Disposable Bag Fee Nexus Study

City of Boulder, Colorado

Submitted to:

City of Boulder, Colorado

September 24, 2012

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TischlerBise, Inc., is a fiscal, economic, and planning consulting firm that specializes in impact fees, fiscal/economic impact analyses, infrastructure funding strategies, user fees, revenue enhancement options, and market/economic studies. Our firm has been providing consulting services to public agencies for over thirty years. ***In this time, we have prepared over 800 impact fee evaluations and over 100 user fee evaluations – both of which require establishing a nexus between the fee amount and those creating the need.*** *We have extensive previous experience preparing fee studies in the State of Colorado, including for the City of Boulder. Other TischlerBise Colorado clients include: Arapahoe County, Castle Rock, Eaton, Erie, Evans, Greeley, Johnstown, Louisville, Mesa County, Pitkin County, Pueblo, Steamboat Springs, and Westminster.*

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DISPOSABLE BAG FEE NEXUS STUDY

City of Boulder, Colorado

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EXECUTIVE SUMMARY

STUDY OVERVIEW

The City of Boulder is developing an ordinance to reduce disposable checkout bag use in Boulder. On May 15, 2012, City Council voted to move forward with an ordinance placing a fee on both plastic and paper checkout bags at food stores.[1] In order to determine the appropriate level and uses of the bag fee, the city issued a Request for Proposals (RFP) to hire an independent consultant to complete a *Disposable Bag Fee Nexus Study*. TischlerBise has been retained by the City of Boulder to conduct the study.

According to the staff recommendation,[2] a nexus fee approach:

- Acknowledges the life cycle environmental impacts of both types of bags, supporting a shift away from disposable bag use in general and not from one type of bag to another;
- Creates an effective financial incentive to change behavior;
- Initial feedback from the large grocers indicated a preference for a fee in comparison to a ban on plastic bags since it minimizes their implementation and administrative costs;
- Retains consumer choice and convenience; and
- Helps offset the city costs for implementation, administration, education, and strategies to minimize impacts to low income consumers and tourists.

Furthermore, by applying the nexus fee only to food stores, the fee:

- Targets a majority of bag use in Boulder while maximizing clarity of the ordinance;
- Avoids confusion for businesses around who must comply; and
- Minimizes city resources required for administration, enforcement and monitoring of exemptions and threshold levels.

This report outlines the approach, methodology, information, and calculations used to derive the disposable checkout bag nexus fee.

[1] See http://www.bouldercolorado.gov/LEAD/bags for background on the issue and city supporting documentation.

[2] From City of Boulder, City Council Agenda Item: "Consideration of a motion providing direction on options for reducing disposable checkout bag use in Boulder," May 15, 2012.

APPROACH

Stores to be Regulated

Boulder City Council voted to move forward with an ordinance placing a fee on both plastic and paper checkout bags at food stores only. The fee will not apply to produce bags, newspaper bags, or any other kind of food packaging bags. At this time the ordinance will not apply to restaurants. There are currently approximately 45 food stores in the city that will be affected.

Fee Components

The nexus fee is comprised of several components that can be viewed as building blocks in calculating the fee:

1. Current estimate of bag usage in the city and the estimate of the current number of bags to which the fee will be applied
2. Future projection of number of bags to which the fee will be applied (including a baseline projection and reductions due to fee implementation)
3. Costs incurred by the public sector
4. Costs incurred by retailers
5. Costs for externalities (*option*)

The approach in calculating the fee is to project costs and bag usage (with assumed reductions due to the imposition of the fee) over a four-year period to derive a weighted average to smooth out costs that are higher in the first years.

Bag Usage

This study provides detail on current and projected bag usage in the City of Boulder. This information was developed through local retailer interviews and ongoing research. Bag usage estimates in this report reflect the number of bags to which the nexus fee will apply, which is a subset of total disposable bag use in the city.

The study also projects future bag usage based on several assumptions. First a baseline projection is established based on natural growth in bag use due to population growth in the city. From there, extensive research was done on the impact of a bag fee/tax on bag reduction. Based on our research

and discussions with city staff, reduction factors are determined and then applied to modify projections of bag use (to which the fee will apply).

Cost Components

The next major elements are the costs to be included in the nexus fee calculation. The following cost components are included in the calculation and discussed in detail in the body of the report:

- City costs to implement and administer the fee and program
- Other public costs for recycling (Boulder County Recycling Center and the Center for Hard to Recycle Materials (CHaRM))
- Costs to retailers to implement the program
- Cost to mitigate externalities (provided as an optional cost factor)

FEE CALCULATION

To derive the city cost portion, a four-year period is used and a weighted average cost per bag is derived. The weighted average city portion of the fee is estimated at $.146 per bag. This is derived based on four-year estimated city costs of $2.2 million and a projected four-year total number of affected bags of 15.3 million. Added to that cost factor is the cost per bag to cover plastic bag contamination at the Boulder County Recycling Center and bag recycling at the Center for Hard to Recycle Materials (CHaRM). Finally, the cost per bag to cover the retailers' costs is included. The total calculated fee is $.198 per bag. A summary is provided in Figure 1. See the body of this report for detail on the calculations.

Figure 1. Summary of Disposable Bag Nexus Fee

		Four-Year Totals / Wtd Avg
CITY COSTS	Total City Costs	$2,222,079
BAG USAGE	Estimated # Bags Subject to Fee	15,264,693
FEE CALCULATION		
City	City Cost per Bag	$0.146
Other Public	County Recycling Ctr Cost per Bag	$0.002
	CHaRM Cost per Bag	$0.006
Retailer	Retailer Cost per Bag	$0.044
Total Fee	City of Boulder Bag Nexus Fee	$0.198

An optional fee component is calculated to reflect externality costs, which adds an additional $.001 per bag. With this cost factor, the total bag nexus fee would be $.199 per bag. See Figure 2.

Figure 2. Summary of Disposable Bag Nexus Fee Option with Externalities

Total Fee	City of Boulder Bag Nexus Fee	$0.198
FEE CALCULATION WITH EXTERNALITIES		
Externalities	Estimated Externality Cost per Bag	$0.001
Total Fee	City of Boulder Bag Nexus Fee w/Externalities	$0.199

USES OF THE REVENUE GENERATED BY THE FEE

Proceeds from fee revenue will be used for implementation and administration of the program. City cost estimates identify specific activities including:

- Developing and implementing the policy;
- Purchasing and distributing reusable bags;
- Designing and implementing an outreach and advertising campaign;
- Development of educational campaign and materials;
- Designing and producing commercial/public service announcements; and
- Developing and producing store signage.

Costs recovered for impacts on county recycling facilities will be used to offset the impact from disposable bags in the waste stream handled at the Boulder County Recycling Center and recycled at CHaRM.

The retailer portion of the fee will be remitted to retailers (or retained by retailers, depending on how the program is set up) to cover their costs of implementation.

If the externality portion of the fee is adopted, those revenues should be used to purchase carbon offsets and to fund stream clean-up programs in the city.

OTHER CONSIDERATIONS AND RECOMMENDATIONS

Other considerations and recommendations are discussed in the report including:

- Compliance: Acknowledgment of potential non-compliance by retailers and recommendations for assessments at regular intervals to determine and address non-compliance.
- Rebound Effect: Experience from some localities indicate a rebounding increase in disposable bag usage after the initial reduction due to implementation of a bag fee or tax. We address this and provide recommendations on ways to counteract this effect including ongoing outreach (particularly in the second year of implementation and beyond) and regular, annual inflationary adjustments to the fee.
- Fiscal Implications: While revenue will be generated from the fee, revenue from the city's trash tax may decrease with reduced bag use.

STUDY BACKGROUND

The City of Boulder is developing an ordinance to reduce disposable checkout bag use in Boulder. On May 15, 2012, City Council voted to move forward with an ordinance placing a fee on both plastic and paper checkout bags at food stores.[3] In order to determine the appropriate level and uses of the bag fee, the city issued a Request for Proposals (RFP) to hire an independent consultant to complete a *Disposable Bag Fee Nexus Study*. TischlerBise has been retained by the City of Boulder to conduct the study.

The City Council's preferred approach is to place a fee on both plastic and paper bags at all food stores (approximately 45 businesses). The purpose of the *Disposable Bag Fee Nexus Study* is to determine[4]:

1. The appropriate types of costs to be offset by fee proceeds,
2. The appropriate fee amount to be charged to consumers to reduce bag use,
3. The recommended portion of the fee to be retained by businesses, and
4. Any guidance on appropriate uses of the fee proceeds by the city beyond directly offsetting costs incurred in the administration of the ordinance.

OVERVIEW OF NEXUS FEES

The disposable checkout bag nexus fee can be thought of as a type of user fee. A user fee is often imposed as a result of a public need to regulate activities, typically related to public health, safety, and welfare. User fees represent the purchase of a privilege or authorization. Local governments historically have made extensive use of these fees to recover costs for such activities as restaurant inspections, building permits, and marriage licenses.

The use of user fees has increased in recent years as local governments are faced with diminishing resources as well as a need to address certain behaviors. One example of a behavior-change effort is from a locality in Pennsylvania that implemented a "false-alarm prevention" fee. Police officers in

[3] See http://www.bouldercolorado.gov/LEAD/bags for background on the issue and city supporting documentation.

[4] City of Boulder, "Consultant Scope of Work" (RFP issued)

this community were spending an inordinate amount of time responding to false alarms. To address this, the locality imposed an additional fee for “excessive false alarms” charged on a progressively increasing scale as the number of false alarms increase. The intent of this fee is to not only cover the costs to the Police Department but to change behavior in the community.

Another analogous type of fee is an impact fee. Impact fees are one-time payments made by new development, which are used to construct system improvements needed to accommodate infrastructure demands from new development. An impact fee represents new growth’s fair share of capital facility needs. Impact fees are subject to legal standards, which require fulfillment of three key elements: need, benefit, and proportionality.

The City of Boulder utilizes both user fees and impact fees for a range of purposes. The city now desires to implement a bag fee that will reflect the impact of bag use on public entities and retailers. To support this effort, the following sections of this report outline the methodology, information, and calculations used to derive the disposable checkout bag nexus fee.

STORES TO BE REGULATED

Boulder City Council voted to move forward with an ordinance placing a fee on both plastic and paper checkout bags at food stores only. The fee will not apply to produce bags, newspaper bags, or any other kind of food packaging bags. At this time the ordinance will not apply to restaurants. There are currently approximately 45 food stores in the city that will be affected.

Several options were considered by city staff regarding the types of stores to be regulated under a disposable bag fee. Ultimately, it was recommended that the fee apply only to food stores at this time for the following reasons. This fee option:

- Targets a majority of bag use in Boulder while maximizing clarity of the ordinance;
- Avoids confusion for businesses around who must comply; and
- Minimizes city resources required for administration, enforcement and monitoring of exemptions and threshold levels.[5]

Furthermore, in the city staff report outlining bag reduction options, staff notes: “Including additional business types will have a diminishing impact, as more city resources would be needed to apply an ordinance to many more businesses that distribute fewer bags. Staff also believes that addressing disposable bag use in food stores will have a “trickle down” effect on encouraging reusable bag use in by residents at all retail stores.”[6]

[5] From City of Boulder, City Council Agenda Item: "Consideration of a motion providing direction on options for reducing disposable checkout bag use in Boulder," May 15, 2012.
[6] Ibid.

FEE COMPONENTS

The Nexus Fee is comprised of several components that can be viewed as building blocks in calculating the fee:

1. Current estimate of bag usage in the city and the estimate of the current number of bags to which the fee will be applied
2. Future projection of number of bags to which the fee will be applied (including a baseline projection and reductions due to fee implementation)
3. Costs incurred by the public sector
4. Costs incurred by retailers
5. Costs for externalities (*option*)

The approach in calculating the fee is to project costs and bag usage (with assumed reductions due to the imposition of the fee) over a four-year period. Because first-year costs are generally higher due to one-time implementation requirements, only using estimated costs in the first year would artificially increase the fee. Therefore, the approach is to derive a weighted average using projections over the first four years of the program. Detail is provided in the following sections including annual assumptions and the four-year weighted average.

BAG USAGE

CURRENT ESTIMATES OF DISPOSABLE BAG USE

Current estimates of disposable plastic and paper checkout bag usage in the City of Boulder was estimated by city staff. Given that there is no current tracking of bag use, TischlerBise and city staff requested and obtained limited information from local grocery stores. TischlerBise and city staff met with representatives from major grocers and followed up with data requests. Based on the information provided by the grocery stores and other research[7], city staff determined a current estimate of disposable paper and plastic bag use to which the fee would apply. Estimates are shown in Figure 3. This estimate reflects a subset of total disposable bag usage in the city (estimated at 66 percent of total bag usage). This number is used as the baseline figure reflecting the number of bags to be regulated by the fee.

Figure 3. Estimate of Current Number of Disposable Plastic and Paper Bags in City of Boulder to which the Fee Will Apply

	Plastic	*Paper*	*Total*
Large Grocery Stores	10,800,000	2,160,400	*12,960,400*
Medium Grocery Stores	300,000	480,000	*780,000*
Small Grocery Stores	215,000	115,000	*330,000*
Convenience Stores	270,000	0	*270,000*
Total	***11,585,000***	***2,755,400***	***14,340,400***

Source: City of Boulder (store names are suppressed for confidentiality reasons)

Projected Disposable Bag Use

These baseline estimates are then used to project natural growth in disposable bag use based on projected population growth and average number of bags per capita (to which the fee will be applied). Based on the above current bag estimate of 14.3 million grocery and convenience store bags and the current city population estimate of 99,069, an average of 145 bags per capita is derived (reflecting the number of bags to which the fee will apply, which is a subset of total bag usage in the

[7] See "Resources Consulted" at end of this report.

city).[8] Without imposition of a bag nexus fee, bag usage at grocery and convenience stores in the city is projected to increase as shown in Figure 4.

Figure 4. Projection of Number of Disposable Plastic and Paper Bags in City of Boulder to which the Fee Will Apply Due to Natural Growth (*with No Fee*)

		Projected Natural Growth with No Reductions			
	Pre-imp.	***1***	***2***	***3***	***4***
	2012	***2013***	***2014***	***2015***	***2016***
City of Boulder Population Projection[1]	99,069	99,676	100,288	100,903	101,521
Estimate # of Bags Subject to Fee[2]					
City of Boulder Estimated (2012)[3]	14,340,400				
Bags per Capita (Subject to Fee)	145				
Projected Growth in Bags (if No Fee)		14,453,089	14,541,712	14,630,879	14,720,593

1. City of Boulder Dept. of Community Planning and Sustainability, "2012 Projections by Subcommunity"
2. Reflects a subset of total bags in circulation
3. City of Boulder

Imposing a nexus fee on disposable plastic and paper bags will decrease disposable bag usage in the city. The next logical question is, "By how much?" TischlerBise and city staff conducted research on the effects of bag fees/taxes on the reduction of bag use. This section describes the results of our findings.

First, TischlerBise researched the literature on bag fees/taxes and bans with a particular emphasis on the level of reduction in communities that have imposed these types of regulations. The research is summarized in Figure 5.

[8] It has been estimated that supermarkets account for 60 percent of total disposable bag use in a community. (See City of Boulder, City Council Agenda Item, May 15, 2012.)

Figure 5. Bag Reduction Experiences[9]

Store/Government	Fee/Tax	% Reduction	Time Period	Notes
[1] Marks and Spencer (UK)	$0.08	83%	1 year	Fee imposed 2008 (converted to $US)
[1] 99 Cents Only Store (Santa Monica)	$0.03	50%	2 months	
[1] IKEA (Burbank)	$0.05	50%	1 year	Plastic bag for $.05 or purchase blue bag for $.59.
[1] IKEA (UK)	$0.05	95%	not reported	Plastic bag for $.05 or purchase blue bag for $.59.
[2] Denmark	$0.03	66%	not reported	Tax on Plastic
[2] Denmark	$0.12	66%	not reported	Tax on Paper
[2], [3] Ireland (2002-2007)	$0.19	*see note*	leveled	Initial decrease at 90-95%; leveled at 60-70%
[2], [3] Ireland (2007-current)	$0.28	*see note*	1 year	additional decrease of 22% (from leveled %)
[2] Taiwan	$.03-.10	65%	not reported	Flexible fee
[4] Washington, DC Government	$0.05	75-80%	1 year	

[1] From "City of Santa Monica Nexus Study," R3 Consulting Group, January 2010 (see footnotes)
[2] From "City of San Jose Single-Use Carryout Bag Fee Fiscal Analysis," Herrera Environmental Consultants, July 2010 (Euro converted to $US)
[3] AP EnvEcon Limited, "Regulatory Impact Analysis on proposed legislation to increase levies on plastic shopping bags and certain waste facilities." Prepared for the Ireland Dept. of the Environment, Heritage, and Local Government; Nov 2008. (Euro converted to $US.)
[4] From City of Boulder, City Council Item: "Consideration of a motion providing direction on options for reducing disposable checkout bag use in Boulder," May 15, 2012 (see footnote 11 and Attachment E).

As shown above, reductions range from 50 percent to a high of 95 percent. Variables that affect the reductions include the amount of the fee/tax as well as the time that had elapsed since the fee/tax was implemented.

In the "City of San José Single-Use Carryout Bag Fee Fiscal Analysis" report[10], a set of assumptions was made assuming an estimated reduction in bag use that is responsive to fee levels. In the study's scenario of a fee on both plastic and paper single-use bags, the assumed reductions of use correspond to the fee level as follows:

Figure 6. Example of Assumed Reductions in Bag Use

Fee/Store Charge Level	% Reduction in Bag Use
$.10	63%
$.15	71%
$.20	83%
$.25	85%
$.30	87%

Source: Herrera Environmental Consultants, "City of San José Single-Use Carryout Bag Fee Fiscal Analysis," July 2010.

[9] The examples here are to illustrate the range of effects on reducing bag usage as opposed to a survey of tax/fee amounts. A range of efforts and fee/tax levels have been implemented globally and in the United States to reduce disposable bag usage. For example, several communities have banned disposable bags outright and many others have implemented fees and taxes at varying levels, occasionally in conjunction with a ban. Two such examples are from the cities of Aspen and Carbondale (Colorado), both of which banned disposable plastic bags and placed a 20 cent fee on paper bags. One good resource for tracking efforts in the United States and internationally can be found at: http://www.dep.state.fl.us/waste/retailbags/pages/mapsandlists.htm.

[10] Herrera Environmental Consultants, July 12, 2010.

Finally, the price elasticity of the fee level should be considered. The experience in Ireland with a nationwide bag tax illustrates several pricing phenomena.[11]

- After the initial bag tax was implemented in Ireland in 2002 at 15 cents ($0.19), bag usage decreased to 22 to 24 bags per capita (an estimated decrease of 90-95 percent from pre-tax levels). By 2006-07, bag usage had rebounded upward to approximately 37 bags per capita.

- This "rebounding" effect has been attributed in part to inflationary effects. The 15 cent tax levied in 2002 was worth 13.4 cents by 2007 due to inflation.

- After the tax was increased to 22 cents ($0.28) in July 2007, it was estimated that demand fell an additional 22 percent from the last previous high usage down to 28 bags per capita.

- Finally, based on Ireland's experience of an increase from a 15 cent to a 22 cent tax, an analysis was conducted as part of a larger study for the Irish Department of Environment, Heritage, and Local Government (DOEHLG) (2008) to determine what the price elasticity of demand is. That is, ***What is the relationship between an increase in the tax levy to a decrease in demand for plastic bags?*** The analysis was based on what the study authors identified as a "large levy increase" as opposed to small changes in the levy (inflationary increase or decreases).

    - The DOEHLG study found that an increase of 10 percent above the current 22 cent tax levy would decrease demand by 7.2 percent; an increase of 15 percent would decrease demand by 10.8 percent and so forth. See table below for results from the analysis.

[11] The information in this section is from AP EnvEcon Limited, "Regulatory Impact Analysis on proposed legislation to increase levies on plastic shopping bags and certain waste facilities." Prepared for the Ireland Department of the Environment, Heritage, and Local Government (DOEHLG); November 2008.

Figure 7. Price Elasticity of Demand of Bag Tax Increase: Scenarios based on the Ireland Experience[12]

% Increase in Levy from 22 cent (Euro)	*% Decrease in Quantity Demanded*
10% (24.2 cents)	7.18%
15% (25.3 cents)	10.76%
20% (26.4 cents)	14.35%
30% (28.6 cents)	21.53%
50% (33 cents)	27.35%
70% (37.4 cents)	50.22%
130% (50.6 cents)	93.28%

Source: AP EnvEcon Limited, 2008, Table 5.8.

Further discussion of how these pricing effects can be addressed by the City of Boulder is provided in the "Other Considerations" section of the report.

Based on the above research and discussions with city staff, assumptions regarding the percentage reduction in bag usage (to which the fee is applied) for the City of Boulder are: 50 percent in Year 1, followed by 75 percent in Year 2 and plateauing at 85 percent in Years 3 and 4. See Figure 8 for projected reductions in bag usage.

Figure 8. City of Boulder Bag Usage Assumptions with Reductions Due to Fee Implementation

	1 *2013*	*2* *2014*	*3* *2015*	*4* *2016*	*Four-Year Total/ Wtd Avg*
Est. # Bags Subject to Fee (Natural Growth w/ No Reductions)	14,453,089	14,541,712	14,630,879	14,720,593	58,346,273
Reduction % (Due to Fee)	50%	75%	85%	85%	74%
Estimated # Bags Subject to Fee	7,226,544	3,635,428	2,194,632	2,208,089	15,264,693

Source: City of Boulder; TischlerBise

[12] The authors note: *In each of these scenarios, the elasticity of demand is assumed to remain at -.72, which is the estimated elasticity of demand for the only large increase in the levy from 15 cent to 22 cent. While this is a somewhat restrictive assumption, the elasticity is based on the best available data and its use is intended as a demonstrative tool to indicate how price inelastic responses to levy increases may impact on quantity demanded. It should be noted that as the actual levy increases, the expected response becomes more uncertain.* (AP EnvEcon, p. 111.)

COST COMPONENTS

The next major element is the costs to be included in the nexus fee calculation. The following cost components are included in the calculation:

- City costs to implement and administer the fee and program
- Other public costs for recycling (County Recycling Center and Center for Hard to Recycle Materials (CHaRM))
- Costs to retailers to implement the program
- Cost to mitigate externalities (provided as an optional cost factor)

CITY COSTS

City costs are included assuming a full cost-recovery model. Costs estimated to implement the program as well as to administer on an ongoing basis are included. Specific city costs are assumed for policy development, implementation, administration, and enforcement.

Costs include:

- Supplies including purchase and distribution of reusable bags for various purposes including at rental properties and hotels; and for low-income populations.
- Outreach and marketing including development of educational campaigns and materials; advertising direct costs; creation of signage for stores.
- One-time costs for the nexus fee study and stakeholder meeting expenses.
- One-time cost to create the "return" for retailers to report fee collection.
- Staff time for policy development, implementation, administration, and enforcement.

City costs are summarized in Figure 9. City staff provided detailed estimates of projected costs based on their experiences to date with this and other comparable programs. As noted above, costs include direct costs for supplies and personnel, one-time expenses, and indirect costs reflecting allocation of costs from other overhead departments that will be affected by program implementation and ongoing administration. Also included is a contingency cost to account for any unidentified costs that may occur. Total city costs over the first four-year period are estimated at $2.2 million.

Figure 9. Estimated City Costs

		Year 1	Year 2	Year 3	Year 4	Four-Year Total
Policy Development & Implementation [1]						
Supplies, Outreach, Marketing, Etc.[2]		$950,000	$375,000	$232,500	$196,000	$1,753,500
Personnel		$121,357	$18,165	$4,512	$4,512	$148,546
Other (Nexus Study; stakeholder meetings)		$19,620	$0	$0	$0	$19,620
Indirect Cost[3]	*6.6%*	$70,710	$25,949	$15,643	$13,234	$125,535
Subtotal		*$1,161,687*	*$419,114*	*$252,655*	*$213,746*	*$2,047,201*
Policy Administration [4]						
One-time Start-up Costs		$1,965	$0	$0	$0	$1,965
Administration and Enforcement		$1,999	$1,999	$1,999	$1,999	$7,995
Indirect Cost	*3.2%*	$127	$64	$64	$64	$319
Subtotal		*$4,091*	*$2,063*	*$2,063*	*$2,063*	*$10,279*
Contingency	*8.0%*	$93,262	$33,694	$20,377	$17,265	*$164,598*
TOTAL CITY COSTS		***$1,259,040***	***$454,871***	***$275,095***	***$233,073***	**$2,222,079**

1. Primarily handled by the Dept. of Community Planning & Sustainability (CPS).

2. Approximately 50% is for bag giveaways with the remainder for advertising and educational campaigns.

3. Reflects cost allocation for CPS (not calculated on "Other" costs).

4. Primarily handled by the Dept. of Finance

Source: City of Boulder, TischlerBise.

The above city costs are used to derive the city's portion of the bag nexus fee, which is provided in the "Fee Calculation" section.

OTHER PUBLIC COSTS

Two recycling facilities are affected by plastic bags in the waste stream—the Boulder County Recycling Center and the Center for Hard to Recycle Materials (CHaRM). Both facilities are run by a non-profit entity (Eco-Cycle). Plastic bags in the waste stream affect both facilities and Eco-Cycle provided cost estimates for this analysis, specifically on the costs to their operations and infrastructure due to plastic bags.

Staff from the County Recycling Center identified four main impacts from plastic bags:

1. The need to stop the sorting lines to clean screens during the day.
2. Sorting staff need to hand-pick the plastic bags out of the recyclable stream.
3. Handling costs for baling and moving trash allocated to bags.
4. Disposal and transportation costs specific to plastic bags.

County Recycling staff estimated labor and operations costs specific to the above impacts. Cost estimates are shown below in Figure 10. Because this is a cost that is incurred today from existing plastic bag usage in the County, the cost per bag is not dependent on future implementation of the nexus fee or reductions in bag use. Nor is the cost dependent on existing revenue generation. The approach is for full cost recovery of the direct costs from plastic bags.

As shown below, the cost per bag is calculated based on the estimated impact at the Boulder County Recycling Center and the estimated number of plastic bags in the *County* waste stream. The resulting cost per bag is $.002 ($182,640 annual costs / 120 million plastic bags used countywide). This cost will be added to the total nexus fee.

Figure 10. County Recycling Center Costs

	Cost/ Day	Cost/ Year
County Recycling Cost Estimates: Current Impacts from Plastic Bags [1]		*240 Days per Yr*
Day labor screen cleaning cost	$28	$6,720
Night labor screen cleaning cost	$56	$13,440
Labor sorting cost	$336	$80,640
Labor handling cost	$45	$10,800
Machine processing cost	$240	$57,600
Disposal cost	$36	$8,640
Transportation cost	$20	$4,800
Total Cost (Countywide)	*$761*	*$182,640*

County Bag Estimate	
Tons of Disposable Plastic Bags Discarded by County Residents (2010)[2]	781
Conversion factor (lbs/plastic bag)[3]	0.013
Number of Plastic Bags Discarded by County Residents (2010)	120,153,846
Cost Impacts per Plastic Bag at County Recycling Center	
Total Annual Cost Impact Due to Plastic Bags (Countywide)	$182,640
Number of Plastic Bags Discarded by County Residents (2010)	120,153,846
Cost per Bag (Countywide)	**$0.002**

1. Boulder County Recycling
2. *Boulder County 2010 Waste Composition Study*, as cited in City of Boulder, City Council Agenda Item, "Consideration of a motion providing direction on options for reducing disposable checkout bag use in Boulder," May 15, 2012.
3. City of Boulder, City Council Agenda item, May 15, 2012

The other facility affected by plastic bags is the Center for Hard to Recycle Materials, or CHaRM. This facility processes plastic film including plastic bags. Eco-Cycle staff provided estimates of the number of bags processed at the facility and cost estimates of the current portion of their expenses attributable to plastic bags. Results are shown in Figure 11.

The same approach is taken for CHaRM as is done for costs incurred at the Boulder County Recycling Center. That is, the cost to recycle plastic bags in the county is not dependent on future implementation of the nexus fee or reductions in bag use. (As bag usage decreases, so should recycling costs for plastic.) The approach is for the nexus fee to recover costs for plastic bag recycling.

Per Eco-Cycle, CHaRM handled 82,606 pounds of plastic film in 2011. Of that amount, 12,000 pounds is from business accounts and therefore not plastic bags. The remainder (70,606 pounds) is from plastic bags, which equates to 5.4 million bags per year.

Costs are estimated at $34,000 per year to process plastic, which is reduced to reflect that portion attributable to plastic bags (85.5 percent). In addition, Eco-Cycle staff indicates a one-time capital cost of $40,000 for a plastic bag baler, which is annualized over a ten-year period to reflect the useful life of the equipment. The combined annual cost is estimated at $33,061 due to plastic bags. The cost per bag is then calculated based on this estimated annual cost at CHaRM divided by the estimated number of plastic bags handled at the facility. The resulting cost per bag is $.006 ($33,061 annual costs / 5.4 million plastic bags). This cost will be added to the total nexus fee.

Figure 11. CHaRM Costs

Plastic Bag Estimate

Pounds of Plastic Handled at CHaRM per Year[1]	82,606	
Less Pounds of Plastic from Business Accounts (non-Plastic Bags) Handled at CHaRM[1]	12,000	*% Plastic Bags*
Pounds of Plastic Bags per Year	*70,606*	*85.5%*
Conversion factor (lbs/plastic bag)[2]	0.013	
Number of Plastic Bags Processed Annually	5,431,231	

CHaRM Cost Estimates: Current Impacts[1]	*One-Time Cost*	*Total Cost/ Year*	*% Allocated to Plastic Bags*	*Total Cost/Year for Plastic Bags*
Annual Operating Cost for Plastic Recycling		$34,000	85.5%	$29,061
Capital Equipment Cost for Plastic Bag Baler[3]	$40,000	$4,000	100%	$4,000
Total Costs	*$40,000*	*$38,000*		*$33,061*

Cost Impacts per Plastic Bag at CHaRM

Total Annual Cost Impact Due to Plastic Bags	$33,061
Number of Plastic Bags Processed Annually	5,431,231
Cost per Bag	**$0.006**

1. Eco-Cycle

2. City of Boulder, City Council Agenda item, May 15, 2012

3. Annualized over 10 year useful life

RETAILER COSTS

It is anticipated that retailers will incur costs to implement the nexus fee. Retailer costs are somewhat more difficult to estimate because of confidentiality concerns and proprietary information. TischlerBise and city staff interviewed several city grocery store representatives[13] and city staff followed up to try to obtain information on direct anticipated costs from the proposed ordinance. Some of the costs that retailers indicated they are likely to incur are:

- Initial implementation and ongoing costs for training for cashiers and managers on the new requirements,
- Initial and ongoing marketing to customers on the fee on plastic and paper bags,
- One-time technology changes to computer systems to handle the new fee and enable tracking,
- Compliance costs for tracking and reporting fee collections, and
- Other ancillary effects such as increased time to pack reusable bags.

The intent of the city ordinance is for the food stores that are subject to the fee to retain the retailer portion of the fee.

To calculate the retailer portion of the fee, TischlerBise researched other localities' bag fee programs, specifically to determine retailer costs and portions retained by retailers, as well as received some information on impacts to City of Boulder food stores. Findings from this research are presented in Figure 12.

[13] Throughout the process, meetings and/or phone interviews have been held with representatives from Safeway, King Soopers, Whole Foods, Alfalfa's, Target, Sprouts, 7 Eleven, India's Grocery, and the Rocky Mountain Food Industry Association.

Figure 12. Retailer Costs for Implementation

	Total Fee Imposed	Retailer Cost per Bag for Implementation
[1] Santa Monica Study	*	$0.095
[2] City of Seattle	$0.20	$0.050
[3] City of Washington, DC	$0.05	$0.010
[4] City of San José	**	$0.047
[5] City of Boulder Sample Retailer	tbd	$0.018
Average		***$0.044***

* *Ordinance is for ban on plastic bags and minimum $0.10 fee on paper bags*

[1] Retailer estimate; from "City of Santa Monica Nexus Study," R3 Consulting Group, January 2010

[2] "City of Seattle Disposable Shopping Bags Green Fee and Expanded Polystyrene Foam Food Container Ban Frequently Asked Questions," Seattle Public Utilities and Seattle Climate Action Now, June 2008.

[3] "Bag Law Details," City of Washington, DC.

[4] TischlerBise analysis; reflects 3-year weighted average of estimated costs derived from figures in "City of San Jos é Single-Use Carryout Bag Fee Fiscal Analysis," Herrera Environmental Consultants, July 2010

[5] Retailer provided estimate based on estimated implementation costs; (information not considered wholly representative of local grocers but included to derive an overall estimated average).

** *Ordinance is for ban on plastic bags.*

In consultation with city staff, it was determined that the average of the above figures provides a reasonable estimation of the impact to retailers of the proposed disposable bag fee. Since direct costs were only obtained from one Boulder grocery store, it is not necessarily representative of all grocery stores in the city. Therefore, data from this establishment is included in the overall average calculation but cannot be used as the citywide figure. Given the above data, the retailer cost per bag to cover the cost of implementation is calculated at $0.044.

EXTERNALITIES

A final cost component is to capture the cost of externalities from disposable bag use. An externality is an unintended or secondary consequence that is not captured through prices and where affected parties do not have a choice in the transaction. The classic example of a negative externality is pollution generated by factories causing a detrimental effect on the surrounding environs.

The externalities as related to disposable bag use in the city are included in the calculation to capture life cycle greenhouse gas emissions from plastic and paper bags, the impact on local water infrastructure, and the overall impact on water usage from disposable bags. These costs are presented as an *option* for inclusion in the fee because these costs are more difficult to quantify.

City staff provided information on the amount of greenhouse gas emissions attributable to plastic and paper bags in the city and the cost to offset those impacts (through the carbon offset program, Colorado Carbon Fund[14]). Based on these costs, a cost per disposable bag can be derived based on the current number of disposable bags to which the fee will apply.

Impacts to the city's water infrastructure are also included in this element of the fee. Program costs related to disposable bags for the city's "Stream Teams" are estimated at $500 per year. A cost per disposable bag is calculated based on this cost estimate and the current number of applicable disposable bags in the city. Results are provided in Figure 13. (It should be noted that the cost per bag is taken out to the fifth decimal place (as opposed to the third from above) due to the costs involved.

A third externality component is the cost of water use from plastic and paper bags. To offset the impact of water usage from disposable bags used in the city, city staff provided information on the amount of water used per plastic and paper bag along with the costs to offset that usage (through the water offset program, Water Restoration Certificates[15]). Based on these costs, a cost per disposable bag can be derived based on the current number of disposable bags to which the fee will apply.

[14] See http://www.coloradocarbonfund.org
[15] See http://www.b-e-f.org/water/cert

Figure 13. Estimated Externality Costs

GREENHOUSE GAS (GHG) EMISSION COSTS		
Plastic bags		
CO2 equiv per 100 million bags	3,097	tons
CO2 equiv for 2011 applicable bags in Boulder	359	tons
Paper bags		
CO2 equiv per 100 million uncomposted bags	7,621	tons
CO2 equiv for 2011 applicable bags in Boulder	210	tons
Total 2011 CO2 equiv for Boulder bags	569	tons
2011 Offset Cost per Metric Ton (Colorado Carbon Fund)	$20	
2011 Estimated Offset Cost for Disposable Bag Use in City of Boulder	$11,376	
Estimated Number of Applicable Disposable Bags	14,340,400	
GHG Cost per Disposable Bag	***$0.0008***	
WATER INFRASTRUCTURE COSTS		
Estimated Cost to Stream Teams per Year	$500	
Estimated Number of Applicable Disposable Bags	14,340,400	
Water Infrastructure Cost per Disposable Bag	***$0.00003***	
WATER USE COSTS		
Plastic bags		
Water use for 1,000 plastic bags (milligrams)	31,150,000	mg
Water use for 1,000 plastic bags (gallons)	9	gal
Estimated Number of Applicable Disposable Bags	11,585,000	
Water use for 2011 applicable bags in Boulder	99,449	gal
Paper bags		
Water use for 1,000 paper bags (milligrams)	3,895,000,000	mg
Water use for 1,000 paper bags (gallons)	1,073	gal
Estimated Number of Applicable Disposable Bags	2,755,400	
Water use for 2011 applicable bags in Boulder	2,957,579	gal
Total 2011 water use for Boulder bags	3,057,028	gal
2011 Water Offset Cost	$3,057	
(BEF Water Restoration Certificates)		
Estimated Number of Applicable Disposable Bags	14,340,400	
Water Use Cost per Disposable Bag	***$0.0002***	
GRAND TOTAL EXTERNALITY COST PER BAG	***$0.0010***	

Source: City of Boulder

FEE CALCULATION

The factors discussed throughout this report are used to calculate the disposable plastic and paper checkout bag nexus fee. The cost layers of the fee are:

- City costs per bag
- Other public costs per bag (for County Recycling Center and CHaRM)
- Retailer costs per bag
- An optional fee element is also presented layering on externality costs per bag.

The calculated disposable bag nexus fee is based on the costs identified and the estimated annual number of bags to which the fee will apply.

To derive the city cost portion, a four-year period is used and a weighted average cost per bag is derived. City costs are repeated from Figure 9 and are estimated at $2.2 million over four years. Bag use reduction factors are as described in this report (repeated from Figure 8). Based on these assumptions, the weighted average city portion of the fee is $.146 per bag as shown in Figure 14.

Figure 14. City Portion of Disposable Bag Nexus Fee

		Year 1	*Year 2*	*Year 3*	*Year 4*	*Four-Year Totals / Wtd Avg*
CITY COSTS	***Total City Costs***	*$1,259,040*	*$454,871*	*$275,095*	*$233,073*	***$2,222,079***
BAG USAGE	Est. # Bags Subject to Fee (No Fee)	14,453,089	14,541,712	14,630,879	14,720,593	58,346,273
	Reduction % (Due to Fee)	50%	75%	85%	85%	74%
	Estimated # Bags Subject to Fee	*7,226,544*	*3,635,428*	*2,194,632*	*2,208,089*	***15,264,693***
FEE CALCULATION						
City	***City Cost per Bag***	*$0.174*	*$0.125*	*$0.125*	*$0.106*	***$0.146***

The other elements of the nexus fee as described in this report are added to the city portion to derive the total fee per bag of $.198. Results are shown below in Figure 15.

Figure 15. Disposable Bag Nexus Fee

		Year 1	Year 2	Year 3	Year 4	Four-Year Totals / Wtd Avg
FEE CALCULATION						
City	City Cost per Bag	$0.174	$0.125	$0.125	$0.106	**$0.146**
Other Public	County Recycling Ctr Cost per Bag	$0.002	$0.002	$0.002	$0.002	**$0.002**
	CHaRM Cost per Bag	$0.006	$0.006	$0.006	$0.006	**$0.006**
Retailer	Retailer Cost per Bag	$0.044	$0.044	$0.044	$0.044	**$0.044**
Total Fee	City of Boulder Bag Nexus Fee	$0.226	$0.177	$0.177	$0.158	**$0.198**

An optional fee component includes the cost for externalities, which adds an additional $.001 per bag. With this cost factor, the total bag nexus fee would be $.199 per bag. See Figure 16.

Figure 16. Disposable Bag Nexus Fee Option with Externalities

		Year 1	Year 2	Year 3	Year 4	Four-Year Totals / Wtd Avg
Total Fee	City of Boulder Bag Nexus Fee	$0.226	$0.177	$0.177	$0.158	**$0.198**
FEE CALCULATION WITH EXTERNALITIES						
Externalities	Estimated Externality Cost per Bag	$0.001	$0.001	$0.001	$0.001	**$0.001**
Total Fee	City of Boulder Bag Nexus Fee w/Externalities	$0.227	$0.178	$0.178	$0.159	**$0.199**

USES OF THE REVENUE GENERATED BY THE FEE

Proceeds from fee revenue will be used for implementation and administration of the program. City cost estimates identify specific activities including:

- Purchasing and distributing reusable bags;
- Development of educational campaign and materials;
- Conducting outreach activities;
- Developing and implementing policy;
- Designing and implementing an outreach and advertising campaign; and
- Designing and producing commercial/public service announcements.

Costs recovered for impacts on recycling facilities will be used to offset the impact from disposable bags in the waste stream handled at the Boulder County Recycling Center and CHaRM. These can include both operation (personnel and operations) and capital impacts (as described in this report).

The retailer portion of the fee will be remitted to retailers (or retained by retailers, depending on how the program is set up) to cover their costs of implementation.

If the externality portion of the fee is adopted, those revenues should be used to purchase carbon offsets and to fund stream clean-up programs in the city.

OTHER CONSIDERATIONS

Compliance

It is possible that there will be less than 100 percent compliance from retailers affected by the nexus fee in the city. This may affect the calculations herein. However by assuming a plateauing reduction factor of 85 percent, a cushion is provided to help account for non-compliance. However, TischlerBise recommends evaluations at regular intervals to determine the level of compliance as well as to check on assumptions and estimates used to establish the nexus fee.

Rebound Effect

As noted elsewhere in this report, some localities have experienced a "rebound effect" in disposable bag usage after initial implementation of a bag fee or tax. This can be attributed to both behavioral factors—getting used to the fee/tax, forgetting to bring reusable bags, etc.,--as well as inflationary effects. Without adjusting bag fees/taxes over time, the real cost to the consumer essentially decreases over time due to inflation thus perhaps making the fee/tax easier to absorb financially.

Therefore, TischlerBise recommends the following items to counteract the rebound effect:

- *Continued marketing, education, and outreach* on the program particularly in the second year of implementation and beyond.

- *Adjusting annually for inflation*. As noted above, without adjusting for inflation on an annual basis, the value of the fee essentially decreases (assuming inflation occurs and not deflation). An inflationary factor can be applied to the fee based on annual changes in the Consumer Price Index (CPI). There are several indices reported as part of the CPI program. It is recommended that the City of Boulder use the national CPI-U (reflecting all urban consumers) for its annual update.[16] The city ordinance establishing the disposable checkout bag fee should indicate the specific CPI and timing for annual updates.

- *By Year 3 to 4, TischlerBise recommends an evaluation of fee revenue, bag usage, and costs reflected in the fee*. The intent will be to determine the efficacy of the program as well as

[16] See http://www.bls.gov/cpi/cpi1998d.htm for further information on available indices and use for escalation.

measure the rebound effect. Per the Irish experience, it may be necessary to increase the fee by an additional amount to counteract the rebound effect if the city were inclined to move beyond cost recovery for the fee to an approach that attempts to influence behavior.

Fiscal Implications

The city will receive revenues from the bag fee. However, a related decrease in revenues may be experienced from the city's Trash Tax. The city currently receives revenue from a Trash Hauler/Recycling Occupancy Tax on Recycling and Trash Hauling, which is paid by haulers to the city. In Fiscal Year 2012, the city budgeted $1.7 million from this revenue source (1.7 percent of the General Fund budget). With reduced bag usage, this revenue stream may decrease, however it is not known by how much and since bags are relatively light, the reduction in revenue is likely to be minimal.

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