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Assembly Bill 424 of the 71st Nevada Legislature
and
Assembly Bill 6 of the 17th Special Legislative Session:

A Study of Sound Walls Along the

Interstate 515 Corridor in the City of Las Vegas and Clark County

By the
Nevada Department of Transportation

March 20, 2003

INTRODUCTION

As Nevada's population soars and its urban areas continue to grow at astronomical rates, more and more pressure is being brought to construct sound walls along highways increasingly filled with traffic.

The Nevada Department of Transportation maintains 68 percent of the roads on which these traffic miles are driven -- 39 percent in urban areas -- and has received a great many requests over the years to retrofit existing highways with sound walls to mitigate the noise caused by the increase in traffic. And the requests grow in number each year.

Indeed, over the years sound barriers have become more of an object for discussion, as the California Department of Transportation attested to in a report on the subject:

"These barriers have generated an extraordinary amount of public opinion, both for and in some instances against the concept of constructing barriers. Most of those people that are helped with the traffic noise problem greatly appreciate the walls and the relative quietness they bring. Others, though, believe that views are being limited, that the barriers are too costly, or that the barriers are spoiling the highway or community aesthetics."

The Nevada Department of Transportation considers sound barriers as part of new road construction if warranted by criteria established by the federal government. This generally means that barriers will be built if sound levels reach or are predicted to reach 66 decibels or higher at existing or approved development adjacent to the new road.

Federal funding, however, which provides a great deal of new road construction monies, is not normally used for sound barriers on existing highways, except when the highway is widened as part of a federally funded construction project.

As an example of this, the US 95 corridor west of the Las Vegas Spaghetti Bowl is undergoing an expansion from six to 10 lanes. Because of this road capacity expansion, the Department will build 13.4 miles of sound walls from Martin Luther King Boulevard to Craig Road, which will cover all currently developed residential areas adjacent to the freeway. Likewise, in the northern part of the state, the renovation of the Reno-Sparks Spaghetti Bowl will include seven miles of sound walls.

There seems to be some confusion over the availability of federal funds to retrofit an existing freeway with sound walls, however, when that freeway is not being widened to add through lanes. Federal funds can be used *only* when freeways were constructed and sound walls, if warranted at the time, were *not* built. There are few, if any, areas in Nevada where such federal funding would be available for sound wall retrofitting, and none in Las Vegas.

In areas such as the Interstate 515 corridor from the Las Vegas Spaghetti Bowl east and south to the City of Henderson, sound studies were performed before the freeway was constructed in the 1980s. A variety of factors, such as land use, population estimates and speed limits, among others, were figured into a noise model that attempted to predict noise levels during a 20-year time span. If the sound levels at the end of that 20-year period were predicted to reach or exceed the federal decibel threshold that was in place at the time, sound walls were considered and built along the corridor.

However, since in many areas the predicted noise levels for 20 years after the freeway was constructed did not reach the federal threshold at the time, sound walls were not built because they did not qualify for federal funding. Unfortunately, they still do not qualify for federal funding, even if the noise levels have exceeded the federal threshold. The Federal-Aid Policy Guide states: "Noise abatement measures

will not be approved at locations where such measures were previously determined not the be reasonable and feasible ... ."

Because of the sensitivity of the public to the highway noise issue, the Department in 1997 established a retrofit program that attempts to limit the intrusion of highway traffic noise into adjacent residential areas to achievable levels within practical and financial limits.

HISTORY

Until 1975, sound barriers were not installed along new highways in Nevada. Although sound barriers would be considered along selected sections of these older highways if they were built today, until a few years ago there was no program to return and construct sound walls.

Even after 1976, the year the Federal Highway Administration noise standard came into effect, sound barriers were not constructed along sections of highway that had no approved development at the time the highway was located and approved. The reasoning behind this is that either local government officials should not approve new residential development adjacent to approved highway corridors without requiring noise mitigation, or they should mandate that the developer construct sound barriers to shield the homes from traffic noise.

In any case, it appeared that prospective buyers should have been aware of the future highway when they bought their homes. For example, homes in a new subdivision situated near a freeway typically sell for considerably less than similar homes in the same subdivision, which are farther away. Thus, buyers are compensated for the traffic noise in the price of their homes. (It should be noted that along the Interstate 515 corridor from the Spaghetti Bowl east and south to the City of Henderson, most of the residential areas were in place before the freeway was constructed. Sound walls along the entire corridor were not built because they did not qualify for federal funding; in many areas the predicted noise levels for 20 years after the freeway was constructed did not reach the federal threshold that was in place at the time.)

For freeways approved after 1976, and with approved residential development nearby, a decision based on a number of criteria is made on whether to consider sound barriers. Basically, if a residential area is expected to have noise levels greater than 67 decibels in the first 20 years after construction of the freeway, then barriers

are installed to reduce those levels by as much as can be reasonably achieved, but at least by about five decibels. (The federal threshold level was reduced to 66 decibels in 1996.)

Decibels (dBA) are based on a logarithmic rather than linear scale: while 66 dBA is twice as loud as 63 dBA, 68 dBA is three times louder than 63 dBA. As examples listed on the attached chart (Tab A) indicate, 50 dBA is "quiet urban daytime" and is similar to the noise level of a dishwasher in the next room, 60 dBA is similar to normal speech at three feet away or heavy traffic at a distance of 300 feet, and 70 dBA is similar to a vacuum cleaner three feet away or a gas lawn mower at 100 feet.

Heavy diesel trucks are the greatest single contributors to highway traffic noise. One heavy truck at 55 mph produces the same acoustical energy as 28 passenger cars traveling at the same speed. This means that for a traffic mix of 7 percent heavy trucks and 93 percent autos, the truck/auto noise energy contributions are 50-50 (i.e., half of the total noise energy is produced by the 7 percent trucks, and the other half by the 93 percent autos).

Unlike cars, heavy trucks consist of various major noise sources, such as tires, engine, and exhaust stacks. Automobile noise basically consists of engine and tire noise. Highway traffic noise increases with speed, volume, and percentage of heavy trucks, and different roadway surfaces may alter the traffic noise as much as 5-9 dBA (see later discussion).

The traffic noise standard was established by the Federal Highway Administration and is found in the United States Code of Federal Regulations, 23 CFR 772, adopted on April 1, 1972, and revised on April 1, 1992. The standard is conscientiously followed throughout the nation, requiring all state transportation agencies to complete a comprehensive noise impact analysis and to provide local government officials with documentation showing predicted traffic noise levels and noise mitigation information early in the planning process to assist in the prevention of future traffic noise impacts.

The Department's sound wall policy, based on these federal guidelines, has been to consider and build noise barriers where impacts are predicted in the future 20-year time frame to shield any existing or approved residential development adjacent to new highways or those which are being upgraded to increase through-lane capacity.

COST

Freeways in Nevada were built largely with federal highway funds. The match in most cases was 5 percent state dollars to 95 percent federal dollars. The only sound walls built were those that were allowed for funding under the strict federal guidelines in place at the time. These federal guidelines would not provide funding for sound walls unless the level of freeway noise was predicted to reach or surpass the federal decibel threshold at the time. If sound walls had been built with 100 percent state money, the state's cost of constructing these freeways would have more than doubled.

All three levels of government -- federal, state, and local -- share responsibility for this problem. Federal government sets the policy on noise barriers and provides funding. State government coordinates the federal policies and provides the matching money. Local government approves freeway alignments and sets conditions for land development adjacent to the freeways.

This is a very expensive problem. In Nevada, until recently the rule-of-thumb cost to construct a 12-foot sound wall to block the noise from heavy truck stacks of 11½ feet was $2 million per mile. However, the cost is escalating: a 5,020-foot, 12-foot-tall sound wall the Department is building with matching Clark County funds on the east side of Interstate 515 between Desert Inn Road and Flamingo Road (discussed later) is estimated to cost $2.2 million. That currently translates to just more than $2.3 million per mile.

In fact, retrofitting -- going into an area with an existing highway and building sound walls -- is so expensive that 27 states, including Pennsylvania, Texas, Illinois and Virginia, do not have retrofit programs, according to information from the Federal Highway Administration. Of the 23 states that do, it is estimated that only 10 have spent more than Nevada has since it instituted its retrofit program (see below). (Some states, including Rhode Island, Alabama, and Mississippi, have not constructed any type of noise barriers.)

Freeway noise is a nationwide problem of massive proportions. (It should also be noted, however, that many areas of noise complaints are actually below the current federal threshold of 66 decibels for new construction.) The Department is very concerned about this problem and during the past number of years NDOT has instituted and implemented a matching-fund sound wall retrofit program to attempt to

mitigate the noise impacts along the worst sections of Nevada's freeways in a cost-effective manner.

THE MATCHING-FUND RETROFIT PROGRAM

To identify less expensive methods of mitigating noise, the Department initiated an experimental sound wall retrofit program and simultaneously created a long-range noise mitigation program for existing freeways.

In March 1995, NDOT's Board of Directors approved an experimental sound wall program to identify and utilize new approaches to noise mitigation that would construct low-cost alternatives to conventional sound walls.

During the experimental program, NDOT constructed a number of sound wall projects (mainly three-feet-four-inch concrete extensions on top of two-foot-eight-inch Jersey barrier rails) covering more than two miles at a cost to the Department of more than $1 million. The City of Las Vegas contributed to two of those projects. (A partial listing of these experimental sound wall projects is in Tab B.)

The Department conducted before and after sound studies at the various locations to determine precisely how effective these experimental walls were (they were estimated to reduce sound levels from 2 to 5 decibels). If these walls were deemed successful in abating noise, it could dramatically reduce the overall cost of retrofitting the state's highways.

In addition, sound engineers and designers met with alternative sound wall suppliers to examine the newest and cheapest technology in the noise mitigation field, and continue to encourage them to provide free or low-cost materials for demonstration projects.

The Department also re-examined its standards for sound wall materials and their ability to stop noise through an exhaustive and comparative study of standards in use throughout the nation.

While the concrete Jersey safety barrier extensions constructed under the experimental program are much cheaper to build than taller sound walls, their efficiency is questionable. On one project the Jersey barrier was extended to 6 feet in a limited area of the viaduct on Interstate 515 east of the Las Vegas Spaghetti Bowl. This was the maximum height the barrier rail could be extended and still stay stable in high winds. The Jersey barrier extensions were expected to achieve from a 1-2 dBA reduction in noise levels.

The Jersey barrier extension at 327-½ 16th St. provided a 7 dBA reduction; the resident there said it was noticeably quieter with the extension. However, this may be considered an anomaly because of the height of the viaduct and the residence's distance from the freeway.

The Jersey barrier extension at the Rulon Earl Mobile Home Park and the Pecos Mobile Home Park at Pecos Road and Stewart Avenue, however, reduced the sound only 1 dBA, which is imperceptible.

After the Jersey barrier was extended on the Pecos Park side, complaints were received from the Rulon Earl Park concerning increased traffic noise levels. Traffic noise in the Pecos Mobile Home Park is complicated, with sound reflecting off the parallel Jersey barriers, the concrete roadway surface which is on a slant curving around the Pecos Park, and the local surface streets underneath the freeway -- Pecos Road and Stewart Avenue.

Also, being on the inside of the freeway curve lowers the effective height of the Jersey barrier. It has also been noted by residents that the steel girders of the freeway's metal bridge over Stewart Avenue seems to resonate freeway traffic noise with an annoying frequency and also reflects noise from trucks passing underneath the structure.

The 7-foot, 4-inch Proto II hollow block wall installed in Reno in 1996 achieved better than expected results (a 5 dBA reduction) and was exceptionally inexpensive to build ($30,007 for a 485-foot wall), but after detailed study cannot be used in most areas because engineers do not believe it can withstand Nevada's heavy wind loads.

In February 1997 the Transportation Board of Directors adopted the matching-fund Freeway Noise Mitigation Retrofit Policy (Tab C) and allocated up to $2 million per year to address the problem over a period of years. The theory behind the policy is that scarce resources would be leveraged by asking local governments to match state funds since they share responsibility by virtue of their approval of freeway alignments and control of adjacent development. (*Note:* NRS 408.290 requires NDOT to obtain local government approval before building a freeway through any city.)

The Department also wanted to encourage compatible adjacent land use. Local governments that control development or plan land use near known highway locations must exercise their powers and responsibility to minimize the effect of highway vehicle noise through appropriate land use control.

This does not always occur, however. As an example, the Clark County School District built the Reynaldo Martinez Elementary School adjacent to Interstate 15 in North Las Vegas without providing adequate safety or noise barriers. As such, the Department entered into a cooperative agreement with the school district and built in late 2002 a sound barrier about 1,600 feet long to shield the school from traffic noise.

Therefore, the sound wall policy adopted by the Transportation Board of Directors states: "Local governments have enacted or agree to adopt ordinances directing developers to install sound walls adjacent to existing or proposed highways when constructing new homes." Those localities that didn't would be placed at the bottom of the list for potential retrofit projects.

Other exclusionary criteria in the sound wall policy mandate that it applies only to controlled access freeways, that there must not be any right-of-way costs, noise levels must exceed 65 decibels at peak hour, sound walls must provide at least a 3 dBA reduction in noise, are limited to no more than 14 feet in height, must meet minimum design and safety standards, and must not compromise roadway drainage, traffic safety, or other essential freeway features. Also, there must be no plans to widen the existing highway within the next five years.

Department personnel expended a great deal of time and energy in researching what other states do to address the freeway noise mitigation issue, and in devising a complex rating formula (Tab D) based on criteria established by other DOTs in the event there was a flood of matching-fund requests from local governments throughout the state.

Because of the expense of retrofitting existing freeways with sound barriers, however, not one local government in Nevada has requested sound walls in their annual highway program proposals to the Department. Apparently local governments believe that approving such requests would sap resources that could otherwise be available for other transportation improvements, among them maintenance, safety, and congestion relief projects.

This is not to say that the long-range freeway noise mitigation program, or its experimental sound wall predecessor program, have been failures, because the Department has participated in several matching-fund projects.

To illustrate, the Department has completed three pure matching-fund projects (one with Clark County, one with the City of Las Vegas, and one with the Clark County School District, mentioned above) to construct full 12- to 14-foot sound

walls. (The Department also has one pending project with Clark County along Interstate 515, mentioned earlier and that will be discussed in more detail later, covering 5,020 feet at an estimated cost to NDOT of $1.1 million.) These are outlined in Tab E.

The Department also participated in a project to construct an 800-foot sound wall for which Clark County provided partial funding of $50,000. These completed projects covered approximately 1.1 miles at a cost to NDOT of $1.46 million. In addition, the Department contributed $2 million to Henderson's $8.9 million project to erect 5 miles of sound walls on Interstate 515. To date, NDOT has expended about $5.54 million on sound wall projects since the experimental and retrofit programs were established.

THE INTERSTATE 515 CORRIDOR

Assembly Bill 424 of the 71st Nevada Legislature, which later became Assembly Bill 6 of the 17th Special Legislative Session (Tab F), directed the Department to work with the City of Las Vegas and Clark County in an attempt to resolve the traffic noise issues along the Interstate 515 corridor.

During the legislative interim, Department personnel met with local government officials to examine the issue. This report, and the solutions to be articulated later, is the result of that legislative direction and delineates what the Nevada Department of Transportation has done, is doing, and stands ready to do in the future.

It is estimated that there are about 7 miles of residential (not commercial or vacant land, where the Department does not install sound walls) area between Las Vegas Boulevard and Russell Road that might be considered for sound barriers. The ambient noise levels in most of those areas average 69 decibels. As the map in Tab G shows, there also are about 7 miles of sound barriers in place or soon to be constructed along the Interstate 515 corridor.

Traveling east along the corridor from the Spaghetti Bowl, the viaduct from Las Vegas Boulevard to Eastern Avenue was designed for a future sound wall. The original design notes show the sound wall was assumed to be 6 feet high and made of masonry. There is a 9-inch ledge on the outside of the viaduct to accommodate this sound wall. It is possible, however, that a taller wall might be able to be installed if it

was constructed of reinforced concrete, yet it must be noted that a 12-foot sound wall could not be constructed on the Interstate 515 bridge over Desert Inn Road.

Traveling south along the corridor, in the area from Charleston Boulevard to Boulder Highway, it will be extremely expensive to erect a noise barrier because of the severe slope and the constraints of physically installing a wall and setting deep enough foundations to adequately support it.

As mentioned earlier, the Department will go out to bid this summer on a matching-fund project with Clark County to build a 5,020-foot, 12-foot high sound wall on the east side of Interstate 515 between Desert Inn Road and Flamingo Road, further south along the corridor. Currently, the engineer's estimate for this wall is $2.2 million.

As the information in Tab H shows, this will be a post and panel sound wall, it will be along the northbound shoulder of Interstate 515, and it will match an existing post and panel wall on the other side of the freeway. (That existing wall was another matching-fund project with Clark County. It is 2,865 feet long and cost about $895,000.)

Farther south, sound walls also might be eligible for the matching-fund program on Interstate 515 in the area between Mountain Vista Street and Nellis Boulevard, although noise studies performed there several years ago placed the peak levels below 65 decibels. While those noise levels may be on the borderline for a matching-fund sound barrier, it should also be noted that traffic volumes have not increased appreciably in the area during the past five years. In 1998 the traffic count for Interstate 515 between Tropicana Road and Russell Road was 100,455 vehicles a day. The preliminary 2002 traffic count for that area is 102,000 vehicles a day (see Tab I).

There is another method of noise reduction that the Department is examining: treating the road surface.

A pavement comparison study conducted by the Department's environmental division showed a 7.2 dBA difference between concrete and asphalt surfaces where US 95 intersects Interstate 15 in Las Vegas. Two microphones were simultaneously set up at 400 feet from where the two surfaces meet to record the differences. And a surface grinding study conducted by the environmental division on Interstate 580 in Reno near Del Monte Lane showed a 3.3 dBA difference between random-transverse grooved tining and the profile grind.

The National Cooperative Highway Research Program has published a report noting that dense grade asphalt was quieter than Portland Cement Concrete surface, in use on Interstate 515, by 2-3 dBA. Even more benefit is shown for dense-graded asphalt when compared to transversely tined cement pavements. Unfortunately, the dense-graded asphalt usually does not have the strong frictional characteristics of concrete pavements, nor the durability.

Open-graded asphalt reported reductions ranging from 1 to 9 dBA. However, the noise reductions seem to decline with surface age and in approximately 5 to 7 years much of the noise benefit has diminished. Also, porous asphalt suffers from problems such as plugging and deterioration.

Construction quality is an important consideration in the final overall noise generation no matter which pavement type or texture is selected. Also, safety must always be considered and, unfortunately, some surfaces that produce low noise also have low friction numbers. It is the official policy of the Federal Highway Administration and the opinion of the American Association of State Highway and Transportation Officials that a small amount of noise reduction is not worth sacrificing safety and durability. This means that departments of transportation throughout the nation must try to find a "happy medium" between noise control and maintaining a high level of safety.

If any of these alternatives are chosen, the cost of building sound walls along this section of Interstate 515 or paving the corridor with a different road surface will be expensive. Traffic control and working limitations will make this a challenge, especially in the many areas along the corridor where there are severe slopes adjacent to the freeway. If 7 miles of the freeway are retrofitted with sound walls, the expense is estimated to be in the $14 million neighborhood. If the road is resurfaced, it is expected to be more expensive.

In any event, the Department continues to budget $2 million each year as part of its retrofit sound wall program (see highlighted sections in Tab J).

There is, however, another alternative that appears to be preferable.

THE INTERSTATE 515 CORRIDOR STUDY

Working with the cities of Las Vegas and Henderson, the Regional Transportation Commission of Southern Nevada, and Clark County as partners, the Department in 2002 initiated a $1.9 million study of the Interstate 515 corridor as the

first step in examining the possibility of what to do about, among other transportation issues, widening the freeway.

The study area will be the Interstate 515 corridor from the Spaghetti Bowl interchange to the Foothills Drive overpass in Henderson, and is defined as the area south of Bonanza Road, east to the limit of planned development, and north of Foothills Drive.

It also includes the area west to a boundary defined by Interstate 15 from Bonanza Road south of Sahara Avenue, Sahara Avenue east to Eastern Avenue, Eastern Avenue south to Sunset Road, Sunset Road east to Green Valley Parkway, and Green Valley Parkway south to the limits of planned development.

The corridor study will be conducted in a number of phases. During the first phase, the purpose and need for the project will be established, improvement alternatives will be identified and screened, a public participation program will be initiated, and an early action plan will be prepared. In this phase, an anticipated nine public informational meetings will be conducted during the late summer and early fall of 2003.

During the second phase of the study, a detailed evaluation of alternatives will be conducted, alternative transportation strategies will be compared, and a staged implementation plan will be developed in conjunction with the local governments. The first two phases of the study are expected to require about a year to complete, with each phase scheduled for six months.

At the end of the second phase, estimated to be in December 2003 or early 2004, a preliminary evaluation of environmental impacts along the corridor, including what to do about noise, will be determined. This phase will be rolled into a third phase, which will be the initiation and completion of a federal environmental review, which will study the option of widening the freeway and installing sound barriers along the corridor.

This will be a comprehensive plan with considerable opportunity of public input that will be agreed to by all local governments that have jurisdictions in that area. These Interstate 515 corridor studies may take several years to complete, and throughout the process close attention will be devoted to noise mitigation strategies and public involvement.

Such a comprehensive plan for noise mitigation appears better than a piecemeal approach for a number of reasons:

- Mitigation measures will be more efficient (e.g., the sound barriers on the US 95 widening project are much taller and more effective than 6-foot concrete Jersey barrier extensions or even 12- to 14-foot retrofit sound walls).
- Local governments and the Department will be unified on what to do about noise issues.
- There will be more consistency in sound wall design and aesthetics.
- The public will be intimately involved.

It is anticipated that this study will lead to a final solution to noise issues along the Interstate 515 corridor, one that is acceptable to the Department, local governments, and the public.

AN INTERIM SOLUTION ALONG THE INTERSTATE 515 CORRIDOR

This corridor study and possible widening of Interstate 515, however, will take a number of years to accomplish. What can be done in the meantime to provide noise relief to the residents along the corridor?

The Department of Transportation, in cooperation with the local governments, has pressed forward with a plan that would construct sound walls along the Interstate 515 corridor during the next several years.

The Department will dedicate its $2 million annual allotment for the retrofit sound wall program during the next three years to corridors such as Interstate 515 where residences were in place before a freeway was built. Department staff believes there are few, if any, areas other than Interstate 515 where this is the case.

The Regional Transportation Commission of Southern Nevada has agreed to match the $2 million annual appropriation over the next three years, provided that Senate Bill 237, which carries out the RTC's recent transportation funding ballot question, is passed by the Legislature.

We believe that this $4 million annual appropriation will enable the Nevada Department of Transportation, in cooperation with its local government partners in Clark County, to complete noise mitigation measures along the remainder of the Interstate 515 corridor during the next three to four years and provide much-needed relief to its residents.