INFRASTRUCTURE COSTS, BROWNFIELDS VS. GREENFIELDS

EXCERPT, "ANALYSIS OF THE ECONOMIC, FISCAL, AND ENVIRONMENTAL IMPACTS OF THE MASSACHUSETTS BROWNFIELDS TAX CREDIT PROGRAM," EVANS PAULL, REDEVELOPMENT ECONOMICS, JUNE, 2012

The following is an excerpt from a forthcoming report, "Analysis of the Economic, Fiscal, and Environmental Impacts of the Massachusetts Brownfields Tax Credit Program," by Redevelopment Economics, for the Massachusetts Chapter of Commercial Real Estate Development Association ("NAIOP") and the Massachusetts Economic Development Council.

Massachusetts Brownfields Tax Credit Program

Under the Massachusetts Brownfields Tax Credit program, authorized in 1998,[1] taxpayers (including non-profits) are allowed a credit against their Massachusetts tax liability for net environmental response and removal costs incurred to rehabilitate contaminated property owned or leased for business purposes and located within an economically distressed area (usually an Massachusetts "Economic Target Area"). The amount of the credit varies according to the extent of the environmental remedy. The BTC is 25 percent for cleanups that result in activity and use restrictions (such as limiting the remediated property to industrial or commercial use) or 50 percent for cleanups that achieve the higher cleanup standard associated with unrestricted use of the remediated property. The tax credit is transferable and is not subject to either an overall program cap or per project ceilings.

The impact analysis is based on information available for 55 BTC projects, representing $2.0 billion in new investment.

BROWNFIELDS AND INFRASTRUCTURE

Brownfields redevelopment is generally assumed to save infrastructure costs relative to alternative greenfields development; however, there is little previous brownfields-specific research that attempts to quantify the cost savings. EPA summarizes the brownfields infrastructure advantages in narrative terms, as follows:

> Infrastructure, such as roads and utilities, to support brownfield redevelopment generally requires less land per capita and results in less stormwater runoff than infrastructure needed to support a similar amount and type of conventional development. Generally, the lower the population density, the more roads and highways are called for to connect trip origin and destination points. On the

[1] See: http://www.malegislature.gov/Laws/SessionLaws/Acts/1998/Chapter206

> other hand, residents and employees in more efficiently located, compact communities typically drive less and have opportunities to use other transportation modes. The resulting lower demand for highways implies fewer lane-miles and less road surface and, consequently, lower stormwater runoff, energy consumption, and cost for construction, maintenance, snow removal, and highway safety programs. Studies have shown that infrastructure costs for conventional development are significantly higher than that of infill areas.[2]

The following analysis examines previous research, compares that to the information for the Massachusetts Brownfields Tax Credit (BTC) projects, and then develops a quantitative "order of magnitude" estimate of the infrastructure savings attributable to the BTC projects.

NATIONAL RESEARCH

There have been a series of studies that compare infrastructure costs for compact development vs. sprawl development. These studies have quantified the infrastructure savings due to compact development at between 10[3] and 65 percent,[4] [5] with most studies estimating the differential at 20 – 30 percent.[6] However, these studies understate the brownfields vs. sprawl differential because:

- The studies are generally looking at two options for NEW development: compact vs. sprawl. It can be assumed that any NEW development, even if it is compact, will require infrastructure investments. Brownfields projects, on the other hand, are almost always infill/REdevelopment and many are comfortably served by existing infrastructure. Thus, the difference between "new/compact" and "infill/redevelopment" (including brownfields) can be quite significant, i.e. the cost of building new infrastructure, even for efficient land uses, is bound to be significantly greater than repairing and hooking up a redevelopment project to the existing system.

- The density differential used in most of these studies (2-5 DU/ac for sprawl and 5-10 DU/ac for compact) understates the density of brownfields projects. For

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[2] US Environmental Protection Agency, "Air and Water Quality Impacts of Brownfields Redevelopment," October 2011, available at http://www.epa.gov/brownfields/BFEnvironImpacts042811.pdf

[3] Robert Burchell, David Listokin, Anthony Downs, et. Al, "Costs of Sprawl Revisited." National Academy of Sciences/ National Research Council. Transportation Research Board TCRP H-10. 1998.

[4].Center for Energy and Environment. (1999). *Two Roads Diverge: Analyzing Growth Scenarios for the Twin Cities Region.* www.me3.org/sprawl. Hammer, Siler, George Associates and Gould Evans Goodman Associates. (2001). *Smart* Choices: Understanding the Cost of Development. Mid-America Regional Council.

[5] Mix, Troy D. "Exploring the Benefits of Compact Development," for Delaware's Office of State Planning Coordination, 2003

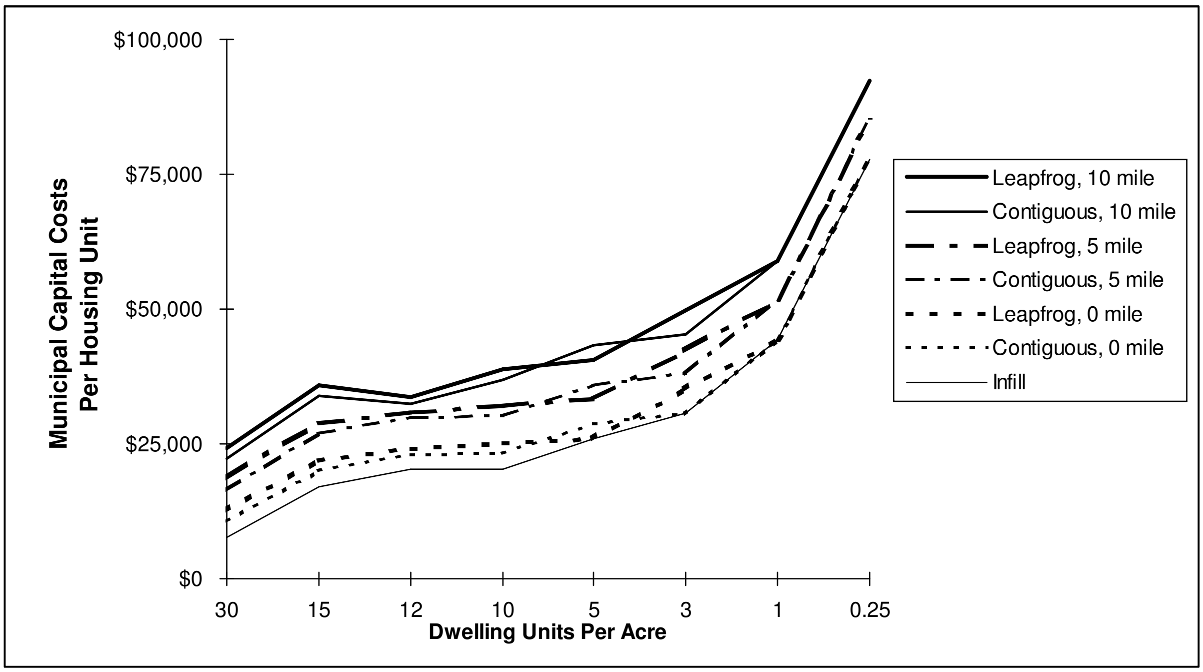
[6] Ken Snyder and Lori Bird, "Paying the Costs of Sprawl: Using Fair-Share Costing to Control Sprawl," December, 1998.

example, the Massachusetts BTC residential projects average 16 units per acre, consistent with national data.[7]

The authors have been able to find only two studies that make an appropriate distinction between compact development and brownfields/infill, as opposed to new compact development.

JAMES FRANK STUDY. First, a widely cited 1989 analysis by James Frank examined the results from eight previous studies and created a graph of the per dwelling unit costs of providing infrastructure. This analysis differentiated projects by infill, contiguous, and leapfrog patterns, as well as by a range of densities and distance from the center.[8]

Figure 1 - Residential Service Costs of Infrastructure - James Frank



Massachusetts BTC projects would all fall within the definition of infill and BTC residential densities are 15.6 DU per acre, which corresponds to infrastructure costs on the order of $20,000 per unit in 1989 dollars ($37,000 in 2012 dollars). Spread development, assuming contiguous @ 3-5 units per acre and 5 miles from the center, costs $35,000 to $40,000 per unit in 1989 dollars (or $65,000 to $74,000 in 2012 dollars). By these calculations the infrastructure savings attributable to BTC projects is a little below 50 percent or between $28,000 and $34,000 per DU.

[7] Evans Paull, Northeast-Midwest Institute, "The Environmental and Economic Impacts of Brownfields Redevelopment, a Working Draft," July, 2008, available at: http://www.nemw.org/images/stories/documents/EnvironEconImpactsBFRedev.pdf

[8] James Frank, **"**The Costs of Alternative Development Patterns: A Review of Literature.**"** Washington, DC. Urban Land Institute. 1989.

CENTER FOR NEIGHBORHOOD TECHNOLOGIES - A 2003 Center for Neighborhood Technologies (CNT) study suggests it takes at least five times more infrastructure investment for a greenfields site (at $50,000 per unit) relative to an infill/grayfields site (at less than $10,000 per unit).[9] Updating the 2003 data to 2012 dollars results in a differential of $62,000 per unit/greenfields vs. $12,500 per unit/brownfields. The CNT conclusion does not appear to represent quantitative analysis of specific sites; rather it reflects the observation that infill development often fits into the existing street grid and minimal infrastructure is needed.

The Capital Area Regional Planning Commission in Wisconsin has produced comparative infrastructure cost data focused on the influence of density. Service costs for recently permitted projects, counting road, water, sewage and stormwater services, were estimated based on actual costs incurred, and indexed to a per-capita basis for occupancy. At the lowest densities, the cost to service was $10,000 and at the highest $25,000 per capita, respectively, a 60% differential.[10] The high density category included both new/compact and infill/redevelopment. The author of the Massachusetts study speculates that, had the study focused on infill/redevelopment in the high density category, the differential may have risen to 80-20 split predicted by CNT.

MASSACHUSETTS BTC PROJECTS/INFRASTRUCTURE SAVINGS

For the Massachusetts BTC projects, analysts counted 18 projects where the information was sufficient to determine whether there were significant infrastructure investments (eleven of the on-line survey responses and seven case studies projects that were covered through interviews). Of these 18 projects only three (17 percent of all projects) listed any infrastructure funding that was required, and all three projects were industrial-commercial, not residential. This limited sample supports the higher 80-20 differential in the CNT study.

Never-the-less, the following estimates conservatively apply BTC project numbers to both models (the Frank study and the CNT study). Figure 5 depicts the two scenarios, applied to the 4,212 DUs that are existing or under construction in BTC projects.

The result is that residential BTC projects can be credited with saving infrastructure investments of between $132 and $208 million.

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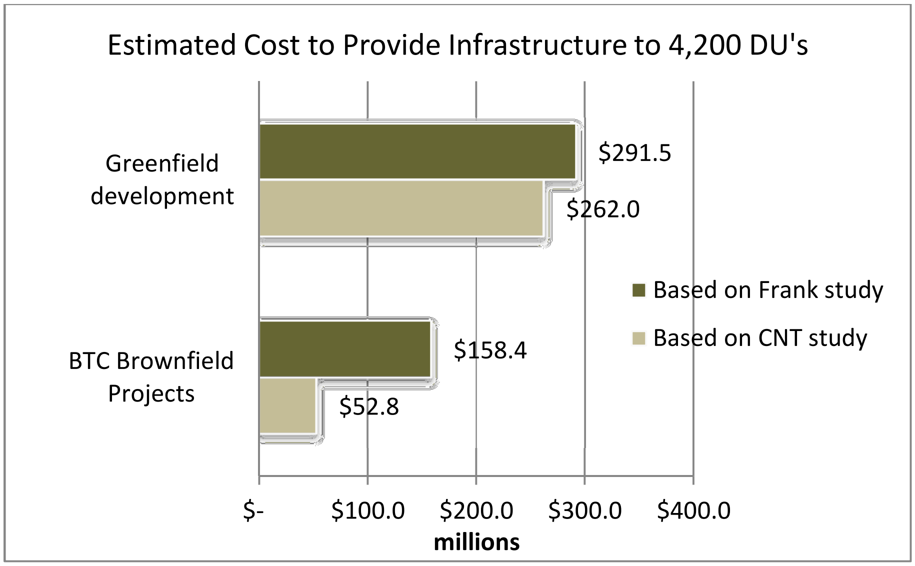
[9] Scott Bernstein, "Using the Hidden Assets of America's Communities and Regions to Ensure Sustainable Communities." Center for Neighborhood Technology, 2003, http://www.cnt.org/hidden-assets/pt1f.html

[10] Personal communication, Center for Neighborhood Technology, July 25, 2012.

Figure 2 - Infrastructure Investments "Saved," BTC vs. Greenfields



It should be pointed out that, in many jurisdictions, developers are paying at least some of the bill for infrastructure through impact fees, water and sewer hook-up fees, special assessment districts, and other mechanisms. A 2011 national survey of impact fees (including water and sewer hook-up fees) found that impact fees average $11,908 per unit, which is approximately 20 percent of the true costs of suburban infrastructure.[11]

However, because other mechanisms, such as special assessment districts, were not included in the survey, the Massachusetts analysts have conservatively assumed that state and local governments pay at least one-half of the infrastructure costs. This leads to the conclusion that the state and local government cost savings attributable to BTC projects is between $66 and $104 million (See Table 1).

Note this counts only the direct cost of providing infrastructure. Many researchers have argued that the true cost of greenfields/suburban infrastructure should include numerous indirect costs, such as: blight and abandonment of urban centers; health costs associated with less walking in car-dependent environments; and greater energy (and other natural resource) consumption.[12] The latter point (natural resource consumption) was the subject of a separate CNT study.[13] Further, the current analysis only represents that capital side of the equation, and a full accounting would also include the presumably greater operation and maintenance costs of sprawl-related infrastructure.

Table 1 - Infrastructure Costs BTC projects vs. Greenfields

[11] Duncan Associates, 2011 Impact Fee Survey, see: http://impactfees.com/
[12] Ken Snyder and Lori Bird, "Paying the Costs of Sprawl: Using Fair-Share Costing to Control Sprawl," December, 1998. .
[13] "Analysis of Infrastructure Capital Stock Accounts Including Depreciation, 2006-2007," Center for Neighborhood Technology 2009.

	BTC projects	Greenfields (theoretical)	Difference
DU	4,203	4,203	
cost per DU, CNT study	$ 12,500	$ 62,000	$ 49,500
cost per DU, Frank study	$ 37,500	$ 69,000	$ 31,500
Total cost to build infrastructure			
> CNT study	$ 52,537,500	$ 260,586,000	$ 208,048,500
> Frank Study	$ 157,612,500	$ 290,007,000	$ 132,394,500
Assume state-local government funds 50% of infrastructure			
> Public infrastructure cost savings using CNT study differential	$ 26,268,750	$ 130,293,000	$ 104,024,250
> Public infrastructure cost savings using Frank study differential	$ 78,806,250	$ 145,003,500	$ 66,197,250

CONCLUSION

The conclusion is that Massachusetts BTC projects save infrastructure costs, relative to alternative greenfields development, by 50 to 80 percent, the former consistent with the James Frank study; the latter consistent with the Center for Neighborhood Technology analysis and the limited sample of BTC projects. It is acknowledged that the 80 percent part of the range is less well documented and follow-up analysis is recommended.

The result is that residential BTC projects can be credited with saving infrastructure investments of between $132 and $208 million.

As a very conservative "order of magnitude" estimate, researchers assumed that state and local governments pay at least one-half of the infrastructure costs, which translates into a state-local-government cost savings attributable to BTC projects of between $66 and $104 million. The total cost of the BTC credit to Commonwealth taxpayers for the projects surveyed was $52.7 million. This analysis indicates BTC investments may be largely recouped just in foregone infrastructure investments.

The full impact analysis of the Massachusetts program, to be distributed in the near future, will explore other economic, fiscal, and environmental impacts of BTC investments.