Summary Report

Investigate the Implications of Lowering the LBP Standard: Policy and Economic Implications

Prepared for:

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Table of Contents

List of Tables

1.0 INTRODUCTION

QuanTech was tasked by HUD under Task Order 1 of Contract No. C-PHI-01043 to investigate the implications of lowering the Lead-Based Paint (LBP) standard (sometimes referred to as the "action level"). CLIN 6 of the Task Order involved developing and issuing this report on the policy and economic implications of reducing the standard. The report is not intended to be a Regulatory Impact Analysis; rather, it provides rough estimates of the economic ramifications to the entire LBP industry if the LBP standard were lowered.

A consideration for lowering the definition of LBP might be to provide the public with a better predictor of which housing units (HUs) may have a lead dust hazard. A HU having LBP should have an increased risk for dust lead hazards, signaling a potential need for control measures. Also, to eliminate inadvertent human exposure to lead in paint in residential housing, one would like to set the definition of LBP low enough to ensure that very few housing units without LBP are likely to have a lead hazard. However, as for most unwanted environmental contaminants, increasing removal of the lead translates to increased costs because more housing units become labeled as having LBP as the action level for LBP is lowered. Society's financial resources are limited. Therefore, a balance must be struck between the potential for human exposure risk and the resources available to combat that risk. Striking the best balance is the subject of public policy determinations. This report, along with a companion report[1], has been created to provide tools to help make such policy determinations.

2.0 ESTIMATES OF HOUSING UNITS POTENTIALLY IMPACTED BY LOWERING THE LBP STANDARD

Investigative efforts indicated that the best survey data available for use in this task order is from the 2005-06 American Healthy Homes Survey (AHHS)[2]. This data was used to generate a series of tables showing estimated numbers of HUs having LBP and other lead hazards using multiple action levels for LBP, lead in dust and lead in soil. These tables are provided in the previously referenced companion report[1]. The definition of various terms used in this and the companion report is the same as for AHHS results presented elsewhere[2]. For example, the term "HU" means “occupied, non-seasonal, non-institutional housing unit in which children are permitted to live”.

Table 1, presented here, is a portion of Table 1 in the companion report[1] which covers all housing years and includes lead results found on ceramic surfaces. Lead in ceramic tile glazing, which has not been banned for use in residential housing, meets the regulatory definition of LBP and is counted as LBP in the AHHS as well as the its predecessor, the 1998-99 National Survey of Lead and Allergens in Housing (NSLAH)[3].

It is worth noting that AHHS data for the four alternative action levels presented in this and the companion report[1] was collected using an XRF instrument action level setting of 1.0 mg/cm². There may be some degradation in the accuracy of the AHHS data at the lower action levels.

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[1] *Investigate the Implications of Lowering the LBP Standard: Review of Existing Survey Data - Findings from the American Healthy Homes Survey*, HUD Contract No. C-PHI-01043, Task Order 1, CLIN 2, May 17, 2011.

[2] http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_REPORT.pdf, reviewed 8/3/11.

[3] *National Survey of Lead and Allergens in Housing, Volume I, Revision 7.1: Analysis of Lead Hazards*. Prepared by Westat, Inc., for U.S. Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control (October 31, 2002).

Table 1. Distribution of U.S Housing Units (HUs) Among Various Categories of LBP using Different Action Levels for LBP (Ceramics Included)											
LBP Category	Number of HUs[1] at Different LBP[2] Action Levels (000s)					Percent of HUs[3] at Different LBP Action Levels (%)					HUs in Sample for 1.0
	1	0.7	0.5	0.3	0.1	1	0.7	0.5	0.3	0.1	
All Years											
HUs with ANY LBP	37,058	40,918	45,688	51,893	68,605	34.9%	38.6%	43.1%	48.9%	64.7%	373
HUs with NO LBP	68,976	65,115	60,345	54,140	37,429	65.1%	61.4%	56.9%	51.1%	35.3%	758
HUs with ANY Deteriorated LBP	20,920	23,191	25,510	28,427	36,171	19.7%	21.9%	24.1%	26.8%	34.1%	208
HUs with NO Deteriorated LBP	85,114	82,843	80,524	77,606	69,863	80.3%	78.1%	75.9%	73.2%	65.9%	923
HUs with ANY Significantly Deteriorated LBP	15,331	16,487	18,528	21,552	26,794	14.5%	15.5%	17.5%	20.3%	25.3%	150
HUs with NO Significantly Deteriorated LBP	90,702	89,546	87,506	84,481	79,240	85.5%	84.5%	82.5%	79.7%	74.7%	981

[1] "Housing Units" are permanently occupied, non-institutional residential units in which children are permitted to live.

[2] Lead based paint, action levels shown are in mg/cm².

[3] All percentages are calculated with total housing units (106,033) as the denominator.

However, recent testing of the XRF instrument model used in the AHHS suggests that it has a method detection limit in the 0.1-0.2 mg/cm² range[4] and that changes in the action level setting do not have a major effect on the instrument reading. This implies that the presented findings for the action levels down to 0.3 mg/cm² are reasonably accurate, though the results at 0.1 mg/cm² may be less so.

3.0 DISCUSSION OF COSTS

For the purposes of this report, we have assumed that all economic impacts of lowering the LBP standard are traceable, directly or indirectly, to existing Federal regulations, namely the Lead-Safe Housing Rule[5] and the Renovation, Repair, and Painting (RRP) Rule[6]. Increases in lead paint inspections/risk assessments and lead hazard control activities motivated by health concerns of private individuals are assumed to be negligible, i.e., individuals taking such actions are already motivated to do so by existing regulations.

Five main cost categories have been identified in estimating the overall economic impact of lowering the LBP standard: Lead Detection Costs; Lead Hazard Control (LHC) and Abatement Costs; Training and Certification Costs; Disclosure Rule Costs; and, Renovation, Repair and Painting (RRP) Rule Costs. These are presented individually in subsections below with Lead Detection and LHC costs further broken down into subcategories.

3.1 Lead Detection Costs

3.1.1 Performance Characteristic Sheets (PCSs)

Identification of LBP requires portable X-Ray Fluorescence (XRF) devices capable of meeting the new LBP standard. XRFs in use today for LBP inspections and risk assessments have received approval for use in residential housing at an action level of 1.0 mg/cm² through the issuance of PCSs under a system developed by EPA and HUD. Any lowering of the LBP standard would mandate the creation of a new PCS for each XRF manufacturer's instrument.

The PCS costs attributable to lowering the LBP standard are dependent on the number of XRF models to be evaluated and the cost incurred to create a PCS. The PCS costs are also dependent on whether or not a market acceptable PCS is obtained from the testing. If it is not, then further testing of other XRF models may be required, effectively increasing the number of XRF models to be evaluated. "Market acceptable" PCSs are those that have no inconclusive zones, which are ranges where measured lead values cannot be conclusively classified as being LBP or not LBP. XRFs that have inconclusive zones are at a competitive disadvantage because when the XRF reading is within the inconclusive zone, it forces the user to either collect a paint sample and send it in for laboratory analysis, or to assume that the surface tested is LBP without really knowing. Currently, there are three XRF models being actively sold for the US LBP inspection market[4]: Niton, RMD, and Innov-X. For the 1.0 mg/cm² action level, both the Niton and RMD have market acceptable PCSs. The PCS for the Innov-X has an inconclusive range and its use for conducting LBP testing is believed to be limited because of this. Despite this, it is assumed that, at a minimum, all three of these existing XRF models would need to be reevaluated should the LBP standard be lowered. At some lower action level, it would become necessary to also evaluate models with newer technology. The

[4] Capabilities of Current XRF Manufacturers: Investigate the Implications of Lowering the LBP Standard, HUD Contract No. C-PHI-01043, Task Order 1, March 14, 2011.
[5] 24 CFR Part 35.
[6] www.epa.gov/lead/pubs/renovation.htm, reviewed 8/3/11.

estimated detection limits for the Niton and RMD[4] are low enough that it appears reasonable that a market acceptable PCS could be produced for at least one of these XRFs for the 0.7 mg/cm² action level but, perhaps, not at levels below 0.7 mg/cm². It is assumed that regardless of how far the LBP standard is dropped, a total of only three PCS evaluations will be needed and the decision whether to evaluate new or existing XRFs will be made based on the new LBP standard.

The estimated unit cost for PCS testing is shown in Table 2. The PCS cost attributable to lowering the LBP standard to any level below 1.0 mg/cm² is assumed to involve 3 XRF models and no more than one evaluation on each XRF model. For any lowering of the LBP standard, the estimated costs for PCS evaluations become:

PCS Testing Cost = $40,000*3 = $120,000.

Table 2. Estimated Costs for LBP Detection		
Item or Activity	**Unit Definition**	**Estimated Cost/unit**
PCS testing[a]	XRF model	$40,000
Portable XRF with silicon drift detector technology[b]	instrument	$27,500
[a]Estimated based on past evaluation efforts by QuanTech [a]Estimated based on discussions with XFR manufacturers; includes anticipated price reductions from increased demand for these instruments if the LBP standard is lowered		

3.1.2 Equipment

Lowering the LBP standard may require the use of newer silicon-drift detector XRF technology[4] which is currently used for lead detection in the consumer product safety market (toys, etc.) The costs of these newer models, after PCS generation, would have to be borne by the LBP inspectors or the organizations that conduct LBP inspections in housing. These costs would likely be passed on to consumers in the form of increased pricing for LBP inspections. According to the XRF manufacturers[4], it is estimated that 3,300 XRFs are actively being used for LBP detection and the estimated useful life is 6-8 years. The need for newer XRFs depends on the value chosen for a new LBP standard. It is assumed that if the standard is lowered below 0.7 mg/cm², XRFs with the newer silicon-drift detector technology will be required. Rather than amortizing the cost of the newer XRF over the useable life of the instrument, we have taken the simpler approach of applying the entire upfront cost of the new XRFs to the total cost in the first year after lowering the LBP standard.

The estimated unit cost for an XRF with silicon drift detector technology, shown in Table 2, is based on discussions with XRF manufacturers[4] and includes about a 30% reduction from current pricing that is anticipated to be realized from an increase in demand for these instruments should the LBP standard be lowered enough to require this newer technology.

For a new LBP standard of 0.7 mg/cm², the estimated cost is zero, as discussed above. For a new LBP standard of less than 0.7 mg/cm², the estimated cost is:

XRF Equipment Cost = $27,500*3,300 = $90,750,000

3.1.3 Increased Inspection Time

In addition to equipment expenditures, the cost of conducting a LBP inspection depends primarily on the time required by the lead inspector or risk assessor to perform the work. A LBP inspection includes travel to and from the site, time to collect the required lead measurements (XRF readings), and time to analyze and

document the results in an inspection report. The total of 4 hours per inspection is assumed to be a reasonable estimate for a typical LBP inspection.

Lowering the LBP standard will not only increase the number of HUs with LBP, it will also increase the number of components in a given HU that have LBP, and this has the potential of increasing the time needed to collect XRF readings[4]. This is because XRFs currently available in the LBP testing marketplace use a variable reading time mode of operation (sometimes referred to as "quick mode") where the measurement time increases when the measured lead level approaches the action level that is keyed into the XRF. If the distribution of lead in a HU involves a large fraction of components with lead near the new LBP standard, then it is conceivable that the average XRF reading time would increase beyond what is typically encountered using the current action level. Although the LBP testing for the AHHS[2] was not a full inspection (fewer components were tested than in a full inspection), the sample is large enough to provide a reasonable estimate of the expected distribution of lead-in-paint in US residential housing. Table 3 presents the average number of XRF readings (individual measurements on different building components) for various ranges of lead expressed as a percentage of the total number of readings collected per HU in the 1131 HUs that are in the AHHS sample.

Table 3. Average Distribution of Lead in Paint in US Housing

Percent of XRF Readings (X)[a] with Lead in mg/cm²:					
X≥1.0	0.7≤X<1.0	0.5≤X<0.7	0.3≤X<0.7	0.1≤X<0.3	X<0.1
3.9%	0.8%	1.0%	1.5%	5.9%	86.9%

[a]XRF results from the American Healthy Homes Survey[2]

Table 3 shows that the vast majority of readings (86.9%) are on components that have less than 0.1 mg/cm² (the lowest action level examined in this task order). This suggests that lowering the LBP standard would not generate very many readings (compared to the total collected) that would have elevated measurement times caused by XRF readings near or at the new action level. The mean reading time for the 54,155 XRF readings collected on building components in the AHHS was 3.0 seconds for components classified as LBP and 2.0 seconds for non-LBP components. This indicates that the total amount of time consumed by "readings" alone in a LBP inspection is small. For example, if we assume that 100 readings are collected in a typical LBP inspection, then the overall time consumed on the XRF readings is less than 5 minutes ([3 seconds/reading*100 readings]/[60 seconds/minute]) out of an inspection that takes four hours. Therefore, increases in reading time resulting from a larger fraction of components with lead near the new LBP standard are considered negligible.

Participating XRF manufacturers[4] suggested that, in general, longer reading times are required to obtain adequate accuracy at lower lead levels. If true, this would also increase the overall reading time in a LBP inspection at lower actions levels. However, recent testing of the XRFs[4] showed that this was true only for the RMD, where the active testing time increased by a factor of roughly 2.6 when the action level was dropped from 1.0 to 0.4 mg/cm². The Niton (used in the AHHS) and Innov-X instruments did not show any significant change in testing time as the action level was dropped from 1.0 to 0.1 mg/cm². As discussed above, the estimated total XRF reading time in a LBP inspection is small, perhaps 5 minutes out of 4 total hours. Even using the factor of 2.6 applicable to the RMD, the estimated total XRF reading time remains small at perhaps 13 minutes (2.6 x 5). Therefore, it is assumed that lowering the LBP standard will not result in any significant costs related to increased inspection time.

3.2 LHC and Abatement Costs

3.2.1 Public Housing

There are approximately 1,200,000 Public Housing units in the United States administered by roughly 3,300 Housing Authorities[7]. According to Subpart L of the Lead Safe Housing Rule (LSHR - 24 CFR Part 35), all pre-1978 Public Housing was to be inspected for LBP and any LBP found was to be abated. While awaiting abatement, lead hazards in Public Housing were to be managed by interim controls. Since Public Housing was required to conform to the requirements of Subpart L within two years of the September 15, 2000 effective date of the LSHR, we will assume for the purposes of this report that all pre-1978 Public Housing has by now either been inspected and found lead-free, or abated. If the definition of LBP is lowered, Public Housing found lead-free at 1.0 mg/cm^2 may no longer be so, and abated units may still have LBP at the new lower level. Thus, lowering the definition of LBP may require re-inspection of all pre-1978 Public Housing and abatement of any LBP at the lower level.

Table 4 shows the estimated number of Public Housing units requiring abatement at each lower definition of LBP, the estimated percent of components with LBP at each level, and the estimated total cost of abatement.

Table 4. Estimated Costs of Public Housing Inspections and Abatements Triggered by Various Lower LBP Definitions

LBP definition	**0.7 mg/cm^2**	**0.5 mg/cm^2**	**0.3 mg/cm^2**	**0.1 mg/cm^2**
Units with LBP	44,000	98,000	168,000	358,000
% Components with LBP	2.7%	3.3%	4.0%	7.7%
Unit Abatement Cost	$4,097	$4,563	$5,107	$7,981
Total Abatement Cost ($M)	$180M	$447M	$860	$2,857M
Inspection Cost ($M)	$101M	$101M	$101M	$101M
TOTAL COST ($M)	**$281M**	**$548M**	**$961M**	**$2,958M**

The assumptions on which the calculations for Table 4 are based are as follows:

1. The percentage of Public Housing units that would be found with LBP at each level is assumed to be the incremental percentage of all housing units with LBP at each level but not at 1.0 mg/cm^2. For example, from Table 1, 38.6% of housing units have LBP at 0.7 mg/cm^2 compared to 34.9% at 1.0 mg/cm^2. Thus, 3.7% of housing units have LBP at 0.7 mg/cm^2 but not at 1.0 mg/cm^2. Hence, it is estimated that if all pre-1978 Public Housing units were re-tested, 3.7% of 1,200,000, or 44,000 units, would have LBP at 0.7 mg/cm^2.
2. The percent of components with LBP at each level in Public Housing units is assumed to be the weighted average percent of XRF readings with LBP at each level in all AHHS units with LBP at that level but not at 1.0 mg/cm^2.
3. Average abatement cost in Public Housing units with LBP at 1.0 mg/cm^2 is assumed to be $10,000. This is at the low end of EPA's abatement cost estimates[8], because Public Housing is mostly multifamily with smaller units than the average for all housing. Of the $10,000, 20% ($2,000) is

[7] portal.hud.gov/hudportal/HUD?src=/topics/rental_assistance/phprog,reviewed 7/24/11.
[8] www.fixr.com/costs/lead-paint-removal, reviewed 7/25/11.

assumed to be a fixed cost independent of the size of the job, with the other 80% ($8,000) proportional to the number of components with LBP, which in turn is assumed proportional to the percent of components with LBP. As an example, 3.3% of components in units with LBP at 0.5 mg/cm^2 but not at 1.0 mg/cm^2 have LBP, compared to 10.3% of components in units with LBP at 1.0 mg/cm^2. Thus, unit abatement cost in Public Housing units with LBP at the lower standard of 0.5 mg/cm^2 is estimated as $2,000 + $8,000*3.3/10.3 = $4,563.

4. Total abatement cost is unit abatement cost multiplied by the number of units with LBP.
5. Inspection cost is assumed to be $350 per unit, again at the low end of EPA estimates[8]. Following the Economic Analysis for the LSHR[9], it is assumed that 39% of Public Housing units would need to be inspected (using the fact that only a sample of units needs to be inspected in multifamily housing). In AHHS, 61.8% of housing units were built before 1978. Applying this percentage to the 1,200,000 Public Housing units, we get an estimated 742,000 pre-78 Public Housing units, of which 289,000 would be inspected at a cost of $101M.

The table shows an order of magnitude range of potential costs in Public Housing, ranging from $281M at a new definition of 0.7 mg/cm^2 to almost $3B at 0.1 mg/cm^2.

3.2.2 Project-Based Assistance

According to the Economic Analysis for the LSHR[9], there were (1999) 126,840 pre-1978 multifamily units receiving project-based assistance of more than $5,000 per year. The LSHR required such properties to receive risk assessments and interim controls of lead hazards in 2-4 years from the effective date of the rule (September 15, 2000). Lowering the definition of LBP would potentially require most of these units to be reassessed, with interim control work required for more components. Table 5 shows the potential costs for units receiving more than $5,000 annually in project-based assistance.

Table 5. Estimated Costs of Risk Assessments and Interim Controls in Multifamily Housing Receiving > $5K in Project-Based Assistance Annually, Triggered by Various Lower LBP Definitions

LBP definition	**0.7 mg/cm^2**	**0.5 mg/cm^2**	**0.3 mg/cm^2**	**0.1 mg/cm^2**
Additional Units with Significantly Deteriorated LBP	2,000	6,200	11,900	22,200
Additional Components with LBP	0.9%	1.9%	3.5%	9.2%
Additional Interim Control Cost per Unit	$1,253	$1,613	$2,191	$4,247
Total Interim Control Cost ($M)	$2.5M	$10M	$26M	$94M
Assessment Cost ($M)	$6M	$6M	$6M	$6M
TOTAL COST ($M)	**$8M**	**$16M**	**$28M**	**$100M**

The calculations on which Table 5 is based are as follows:

1. Table 1 shows the additional units with significantly deteriorated LBP added by each reduction of the LBP definition. Pro-rating these numbers to the 126,840 pre-1978 units above gives the additional units with significantly deteriorated LBP in the second row of the table. This is a conservative estimate of additional units requiring interim controls, since some of these units may already have been included because of dust or soil hazards.
2. Row 3 of the table shows the additional percent of components with LBP for each reduction of the definition. These percents are taken from Table 7 below.

[9] *Economic Analysis of the Final Rule on Lead-Based Paint*, HUD, September 7, 1999.

3. Average interim control cost for a multifamily unit at an LBP definition of 1.0 mg/cm^2 is assumed at $4,645 (see the discussion of HUD Grant Programs below). Of this, 20% is assumed to be fixed and 80% proportional to the % of components with LBP (10.3% for a LBP definition of 1.0 mg/cm^2). For example, the additional per-unit cost of interim control for a lower definition of 1.0 mg/cm^2 is estimated as $[4,645*0.2 + 4,645*0.8*3.5/10.3] = $2,191.
4. At the effective date of the LSHR, approximately 81% of multifamily units had no LBP hazards[3]. It is assumed that these units would be subject to re-assessment (units with LBP hazards are already subject to periodic reassessments.) The Economic Analysis for the LSHR[9] estimates that an average sample of 16% of multifamily units must receive a risk assessment. Thus, the number of units that would need to be re-assessed is approximately 126,840*0.81*0.16 = 16,438. Average cost of a risk assessment is assumed to be the same as an inspection, i.e., $350.

3.2.3 Other HUD Housing Programs

Other programs which may incur additional costs due to a lowering of the LBP definition are Multifamily Mortgage Insurance (Subpart G), HUD-Owned Multifamily Property (Subpart I) and Rehabilitation Assistance (Subpart J) of more than $5,000 per unit. Using figures from the Economic Analysis of the LSHR[9], these programs contribute approximately 28,000 units annually potentially subject to abatement, and approximately 72,000 subject to interim controls. The units potentially subject to abatement constitute 3.8% of the number of pre-78 Public Housing units (742,000), while the units potentially subject to interim controls are 56.8% of the 126,840 units covered by Table 5. Pro-rating the cost estimates from Tables 4 and 5 according to these percentages gives the cost figures in Table 6 (note that there is no additional cost for risk assessments or inspections, since these are already required).

Table 6. Estimated Additional Annual Costs in Other HUD Programs Subject to the LSHR, Triggered by Various Lower LBP Definitions

LBP definition	**0.7 mg/cm^2**	**0.5 mg/cm^2**	**0.3 mg/cm^2**	**0.1 mg/cm^2**
Additional Abatement Costs ($M)	$11M	$21M	$37M	$112M
Additional Interim Control Costs ($M)	$1.4M	$6M	$15M	$53M
TOTAL ADDITIONAL COST ($M)	**$12M**	**$27M**	**$52M**	**$165M**

3.2.4 HUD Grant Programs

Through its Lead Hazard Control (LHC) and Lead Hazard Reduction Demonstration (LHRD) grant programs, OHHLHC funds lead hazard control work in an average of 12,000 privately-owned housing units annually[10]. The FY2010 LHC and LHRD grant awards propose to make a total of 8,617 homes lead safe[11], somewhat less than the historical average of 12,000. For the purposes of this report, we will assume an annual average of 10,000 homes made lead safe in these grant programs.

Lowering the definition of lead-based paint will increase the cost of lead hazard control under these grants by increasing the number of components with lead-based paint. Table 7 shows the estimated cost impact of various lower LBP definitions on lead hazard control costs on the grants.

[10] Eugene A. Pinzer (OHHLHC), personal communication.
[11] HUD Press Release No. 11-004, January 13 2011.

Table 7. Estimated Annual Costs of Lead Hazard Control under OHHLHC Grants, Triggered by Various Lower LBP Definitions					
LBP definition (mg/cm^2)	**1.0**	**0.7**	**0.5**	**0.3**	**0.1**
% Components with LBP	10.3%	11.2%	12.2%	13.8%	19.5%
Unit LHC Cost	$8,627	$9,230	$9,900	$10,900	$14,792
Total LHC($M)	$86M	$92M	$99M	$109	$148M
Cost Increase (%)	0%	7%	15%	27%	72%
Cost Increase ($M)	**$0**	**$6M**	**$13M**	**$23M**	**$62M**

The calculations on which the table is based are as follows:

1. The percent of components with LBP is the weighted average percent of XRF readings exceeding each LBP definition, in AHHS units with at least one such reading.
2. An analysis of quarterly reports from 13 LHC and LHRD 2005-2007 grants provided to QuanTech shows an average LHC cost of $9,380 in single family homes and $4,645 in multifamily homes. Weighting these costs by the AHHS percentages of single-family (84.1%) and multifamily (15.8%) units gives an average LHC cost of $8,627 at the current definition of LBP. If one assumes that 20% of LHC control costs in a given unit is fixed (set-up, clearance, etc.), and the other 80% is proportional to the number of components with LBP, units costs for lower LBP definitions can be calculated. For example, for an LBP definition of 0.3 mg/cm^2, the cost of LHC would be 0.2*$8,627 + 0.8*$8,627*13.8/10.3 = $10,900.
3. Total cost is estimated by multiplying unit cost by an estimated 10,000 units per year.

Annual cost increases are modest for the 0.7 and 0.5 mg/cm^2 standards, but larger for the 0.3 or 0.1 mg/cm^2 standards. These cost increases could be reflected in larger grant awards for the same numbers of proposed units or, more likely, in reduced numbers of units made lead safe through these grant programs.

3.2.5 Enforcement of the 1018 Disclosure Rule

The 1018 Disclosure Rule (24 CFR Part 35, Subpart A) requires the disclosure of known LBP hazards in rental and purchase transactions in residential housing. OHHLHC investigates potential violations of the disclosure rule by landlords. When violations are found, OHHLHC, rather than levying fines prescribed by the rule, usually reaches an agreement with the offending landlord to conduct lead hazard reduction. Since 1999, lead hazard reduction has been conducted in 186,253 units as a result of these enforcement activities[12]. Obviously, lowering the definition of LBP would have no impact on completed enforcement actions, because any lead hazard reduction activities to be conducted are subject to Consent Decrees already entered in Federal Court. Going forward, only about 500 units per annum are expected to be subject to lead hazard reduction as a result of enforcement activities. Thus, any economic impact of reducing the LBP definition is minimal.

3.3 Training and Certification Costs

Identification and control of lead in US housing requires professional lead workers such as Trainers, Project Designers, Supervisors, Inspectors, Risk Assessors, and Abatement Workers. Since lowering the LBP standard increases the number of HUs with LBP, more professional lead workers may be needed to detect

[12] Robert Weisberg (OHHLHC), personal communication, July 22, 2011.

and control lead hazards in these HUs. Therefore, training and certification costs will be incurred if there is a need to increase the number of these workers.

If an expansion in the professional workforce is deemed necessary, it is assumed that only the initial training and certification costs apply to this increase and not the required refresher courses and renewal certification fees, which are assumed to be absorbed by the rates already charged for lead detection and LHC activities. The equation for training and certifications costs is shown below.

Training and Certification Cost = (T1+C1+C3)(T1n)+(T2+C1+C3)(T2n)+(T3+C1+C3)(T3n)+
(T4+C2)(T4n)+(T5+C1)(T5n)+(C4)(C4n)

where:

T1 = unit cost for inspector training
T1n = number of inspectors to be trained
T2 = unit cost for risk assessor training
T2n = number of risk assessors to be trained
T3 = unit cost for supervisor training
T3n = number of supervisors to be trained
T4 = unit cost for abatement worker training
T4n = number of abatement workers to be trained
T5 = unit cost for project designers
T5n = number of project designers to be trained
C1 = certification fee for all disciplines except abatement worker
C2 = certification fee for abatement worker
C3 = certification exam fee (inspector, risk assessor and supervisor)
C4 = LBP firm certification fee
C4n = number of firms to be certified

Estimated unit costs for training and certification in Table 8 are from Marine Service Chemist, Inc.[13] Discussions held with several other trainers indicated that these costs are typical for the various professional lead disciplines. The estimated costs shown for certification are from EPA's website[14] and are for States under EPA jurisdiction for lead certifications. It is assumed that these costs are also typical for States who run their own certification programs even though discussions with several trainers indicated that certification costs can vary a great deal from State-to-State.

As discussed in the previous section, the three XRF manufacturers who participated in discussions and preliminary testing in January 2011[4] seemed skeptical that any lowering of the Federal LBP standard would result in a significant increase in testing (and LHC) and, for privately owned housing, this reasoning was found to be sound. Therefore, for private housing, a lowering in the LBP standard would not require any expansion in the workforce. In Federally-assisted housing, most additional work required by a lowering of the LBP standard would likely be carried out by force-account labor already responsible for lead hazard control as part of their duties. The XRF manufacturers also agreed that excess capacity for all the disciplines already exists in the marketplace and should any increase be needed in the workforce, it would most likely be absorbed by the existing excess capacity. With these assumptions, there is no additional training or certification cost attributable to lowering the LBP standard. However, should the assumptions be challenged, the formula and data in this section provide a reasonable basis for cost estimation.

[13] www.marinechemist.com/training.html, reviewed 5/30/11.
[14] http://epa.gov/lead/pubs/traincert.htm, reviewed 5/30/11.

Table 8. Estimated Unit Costs for Training and Certification			
Variable Name	**Item or Activity**	**Unit Definition**	**Estimated Cost/unit**
Training Costs[a]			
T1	Inspector (initial, 3 days)	person	$450
T2	Risk Assessor (initial, 2 days)[b]	person	$325
T3	Supervisor (initial, 4 days)	person	$650
T4	Abatement Worker (2 days)	person	$300
T5	Project Designer (initial, 1 day)	person	$150
T6	Inspector (refresher/update, 1 day)	person	$185
T7	Risk Assessor (refresher/update, 1 day)	person	$185
T8	Supervisor (refresher/update, 1 day)	person	$175
T9	Project Designer (refresher/update, 1 day)	person	$125
T10	Renovator (RRP rule, 1 day)	person	$200
Certification Costs[c]			
C1	Fee for all disciplines except Abatement Worker	person	$410
C2	Fee for Abatement Worker	person	$310
C3	Certification exam Fee[d]	person	$70
C4	LBP Firm Certification	firm	$550
C5	Multi-jurisdictional fee for individuals[e]	person	$35
C6	Multi-jurisdictional fee for firms[e]	person	$35

[a]http://www.marinechemist.com/ training.html
[b]$225 if taken with initial Lead Inspector
[c]http://epa.gov/lead/pubs/traincert.htm; Re-certification fees are the same as initial
[d]Does not apply to Project Designers, or Abatement Workers
[e]Fee for each additional EPA-run jurisdiction

3.4 Disclosure Rule Costs

Lowering the LBP standard increases the total number of HUs that have LBP and this increase may result in more disclosures of the presence of LBP if inspections are done in these newly identified HUs with LBP. It is conceivable that disclosures of the presence of LBP may have a depressing effect on the market values of the properties with newly identified LBP, thereby resulting in a cost burden to the sellers or lessors of the affected properties. However, as stated in the preamble of the (24 CFR Part 35, Subpart A) covering cost impact, "indirect costs resulting from actions taken by consumers in response to the information made available by the rule were not quantified". This was primarily because of the difficulties involved in obtaining a reasonable cost estimate. Although there could be a property value cost for lowering the LBP standard, such costs are assumed to be offset by benefits to the public obtained from communicating property information through the disclosure rule. In any case, any loss to a seller or lessor is balanced by an equal gain to the buyer or lessee. Therefore, it is assumed that there are no disclosure rule costs associated with lowering the LBP standard. It should be noted, however, that properties previously certified as free of lead paint under the 1.0 mg/cm^2 standard could no longer make such a claim without re-testing, if the standard were lowered.

3.5 RRP Rule Costs

Under the RRP Rule[6], effective April 22, 2010 contractors performing renovation, repair and painting projects that disturb LBP in homes, child care facilities and schools built before 1978 must be certified and must follow specific work practices to prevent lead contamination. The rule allowed owner-occupants of pre-1978 homes to certify that no child under 6 or pregnant woman lived there, and to opt out of having their contractors follow lead-safe work practices (LSWP). A final rule to apply lead-safe work practices[15], effective July 6, 2010, eliminated the opt-out provision.

The Economic Analysis[16] for the proposed rule estimated that 10,727,895 renovation events, in rental housing and owner-occupied housing with children under 6, would incur compliance costs in the first year of the regulation. It was assumed that LBP test kits would be used to determine the need for lead-safe work practices in each of these renovation events, with an estimated 8,122,187 (76%) employing LSWP. This estimate was comprised of both homes with LBP and homes without LBP for which the test kit gave a false positive indication. A 63% false-positive rate (FPR) for test kits was assumed in the first year. In the second year of the regulation, improved test kits with a 10% FPR were assumed to be available, resulting in a dramatic reduction in the number of events with LSWP, to 4,371,683. The elimination of 3,750,504 events with LSWP based on reducing the FPR from 63% to 10% implies that approximately 4,458,146 of the 8,122,187 events resulted from test-kit false positives, with 3,664,041 actually having LBP[17].

Unfortunately, the expected improvement in test-kit performance has not been realized. EPA conducted extensive testing of new test-kit technologies as part of its Environmental Technology Verification (ETV) program, with the result that one new kit was recognized as acceptable for use in complying with only the false-negative criterion[18] of the RRP rule. With this addition, there are two commercially available kits recognized for RRP use. The *Lead Check* kit has an overall FPR of greater than 95%[19] at 0.8 mg/cm^2, while the newer *D-Lead* kit has a FPR ranging from 52.5% to 94.9% at 0.8 mg/cm^2, depending on substrate, paint color and operator expertise[20]. Thus, there is no reason to reduce the initial assumption of an average 63% FPR for test kits. In estimating the impact of reducing the LBP definition on costs attributable to the RRP rule, we will therefore assume 3,664,041 LSWP events with LBP at 1.0 mg/cm^2, and 4,458,146 LSWP events due to test-kit false positives at 1.0 mg/cm^2, in pre-78 rental housing and owner-occupied housing with a child under 6.

The elimination of the opt-out provision[15] considerably expands the universe of housing subject to the rule. The AHHS[2] estimated that 69% of housing is owner-occupied and 31% rental, while 16% has a resident under 6 years old. This implies that 11% of housing is owner-occupied with a child under 6, so that 42% of pre-1978 housing was subject to the RRP rule with the opt-out provision. Thus, the universe of housing covered by the rule increased by a factor of 100/42 = 2.38 upon elimination of the opt-out provision. This gives an annual estimate of 8,720,418 LSWP events with LBP at 1.0 mg/cm^2, and 10,610,387 LSWP events due to test-kit false positives at 1.0 mg/cm^2, for a total of 19,330,805 LSWP events annually.

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[15] http://edocket.access.gpo.gov/2010/pdf/2010-10100.pdf, reviewed 8/3/11.
[16] *Economic Analysis for the Renovation, Repair, and Painting Program Proposed Rule* (February 2006)
[17] The calculation is approximate because the economic analysis does not provide assumed FPRs at the level of individual renovation types.
[18] www.epa.gov/lead/pubs/testkit.htm#recognized, reviewed 8/3/11.
[19] *Spot Test Kits for Detecting Lead in Household Paint: A Laboratory Evaluation,* NISTIR 6398, May 2000.
[20] www.epa.gov/nrmrl/std/etv/este.html#pcqstklp, reviewed 8/3/11.

Table 9. Estimated Additional Annual Costs for RRP rule, Triggered by Various Lower LBP Definitions				
LBP definition	**0.7 mg/cm^2**	**0.5 mg/cm^2**	**0.3 mg/cm^2**	**0.1 mg/cm^2**
Additional Homes with LBP (%)	10.4%	23.3%	40.0%	85.1%
LSWP Events with LBP (M)	9.63M	10.75M	12.21M	14.16M
LSWP Events Due to Test Kit False Positives (M)	10.04M	9.33M	8.41M	7.18M
Total LSWP Events (M)	19.67M	20.08M	20.62M	21.34M
Increase in LSWP Events (%)	1.8%	3.9%	6.7%	10.4%
TOTAL ADDITIONAL COST ($M)	**$36M**	**$77M**	**$132M**	**$204M**

The assumptions and calculations on which Table 9 is based are as follows:

1. "Additional homes with LBP", as a percentage of homes with LBP at 1.0 mg/cm^2, is calculated from the first row of Table 1.
2. "LSWP Events with LBP" is calculated by increasing the base number 8,720,418 by the percent in the row above.
3. "LSWP Events Due to Test Kit False Positives" is calculated as 63% of the 25.53M (10.73M x 2.38) covered events minus events with LBP.
4. "Increase in LSWP Events" is a percent of the 19.33M events at a LBP definition of 1.0 mg/cm^2.
5. The additional cost of compliance with the RRP rule, due to lowering the LBP definition, is assumed to be due only to "Work Practice Costs". That is, training and certification costs are assumed not to increase. This is reasonable because, regardless of the LBP definition, the rule forces training and certification on most contractors as a matter of competitiveness. Work Practice Costs are estimated at $713M (2005$) in the economic analysis for the proposed rule[16]. This would increase to $1,697M based on elimination of the opt-out provision. The additional costs due to lowering the LBP definition (2005$) are estimated by applying the percent increase in LSWP events to the $1,697M figure. These costs were inflated to 2011 dollars based on the Consumer Price Index by adding 16%[21].

3.6 Total Costs

Costs due to lowering the LBP standard are either one-time (XRF equipment and testing costs), annual (other HUD programs, HUD grant programs and the RRP Rule) or incurred over a period of years (Public Housing and Project-Based Assistance). We will assume that one-time costs are incurred in the first year after lowering the standard, and that costs for Public Housing and Project-Based Assistance are incurred evenly over the first three years. This is similar to the timeframes for these programs in the LSHR. Tables 10-12 below show annual costs for Year 1, Years 2-3 and Years 4 and higher, respectively.

The costs are shown in current (2011) dollars, without inflation to future years or discounting future costs to present value. Inflation rates are expected to remain low for the next several years, as are interest rates. Thus, neither inflation nor net-present-value calculations would have a major impact on the cost figures. In addition, the two calculations cancel each other out to some extent. Typically, the discount rate used for net-present-value calculations is higher than the inflation rate to account for the time value of money. Thus, the result of the two calculations would be a small reduction in the cost figures in Tables 10-12.

[21] http://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/, reviewed 8/3/11.

Table 10. Estimated Annual Costs ($M) at Various Lower Action Levels (First Year)				
	Action Level (mg/cm²)			
Cost Element	**0.7**	**0.5**	**0.3**	**0.1**
XRF Equipment and PCS Testing	$0M	$91M	$91M	$91M
Public Housing	$94M	$183M	$320M	$986M
Project-Based Assistance	$3M	$5M	$9M	$33M
Other HUD Housing Programs	$12M	$27M	$52M	$165M
HUD Grant Programs	$6M	$13M	$23M	$62M
RRP Rule	$36M	$77M	$132M	$204M
Total Cost	**$151M**	**$396M**	**$627M**	**$1,541M**

Table 11. Estimated Annual Costs ($M) at Various Lower Action Levels (Second and Third Years)				
	Action Level (mg/cm²)			
Cost Element	**0.7**	**0.5**	**0.3**	**0.1**
Public Housing	$94M	$183M	$320M	$986M
Project-Based Assistance	$3M	$5M	$9M	$33M
Other HUD Housing Programs	$12M	$27M	$52M	$165M
HUD Grant Programs	$6M	$13M	$23M	$62M
RRP Rule	$36M	$77M	$132M	$204M
Total Cost	**$151M**	**$304M**	**$536M**	**$1,450M**

Table 12. Estimated Annual Costs ($M) at Various Lower Action Levels (Fourth and Later Years)				
	Action Level (mg/cm²)			
Cost Element	**0.7**	**0.5**	**0.3**	**0.1**
Other HUD Housing Programs	$12M	$27M	$52M	$165M
HUD Grant Programs	$6M	$13M	$23M	$62M
RRP Rule	$36M	$77M	$132M	$204M
Total Cost	**$54M**	**$117M**	**$207M**	**$431M**

4.0 CONCLUSIONS

The economic impact of lowering the LBP standard increases sharply with lower values of the new standard. Costs for a new standard of 0.1 mg/cm^2 are from 8 to 10 times higher than for a new standard of 0.7 mg/cm^2, and exceed the costs of the entire RRP Rule as estimated in the Economic Analysis of the proposed rule[16].

The costs are highest in the first three years after the new standard goes into effect, due to new inspections/risk assessments, abatements and lead hazard control activities in Public Housing and Project-Based Assisted Housing required by the LSHR. In later years, the cost impact drops by about two thirds due to completion of required activities in Public and Project-Based Assisted Housing. The remaining costs are attributable to ongoing activities in other HUD programs and renovations covered by the RRP Rule.

The largest cost impacts attributable to lowering the LBP standard are in Public Housing and in private renovations subject to the RRP Rule. These two factors combined typically account for over 80% of the costs. On way to significantly reduce these impacts would be to grandfather Public Housing already abated under the LSHR, i.e., to not make the new standard retroactive in Public Housing.