

Running head: REDUCED RISK ROOFING CHOICES

Developing Educational Materials Detailing Reduced Risk Roofing Choices for

The City of Mill Creek

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### CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed\_\_\_\_\_

### Abstract

The loss of a single family residence in The City of Mill Creek, Washington in August 2009 was facilitated by dry, hot weather and a roofing system incapable of withstanding the fire exposure. Concerned homeowners questioned the safety of the roofing systems required by their homeowner's associations. These individuals were looking to the fire department to provide technical guidance regarding safe roofing choices. The purpose of this research project was to develop educational literature emphasizing residential fire risk reduction through roofing material for constituents of The City of Mill Creek. The following research questions were answered: (a) What is the current fire risk for residential structures in The City of Mill Creek based on utilized roofing materials? (b) What recommendations have other jurisdictions and fire industry specialists made regarding roofing materials to reduce residential fire risk? (c) What fire resistant roofing materials are recommended for The City of Mill Creek by local roofing companies? (d) What is the average cost of the recommended installed roofing materials offering satisfactory fire resistance? (e) What roofing materials give the overall best value and acceptable fire resistance for residential structures in The City of Mill Creek? This research project utilized action research methodology and answered research questions through observation and questionnaires. Results demonstrated that fire risk due to roofing material in some areas of The City of Mill Creek was significant. Correctly installed dimensional fiberglass composite roofing provided the best value and fire resistance for replacement roofs. Distribution of educational literature through Snohomish County Fire District 7 to The City of Mill Creek residents and The City's Building Department should result in policy change within the homeowner's associations. Additionally, operational changes to address wildfire potential within the occluded community of The City of Mill Creek should be addressed.

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## Developing Educational Materials Detailing Reduced Risk Roofing Choices for The City of Mill Creek

In August 2009, following two months of low precipitation and high temperatures in the Pacific Northwest, Snohomish County Fire District 7 received a 9-1-1 dispatch to a single family residential fire located in The City of Mill Creek. The first in company reported a structure fire involving the entire roof. The surrounding trees were igniting, and there were significant exposure issues involving neighboring residences. The home was a complete loss, but surrounding homes were saved through defensive measures. At a community meeting following the event, residents expressed questions about the safety of roofing material choices dictated by community covenants. The individuals at this meeting were looking to the fire department to provide technical guidance to ensure safe roofing choices.

Snohomish County Fire District 7 does not have existing resources to assist homeowners in roofing material choices. The purpose of this research project was to develop educational literature emphasizing residential fire risk reduction through roofing material selection for The City of Mill Creek and its constituents.

In order to adequately investigate the proposed educational literature, the following research questions were used to guide this research: (a) What is the current fire risk for residential structures in The City of Mill Creek based on utilized roofing materials? (b) What recommendations have other jurisdictions and fire industry specialists made regarding roofing materials to reduce residential fire risk? (c) What fire resistant roofing materials are recommended for The City of Mill Creek by local roofing companies? (d) What is the average cost of the recommended installed roofing materials offering satisfactory fire resistance? (e) What roofing materials give the overall best value and acceptable fire resistance for residential structures in The City of Mill

Creek? This research project utilized action research methodology. The research questions were answered using personal observation and questionnaires.

### Background and Significance

Snohomish County Fire District 7 is located in southeast Snohomish County, Washington and covers approximately 50 square miles of rural, suburban and one incorporated urban area. District 7 provides fire, EMS and technical emergency services to a population of 65,000.

Located on the northwest boundary of District 7, The City of Mill Creek contracts for emergency services with Fire District 7. The City of Mill Creek has a population of over 18,000 residents and an estimated 4,769 total housing units spread over approximately 5 square miles (City of Mill Creek, 2009a, ¶ 2). Incorporated in 1983, The City of Mill Creek was developed as a planned community designed to provide its population with “a more equitable tax structure and improved police protective services” (City of Mill Creek, 2009b, ¶ 8). Additionally, The City’s goals included ensuring “neighborhoods that are complementary to the high quality and unique suburban residential character of the community” (City of Mill Creek, 2009c, p. IV-1). The City derived its image from “an abundance of natural vegetation indigenous to the northwest” and used this element to unify its neighborhoods (City of Mill Creek, 2009c, p. XII-10). As The City expanded, much of the surrounding forest and vegetation was protected and served as neighborhood buffers, connecting trails and parks. Most recent annexes (since 1993) of existing neighborhoods on the outskirts of Mill Creek reflected more typical county building practices of high density housing without forested or naturalized buffers.

As of December 2009, the single family residences within The City of Mill Creek were divided into 26 homeowner’s associations, with only a few recently annexed divisions remaining unorganized. Each neighborhood association was tasked with maintaining the overall natural

northwest image and continuity of The City of Mill Creek through its covenants and rules. One of the ways the desired appearance was achieved was through architectural controls and the specification of allowable building materials.

With few exceptions, the original neighborhoods of incorporated The City of Mill Creek utilized natural cedar shake or curved tile roof coverings. Many of these original roofs are still in place. A number of the homeowner's associations have expanded their list of acceptable roofing materials to include other options, but little thought has been given to the fire ratings of these specified roofing systems.

Some residents of The City of Mill Creek chose to consider the fire of August 2009 a warning. In their opinion, the practice of building high density housing with predominantly cedar shake roofs in a heavily forested area was risky. Adding to their concern was the memory of a 2003 fire 20 miles southeast of The City of Mill Creek in Carnation, Washington. This similar community experienced a brush fire that threatened hundreds of homes. The publicity following this fire struck a chord with some The City of Mill Creek residents: "More than 90 percent of wildfires here now threaten private homes, many of them situated on narrow cul-de-sacs, framed with dense shrubbery and topped with attractive -- and highly flammable -- cedar shakes" (Rowe, 2004, ¶ 4).

The problem of choosing roofing material ultimately belongs to the citizens of The City of Mill Creek and their homeowner's associations. It is the responsibility of Snohomish County Fire District 7 to recognize, draw attention to and help reduce community fire risk when issues are identified. Roofs in the original areas of The City of Mill Creek are aging and replacement of these roofs is imminent. It is timely and appropriate that Snohomish County Fire District 7



assists these homeowners in identifying acceptable fire safe roofing materials that will reduce their fire risk.

In 2009, the United States Fire Administration identified four operational objectives in their Operational Policies and Procedures. Two of these objectives apply to the goals of this paper: (a) “Reduce risk at the local level through prevention and mitigation”, and (b) “Improve local planning and preparedness” (United States Fire Administration, 2009, p. 34). Assisting The City of Mill Creek residents in identifying fire-resistant roofing material for use within The City will serve to directly reduce the local community fire risk. Addressing the fire resistant nature of roofing materials required by the homeowners associations will raise awareness of the potential impact of policy making without concern for community fire risk. Ultimately, this should serve to improve the local planning and fire preparedness.

This project related to the Executive Analysis of Community Risk Reduction course of the Executive Fire Officer Program (National Fire Academy, 2009, p. 1-3). This study supported the assessment and reduction of community risk through the analysis of current community roofing practices and the development of educational literature that should promote the use of fire safe roofing choices for The City of Mill Creek.

#### Literature Review

The City of Mill Creek presents as a typical suburban high density bedroom community. It has purposefully differentiated its neighborhoods with a naturalized setting, drawing a sense of affluence from the richness of the surrounding forest (City of Mill Creek, 2009c, p. XII-10). According to Walsh (2008), a community with this description is an occluded community:

The Occluded Community generally exists in a situation, often within a city, where structures abut an island of wildland fuels (e.g., park or open space). There is a clear line

of demarcation between structures and wildland fuels. The development density of a occluded community is usually similar to those found in an interface community, but the occluded area is usually less than 1,000 acres in size. (p. 30)

The National Archives and Records (2001) defines the occluded community as an urban wildland interface, “where humans and their development meet or intermix with wildland fuel” (p. 29). In these communities, wildland fire prevention, theory and tactics must be considered for effective fire protection.

The process of wildfires is inevitable. They may be sparked by human intervention or through natural events such as lightning (Firewise Landscapes, (2001) p. 2). A residential fire is generally ignited from a wildfire by one of three methods:

By direct contact with the fire, by radiative heating, and by firebrands (burning materials lifted by the wind or the fire’s own convection column). Protection of homes must address all three. Research has identified the keys to protecting structures: having a non-flammable roof; clearing burnable materials that abut the house (e.g., plants, flammable mulch, woodpiles, wooden decks); and landscaping to create a defensible space around the structure. (Gorte, (2008) ¶ 3)

According to Mitchell and Patashnik (2007),

Examination of the historical record of wildland fires reveals that firebrands play a key role in the ignition of structures. Restricting firebrand entry, removing ignition points, and extinguishing embers are methods that can be used to significantly reduce structure loss rates on the Wildland-Urban interface.” (¶40)

Researchers have noted:

The most vulnerable part of the house to firebrands is the roof. Because of its angle, the roof can catch and trap firebrands. If the roof is constructed of combustible materials such as untreated wood shakes and shingles, the house is in jeopardy of igniting and burning. (Smith, Christopherson, and Adams, (n.d.) ¶ 6)

Smith et al. (n.d.) further notes “the most cost effective method of increasing house survivability during a wildfire event is the presence of a fire resistant roof” (¶ 13).

The ASTM E108 and UL 790 tests are commonly used to classify roofing materials according to their fire resistance. Both tests separate roofing material into three classification levels: A, B, and C (Firewise Landscapes, (2001) p. 9).

Class A roof coverings are effective against severe fire test exposures....Class C roof coverings are effective against light fire test exposures. Under such exposures, roof coverings of this class afford a light degree of fire protection to the roof deck, do not slip from position, and are not expected to produce flying brands. (Underwriters Laboratories, (2010) ¶ 3)

A caveat in test standard documentation is that “These fire test methods do not provide a basis to compare expected performance under all actual fire conditions” (Underwriters Laboratories, (2010) ¶ 6).

The Underwriters Laboratories’ UL 790 and ASTM International’s ASTM E108 tests are used to define minimum standards for fire resistance of roofs used in residential construction. The International Building Code, a construction and fire industry standard, currently calls for all single family residences to be roofed with Class C or better roof coverings for those jurisdictions that require compliance (International Code Council, (2006) p. 265). The City of Mill Creek

utilizes the International Building Code to guide the building practices within The City (Code Publishing, (2009) ¶ 5).

According to the National Fire Protection Association, choosing a fire resistant roof covering is not enough to adequately protect the home. The installation of the roof covering is critical to its fire performance. An improperly installed roof cannot be expected to perform according to its measured standard.

It is important to realize that the roofs are installed in a very specific manner for testing.

For this reason, the class ratings should be thought of as roof covering assembly tests. In other words, in order to meet the standard at which it is rated, a roof covering material should be installed in the same manner as described in its listing. (National Fire Protection Association, (2008) p. 21)

Additionally, maintenance is imperative to protect the fire resistant qualities of the roof covering over time. Missing or warped roof covering can leave the roof susceptible to fire. National Fire Protection Association 1144 states a roof should be examined “for gaps in the roof covering that might allow small wind-blown firebrands to penetrate under the coverings and ignite materials below” (National Fire Protection Association, (2008) p. 16).

Many roofing materials fit neatly into a single rating category. Tile, for example, is considered non-flammable and is classified Class A fire resistant in ASTM International and Underwriters Laboratories testing (MCA, (2010) ¶ 9), resisting severe fire exposure (Underwriters Laboratories, (2010) ¶ 3). The cedar shake industry produces roofing that has materials in two categories (B and C), depending on the treatment, installation technique and quality of the shake. Cedar covering can also be used as part of a Class A roofing system if it is placed over fiberglass underlayment (Christensen, (2006) p. 213). The cedar shake industry

supports the results of rigorous testing of their products through testing agencies: “In areas prone to wildfires, pressure impregnated fire retardant treated cedar shakes and shingles are a wise choice” (Christensen, (2006) p. 213).

An Orange County Grand Jury (2003) report entitled “Wood Roofs are Dangerous” allows that “The Department of Agriculture’s Forest Product Laboratory, independent testing laboratories and manufacturers all indicate that the treatment process renders the wood fire retardant for the life of the roof” (p. 5). However, the report goes on to say, “The City of Los Angeles has found that in their tests, the exposed edges created by cutting during the installation will sustain combustion” (p. 5). Further, the same report notes, “There remains a debate among officials of the fire resistance of treated wood roofs and the longevity of the treatment. In place treatment of roofs has not proven successful” (p. 5).

A study released by the National Institute of Standards and Technology examined the burning characteristics of variable wood products. Their firebrand testing showed that “the lighter wood species, western red cedar and balsa, appear to burn to completion via glowing surface combustion” (Bryner, (2000) p. 375). Conversely, they found that denser wood species self-extinguish with mass intact when exposure to flame is removed. They concluded their test “seems to further indite cedar shakes and shingles, which start with an aerodynamically advantageous shape, burn well via surface glowing after flaming ceases, and have grain orientations that encourage edge burning” (p. 375).

Following the San Diego Scripps Ranch Fire in October 2003, researchers found “It was evident that a house’s having a wood-shake shingle roof was a very good predictor of whether it survived” (Mitchell and Patashnik, (2007) ¶ 18). The results of this single fire do not stand alone. In a related fire on Grainwood Way, also in San Diego, there was a 100% correlation

between having a wood roof and home destruction (Mitchell and Patashnik, (2007) ¶ 22). These researchers suggest a possible reason for their findings could be found in a bias against wood roofs. “When firefighters have limited resources, they will concentrate their efforts on saving houses they think have a better chance of survival” (¶ 22).

However, additional findings by Mitchell and Patashnik (2007) could not be attributed to firefighter bias. Spanish-style curved tile roofs demonstrated poor fire resistance when compared to newer stone-covered steel and flat tile/concrete fire-resistant roofs. In fact, “The curved tile houses showed no significant difference from the houses with a wood-shake shingle roof” (¶ 29). Although no definitive explanation is given for the lower than expected flame resistance of these roofs, the authors suggest the “gaps between tiles that small firebrands could infiltrate” allowed a possible point of ignition (¶ 31).

The Pacific Northwest Wildfire Coordinating Group (2006) states homeowners with existing combustible roofs have few options. “There are no long-term reliable measures available to reduce roof vulnerability to wildfire other than re-roofing with fire resistant materials” (p. 11). In some areas, automated spray systems have been tried as an alternative to re-roofing. These systems are relatively rare, and their use has not been scientifically proven effective (Mitchell and Patashnik, (2007) ¶ 58).

Although Mitchell and Patashnik’s study was conducted in California, their findings apply in more temperate Washington State. The National Fire Protection Association (2009) notes that “generally speaking, areas subject to long periods of hot, dry, windy weather are more at risk from wildfire. However, short periods of this kind of weather during your area’s “dry season” mean that your wildfire risk increases” (p. 30).

A typical Pacific Northwest dry season is approximately three months. July temperatures average around 75 degrees Fahrenheit (*Seattle climate data temperature summary*, 2010) with precipitation averages at .79 inches (*Seattle climate data precipitation summary*, 2010). The July 2003 wildfire in Carnation, Washington happened during a summer that was unusually hot and dry for the Pacific Northwest, with July temperatures averaging close to 80 degrees Fahrenheit (*Seattle climate data temperature summary*, 2010) and precipitation in the same month at .06 inches (*Seattle climate data precipitation summary*, 2010). Climatologists from the University of Washington predict more similar summers. Their models project:

increases in annual temperature of, on average, 1.1°C (2.0°F) by the 2020s, 1.8°C (3.2°F) by the 2040s, and 3.0°C (5.3°F) by the 2080s, compared with the average from 1970 to 1999, averaged across all climate models. Rates of warming range from 0.1 to 0.6°C (0.2° to 1.0°F) per decade. Projected changes in annual precipitation, averaged over all models, are small (+1 to +2%), but some models project an enhanced seasonal cycle with changes toward wetter autumns and winters and drier summers. (Mote and Salathé, (2009) p. 1)

In response to concerns regarding flammable roofing materials, some jurisdictions have removed choice from the homeowner. The City of Los Angeles and Santa Barbara County notably prohibit new wood roofs (Orange County Grand Jury Report, (2003) p. 6). In Colorado, the General Assembly has removed the right of the homeowner's association to dictate flammable roofs, including cedar (Colorado General Assembly, (2006) ¶ 2). Insurance companies have responded to the risk by increasing premiums for homes with wood roofs, or in some cases, refusing coverage altogether (Orange County Grand Jury, (2003) p. 1).

Review of product information for each recommended product from the roofer questionnaire revealed the following information about fire resistance and warranty:

CertainTeed Landmark TL had a lifetime warranty for the original owner and was rated Class A fire resistant (CertainTeed, (2008) ¶ 17-18). CertainTeed Presidential Shake TL was similarly qualified with a lifetime warranty and Class A fire resistance (CertainTeed, (2009a) ¶ 12-13). CertainTeed Presidential Shake also came with a lifetime warranty and Class A fire resistance (CertainTeed, (2009b) ¶ 19-20). Pabco Paramount Advantage had a lifetime warranty for the original owner, and was also rated Class A fire resistant (Pabco, (2008) ¶ 1-3). The Owens Corning Woodmoor collection also carried a lifetime warranty for the original owner and was rated Class A fire resistant (Owens Corning, (2010) ¶ 1-3). The IKO Armourshake product line was similarly warranted for a lifetime and had Class A fire resistance (IKO, (2009) ¶ 6).

Review of the products currently accepted within The City of Mill Creek, as reported by homeowner's associations, demonstrated the following attributes: Cedar shakes from The Teal-Jones Group carried a warranty of 20 to 50 years (Teal-Jones Group (2010a) ¶ 1) and were rated Class C or B fire resistant, depending on the cut and installation (Teal-Jones Group (2010b) ¶ 4). Spanish curved clay tile products were found with 50 year warranties (MCA, (2010) ¶ 15) and were rated Class A in fire resistance (MCA, (2010) ¶ 9). Decra Stone Coated metal roofing systems were warranted for 50 years and had a Class A fire resistance (Decra, (2010) ¶1). Country Manor Shakes, also a metal roofing system, had a lifetime warranty, but literature available from the company did not specifically address fire rating (Classic Metal Roofing, (2010) ¶ 11). Resources citing the fire rating of general metal roofing systems stated that metal roofing systems may range from a Class C to a Class A in fire resistance, depending on the product and installation techniques (*Roofing materials comparison sloped roof application*,



(2010) ¶1). Review of Euroshield's Euroslate and Euroshake recycled rubber roofing systems revealed that these products came with a 50 year warranty, and were rated Class C in fire resistance (Euroshield, (2009) p. 1).

### Procedures

This applied research project used the action research methodology to answer: (a) What is the current fire risk for residential structures in The City of Mill Creek based on utilized roofing materials? (b) What recommendations have other jurisdictions and fire industry specialists made regarding roofing materials to reduce residential fire risk? (c) What fire resistant roofing materials are recommended for The City of Mill Creek by local roofing companies? (d) What is the average cost of the recommended installed roofing materials offering satisfactory fire resistance? (e) What roofing materials give the overall best value and acceptable fire resistance for residential structures in The City of Mill Creek?

A list of the known existing Homeowner's Associations within The City of Mill Creek (see Appendix A) and their contact information was obtained from city officials. For the purposes of this study, the overall list was reduced to the 26 Homeowner's Associations comprised of single family residences (see Appendix B). Of the 26 homeowner's associations, 20 had contact information sufficient to attempt contacting them. A Homeowner's Association Roofing Letter (see Appendix C) requesting covenant roofing requirements was sent to each of the Homeowner's Association's contacts, either by email or mail, depending on the nature of their contact information. Responses were compiled in an Excel spreadsheet to assist researchers in understanding what roofing material types were currently allowed in The City of Mill Creek (see Appendix D). In preparation for collecting observable roofing data described below, the list of allowable roofing was then used to establish four categories of roof types within The City of

Mill Creek. These categories included: Cedar Shake or Shingle, Spanish Style Curved Tile, Composition Shingle, and Other (including engineered rubber, metal, other tile applications). The choice of categories reflected, in part, the ease of distinguishing one roof type from another. Researchers were able to determine real cedar from a man-made product due to irregularities in the true wood roof. Likewise, the identification of Spanish Style Curved Tile from similarly styled engineered rubber or metal roofing systems was facilitated by the irregularities of the Curved Tile roof. Composition shingle was sufficiently distinctive in appearance to create an individual group. However, clearly delineating differences between engineered rubber, metal and other systems (especially given coating processes) was not as reliable. For the purposes of this evaluation, it was decided to group these materials.

Existing roofing data was collected to help determine the current fire risk for single family residential structures in Mill Creek based on roofing material. The most recent (2008) address map of The City of Mill Creek (see Appendix E) was obtained from city officials. This map delineated the current city boundaries, each road, every distinct subdivision and all addresses within the city boundaries. The City of Mill Creek address map was used as a reference and recording tool.

On December 29-30, 2009 from 9am to 3pm, the researcher systematically reviewed each single family residence in every neighborhood within The City of Mill Creek, documenting the roofing material. For safety reasons, an assistant drove the vehicle while the researcher performed documentation. During observation, each address on the map was designated either *C* for Cedar, *T* for tile, *Co* for composition or *O* for other (see sample, Appendix F).

For purposes of evaluating the data, roof data for each subdivision in The City of Mill Creek was entered into a Microsoft Excel spreadsheet by category (Appendix G). These

categories were summed to provide a total of categorized roofs. To ensure validity, the sum of the categorized roofs was compared to the overall sum of single family residences within the neighborhoods (as tabulated from the map). If a discrepancy existed, both the roof types and overall subdivision's residence sum were recounted. In cases where there was any question regarding map markings, the neighborhood was revisited for clarification.

A percentage was calculated for each roof type within a subdivision. These neighborhoods were placed on The City of Mill Creek map (see Appendix H) by subdivision to find existing patterns of roof demographics. Patterns were visually evaluated for significance with regards to fire safety.

To ascertain the roofing material recommendations of fire prevention specialists, a Fire Jurisdiction Roofing Recommendations questionnaire (see Appendix I) was distributed by email and hand delivery to fire prevention officers and training officers in 20 jurisdictions located in the Puget Sound/Cascade foothills region. These Northwest jurisdictions were targeted because they share similar building construction, climate and geographic demands to those found in Snohomish County Fire District 7.

The questionnaire asked respondents if they had roofing guidance for their constituents. If the answer was yes, a follow-up question asked them to detail their recommendations. Additional room was provided for comments. Answers from the Fire Jurisdiction Roofing Recommendations questionnaire were compiled into an Excel spreadsheet (see Appendix J) for recording and evaluation purposes.

Finally, the Roofing Recommendations for The City of Mill Creek questionnaire (see Appendix K) was delivered to available roofing businesses observed to be active in The City of Mill Creek. It was decided to personally deliver the questionnaire in order to allow the

researcher to answer any individual business' questions or concerns for the reasons behind the study. Part I of the questionnaire asked roofing companies to cite their recommendations for roofing materials for The City of Mill Creek, give average installed prices for this material and list major features supporting their recommendation. This was designed to help the researcher answer the questions: (c) What fire resistant roofing materials are recommended for the City of Mill Creek by local roofing companies? and (d) What is the average cost of the recommended installed roofing materials offering satisfactory fire resistance? Part II asked the roofing company to provide comparative pricing on existing allowable roofing materials. This information was required in order to produce a final answer to e) What roofing materials give the overall best value and fire resistance for residential structures in The City of Mill Creek? Results of the Roofing Recommendations for The City of Mill Creek questionnaire were compiled in a Roofer Recommendations spreadsheet (see Appendix L) for tracking and analysis.

One limitation to the research in this study was the lack of updated information for the homeowner's association's contacts. In many cases, the information dispensed by The City was not deliverable. Of those that were contacted, relatively few chose to respond to the request for information. This may have impacted the establishment of adequate roofing categories due to the incomplete list of currently acceptable roofing materials.

Another limitation was the use of the category *Other* during the roofing data collection. These roof types were placed together mostly because they were not readily distinguishable from one another, not because they shared similar fire ratings. No real assumptions could be made as to the significance of this group's fire risk because of the dissimilarity of products included in this category.

An additional limitation to the research in this study was the potential that roofs were categorized incorrectly. Although the categories were set up with accurate identification of materials in mind, this still did not remove the possibility that some roofs were incorrectly labeled. Additionally, a few roofs were significantly shaded or visually blocked by the tree canopy, moss-covered or held significant amounts of debris which further complicated the process of identification. Although the numbers of such houses was limited, misidentification would affect the final data.

Further, the classification of these roofs is a picture in time, which in itself is a limitation. Roofers operating in The City of Mill Creek continue to alter the roofing data weekly; results drawn from data collected in December, 2009 will be outdated almost immediately. Finally, the delivery of the roofer questionnaires was limited to companies that had storefronts or made themselves otherwise available and were therefore accessible. Many roofers operate out of their homes, and this practice eliminated these roofing companies from having their recommendations included in this study. The resulting recommendations therefore came from a limited sample of roofing professionals.

## Results

Results from the above described research procedures provided the basis for developing educational literature emphasizing residential fire risk reduction through roofing material selection. First, a baseline understanding of allowable roofing was developed through responses from The City of Mill Creek's homeowner's associations to the Homeowner's Association Roofing Letter (see Appendix D). Of the 20 associations contacted, nine responded with current roofing requirements, representing 2,366 (60.19%) out of the 3,931 total single family residences within The City of Mill Creek. Responses indicated that The City of Mill Creek residences

potentially had cedar shakes and shingles, curved tile, dimensional fiberglass composition, engineered rubber, and metal roofing systems. Although brands of composition, rubber, and metal roofing systems were specified in many cases, there was no such specification for curved tile or cedar shake. Additionally, no level of fire resistance or installation procedure was specified for any roofing material.

The researcher visually evaluated 3,931 single family residential properties in The City of Mill Creek, marking each address with one of the four roofing categories: wood shake or shingle (*C*), Spanish curved tile (*T*), composition (*Co*), or other (*O*). Results demonstrated 1,961 (49.98%) homes with wood shake or shingle, 74 (1.88%) homes with Spanish curved tile, 1,796 (45.69%) homes with composition roofs and 100 (2.54%) homes with Other category roofs.

The distribution of the roofing types within The City of Mill Creek (see Appendix G) demonstrated a significant pattern. The frequency of a roof type varied with area of the city and was reflected by the time of incorporation, creating a highly stratified roofing condition (see Appendix H). The original The City of Mill Creek incorporation and its surrounding annexations through 1992 (all adjacent to the original boundary) share similar roofing statistics. Of the 2,665 total homes in pre-1993 The City of Mill Creek, 1,888 (70.84%) had cedar shake roofs. Forty-two of these roofs had Spanish curved tile (1.58%), 644 were composition roofs (24.17%), and the roofs of 91 homes (3.41%) were categorized as Other.

Areas annexed after 1992 were established county-regulated communities with shared roofing trends. Of the 1,266 residences located in these areas, 73 homes had cedar roofs (5.77%), 32 were roofed with curved tile (2.53%), 1,152 had composition roofs (91.00%) and 9 homes were categorized as Other (0.71%).

According to the recorded observations of roofing types in The City of Mill Creek, fire risk potential was variable depending on the area. In concentrated areas of The City of Mill Creek (the incorporation and annexations prior to 1993), over 70% of the homes had cedar roofs. In other areas incorporated in 1993 and after, composite roofs predominated.

The Fire Jurisdiction Roofing Recommendations questionnaire was distributed to 20 fire jurisdictions in the Puget Sound/Cascade foothills region (see Appendix J). Twenty (100%) of the jurisdictions responded. Three out of 20 jurisdictions (15.00%) had recommendations pertaining to roofing within their area. Snohomish County Fire District 26 and Snohomish County Fire District 3 cited Firewise counsel as the basis for their recommendation that constituents should not use cedar roofs. Woodinville Fire and Life Safety specifically advocated fire resistant tile or composition roofs. All other responding jurisdictions (85.00%) indicated they had no roofing guidance for their citizens.

Of five roofing companies receiving the Roofing Recommendations for The City of Mill Creek questionnaire, four (80%) gave responses (see Appendix L). The four responding companies universally recommended dimensional fiberglass composite roofing as the best roofing choice for The City of Mill Creek. Three of four (75%) roofing companies recommended CertainTeed Presidential TL for The City of Mill Creek. Two of the four (50%) recommended the Pabco Paramount Advantage and CertainTeed Landmark TL products. Other individually recommended materials (one out of four, or 25%) included CertainTeed Presidential, Owens Corning Woodmoor and the IKO Armourshake product lines. The roofing companies indicated that all of the recommended products were chosen for reasonable price, excellent warranty and fire rating.

Each of the four responding local roofing companies listed average installation prices for their recommendations. Several of the companies noted that the actual price would vary depending on need for underlying sheathing, pitch of roof and numbers of valleys and hips. Local average installed price for CertainTeed Presidential TL (based on pricing from four companies) was \$591/square installed. Local average installed price for Pabco Paramount Advantage (based on pricing from four companies) was \$559/square installed. Local average installed price for CertainTeed Landmark TL (based on two company's response) was \$420/square installed. Local average installed price for CertainTeed Presidential (based on one company's response) was \$540/square installed. Local average installed price for Owens Corning Woodmoor (based on one company's response) was \$600/square installed. Local average installed price for IKO Armourshake (based on one company's response) was \$400/square installed. The price range for recommended roofing products was \$400-\$600/square installed.

Price points for existing allowable roof products in The City of Mill Creek ranged widely. Of the known allowable materials, Presidential TL and Paramount Advantage were the least expensive at \$591 and \$551, respectively. Curved tile was most expensive at \$1,000/square installed. Rubber systems averaged \$900/square installed and metal systems ranged from \$680-\$790/square installed, depending on the specific product line utilized. At \$630/square installed, cedar roofing products were the closest product in price to the roofer recommended products. The questionnaire submitted by Robert's Rapid Roofing included additional information for the cedar product priced; this roofer specified a product with a 25-35 year life (a heavy cedar shake roof) and a fire rating of B or C.



To arrive at the best overall value, three measurable attributes of the roofing systems were compared: pricing, fire resistance and warranty. Cedar (an existing product) was closest in price to the recommended products. However, when considering warranty and fire rating, the 25-35 year warranty and B or C fire rating would indicate cedar is not as good of an overall value. The metal, rubber and tile systems were more expensive alternatives. Metal pricing started at 12% more than the highest priced recommended dimensional fiberglass composite; if its warranty and fire rating was deemed adequate, it may be considered a good value, but did not offer *best* value to the homeowner. Rubber roofing systems were priced 33% more than dimensional fiberglass. Similarly, it does not offer *best* value by price alone. Tile, at 40% more than the highest priced composite roofing, cannot be included in best value by price. In final analysis of the questionnaire results, the following roofing materials recommended by the roofing companies were most consistent with overall best value: CertainTeed Presidential TL, Presidential and Landmark TL, Pabco Paramount Advantage, Owens Corning Woodmoor, and IKO Armourshake.

The educational literature resulting from this research is a brochure entitled *Fire Safe Roofing: A Homeowner's Guide* (see Appendix M). It is intended to help the homeowner and community leaders understand the importance and process of choosing a fire safe roof. The brochure outlines the fire rating classification system and encourages the choice of Class A rated roofing surfaces. It points out the firebrand as a common initiating mechanism for structure fire when fire occurs outside a building, and discusses the importance of considering an impenetrable roof design.

The literature addresses the importance of choosing a qualified roofer for proper installation and protection of fire rating. Additionally, the *best value* roofing recommendations

are cited to assist homeowners with their roofing decisions: CertainTeed Presidential TL, Presidential and Landmark TL, Pabco Paramount Advantage, Owens Corning Woodmoor, and IKO Armourshake. A brief discussion of what makes these products *best value* (fire rating, warranty and price) is included.

### Discussion

The literature review of residential fire risk as determined by roofing material uncovered a large amount of resources pertaining to urban-wildland interface. Within the urban-wildland interface, firebrands are a primary source of residential fire, and roofing choice can be a strong indicator of residence survivability (Gorte, (2008) ¶ 3). An unexpected discovery while reviewing urban-wildland literature on roofing fire mechanisms was the definition of an occluded community: “The Occluded Community generally exists in a situation, often within a city, where structures abut an island of wildland fuels (e.g., park or open space)...the occluded area is usually less than 1,000 acres in size” (Walsh, (2008) p. 30).

This definition precisely described The City of Mill Creek. It has been their vision to maintain a forested park-like community image (City of Mill Creek, 2009c, p. XII-10). An unintentional result of their preferred image is the classification of their city as an urban wildland interface community. When reviewing The City of Mill Creek and its fire risk associated with roofing material selection, it was relevant to apply urban wildland fire prevention considerations.

In wildland fire situations, firebrands are a key source of ignition. Roofing materials that maximally resist fire reduce residential loss most effectively (Mitchell and Patashnik, (2007) ¶40). The City of Mill Creek has concentrated areas of residences with cedar shake roofs. In fact, in areas incorporated into The City prior to 1993, 70.84% of homes currently have cedar shake roofs. Review of industry literature regarding cedar shakes reveals a Class B or C fire

rated surface, at best (Teal-Jones Group (2010b) ¶ 4). These roofs are maximally capable of withstanding moderate fire exposure under testing conditions (Underwriters Laboratories, (2010) ¶ 3).

However, studies demonstrated upon installation that these roofs lose some of their factory fire resistance and for older cedar roofs, additional resistance was thought to be lost due to weathering over time (Orange County Grand Jury (2003) p. 5). Bryner (2000) reported that cedar had a propensity to catch fire at the edge, and once ignited, burned to completion. Further, upon ignition, it emitted firebrands that tended to also burn to completion (p. 375). Supporting these assertions was the results of forensic studies summarized by Mitchell and Patashnik (2007). Their findings concluded that wood roofs are an excellent predictor of the destruction of a home in wildland fire conditions (¶18).

In areas of The City of Mill Creek, there is significant fire risk for the homes based on the prevalence of cedar shake roofing. This risk increases in the hot and dry summer months (National Fire Protection Association (2009) p. 30) and is predicted to become greater over the next number of decades according to University of Washington climatologists (Mote and Salathé, (2009) p. 1). The risk of a cedar shake roof in an urban wildland interface community is significant enough that insurance companies are increasing premiums for homes with wood roofs, or at times, completely denying coverage (Orange County Grand Jury Report, (2003) p. 1).

One unexpected finding was from the forensic data collected by Mitchell and Patashnik. Ceramic tile was given a Class A fire resistance since the tile itself does not burn (MCA, (2010) ¶ 9). Regardless of the rating, ceramic tile demonstrated no difference in home survivability when compared to cedar (Mitchell and Patashnik, (2007) ¶29). Only 1.88% of homes in The City of Mill Creek are roofed using ceramic tile; this finding does not significantly add to the fire risk in The City. However, it does add weight to the disclaimer that fire ratings do not necessarily

reflect performance in the field (Underwriters Laboratories, (2010) ¶ 6) and highlights that roofing systems that allow penetration by firebrands should not be considered a viable fire resistant roofing option for The City of Mill Creek.

Of twenty fire departments responding to the Fire Jurisdiction Roofing Recommendations questionnaire, only three (15.00%) had recommendations increasing fire safety through roofing material. These results are not surprising, given the lower incidence of wildfire in the Puget Sound/Cascade foothills region. However, homeowner guides developed for use in the Pacific Northwest acknowledge the need for homeowners with wood roofs to re-roof and state it is the only reliable way to reduce roof susceptibility to fire (Pacific Northwest Wildfire Coordinating Group (2006) p. 11). In some jurisdictions where wildfire is prevalent and fire prevention efforts are more keenly focused on preventative measures, legislation is in place dictating the replacement of existing cedar roofs (Orange County Grand Jury (2003) p. 6) and prohibiting homeowner's associations from requiring flammable roofing materials (Colorado General Assembly, (2006) ¶ 2).

In weighing roofing recommendations for The City of Mill Creek, avoiding flammable roofs (the tact that Snohomish County Fire District 26 and 3 has chosen) appears obvious. When considering the comment by Smith et al. (n.d.): “the most cost effective method of increasing house survivability during a wildfire event is the presence of a fire resistant roof” (¶13), a recommendation for maximal fire resistance is clearly most consistent with risk reduction. For The City of Mill Creek, a wildland interface community, a recommendation of Class A roof surfaces would be most appropriate.

Local roofing companies recommended specific brands of composition roofing over all other materials as best for The City of Mill Creek. It was their estimation that this roofing

material provided excellent price, warranty and fire resistance. Specific roofing materials recommended included CertainTeed Presidential TL with a lifetime warranty and Class A fire rating (CertainTeed, (2009a) ¶ 12-13), CertainTeed Presidential with a lifetime warranty and Class A fire rating (CertainTeed, (2009b) ¶ 19-20), CertainTeed Landmark TL with a lifetime warranty and Class A fire rating (CertainTeed, (2008) ¶ 17-18), Pabco Paramount Advantage with its lifetime warranty and Class A fire rating (Pabco, (2008) ¶ 1-3), Owens Corning Woodmoor with a lifetime warranty and Class A fire rating (Owens Corning, (2010) ¶ 1-3), and IKO Armourshake with its lifetime warranty and Class A fire rating (IKO, (2009) ¶ 6). All of these products are described as dimensional fiberglass composition roof surfaces and are effectively competitive roofing products. Interestingly, no roofing company recommended any other type of roofing material for The City of Mill Creek.

At the time of this study, the least expensive of the recommended roofing material was IKO Armourshake, at \$400/square installed. CertainTeed Landmark TL was next in price, averaging \$420/square installed, an increase of 5% over the IKO product. CertainTeed Presidential was priced at \$540/square installed, 35% more than IKO Armourshake. Pabco Paramount Advantage's average price was \$559/square installed. This represented a price increase of 40% over IKO. CertainTeed Presidential TL's average price was \$591/square installed, a price increase of 48% over IKO. Finally, Owens Corning Woodmoor was quoted at \$600/square installed, a difference of 50% more than IKO Armourshake. Although there was a significant variation in pricing across these products (50%), as a group they were in the lower price range of the current products allowed by the homeowner's associations, rendering them acceptably priced in The City of Mill Creek market.

Roofing materials that gave the best overall value and fire resistance for the residential structures in The City of Mill Creek were dimensional fiberglass composition products. Their design provided superior warranty and fire resistance. The scope of this paper was to identify products with “best value” as defined by price, warranty and fire rating. It is important to note, however, that there are other products on the market equally durable and effective against fire that are relatively more expensive, and therefore, do not meet the definition of *best value* as defined in this research.

Proper installation of any roof is critical to its fire resistance. The best roofing material may be rendered ineffective in fire resistance if not appropriately installed (National Fire Protection Association, (2008) p. 21). The verification of roofer credentials in the product line prior to selecting a company is prudent and will safeguard the quality and longevity of the roof.

The distribution of educational literature encouraging the use and proper installation of Class A fire resistant roofing will address current concerns from constituents and increase awareness of building material choices for fire safety within The City of Mill Creek. Increasing individual awareness of how building material choices affect fire vulnerability will aid in reducing community risk through changes in the homeowner’s associations’ covenants. For Snohomish County Fire District 7, convincing its citizens to utilize fire resistant roofing choices will result in less potential exposures when fire does occur in The City of Mill Creek.

### Recommendations

The loss of a single family residence in The City of Mill Creek in August, 2009 was facilitated by dry hot weather and a roofing system that was not capable of withstanding the fire exposure. The surrounding forest canopy had caught fire, and neighboring houses were immediately threatened. Questions from concerned homeowners regarding the safety of the

roofing systems required by their homeowner's associations followed. These individuals were looking to the fire department to provide technical guidance regarding safe roofing choices.

The educational literature generated from this study process should be adopted by the fire prevention personnel and department members with Snohomish County Fire District 7 and made available for concerned constituents from The City of Mill Creek. The resident-governed homeowner's associations of The City of Mill Creek make and enforce the decisions regarding allowable roofing materials. Educating residents will lead to fire-safe changes in roofing material policy within the associations.

Copies of the literature should be sent to the Building Department in The City of Mill Creek, and presented at The Joint Board of Snohomish County Fire District 7 and The City of Mill Creek to raise awareness at higher levels. Homeowner's associations that were successfully contacted for questionnaire purposes should also receive copies to assist them in drafting future policy.

The recognition of The City of Mill Creek as an occluded community vulnerable to the potential risks of wildfire should change the response of Snohomish County Fire District 7 operations during the dry summer months. Each residential fire response to The City of Mill Creek should be considered both a structure fire as well as a possible wildland interface fire. Crews should be educated to increase awareness of this potential hazard.

Although these results were intended for single family residences within The City of Mill Creek, they should be applied to the rest of the residences in Snohomish County Fire District 7, including multifamily residences within the fire district and The City of Mill Creek. This information should be disseminated in the departmental newsletter and made available at all stations.

This research highlighting roofing materials, firebrands and wildfire mechanisms underscored another fire prevention issue within The City of Mill Creek. The naturalized image of The City, with untouched green belt areas and unmaintained forest canopy has resulted in the accumulation of significant wildland fuel. With the right conditions, this could represent a considerable hazard to The City of Mill Creek and its residents. Future fire prevention efforts within The City should address the reduction of natural fuels in parks, along the roads and in greenbelts.



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## Appendix A

## The City of Mill Creek Homeowner's Association List

List Last Updated 4/17/08, Printed 11/30/09

**Homeowner's Association**

- Apple Tree North
- Blue Grass Meadows
- Brighton Homeowners Association
- Cherry Lane
- Country Place Condominium Association
- Copper Tree Condominiums
- Lakewood Condominiums
- Mill Run I Condominiums
- Mill Run II Condominiums
- Mill Lane Condominiums
- Stratford Greens Condominiums
- Pembroke PUD
- Millers Village Phase I
- Miller's Village Phase II
- Dumas Lane Association
- Fairway Village I Association
- Fairway Village II Association
- Highlands Association
- Highland Trails Association
- The Woodlands
- The Lakes Home Owners Association
- Lockwood Village Homeowners Association
- The Masters
- The Meadows
- Mill Creek Estates Homeowners Association
- Mill Creek Village Condominium Association
- Mill Park Village
- Monterra Condominium Property Management
- The Parks Homeowners Association
- Parkridge Lane Homeowners Association
- Parkside Homeowners Association
- The Reserve Apartments Property Management
- Rivendale Townhomes Association
- River Crossing I, II, III
- Seattle Hill Estates
- The Springs Homeowners Association
- Stratford Green Homeowners Association

**Residence Type**

Single Family Homes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Condominiums  
Condominiums  
Condominiums  
Condominiums  
Condominiums  
Condominiums  
Condominiums  
Condominiums  
Condominiums  
Single Family Homes  
Condominiums  
Condominiums  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Condominiums  
Condominiums  
Condominiums  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Apartments  
Townhomes  
Single Family Homes  
Single Family Homes  
Single Family Homes  
Condominiums

|                                       |                     |
|---------------------------------------|---------------------|
| St. Moritz Condominium Association    | Condominiums        |
| Stonehedge Homeowners Association     | Single Family Homes |
| Websters Pond Homeowner Association   | Single Family Homes |
| Westfield Park Homeowners Association | Single Family Homes |
| Winslow Homeowners Association        | Single Family Homes |
| Wexford Court Homeowners Association  | Single Family Homes |
| Vineyards Homeowners Association      | Single Family Homes |
| Mill Creek Community Association      | Single Family Homes |

*Specific contact information for Homeowner's Associations available from The City of Mill Creek,  
[www.cityofmillcreek.com](http://www.cityofmillcreek.com)*

## Appendix B

## Homeowner's Association List, Single Family Residences

*List Last Updated 4/17/08, Printed 11/30/09*

| <b><u>Homeowner's Association</u></b>     | <b><u>Residence Type</u></b> | <b><u>Contacted</u></b> |
|-------------------------------------------|------------------------------|-------------------------|
| Apple Tree North                          | Single Family Homes          | Yes                     |
| Blue Grass Meadows                        | Single Family Homes          | Yes                     |
| Brighton Homeowners Association           | Single Family Homes          | Yes                     |
| Cherry Lane                               | Single Family Homes          | Yes                     |
| Dumas Lane Association                    | Single Family Homes          | Yes                     |
| Highlands Association                     | Single Family Homes          | Yes                     |
| Highland Trails Association               | Single Family Homes          | Yes                     |
| The Woodlands                             | Single Family Homes          | Yes                     |
| The Lakes Home Owners Association         | Single Family Homes          | Yes                     |
| Lockwood Village Homeowners Association   | Single Family Homes          | Yes                     |
| The Masters                               | Single Family Homes          | Yes                     |
| The Meadows                               | Single Family Homes          | Yes                     |
| Mill Creek Estates Homeowners Association | Single Family Homes          | No                      |
| The Parks Homeowners Association          | Single Family Homes          | Yes                     |
| Parkridge Lane Homeowners Association     | Single Family Homes          | Yes                     |
| Parkside Homeowners Association           | Single Family Homes          | Yes                     |
| River Crossing I, II, III                 | Single Family Homes          | Yes                     |
| Seattle Hill Estates                      | Single Family Homes          | Yes                     |
| The Springs Homeowners Association        | Single Family Homes          | Yes                     |
| Stonehedge Homeowners Association         | Single Family Homes          | Yes                     |
| Websters Pond Homeowner Association       | Single Family Homes          | No                      |
| Westfield Park Homeowners Association     | Single Family Homes          | No                      |
| Winslow Homeowners Association            | Single Family Homes          | No                      |
| Wexford Court Homeowners Association      | Single Family Homes          | No                      |
| Vineyards Homeowners Association          | Single Family Homes          | No                      |
| Mill Creek Community Association          | Single Family Homes          | Yes                     |

*Specific contact information for Homeowner's Associations available from The City of Mill Creek, [www.cityofmillcreek.com](http://www.cityofmillcreek.com)*

Appendix C

Homeowner's Association Roofing Letter



**SNOHOMISH COUNTY FIRE DISTRICT SEVEN**

8010 – 180<sup>th</sup> Street Southeast; Snohomish, Washington 98296

(425) 486-1217 or (360) 668-5357

Fax (360) 668-6234

[www.firedistrict7.com](http://www.firedistrict7.com)

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December 15, 2009

Individual  
Home Owners Association  
Address  
Mill Creek, WA 98012

Dear,

Your name has been given to us as the contact for the *Home Owners Association*. In an effort to conduct a community risk assessment of the City of Mill Creek area, we are asking each Mill Creek Homeowner's Association for a comprehensive list of their current allowable roofing. We ask that this information be returned back, either by email or using the enclosed envelope, as soon as possible for inclusion in our study. Thank you for your assistance in this matter.

Respectfully,

Craig Clinton  
Deputy Chief, Training  
Snohomish County Fire District 7  
[cclinton@firedistrict7.com](mailto:cclinton@firedistrict7.com)

## Appendix D

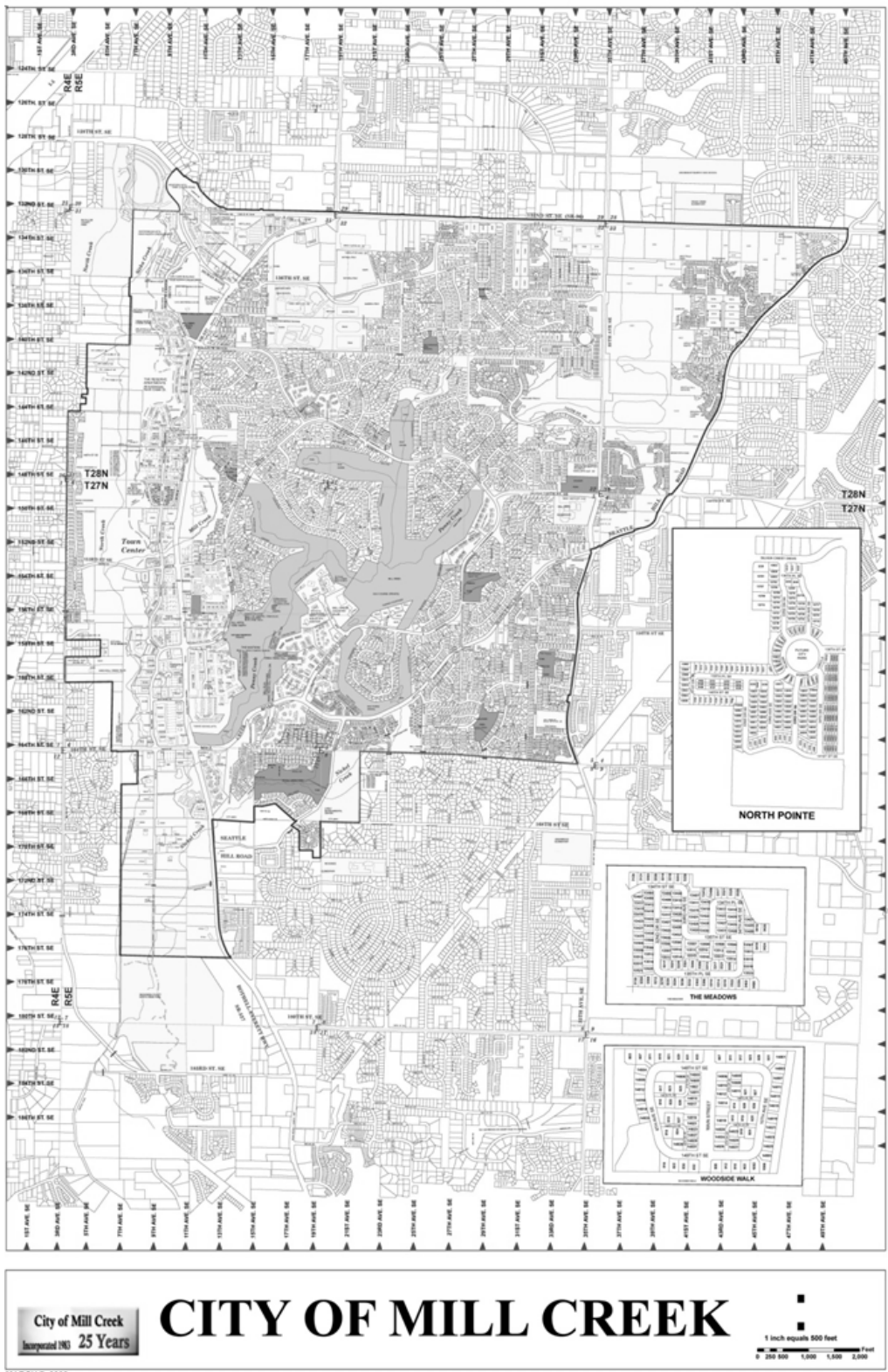
## Homeowner's Association Roofing Letter Responses

| Homeowners Association                                   |      | Allowable Roofing Material                                     |
|----------------------------------------------------------|------|----------------------------------------------------------------|
| Apple Tree North                                         | 29   | composition                                                    |
| Brighton Homeowners Association                          | 102  | split shakes                                                   |
| Highlands Association                                    | 201  | cedar shake or high dimensional fiberglass composition (50 yr) |
| Mill Creek Community Association                         | 1533 | cedar, tile, 50 year composition, rubber, metal                |
| Mill Creek Estates                                       | 82   | cedar shakes or 50 year composition                            |
| Westfield Park Homeowners Association                    | 60   | 30 year composition                                            |
| The Parks Homeowners Association                         | 256  | cedar, rubber, metal, must look like cedar                     |
| Parkside Homeowners Association                          | 79   | cedar or earth-tone tile                                       |
| Stonehedge Homeowners Association                        | 24   | 30 year composition                                            |
| <b>Total Homes</b>                                       |      | <b>2366</b>                                                    |
| <b>Total Single Family Homes, The City of Mill Creek</b> |      | <b>3931</b>                                                    |
| <b>Percent Homes Represented</b>                         |      | <b>60.19</b>                                                   |



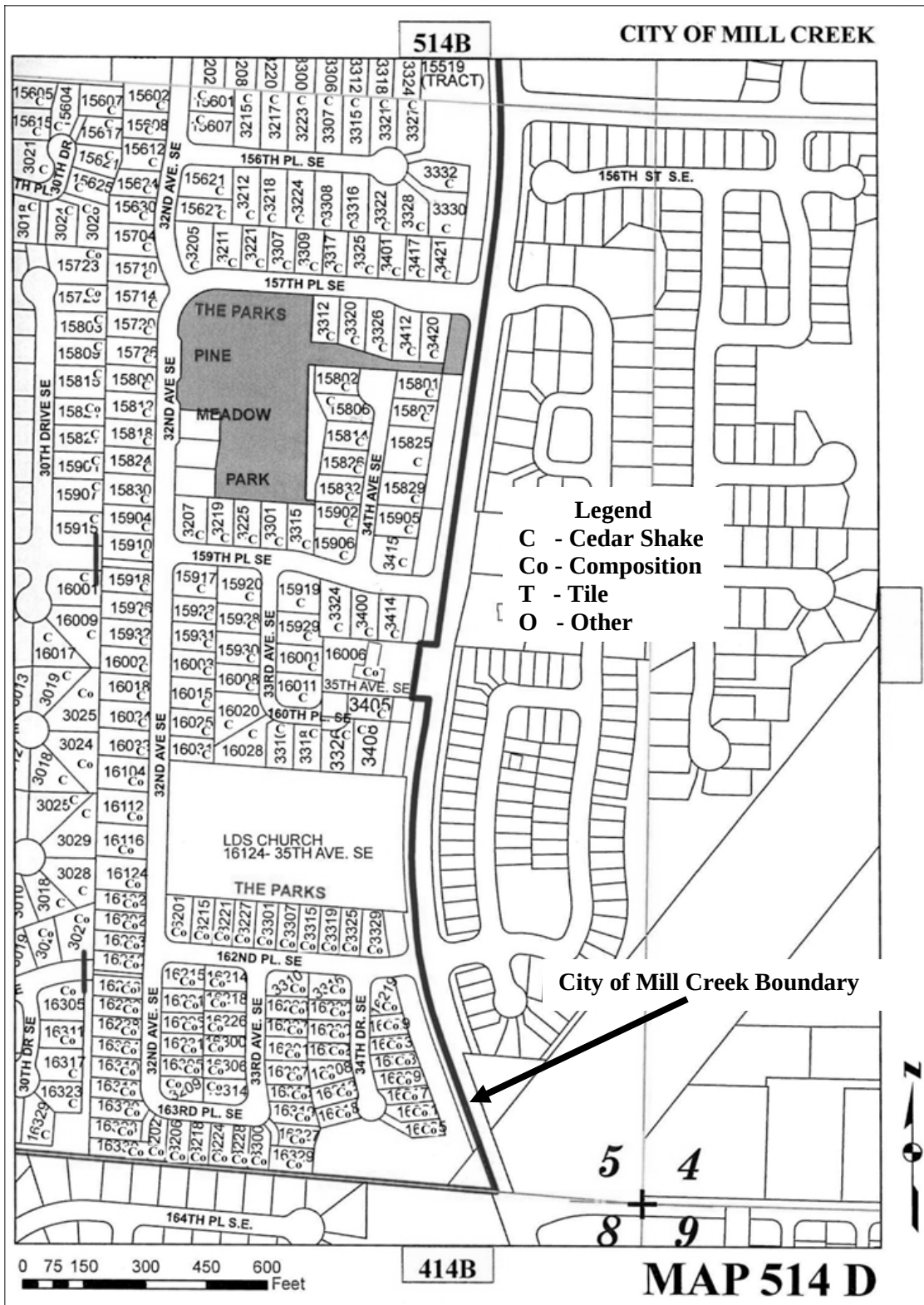
Appendix E

Address Map, The City of Mill Creek



Appendix F

Sample Map of Subdivisions, marked



## Appendix G

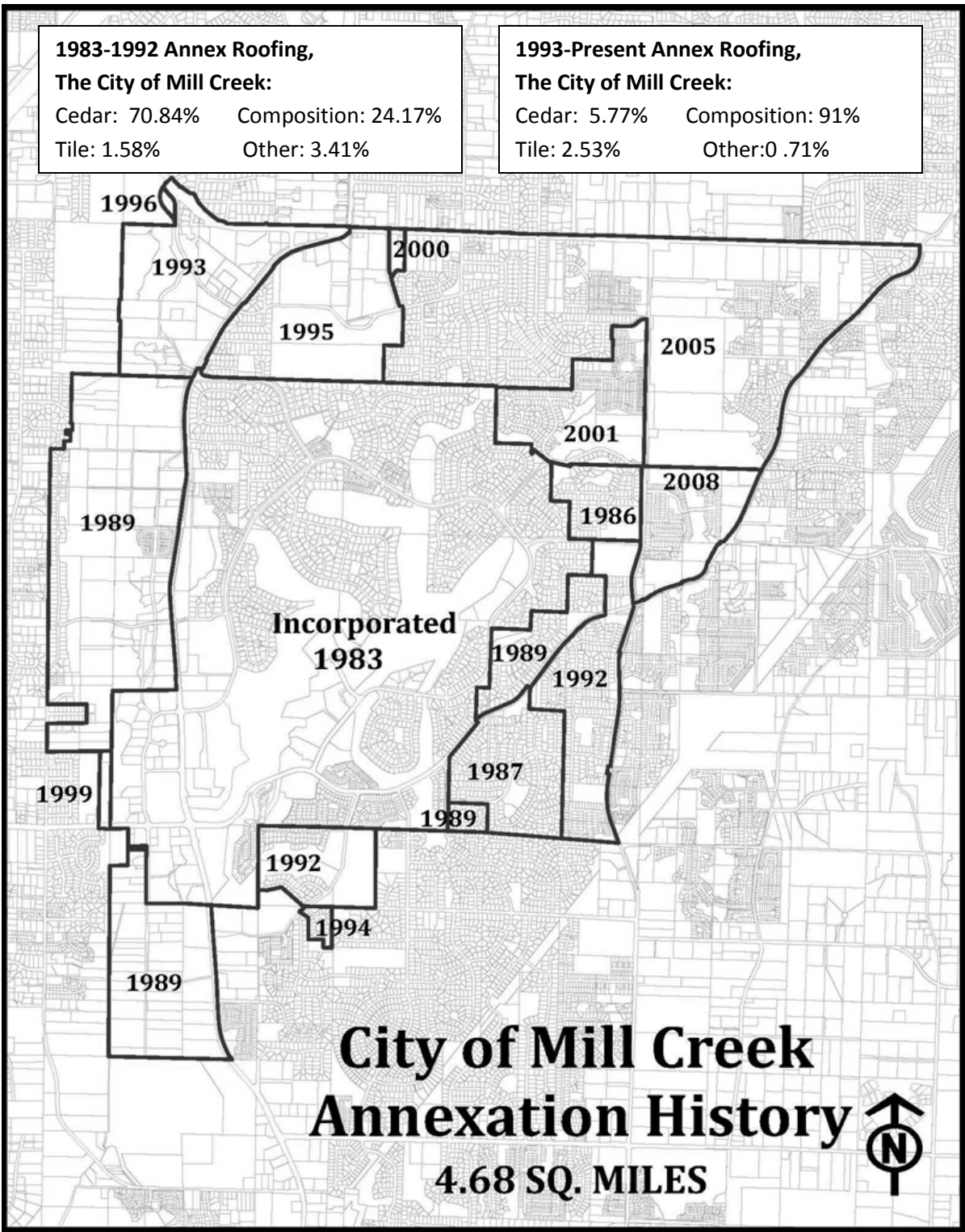
## Observed Roofing Data by Subdivision

| Subdivision         | Total # | Cedar # | Cedar % | Comp # | Comp % | Tile # | Tile % | Other # | Other % | Totals by column (✓) |
|---------------------|---------|---------|---------|--------|--------|--------|--------|---------|---------|----------------------|
| Agens Addition      | 46      | 11      | 23.91   | 35     | 76.09  | 0      | 0.00   | 0       | 0.00    | 46                   |
| Appletree North     | 29      | 0       | 0.00    | 29     | 100.00 | 0      | 0.00   | 0       | 0.00    | 29                   |
| Aspen               | 45      | 40      | 88.89   | 1      | 2.22   | 2      | 4.44   | 2       | 4.44    | 45                   |
| Bluegrass Meadows   | 57      | 0       | 0.00    | 57     | 100.00 | 0      | 0.00   | 0       | 0.00    | 57                   |
| Brighton            | 102     | 102     | 100.00  | 0      | 0.00   | 0      | 0.00   | 0       | 0.00    | 102                  |
| Burke Place         | 21      | 5       | 23.81   | 14     | 66.67  | 0      | 0.00   | 2       | 9.52    | 21                   |
| Cedarcrest Lane     | 15      | 3       | 20.00   | 12     | 80.00  | 0      | 0.00   | 0       | 0.00    | 15                   |
| Chatham Park        | 27      | 27      | 100.00  | 0      | 0.00   | 0      | 0.00   | 0       | 0.00    | 27                   |
| Cherry Lane         | 11      | 2       | 18.18   | 8      | 72.73  | 0      | 0.00   | 1       | 9.09    | 11                   |
| Cottonwood          | 68      | 58      | 85.29   | 9      | 13.24  | 1      | 1.47   | 0       | 0.00    | 68                   |
| Cypress             | 14      | 13      | 92.86   | 1      | 7.14   | 0      | 0.00   | 0       | 0.00    | 14                   |
| Douglas Fir         | 94      | 37      | 39.36   | 41     | 43.62  | 2      | 2.13   | 14      | 14.89   | 94                   |
| Dumas Lane          | 36      | 15      | 41.67   | 19     | 52.78  | 0      | 0.00   | 2       | 5.56    | 36                   |
| Estates Thomas Lake | 19      | 0       | 0.00    | 19     | 100.00 | 0      | 0.00   | 0       | 0.00    | 19                   |
| Evergreen           | 180     | 92      | 51.11   | 53     | 29.44  | 9      | 5.00   | 26      | 14.44   | 180                  |
| Fairway             | 97      | 83      | 85.57   | 7      | 7.22   | 5      | 5.15   | 2       | 2.06    | 97                   |
| Fairway Fountains   | 7       | 3       | 42.86   | 2      | 28.57  | 0      | 0.00   | 2       | 28.57   | 7                    |
| Falls, The          | 9       | 0       | 0.00    | 9      | 100.00 | 0      | 0.00   | 0       | 0.00    | 9                    |
| Fernwood            | 19      | 2       | 10.53   | 17     | 89.47  | 0      | 0.00   | 0       | 0.00    | 19                   |
| Heatherstone        | 53      | 42      | 79.25   | 9      | 16.98  | 2      | 3.77   | 0       | 0.00    | 53                   |
| Heatherwood Lane    | 33      | 2       | 6.06    | 13     | 39.39  | 18     | 54.55  |         | 0.00    | 33                   |
| Heatherwood West    | 146     | 14      | 9.59    | 116    | 79.45  | 13     | 8.90   | 3       | 2.05    | 146                  |
| Highland Trails     | 10      | 0       | 0.00    | 10     | 100.00 | 0      | 0.00   | 0       | 0.00    | 10                   |
| Highlands           | 201     | 132     | 65.67   | 69     | 34.33  | 0      | 0.00   | 0       | 0.00    | 201                  |
| Hillcrest Glen      | 116     | 0       | 0.00    | 116    | 100.00 | 0      | 0.00   | 0       | 0.00    | 116                  |
| Holly               | 77      | 41      | 53.25   | 28     | 36.36  | 2      | 2.60   | 6       | 7.79    | 77                   |
| Hollymere           | 22      | 21      | 95.45   | 0      | 0.00   | 0      | 0.00   | 1       | 4.55    | 22                   |
| Huckleberry         | 149     | 124     | 83.22   | 19     | 12.75  | 0      | 0.00   | 6       | 4.03    | 149                  |
| Irish Woodlands     | 28      | 1       | 3.57    | 27     | 96.43  | 0      | 0.00   | 0       | 0.00    | 28                   |
| Juniper             | 64      | 53      | 82.81   | 5      | 7.81   | 3      | 4.69   | 3       | 4.69    | 64                   |
| Lakes, The          | 34      | 34      | 100.00  | 0      | 0.00   | 0      | 0.00   | 0       | 0.00    | 34                   |
| Laurel              | 22      | 13      | 59.09   | 5      | 22.73  | 1      | 4.55   | 3       | 13.64   | 22                   |
| Madison             | 11      | 0       | 0.00    | 11     | 100.00 | 0      | 0.00   | 0       | 0.00    | 11                   |
| Magnolia            | 29      | 29      | 100.00  | 0      | 0.00   | 0      | 0.00   | 0       | 0.00    | 29                   |
| Meadows, The        | 45      | 0       | 0.00    | 45     | 100.00 | 0      | 0.00   | 0       | 0.00    | 45                   |

| Subdivision          | Total #     | Cedar #     | Cedar %      | Comp #      | Comp %       | Tile #    | Tile %      | Other #    | Other %     | Totals by column (✓) |
|----------------------|-------------|-------------|--------------|-------------|--------------|-----------|-------------|------------|-------------|----------------------|
| Mill Creek Estates   | 45          | 7           | 15.56        | 38          | 84.44        |           | 0.00        |            | 0.00        | 45                   |
| Mill Creek South     | 30          | 16          | 53.33        | 14          | 46.67        | 0         | 0.00        | 0          | 0.00        | 30                   |
| Mill Creek Village   | 14          | 5           | 35.71        | 8           | 57.14        | 0         | 0.00        | 1          | 7.14        | 14                   |
| Mill Park Village    | 21          | 0           | 0.00         | 21          | 100.00       | 0         | 0.00        | 0          | 0.00        | 21                   |
| Montage              | 10          | 10          | 100.00       | 0           | 0.00         | 0         | 0.00        | 0          | 0.00        | 10                   |
| Parkridge Lane       | 16          | 16          | 100.00       | 0           | 0.00         | 0         | 0.00        | 0          | 0.00        | 16                   |
| Parks, The           | 256         | 187         | 73.05        | 69          | 26.95        | 0         | 0.00        | 0          | 0.00        | 256                  |
| Parkside             | 79          | 79          | 100.00       | 0           | 0.00         | 0         | 0.00        | 0          | 0.00        | 79                   |
| Penny Creek          | 7           | 7           | 100.00       | 0           | 0.00         | 0         | 0.00        | 0          | 0.00        | 7                    |
| Red Cedar            | 72          | 68          | 94.44        | 4           | 5.56         | 0         | 0.00        | 0          | 0.00        | 72                   |
| River Crossing       | 92          | 92          | 100.00       | 0           | 0.00         | 0         | 0.00        | 0          | 0.00        | 92                   |
| Seattle Hill Estates | 55          | 0           | 0.00         | 55          | 100.00       | 0         | 0.00        | 0          | 0.00        | 55                   |
| Silver Crest         | 161         | 0           | 0.00         | 161         | 100.00       | 0         | 0.00        | 0          | 0.00        | 161                  |
| Silver Glen          | 40          | 0           | 0.00         | 40          | 100.00       | 0         | 0.00        | 0          | 0.00        | 40                   |
| Springs, The         | 19          | 15          | 78.95        | 4           | 21.05        | 0         | 0.00        | 0          | 0.00        | 19                   |
| Springtree           | 100         | 79          | 79.00        | 16          | 16.00        | 4         | 4.00        | 1          | 1.00        | 100                  |
| Stonehedge           | 24          | 0           | 0.00         | 24          | 100.00       | 0         | 0.00        | 0          | 0.00        | 24                   |
| Sunrise              | 36          | 31          | 86.11        | 4           | 11.11        | 1         | 2.78        | 0          | 0.00        | 36                   |
| Sunrise Court        | 12          | 0           | 0.00         | 12          | 100.00       | 0         | 0.00        | 0          | 0.00        | 12                   |
| Sunrose (NE)         | 23          | 0           | 0.00         | 23          | 100.00       | 0         | 0.00        | 0          | 0.00        | 23                   |
| Sunrose              | 25          | 8           | 32.00        | 10          | 40.00        | 4         | 16.00       | 3          | 12.00       | 25                   |
| Sunset Lane          | 37          | 0           | 0.00         | 37          | 100.00       | 0         | 0.00        | 0          | 0.00        | 37                   |
| Sweetwater Ranch     | 50          | 49          | 98.00        | 1           | 2.00         | 0         | 0.00        | 0          | 0.00        | 50                   |
| Swordfern            | 24          | 14          | 58.33        | 5           | 20.83        | 2         | 8.33        | 3          | 12.50       | 24                   |
| Vinemaple            | 186         | 133         | 71.51        | 36          | 19.35        | 3         | 1.61        | 14         | 7.53        | 186                  |
| Vineyards            | 46          | 0           | 0.00         | 46          | 100.00       | 0         | 0.00        | 0          | 0.00        | 46                   |
| Webster's Pond       | 149         | 0           | 0.00         | 149         | 100.00       | 0         | 0.00        | 0          | 0.00        | 149                  |
| Westfield Park       | 60          | 0           | 0.00         | 60          | 100.00       | 0         | 0.00        | 0          | 0.00        | 60                   |
| Wexford Court        | 40          | 13          | 32.50        | 26          | 65.00        | 1         | 2.50        | 0          | 0.00        | 40                   |
| Wildflower           | 57          | 35          | 61.40        | 21          | 36.84        | 0         | 0.00        | 1          | 1.75        | 57                   |
| Willows              | 6           | 4           | 66.67        | 0           | 0.00         | 0         | 0.00        | 2          | 33.33       | 6                    |
| Winslow              | 58          | 58          | 100.00       | 0           | 0.00         | 0         | 0.00        | 0          | 0.00        | 58                   |
| Woodfern             | 51          | 36          | 70.59        | 12          | 23.53        | 1         | 1.96        | 2          | 3.92        | 51                   |
| Woodlands, The       | 6           | 0           | 0.00         | 6           | 100.00       | 0         | 0.00        | 0          | 0.00        | 6                    |
| Woodside Walk        | 88          | 0           | 0.00         | 88          | 100.00       | 0         | 0.00        | 0          | 0.00        | 88                   |
| <b>Totals</b>        | <b>3931</b> | <b>1961</b> | <b>49.89</b> | <b>1796</b> | <b>45.69</b> | <b>74</b> | <b>1.88</b> | <b>100</b> | <b>2.54</b> | <b>3931</b>          |

Appendix H

Map with Existing Patterns of Roof Demographics



Appendix I



**SNOHOMISH COUNTY FIRE DISTRICT SEVEN**

8010 – 180<sup>th</sup> Street Southeast; Snohomish, Washington 98296

(425) 486-1217 or (360) 668-5357

Fax (360) 668-6234

[www.firedistrict7.com](http://www.firedistrict7.com)

**Fire Jurisdiction Questionnaire**

**Fire Department:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_

**Phone Number:** \_\_\_\_\_

1. Does your department have any recommendations for your constituents regarding suggested roofing materials?

**Yes    No**

2. If so, what are the specific recommendations?

3. Additional Comments:

## Appendix J

## Fire Jurisdiction Roofing Recommendations Results

| Department                           | Sent | Received | Question 1 | Question 2                                          | Comments |
|--------------------------------------|------|----------|------------|-----------------------------------------------------|----------|
| Bellingham Fire                      | X    | X        | N          |                                                     |          |
| Bothell Fire                         | X    | X        | N          |                                                     |          |
| Central Kitsap Fire                  | X    | X        | N          |                                                     |          |
| Everett Fire                         | X    | X        | N          |                                                     |          |
| Lynnwood Fire                        | X    | X        | N          |                                                     |          |
| Marysville                           | X    | X        | N          |                                                     |          |
| Mukilteo                             | X    | X        | N          |                                                     |          |
| North County Regional Fire Authority | X    | X        | N          |                                                     |          |
| Shoreline                            | X    | X        | N          |                                                     |          |
| Snohomish Co. 1 SE Sno County        | X    | X        | N          |                                                     |          |
| Snohomish Co. 3 Monroe               | X    | X        | Y          | Fire wise<br>recommended                            |          |
| Snohomish Co. 4 Snohomish            | X    | X        | N          |                                                     |          |
| Snohomish Co. 5 Sultan               | X    | X        | N          |                                                     |          |
| Snohomish Co. 8 Lake Stevens         | X    | X        | N          |                                                     |          |
| Snohomish Co. 19 Silvana             | X    | X        | N          |                                                     |          |
| Snohomish Co. 21 Arlington Heights   | X    | X        | N          |                                                     |          |
| Snohomish Co. 22 Getchell            | X    | X        | N          |                                                     |          |
| Snohomish Co. 23 Robe                | X    | X        | N          |                                                     |          |
| Snohomish Co. 26 Goldbar             | X    | X        | Y          | No Shake, Fire wise<br>recommended                  |          |
| Woodinville Fire                     | X    | X        | Y          | Fire Resistive Tile and<br>Comp, Non Cedar<br>Shake |          |

## Appendix K

**Roofing Recommendations for The City of Mill Creek**

The City of Mill Creek has passed its 25<sup>th</sup> anniversary of incorporation. The residential roofs are aging, and will soon require replacement. Recent residential fires within the city have illustrated that roofing choices make a significant difference in the outcome of structure fires. Fire District 7 is studying different roofing options with the intent to assist the homeowners associations in making informed covenant decisions.

It is the purpose of this questionnaire to allow local roofing companies the ability to advise the homeowners associations. Although roofing companies will be given credit for their participation, please be assured that all numbers included in this questionnaire will be held confidential and only be used to create generalized local pricing averages. Thank you for your assistance.

**Part I**

The City of Mill Creek derives its image and community continuity from its Northwest landscaping and the use of high quality building material with natural appearance. Based on this information, what roofing products would your company recommend to the homeowners associations within the City of Mill Creek?

| Roofing Material/Manufacturer | Avg. \$/Sq, Installed | Durability (years) | Other Considerations (use key below) |
|-------------------------------|-----------------------|--------------------|--------------------------------------|
|                               |                       |                    |                                      |
|                               |                       |                    |                                      |
|                               |                       |                    |                                      |
|                               |                       |                    |                                      |
|                               |                       |                    |                                      |

Other Considerations Key: **A**= Appearance, **I**= Simplicity of Installation, **P**= Price, **W**= Warranty, **C**= Color Options, **F**= Fire Resistance

**Part II**

Currently, variable Mill Creek HOAs allow the following roofing materials. Please provide your company's approximate price per square for each material on an average roof (*this information will be treated confidentially, and will be used solely to accomplish a local average for the roofing materials*):

|                              |                       |                          |                       |
|------------------------------|-----------------------|--------------------------|-----------------------|
| Cedar Shake (wood)           | \$_____/Sq, Installed | Country Manor Shake      | \$_____/Sq, Installed |
| Presidential TL(CertainTeed) | \$_____/Sq, Installed | Decra Stone Coated Steel |                       |
| Paramount Adv (Pabco)        | \$_____/Sq, Installed | Tile                     | \$_____/Sq, Installed |
| Euroshake                    | \$_____/Sq, Installed | Shake                    | \$_____/Sq, Installed |
| Euroslate                    | \$_____/Sq, Installed | Shingle                  | \$_____/Sq, Installed |
| Curved Tile                  | \$_____/Sq, Installed |                          |                       |



## Appendix L

## Roofer Recommendations for The City of Mill Creek

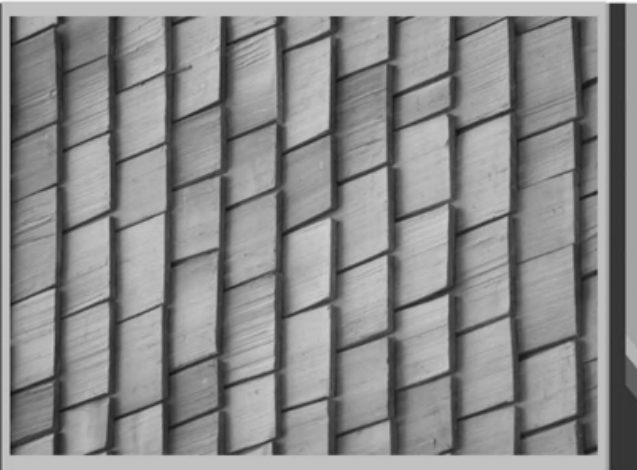
| <b>1. Companies</b>   | <b>Response</b> |
|-----------------------|-----------------|
| Cornerstone Roofing   | Yes             |
| North Creek Roofing   | Yes             |
| State Roofing         | No              |
| Star Roofing          | Yes             |
| Roberts Rapid Roofing | Yes             |

| <b>2. Recommended Products</b> | <b>Type</b>                            | <b># of Recommendations</b> | <b>Average Price</b> |
|--------------------------------|----------------------------------------|-----------------------------|----------------------|
| CertainTeed Presidential TL    | dimensional fiberglass composite, 50yr | 3                           | \$591                |
| CertainTeed Presidential       | dimensional fiberglass composite, 50yr | 1                           | \$540                |
| CertainTeed Landmark TL        | dimensional fiberglass composite, 50yr | 2                           | \$420                |
| Pabco Paramount Advantage      | dimensional fiberglass composite, 50yr | 2                           | \$559                |
| Owens Corning Woodmoor         | dimensional fiberglass composite, 50yr | 1                           | \$600                |
| IKO Armourshake                | dimensional fiberglass composite, 50yr | 1                           | \$400                |

## Appendix M



**SNOHOMISH  
COUNTY  
FIRE DISTRICT 7**



**Fire Safe Roofing:**  
*A Homeowner's Guide*



**WHAT PRODUCTS DO LOCAL ROOFERS  
RECOMMEND AS BEST VALUE?**

- Certainteed Presidential TL
- Certainteed Presidential
- Certainteed Landmark TL
- Pabco Paramount Advantage
- Owens Corning Woodmoor
- IKO Armourshake

All of these products are rated Class A fire resistant, include a lifetime warranty for the original homeowner and are competitively priced.

Snohomish County Fire District 7  
8010 180<sup>th</sup> St SE  
Snohomish, WA 98296

Phone | 360.668.5357  
Phone | 425.486.1217  
[www.firedistrict7.com](http://www.firedistrict7.com)

**CONSIDERING A ROOF  
CHANGE?**

A new roof on your home is major investment. There are many choices that must be made when deciding to re-roof. One of the most significant choices you will make is the material you will use.

A roof is not just an important visual aspect of your home. It functions to protect your investment from the elements. Most new roof coverings do a reasonable job protecting your home from wind and rain.

When fire is the element involved, not all roofing materials protect your home equally.

*What roofing materials do local roofing professionals recommend?*

When asked to recommend a high quality roofing material that reflects a natural Northwest image for The City of Mill Creek, local roofing professionals unanimously recommend Class A rated dimensional fiberglass composite roofing.

*See back for specific recommendations*

# FIRE SAFE ROOFS

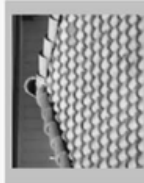
A GUIDE FOR THE CITIZENS OF MILL CREEK

www.firedistrict7.com

Choose Class A materials



Make it impenetrable



Hire qualified professionals



Maintain your roof



## Elements of a fire safe roof:

- Choose a Class A fire rated roof surface
- Hire qualified professionals to install your roof
- Ensure your roof design is impenetrable to firebrands
- Keep your new roof clean of debris, especially during hot summer months

## MAKING A FIRE-SAFE CHANGE

### Why make a change?

Fire happens. Even in rainy Western Washington, we experience dry seasons significant enough to heighten concerns of fire in forested areas containing thick underbrush.

When fire does occur outside a building, the greatest exposure happens on the roof, where airborne burning material (called "firebrands") land and become trapped.

Fire safety standards for roofing created by Underwriters Laboratory, Inc. (UL) can assist homeowners in choosing fire safe roofing. Using UL Standards, roofing is rated from Class C (effective against light fire exposure) to Class A (effective against severe fire exposure.) A Class A fire resistant roof surface is your best defense against even the largest firebrands.

Snohomish County Fire District 7 encourages you to choose a Class A fire resistant roof covering for your home.

### Will any Class A roof surface work?

Choosing a Class A surface material is a good start, but not all Class A rated materials perform the same. In a recent study, Spanish tile roofs were found to perform poorly in real fire conditions. Researchers speculate the gaps inherent in this roof design allow fire brands to penetrate<sup>1</sup>. The best roof coverings provide a fire resistant, impenetrable surface.

### What else should I consider?

The fire rating of your roofing material is only effective if your roof is properly installed to provide Class A fire resistance. Installing over existing roofing or on inferior sheathing may reduce the fire resistance of your roof and void the manufacturer's warranty. Hiring reputable, competent roofing professionals certified to install your roofing material of choice is an important step in ensuring your roof will function as intended.

<sup>1</sup> Mitchell, J.W. & Patashnik, O. (2007). *Firebrand Protection as the Key Design element for Structure Survival during catastrophic Wildland Fires*.