III. FINDINGS

The PPCP concept and constructed projects are discussed previously. The benefits found in implementing PPCP projects are unified include: the speed of construction- no extra time required for curing, open to traffic once the construction finished each stage; reduced user delay costs (from approximately $680,610/day to $124,500/day); material savings-reduced pavement thickness (40–50% of a conventional pavement thickness), fewer joints (slab lengths of up to 440 ft), less maintenance, and enhanced durability (cracks are pulled closed by post-tensioning), overnight or weekend construction, greater control with prefabrication [6,7], reduced disruption to local business and improved safety and reduced traffic control cost [12]. Above mentioned benefits stressed that the concept and construction of PPCP is a sustainable choice. It can be a good choice for future paving.

The comparison of each PPCP project is summarized in Table 4. It shows that the pavement design needed to adjust based on the site condition, project characteristics, environmental condition and the state requirement. As the PPCP method experimented in different state, the demonstration projects are generally small in size which leads to the high construction cost. The optimized approach may be reach with continuous improvement from the demonstration projects. The lower cost can be expected with larger scale implementation.

IV. CONCLUSION

The PPCP method was theoretically sound with sustainable variants. With the aforementioned successful demonstration projects in the US, the method is providing a sustainable choice for paving the future.

ACKNOWLEDGMENT

The authors would like to thank the financial support of Department of Energy (DOE) , Taiwan [Project number: 102-EC-17-A-15-S1-223] and Indiana Department of Transportation, U.S. [Project number: C-36-46X] .

REFERENCES

[1] United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2012 Revision, Highlights and Advance Tables. Working Paper No. ESA/P/WP.228, 2013

[2] ASCE 2013 Report Card for America’s Infrastructure, American Society of Civil Engineering.(http://www.infrastructurereportcard.org/a/browser-options/downloads/2013-Report-Card.pdf; Access: July 11, 2013), pp.48-50

[3] Taylor, Peter, Dam, Tom Van, Fick, Gary, Gress, David, VanGeem Martha, Lorenz, Emily, Sustainable Concrete Pavements: A Manual of Practice, National Concrete Pavement Technology Center, FHWA/DTFH61-06-H-00011, January, 2012

[4] Merritt, David K., McCullough Frank and Burns, Ned H., Construction and Preliminary Monitoring of the Georgetown, Texas Precast Prestressed Concrete Pavement, Center for Transportation Research, The University of Texas at Austin, FHWA/TX-03-1517-01-IMP-1, 2002

[5] Chang, Luh-Maan, Lee, S., and Chen, Yu-Tzu, “Using Pre-cast Concrete Pavement Under Severe Congested Traffic Condition,” The Proceedings of the 4th International Conference on Concrete Under Severe Conditions of Environment and Loading, (2004). CONSEC04, Seoul National University, and Korea Concrete Institute, Seoul, Korea, June 27-July , pp. 1580-1587.

[6] Merritt, D. K., McCullough, B. F., Burns, N. H., and Schindler, A. K., The Feasibility of Using Precast Concrete Panels to Expedite Highway Pavement Construction, Research Report 1517-1, Center for Transportation Research, The University of Texas at Austin, February,2002

[7] Merritt, D. K., McCullough, F. B., and Burns, N. H., (2002)“Texas Tests Precast for Speed and Usability”, US department of Transportation, Federal Highway Administration, July/August, Vol.66, No.1.

[8] Chang, L. M., Y. Chen, and S. Lee. Using Precast Concrete Panels for Pavement Construction in Indiana. FHWA/IN/JTRP-2003/26. Joint Transportation Research Program, Indiana Department of Transportation and Purdue University, West Lafayette, Indiana

[9] Cable, N. D., McCullough, B. F., and Burns, N. H.., Instrumentation and Behavior of Prestressed Concrete Pavements, Research Report 401-4, Center for Transportation Research, the University of Texas at Austin, Nov. 1986

[10] Merritt, David K., B. F. McCullough, and Ned H. Burns. “Design-Construction of a Precast, Prestressed Concrete Pavement for Interstate 10, El Monte, California.” PCI Journal, vol. 50, no. 2. Precast/Prestressed Concrete Institute, Chicago, IL. March/April 2005.

[11] Merritt, D.K., Rogers, R. B., Rasmussen, R.O., Construction of a Precast Prestressed Concrete Pavement Demonstration Project on Interstate 57 near Sikeston, Missouri, FHWA-HIF-08-009, March 2008

[12] Merrit, D.K., Miron A.J., Rogers, R. B. and Rasmussen R. O., Construction of the Iowa Highway 60 Precast Prestressed Concrete Pavement Bridge Approach Slab Demonstration Project, FHWA-1F-07-034, July 2007

[13] Rao, Chetana and Ullman, Gerry, Virginia I-66 Concrete Pavement Replacement Using Precast Concrete Pavement Systems, February 2012

[14] Cable, N. D., Burns, N. H. and McCullough, B. F.. “New Concepts in Prestressed Concrete Pavement” Research Report 401-2 Center for Transportation Research, The University of Texas at Austin, August 1985