Traffic Noise Basalt Creek Parkway Extension Project

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Land Use & Transportation

Presentation outline

- Introduction to traffic noise and acoustics
- FHWA traffic noise policy
- Traffic noise analysis process
- Typical noise abatement measures
- How noise walls work
- Other abatement considerations
- Basalt Creek Parkway
- Summary

Introduction to traffic noise

Noise is measured in Decibels (dB) – with A-Weighting (dBA) for humans

Human perception of traffic noise level change:

- 3 dB: Minimum change most humans typically perceive
- 5 dB: Clearly noticeable to almost everyone
- 10 dB: Perceived as halving (doubling) of the sound level

Traffic noise 3 dB change rules:

- Distance: doubling/halving of distance ~ 3 dB
- Speed: 10 mph change ~ 3 dB
- Traffic volumes: double/halve volumes ~ 3 dB

Foliage 100 ft. of dense evergreen foliage ~ 3 to 5 dB noise reduction

Structures and topography can also reduce traffic noise

Introduction to noise/acoustics

Typical sound pressure levels

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (human judgment of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-horse power siren (100 feet)	130		32 times as loud
Loud rock concert near stage, Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)	90		2 times as loud
Garbage disposal (2 feet) Pneumatic drill (50 feet)	80	**Moderately loud**	**Reference loudness**
Vacuum cleaner (10 feet), Passenger car at 65 mph (25 feet)	70		1/2 as loud
Typical office environment	60		1/4 as loud
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Bedroom or quiet living room Bird calls	40		1/16 as loud
Quiet library, soft whisper (15 feet)	30	Very quiet	
High quality recording studio	20		
Acoustic Test Chamber	10	Just audible	
	0	Threshold of hearing	

Typical traffic noise level range

FHWA traffic noise policy

Impact Levels (land use, not zoning)

- Residences, schools: "*approach*" 67 dBA peak hour
- Hotels, business: "*approach*" 72 dBA peak hour
- Substantial Increase over existing, typically 10 to 15 dB
- No criteria for industrial and undeveloped lands

FHWA requires states to develop some criteria

- Define "*approach*" criteria (1 to 3 dB)
  - *ODOT uses 2 dB; impacts occur at 65 dBA for residences*
- Define "Feasible and Reasonable" noise abatement
  - Feasibility: Noise reduction requirements for impacts (5 to 7 dB)
  - Reasonability: Cost of abatement must be within specified amount based on the number of units with benefit (5 dB noise reduction)

FHWA traffic noise policy

Traffic noise studies are required when:

- New roads built in a new location
- Added capacity (new through lanes)
- Substantial realignment: horizontal or vertical
  - Half the distance from road to outdoor use
  - Also includes removal of shielding
- To provide information to the public
- Normally not needed for minor/local streets, safety improvements, turn lanes, or in areas without noise-sensitive properties

Traffic noise analysis process

Analysis and decision-making process

- Measure and predict noise levels
- Identify noise impacts
- Examine noise mitigation
- Benefit-cost review

Typical noise abatement measures

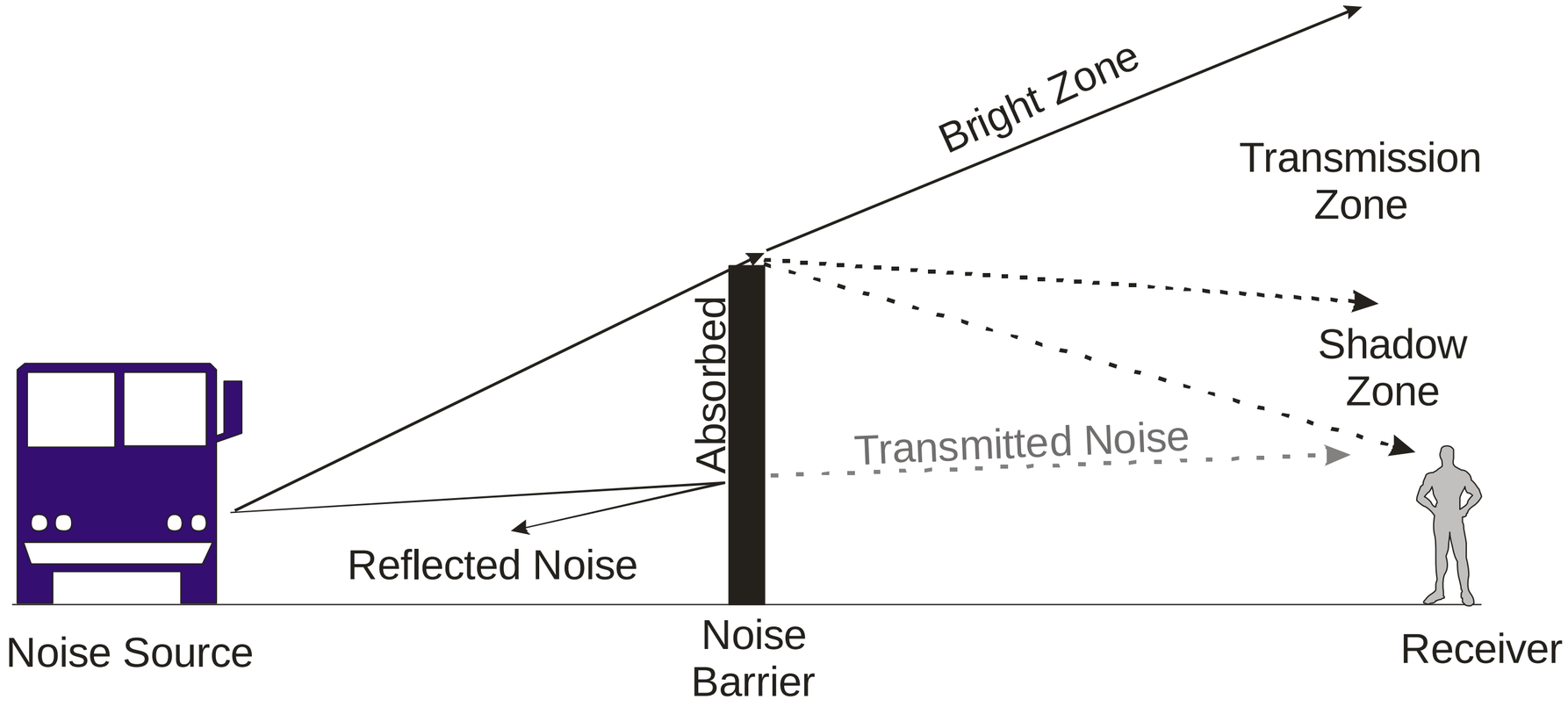
Noise barriers:

- Typically prefabricated or cast in place walls in public right-of-way

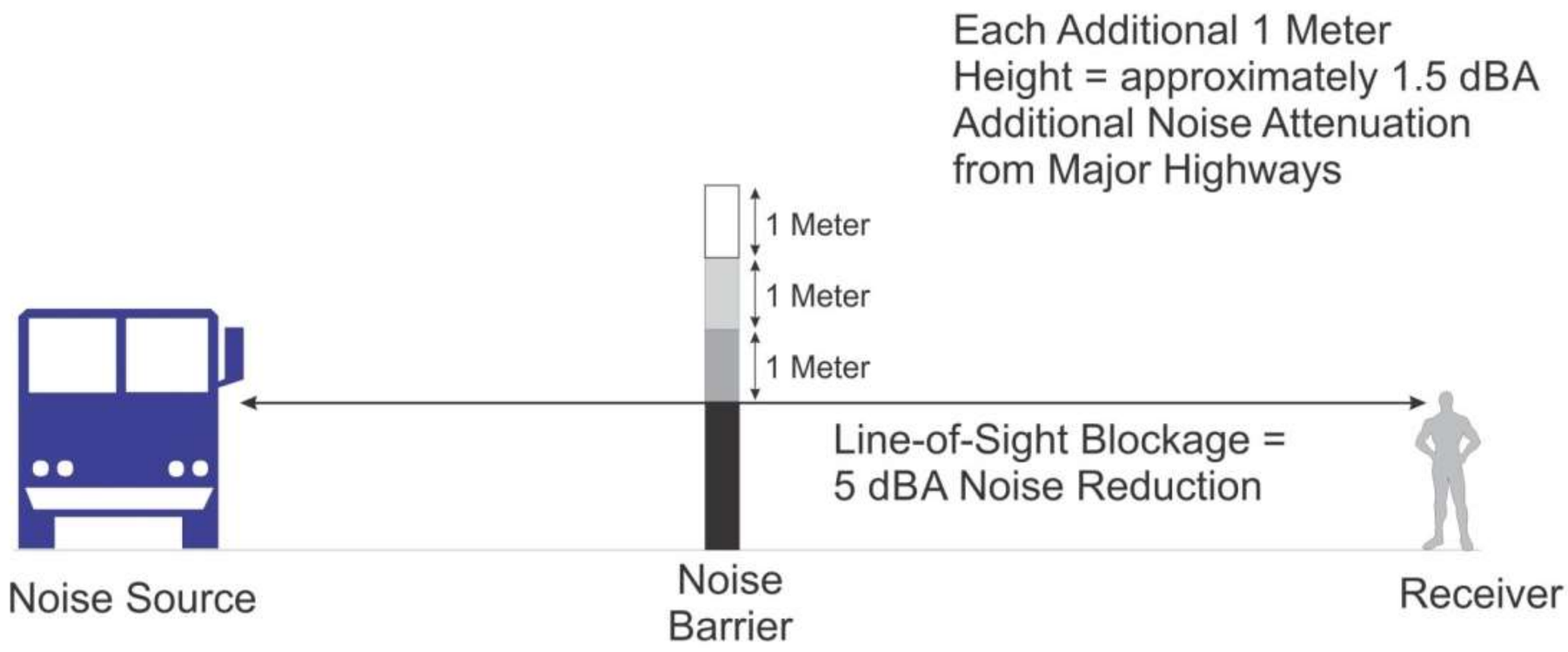
Architectural treatments:

- Used only for noise abatement at schools, hospitals, churches and libraries
- Includes upgraded windows and ventilation/air- conditioning systems

How noise walls work



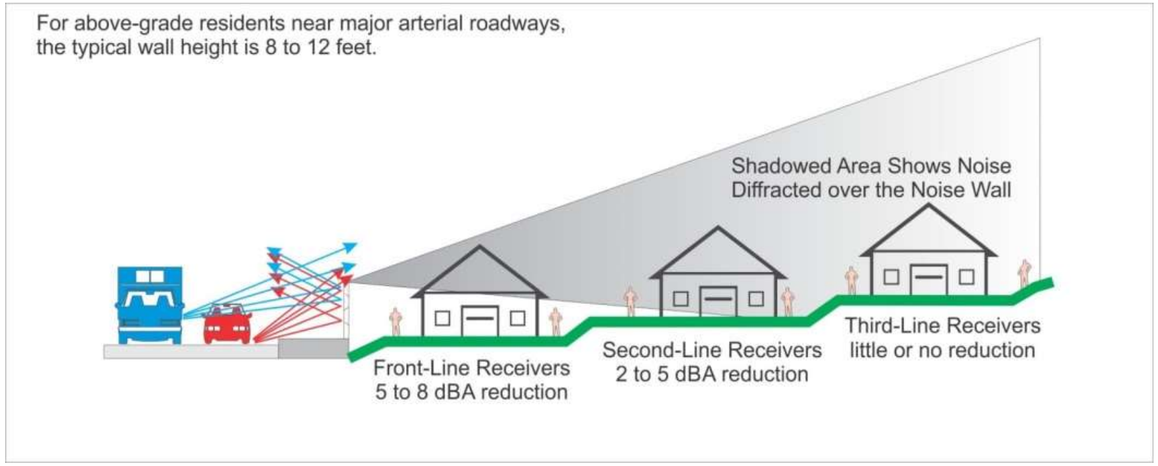
How noise walls work

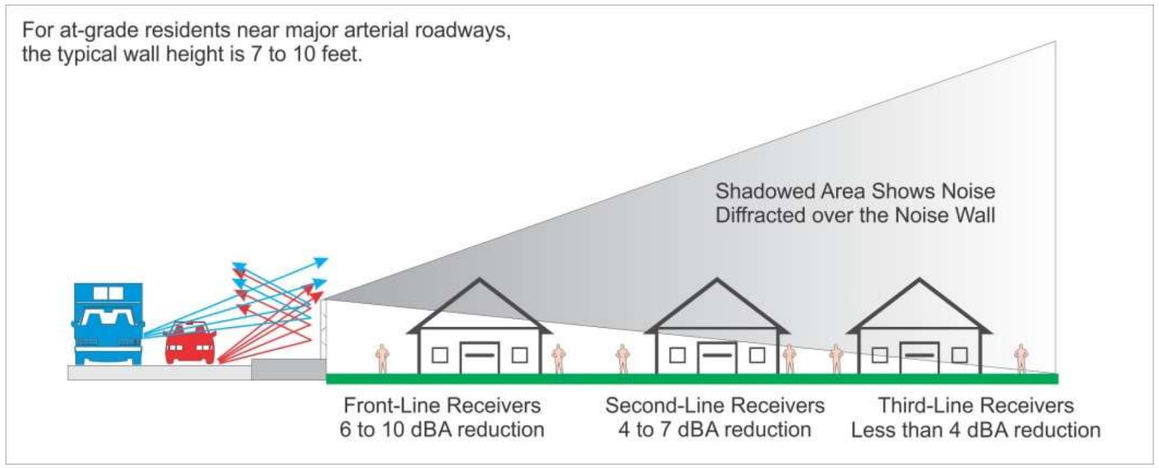


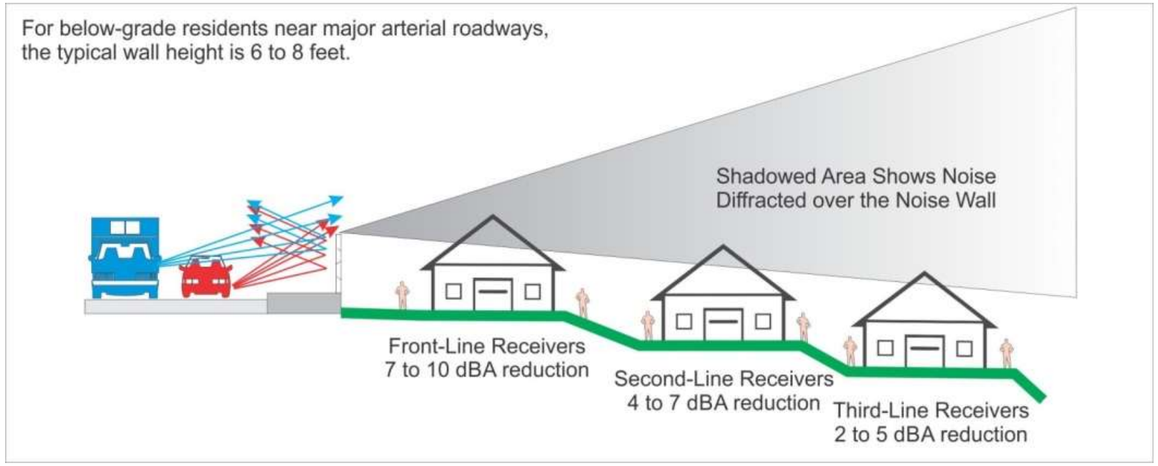
Source: Adapted from FHWA Highway Noise Barrier Design Handbook

How noise walls work

Height and effectiveness depend on roadway, receiver and wall locations/elevations







Noise wall requirements

ODOT requirements:

- Must meet noise reduction criteria:
  - At least one receiver must achieve 7 dB noise reduction
  - Average reduction of front-line receivers with noise impacts must be ≥ 5 dB

- Walls must meet cost criteria:
  - Available capital: $25,000 for each benefited receiver (with ≥ 5 dB reduction)
  - Wall cost: Multiply square foot of wall by $20.00 ($25.00 for walls above 16 feet high)
  - Walls 26 feet or taller considered on a case-by-case basis

Noise wall requirements

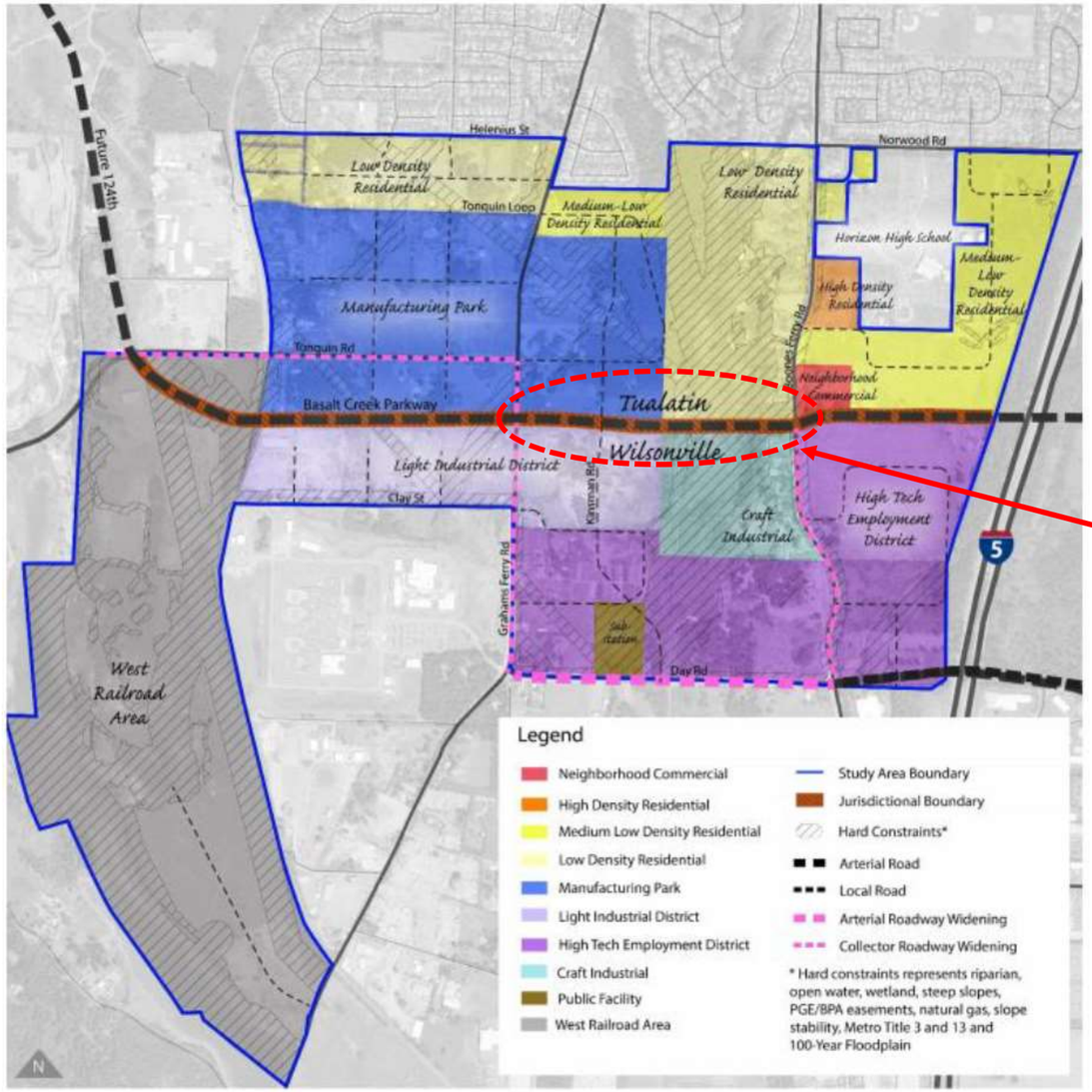
ODOT special considerations:

- ODOT manual provides some flexibility for special circumstances:
  - Noise level increase ≥ 15 dB
  - Noise level ≥ 70 dB at residential use
  - Logical wall termini; close gap between two walls
- ODOT may authorize up to $35,000 per benefited receiver for noise abatement cost (vs. $25,000)
- If reasonable and feasible criteria is met, do the majority of the residents want the abatement?

Basalt Creek Planning

Need and general alignment for Basalt Creek Parkway established through the Basalt Creek Transportation Refinement Plan, approved in 2012

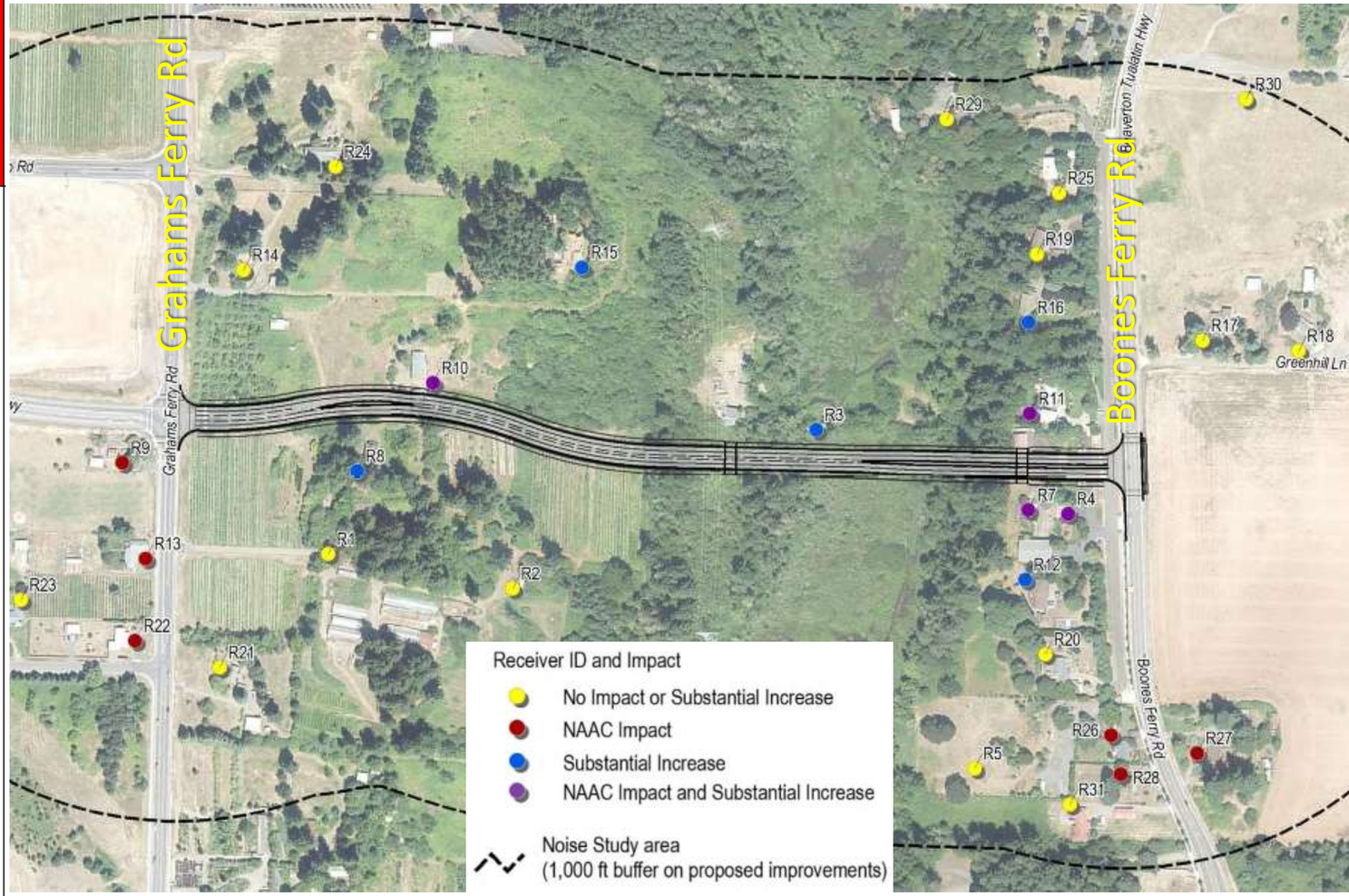
Concept Plan (land uses) approved in 2018



Project location

Basalt Creek Parkway noise analysis

Receiver ID	Land Use Description[1]	Number of Receptors	Activity Category	ODOT NAAC (dBA Leq(h)) ;	Existing Noise (dBA Leq(h))[2]	No-Build Alternative (dBA Leq(h))[2]	Change in Noise Level between Existing and No-Build Alternative (dB)	Build Alternative (dBA Leq(h))[2]	Change in Noise Level between Existing and Build Alternative (dB)[2]
R1	Commercial Nursery	1	E	70	54	54	0	59	5
R2	Commercial Nursery	1	E	70	48	49	1	57	9
R3	SF	1	B	65	45	46	1	61	**16**
R4	SF	2	B	65	53	55	2	**68**	**15**
R5	SF	1	B	65	47	49	2	54	7
R6	SF	1	B	65	48	49	1	50	2
R7	SF	2	B	65	50	52	2	**68**	**18**
R8	Historic School Interior	1	D	50	34	34	0	45	**11**
R9	SF	1	B	65	**66**	**67**	1	**67**	1
R10	SF	1	B	65	51	51	0	**71**	**20**
R11	SF	1	B	65	50	51	1	**66**	**16**
R12	SF	1	B	65	49	51	2	61	**12**
R13	SF	1	B	65	**70**	**71**	1	**69**	-1
R14	SF	1	B	65	59	60	1	60	1
R15	SF	1	B	65	47	48	1	57	**10**
R16	SF	1	B	65	50	52	2	60	**10**
R17	SF	1	B	65	56	58	2	62	6
R18	SF	1	B	65	48	49	1	55	7
R19	SF	1	B	65	52	54	2	59	7
R20	SF	1	B	65	51	53	2	58	7
R21	SF	1	B	65	61	62	1	60	-1
R22	SF	1	B	65	**68**	**68**	0	**66**	-2
R23	SF	1	B	65	55	55	0	55	0
R24	SF	1	B	65	53	53	0	55	2
R25	SF	1	B	65	54	55	1	60	6
R26	SF	1	B	65	60	62	2	**66**	6
R27	SF	1	B	65	63	64	1	**68**	5
R28	SF	1	B	65	60	62	2	**66**	6
R29	SF	1	B	65	46	47	1	53	7
R30	SF	1	B	65	51	53	2	57	6
R31	SF	1	B	65	52	54	2	58	6



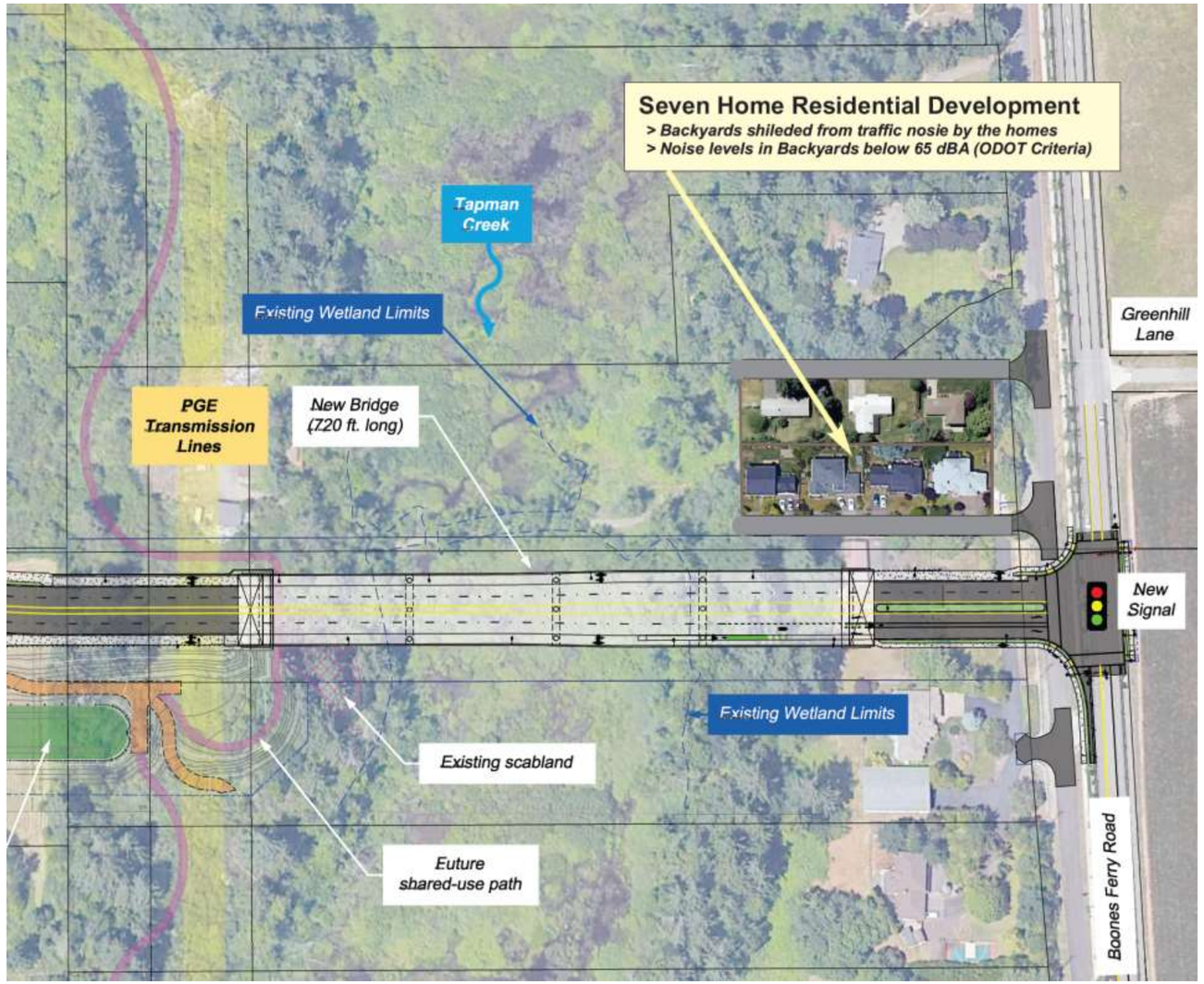
Basalt Creek Parkway

Noise abatement challenges:

- Difficult and costly to install walls on bridges
- Only one benefitted residence with future residential land use designation; wall would be “feasible” but not “reasonable”

Noise mitigation opportunities with future redevelopment:

- Orient buildings to maintain noise levels in backyards below the criteria (see illustration)
- Developer could construct noise walls if desired



Questions/Discussion

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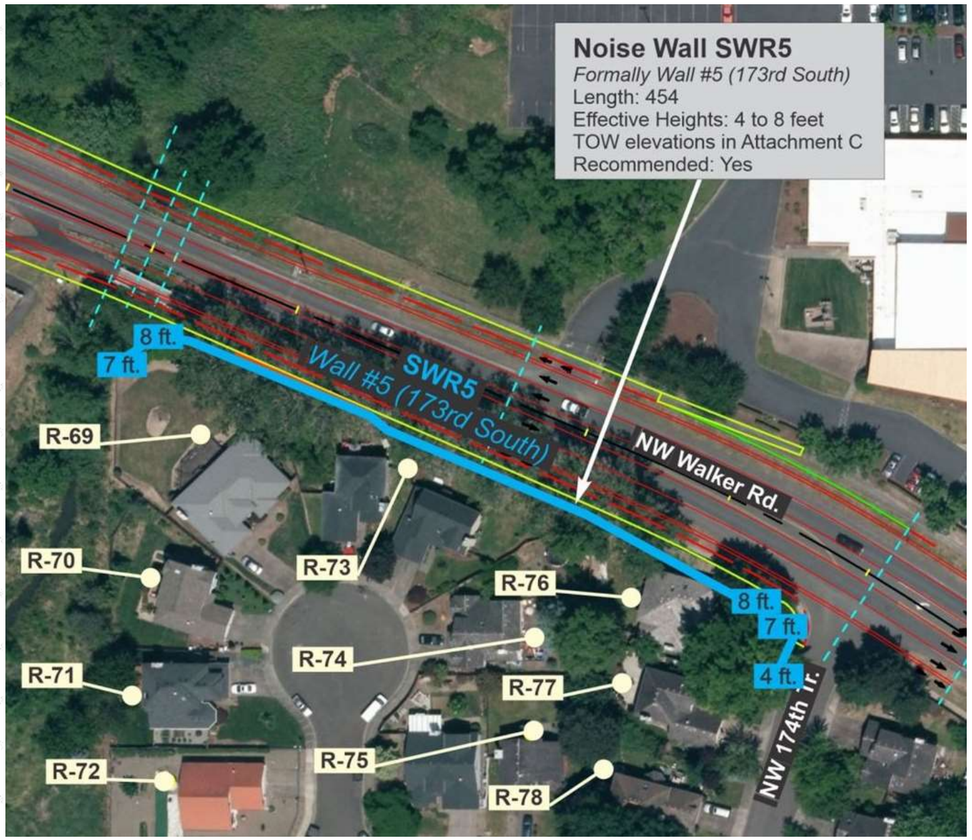
Noise wall

Noise walls are required to meet benefit/cost test

Table 9. Noise Wall SWR5-2: Southside, NW 173rd Avenue

Noise Wall Information					Receiver Information		
Length	Min Height	Max Height	Square Feet	Cost	No. Benefited	Available Capital	Meet WC Criteria
454	4	8	3502	$70,040	6	$120,000	Yes

Receiver Information		Noise Level Summary (dBA-Leq)				Benefit Calculations	
Number[1]	Uses[2]	Existing Noise[3]	Build Noise[3]	Build Wall[4]	Noise Reduction[5]	Benefited Units[6]	Abatement Capital[7]
R-69	1	63	68	63	5	1	$20,000
R-70	1	58	63	60	3		
R-71	1	56	60	58	2		
R-72	1	55	59	57	2		
R-73	2	68	71	64	7	2	$40,000
R-74	1	64	67	62	5	1	$20,000
R-75	2	61	64	60	4		
R-76	1	68	70	64	6	1	$20,000
R-77	1	64	67	62	5	1	$20,000
R-78	1	61	64	60	4		
Total Capital for Abatement:							**$120,000**



How to develop and reduce traffic noise

Parking located inside, shielded from traffic noise by apartments?

Placing the parking between roadway and receiver will reduce noise!