project contracting have been most frequently adopted with success: Design-Build and use of contractor incentives to reduce construction time, cost and impacts to speed implementation (ABC Contracting).

2.2.1 Design-Build

Design-Build is a project delivery method under which a project owner, having defined its initial expectations to a certain extent, executes a single contract for both architectural/engineering services and construction. The Design-Build entity may be a single firm, a consortium, joint venture, or other organization. However, the fundamental element of Design-Build delivery remains that one entity assumes primary responsibility for design and construction of the project. This approach typically allows the contractor to use any materials, techniques, and equipment, as long as they can meet performance quality criteria put forth by the contracting agency.

Design-Build delivery provides the contracting agency with the benefit of a single point of responsibility for the majority of project development, which can streamline coordination between the design and construction teams. It can reduce the transportation agency's administrative burdens by eliminating the need to coordinate or arbitrate between separate design and construction entities. With the primary designer and the contractor working as a team, scheduling considerations can be addressed up front, often leading to more efficient implementation. Together with these efficiencies, the fact that design and construction activities can proceed concurrently also creates the potential for time savings and, ideally, will lower implementation costs. Design-Build can also promote innovation by utilizing the designers' and builders' separate strengths to develop new design and construction techniques.

As of 2002, 30 state DOTs were legally authorized to undertake Design-Build contracts for transportation projects. While Vermont has authorized Design-Build for general state construction projects, the Legislature has not extended that authority to transportation projects.

2.2.2 ABC Contracting Methods

Innovations in contracting may also include incentives for delivering projects at or below estimated costs and/or by or before a specified date. In addition, these methods can use "penalty" fees such as those a contractor could incur for shutting down travel lanes.



The generic term for this type of method is “ABC Contracting.” In the ABC approach, “A” is the cost of the construction, “B” is the time it takes to complete the job, and “C” is a fee incurred for traffic impacts due to construction. Across the country, there are a variety of arrangements that employ different combinations of these elements.

A variation on ABC Contracting is the use of “warranties” for contractor construction quality. In this case, contracting agencies may hold contractors accountable for the long-term quality of project construction and/or operation, and have the option to impose financial penalties for deficiencies that arise well after construction is complete.

It is worth noting that an important element of success when using these methods is enabling contractors to have significant freedom and flexibility in techniques and materials. Similarly, those agencies that have experienced success also employ clear performance criteria for contractor timeliness and quality.¹

2.3 INNOVATION IN ENVIRONMENTAL REVIEW PROCESSES

Before a federally funded highway project can be built, it must comply with the requirements of the National Environmental Policy Act of 1969 (NEPA), among other things. Under the act, the consequences, if any, of proposed transportation projects and alternative choices (such as alternative routings) on the natural and human (e.g., health) environment and on historic properties must be identified and assessed. Recent research found that the average NEPA environmental review process requires nine to 36 months to complete. NEPA processes and the amount of time typically required can be the most expensive part of the project delivery.

With recent and continuing increases in transportation project construction costs, considering options for reducing the time associated with the environmental review process could lead to a significant cost reduction for the overall project. A concept called “Environmental Streamlining” has been embraced as one of the most effective ways to ensure adequate review while still moving the process forward. Recent examples of innovation in this area include:

- **New Jersey DOT’s Approach to Environmental Stewardship** - NJDOT has recently stepped up efforts to enhance relationships between NJDOT and the resource agencies. In the past, NJDOT staff believed that their job was to build highways and obtain permits. Today, NJDOT environmental employees operate with the mindset that their job is to be stewards of the environment and be responsible for protecting the environment.
- **Maryland’s Streamlined Environmental and Regulatory Process** - The Maryland State Highway Administration (MDSHA) has incorporated the streamlining provisions of TEA-21 into its environmental process. By modifying its process, the agency ensures concurrences

¹ See AASHTO’s *Primer on Contracting for the 21st Century* for an overview of recent innovative contracting programs.



are obtained by the specific due date, and issues are not revisited unless there is substantive new information that warrants a reevaluation.

- **Kentucky’s Checklists Process** - To reduce the cycle time for environmental processes, the Kentucky Transportation Cabinet (KYTC), in concert with FHWA, has initiated a method of using Guidance and Accountability Forms (GAF) for key environmental processes. The GAF is basically a checklist that contains what is expected and references to identify the level of effort expected. Also, it is designed to coordinate key stakeholders of the process, which includes accountability for quality features.
- **Chicago’s Green Permit Program** - Although not yet used for major transportation projects, expedited permitting programs tied to “green” infrastructure are increasingly mentioned as an approach worth consideration. For example, in 2005, the Chicago Department of Construction and Permits implemented a Green Permit Program, the first of its kind in a large U.S. jurisdiction. Its success—from 19 permits in 2005 to 71 in 2006 and a goal of over 100 this year—has helped significantly accelerate the growth of private-sector green building in the city because permits for large or complex projects can be issued in as little as six weeks from the time of construction document submission—approximately half the typical time. This time savings can translate into substantial financial benefit for developers because earlier construction starts mean earlier sales or leasing and reduced interest on construction loans. In addition, the program offers a more direct financial incentive in the form of reduced fees.

2.4 INNOVATION IN RIGHT-OF-WAY ACQUISITION

Costs and procedures for acquiring right-of-way have increased substantially. In recent years, DOTs and other agencies have developed a variety of methods for negotiating and reducing the time associated with right-of-way transactions. Examples include:

- Offering “signing bonuses” that provide a set percentage increase to a landowner if he or she is willing to release the property or relocate within a specified time;
- Raising the nominal dollar thresholds for low-cost parcels, which allows appraisers or negotiators to make an attractive offer to property owners on the spot. This removes many transactions from the formal bargaining process, thus reducing time required to obtain right-of-way. Some states report that more than 80 percent of their parcels are now being acquired in this fashion.
- Allowing above-fair-market offers, where right-of-way negotiators make offers above a property’s fair market value. This approach recognizes that the real costs of the acquisition may also include the avoidable costs of the condemnation process and/or project delays.



- Allowing the landowner to select the appraiser from an approved list, thus building the sense of trust the landowner has that he or she is getting a fair deal. As a result, the number of parcels that must go through the condemnation process is reduced.

2.5 ADAPTATION OF NEW TECHNOLOGIES AND METHODS FOR PROJECT CONSTRUCTION

Across the country, transportation agencies are employing a variety of innovative technologies, building materials, and construction methods in an effort to reduce project costs, construction time and environmental impacts. Examples include:

- **Prefabricated Bridge Elements and Systems (PBE):** Traffic and environmental impacts are reduced, constructability is increased, and safety is improved because work is moved out of the right-of-way to a remote site, minimizing the need for lane closures, detours, and use of narrow lanes. Prefabrication of bridge elements and systems can be accomplished in a controlled environment without concern for job-site limitations, which increases quality and can lower costs.
- **Complete Lane and/or Highway Shutdowns for Construction** are being used with increasing frequency. As highways require more significant re-work and rebuilding, it may be cheaper and easier to reroute traffic for a finite period rather than implementing multiple stages of traffic control over an extended period of time. In addition, recent research suggests that the public supports short-duration, high-intensity shutdowns of projects to conduct long-lasting repairs. For example, nearly 67% of the public supports a 1-week closure of a facility if the work is done in accordance with the promise to stay out. This method may not only shorten project delivery time but may also improve work-zone safety as fast-moving traffic is moved away from project sites with many workers.
- **Hot In-Place Recycling:** The process is a time-saver in that it uses specialized equipment to heat and then remove between one and two inches of surface asphalt from the road to be resurfaced, and then the material is heated and processed with some non-recycled hot-mix asphalt right on the site to allow it to be reapplied to the roadbed. Though state DOTs have been recycling asphalt surfaces successfully for many years, hot in-place recycling saves not only time as a result of its on-site approach but also cost, because conventional recycling requires the removed asphalt to be stored and hauled prior to its reapplication.
- **ITS in Work Zones:** The use of Intelligent Transportation Systems (ITS) technology in work zones is an emerging area. ITS applications such as ramp metering systems, intrusion alarms, and queue detection information, are aimed at increasing safety for both workers and road users and ensuring a more efficient traffic flow. These technologies provide the means to better monitor and manage traffic flow through and around work zones, thus enhancing the overall efficiency of the project construction process.
- **Geofoam:** New materials are also providing engineers with high-speed options for soil stabilization. A cutting-edge material finding wide use in speedy construction or



reconstruction is expanded polystyrene geofoam, which is used to shore up loose or soft soils that become the sub-base for roads carrying heavy vehicle loads.

- **Global Positioning Systems (GPS)** utilizes a constellation of satellites that transmit signals continuously that can have numerous highway applications, such as surveying pavement condition and inventorying highway assets. It offers such benefits as increased accuracy and reductions in labor, time, and costs.
- **Fiber Reinforced Polymer (FRP) Repair of Aluminum Overhead Sign Structures:** Overhead Sign Structures (OSS) can become hazards if they are not properly maintained. This new technology is proving effective in repairs as strong as the original weld.

3.0 PROJECT DELIVERY IN VERMONT

Most major transportation projects in Vermont, which are typically at least partly financed with state and federal funds, are developed through the VTrans “project definition” process. This process includes an important task called “scoping,” which is an assessment of alternatives for a project that is undertaken to develop an acceptable cost estimate, engage the public, identify right-of-way and establish reasonable assurance for permitting. Although this is a state-driven process, in recent years VTrans has enabled scoping efforts to be undertaken by regional and local entities to help spread the project development burden across more players and expedite the delivery of transportation projects.

In addition, during the 1990s, VTrans established a “Local Transportation Facilities” (LTF) program, which is responsible for the development of Enhancement Projects, Bicycle and Pedestrian Facilities, Safe Routes to School Projects, Park-n-Rides, Scenic Byways and "Local" Projects. Most of these projects have a high degree of local focus and for the most part, development and construction are managed by local municipalities. The LTF office, through the assignment of VTrans technical staff, works with and supports the community in the development of the project. Guidance in areas of federal and state regulations, standards and processes is provided. Projects are selected on the basis of priority, as defined by the Regional Transportation Planning Initiative and availability of funding.

