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**Proposed Noise Mitigation Guidance Is Ineffective and Misleading.
PA 2020-CW-3CP Should Not Be Adopted.**

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**Proposed Noise Mitigation Guidance Is Ineffective and Misleading.
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1. Paper Summary

The 45 dBA interior noise mitigation standard proposed in subject plan amendment is ineffective and misleading. It is incapable of effectively mitigating interior noise levels because it is not attainable in the Dulles aircraft noise environment between the 60 and 65 DNL contours. It is misleading because it implies that peak noise levels during aircraft flyovers would be little different from the noise level in a quiet home in a quiet neighborhood, and that would not be the case. The 45 dBA interior noise mitigation standard is not useful and risks the welfare of residents. It should be deleted from the plan amendment.

None of the four developments recommended for approval by the Planning Commission since the 45 dBA standard was introduced in the Westfields amendment proffered to meet the standard. Three of the four developments proffered to meet a 45 DNL interior noise standard. However, a 45 DNL standard would not adequately protect home interiors and would provide no protection against the possibility that conflicts between residents and Dulles airport over aircraft noise issues would escalate to the level characteristic of National airport today (76,000 noise complaints in 2018).

The county should develop effective standards for interior noise mitigation by surveying related standards and practices of major airports that have successfully accommodated residential developments between the 60 and 65 DNL contours. In the process, the county should document in a staff report the basis upon which the Board and county residents can be confident that new developments between the contours would provide homes compatible with the airport noise environment.

Online access to six papers I have submitted to the Board of Supervisors and the Planning Commission regarding Dulles noise policy is available [here](#).

2. Background and Context

On 7 May 2019 the Board adopted PA 2018-III-DS1 (Westfields), which recommended residential development between the 60 and 65 DNL contours of Land Unit J of the Dulles Suburban Center under conditions recommending noise survey and analysis, interior noise mitigation to 45 dBA, occupant notification, and avigation or similar hold-harmless agreements allowing the airport to use airspace above developments for flight operations. The amendment was based on a Westfields Business Owners Association master plan focused on transitioning the 40-year-old, outdated, failing office park to a mixed-use residential, retail, and office development. Westfields occupies the entirety of or nearly the entire Land Unit J. The appendix provides a short summary of a two-day Urban Land Institute analysis of the status of Westfields and means for repositioning the site for economic success.

The Westfields amendment recommended 4250 additional residential units above the number then existing and approved. Prior to adoption, residential development inside the 60 DNL contour was not recommended in any land unit [[Ref1](#), pg 19], and residential development in Land Unit J was limited by the Comp Plan to a total of 1246 units of which only 248 had been constructed [[Ref2](#), pg 6]. As a consequence of the Westfields amendment, 5496 dwelling units now are recommended – enough housing for 12,600 residents.¹

¹ At 2.3 residents per dwelling unit.

From hearing testimony, it is apparent that the Board’s principal objective in promoting the Westfields amendment was to protect and increase the county’s property tax base, in particular, to preserve Westfields property values by allowing a transition to mixed-use. [Ref3 Video]. The objective to promote the property tax base with residential development between 60 and 65 DNL had been cited in an earlier 26 March 2019 meeting of the Board with representatives of MWA [Ref4 Video] and was cited again in the 21 July 2020 meeting of the Land Use Policy Committee [Ref5 Video].

Of course it is appropriate for the Board to protect property values and tax revenue. The concern expressed herein is the focus on property tax revenue has not been balanced by Board attention to noise mitigation standards that would adequately protect the health and welfare of families living in the new residential developments. To the contrary, in the 21 July 2020 LUPC meeting, the situation for future residents was described as “buyer beware.” [Ref5 Video]. That is, disclosure statements would notify prospective buyers of the presence of the airport. It would then be the buyer's responsibility to adequately research and understand the noise environment and the expected evolution of that environment to arrive at a responsible decision to invest (or not) his/her savings in one of the dwelling units. In the meantime, the Board’s noise mitigation standard introduced by the Westfields amendment and passed on to subject proposed amendment is and would be both ineffective and misleading.

3. Proposed Noise Mitigation Guidance Is Ineffective

Subject plan amendment proposes to allow residential uses between 60 and 65 under the following conditions: [Ref6, pg 33]

Figure 1. Proposed Conditions for New Residential Uses Between Contours

In order to avoid exacerbating noise and land use conflicts and to further the public health, safety and welfare, where new residential development is considered in the DNL 60- 65 dBA aircraft noise contours, the following should be fulfilled:

1. A noise study that documents the expected noise impacts is conducted during the development review process
2. *Commitments to construction standards and materials are provided during the development review process to ensure that noise levels within interior living spaces do not exceed 45 dBA.*
3. Pre-construction noise modeling for building components is conducted and documentation submitted to the County for review and approval prior to building permit issuance to ensure noise levels within interior living spaces do not exceed 45 dBA.
4. Verification letters are submitted to the County certifying that the noise-modeled components have been properly installed prior to issuance of a Residential Use Permit.
5. Post-development noise studies are conducted, if requested by Fairfax County prior to issuance of a Residential Use Permit in order to evaluate the effectiveness of the noise mitigation measures.
6. Adequate assurances are provided by the property owner at the time of rezoning to address potential conflicts or threats to the long-term viability of, Dulles Airport. These assurances may include such things as recorded avigation easements/plats, hold harmless agreements, and/or similar assurances.
7. All promotional and marketing materials and leasing and purchasing agreements include disclosure statements that disclose the presence of the airport and potential associated impacts, as well as a map of Dulles Airport, the DNL 65 dBA noise contour line, and general locations of residential units and private active recreation spaces. Such disclosure statements, as well as a map of Dulles Airport and the DNL 65 dBA noise contour line are included in any community association documents and recorded in the land records. Notice of such statements, maps, and noise contours are made to all initial and subsequent lessors and purchasers.

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The proposed noise mitigation guidance is in Condition #2 above, namely that noise levels in interior living spaces should not exceed 45 dBA. Noise from aircraft overhead at Dulles can exceed 85 dBA. Reducing aircraft noise (plus any contributing roadway noise) to 45 dBA inside a home would require 40+ dBA building shell attenuation, which is at least 100 times greater than the 20 dBA attenuation one can expect from standard building materials and construction practices. The staff report notes on page 26 that, in some cases, 25 dBA shell attenuation can be provided at an additional cost of \$5000 per dwelling unit, and the cost of attenuation increases significantly for 30 dBA attenuation and greater. Forty dBA attenuation is 10 times 30 dBA; it requires the shell to deflect or absorb 99.99% of the noise outside. Residential construction providing this level of sound insulation is not affordable among homes that will be constructed between the 60 and 65 DNL contours at Dulles. Consequently, the proposed 45 dBA interior noise limit is not useful guidance for noise mitigation. It's simply not feasible economically.

As noted earlier, the 45 dBA interior noise limit was introduced into the Comp Plan by the Westfields amendment. The fact that none of the four Land Unit J developments approved by the Planning Commission since adoption of the Westfields amendment proffered to meet the 45 dBA limitation supports the conclusion that the guidance cannot effectively mitigate interior noise. **The proposed 45 dBA noise mitigation guidance is incapable of serving its purpose and should be deleted.**

4. Proposed Noise Mitigation Guidance Is Misleading

The unattainable 45 dBA noise standard in the Comp Plan potentially would mislead prospective home buyers/tenants and others to expect that new homes constructed between the contours at Dulles would provide interior spaces with peak noise levels during aircraft flyovers only 5 to 10 dBA above the 30-40 dBA level characteristic of a quiet residence in a quiet neighborhood. The notion is enticing but misleading. **The 45 dBA standard should be deleted from the proposed amendment.**

5. Allowing Residential Uses between 60 and 65 DNL Contours Is Not a Settled Issue

Discussions of Dulles noise policy sometimes cite adoption of the Westfield amendment as evidence that the question of allowing residential uses between the contours has been settled in the affirmative. However, the Westfields amendment intended to allow the residential uses only under the condition that applicants committed to the 45 dBA interior noise limit during the development review process, and the amendment was adopted with that understanding. [Ref7, pg 125]. If the 45 dBA standard had been recognized as unattainable and removed from the amendment proposal leaving no guidance whatsoever, it seems certain that the Westfields amendment would not have been adopted. **It's fair to say that allowing residential users between the contours without viable noise mitigation guidance (the current situation) is not a settled question.**

6. Options for Guidance

A 45 DNL standard is one possibility for replacing the unattainable 45 dBA standard in Condition #2. A second option is to learn from the experience of major hub airports that successfully accommodate residential developments between their 60 and 65 DNL contours.

6.1. The 45 DNL Option

Noise levels expressed in terms of dBA refer to instantaneous (here and now) sound pressure levels. DNL values are very different. DNL values are sound pressure levels averaged over one or more contiguous 24-hour periods, perhaps one day, a month, or an entire year.³ [Ref8, Sect 4]. A noise at 45 dBA would be heard as sound at a constant volume. However, aircraft noise is episodic - a quiet period followed by a noisy period as the aircraft passes. In order for aircraft noise to average out to 58 DNL, as an example, the noisy periods will significantly exceed 58 dBA in order to average up the quiet periods. In a May 2019 sample of 6287 aircraft noise events (flyovers) captured by Dulles Noise Monitoring Terminal #25 located on the final approach path to Runway 1 Right, the average noise level over the 31-day period was 58.1 DNL, the loudest noise event recorded was 87 dBA, and 11% of the noise events exceeded 75 dBA. At two principal noise monitors at Dulles, maximum noise levels during aircraft flyovers exceed DNL noise levels by 25 to 30 dBA. [Ref9, Section3.]

The Planning Commission has recommended approval of four developments in Land Unit J since the Board adopted the Westfield amendment with its guidance that interior noise levels should not exceed 45 dBA. In three cases, The Retreat, Boulevards, and Commonwealth Land Bay A, the applicants proffered to limit interior noise levels to 45 DNL in lieu of the 45 dBA guidance in Condition #2. The county asked the Stonebrook applicant to proffered 25 dBA building shell attenuation, and the developer agreed noting that windows and doors would need to provide 6-8 dBA more attenuation than their standard products. [Ref8, Sect 6.1]. In a 65 DNL noise setting, 25 dBA shell attenuation would limit interior noise to 40 DNL, but, in the May 2019 data sample from Dulles NMT #25, interior noise levels still would reach 62 dBA and 2251 noise events per month (73/day) would exceed 45 dBA.

Figure 2 attached provides an example of 45 DNL aircraft noise. It represents the noise that would have been experienced inside a home meeting a 45 DNL interior noise standard located at the Dulles NMT #25 location during the month of May 2019: [Ref9, Section 2].

- 85% of the flyovers (5355 events or 173 per day) produced noise exceeding 45 dBA
- 20% (1235 events or 40 per day) exceeded 60 dBA
- 3% (161 events or 5 per day) exceeded 65 dBA

This is too much noise for a home interior. As traffic grows at Dulles over decades to come, the noise per flyover is unlikely to increase, but the number of flyovers in a 24-hr period is expected to increase by a factor between two and three, perhaps a factor of four for nighttime operations.

Standard building materials and construction practices are sufficient to provide 20 dBA shell attenuation, sufficient attenuation to meet a 45 DNL interior noise standard between the 60 and 65 DNL contours. No additional sound insulation would be required. Consequently, developers would be able to meet the standard simply by building homes of standard quality. At the same time, the residents who filed the 76,000 noise complaints against Washington National airport in 2018 presumably lived in homes of more or less standard builder quality. If homes of standard quality in the National noise environment create 10s of thousands of noise complaints annually, it seems likely that standard homes in a built-out Dulles noise environment will do the same, and more, since low-altitude flights paths at National largely are over water. Hence one concludes that a 45 DNL standard would provide no protection against the likelihood that residential developments between the contours at Dulles would expose homes and residents to highly annoying aircraft noise to a degree similar to the trauma that plagues National airport today. Mt. Vernon Supervisor Storck has described the aircraft noise in his neighborhood as “terrifying” some residents. No one wants that for residents at Dulles. (See Ref5 Video at 2:29:10 for Supervisor Storck’s description of the noise at National.)

A 45 DNL noise mitigation standard would not effectively protect residents in homes located between the contours at Dulles.

6.2. Option to Learn from Others

Some have recommended that Dulles should embrace the destiny of other major airports by allowing residential uses to congregate around the airport. Proponents include staff in the July 2020 LUPC meeting [[Ref10](#)], Supervisor Smith in her 28 Jul 2020 motion to authorize this plan amendment [[Ref11](#)], and the conclusions section of the staff report [[Ref6](#)]. It's a reckless suggestion. Residential developments too close to Dulles will be damaged by aircraft noise and the damage would be permanent. There will be no means for turning the noise off and it will only increase as traffic grows at the airport.

A large number of major hub airports contend with encroaching residential developments exposed to highly annoying aircraft noise. They are potential sources of lessons learned, best practices, and guidance regarding means whereby local jurisdictions attempt to mitigate noise and cope with the associated issues. The Johnson Aviation report provides a description of related activities at Minneapolis-Saint Paul International Airport (MSP). Since 1992, the airport has spent \$482 million meditating noise out to its current 60 DNL contour and beyond. [[Ref12](#), Section3.2].

The county should develop effective standards for interior noise mitigation that adequately would protect the health and wellbeing of residents as well as protect the airport from the fate suffered by National. The standards should be based on documented experience and best practices at major hub airports that have successfully accommodated residential development between 60 and 65 DNL contours. The noise mitigation standard should be added to Section 3103.2 of the Zoning Ordinance. Experience with the four recent developments in Land Unit J has demonstrated that a discretionary noise mitigation standard in the Policy Plan is not sufficient for protecting the welfare of residents and the airport.

7. FAA Neighborhood Environmental Survey (NES)

FAA standards today consider all land uses compatible with noise levels below 65 DNL. This standard is based on noise research conducted in the 1970's that produced the Schultz Curve, which relates transportation noise levels to the percentage of the population that finds these levels highly annoying.

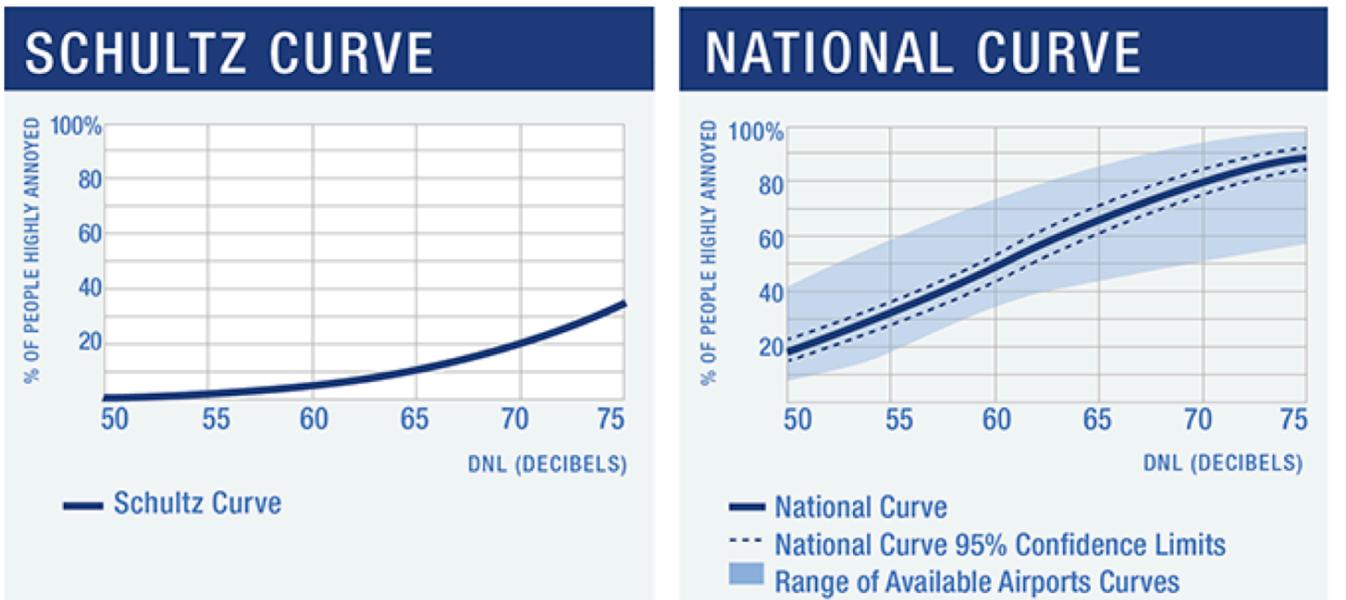
With recognition that the Schultz Curve was based on a 40-year-old social survey of community response to noise and on a mix of transportation noise sources, in Oct 2015 the FAA initiated a survey focused specifically on aircraft noise. Surveys were distributed to more than 25,000 individuals living nearby one of 20 representative airports nationwide. More than 10,000 responses were received. On 13 Jan 2021, the FAA issued a notice in the Federal Register inviting public comment on the applicability of the survey results with the understanding that the agency would not consider changes in noise policies until all comments to the Federal Register notice had been reviewed. By the time the comment period closed on 14 Apr 2021, the FAA had received more than 4000 responses.

A principal result of the survey was the National Curve in Figure 3, which, relative to the Schultz Curve, shows a substantial increase in the percentage of the population that is highly annoyed by aircraft noise. For example, the 1978 Schultz (aka FICON 92) Curve indicates that 6.5% of the

population found 60 DNL noise highly annoying; the 2016 National Curve indicates that 48.8% found it highly annoying. For 65 DNL, the numbers are 12.3% for Schultz and 65.7% for the National Curve. **If one subjected a representative population to a 60-65 DNL aircraft noise environment today, one should expect more than half to find the noise highly annoying.**

Figure 3. Comparison of Schultz (FICON 92) Curve and U.S. National Curve from NES

DNL Noise Level	FICON 92 Curve % Highly Annoyed	National Curve % Highly Annoyed	National Curve % Highly Annoyed (95% Confidence Limits)
65dB	12.3%	65.7%	60.1%-70.9%
60dB	6.5%	48.8%	43.8%-53.7%
55dB	3.3%	32.1%	27.8%-36.8%
50dB	1.7%	19.1%	15.4%-23.4%



The substantial increase in the population’s sensitivity to noise can be attributed in part to the fact that the National Curve characterizes response to episodic aircraft noise while the Schultz Curve is based on a mix of transportation noise sources, including roadway. Another factor, undoubtedly, is the relative intolerance of today’s population regarding environmental degradation in all its forms, including noise pollution.

The NES mail questionnaire followed the recommendations of the International Commission on the Biological Effects of Noise (ICBEN) and used a single question that read: “Thinking about the last 12 months or so, when you are here at home, how much does noise from aircraft bother, disturb or annoy you?” This primary question was embedded among 13 other questions on various sources of noise and other aspects of the respondent’s community to mask the purpose of the survey and minimize potential response bias. Consistent with ICBEN recommendations, the respondent was given choices of “not at

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all,” “slightly,” “moderately,” “very,” or “extremely.” A respondent was identified to be ‘highly annoyed’ if they answered either of the latter two choices.

The noise exposure of each respondent was determined from the noise exposure map of the respective airport. Presumably, respondents lived in housing of more or less standard quality. [Ref13](#) provides a link to the NES final report at the bottom of the page.

8. The Need to Assure That Developments Are Compatible with Noise

County standards in the Comp Plan and Zoning Ordinance for developments between the contours should assure that units will be compatible with the aircraft noise environment at Dulles. The most effective way to demonstrate compatibility is to compare the county’s standards for noise mitigation with related standards of airports that have successfully accommodated residential developments between 60 and 65 DNL.

A full buildout of the area between the 60 and 65 DNL contours at Dulles would provide abundant opportunities for conflicts between residents, the airport, and the county regarding aircraft noise. Land Unit J, with an area of 1100 acres, currently is approved for approx. 5500 dwelling units. The area between the contours is on the order of 3100 acres (more when the 2019 contours are adopted). Full buildout at the Land Unit J density would provide approx. 16,500 dwelling units, sufficient housing for 38,000 residents. In 2019 (pre-pandemic), Dulles averaged 800 operations per day, a number that is expected to increase by a factor of three as traffic approaches capacity in the future. At full buildout then, there could be 38,000 residents experiencing 800-2400 aircraft operations per day while living between the 60 and 65 DNL contours where the NES report tell us that more than 50% of the population residing nearby airports today would find the noise highly annoying. It’s a clear prescription for a legion of noise-stressed, frustrated residents anxious for remediation and someone to blame.

Some of these residents undoubtedly will expect support from the county based on their conviction that they would not be in their predicament had the county done due diligence in approving the developments. And they would have a point. The Board’s objective to increase property tax revenues has been clearly stated in hearings and meetings as described above. However, no evidence suggests that the Board has taken care to convince themselves and county residents that the developments would provide homes where families can be well and thrive given the noise, nor is there evidence that the Board feels a responsibility to assure that the homes would be compatible with the noise environment. Rather, and unrealistically, there’s an attitude of “buyer beware” on the part of the Board, that it’s up to prospective occupants to understand and beware of the risks inherent in exposure to highly annoying aircraft noise and then, based on whatever information they are able to gather, to decide and accept sole responsibility for their choice. Notwithstanding this attitude, many prospective occupants will automatically assume that the units are “OK” because, otherwise, Fairfax County would not allow the new units to be occupied. Clearly, the Board is responsible for establishing and enforcing noise mitigation standards that assure the homes would adequately protect their occupants from the Dulles aircraft noise environment.

However, the Board has placed no requirement in the zoning ordinance for noise mitigation, leaving it to applicants to decide whether to comply with the discretionary guidance. And the discretionary guidance (45 dBA) is not attainable and so is no guidance at all. Finally, the noise mitigation proffered in three out of four cases to date (45 DNL) is not capable of assuring a suitable interior living environment amid the aircraft noise between contours.

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The Board's development of standards for residential uses between the contours has lacked appropriate awareness, care, and caution given the weight of the issues involved. Some members of the Board vastly underestimate the consequences of communities exposed to highly annoying aircraft noise.

As recommended earlier, the county should survey a number of major hub airports that have successfully accommodated residential development between 60 and 65 DNL and, based on that experience, adopt appropriate noise mitigation standards for the Comp Plan and Zoning Ordinance. In the process, the county should document in a staff report the basis upon which the Board and county residents can be reasonably confident that the developments will provide homes compatible with the noise environment.

If new developments fail to effectively mitigate interior noise and a sufficient number of occupants later complain about the noise in their homes, future Boards may find themselves, like Minneapolis-St. Paul Int'l, obliged to fund noise abatement projects, including installation of sound insulation in homes. Noise abatement is expensive and county residents would be responsible for the cost. The FAA does not provide funding for noise abatement projects outside 65 DNL.

CC: Planning Commission
HRVCA Members

Appendix: Westfields International Center at Dulles

Westfields is an 1100-acre, 40-year-old, failed or failing business park with boundaries congruent with those of Land Unit J in the Dulles Suburban Center. In 2016, the Westfield Business Owners Association engaged the Urban Land Institute (ULI) to convene a two-day technical assistance panel to develop strategies for repositioning Westfields for economic success. In its prime, more than 25,000 people commuted daily to Westfield for work. Core tenants included large-scale, prestigious contractors principally engaged on contracts with DOD and other federal government agencies.

The 25-page ULI report [[Ref14](#)] summarizes the status of the office park in 2016 as follows:

“While the office park’s assets are numerous, several challenges exist, including obsolete office buildings; internal office space planning severely lagging behind current office market trends; lack of mix of uses in the vicinity; auto-centric design with heavy traffic congestion; lack of pedestrian connections and other modes of transportation; lack of community identity and branding; and newer competitors in the market offering modern amenities and easy multi-modal access in close proximity to the Westfields location.....

Over the years, it continued to operate along the lines of an outdated vision, and must now renew itself to what a 1,100-acre office park should look and feel like in 2017 and beyond. Panelists contended that evolving into a mixed-use environment by attracting retail and residential uses that support employees will be key to success. Because a large portion of the office buildings are either obsolete or vacant, change will be necessary to accommodate current and future market requirements.

The site lacks cohesion, a sense of community, and an identifiable brand. Panelists noted the importance of stitching the campus together with architecture, land uses, and other design elements. Furthermore, there is a lot of newer, more accessible office stock nearby, which creates competition for attracting tenants. This is further putting pressure on Westfields to provide modern amenities and solve traffic issues to balance the lack of transit access.”

The marketing strategy recommended by the panel was in three parts:

- Market outward-facing uses to potential retail and residential investors/ developers.
- Market inward-facing uses to brokers as a secure, connected, and peaceful office environment using existing office space.
- Recognize that retail and residential uses are the future of Westfields’ success, and will drive the office leasing process.

The report made a number of recommendations regarding land use, transportation and physical design, development strategies, and implementation. Office occupancy was described as dependent upon a “secure hub” concept of federal agencies and their contractors as a continuing theme of the office park. The introduction of residential and retail uses was emphasized as the principal objective in the first phase of the transition, and high-density development was encouraged to compensate for the cost of noise insulation for buildings. In later phases of the redevelopment, obsolete office buildings would be demolished.

The goal recommended by the panel was a transition from a business park to a community within a park, a town. The report did not address the effects of aircraft noise or prospects for effective noise mitigation.

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**Figure 2. Example of 45 DNL Aircraft Noise at Dulles:
Interior Noise Events during May 2019 for Hypothetical Home Located at
Dulles NMT #25 and Compliant with 45 DNL Noise Mitigation Guidance, 6287 Flyovers**

Noise Level (dBA)	Number of Events Exceeding Noise Level	Percent Exceeding Noise Level
38	6283	99.9%
39	6258	99.5%
40	6200	98.6%
41	6107	97.1%
42	5961	94.8%
43	5787	92.0%
44	5579	88.7%
45	5355	85.2%
46	5183	82.4%
47	5024	79.9%
48	4881	77.6%
49	4758	75.7%
50	4647	73.9%
51	4493	71.5%
52	4309	68.5%
53	4073	64.8%
54	3787	60.2%
55	3408	54.2%
56	2831	45.0%
57	2189	34.8%
58	1746	27.8%
59	1450	23.1%
60	1235	19.6%
61	941	15.0%
62	665	10.6%
63	416	6.6%
64	265	4.2%
65	161	2.6%
66	87	1.4%
67	44	0.7%
68	20	0.3%
69	11	0.2%
70	7	0.1%
71	4	0.1%
72	2	0.0%
73	1	0.0%