MATANUSKA-SUSITNA BOROUGH
PLANNING COMMISSION AGENDA

Vern Halter, Mayor

PLANNING COMMISSION
Mary Anderson, District 1
Jason Ortiz, District 2
Patricia Chesbro, District 3
Colleen Vague, Chair, District 4
Chris Elder, District 5
Stafford Glashan, District 6
Sassan Mossanen, District 7

John Moosey, Borough Manager

PLANNING & LAND USE DEPARTMENT
Eileen Probasco, Director of Planning & Land Use
Kim Sollien, Planning Services Manager
Alex Strawn, Development Services Manager
Fred Wagner, Platting Officer
Mary Brodigan, Planning Clerk

Assembly Chambers of the
Dorothy Swanda Jones Building
350 E. Dahlia Avenue, Palmer

March 2, 2020
REGULAR MEETING
6:00 p.m.

I. CALL TO ORDER, ROLL CALL, AND DETERMINATION OF QUORUM

II. APPROVAL OF AGENDA

III. PLEDGE OF ALLEGIANCE

IV. CONSENT AGENDA

Items on the consent agenda are considered to be routine and non-controversial by the Commission and will be approved by one motion. There will be no separate discussion of these items unless a Commission Member so requests, in which case the item will be removed from the Consent Agenda and considered in its normal sequence on the agenda.

A. MINUTES
1. February 3, 2020, regular meeting minutes

B. INTRODUCTION FOR PUBLIC HEARING: QUASI-JUDICIAL MATTERS

C. INTRODUCTION FOR PUBLIC HEARING: LEGISLATIVE MATTERS
1. **Resolution PC 20-12**, recommending Assembly adoption of MSB 17.68, Outdoor Shooting Facilities, in order to establish standards for commercial, educational, and nonprofit outdoor shooting facilities. Public Hearing: March 16, 2020. (*Staff: Alex Strawn*)

V. COMMITTEE REPORTS

VI. AGENCY/STAFF REPORTS

VII. LAND USE CLASSIFICATIONS

VIII. AUDIENCE PARTICIPATION (*three minutes per person, for items not scheduled for public hearing*)

IX. PUBLIC HEARING: QUASI-JUDICIAL MATTERS (*Public Hearings shall not begin before 6:15 p.m.)*

Commission members may not receive or engage in ex-parte contact with the applicant, other parties interested in the application, or members of the public concerning the application or issues presented in the application.

The Planning Commission members may submit questions to the Planning Commission Clerk concerning the following matters or request for more information from the applicant at the time of the introduction. All questions and requests submitted by the Commission shall be in writing and copies will be provided to the applicant and made available to all interested parties and the public upon request. Answers to questions and additional material requests will be addressed in the staff report for the public hearing.

A. **Resolution PC 20-06**, an application under MSB 17.65 Variances, for an exception to the minimum 25-foot right-of-way setback requirement under MSB 17.55. The variance would allow the existing single-family home to remain 21.3 feet from the E. Rough Cut Circle (Tax ID# 6333B02L008) right-of-way, and the existing garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way. (*Applicant: Adam Copson and Janet Flaherty, Staff: Joe Metzger*)

X. PUBLIC HEARING: LEGISLATIVE MATTERS

A. **Resolution PC 20-05**, supporting an ordinance amending MSB 43.05.015(B)(3) to adopt the 2020 Subdivision Construction Manual. (*Staff: Eileen Probasco*)

B. **Resolution PC 20-07,** recommending Assembly approval of an ordinance adopting MSB 11.12 Driveway Standards in order to ensure driveways within borough right-of-ways minimize negative impact to drainage, maintenance, and safety of the traveling public. (*Staff: Eileen Probasco*)

XI. CORRESPONDENCE & INFORMATION

A. Memorandum from Director Probasco requesting the Commission amend the agenda by removing PC Resolutions 20-05 and 20-07. Amended documents will be re-introduced at a later date.

XII. UNFINISHED BUSINESS

XIII. NEW BUSINESS

XIV. COMMISSION BUSINESS

A. Adjudicatory (*if needed*)

B. Upcoming Planning Commission Agenda Items (*Staff: Alex Strawn*)

XV. DIRECTOR AND COMMISSIONER COMMENTS

XVI. ADJOURNMENT (Mandatory Midnight)

In order to be eligible to file an appeal from a decision of the Planning Commission, a person must be designated an interested party. See MSB 15.39.010 for definition of "Interested Party." The procedures governing appeals to the Board of Adjustment & Appeals are contained in MSB 15.39.010-250, which is available on the Borough Internet home page, http://www.matsugov.us, in the Borough Clerk's office, or at various libraries within the Borough.

Disabled persons needing reasonable accommodation in order to participate at a Planning Commission Meeting should contact the borough ADA Coordinator at 861-8432 at least one week in advance of the meeting.

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MINUTES
February 3, 2020

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MINUTES

MATANUSKA-SUSITNA BOROUGH **REGULAR MEETING**
PLANNING COMMISSION MINUTES **FEBRUARY 3, 2020**

The regular meeting of the Matanuska-Susitna Borough Planning Commission was held on February 3, 2020, at the Matanuska-Susitna Borough Assembly Chambers, 350 E. Dahlia Avenue, Palmer, Alaska. The meeting was called to order at 6:00 p.m. by Vice-Chair Mary Anderson.

I. CALL TO ORDER, ROLL CALL, AND DETERMINATION OF QUORUM

Planning Commission members present and establishing a quorum:

Ms. Mary Anderson, Assembly District #1, Vice-Chair
Mr. Jason Ortiz, Assembly District #2
Ms. Patricia Chesbro, Assembly District #3
Ms. Colleen Vague, Assembly District #4, Chair, (*arrived at 6:18 p.m.*)
Mr. Chris Elder, Assembly District #5
Mr. Stafford Glashan, Assembly District #6
Mr. Sassan Mossanen, Assembly District #7

Staff in attendance:

Mr. Alex Strawn, Development Services Manager
Ms. Susie Lemon, Assistant Borough Attorney
Mr. Joseph Metzger, Planner II
Ms. Mary Brodigan, Planning Commission Clerk

II. APPROVAL OF AGENDA

Vice-Chair Anderson inquired if there were any changes to the agenda.

GENERAL CONSENT: The agenda was approved without objection.

III. PLEDGE OF ALLEGIANCE

The pledge of allegiance was led by Mr. Joseph Metzger, a member of the planning staff.

IV. CONSENT AGENDA

A. Minutes

1. January 6, 2020, regular meeting minutes

B. INTRODUCTION FOR PUBLIC HEARING: QUASI-JUDICIAL MATTERS

1. **Resolution PC 20-06**, an application under MSB 17.65 Variances, for an exception to the minimum 25-foot right-of-way setback requirement under MSB 17.55. The variance would allow the existing single-family home to remain 21.3 feet from the E. Rough Cut Circle (Tax ID# 6333B02L008) right-of-way, and the existing garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way. Public Hearing: March 2, 2020. (*Applicant: Adam Copson and Janet Flaherty, Staff: Joe Metzger*)

C. INTRODUCTION FOR PUBLIC HEARING: LEGISLATIVE MATTERS

1. **Resolution PC 20-05**, supporting an ordinance amending MSB 43.05.015(B)(3) to adopt the 2020 Subdivision Construction Manual. Public Hearing: March 2, 2020. (*Staff: Eileen Probasco*)
2. **Resolution PC 20-07,** recommending Assembly approval of an ordinance adopting MSB 11.12 Driveway Standards in order to ensure driveways within borough right-of-ways minimize negative impact to drainage, maintenance, and safety of the traveling public. Public Hearing: March 2, 2020. (*Staff: Eileen Probasco*)

Vice-Chair Anderson read the consent agenda into the record.

Vice-Chair Anderson inquired if there were any changes to the consent agenda.

GENERAL CONSENT: The consent agenda was approved without objection.

V. COMMITTEE REPORTS

(There were no committee reports.)

VI. AGENCY/STAFF REPORTS

(There were no agency/staff reports.)

VII. LAND USE CLASSIFICATIONS

(There were no land use classifications.)

VIII. AUDIENCE PARTICIPATION (Three minutes per person.)

(There were no persons to be heard.)

(*The meeting recessed at 6:05 p.m., and reconvened at 6:15 p.m.*)

IX. PUBLIC HEARING: QUASI-JUDICIAL MATTERS *(Public Hearings not to begin before 6:15 P.M.)*

Commission members may not receive or engage in ex-parte contact with the applicant, other parties interested in the application, or members of the public concerning the application or issues presented in the application.

A. **Resolution PC 20-03**, a conditional use permit in accordance with MSB 17.60 – Conditional Uses; for the operation of a marijuana retail facility, located at 173 N. Rosie Circle (Tax ID# 17N01W11A011/91911000U001); within Township 17 North, Range 1 West, Section 11, Seward Meridian. (*Applicant: Kyle Lutz, on behalf of Laughing Salmon, Staff: Joe Metzger*)

Vice-Chair Anderson read the resolution title into the record.

Vice-Chair Anderson:

- read the memorandum regarding quasi-judicial actions into the record;
- queried commissioners to determine if any of them have a financial interest in the proposed Conditional Use Permit (CUP);
- have had any ex parte contact with the applicant, members of the public, or interested parties in the proposed CUP; and
- if all commissioners are able to be impartial in a decision.

(*Commissioner Vague entered the meeting at 6:18 p.m.*)

Vice-Chair Anderson:

- queried Commissioner Vague to determine if she has a financial interest in the proposed Conditional Use Permit (CUP);
- has had any ex parte contact with the applicant, members of the public, or interested parties in the proposed CUP; and
- if she is able to be impartial in a decision.

(*Commissioner Vague assumed the powers of the Chair at 6:18 p.m.*)

Mr. Metzger provided a staff report:

- staff recommended approval of the resolution with conditions.

Commissioners requested clarification regarding the applicant holding barbeques at the facility.

Chair Vague invited the applicant or their representative to provide an overview of their application.

Mr. Kyle Lutz, applicant, stated that he had nothing further to add and would answer questions.

Commissioners questioned the applicant regarding why he included something about barbeques in his application.

Chair Vague opened the public hearing.

There being no persons to be heard, Chair Vague closed the public hearing and discussion moved to the Planning Commission.

MOTION: Commissioner Mossanen moved to approve Resolution PC 20-03. The motion was seconded.

Discussion ensued regarding whether information about potential barbeque events should be included in an application for a conditional use permit.

MOTION: Commissioner Glashan moved a primary amendment to strike from the resolution "WHEREAS, the application material indicates that during the summer months outdoor BBQ events may be held on the south side of the structure between the

hours of 10:00 a.m. and 6:00 p.m., and WHEREAS, the application material indicates during the BBQ events, small speakers may be used to play music." The motion was seconded.

VOTE: The primary amendment passed with no objection.

VOTE: The main motion passed as amended without objection.

B. **Resolution PC 20-04,** a conditional use permit in accordance with MSB 17.30 – Conditional Use Permit for Earth Material Extraction, located at 3429 N. Pittman Road (Tax ID# 18N02W23B002 and 18N02W23A002); within Township 18 North, Range 2 West, Section 23, Seward Meridian. The proposed mining area is approximately 41 acres of the 71-acre parcel. A CUP would allow for the removal of approximately 400,000 cubic yards of earth materials through 2059. (*Applicant: Dan Steiner, on behalf of Foremost Construction, Staff: Joe Metzger*)

Chair Vague read the resolution title into the record.

Chair Vague:
- read the memorandum regarding quasi-judicial actions into the record;
- queried commissioners to determine if any of them have a financial interest in the proposed Conditional Use Permit (CUP);
- have had any ex parte contact with the applicant, members of the public, or interested parties in the proposed CUP; and
- if all commissioners are able to be impartial in a decision.

Mr. Metzger provided a staff report:
- staff recommended approval of the resolution with conditions.

Commissioners questioned staff regarding:
- why staff is recommending that the final year of extraction be 2030 instead of the requested 2059;
- how does this gravel pit fit in with the Meadow Lakes Comprehensive Plan;
- clarification of the lack of a definition for large scale mining;
- an explanation for why staff does not consider this a rural residential area;
- clarification of the reclamation process; and
- how much gravel will be extracted monthly.

Chair Vague invited the applicant or their representative to provide an overview of their application.

Mr. Dan Steiner, Civil Engineer, and Ms. Irina Filyuk, applicant, provided an overview of their application.

Commissioners questioned the applicants regarding:
- will the extracted material be screened on-site;
- how many employees does Foremost Construction employ;

- how will accelerating the extraction to ten years affect their plans; and
- clarification of the amount of gravel that they plan to extract.

(*The meeting recessed at 7:16 p.m., and reconvened at 7:22 p.m.*)

Chair Vague opened the public hearing.

The following persons spoke in opposition to Resolution PC 20-04: Mr. John Kroutsky, Mr. Joe Bradley, Mr. Michael Gullett, Mr. Thomas Hood, Mr. Douglas Beaty, Ms. Michelle Meade, Mr. Gary Beach, and Mr. Kevin Ricke.

Chair Vague invited staff to respond to questions and statements from the audience.

Mr. Metzger stated that he had nothing further to add.

Chair Vague invited the applicants to respond to questions and statements from the audience.

Mr. Steiner and Ms. Filyuk responded to questions and statements from the audience.

There being no one else to be heard, Chair Vague closed the public hearing and discussion moved to the Planning Commission.

MOTION: Commissioner Glashan moved to approve Resolution PC 20-04. The motion was seconded.

Discussion ensued regarding:
- it is the purview of the PC to determine the best use for a property;
- does a gravel pit fit the value, character, and integrity of the area; and
- whether the area is considered residential.

Commissioners Glashan, Elder, and Ortiz spoke in favor of the resolution.

Commissioners Chesbro, Anderson, and Vague spoke to their concerns with the resolution.

VOTE: The main motion passed with Commissioners Chesbro, Vague, and Anderson in opposition.

X. PUBLIC HEARING LEGISLATIVE MATTERS

(There were no legislative public hearings.)

XI. CORRESPONDENCE AND INFORMATION

(There was no correspondence and information.)

XII. UNFINISHED BUSINESS

(There was no unfinished business.)

XIII. NEW BUSINESS

(There was no new business.)

XIV. COMMISSION BUSINESS

A. Adjudicatory (*if needed*)
B. Upcoming Planning Commission Agenda Items

Mr. Strawn provided a brief update on projects that will be coming before the Planning Commission.

XV. DIRECTOR AND COMMISSIONER COMMENTS

Ms. Lemon:
- stated that she will be covering the next several meetings; and
- announced that Trina Sears has accepted a position with the District Attorney's office and has left the Borough Attorney's office.

Commissioner Chesbro:
- stated that she always worries about comprehensive plans and how they can be used when looking at applications for conditional use permits; and
- questioned how the Planning Commission can determine the character and integrity of an area and whether an application fits or doesn't fit.

Commissioner Glashan:
- acknowledged that he struggles with this as well, but doesn't see how they can do anything other than look at code; and
- opined that staff has listened to the commissions' concerns about neighbors and impacts, and appreciates that they encourage applicants to go beyond the bare minimums.

Commissioner Anderson:
- stated her appreciation for staff and their hard work;
- opined that comprehensive plans are in their toolbox and they are supposed to be looking at them;
- questioned how the commission can interpret these things when there aren't clear definitions;
- requested the inclusion of definitions as comprehensive plans are updated; and
- stated her appreciation for the debate since it is healthy to hear other points of view.

Chair Vague:
- stated that she understands the pain and despair of the neighbors because she has been there as well;

- acknowledged that the commission has ordinances that they must follow, but noted that they are not a rubber stamp; and
- the commission has to be able to use comprehensive plans when looking at conditional use permits.

XVI. ADJOURNMENT

The regular meeting adjourned at 8:24 p.m.

COLLEEN VAGUE, Planning Commission Chair

ATTEST:

MARY BRODIGAN, Planning Commission Clerk

Minutes approved: ____

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INTRODUCTION FOR PUBLIC HEARING

LEGISLATIVE

Resolution No. PC 20-20

MSB 17.68
Outdoor Shooting Facility Standards

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INTRODUCTION FOR PUBLIC HEARING

MATANUSKA-SUSITNA BOROUGH INFORMATION MEMORANDUM IM No. 20-047

SUBJECT: AN ORDINANCE OF THE MATANUSKA-SUSITNA BOROUGH ASSEMBLY ADOPTING MSB 17.68 OUTDOOR SHOOTING FACILITIES IN ORDER TO ESTABLISH STANDARDS FOR COMMERCIAL, EDUCATIONAL, AND NONPROFIT OUTDOOR SHOOTING FACILITIES.

AGENDA OF: February 18, 2020

ASSEMBLY ACTION:

MANAGER RECOMMENDATION: Refer to Planning Commission.

APPROVED BY JOHN MOOSEY, BOROUGH MANAGER:

Route To:	Department/Individual	Initials	Remarks
	Originator - A. Strawn		
	Planning and Land Use Director		
	Borough Attorney	for N.S.	form only.
	Borough Clerk	2/10/20	

ATTACHMENT(S): Fiscal Note: YES ____ NO X
Planning Commission Resolution PC 20- (__pp)
EPA Best Management Practices for Lead at Outdoor Shooting Ranges (2005) (103 pp)
U.S. Department of Energy Range Design Criteria (2012)(58 pp)
Rutgers University Community Noise Enforcement Handbook (2012) (31 pp)
Excerpt from National Rifle Association Range Source Book (2012) (1 page)
Occupation Safety and Health Administration Noise Exposure Standard 1910.95 (13 pp)
Ordinance Serial No. 20-25 (12 pp)

SUMMARY STATEMENT:
In September 2019 the Matanuska-Susitna Borough Assembly adopted Resolution 19-083, directing the Planning Department to "develop a conditional use permit process for commercial, educational, and nonprofit outdoor shooting facilities to be reviewed by the Planning Commission and adopted by the Assembly."

from the value, character, and integrity of the surrounding area;

Another specific power granted to municipalities within state law includes the power to regulate noise associated with shooting ranges under AS 34.75.030 which provides:

> AS 34.75.030 State and municipal regulation
>
> (a) Notwithstanding AS 02.15.020 and AS 02.25.020, the state or a municipality may not regulate the outdoor level of noise at a facility if the facility is exempt from a criminal or civil action under AS 34.75.010(a).
>
> (b) Except as otherwise provided in this chapter, a municipality may regulate the noise level produced by a facility.

Finally, AS 29.35.210(b)(4) specifically gives second class authority to provide for water pollution control on an areawide basis. Alaska Statutes also mandate municipalities provide for Land Use Regulations under AS 29.35.180 Land Use Regulation.

With state law in mind, all of the standards within the ordinance address inherent issues associated with outdoor shooting facilities that the borough has specifically been given the authority to regulate. Specifically, the ordinance addresses lead contamination, stray bullets, and harmful levels of noise.

Lead contamination - According to Environmental Protection Agency (EPA) Manual on Best Management Practices for Lead at Outdoor Shooting Ranges (Rev. 2005), lead from improperly managed shooting ranges can be dissolved or carried by stormwater, can migrate through soil, and can be carried long distances in solution by groundwater. Exposure to very low concentrations of lead can have dangerous effects to infants and children. The ordinance addresses lead contamination by requiring new ranges to submit and follow a lead stewardship plan in accordance with EPA Best Management Practices.

Stray Bullets - Stray bullets are an obvious safety concern for outdoor shooting facilities if they are not designed to capture stray bullets. This ordinance ensures that ranges are designed to capture stray bullets and prevent unwanted ricochet.

Harmful levels of noise - According to Rutgers University Noise Technical Assistance Center, excessive noise can cause an assortment of impacts on human health including physiological impacts such as elevated blood pressure, faster heart rates,

increased neuroendocrine hormone levels. Noise can also effect the quantity and quality of sleep. The threshold of 90 dB(a) was chosen because any exposure beyond 90 dB(a) for greater than eight hours in a workplace would exceed Occupational Safety and Health Administration (OSHA) standards for the workplace. Additionally, the NRA Range Source Book (2012) lists exceedance of 90 dB(a) for 1 hour out of 24 as "unacceptable."

A major change from the original draft ordinance is the permit type has been changed from a conditional use permit to an administrative permit. Administrative permits do not require as much judgment in the decision to grant or deny the permit. They are decided by the Planning & Land Use Director instead of the Planning Commission and typically do not require judgement on highly subjective standards such as whether or not a development meets the "character and integrity" of a surrounding area.

Finally, a common criticism of the original draft ordinance was that it was not clear what types of shooting ranges the ordinance applied to. The language has not been modified from the original draft because staff believes that the language is clear and does not need modification. A couple of examples mentioned were: a person teaching a group of boy scouts how to fire weapons on private property; and a gunsmith sighting in or testing, on a private range, firearms that he repaired. Neither of these examples are intended to be regulated under this chapter. MSB 17.68.030(D) provides:

> (D) This chapter does not regulate the discharge of firearms on private property <u>where the property is not open to the public</u> on a commercial, education, nonprofit, or membership basis.

In both of these scenarios the range is not open to the public and is therefore not regulated under this chapter.

Comprehensive Plan

This ordinance implements several goals and policies of the Comprehensive Plan.

Goal (LU-1): Protect and enhance the public safety, health, and welfare of Borough residents.

Goal (LU-4): Protect and enhance the Borough's natural resources including watersheds, groundwater supplies and air quality.

> Policy LU4-1: Identify, monitor, protect, and enhance the quantity and quality of the Borough's watersheds, groundwater aquifers, and clean air resources.

Goal (CQ-1): Protect natural systems and features from the potentially negative impacts of human activities, including, but not limited to, land development.

Policy CQ1-2: Manage activities affecting air, vegetation, water, and the land to maintain or improve environmental quality, to preserve fish and wildlife habitat, to prevent degradation or loss of natural features and functions, and to minimize risks to life and property.

Goal (CQ-2): Manage the natural and built environments to achieve minimal loss of the functions and values of all drainage basins; and, where possible, enhance and restore functions, values, and features. Retain lakes, ponds, wetlands, streams, and rivers and their corridors substantially in their natural condition.

Policy CQ2-2: Comprehensively manage activities that may adversely impact surface and ground water quality or quantity.

Goal (LU-2): Protect residential neighborhoods and associated property values.

Policy LU2-1: Develop and implement regulations that protect residential development by separating incompatible uses, while encouraging uses that support such residential uses including office, commercial and other mixed-use developments that are shown to have positive cumulative impacts to the neighborhood.

Goal (LU-3): Encourage commercial and industrial development that is compatible with residential development and local community desires

Policy LU3-1: Develop and implement regulations that provide for non-residential development.

RECOMMENDATION OF ADMINISTRATION:

Staff respectfully recommends the Assembly consider adoption of this ordinance.

EPA Best Management Practices for Lead at Outdoor Shooting Ranges (2003)

United States
Environmental Protection
Agency

EPA-902-B-01-001
Revised June 2005
Region 2

Best Management Practices for Lead at Outdoor Shooting Ranges

For additional copies of this manual, please contact:

United States Environmental Protection Agency
Division of Enforcement and Compliance Assistance
RCRA Compliance Branch
290 Broadway, 22nd Fl.
New York, New York 10007-1866

Tel: 212-637-4145
Fax: 212-637-4949

Copies of this manual along with any additions or updates can also be obtained on-line at:
http://www.epa.gov/region2/waste/leadshot

Copying and Reprinting

This document is in the public domain and may be freely copied or reprinted.

Fourth Printing, June 2005

Best Management Practices for Lead at Outdoor Shooting Ranges

Notice

This manual is intended to provide useful general information to shooting range owners/operators. The United States Environmental Protection Agency (EPA) does not certify or approve ranges, range design or lead management practices. While every effort has been made to provide up-to-date technical information, this manual is not to be used as a substitute for consultation with scientists, engineers, attorneys, and other appropriate professionals who should be called upon to make specific recommendations for individual range design and lead management.

Any variation between applicable regulations and the summaries contained in this guidance document are unintentional, and, in the case of such variations, the requirements of the regulations govern.

This guidance was developed by EPA Region 2 in cooperation with a few states as well as many EPA offices. In addition, EPA, with the assistance of the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) provided all 50 states with an opportunity to review the RCRA regulatory portion of the guidance. At the time of printing, about 40 states had contacted the EPA and given their support and concurrence. EPA is continuing to get the agreement of the remaining states. Therefore, it appears that most, if not all, states will share the same view as to how lead shot is regulated.

Following the steps set forth in this guidance should result in compliance with applicable regulations. EPA does not make any guarantee or assume any liability with respect to the use of any information or recommendations contained in this document.

This guidance does not constitute rulemaking by the EPA and may not be relied on to create a substantive or procedural right or benefit enforceable, at law or in equity, by any person.

Acknowledgements

The USEPA would like to acknowledge the support of:

- The National Rifle Association of America
- The National Shooting Sports Foundation
- The Wildlife Management Institute
- Mark Begley of the Massachusetts Department of Environmental Protection
- Mr. Dick Peddicord of Dick Peddicord and Company, Inc.

These participants provided valuable information and assistance as peer reviewers in the development of the manual and their efforts are truly appreciated. EPA also wishes to give special thanks to Dr. Charles W. Sever of Okie Environmental Consulting, L.L.C., Inc., Mr. Mike Warminsky of Brice Environmental Services Corp., and Mr. Victor Ordija of Sporting Goods Properties.The EPA also wishes to acknowledge and thank the many others who provided important comments and insight, and especially those individuals who took the time to meet with us in person or on the phone.

Cover photo by: Mr. Jack Hoyt, EPA Region 2

Statement of Goals

The goals of this manual are:

- to inform shooting ranges :
  - that the United States Environmental Protection Agency's (EPA) purpose in developing and distributing this manual is to assist range owners and operators to operate in an environmentally protective manner.
- to promote an understanding of:
  - why lead is an environmental, public and regulatory concern,
  - what laws and regulations apply,
  - the benefits of applying good management practices,
  - what can be done to successfully manage lead,
  - why implementing lead best management practices is an integral part of environmental stewardship,
  - how to minimize litigation risk.
- to promote action by ranges to:
  - adopt and implement best management practices for managing lead,
  - recycle a finite natural resource,
  - become a model for other ranges through proper lead management,
  - advocate environmental stewardship.

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EPA Statement on National Guidance

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 10 2001

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: National Guidance on Best Management Practices for Lead at Outdoor Shooting Ranges

FROM: Elizabeth A. Cotsworth, Director
Office of Solid Waste

TO: RCRA Senior Policy Advisors

The purpose of this memo is to transmit a Region 2 document entitled "Best Management Practices for Lead at Outdoor Shooting Ranges," EPA-902-B-01-001, January 2001. This report is a technical information manual to assist range owners and operators in managing lead at shooting ranges. The report covers the environmental concerns, applicable laws and regulations, and current best management practices. This document was developed collaboratively with a number of stakeholders and is considered by my office to be the national guidance on this subject.

Background

Lead at some shooting ranges can be a significant environmental concern depending on location (e.g., proximity to wetlands) and hydrogeologic setting, as evidenced by a number of cases where lead pellets and shot have been taken in by fish and fowl at ranges over wetlands, and at some ranges where streams in acid lead-leaching environments have picked up lead contamination. Recognizing these problems, Region 2 in collaboration with EPA HQ, States, shooting range associations, and other shooting range experts, developed the enclosed technical guidance to identify the problems and solutions for preventing and controlling these problems. We commend this guidance to you as an information source for your use in working with range owners and operators to identify and address these concerns at specific ranges. Copies of this manual have been sent to all 50 States, with the help of ASTSWMO, and at least 40 States have responded with concurrence and support for this guidance.

Also enclosed for your information is a list of references "Summary of Shooting Range Lead Management Guidance" prepared by various shooting range-interested associations, and a copy of an NPDES permit for the Naperville, IL Sportsman's Park shooting range.

Internet Address (URL) • http://www.epa.gov
Recycled/Recyclable • Printed with Vegetable Oil Based Inks on Recycled Paper (Minimum 25% Postconsumer)

If you have any questions regarding lead at shooting ranges, please contact George Meyer (Chief, RCRA Compliance Branch, Region 2) at 212-637-4144, Meyer.George@epa.gov, or Ken Shuster in the Office of Solid Waste at 703-308-8759, shuster.kenneth@epa.gov.

It is my hope that wide distribution of these documents will help encourage greater cooperation and coordination on shooting range issues among RCRA, Superfund, and Water staff in the regions and states. To this end, it would be helpful if you would send the name of a point of contact in your region to Ken Shuster and George Meyer.

For additional copies of the Region 2 guidance, please contact George Meyer. It is also available at www.epa.gov/region2/waste/leadshot.

Enclosures

cc: George Meyer, Region 2
Elaine Davies, OERR
Michael Cook, OW
Eric Schaeffer, ORE, OECA
Craig Hooks, FFEO, OECA
Bob Byrne, Wildlife Management Institute
Barbara Simcoe, ASTSWMO
Regional Superfund Division Directors w/o Region 2 enclosure
Regional Water Division Directors w/o Region 2 enclosure
Regional RCRA Enforcement Section Chiefs w/o Region 2 enclosure

Best Management Practices for Lead at Outdoor Shooting Ranges

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Introduction

This manual provides owners and operators of outdoor rifle, pistol, trap, skeet and sporting clay ranges with information on lead management at their ranges. This manual serves as a reference guide and presents best management practices (BMPs) available to the shooting range community. The practices have been proven to effectively reduce or eliminate lead contamination and may also be economically beneficial to the range owner/operator. Since each range is unique in both the type of shooting activity and its environmental setting, specific solutions are not provided in this manual. Rather, a range owner or operator may use this manual to identify and select the most appropriate BMP(s) for their facility. Other information on environmental aspects of management at outdoor shooting ranges can be found in the National Shooting Sports Foundation's *Environmental Aspects of Construction and Management of Outdoor Shooting Ranges.*

The manual does not address range layout or design to meet range safety or competition requirements. For information on range safety and competition requirements, range owners/ operators are directed to other comprehensive reference materials available on that subject, such as the National Rifle Association's *Range Source Book,* and the National Association of Shooting Range's website (www.rangeinfo.org).

Owners/operators of ranges may want to assign the use of this BMP Manual to a specific team or committee. Delegating this responsibility to a specific team or group helps to assure that the BMP's are identified and implemented.

The manual is organized as follows:

- Chapter I provides the background on why lead is of concern to human health and the environment. It includes a discussion of how environmental laws impact shooting ranges and the importance of an integrated BMP program to manage lead.
- Chapter II discusses physical and operational characteristics to be considered when selecting a successful BMP program.
- Chapter III addresses best management techniques for rifle/pistol ranges, skeet and trap ranges, and sporting clay ranges. In this chapter, the manual explores possible solutions to prevent, reduce and/or remove lead contamination for each type of range.
- The Appendices provide current (as of June 2005) contacts for lead reclamation and recycling companies, vendors that provide prevention and/or remediation techniques and shooting organizations that have additional information on the lead issue. Additionally, the Appendices provide information on alternatives to lead, diagrams of bullet trap designs, summaries of regulatory requirements and interpretations, and a sample Environmental Stewardship Plan.

EPA is very interested in any suggestions you have about practices included in this manual which have proven effective in controlling lead contamination or recycling lead bullets/shot. Please send such information to the address below. Also, for additional information, or to be added to the list of lead reclaimers or remediation contractors, contact the National Rifle Association (NRA), the National Shooting Sports Foundation (NSSF) or:

Lead Shot Coordinator
RCRA Compliance Branch
U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, New York 10007-1866
Telephone: (212)637-4145
E-Mail: Leadshot.Region2@epa.gov

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Chapter I: Environmental and Regulatory Concerns at the Shooting Range

1.0 Background

Outdoor shooting ranges provide recreational facilities for millions of shooting sports enthusiasts in the United States. Recently, there has been a growing public concern about the potential negative environmental and health effects of range operations. In particular, the public is concerned about potential risks associated with the historical and continued use of lead shot and bullets at outdoor ranges.

This concern is not unfounded. An estimated 9,000 non-military outdoor ranges exist in the United States, collectively shooting millions of pounds of lead annually. Some ranges have operated for as long as several generations. Historical operations at ranges involved leaving expended lead bullets and shot uncollected on ranges. Many of these ranges continue to operate in the same manner as in the past.

It is estimated that approximately four percent (4%) (80,000 tons/year) of all the lead produced in the United States in the late 1990's (about 2 million tons/year), is made into bullets and shot. Taking into account rounds used off-range, and rounds used at indoor ranges, it is clear that much of this 160,000,000 pounds of lead shot/ bullets finds its way into the environment at ranges.

Since the mid-1980's, citizen groups have brought several lawsuits against range owners and have urged federal and state agencies to take action against owners and operators of outdoor shooting ranges. The citizen groups argued that range owners improperly managed discharged lead bullets and shot. Federal courts have supported parts of these suits, requiring range owners/operators to clean up lead-contaminated areas. Concurrent with the increased citizen suit activity, the federal EPA, the Centers for Disease Control and Prevention (CDCP), and a large number of states have identified human exposure to all forms of lead as a major health concern in the United States.

Lead management practices at ranges across the United States remain inconsistent. Some range owners/operators have examined the impact of range operations on human health and the environment and have implemented procedures to manage and/or remove accumulated lead from ranges. Other range owners/operators are just beginning to characterize and investigate their ranges in order to design an environmental risk prevention and/or remediation program(s) specific to their sites. A third group of ranges has adopted a "wait and see" policy – taking no action until specifically required to do so by law or clear guidance is in place. Finally, a fourth, small, but important group of range owners/operators remain unaware of lead's potential to harm human health and the environment, and of existing federal and state laws.

To manage lead, many owners and operators have successfully implemented Best Management Practices (BMPs) at their ranges. These range owners and operators have realized many benefits from sound lead management including:

- stewardship of the environment, natural resources and wildlife,
- improved community relations,
- improved aesthetics of the range/good business practices,
- increased profitability through recovery/ recycling lead, a valuable and finite resource, and
- reduced public scrutiny.

Shooting sports organizations [e.g., National Rifle Association (NRA) and the National Shooting Sports Foundation (NSSF)] promote lead management throughout the United States. These organizations have researched different methods to effectively address potential and actual lead mobility and exposure without detracting from the enjoyment of the sport. The NRA, NSSF, and a number of other shooting sports organizations strongly encourage range

owners/operators to develop a BMP program that contains elements discussed later in this manual. Contact the NRA and NSSF for additional guidance materials available on lead management practices.

By implementing appropriate lead management at outdoor shooting ranges, range owners and operators can reduce the environmental and health risks associated with lead deposition, meet legal requirements and realize quantifiable benefits.

1.1 Lead Contamination's Impact on Human Health and the Environment

Exposure Routes

Historically, the three major sources for human exposure to lead are lead-based paint, lead in dust and soil and lead in drinking water. Typically, human exposure occurs through ingestion, which is the consumption of lead or lead-contaminated materials, or by inhalation. The main human exposure to lead associated with shooting ranges is through lead-contaminated soil. However, other pathways are discussed below, along with lead's detrimental effects on humans and animals.

Lead can be introduced into the environment at shooting ranges in one or more of the following ways. Each of these pathways is site-specific and may or may not occur at each individual range:

- Lead oxidizes when exposed to air and dissolves when exposed to acidic water or soil.
- Lead bullets, bullet particles, or dissolved lead can be moved by storm water runoff.
- Dissolved lead can migrate through soils to groundwater.

<u>Lead oxidizes when exposed to air and dissolves when exposed to acidic water or soil</u>

When lead is exposed to acidic water and/or soil, it breaks down by weathering into lead oxides, carbonates, and other soluble compounds. With each rainfall, these compounds may be dissolved, and the lead may move in solution in the storm runoff waters. Decreases in water acidity (i.e., increases in its pH) will cause dissolved lead to precipitate out of solution. Lead concentrations in solution are reduced by this precipitation. At pHs above 7.5, very little lead remains in solution. Increased time of contact between lead and acidic water generally results in an increase in the amount of dissolved lead in the storm runoff water. The five factors which most influence the dissolving of lead in water are summarized below:

Annual Precipitation Rate - The higher the annual precipitation rate, the faster the lead weathers. Also, during prolonged rains, the contact time between water and lead is increased. In general, the higher the precipitation rate, the higher the potential risk of lead migration off-site in solution.

pH of Rain and Surface Water - The acidity of the rainwater decreases as basic (alkaline) minerals in the soil are dissolved. If sufficient minerals such as calcium, magnesium, and iron are present in local soils, then the lead may quickly precipitate out of solution entirely as these other minerals are dissolved. The pH of shallow surface water is an indicator of the presence or absence of basic minerals in the local soil and in gravel within the stream beds through which the water has moved. The water in deeper streams and lakes is more likely to be composed of acidic rainwater that is not neutralized.

Contact Time - The contact time between acidic surface water and lead is a factor in the amount of lead that is dissolved. For example, lead shot deposited directly into a lake has a longer contact time then lead shot deposited in upland areas.

Soil Cover - Organic material will absorb lead and remove it from a water solution. The thicker the organic leaf and peat cover on the soil, the lower the lead content in solution in water leaving the shot area. Organic material has a strong

ability to extract lead out of solution in water.

pH of Groundwater - During periods of no rainfall, the water flowing within most streams comes from groundwater discharging into the stream channel. Therefore, the acidity of the groundwater affects the acidity of the surface water, and hence, affects the solubility of any lead particles carried into the stream during storm runoff.

Lead bullets, bullet particles or dissolved lead can be moved by storm water runoff

The ability of water to transport lead is influenced by two factors: velocity of the water and weight or size of the lead fragment. Water's capacity to carry small particles is proportional to the square of the water's velocity. Clear water moving at a velocity of 100 feet per minute can carry a lead particle 10,000 times heavier than water moving at a velocity of 10 feet per minute. Muddy water can carry even larger particles. The five factors that most influence velocity of runoff are described below:

Rainfall Intensity - The greater the volume of rainfall during a short period of time, the faster the velocity created to carry the rainfall off-site. The higher the annual rainfall, the greater the number of periods of heavy rainfall.

Topographic Slope - Generally, the steeper the topographic slope, the faster the velocity of stormwater runoff.

Soil Type - More rainfall will soak into sandy soils then into clay soils. Hence, for a given rainfall intensity, the volume of runoff will be greater from areas underlain by clays or other low permeable soils than from permeable sandy soil.

Velocity - Velocity tends to decrease as stream width increases. Merging streams, eddy currents, and curves in streams are other factors that may reduce the velocity. Generally, the shorter the distance from the lead deposit to the property line, the more likely it is that the lead fragments in suspension will be transported off-site.

Vegetative Cover and Man-made Structures - Structures such as dams and dikes reduce the water's velocity and greatly reduce the size and weight of the lead particles the water can carry. Since lead particles are heavy compared to the other suspended particles of similar size, they are more likely to be deposited under the influence of anything that reduces velocity of the storm runoff. Grass and other vegetation reduce runoff velocity and act as a filter to remove suspended solids from the water.

Dissolved lead can migrate through soils to groundwater

Acidic rainwater may dissolve weathered lead compounds. A portion of the lead may be transported in solution in groundwater beneath land surfaces. Groundwater may transport lead in solution from the higher topographic areas to the lower areas such as valleys, where it is discharged and becomes part of the surface water flow. If the water flowing underground passes through rocks containing calcium, magnesium, iron, or other minerals more soluble then lead, or through minerals that raise the pH of the water, then the lead in solution may be replaced (removed) from the solution by these other metals. However, if the soil is a clean silica sand and gravel, fractured granite, or similar type material, then the lead may move long distances in solution. The factors most likely to affect the amount of lead carried by the groundwater in solution are discussed below:

Annual Precipitation - Generally, high precipitation rates result in heavy dew, more frequent rainfall, numerous streams, shallow depth to groundwater, shorter distance of travel, and more rapid rates of groundwater flow. Also, the greater volumes of rainfall over geologic time probably have reduced the amount of calcium and other soluble basic minerals that could raise the water pH and cause lead to precipitate (settle) out of solution from the groundwater.

Soil Types - Clays have a high ionic lead bonding capacity and more surface area to which the lead can bond. Also, groundwater movement in clay is very slow, which increases the contact time for lead to bond to the clay.

Low permeability reduces the amount of historical leaching and increases the probability of the presence of basic (pH-increasing) minerals that can precipitate out of solution in groundwater or cause the lead to bond to the clay. All of the basic calcium and related minerals generally will have been removed from the clean silica sand and gravel soils, so the lead in solution in groundwater in these type soils can move long distances (miles) through the ground relatively unchanged.

Soil Chemistry - The more basic minerals like calcium and magnesium that are present in soils along the pathways through which the groundwater moves, the greater the lead precipitation (removal) rate. Lead should move in solution only a short distance (a few feet) through a sand composed of calcium shell fragments, but could move in solution long distances (miles) through clean quartz sand.

Depth to Groundwater - In areas of groundwater discharge such as river flood plains and most flat areas, the groundwater surface is often a few feet below the surface. Remember, the shorter the distance traveled, the greater the risk that the lead will migrate into the environment. Shallow depth to groundwater is indicative of higher risk for lead to reach the water.

pH of Groundwater - Although other factors influence solubility of lead in water, a good rule of thumb is that lead will precipitate out of solution when the pH or alkalinity of water is greater then about 7.5. But, lead dissolved in acid groundwater may travel many miles without change.

Health Effects of Lead Exposure on Ranges

Lead poisoning is a serious health risk. At higher concentrations, it is dangerous to people of all ages, leading to convulsions, coma and even death. At even very low concentrations, it is dangerous to infants and young children, damaging the developing brain and resulting in both learning and behavioral problems. Figure 1-1 describes the effects of exposure to lead on children and adults.

Federal, state and local actions, including bans on lead in gasoline, paint, solder and many other lead-containing products, have resulted in significant reductions in average blood-lead levels. Despite these advances, the number of lead-poisoned children remains alarmingly high. Children living in older homes may be exposed to lead in peeling paint or paint dust. Children can also come in contact with lead in soil and with lead dust carried home on the clothing of parents.

On ranges, inhalation is one pathway for lead exposure since shooters are exposed to lead dust during the firing of their guns. Because wind is unlikely to move heavy lead particles very far, airborne dust is generally considered a potential threat only when there are significant structures that block air flow on the firing line. Under such conditions, the hygiene and other practices proposed by the NRA for indoor shooting ranges in their "Source Book" are applicable to outdoor ranges.

Range workers may also be exposed to lead dust while performing routine maintenance operations, such as raking or cleaning out bullet traps. Owners/operators may want to protect these workers by requiring them to wear the proper protective equipment or dampening the soil prior to work.

Another exposure route for lead at outdoor ranges is ingestion by direct contact with lead or lead particles. For example, lead particles generated by the discharge of a firearm can collect on the hands of a shooter. These particles can be ingested if a shooter eats or smokes prior to washing his/her hands after shooting. **The relative risk of lead exposure to people in a well managed facility is low.**

Detrimental effects due to elevated lead levels can also be found in animals. Excessive exposure to lead, primarily from ingestion, can cause increased mortality rates in cattle, sheep and waterfowl. For example, waterfowl and other birds can ingest the shot, mistaking it for food or grit. Waterfowl, in particular, are highly susceptible to lead ingestion. This is a concern at ranges where shooting occurs into or over

Effects on the Human Body from Excessive Exposure to Lead

If not detected early, **children** with relatively low levels of lead (as low as 10 microgram/deciliter for children) in their bodies can suffer from:

- damage to the brain and nervous system,
- behavior and learning problems (such as hyperactivity and aggressiveness),
- slowed growth,
- hearing problems,
- headaches, and
- impairment of vision and motor skills.

Adults can suffer from:

- difficulties during pregnancy,
- reproductive problems in both men and women (such as low birth weight, birth defects and decreased fertility),
- high blood pressure,
- digestive problems,
- neurological disorders,
- memory and concentration problems,
- muscle and joint pain, and
- kidney dysfunction.

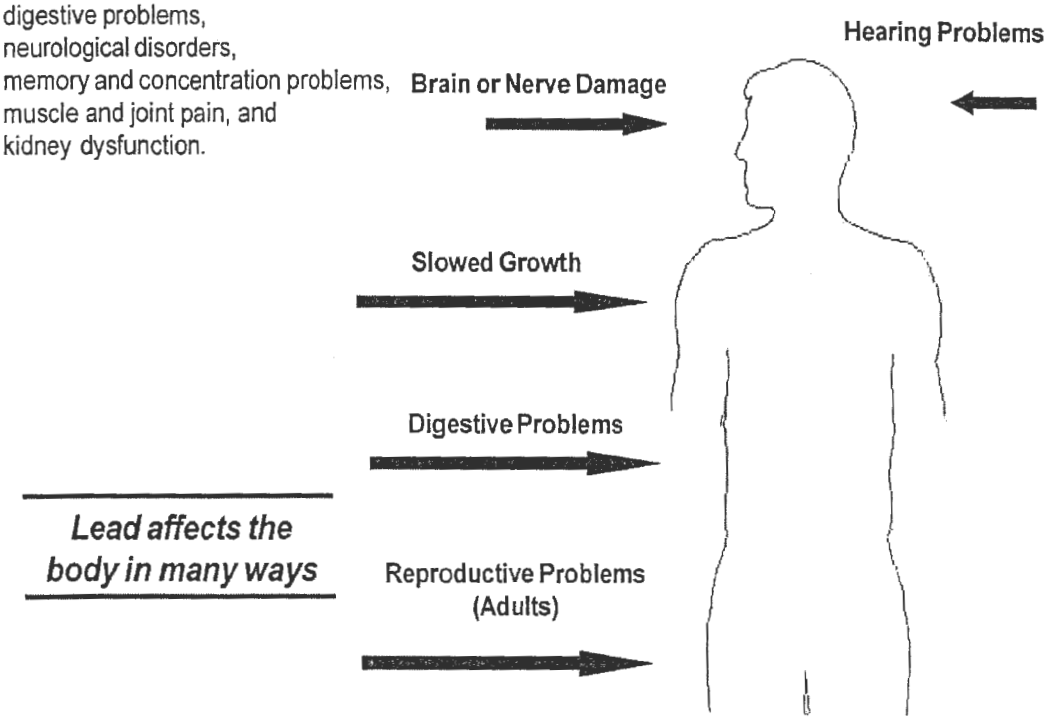

Figure 1-1: Effects on the Human Body from Excessive Exposure to Lead

water. Many of the legal and government actions that have been brought against ranges are based on elevated levels of lead and increased mortality in waterfowl. For example, in one case, an upland area of a range became a temporary pond after a thunderstorm. Waterfowl used the pond to feed and shortly thereafter, there was a waterfowl die-off (increase in bird mortality), apparently from lead ingestion.

1.2 Legal Requirements & Court Rulings

To date, most litigation concerns have been at shotgun ranges where the shotfall zone impacts water or wetland areas. The potential environmental and human health risks are greater at these ranges. However, all ranges, including those not located near water bodies, may be subject to legal and government action if proper range management programs are not implemented. Range owners/operators should expect greater scrutiny as ranges become more visible to regulators, environmental groups and the general public.

Citizen groups have been the driving force behind most legal actions taken against outdoor ranges. These groups have sued range owners/ operators under federal environmental laws. Two of EPA's most comprehensive environmental laws, the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act (CWA), specifically provide citizens with the right to sue in cases in which the environment and human health are threatened. These citizen suits have been highly effective in changing the way ranges operate, even when out-of-court settlements have been reached. The decisions of the United States Court of Appeals for the Second Circuit in *Remington Arms* and *New York Athletic Club* set a legal precedent in the application of RCRA and/or the CWA to outdoor ranges. Lead management programs at outdoor ranges must comply with both laws. Actions have also been taken under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) commonly know as Superfund. State and local statutes and regulations may also apply. To ensure environmental laws are being followed, range owners/operators must understand the legal issues and requirements.

1.2.1 Resource Conservation and Recovery Act (RCRA)

RCRA provides the framework for the nation's solid and hazardous waste management program. Under RCRA, EPA developed a "cradle-to-grave" system to ensure the protection of human health and the environment when generating, transporting, storing, treating and disposing of hazardous waste. RCRA potentially applies to many phases of range operation because lead bullets/shot, if abandoned, may be a solid and/or a hazardous waste and may present an actual or potential imminent and substantial endangerment.

Connecticut Coastal Fishermen's Association v. Remington Arms Company, et al.

In the late 1980s, the Connecticut Coastal Fishermen's Association filed a lawsuit against Remington Arms Company as the owner of the Lordship Gun Club. The Lordship Gun Club (a.k.a. Remington Gun Club) is a 30-acre site in Stratford, Connecticut, located on the Long Island Sound at the mouth of the Housatonic River. In the mid-1960s, the Lordship Gun Club was reconstructed to its final configuration of 12 combined trap and skeet fields and one additional trap field. Over the years, the Lordship Gun Club became known as one of the premier shooting facilities on the East Coast.

The Connecticut Coastal Fishermen's Association filed a lawsuit, alleging that lead shot and clay targets are hazardous waste under RCRA. The Complaint alleged that because the lead shot and clay targets were hazardous wastes, the gun club was a hazardous waste storage and disposal facility subject to RCRA requirements. The plaintiff also sought civil penalties and attorney's fees.

Remington moved for a summary judgment dismissing the complaint, and the Connecticut Coastal Fisherman's Association cross-moved for a partial summary judgment on the issue of liability. On September 11, 1991, the United

States District Court for the District of Connecticut ruled on the case.

Regarding the plaintiff's claims under RCRA, the District Court ruled in favor of the Connecticut Coastal Fishermen's Association, holding that the lead shot and clay targets were "discarded materials" and were "solid waste;" therefore, the materials were subject to regulation under RCRA. The court further stated that the discharged lead shot was a "hazardous waste," but declined to rule on whether the clay target fragments were also hazardous waste. Remington petitioned the United States Court of Appeals for the Second Circuit Court to review the lower court's ruling.

On June 11, 1992, both parties presented oral arguments before the court. Subsequent to oral arguments, the appellate court requested that EPA file an amicus brief "addressing whether lead shot and clay target debris deposited on land and in the water in the normal course of trap and skeet shooting is 'discarded material'... so as to constitute 'solid waste' under RCRA."

On March 29, 1993, the United States Court of Appeals for the Second Circuit reached its decision. With respect to RCRA, the court both reversed and affirmed the lower court's opinion in part.

Briefly, the decision affects currently operating and future gun clubs, and the following key points are of primary concern:

1. With respect to RCRA, the court agreed with EPA's amicus brief, which had argued that shooting at gun clubs is not subject to regulatory (as opposed to statutory) requirements. In other words, during routine operations, gun clubs are not viewed as facilities that manage hazardous wastes subject to RCRA regulations and, as such, do not require RCRA permits.

2. Another argument in the EPA's amicus brief with which the court agreed was the view that the RCRA statute allows citizen suits to be brought if a gun club's shooting activities pose an "imminent and substantial endangerment to health or the environment." Although gun clubs are not subject to RCRA regulations, EPA or any state, municipality, or citizen group can take legal action under the statutory provisions of RCRA against gun clubs for actual or potential environmental damage occurring during, or even after, the operation of the club. Under RCRA, the plaintiff would be eligible to recover its legal fees as well.

3. The court concluded that lead shot and clay targets meet the statutory definition of solid waste because these materials were "discarded (i.e. abandoned)" and "left to accumulate long after they have served their intended purpose." Further, the court concluded that based upon toxicity testing and evidence of lead contamination, the lead shot was a hazardous waste subject to RCRA.

The important point to consider here is that if lead shot and clay target debris are discarded (i.e. abandoned), these materials are considered a solid waste as defined in the statute and the facility may be subject to governmental or citizen suits.

If, on the other hand, the discharged lead shot is recovered or reclaimed on a regular basis, no statutory solid waste (or hazardous waste) would be present and imminent hazard suits would be avoided.

Thus, the Remington Arms case is an important legal precedent. Even though regulations have not been issued regarding gun club operations and environmental protection, gun clubs are still at risk of legal action under RCRA if they fail to routinely recover and reclaim lead, do not take steps to minimize lead release or migration, or if they abandon lead in berms.

Gun clubs where there is shooting into water, wetlands, rivers, creeks, and other sensitive environments have the highest degree of litigation risk. Conversely, gun clubs that have the lowest risk of environmental litigation or government action are those clubs that do not shoot into water or wetlands and which have an active program to recover lead.

The following describes how RCRA may apply to outdoor shooting ranges.

How is Lead Shot Regulated Under RCRA?

Lead shot is not considered a hazardous waste subject to RCRA at the time it is discharged from a firearm because it is used for its intended purpose. As such, shooting lead shot (or bullets) is not regulated nor is a RCRA permit required to operate a shooting range. However, spent lead shot (or bullets), left in the environment, is subject to the broader definition of solid waste written by Congress and used in sections 7002 and 7003 of the RCRA statute.

With reference to reclaiming and recycling lead shot, the following points should serve as guidance in understanding RCRA and how it applies to your range. (A more detailed discussion of the underlying RCRA rules applicable to lead shot removal at ranges is included in Appendix D)

- **Removal contractors or reclaimers should apply standard best management practices, mentioned in this manual, to separate the lead from soil. The soil, if then placed back on the range, is exempt from RCRA. However, if the soil is to be removed off-site, then it would require testing to determine if it is a RCRA hazardous waste.**

- **Lead, if recycled or reused, is considered a scrap metal and is, therefore, excluded from RCRA.**

- Collected lead shot and bullets are excluded from RCRA regulation, and need not have a manifest, nor does a range need to obtain a RCRA generator number (i.e., the range is not a hazardous waste "generator"), provided that the lead is recycled or re-used. The reclaimer does not need to be a RCRA transporter. **However, it is recommended that ranges retain records of shipments of lead to the receiving facilities in order to demonstrate that the lead was recycled. Records should also be kept whenever the lead is reused (as in reloading.) The range should be aware that it ultimately may be responsible for the lead sent for reclamation. Therefore, only reputable reclaimers should be utilized.**

- Lead from ranges destined for recycling may be temporarily stored on range property after separation from soil if the lead is stored in closed, sealed containers, the containers are stored in a secure location and routinely inspected by range staff, and records of inspections are maintained.

- Sections 7002 and 7003 of the RCRA statute allow EPA, states or citizens to use civil lawsuits, to compel cleanup of or other action for "solid waste" (e.g., spent lead shot) posing actual or potential imminent and substantial endangerment. Such actions can be sought whether the range is in operation or closed, and is based solely on a determination that harm is being posed or may be posed by the range to public health and/or the environment. Since the risk of lead migrating increases with time, making ranges that have not removed lead more likely candidates for government action or citizen lawsuits under RCRA Section 7002 and 7003, ranges are advised to maintain a schedule of regular lead removal.

- With time, lead in soil can become less desirable to reclaimers and smelters, thereby potentially reducing or eliminating financial returns from lead removal. Moreover, such soil may be subject to more expensive treatment to separate the lead for recycling.

- Lead removal will allow the range to: avoid contamination of the site and potential impacts to human health and the environment; reduce liability with regard to potential government agency or citizen suit action; and, possibly, benefit economically from the recycling of lead. Additional guidance on reclaiming lead is provided in other parts of this manual.

- Soil from berms and shotfall zones may be moved to another area of the range for such reasons as addressing potential environmental impacts (e.g., runoff), altering the layout to address safety concerns or allowing different types of shooting activities, or adding or removing shooting positions. However, removal of lead prior to such

movement of soil is normal practice and highly advised because it extends the usable life of the materials and reduces the possibility of release of lead into the environment. If lead is not first removed, it will be further dispersed and will be more difficult to remove in future reclamation. Written records of all such activity should be maintained indefinitely, as they will be necessary in subsequent construction or range closure.

- This RCRA summary applies to operating and non-operating ranges, and the use of BMPs at operating ranges is highly recommended. However, because of increased risk if lead is not actively managed, such application may not preclude the need for remediation, as appropriate and/or as required by states' regulations, when a range is permanently closed, on-site lead is abandoned, or the land use changes. Introductory guidance for remediation can be found at www.epa.gov/epaoswer/osw or www.epa.gov/superfund. Look under the sections "Cleanup" or "Resources," or use the Search function.

1.2.2 - Clean Water Act

The goal of the Clean Water Act (CWA) is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The most common allegation against ranges by the EPA and citizen groups, is that they violate the CWA if they do not have permits that allow spent ammunition to be discharged into water. The CWA prohibits "the discharge of any pollutant by any person" into the waters of the United States without a National Pollution Discharge and Elimination System (NPDES) permit. There have been two court cases that have applied the provisions of the CWA to civilian shooting ranges. To understand how the CWA can apply to shooting ranges, a summary of the cases follows. Also see Table 1-1.

To understand the application of the CWA to outdoor ranges, one must know the definitions of key terms and how they have been applied to shooting activities. See Table 1-1.

In the *Remington Arms* and the *New York Athletic Club* lawsuits, citizen groups argued that the defendants violated the CWA by discharging pollutants from point sources into the Long Island Sound without a NPDES permit. Application of the CWA requires the violations to be ongoing. Consequently, the court in *Remington Arms* dismissed the CWA charge against the range because it had ceased operating before the lawsuit was filed.

However, in the *New York Athletic Club* case, the club was still in operation during the time of litigation, but had switched to steel shot. EPA's opinion on this case also addressed the CWA violation. EPA argued that certain trap/skeet ranges can convey pollutants, via point sources, to water in violation of the CWA if a NPDES permit is not obtained. Although some shooting organizations have disagreed with the EPA position, the United States District Court for the Southern District of New York specifically found that:

- The mechanized target throwers, the concrete shooting platforms, and the shooting range itself are considered point sources as defined by the CWA;

- Expended shot and target debris, including non-toxic shot, such as steel shot, left in water, are pollutants as defined by the CWA.

Although the New York district court's decision in the *New York Athletic Club* case is not controlling in any other district, range owners and operators of outdoor ranges that shoot over or into wetlands or other navigable waters of the United States should be aware of it.
Based on the court's decision in the *New York Athletic Club* case, any range whose shot, bullets or target debris enter the "waters of the United States" could be subject to permitting requirements as well as governmental or citizen suits. "Waters of the United States" or "navigable waters of the United States" are waters of the United States, including territorial seas that include any body of water that has any connection to, or impact on, interstate waters or commerce. The waters may include lakes,

Table 1-1: Application of Key Terms to Outdoor Ranges

Key Term	Statutory Definition	Application to *New York Athletic Club*
Discharge of a Pollutant	"any *addition* of any pollutant to navigable waters from any point source" (emphasis added) 33 U.S.C. § 1362 (12)	Shooting into water (including wetlands) constitutes a discharge. In the *New York Athletic Club*, the range did not dispute that its shooting operations resulted in the deposition of spent shot and other debris into the waters of the United States.
Point Source	"any discernible, confined, and discrete conveyance... from which pollutants are or may be discharged" into the Nation's waters. 33 U.S.C. § 1362 (14)	In *New York Athletic Club*, the court found that shooting ranges act to systematically channel pollutants into regulated waters and that mechanized target throwers convey pollutants directly into water. Specifically, it stated, "A trap shooting range... is an identifiable source from which spent shot and target fragments are conveyed into navigable waters of the United States." The court also determined that the concrete shooting platforms can be seen as separate "point sources" under the CWA or as one facet of the shooting range that systematically delivers pollutants (e.g. shot and wadding) into the water.
Pollutant	"dredged spoil, solid waste,... munitions... discharged into water" 33 U.S.C. § 1362 (6)	In *New York Athletic Club*, shot and target residue constitute a form of "solid waste" subject to regulation under the CWA as a "pollutant." Based on these determinations, the court supported EPA's contention that the ranges were discharging pollutants from a point source without a permit, in violation of the CWA.

ponds, rivers, streams, wetlands, or even guts that are frequently dry, which may not be obvious to range owners/operators. These ranges may be required to remediate contaminated sediments and soils, which could be both difficult and expensive, and to cease operations over waters and wetlands. **It is essential that these ranges change the direction of shooting, to avoid shooting over or into wetlands or other navigable waters of the United States, and initiate lead removal and recycling activities, where feasible.**

In addition, these ranges can cause a substantial impact on wildlife and wetlands, which range owners/operators may be required to restore under other federal laws (e.g., CERCLA, discussed below). Lead shot entering a water body substantially increases the potential risk of contaminating surface and groundwater which, in turn, threatens human health and the environment. Finally, as *New York Athletic Club*, *Remington Arms* and similar cases show, neighbors have the most leverage when range activity affects wetlands and waterways.

For ranges located away from coastal areas or whose operating areas are situated wholly over land, compliance with the CWA can be achieved by obtaining a NPDES permit for piped or channeled runoff from the range into water[1].

Shooting ranges impacting wetland areas may be subject to other regulations found in Section 404 of the CWA. This section is the principal federal regulatory program protecting the Nation's remaining wetland resources. Any plan by range owners/operators to dredge and/or fill wetlands may require a permit and will come under close scrutiny by federal, state and local governments and citizen groups. Owners and operators must comply with the CWA for range design, redesign, construction, reclamation or remediation occurring in wetland areas.

[1] The term "land" in this instance refers specifically to terrain recognized as "non-wetland" areas.

1.2.3 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), imposes liability on past and present owners or operators of properties where a release of a hazardous substance into the environment exists. CERCLA is used to ensure that an owner/operator cleans a contaminated site or to seek reimbursement from past owners/operators or disposers (potentially responsible parties or PRPs) when a party, either the government or private party, has cleaned up the contamination. Under CERCLA, lead is considered a hazardous substance.

EPA has the authority to order a PRP to clean up a site or conduct the cleanup and recover its costs from the PRP under CERCLA. Responsible parties may be held liable for all cleanup costs, which can be substantial. Under CERCLA, shooting ranges may be liable for government costs incurred during the cleanup of ranges, natural resources damages, and health assessments and/or health effects studies. The following two examples illustrate how shooting ranges (including one operated by the federal government) can be affected by CERCLA.

Southern Lakes Trap and Skeet Club Site, Lake Geneva, Wisconsin, et al.

In 1992, the US Fish and Wildlife Service (USFWS) began an investigation to determine the cause of death of over 200 Canada geese. The geese died as a result of acute lead poisoning after ingesting lead shot, which research indicated came from the Southern Lakes Trap and Skeet Club. The USFWS, in its role as Natural Resource Trustee, took action to recover the cost of damage to the natural resources (i.e., migratory geese) under CERCLA. In addition, EPA pursued a separate action under the Agency's CERCLA response authority. The club had leased the property from the property owners to operate a shooting range. Shortly after EPA sent out the notice of potential liability to the current and former owners and

operators of the club site, the club closed permanently.

In 1994, EPA issued an Administrative Order on Consent (AOC) against one current and one former owner of the property where the now closed Southern Lakes Trap and Skeet Club was located. The AOC required the owners to perform a site assessment, which included an evaluation of the costs to restore the wetlands. In 1998, EPA completed activities to clean up the site and restore some of the natural resources and wetlands. In a negotiated settlement, EPA recovered $1 million of the cost of the cleanup.

Walter L. Kamb v. United States Coast Guard, et al.

In another CERCLA action, Mr. Kamb (court appointed property guardian) sued the U.S. Coast Guard, California Highway Patrol, City of Fort Bragg, and the County of Mendocino (the defendants) for recovery of cleanup costs under CERCLA. Mr. Kamb had been appointed by the Mendocino County Superior Court to sell the property on behalf of the property owners. The property was formerly used by defendants as a rifle, pistol and trap range. Soil analysis indicated the presence of lead in the form of leadshot, bullets, pellets, and dust. The court found the defendants were "responsible parties" (liable for cleanup costs) under CERCLA. No apportionment of liability was made and the final determination of each parties' pro rata share of the response cost was deferred.

This case shows that range activity need not affect a water body to trigger CERCLA liability. CERCLA is a powerful statutory authority that can greatly impact current and former range owners/operators. The statute allows for recovery of damages to natural resources, the cost of any health assessment studies and all cleanup costs. Liability may extend to past owners and operators long after a range ceases operation.

1.2.4 Additional Laws and Regulations

Shooting ranges may also be subject to state and local laws and regulations. Many states have adopted their own environmental laws, which are based on federal laws. Specifically, these states have laws and regulations that mirror the CWA and RCRA program laws. EPA-approved state program laws must be as stringent as the federal laws and may be more stringent. Activities at shooting ranges may also be subject to local laws, ordinances and regulations addressing issues such as noise, zoning, traffic, wetlands and nuisance. Often, citizens or neighbors of outdoor shooting ranges can initiate noise nuisance claims against range owners/operators. Because many states have passed legislation protecting ranges from noise nuisance lawsuits, these may turn into claims of environmental violations under the laws discussed above due to the presence of lead and other products at ranges.

1.3 Benefits of Minimizing Lead's Environmental Impact

All ranges will benefit from proactively implementing successful BMPs. Even if range activities currently do not cause adverse public health and environmental impacts, by developing and promoting active lead management programs, ranges will benefit in the following ways:

- **Through a sound lead management program, shooting sports enthusiasts can reduce the potential of lead exposure and contamination to humans, animals and the environment.**

- **A lead management program will result in improved public relations for the range and the shooting sports**. Ranges can promote and publicize their successful BMP programs to improve their public image. Since many of the legal and governmental actions begin with or are due to citizen groups, an active lead management program may improve the public image of the range with these citizen groups.

- **The removal of spent lead from the range presents a clean, well maintained facility, which will increase customer satisfaction.**

- **Lead is a recyclable and finite resource and can be recovered from the active portion of ranges and sold to lead reclaimers.** Frequently, reclaimers do not charge range owners/operators to recover lead from ranges, and owners and operators may receive a percentage of the profit from the sale of reclaimed lead. This factor drives recycling efforts at many ranges.

- **By reducing or eliminating a potential source of lead migration in soil, surface water and groundwater, range owners/ operators may avoid costly and lengthy future remediation activities.**

- **Finally, implementing a BMP program for lead may eliminate or greatly reduce the risk of citizen lawsuits and the legal costs associated with these lawsuits.** Through management and removal practices, lead may no longer represent a threat upon which citizen lawsuits are based.

Range owners/operators may question whether the benefits of a regular and timely BMP program outweigh the efforts of implementing and maintaining a program. The questions may arise especially for ranges at which shooting activities involve waterways, since national attention has focused on ranges located adjacent to water (e.g., *Remington Arms* and the *New York Athletic Club*). However, all outdoor ranges may be subject to legal actions under RCRA and CERCLA authority. All of the benefits for adopting best management practices are available and worthwhile for every range owner and operator.

The following sections provide information that will assist the range owner or operator in implementing a BMP program for recovery and recycling of lead shots and bullets.

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Chapter II: Range Characteristics & Activities to Consider When Implementing Best Management Practices (BMP)

2.0 Background

Since each firing range site is unique, BMPs for lead must be selected to meet site-specific conditions in order to achieve maximum success. A range's physical characteristics and the operational aspects (e.g., volume of shooting, shooting patterns and operating schedules) will effect which BMPs may apply and how they will be implemented. Accordingly, whether designing a new outdoor range or operating an existing range, it is important that BMPs incorporate techniques appropriate for the range's individual characteristics.

Section 2.1 of this chapter identifies the physical characteristics that must be considered when evaluating your range. A summary of common physical characteristics at ranges is also presented in Table 2-1. These factors include:

- Range Size (primarily for shotgun ranges)
- Soil Characteristics
- Topography/Runoff Direction
- Annual Precipitation
- Ground and Surface Water
- Vegetation
- Accessibility

Section 2.2 discusses the operational aspects that must be considered. These factors include:

- Lead Volume
- Size of Shot/Bullets
- Operating Schedule
- Shooting Direction and Pattern
- Range Life Expectancy

In addition, Section 2.3 discusses issues that are specific to implementing BMPs when planning a new range.

2.1 Physical Characteristics

Physical characteristics of ranges, relative to lead management issues, are discussed below.

Range Size

Shotgun range design and type affects the ease of lead shot collection. Larger ranges typically tend to have lead shot that is dispersed over a wider area, while smaller ranges tend to concentrate lead shot in a smaller area. Reducing the area of the shotfall zone will concentrate the shot within a smaller area, allowing for easier cleanup and reclamation. BMP techniques for reducing the shotfall zone at trap and skeet ranges, as well as sporting clay ranges, are discussed in Chapter III.

Soil Characteristics

Spent lead bullets and shot are most often deposited directly on and into soil during shooting. When lead is exposed to air and water, it may oxidize and form one of several compounds. The specific compounds created, and their rate of migration, are greatly influenced by soil characteristics, such as pH and soil types. **Knowing the soil characteristics of an existing range site is a key component to developing an effective lead management plan.**

Soil pH

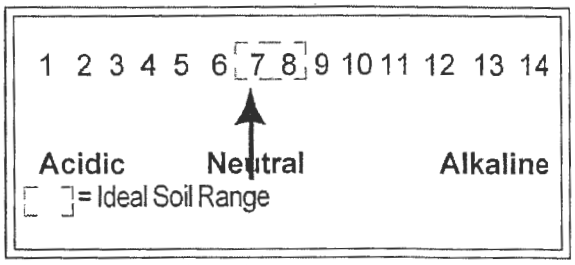

Figure 2-1 – pH scale

Soil acidity is measured as pH on a scale (illustrated as Figure 2-1) between 1 (most acidic) and 14 (most alkaline, or basic), where 7 is termed neutral. Ideal soil pH for shooting ranges is 6.5 to 8.5.[1]

1 National Shooting Sports Foundation, "Environmental Aspects of Construction and Management of Outdoor Shooting Ranges," June 1997.

Lead reacts more readily and may become more mobile under acidic (pH < 6) or higher alkaline (pH>8) conditions. This means that spent lead shot left in or on such soils may eventually break down and contaminate underlying soil. In moderately alkaline soils (pH 7 - 8.5), the lead precipitates out of solution and binds to the soil. This "binding" effect prevents the lead from migrating to the subsurface. In general, soils in the eastern part of the United States tend to be acidic, whereas western soils tend to be more alkaline.

Soil Physical Characteristics

The migration rate of specific lead compounds is affected by the physical characteristics of soil. For example, dense soils, consisting of heavy clays, will prevent the lead compound from moving quickly through the subsurface. Any "free" lead ions become attached to clay particles, with this bond helping to prevent migration. However, with denser soils, the amount of surface runoff increases.

Although clay soils inhibit migration, lead reclamation by contemporary removal machinery tends to be more difficult in clayey conditions. Clayey soils tend to clog the screens and "bind" with shot and bullets. This situation may require additional traditional screening, or perhaps screening using water to enhance separation.

In contrast, sandy soils or gravel may not impede migration because the open pores of these soils allow lead compounds to percolate quickly. Fortunately, lead reclamation activities are more easily conducted in sandy soils. With this in mind, ranges located in sandy soils should remove lead more frequently.

Annual Precipitation

One of the most important factors that influences lead degradation (i.e., chemical reactions) and migration is precipitation. Water, most often in the form of rain, provides the means by which lead is transported. In general, ranges located in areas with high annual/seasonal rainfall[2] have a higher risk of lead migration than those located in arid regions. This is especially true of outdoor ranges using "Steel Bullet Traps."

Steel bullet traps build up a layer of lead residue; these particles are extremely small and more easily transported by rain/water. Also, the smaller the particle, the quicker it will degrade. A bullet trap needs to have a means to collect contact water, or be covered to prevent water from reaching it, and to minimize releases and degradation.

Topography/Runoff Directions

The topography of your range impacts both the ease of lead reclamation and the mobility of the lead. For example, lead reclamation is more successful at ranges where the shotfall zone is relatively flat, since many lead reclamation companies use heavy machinery that cannot operate on slopes or steep hills.

Another important characteristic is the direction in which your range topography slopes. During and after periods of rain, stormwater runoff may wash lead particles or lead compounds off the range. If there are surface water bodies such as lakes, rivers, or wetlands downgradient, the potential for lead to adversely affect the surrounding environment is even greater. Therefore, it is important to identify and control the direction of surface water runoff at your range. BMPs for modifying and controlling runoff are described in detail in Chapter III.

Groundwater

Groundwater depth should be considered when developing a lead management plan since the closer the groundwater is to the surface, the greater the potential for dissolved lead to reach it.

Vegetation

Vegetative ground covers can impact the mobility of lead and lead compounds. Vegetation absorbs rainwater, thereby reducing

2 Heavy annual rainfall is anything in excess of the average annual rainfall, which for the northeast United States (e.g. New York, New Jersey) is between 40 and 45 inches.

Table 2-1 – Common Physical Characteristics at Ranges – Potential Risks and Benefits Associated with Range Operations

Physical Characteristics	Potential Risk to Environment	Potential Benefits in Preventing/Managing Contamination
Clay, acidic soils	Acidic soils contribute to lead dissolution -- increasing the potential for lead contamination -- may increase run-off Difficult to reclaim lead via sifting/raking	May impede percolation of water through contaminated soil Binds "free" lead ions May benefit growth of vegetative covers
Sandy, alkaline soils	Contaminated rainwater can easily percolate through soil and groundwater Extremely alkaline soil will not support vegetation	Alkaline soils may inhibit lead dissolution Easier to reclaim lead via sifting/raking
Sandy, acidic soils	Acidic soils contribute to lead dissolution -- increasing the potential for lead contamination Contaminated rainwater percolates quickly through sandy soils	Easier to reclaim lead via sifting/raking
Steep Rolling Terrain	May promote off-site drainage or drainage to on-site surface water bodies Can impede reclamation of expended shot via raking	None
Flat Terrain	Rainwater may "pond" in areas, promoting lead dissolution and contamination	Expended shot easily recovered Off-site drainage minimized
Wooded areas	May impede lead reclamation activities making equipment difficult to maneuver May provide habitat for wildlife - increasing exposure to lead	None
On-site or contiguous surface water bodies	VERY high potential for contamination when shot fall zone is located over or adjacent to water; increased wildlife exposure; increased lead dissolution. This is NOT an option for successful range location and may be more likely subject to litigation and/or governmental action if lead is deposited into water bodies	None
Vegetation	Lead may be absorbed into grasses, other wildlife food sources	Ground covers slow down surface water run-on and run-off Some vegetation can extract lead ions from the soils

the time that the lead is in contact with water. Vegetation also slows down surface water runoff, preventing the lead from migrating off-site. However, excessively wooded areas (such as those often used for sporting clay ranges) inhibit lead reclamation by making the soils inaccessible to some large, lead-removal machinery. Understanding the type, concentration and variety of vegetation on your range is necessary for developing your lead management program and implementing BMPs at your range.

Accessibility

Accessibility to shotfall zones and backstops is extremely important for lead reclamation activities. A range that is not accessible to reclamation equipment will have difficulty implementing lead reclamation practices.

2.2 Operational Aspects

Operating practices can have a great affect on the volume and dispersion of lead at your range.

Lead Volume

Keeping records of the number of rounds fired over time at your range is important. The number of rounds fired provides a realistic estimate of the quantity of lead available for reclamation. This information helps to determine when reclamation is necessary in order to prevent accumulation of excess amounts of lead, thereby decreasing the potential for the lead to migrate off-site.

Size of Shot/Bullets

Knowledge of the size shot/bullets used on your range may be helpful. Lead reclamation companies generally use physical screening techniques to separate lead shot and bullets from soil. These screens come in a variety of sizes. Knowing what size shot/bullets have been used at your range will allow the reclaimer to maximize the yield of lead shot/bullets at your range.

Shooting Direction and Patterns

Shooting directions and patterns are important to consider when determining the effectiveness of bullet containment devices. For example, many bullet traps are effective in containing bullets fired from specific directions. It is vital that you utilize bullet containment devices that match your range's specific shooting patterns and manufacturers specifications. Understanding the shooting direction and patterns will also help to correctly identify the shotfall zone at trap and skeet ranges.

Shooting into Water Bodies

Shooting into water bodies or wetlands should not occur. Besides the environmental impacts discussed previously, the introduction of lead to surface water bodies will likely cause a range to be susceptible to litigation and/or governmental action. Shooting into water bodies or wetlands is NOT an option for ranges that want to survive in the future.

Range Life Expectancy and Closure

The life span of your range may be impacted by many factors, including financial and environmental issues, noise, and encroachment on residential areas. If your range is slated for closure, contact your local state or EPA representatives for guidance.

2.3 Planning a New Range

As discussed in the previous sections, site characteristics and operational aspects affect lead migration, degradation and reclamation activities at ranges. **If you are planning on opening a new range, you should select and/ or design a site in consideration of the factors discussed in this manual.** This will allow you to minimize the potential of lead impacting your site or adjacent properties. A new range owner has the advantage of being able to design a successful lead management program in full consideration of the site characteristics and recommended BMPs. This advanced understanding of operational aspects

and requirements will allow you to minimize the potential for lead migration prior to opening.

The most important site selection criteria to consider when selecting a new range location include: topography; surface water flow patterns; and depth to groundwater. If possible, ranges should be developed on flat terrain, as it facilitates reclamation and reduces the chance of off-site migration due to surface water runoff as compared with highly sloped terrain. When considering a prospective location for a range, ask yourself: What is the direction of surface water runoff? Does the site drain to surface water (e.g., streams, rivers) on-site? Off-site? Can the range design be modified to minimize potential runoff? Is reclaimation equipment accessible to the area to clean the range?

By selecting an appropriate location and designing a lead management program in consideration of site characteristics, new shooting ranges can be developed to minimize the potential for lead contamination. Other important site characteristics can be modified. For example, a new shotgun range can be designed to concentrate the shotfall area, vegetation can be added or altered, and the most advantageous shooting direction can be selected. These modifications are BMPs, and are discussed in further detail in Chapter III.

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Chapter III: Best Management Practices (BMPs) For Outdoor Ranges

3.0 Background

To operate an outdoor range that is environmentally protective requires implementing an integrated lead management program, which incorporates a variety of appropriate BMPs. These BMPs create a four step approach to lead management:

- Step 1 - **Control and contain lead bullets and bullet fragments**
- Step 2 - **Prevent migration of lead to the subsurface and surrounding surface water bodies**
- Step 3 - **Remove the lead from the range and recycle**
- Step 4 - **Documenting activities and keeping records**

An effective lead management program requires implementing and evaluating BMPs from each of the four steps identified above and illustrated as Figure 3-1. The BMPs discussed in Sections 3.1 and 3.2 should not be considered alternatives to lead reclamation, but rather practices that should be followed between lead reclamation events.

It is important to note that the cost and complexity of these BMPs vary significantly. **It is your range's individual characteristics that will determine which BMPs should be implemented.** The specific BMPs are described more fully below.

3.1 Bullet and Shot Containment Techniques (Step 1)

3.1.1 Bullet Containment

Knowing where spent lead is allows the appropriate BMP to be used. The single most effective BMP for managing lead in these areas is by bullet containment. Owners/operators should employ a containment system that allows for the maximum containment of lead on-site. The containment systems mentioned in this section are for reference only. Each containment design for a range is site specific. Each owner/operator must look at the various factors in determining which containment system is best for his or her range. Some factors include: overhead, cost of installation, maintenance (e.g., creation of lead dust from steel containment systems). Range owner/operators should consult with various contractors to determine which containment system is best for their range.

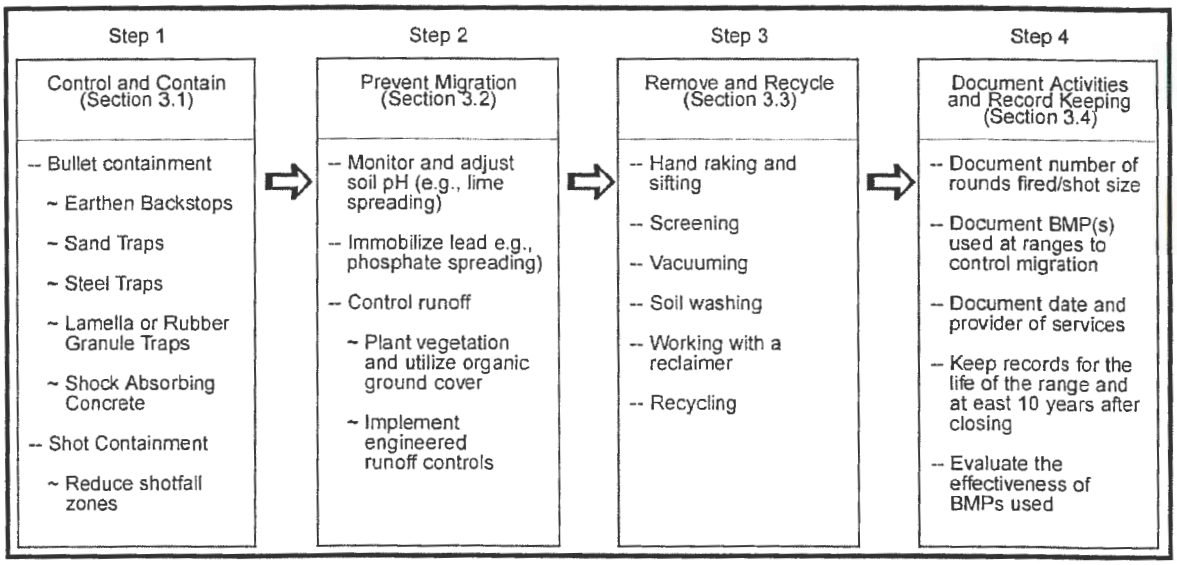


Figure 3-1 – 4 Steps to Build a Successful Lead Management Program Utilizing a Variety of BMPs

This section discusses BMPs for controlling spent lead bullets and fragments in a "controlled" and well-defined area behind the target area. Containing bullets and bullet fragments is critical to successfully managing lead.

There are a variety of containment device options available that serve as BMPs to control lead. The principle behind all of them is trapping and containing the actual bullet. They include:

- Earthen Berms and Backstops
- Sand Traps
- Steel Traps
- Lamella or Rubber Granule Traps
- Shock Absorbing Concrete

For each type of trap, design variations have been developed to fit the specific needs of an individual range. Below are discussions of each general category of trap. Some bullet containment devices are so comprehensive that they virtually eliminate lead's contact with the environment.

However, it is important to discuss all types of bullet containment devices because they are part of comprehensive BMPs for managing lead at rifle and pistol ranges.

EPA does not endorse any bullet containment design as being "better" than another. Different containment designs attempt to eliminate lead's contact with the environment, however, additional BMPs may be required for lead management.

EPA recommends that you discuss your range's bullet containment needs with a variety of vendors before deciding what type of containment device to use. This manual does identify the possible advantages and disadvantages associated with each containment device in Table 3-1, at the back of this chapter.

Earthen Berms and Backstops

Perhaps the most common bullet containment system at rifle and pistol ranges is the earthen backstop (earthen material, i.e., sand, soil, etc., which is located directly behind the targets). The earthen backstop is generally between 15 and 20 feet high with a recommended slope as steep as possible[1]. In many instances, backstops may be naturally occurring hillsides. When using an earthen berm or backstop, ensure that the uppermost layer (to a depth of one to two feet) exposed to the shooting activity is free of large rocks and other debris. These materials tend to increase ricochet and bullet fragmentation, which will, in turn, make lead reclamation activities more difficult, not to mention possible safety issues.

Removal of lead from earthen backstops may require lengthy reclamation (see Section 3.3) of the soil to remove the lead. Continued use of the backstop without removing the lead may result in increased ricochet of bullets and fragments. In addition, the backstop may lose its slope integrity because of "impact pockets" that develop. Once the lead has been removed from the earthen backstop, the soil can be placed back on the range and used again. Adding lime and phosphate during the rebuilding process is recommended as appropriate (see Section 3.2). However, other bullet containment techniques, including those listed below, should be considered prior to reestablishing an earthen backstop.

Sand Traps

A variation of the earthen backstop is the sand trap. Sand traps range from those that are simply mounds of sand or soil located directly behind the bullet targets, which serve as backstops to a sand trap that employs a system designed to contain, collect and control lead and contact water. This sand trap uses a grade of sand that is ballistically acceptable. Regular maintenance must be performed to remove larger particles (bullets) from the impact area. These traps are placed so that bullets fired across the range pass through the targets and become embedded in the sand. These traps are typically 15 to 20 feet high with a slope as

1. National Rifle Association, "The NRA Range Source Book: A Guide to Planning and Construction," June 1998

steep as possible. The most important design criterion for these traps is that the uppermost layer (to a depth of 1 to 2 feet) be free of large rocks and other debris to reduce ricochet and bullet fragmentation, and to facilitate reclamation efforts. There may also be an impermeable layer (e.g., clay or liner) under the sand to prevent lead from contacting the soil underlaying the trap.

Sand traps come in various designs and levels of complexity. The sand trap may be ballistic grade sand contained in a high backstop, or a more complex "Pit and Plate" system. The Pit and Plate system uses an angled, steel deflection plate cover that helps to direct bullets and bullet fragments to the top layer of sand only. Some of the more sophisticated sand traps incorporate lead recovery devices. However, the Pit and Plate may increase the surface-to-mass ratio of the bullet splatter and, therefore, may increase environmental risk of lead migration.

Regardless of the type of sand trap that is used, the traps become saturated with bullets/bullet fragments. Once this happens, the sand must be sifted (see Section 3.3) to remove the bullets. The recovered bullets can then be sold to a lead recycler (this is discussed in more detail later in the chapter). After sifting, the sand can be returned to the trap. Continued use of the trap, without removing the lead, may result in an increased risk of ricocheting off the backstop and thus creating an increased safety hazard. Furthermore, the sand trap will become unstable over time. Sand traps may be located over an impermeable liner, to prevent lead from contacting soil underlying the trap. This will provide additional protection to soil and groundwater.

Steel Traps

Steel traps are located directly behind the targets so that expended bullets, along with bullet particles, are directed into some form of deceleration chamber. Once inside the chamber, the bullets decelerate until the bullets/ bullet particles fall into collection trays at the bottom of the deceleration chamber. When the trap is full, or on a more frequent basis, the spent lead can easily be reclaimed for recycling.

With some steel traps, expended lead bullets may not come in direct contact with soils, thereby possibly minimizing lead's contact with the environment. Consequently, the need for other BMPs (e.g., lime spreading, and/or engineering controls), such as those required at ranges with unlined earthen backstops or unlined sand traps, may be avoided if this trap design is selected for the range's bullet containment device. In addition, bullet removal is somewhat easier than from a sand trap, and may only require emptying the bucket or tray containing the bullets and/or bullet fragments. However, an increase of lead dust and fragmented lead may be an additional environmental concern. Therefore, understanding the amount of lead dust and fragments is important to a successful lead management program. Also, some steel trap designs are not intended for shooting at different angles, therefore limiting the shooter to shooting straight on (no action shooting).

As with sand traps, steel traps vary in design and complexity. For example, the Escalator Trap has an upward sloping deflection plate that directs bullets into a spiral containment area at the top. The Vertical Swirl Trap is a modular, free standing trap with four steel plates that funnel the bullets into a vertical aperture in which they spin, decelerate, and become trapped in a bullet collection container. The Wet Passive Bullet Trap is equipped with steel deflection plates that slope both upward and downward. The upwardly sloped deflection plate is covered with an oil/water mixture to help reduce the occurrence of ricochet and bullet fragmentation. The bullet follows its own path in the round deceleration chamber for bullet recycling.

Lamella and Rubber Granule Traps

The Lamella Trap uses tightly-hanging, vertical strips of rubber with a steel backing to stop bullets. This trap is located directly behind the targets and, in many cases, the targets may actually be mounted to the trap. Lead removal

requires mining the bullets from the rubber. The Rubber Granule Trap uses shredded rubber granules, housed between a solid rubber front and a steel backing, to stop bullets once they pass through the target. For both traps, the bullets remain intact, thus eliminating lead dust and preventing lead and jacket back splatter. Depending on the design of the rubber trap, the bullet either remains embedded in the rubber strip or falls to the bottom of the trap, from which the bullets are removed for recycling.

These traps, when properly installed, are intended to increase safety by decreasing the occurrence of back splatter and eliminating the introduction of the lead dust into the air and ground. However, there are several concerns over their use, since they may:

- require additional maintenance;
- in some cases, present a fire threat under extremely high volume use (due to heat from friction created upon bullet impact);
- not withstand weather elements over the long term; and
- cause the rubber particles to melt to the lead bullets, making reclamation more difficult.

With the availability of fire-resistant rubber and gels (see Appendix A), these issues are becoming less of a concern than in earlier models.

Shock Absorbing Concrete

In addition to the bullet containment devices discussed above, there are new designs and innovations continually being developed. One of these innovative bullet containment devices is Shock Absorbing Concrete (SACON). SACON, which has been used as a bullet containment device since the 1980s and was extensively field tested by the military, has become commercially available in the past several years as a backstop material for small arms ranges. For conventional rifle and pistol ranges, SACON may provide a means to easily reclaim lead. Additionally, crushed, lead-free SACON can be recycled (recasted) after bullet fragments have been removed by adding it to other concrete mixtures for use as sidewalks, curbs, etc.

3.1.2 Shot Containment

Reducing the Shotfall Zone

Unlike rifle and pistol ranges, the area impacted by lead shot fired at trap, skeet and sporting clays ranges is spread out and remains primarily on the surface. **Knowing where spent lead is allows the appropriate BMP to be used. The single most effective BMP for managing lead in these areas is reducing shotfall zones.**

Concentrating the lead shot in a smaller area by modifying the shooting direction facilitates lead management by providing a smaller and more dense area of lead to both manage in-place and reclaim, thereby making the management and reclamation process simpler and more effective.

Sporting Clays Courses

Technologies have been developed to assist in reducing the range size of trap and skeet, and sporting clays facilities. The National Sporting Clays Association (NSCA) supports and promotes the Five-Stand Sporting Clays compact course design for shooting sporting clay targets, invented by Raymond Forman of Clay-Sport International, Cochrane, Alberta, Canada. The targets are directed over a smaller area than in English Style Sporting Clays (conventional sporting clays). It was originally designed to be overlaid on a conventional trap or skeet field and to be an alternative to earlier designs, which cover a much larger area. Another design, known as the National Rifle Association (NRA) Clays, is a portable target throwing unit which concentrates 15 rail-mounted machines on a two-story flatbed trailer. The NRA has also developed "compact sporting," which is specifically for sporting clay facilities. This practice alters the angle that the target is thrown to concentrate the shotfall zone.

Skeet Fields

The typical single skeet field has a shotfall zone that is fan-shaped. For skeet fields with multiple stands side-by-side, the shotfall zones would overlap creating a shotfall zone that has a concentration of shot near the center of the fan.

Trap Fields

One way to reduce the shotfall zone at trap fields is to build the fields at an angle to one another. This will make the shape of the shooting dispersal pattern smaller and more concentrated. However, if you do decide to choose this option, be aware of safety issues when designing the overlapping shotfall zones.

For a range with only one trap field, one way to minimize the shotfall zone is to keep trap machines set in as few holes as possible (e.g., the number two or three hole setting). This reduces the area of lead concentration by limiting the angles for pigeon throwing, and therefore the area for lead shot fall. However, when two or more trap fields are positioned side by side, the shotfall zone will be continuous regardless of the "hole" setting.

Shot Curtains

Another method to consider for concentrating lead shot is the use of a shot curtain. This device is emerging as a potentially effective tool to keep lead shot out of selected areas of the range and, thereby, reduce the size of the shotfall zone and corresponding cost of reclamation. Different designs and material have been utilized in shot curtains and a number are in operation. The effectiveness of shot curtains is site specific and their long term viability and expense have yet to be fully determined.

3.2 BMPs to Prevent Lead Migration (Step 2)

This section discusses BMPs for preventing lead migration. These BMPs include:

- **Monitoring and adjusting soil pH**
- **Immobilizing lead**
- **Controlling runoff**

These BMPs are important for all outdoor ranges.

3.2.1 Monitoring and Adjusting Soil pH and Binding Lead

Lime Addition

The BMP for monitoring and adjusting soil pH is an important range program that can effect lead migration. Of particular concern are soils with low pH values (i.e., acidic conditions), because lead mobility increases in acidic conditions since the acid of the soils contributes to the lead break down. **The ideal soil pH value for shooting ranges is between 6.5 and 8.5**. This BMP is important because many soils in the eastern United States have pH values lower than 6.[2]

To determine the pH of your soil, purchase a pH meter at a lawn and garden center. The pH meters are relatively inexpensive but valuable tools in the management of lead at your range. If the soil pH is determined to be below 6, the pH should be raised by spreading lime. **It is recommended that the pH be checked annually**.

One way to control lead migration is by spreading lime around the earthen backstops, sand traps, trap and skeet shotfall zones, sporting clays courses and any other areas where the bullets/shots or lead fragments/dust accumulate. For example, lead mobilized in rainwater from the lead that spatters in front of backstops after bullet impacts can be effectively controlled by extending a limestone sand layer out about 15 feet in front of the backstop. Likewise, spreading lime over the shotfall zone will help to raise the pH of the very top soil layer to a pH closer to ideal levels and reduce the migration potential of lead. This is an easy, low cost method. Spreading lime neutralizes the acidic soils, thus minimizing the potential for the lead to degrade. Lime can be easily spread by using a lawn fertilizer drop spreader available at any lawn and garden center.

Smaller forms of limestone (powdered, pelletized, and granular) are better suited

2 National Shooting Sports Foundation, "Environmental Aspects of Construction and Management of Outdoor Shooting Ranges," June 1997

because they dissolve and enter the soil more quickly then larger forms. However, the smaller forms of lime must be replenished more often. Conversely, limestone rock dissolves more slowly but does not need to be replenished as often. The larger rock form is better suited for drainage ditches, where it can decrease lead mobility by raising the pH of the storm water runoff.

Another way to control lead migration in earthen backstops is to break the capillarity within the base of the backstop. Most porosity in the soil material used in backstop is of capillary size, and, as a result, water is pulled upward into a capillary fringe within the base of the backstop. The height to which the water will rise in an earthen backstop depends on the soil material in the backstop. Water will rise more then 6 feet in clay, 3.3 feet in silt, 1.3 feet in fine sand, 5 inches in coarse sand, and only 2 inches in gravel.

Because of capillarity, the spent bullets may be in contact with acidic rainwater for a longer period of time, hence more lead is dissolved. Breaking the capillarity by adding a layer of limestone or gravel to the base of the backstop should reduce the rate of deterioration of spent bullets, the erosion of the backstop, and the amount of lead going into solution in the water in the backstop. Also, any lead dissolved should precipitate out of solution as the acids are neutralized and the pH raised from the water passing through and reacting with the limestone.

Lime spreading is an especially important method for implementing this BMP at sporting clays ranges where heavily wooded areas are less accessible to conventional lead removal equipment. These types of ranges also tend to have more detritus (e.g., leaves, twigs, etc.) on the ground, which can increase soil acidity as they decompose. **In these areas, semiannual monitoring of the soil pH levels is suggested.**

Spreading bags of 50 pounds (at ranges with sandy soils) or 100 pounds (at ranges with clayey soils) per 1,000 square feet of range will raise the pH approximately one pH unit for a period of between one and four years, respectively. The market price of lime in either the granular or pelletized form commonly ranges from approximately $2.00 to $4.00 per fifty pound bag.

Table 3-2 provides information for raising pH levels of clay soils in temperate climates (i.e., Mid-Atlantic/Northeast). Additional information on the amount of lime to apply may also be found on the bags of the purchased lime and/or from the local lawn and garden center. It should be noted that if the soil pH is below 4.5, the addition of lime may only raise the soil pH to approximately 5. In this situation, other BMPs should be used as well. If the soil pH is above the ideal range upper value (8.5), do not add lime. Adding lime to a soil of this pH could result in mobilization of the lead. Lime spreading may be done at anytime during the year, except when the ground is frozen.

Additionally, it is important to remember to monitor the soil pH annually, as the effectiveness of the lime decreases over time. Additional routine applications will be necessary throughout the life span of most ranges.

Table 3-2 – Calculating Weight of Lime to Increase Soil pH Values*

		Current pH							
		4.0	4.3	4.5	4.8	5.0	5.5	6.0	6.5
Desired pH	5.0-6.0	14	11	8	5	3	-	-	-
	6.5-8.5	-	-	-	20	17	11	7	-

* Lime requirements stated as pounds of lime/100 square foot of problem area for clay soils in temperate climates (i.e., Mid-Atlantic/Northeast US).

Phosphate Addition

In addition to lime spreading, another way to control lead migration is phosphate spreading. This method is recommended where lead is widely dispersed in range soils, a range is closing, or there is a high potential for vertical lead transport to groundwater (e.g., low soil pH, shallow water table). Under these circumstances, range soils may benefit from phosphate treatment. Unlike lime spreading, the main purpose of phosphate spreading is not to adjust soil pH but to bind the lead particles. This process also decreases the potential amount of lead that can migrate off-site or into the subsurface. Phosphate spreading can be done either separately or in conjunction with lime spreading. Generally, 15 to 20 pounds of phosphate per 1,000 square feet will effectively control the lead.

Phosphate spreading is especially recommended for sporting clays ranges and those parts of ranges not easily accessible by reclamation equipment. Phosphate spreading should be repeated frequently during the range's lifetime. See pilot testing under "Other Ways to Bind Lead" below for proper frequency for replacing phosphate.

You can purchase phosphate either in its pure form, as phosphate rock, or as lawn fertilizer. The average lawn fertilizer costs approximately $7.00 per 40 pound bag. If you purchase lawn fertilizer, remember to check the bag for the actual percentage of phosphate. Most fertilizers contain 25% phosphate, so that if you purchase a 40 pound bag of fertilizer that contains 25% phosphate (i.e., 10 pounds of phosphate) you will need to spread 80 pounds of fertilizer per 1,000 square feet of the backstop. A typical fertilizer drop spreader can be used for distributing the phosphate. Like lime, phosphate should not be spread when the ground is frozen. In addition, it is not advised to use phosphate near water bodies since it contributes to algal blooms. Rock phosphate is a better choice if water is nearby.

Other Ways to Bind Lead

Although it may be possible to minimize lead's mobility by spreading fertilizers that contain phosphate at impacted areas of the range, a more comprehensive procedure for immobilizing leachable lead in soils, by using pure phosphate in rock form or a ground phosphate rock [Triple Super Phosphate (TSP)], was developed and patented by the U.S. EPA/Ohio State University Research Foundation and RHEOX, Inc. This procedure used a three step approach to minimize lead's mobility. The first step was to identify the boundaries of the area of the range to be treated. This included not only determining the length and width of the range area, but also the depth of lead within the area.

Depth was determined by taking sample cores of the area, which also identified "hot spots" where lead accumulation was greatest. Once the area was identified, the second step was to treat the area with TSP. Pure phosphate rock was used rather then fertilizers, as this phosphate is insoluble in water and will not cause an increase in phosphate runoff.

In this step, pilot testing was conducted. Here, various amounts (in increasing percentages by weight) of TSP were added to the affected soil areas, then the area was tested according to an EPA test method that identified the amount of leachable lead in a given soil sample. This test is called the Toxicity Characteristic Leaching Procedure, or TCLP. Separate TCLP testing of the range's hot spots was conducted.

Upon completion of the pilot testing, which determined the amount of TSP needed at the range, the third step was to begin actual treatment of the range. Where the depth of the lead accumulation was shallow (less than two feet), then standard yard equipment, such as tillers, seed/fertilizer spreaders, and plows were used to mix TSP with the affected soil. Where the affected area's lead accumulation was deeper than two feet, an auger was required to mix the TSP with the affected soil. Random testing of the range ensured the effectiveness of the treatment level.

3.2.2 Controlling Runoff

The BMPs for controlling soil erosion and surface water runoff are important to preventing lead from migrating off-site. There are two factors that influence the amount of lead transported off-site by surface water runoff: the amount of lead fragments left on the range and the velocity of the runoff.

The velocity of the water can successfully be controlled at outdoor ranges by: (1) using vegetative, organic, removable and/or permanent ground covers; and (2) implementing engineered controls which slow down surface water runoff and prevent or minimize the chances of lead migrating off-site. Bear in mind that safety considerations and potential ricochets need to be considered when implementing any engineered controls.

Vegetative Ground Cover

Planting vegetative ground cover (such as grass) is an important and easy erosion control method. Vegetation provides several benefits by minimizing the amount of lead that will run off the land surface during heavy rainfall. It is important to use a mixture of grass seeds to ensure that the cover will last into the future (i.e., annual rye grass lasts one year and dies and perennial rye grass lasts three to four years, then dies off). Fescue grasses form useful mats that are effective in controlling erosion.

Ground cover absorbs rainwater, which reduces the amount of water the lead is in contact with, as well as the time that the lead is in contact with the water. Furthermore, the ground cover will divert and slow down surface water runoff, thus helping to prevent lead from migrating off-site.

Grasses yield the greatest benefit at rifle and pistol ranges where the bullet impact areas are sloped, and water runoff and soil erosion may be more likely. Specific recommendations are to:

- Utilize quick growing turf grass (such as fescue and rye grass) for the grass covering of backstops, which can be removed prior to reclamation and replanted thereafter;
- Avoid vegetation that attracts birds and other wildlife to prevent potential ingestion of lead by wildlife; and
- Use grass to direct surface water drainage away from the target area (e.g., planting them at the top of the backstop or sand trap). This will minimize the water's contact with lead bullet fragments, minimizing the potential for lead migration.

Grass is not impermeable; however, it does slow down the rate of flow and reduce the amount of lead entering the soil via rainwater. Remember, grass requires periodic maintenance (i.e., mowing) to maintain its effectiveness as well as for aesthetic reasons.

Mulches and Compost

Mulches and composts can reduce the amount of water that comes in contact with the lead fragments. In addition, mulches and compost contain hermic acid, which is a natural lead chelating agent that actually sorbs lead out of solution and reduces its mobility. At a minimum, the material should be two inches thick. These materials can be spread over any impacted area and/or low lying areas where runoff and lead may accumulate. Like vegetative covers, organic surface covers are not impermeable. In addition, the organic material needs periodic replacement to maintain effectiveness and aesthetic integrity. Furthermore, these materials should be removed prior to any lead removal event, as they may impede sifting or screening. **Note that these materials tend to be acidic (especially during decomposition), so, if low pH is a concern at your range, this option may not be appropriate. Again, however, lime may be used to control pH (see Section 3.1.1)**

Surface Covers

Removable Surface Covers

Removable surface covers may be effective at outdoor trap and skeet ranges. In this case, impermeable materials (e.g., plastic liners) are

placed over the shotfall zone during non-use periods. This provides the range with two benefits during periods of rainfall: (1) the shotfall zone is protected from erosion; and (2) the spent lead shot is contained in the shotfall zone and does not come in contact with rainwater.

Permanent Surface Covers

For outdoor rifle and pistol ranges, impact backstops and target areas can also be covered with roofed covers or other permanent covers to prevent rainwater from contacting berms. However, this method may be less desirable because of the cost to install the roof, which must be carefully designed to avoid safety issues with ricochets, etc.

For shotgun and other ranges, synthetic liners (e.g., asphalt, Astroturf™, rubber, other synthetic liners) can also be used beneath the shotfall zone to effectively prevent rainwater or runoff from filtering through lead and lead contaminated soil. Synthetic liners will generate increased runoff, which must be managed, however. No single type of liner is suitable for all situations based on site characteristics. Therefore, liners must be chosen on a site-specific basis, bearing in mind the site's unique characteristics, such as soil type, pH level, rainfall intensity, organic content of soil, and surface water drainage patterns.

Engineered Runoff Controls

Runoff control may be of greatest concern when a range is located in an area of heavy annual rainfall because of an increased risk of lead migration due to heavy rainfall events. A "hard" engineered runoff control may be needed in this situation. A heavy rainfall event is defined as rainfall that occurs at such a rate that it cannot be absorbed into the ground and causes an increase in the volume and velocity of surface runoff. The impacts of rainfall are greater in rolling or sloped terrain (increases velocity of runoff) or where surface water bodies are located on, or immediately adjacent to, the range.

Examples of "hard" controls include:

- Filter beds
- Containment Traps and Detention Ponds
- Dams and Dikes
- Ground Contouring.

Designing and implementing these "hard" engineering controls may require the assistance of a licensed professional civil engineer. They are included in this manual to offer the reader a general understanding of these BMP options. However, this manual does not offer specific instructions for construction and operation of these controls. For information about designing and implementing any of these controls, or assistance with other range design questions, contact a licensed professional civil engineer having applicable experience or the NRA Range Department, at (800) 672-3888, ext. 1417. The National Sports Shooting Foundation (NSSF) may be contacted at (203) 426-1320 for specific references regarding the use and design of these controls.

Filter Beds

Filter beds are engineering controls built into an outdoor range to collect and filter surface water runoff from the target range. The collected runoff water is routed to a filtering system, which screens out larger lead particles, raises the pH of the water (thus reducing the potential for further lead dissolution), and drains the water from the range area. This technique may not completely prevent lead from entering the subsurface, since lead bullets, fragments and large particles may still remain on the range.

Filter beds should be established at the base of the backstop (see Figure 3-2). In addition to mitigating off-site migration, the filter beds work to raise the pH of the rainwater, which has fallen on the target range, to reduce lead dissolution, and to strain small lead particles out of the rainwater. The filters typically consist of two layers: a fine-grained sand bed underlain by limestone gravel or other neutralization material. By design, the backstops and berms direct the runoff so that it drains from the range to the filters. The collected water then soaks through the top sand layer into the neutralization material,

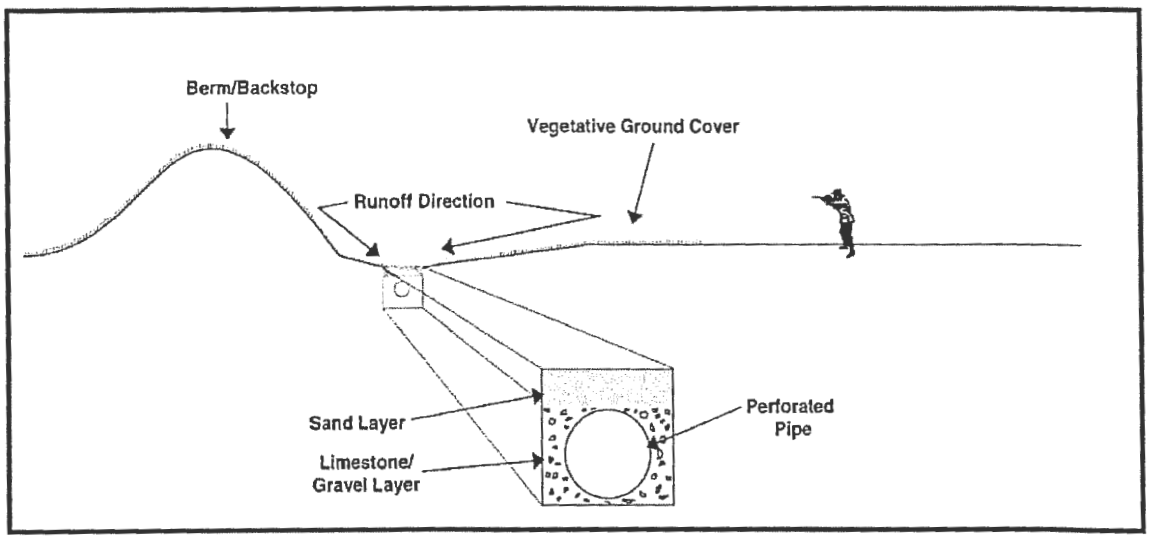


Figure 3-2 – Sample Filter Bed System (Adapted from Proceedings for National Shooting, Range Symposium, October 17-19, 1993, North American Hunting Club and Wildlife Forever)

which raises the pH of the filtrate. The lead particles in the rainwater are collected on the sand, while the pH-adjusted water drains through the filter to a perforated drainage pipe located within the limestone gravel.

Filter beds are designed to capture fine particles of lead transported in surface water runoff. They are not designed to capture bullets. The operation and maintenance requirements of filter beds are minimal. Maintenance activity is limited to periodic removal of debris (such as litter, leaves, etc.) and occasional replenishment of the limestone.

The use of filter beds is most effective on sites with open, rolling terrain where surface water runoff is directed to them. At existing rifle and pistol ranges, a limited system of trenches and filters can be installed at the base of natural soil backstops or at natural drainage depressions.

Containment Traps and Detention Ponds

Containment traps and detention ponds are designed to settle out lead particles during heavy rainfall. Typically, they are depressions or holes in the range's drainage paths. Here, the lead-containing runoff passes through the trap or pond, allowing the lead bullet fragments to settle out. Vegetative cover can be placed in the drainage path to increase the effectiveness of containment traps and ponds by further reducing the velocity of runoff and allowing for more lead fragments to settle from the runoff. It is important to regularly collect the lead and send this lead to a recycler.

Dams and Dikes

At shotgun ranges, dams and dikes can also be used to reduce the velocity of surface water runoff. Dams and dikes must be positioned perpendicular to the direction of runoff to slow the flow of surface water runoff. To accomplish this, determine the direction of the range's surface water runoff. This will be particularly obvious at ranges with sloped terrain. The dams or dikes should be constructed using mounds of dirt that are approximately a foot high. These mounds should transect the entire range perpendicular to the stormwater runoff direction.

These runoff controls are most important at ranges at which off-site runoff is a potential problem, such as ranges where the lead accumulation areas are located upgradient of a surface water body or an adjacent property. Since lead particles are heavier than most other suspended particles, slowing the velocity of surface water runoff can reduce the amount of lead transported in runoff.

Ground Contouring

Another mechanism to slow runoff and prevent lead from being transported off site is ground contouring. By altering drainage patterns, the velocity of the runoff can be reduced. Furthermore, in areas where pH is high (resulting in a lower potential for lead dissolution), the soil can be graded or aerated to increase the infiltration rate of precipitation, so that rainwater is more easily absorbed into the soil. This slows down or prevents surface water runoff and off-site migration. It should be pointed out that this design, in effect, collects lead in the surface soils. Therefore, range operation and maintenance plans should include lead reclamation as well as adjusting the pH, and adding phosphate.

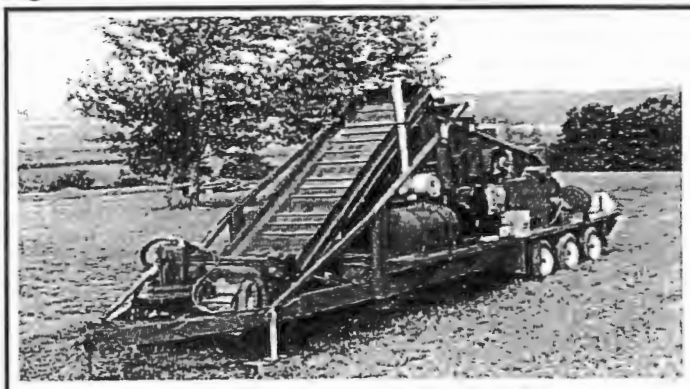
3.3 Lead Removal and Recycling (Step 3)

To successfully minimize lead migration, the most important BMP for lead management is lead reclamation. Implementing a regular reclamation program will allow you to avoid expensive remediation and potential litigation costs. Ranges in regions with high precipitation and/or with acidic soil conditions may require more frequent lead recovery since the potential for lead migration is greater. In regions with little precipitation and/or where the soil is somewhat alkaline, spent bullets may be allowed to accumulate on the soil for a longer time between reclamation events. It should be noted that to ensure that lead is not considered "discarded" or "abandoned" on your range within the meaning of the RCRA statute (i.e., a hazardous waste), periodic lead removal activities should be planned for and conducted. This typically requires one or more of the following:

- Hand Raking and Sifting
- Screening
- Vacuuming
- Soil Washing (Wet Screening, Gravity Separation, Pneumatic Separation)

These methods are discussed in detail below. Figure 3-3 provides examples of common lead reclamation equipment.

Figure 3-3 – Examples of Common Lead Reclamation Equipment



Example of shaker system. Courtesy of National Range Recovery

Example of final separation device *(Patented Pneumatic Separation Unit) used with a Shaker System. Courtesy of MARCOR.*

Also, it is important to be aware that state regulations may require that the material being sent for recycling have a minimum lead content in order to qualify as a scrap metal that can be shipped under a bill of lading (i.e., exempt from RCRA).

3.3.1 Hand Raking and Sifting

A simple BMP that can be done by club members, particularly at small ranges, is raking and/or sifting bullet fragments from the soil. Sifting and raking activities should be concentrated at the surface layer. This is a low-technology and low-cost management alternative for lead reclamation. Once collected, the lead must be taken to a recycler or reused. Arrangement with a recycler should be made prior to collecting any spent lead to avoid having to store the lead and avoid potential health, safety and regulatory concerns associated with storing lead.

At trap and skeet ranges, conducting sifting and raking activities in the shot fall zone (approximately 125 - 150 yards from the shooting stations) will yield the most lead. For sporting clay ranges, these activities should be conducted around tree bases, where lead shot tends to collect. Basically, the process consists of raking with a yard rake the topsoil in the shot fall areas into piles, as if you were raking leaves, removing any large debris (e.g., rocks, twigs, leaves, etc.), and then sifting the soil using screens.

Once the soil has been raked and collected, pass it through a standard 3/16 inch screen to remove the large particles. This process will allow the lead shot sized particles to pass through the screen. The sifted material (those not captured by the 3/16 inch screen) should be passed through a 5/100 inch screen to capture the lead and lead fragments. This process will also allow sand and other small sediment to pass through the screen. Screens can be purchased at many local hardware stores. The screens should be mounted on a frame for support. The frame size will vary based on the technique used by each range. For example, if one person is holding the framed screen, it may be better to use a smaller frame (2 feet by 2 feet) whereas, if several people are holding the framed screen, it can be larger.

Raking and sifting can be performed by club members on a volunteer basis. Some clubs provide incentives, such as reduced fees, to members who assist with the lead removal process. Other clubs have hired college students during the summer. A number of small clubs have found that reloaders will volunteer to rake in exchange for collected shot.
Hand sifting and raking are cost effective lead removal techniques for small ranges, or low shooting volume ranges. However, these techniques may not be appropriate for situations in which there is a large volume of lead on the range. In this instance, reclamation machinery may be more appropriate.

Note: Those conducting the hand raking and sifting reclamation at ranges should protect themselves from exposure to lead. Proper protective gear and breathing apparatus should be worn. The Occupational Safety and Health Administration (OSHA) or an appropriate health professional should be contacted to learn about proper protection.

3.3.2 Purchasing/Renting Mechanical Separation Machinery

Reclamation equipment may be rented from local equipment rental services. One type of machine that it may be possible to rent for lead shot reclamation is known as a screening machine (also referred to as a mobile shaker, gravel sizer, or potato sizer). This device uses a series of stacked vibrating screens (usually two screens) of different mesh sizes and allows the user to sift the lead shot-containing soil [gathered by hand raking, sweeping, or vacuuming (discussed above)]. The uppermost screen (approximately 3/16 inch mesh) collects larger than lead shot particles, and allows the smaller particles to pass through to the second screen. The second screen (approximately 5/100 inch mesh) captures lead shot, while allowing smaller particles to pass through to the ground. The lead shot is then conveyed to a

container such as a five gallon bucket. In the Northeastern United States, the typical rental cost for this equipment is between $500 and $4,500 a week, depending on the size shaker desired. It may be possible to get more information on rentals for this type of equipment from heavy equipment rental companies.

Another possible option is to rent a vacuum system that will collect the lead shot-containing soil from the range. Here, vacuuming takes the place of hand raking or sweeping. A vacuum machine is used to collect the lead shot-containing soil. Once collected, the lead shot-containing soil must be sifted through a screening system (either a rental screening machine, or a series of home made framed screen sets). You may be able to obtain more information about renting vacuums or vacuuming services (e.g., it may include a person to operate the machinery) from heavy equipment rental companies.

Some clubs have found that performing their own lead reclamation to be very time consuming. Part of the reason these reclamations took so long is that the soils were wet. Reclamation is much easier under dry soil conditions. For example, one club reclaimed lead from their range using equipment they modified themselves. Twenty-five tons of lead were collected but the reclamation took over two years. Another club took a year to reclaim 10 tons of lead. A more preferable option may be to hire a reclamation company.

3.3.3 Hiring a Professional Reclamation Company

Another option for lead removal is to hire a professional reclaimer. Lead reclamation companies claim to recover 75%-95% of the lead in the soils. Generally, with reclamation companies there is no minimum range size requirement for lead reclamation. Concentration of lead is more important than quantity spread over a field, especially if it is a difficult range for reclamation (e.g., hilly, rocky, a lot of clay in the soil).

Please note that reclamation companies tend to be in high demand — it may take over a year for the company to start at your club. Therefore, it is wise to plan ahead and make the call to the reclamation company as early as possible.

Some reclamation companies require a site visit to view the topography, the soil composition, and amount of lead observed on the ground. During the visit, some companies may even do a site analysis to determine whether or not it is feasible to reclaim. This analysis identifies the location of lead, the expected recovery amount, and the depth lead reaches into the soils.

3.3.4 Reclamation Activities

Using machinery to reclaim lead usually requires that the area be clear of scrub vegetation. Grass, mulch, or compost is generally removed or destroyed during the reclamation process. Some reclamation companies have no problem beginning reclamation on a grassy field. Other reclamation companies will remove grass before or during reclamation (by burning it, if allowed locally, leaving behind the lead shot), and still others require that all vegetation be removed before they arrive at the range. Some companies will re-seed the area once the reclamation is completed.

Since sporting clay ranges generally have many trees, removal of vegetation as discussed above may not directly apply to existing sporting clay ranges. At these ranges, the focus is on removing vegetative debris (i.e., fallen limbs, tree bark, etc.) prior to reclamation. This may include removing some trees to gain better access with the reclamation machinery. Of course, when designing a new sporting clay range, steps to facilitate lead reclamation should be taken into account. For example, less and more widely spaced trees will facilitate lead reclamation.

Reclamation companies use several types of machinery to reclaim lead. Some companies drive their separation machinery over the site. The lead-laden soil is picked up, processed and then returned to the ground after most of the lead

is removed. Other companies scrape off the top several inches of soil from the ground, using a front-end loader to bring the soil/lead to stationary reclamation machines, and then return the soil to the field after reclamation. Many companies till the top two to five inches of soil and grass immediately prior to reclamation to facilitate the process (some companies may require this to be done prior to arrival on the range).

Regardless of how it is collected, the actual reclamation of the lead follows the same general pattern. Most often, it is sifted through a series of shaking screens. The lead and soil pass through shaking screens (usually at least two screens) of decreasing mesh (hole) size, with the topmost screen having the largest mesh. This part of the reclamation machinery is usually adapted from machinery used for potato or gravel sizing.

Any soil/debris automatically screened out as being too big or too small is either returned to the field or re-screened to ensure no lead is caught in the debris. This procedure is why moist, clay soils are more difficult to reclaim. The moist, clay soils can bind together into shot-sized pellets producing more "product" for the second part of the reclamation. The wet soils can also clog the screens.

For some reclamation companies, their process ends after sifting the soil and returning it to the ground. However, some companies take reclamation one step further. After screening, the resulting lead, soil, and other lead-sized particles enter a blowing system. Here the lead shot is easily separated from the soil and other debris by the blowing air. The lead is much more dense than the soil and other lead-sized debris so that it falls out first. Figure 3-3 depict examples of actual lead reclamation machinery.

Some lead reclamation companies will perform the reclamation during club off-hours so that club activities are not interrupted. Additionally, some perform the reclamation on a field-by-field basis, to minimize any disruptions to club activities. However, others companies require the club to shut down during the reclamation. Reclamation time varies depending on weather, site accessibility, range size, and number of personnel assigned to perform the reclamation.

Reclamation activities may generate dust, especially in drier western locations. To prevent or minimize dust from traveling off the range and causing complaints from neighbors, reclamation activities generating dust should only be conducted during periods of no wind. In addition, such activities should be completed as quickly as possible.

Vacuuming

For ranges that are located on hilly, rocky, and/or densely vegetated terrain, several reclamation companies employ a vacuum system that collects the lead shot (and soil and other detritus). The resulting mix is then placed into the reclamation machinery discussed above. This method is especially effective for sporting clay ranges where lead shot tends to pile up around tree bases.

Vacuuming has traditionally been used for removal of lead shot from trap, skeet and sporting clay ranges. Another way to apply this method involves removing the top layer of an earthen backstop or sand trap with shovels. It is then spread thinly over an impermeable material such as plywood. A vacuuming device is then used to collect the materials that are lighter than lead (e.g., sand or soil), while leaving behind the heavier materials (i.e., lead bullets/shots and fragments). The soil can then be returned to the range. This process is most efficient for dry, sandy soils without a lot of organic material. A more recent innovation is the use of a high suction vacuum. This vacuum itself does not have to be moved about, since a very long hose (up to 600 feet) is used to move in and around trees during the collection of lead shot at trap and skeet ranges.

Soil Washing (Physical and Gravity Separation)

Soil washing is a proven technology and another lead reclamation method used by some reclaimers to separate the lead particles from

the soils. Soil washing is the separation of soils into its constituent particles of gravel, sand, silt and clay. Because of the much higher surface area and surface binding properties of clay, most lead contaminants tend to adhere to the clay particles.

Soil washing, therefore, attempts to generate a clean sand and gravel fraction by removing any fines adhering to the larger soil particles and, if necessary, to transfer contaminants bound to the surface of the larger particles to the smaller soil particles. Typically, the soils are first excavated from the range and then mixed into a water-based wash solution. The wet soil is then separated using either wet screening or gravity separation techniques. One benefit of this system of reclamation is that it does not require that soils be dry.

In addition, soil washing may be able to recover all or almost all lead particles through a combination of wet screen sizing and density separation. This technique is an option for remediation of a range being closed and may compare favorably from an economic standpoint with the disposal option.

Soils treated using this method have been shown to be below 5 mg/L TCLP and to have up to 99% of particulate lead removed. Treatment costs are site specific, but can range from less then $40 per ton (1999 levels) for simple physical/gravity separation up to about $100 per ton for processes involving leaching. Credits for recycled lead help offset the treatment cost and the cost of recycling any treatment sludges and concentrated soil fines. Water used in soil washing is from a closed loop system and should only be disposed at completion of cleanup. Experience shows the water to not be a RCRA regulated hazardous waste, therefore probably allowing disposal to a local wastewater treatment plant.

Wet Screening

With this method, particles larger and smaller than the surrounding soils are passed through a series of large-mesh to small-mesh screens. Each time the mixture passes through a screen, the volume of the soil mixture is reduced. Large particles such as lead shot/bullets and fragments are screened out of the soil/wash mixture early in the process and can be taken off-site for recycling - allowing the soil to be placed back on-site.

Gravity Separation

This technique can be used in cases where the lead particles are the same size as surrounding soil particles. The wet soil/wash mixture is passed through equipment, which allows the more dense materials (i.e., lead materials) to settle to the bottom of unit and separate out of the soil/wash mixture.

Pneumatic Separation

Pneumatic separation (see figure 3-3) is an effective means to enhance the traditional screening results. Traditional screening cannot separate shot and bullets from other shot and bullet sized material, i.e., rocks, stones, roots, and various debris. A recycling facility considers non-lead items as "contaminants" which drastically reduces the value of the recycled lead. Pneumatic separation utilizes an air stream, and specific density analysis, to effectively separate the shot/bullets from the other shot/bullet sized material.

3.3.5 BMPs to Assist Lead Reclamation and Recycling

There are several operational activities that should be conducted throughout the year to facilitate reclamation. The following is a discussion of these activities.

Frequency of Lead Removal

It is important to perform lead removal at a frequency appropriate for your site. The frequency is dependent on several factors. These include:

- Number of rounds fired
- Soil pH
- Annual precipitation
- Soil Type
- Depth to groundwater.

Lead quantity, as estimated by the number of rounds fired, is a factor in determining the appropriate frequency of reclamation at ranges. It also assists in determining the cost of reclamation. One reclamation company indicated that reclamation was most cost effective when it contains at least 20 pounds of lead per square foot of backstop. Another source indicated that a minimum of 100,000 rounds per firing lane should be allowed before lead reclamation occurs. This would ensure good range operation and maintenance, while minimizing the cost per quantity of lead recovered.

For shotgun ranges, tracking the number of targets thrown can help indicate when the lead shot should be reclaimed. For example, considering environmental issues, the market for scrap lead and common cleanup methods, one source indicated that when a range has thrown at least 250,000 to 1,000,000 targets, depending on the shooting area, reclamation of the lead shot is encouraged. Another reclaimer indicated that if at least two pounds of lead per square foot have accumulated on the range, reclamation is recommended.

Because the number of rounds fired is important to know, establishing record keeping procedures to monitor the number of rounds fired is recommended. This can be accomplished by maintaining logbooks and asking shooters to list the number of rounds shot and the type/size of shot/bullets they use. This should be done by lane and by stand.

There are many ranges at which lead removal has not occurred for many years. Many of these ranges are used extensively. Such ranges are especially good candidates for lead removal and recycling. Subsequent removal frequency depends on range use and environmental factors. The NRA recommends a frequency of one to five years for lead cleanup, even on ranges with minimal use[4]. One possible approach to reducing the cost of reclamation more cost effective is for a number of ranges in the same geographical area to work together in organizing coordinated removals at their ranges. This will reduce the reclaimer travel and mobilization cost for each range.

Minimization of Vegetation

As discussed previously, vegetation is useful both for controlling the amount of runoff and erosion from the range and inhibiting lead mobility. **However, excessive or unmaintained vegetative cover can interfere with reclamation activities.** For example, large amounts of vegetation impedes the screening and sifting processes used by many reclamation companies. Therefore, prior to reclamation activities, it is best to remove, reduce, or mow excessive vegetation from the area. Once the reclamation has been conducted, quick-growing vegetation such as a rye/fescue grass mix should be replanted. This process should be repeated for each reclamation event.
In addition, heavily wooded areas may inhibit lead reclamation because they are less accessible by heavy reclamation machinery. For ranges that are heavily wooded, it is recommended that you minimize the vegetation or modify the range design to allow lead reclamation equipment access to the range. Access to the impact area should be developed to facilitate reclamation. **Make sure that the pathways do not present a safety risk.**

Innovative Landscaping

Some new ranges are landscaping their ranges to include a sand track (an area the size of the shotfall zone that is only sand) located behind some aesthetically pleasing shrubs. This allows the spent shot to concentrate on the sand, making it very easy to perform reclamation because there is no interference by vegetation.

Selecting a Lead Reclaimer

In ensuring that the reclamation is conducted appropriately, selecting a reclaimer that is right for your range is extremely important. Some lead reclamation companies will travel to your range and assess the range prior to conducting

4. National Rifle Association, "Metallic "Bullets" lead Deposits on Outdoor and Indoor Firing Ranges" 1991

lead collection activities. This assessment trip allows the reclamation company to confirm information gained during initial discussions, as well as to assist in appropriately estimating costs, time required, and the estimated volume of lead at the range. Conducting this pre-assessment also allows you to determine which reclaimer is right for your situation.

Questions Commonly asked by the Reclaimer

When you contact a reclamation company, it is likely that the reclaimer will ask several general questions. Typical questions include:

- When was the last reclamation conducted?
- How many rounds have been shot since that last reclamation?
- What is the use frequency of the range?
- What are the site characteristics and soil types?
- What type of bullet containment device is used at the range?

Answering these questions will be a lot easier if you have maintained good records, as is suggested above.

Questions to ask the reclaimer

When choosing a reclaimer be sure to ask the general questions about prior cleanups (past projects), insurance to cover company and cleanup (general liability insurance, pollution insurance, bonding, etc.), and site plans to ensure health and safety of workers and range personnel. Other questions you may want to ask the reclaimer include:

- Can the reclamation take place outside normal hours of range operation?
- What costs are involved?
- How long will the reclamation take?
- Does vegetation at the range need to be removed?

Economic Considerations

Lead removal costs may vary dramatically depending upon the type and volume of soil or sediments, topography, amount of lead, location, and reclamation company and technique used. Because the economics vary due to many factors, this manual does not provide specific estimates. However, it is important to understand that lead reclamation will generally require an expenditure by the range, even when considering any monetary returns from selling reclaimed lead. By tracking the range use and using the criteria discussed earlier (see Frequency of Lead Removal), the reclamation costs per quantity of lead can be optimized. For long term range management, routine lead removal will help future cost avoidance by minimizing the need for costly site remediation

Some reclaimers bid the lowest flat fee with all the lead provided to the range for selling. The range owners/operators must then consider the transportation costs and recycling fee associated with sending the reclaimed shot and bullets to a recycling company. Alternatively, the reclaimer will use the economic return of lead sold for recycling, based on the volume reclaimed and the current value of lead, to reduce the total cost of reclamation and recycling. Although the value of lead varies, the scrap value of reclaimed lead typically falls between $.06 and $.25 per pound, **excluding transportation cost**. See the appendix for contact information regarding lead reclamation companies that specialize in lead removal at outdoor ranges.

3.4 Documenting Activities and Record Keeping (Step 4)

Documenting activities and keeping good records is of paramount importance for an effective lead management program at a range. Owners/operators should document all activities done at the range with respect to BMPs and recycling of lead. Records should be kept on when services were provided and who provided them.

Owners/operators may want to document what type of BMP(s) were implemented to control lead migration, the date of service, and who did the services. The records should be kept for the life of the range. Records may be used to show that owners/operators are doing their part to

help prevent lead migration off-site and show that they are doing their part to be stewards of the environment.

3.5 Additional Economic Considerations

Not all BMPs need to be implemented at once. Many can be phased in over time. However, it is important to begin implementing BMPs, especially lead reclamation and recycling, as soon as possible. Implementing the most appropriate BMPs for your range requires consideration of your range characteristics and costs associated with implementing the BMPs. This manual provides a large selection of BMPs that vary in both cost and sophistication. In selecting BMPs for your range, it is important to look at all costs and all the benefits (or potential problems) associated with each BMP.

3.6 Summary of Key BMPs for Shooting Ranges

There are several BMPs that are highly recommended to be implemented, if applicable to your range. Table 3-1 identifies the advantages and disadvantages of all BMPs discussed in this chapter. This table serves as a quick reference guide for potential BMPs. Readers should refer back to the detailed discussions above for further information regarding these BMPs.

3.7 Certificate of Recognition

EPA has established a voluntary process whereby a shooting range may apply for a "Certificate of Recognition." The Certificate is intended to be awarded to ranges that have certified that they have prepared and intend to implement, or have implemented, a written Environmental Stewardship Plan that is consistent with the EPA *Best Management Practices for Lead at Outdoor Shooting Ranges* manual. To assist in this process, Appendix E contains a template for an Environmental Stewardship Plan, an electronic copy of which is available on EPA's shooting range website (http://www.epa.gov/region2/leadshot) in several formats. This template, combined with information provided throughout this manual, other resources and guidance, and site-specific factors, will help in guiding the process of evaluating relevant information about your facility and determining which BMP(s) might be appropriate for your ranges. EPA's template was adapted from Appendix C of the National Shooting Sports Foundation's manual, *Environmental Aspects of Construction and Management of Outdoor Shooting Ranges* (the NSSF manual.) Accordingly, use of that template would also be acceptable for use in EPA's Certificate of Recognition program.

In order to request this certificate, a range must submit a notice to the Lead Shot Coordinator in EPA Region 2 stating that they have completed an Environmental Stewardship Plan as indicated above and are intending to implement it within six months. The certificate is intended to convey, to all that may see it, that the range has declared its intention to properly manage lead shot and bullets. However, it must be noted that a certificate is not a permit to operate and provides no additional operational approval, implied or otherwise.

Table 3-1 – Summary of Key BMPs

BMPs for Preventing Lead Migration		
Monitoring and Adjusting pH		
BMP Option	**Advantages**	**Disadvantages**
Lime Spreading	1. Easy 2. Inexpensive 3. Effective	1. Does not offer a permanent solution 2. Will not work in extremely acidic conditions
Immobilizing Lead		
BMP Option	**Advantages**	**Disadvantages**
Phosphate Spreading	1. Easy 2. Inexpensive 3. Effective	1. Does not offer a permanent solution
Controlling Runoff		
BMP Option	**Advantages**	**Disadvantages**
Vegetative Ground Cover (e.g., grass, etc.)	1. Easy 2. Aesthetically pleasing 3. Relatively inexpensive 4. Effectively slows and can redirect runoff 5. Some may "bioabsorb" lead	1. Requires periodic maintenance 2. Must be removed or reduced prior to reclamation 3. Excessive vegetation will interfere with reclamation
Organic Surface Cover (e.g., mulch and compost)	1. Easy 2. Aesthetically pleasing 3. Relatively inexpensive 4. Effectively slows and can redirect runoff	1. Requires periodic maintenance 2. Must be removed prior to reclamation 3. May not be suitable at ranges with acidic soil conditions
Filter Beds	1. Diverts and treats lead contaminated runoff 2. Low maintenance 3. Assists with range drainage	1. May require hiring a licensed engineer 2. Higher initial setup cost

Table 3-1 – Continued

Controlling Runoff (cont.)		
BMP Option	**Advantages**	**Disadvantages**
Water/Sediment Traps	1. Low maintenance 2. Assists with range drainage	1. May require hiring a licensed engineer 2. Higher initial setup cost
Dams and Dikes	1. Low maintenance 2. Assists with range drainage	2. Higher initial setup cost
Ground Contouring	1. Lower initial setup cost 2. Assists with range drainage	1. May require hiring a licensed engineer
Controlling and Containing Bullets		
Bullet Containment Devices		
BMP Option	**Advantages**	**Disadvantages**
Earthen Backstop	1. Minimal (if any) initial setup cost 2. Accepts firing from various guns and directions	1. Build up of bullets increases chances of ricochet and fragmentation problems 2. Lead removal requires mining 3. Potential decreased value of lead because it is less clean than lead reclaimed from other trap systems 4. Does not eliminate lead's introduction into the environment
Sand Trap	1. Low initial setup cost 2. Ease of maintenance 3. Accepts firing from various guns and directions	1. Build up of bullets increases chances of ricochet and fragmentation problems 2. Lead removal requires mining
Pit and Plate Trap (Sand)	1. Low initial setup cost 2. Simple installation 3. Lead removal and recycling requires less extensive mining	1. Lead builds up on top layer of sand causing ricochet problems 2. Increased bullet fragmentation 3. Higher level of maintenance than sand traps

[1] Much of this information was obtained from Action Target's Bullet Containment Trap Technologies video. Reference to various pros and cons of individual bullet containment devices is included in this manual for informational purposes only. The USEPA does not endorse any particular bullet containment device, design, or product.

Table 3-1 – Continued

Controlling and Containing Bullets (Cont.)		
Bullet Containment Devices (cont.)		
BMP Option	**Advantages**	**Disadvantages**
Escalator Trap (Steel)	1. Can be used indoors and outdoors	1. Deflection plates require regular oiling. The oil used is hazardous and can easily migrate at outdoor ranges 2. Relatively high maintenance 3. Poor lead collection because the bullets may become clogged at the spiral collection area at the top of the deflection plate 4. Increased bullet fragmentation 5. May require rubber curtains to be placed in front of the trap to slow bullets 6. More noise 7. Possible creation of lead dust
Vertical Swirl (Steel)	1. Can be used indoors or outdoors 2. Bullets are captured in pure form in containers, thus removal and recycling is easy	1. Does not accept shooting from all directions 2. Corners where each unit meet can cause ricochet and fragmentation problems 3. More noise 4. May create lead dust
Wet Passive Bullet Trap (Steel)	1. Can be used indoors and outdoors 2. Excellent results (i.e., low ricochet, low fragmentation, ease of removal) 3. Bullets are captured in containers, thus removal and recycling is easy	1. Expensive 2. Oil and water mixture is hazardous 3. More noise
Lamella Trap	1. Can be used indoors or outdoors 2. Reduction of lead dust	1. Rubber strips quickly become destroyed and must be replaced 2. Potential fire hazard 3. High maintenance 4. Scattered lead fragments mixed with rubber can migrate; lead contaminated granules are hazardous and require special handling

Table 3-1 – Continued

Controlling and Containing Bullets (Cont)		
Bullet Containment Devices (cont.)		
BMP Option	**Advantages**	**Disadvantages**
Rubber Granule	1. Can be used indoors or outdoors 2. Reduction of lead dust 3. Minimizes fragementation, compared with some backstops	1. Rubber strips can quickly become destroyed and must be replaced 2. Some pose potential fire hazard, although fire-retardant/resistant materials are available in some designs 3. High maintenance 4. Scattered lead fragments mixed with rubber can migrate; lead contaminated granules are hazardous and require special handling
Shock Absorbing Concrete	1. Adaptable/can be formed in any shape 2. Can be used to reduce erosion in soil berms/target emplacements 3. Crushed concrete can potentially be recast after fragments removed	1. Mechanical lifting and handling equipment must be used during installation and maintenance 2. High maintenance (replacement) costs
Removal and Recycling of Lead		
Hand Raking and Sifting	1. Easily done by club members 2. Inexpensive 3. Can be done outside operating hours 4. Relatively effective	1. May be more time consuming at large ranges 2. Weather sensitive (i.e., works best under dry conditions) 3. Exposure to lead and lead dust possible
Screening	1. Effective 2. Potential economic returns	1. Vegetation must be removed 2. Weather sensitive (i.e., works best under dry conditions)
Vacuuming	1. Effective 2. Can be used at least accessible ranges 3. Less vegetation needs to be removed	1. Weather sensitive (i.e., works best under dry conditions)
Soil Washing	1. Effective at cleaning the soil to remove the lead particles so one is left with non-lead soil	1. Vegetation must be removed

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Long Island Soundkeeper Fund, Inc. v. New York Athletic Club of the City of New York, 1996 U.S. Dist. LEXIS 3383 (S.D.N.Y. 1996)

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U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C., Directive 9355.4-12, *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, July 14 1994

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington D.C., *A Citizen's Guide to Soil Washing*, EPA 542-F-96-002., April 1996.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. *Physical/Chemical Treatment Technology Resource Guide*, EPA 542-B-94-008. September 1994.

Appendix A: Resources

This manual provides contacts for lead reclamation companies, lead recycling companies, bullet trap manufacturers, and organizations that provide prevention and/or remediation techniques to assist clubs and firing ranges in implementing Best Management Practices for shooting ranges. The list was updated for the June 2005 printing. Vendors who are interested in being added to the list of lead reclaimers or remediation contractors should contact:

Lead Shot Coordinator
RCRA Compliance Branch
US EPA Region 2
290 Broadway
New York, NY 10007-1866
Telephone: (212)637-4145
E-mail: Leadshot.Region2@epa.gov

Lead Recycling Companies

Below is a list of recycling companies for lead in soils and spent lead shot/bullets that were contacted during the writing of this manual. Lead recycling companies smelt lead. It is not inclusive and is included for informational purposes only. Local scrap metal recyclers may also accept spent lead shot or spent bullets. Mention of these companies does not serve as an endorsement by the EPA.

The Doe Run Company Resource Recycling Divsion HC1 Box 1395 Boss, MO 65440 800-633-8566 573-626-3476 Lou Magdits l.magdits@doerun.com	**East Penn Manufacturing Company, Inc.** P.O. Box 147 Lyon Station, PA 19536 610-682-6361 Rick Leiby Web Site: http://www.eastpenn-deka.com
Exide Spring Valley & Nolan Streets Reading, PA 19612 800-437-8495 Robert Jordan, Maritza Rojas-Suarez Web site: http://www.exide.com	**Gopher Smelting and Refining** 3385 Highway 149 South Eagan, MN 55121 651-454-3310 800-354-7451 Mark Kutoff Web Site: http://www.gopherresource.com/
Gulf Coast Recycling 1901 N. 66th St Tampa, FL 33619 813-626-6151 William Weston	**Kinsbursky Brothers, Inc.** 1314 N. Anaheim Blvd Anaheim, CA 92801 714-738-8516 Paul Schneider Web Site: http://www.kinsbursky.com
Reserve Trading Corp. P.O. Box 302 Medina, OH 44258 330-723-3228	

Lead Reclamation Companies

Below is a list of reclamation companies for lead in soils and spent lead shot/bullets that were contacted during the writing of this manual. Lead reclamation companies reclaim lead from ranges. It is not inclusive and is included for informational purposes only. Mention of these companies does not serve as an endorsement by the EPA.

Brice Environmental 3200 Shell St, P.O. Box 73520, Fairbanks, AK 99707 Craig Jones 907-456-1955 www.briceinc.com Reclaims primarily from earthen backstops and sand traps.	**En·Range, Inc.** 3326 NW 29th St. Miami, FL 33142-6310 Thomas M. Taylor 305-999-9965 Fax 305-635-8645 Email: enrange1@yahoo.com www.en-range.com Provides lead reclamation and other environmental and maintenance services.	**Entact** 1010 Executive Court Suite 280 Westmont, IL 60559 630-986-2900 www.entact.com Performs physical removal of the lead from backstops, chemical treatment of soils and returns soil to the backstop.
Karl & Associates, Inc. 20 Lauck Road Mohnton, PA 19540 Edmund Karl III 610-856-7700 Works primarily in the the mid-Atlantic area. Lead-containing soil is physically removed and sent to licensed disposal sites or licensed recycling facilities.	**MARCOR** 246 Cockeysville Road Hunt Valley, MD 21030 Dave Jungers 410-785-0001 www.marcor.com Uses a pneumatic separation unit to remove lead from contaminated soil and treats soil to pass TCLP.	**Metals Treatment Technologies, LLC (MT²)** 12441 West 49th Avenue Suite 3 Wheat Ridge, CO 80033 Jim Barthel 303-456-6977 www.metalstt.com Removes lead from soil and treats soils at all types of ranges.
Sears Trucking Company P.O. Box 38 El Reno, OK 73036 Garland Sears 800-522-3314 Fax 405-262-2811 Physically removes lead from soils at trap and skeet ranges.	**Solucorp Industries, Ltd.** 250 West Nyack Road West Nyack, NY 10994 Mike DeLuca 845-623-2333 Fax 845-623-4987 Email: solucorpmbs@aol.com www.solucorpltd.com Removes and treats soil using their Molecular Bonding System (MBS) soil stabilization technology.	**Southern Lead Removal** P.O. Box 2645 Daytona Beach, FL 32115 Kevin Gilchrist 386-763-0115 Fax 386-761-6991 Removes lead from indoor and outdoor pistol ranges only.
Sport Shooting Services P.O. Box 667 Crawfordville, FL 32326 Ed Tyer 850-926-7375 Cellphone 850-294-0132 Email: envirorange@aol.com Removes lead from earthen berms, uses a shaker and screen system to separate lead from soils, rents screening equipment, and consults on range design, primarily in Florida.	**Terra Resources, Ltd.** HC4 Box 9311 Palmer, AK 99645 Larry Wood 907-746-4981 Cellphone: (907) 232-5059 Fax: 907-746-4980 www.terrawash.com Uses gravimetric process to separate lead and TerraWash™ soil washing technology.	**Waste Recycling Solutions, Inc.** 1850 Route 112 Medford, NY 11763 Tommy Arabia, President 631-654-3811 Uses a vacuum system to remove lead from trap and skeet ranges.

Other Resources

Below is a list of additional phone numbers that may be of use if you have general questions including questions on range construction, design, and implementing BMPs.

U.S. Fish and Wildlife Service 4401 North Fairfax Arlington, VA 22203 703/358-2156 Web site: http://www.fws.gov/	**Institute of Scrap Recycling Industies, Inc.** 1325 G Street, NW, Suite 1000 Washington, DC 20005-3104 202/737-1770 Web site: http://www.isri.org/
Lead Industries Association, Inc. 13 Main Street Sparta, NJ 07871 973/726-LEAD (973/726-5323) fax: 973/726-4484 Web site: http://www.leadinfo.com	**National Rifle Association of America** 11250 Waples Mills Road Fairfax, VA 22030 800/NRA-3888 Web site: http://www.nra.org
National Shooting Sports Foundation and National Association of Shooting Ranges 11 Mile Hill Road Newtown, CT 06470 203/426-1320 NSSF web site: http://www.nssf.org NASR web site: http://www.rangeinfo.org	**Sporting Arms and Ammunition Manufacturers' Institute, Inc.** Flintlock Ridge Office Center 11 Mile Hill Road Newtown, CT 06470-2359 203/426-4358 Web site: http://www.saami.org
Wildlife Management Institute 1101 14th Street, N.W. Suite 801 Washington, DC 20005 202/371-1808 Web site: http://www.wildlifemanagementinstitute.org	

Web Resources

Useful Web Sites	
Description	**Web Address**
Federal Government Sites	
U.S. EPA's Outdoor Shooting Range Home Page	http://www.epa.gov/region2/waste/leadshot/
U.S. EPA – Military Munitions Rule	http://www.epa.gov/epaoswer/hazwaste/military/ http://www.epa.gov/tribalmsw/thirds/remunition.htm
U.S. Occupational Safety and Health Administration (OSHA)	http://www.osha.gov/
National Institute for Occupational Safety and Health (NIOSH)	http://www.cdc.gov/niosh/
State Government Sites	
Florida: BMPs for Shooting Ranges	http://www.dep.state.fl.us/waste/categories/shooting_range/
Massachusetts : Lead Shot in the Environment	http://www.state.ma.us/dep/files/pbshot/pb_shot.htm
Minnesota: Poster for "Firing Range Hazards"	http://www.cdc.gov/niosh/mnables.html
Ohio: Lead Shot Reclaimers list	http://www.epa.ohio.gov/dhwm/leadrecy.htm
Wyoming: Lead Recyclers List	http://deq.state.wy.us/outreach/lead.htm
Court Decisions	
Connecticut Coastal Fishermen's Association v. Remington Arms	http://www.duedall.fit.edu/summer/rcra.htm
Long Island Soundkeeper Fund and NY Coastal Fishermen's Assoc. v. New York Athletic Club	http://www.epa.gov/region02/waste/leadshot/lisfnyac.htm
Articles and Research	
USAF - Lead Contamination in Soils at Military Small Arms Firing Ranges	http://www.afcee.brooks.af.mil/pro-act/fact/june98a.asp
U.S. Army Env. Center (AEC) – Small Arms Range Technology	http://aec.army.mil/usaec/range/operations03.html http://aec.army.mil/usaec/technology/rangexxi03.html http://aec.army.mil/usaec/publicaffairs/update/win97/range.htm
AEC – Green Bullets	http://aec.army.mil/usaec/publicaffairs/publicity02.html http://aec.army.mil/usaec/technology/rangexxi00a.html http://aec.army.mil/usaec/publicaffairs/update/spr97/bullets.htm
AEC - Recycling of Firing Range Scrap	http://aec.army.mil/usaec/publicaffairs/update/spr99/spr9911.htm
Florida Center for Solid and Hazardous Waste Management	http://www.floridacenter.org/
National Association of Shooting Ranges' Reference Library	http://www.rangeinfo.org/resource_library/facility_mngmnt/

Bullet Trap Manufacturers[1]

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Action Target (801) 377-8033 Contact: John Curtis, CEO actiontarget.com	Total Containment Trap (TCT)	$1,600 to $1,800 /linear foot (dependent on features selected)	Purchase of Equipment Installation Delivery (Freight included)		Rifle Pistol Armor - piercing* *depends on type of armor-piercing	The TCT is a funnel-style trap that uses steel plates mounted at low angles to direct bullets into a deceleration chamber. The low angles prevent break up of the bullets until they reach the chamber, where the bullets lose energy and drop into removeable storage containers. An optional dust collection unit uses a powerful vacuum to remove lead dust and other fine particles from the collection chamber.	The TCT is designed for both indoor and outdoor applications. It may be used safely with handguns, shotguns, and high-powered rifles, and has been successfully tested and used with 50-caliber fire.
Action Target (Cont.) see details above	Rubber Berm Trap (RBT)	$1100/liner foot	Installation and Delivery		Rifle or Pistol. Armor-piercing. Cannot use incendiary rounds.	The RBT is very similar in form and function to a traditional sand or earthen berm trap, with the obvious difference being the use of chopped rubber instead of sand as a collection medium. Bullets fired into the trap are absorbed by the rubber and remain there until reclamation through mining of lead from the trap.	Because rubber is a softer collection medium, bullets can be captured with less break-up and fragmentation. The resulting reduction in lead dust levels is especially beneficial in indoor ranges. This benefit is decreased as more rounds accumulate in the trap, causing newly fired bullets to impact bullets already in the trap.

[1] EPA does not endorse any particular bullet containment device or product. Information on this table is offered to readers for a general understanding of some common bullet trap options and is based on vendor marketing literature.

Bullet Trap Manufacturers Con't.[1]

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Copius Consultants (516) 783-7489 Contact: Craig Copius	Containment/ Recovery System	Ranges from $600/linear foot to $1,000/linear foot (Price varies with specific design selected)	Purchase of Equipment	Shipping	Rifle Pistol Machine gun Shotgun	This is a modification of the sand backstop. Sizes vary depending on the needs and characteristics of the range; however, average height is 10' - 12' and average width is 12' - 14'. The trap utilizes ballistic grade sand to trap bullets and bullet fragments in a sealed system. The system contains collection and filtration systems to ease reclamation and eliminate off-site migration of lead.	Specific recommended bullet trap is based on the following: 1) Type of usage, quantity of usage, etc. 2) Location in country 3) Environmental issues (e.g., location near a waterbody) Price will depend on the design adopted. One unique feature is that shooting can occur at any angle.
Meggitt Defense Systems Caswell (612) 706-6201 Contact: Brian Danielson	Granular Rubber Bullet Traps	$940 to $1,300/linear foot (dependent on type of trap and other features selected)	Purchase of Equipment Installation Delivery (Freight included)		Pistol Rifle Armor- Piercing Shotgun Machine gun Tracers (Speak to Sales Rep.)	The trap absorbs bullets fired from any angle or distance. No exposed steel surfaces; bullets are not fragmented. The granulated material used in the trap can be turned over quickly to recover the spent rounds.	Suitable for indoor and outdoor ranges. Eight types of traps available. Custom builds traps. Provides site-specific design, if requested. Reclamation is recommended after approximately 90,000 rounds have been fired (depending on trap type.)

[1] EPA does not endorse any particular bullet containment device or product. Information on this table is offered to readers for a general understanding of some common bullet trap options and is based on vendor marketing literature.

Bullet Trap Manufacturers Con't.[1]

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Range Systems (888) 999-1217 (763) 533-9200 Contact: Steve Thomas range-systems.com	Encasulator Bloc Trap™ Encasulator Granular Trap™	$800-$1,250/linear ft (Price varies with design criteria and product selection)	Purchase of Equipment Installation	Freight	Pistol Rifle Shotgun (shot and slugs)	The bullet traps are constructed for maximum bullet retention with minumum space and cost. The bullet traps virtually eliminate ricochet and airborne lead.	Full service shooting range provider from design and engineering to construction and maintenance. Custom-built traps with exclusive patented rubber technology.
Savage Range Systems (413) 568-7001 Contact: Joan Drucker snailtraps.com	The SNAIL™ Trap	Two types of traps: Pistol Wet: $2,250/linear ft Pistol Dry: $2,150/linear ft Rifle Wet: $2,400/linear ft Rifle Dry: $2,300/linear ft	Purchase of Equipment	Shipping Installation	Rifle (up to .50 cal BMG) Pistol	The SNAIL trap is designed with low angle entrance ramps to guide the bullet into the circular deceleration chamber without scarring the plate. The bullet loses all of its energy in the chamber and drops into a collection system. The use of water and synthetic oil contains the lead particulates and dust, and minimizes friction on the plates.	Usage for indoor and outdoor ranges. Can also be provided with a conveyance system that drops the bullet to a single collection point (e.g., 55-gallon drum) for recycling. Low-maintenance system

[1] EPA does not endorse any particular bullet containment device or product. Information on this table is offered to readers for a general understanding of some common bullet trap options and is based on vendor marketing literature.

Bullet Trap Manufacturers Con't.[1]

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Stapp EBC, Incorporated (703) 239-9223 Contact: Matt Ciskowski, P.E. 8101 Ox Road Fairfax Station, VA 22039 Fax: (703) 239-9224 bulletcatcher.com	STAPP Bullet Catcher	Varies by specific design (measured by square foot)	Purchase of Equipment Installation Delivery (Freight)		Pistol & Rifle (best for calibers up to 12mm) Can handle jacketed rounds and tracers	The STAPP bullet catcher (consisting of a bottom rubber liner, drainpipe reservoir, rubber granule fill, and cover layer of rubber) collects lead and any infiltrating water without runoff. The system is constructed over an earthen berm and can be modified to any range configuration. Projectiles are completely collected by the bullet catcher with minimal fragmentation. The surrounding structure is ricochet-proof even under the most extreme temperatures.	Designs are site adapted. Reclamation can be performed by Stapp EBC or by range personnel. Email: mciskowski-trc@verizon.net

[1] EPA does not endorse any particular bullet containment device or product. Information on this table is offered to readers for a general understanding of some common bullet trap options and is based on vendor marketing literature.

Bullet Trap Manufacturers Con't.[1]

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Super Trap Inc. (951) 736-9440 Contact: Art Fransen, Retired, L.A.S.D. 1601 Commerce St Corona, CA 92880 Fax: (951)736-9450 Email: info@supertrap.com supertrap.com	Gel-Cor™ Class A, Fire-Rated Rubber Bullet Traps ELIxIR™ Tactical Shooting Ranges Super Trap® Range Backstops SACON® Perimeter Facilities, Walls, Blocks & Tiles	Approx $520 to $1,600 per linear foot Varies by design, including: - indoor - outdoor - foundation - width of trap	Purchase of Equipment Installation Training	Shipping (Price will depend on destination)	Rifle & Pistol (up to and including .50 cal) Machine Gun Armor Piercing Tracer & Incendiary Ammunition *Also:* Frangible & Tungsten Traditional & Tactical Shooting	STI specializes in tactical shooting ranges. The firing range system captures and contains bullets whole, using a treated, granular ballistic media of recycled pure SBR (styrene-butadiene rubber), free of all steel and fiber contaminants that could normally allow fires to ignite. The infrastructure is 10 gauge galvanized steel and the hopper/deflection baffle is 3/8" AR 500 steel rifle rated (indoor and outdoor.) Outdoor Ranges: The backstop base typically lies on a graded berm at the appropriate angle determined by the user and STI staff. SACON® can absorb bullets and prevent lead contamination, replacing railroad ties, logs, brick walls and concrete enclosures on firing ranges.	STI's bullet trap systems eliminates hazardous materials contamination (TCLP tests below 1ppm), in addition to preventing ricochets and lead splash-back. Reclamation is recommended after approximately 100,000 to 130,000 rounds per 4 ft lane, based on type of shooter position and layout of targetry (static vs. dynamic.) Lead reclamation is performed using a vacuum air density separator system and rubber media is continuously reused. Use of recycled rubber media in the trap may qualify the range improvement for grant funding. Contact regional recycling associations for more information. STI offers more than six versions of Tactical Shooting Ranges, as well as custom built traps.

[1] EPA does not endorse any particular bullet containment device or product. Information on this table is offered to readers for a general understanding of some common bullet trap options and is based on vendor marketing literature.

Appendix B: Lead Shot Alternatives

Another method of preventing lead contamination at pistol, rifle, trap, skeet, or sporting clays ranges is to use less toxic or non-lead ammunition.

Much progress has been made in the development of alternatives to lead shot for hunting uses. Information gathered since 1976 on lead poisoning of endangered and non-endangered migratory birds due to lead shot ingestion led the United States Fish and Wildlife Service (USFWS) to consider several alternatives to eliminate lead poisoning among migratory waterfowl birds. A ban on lead shot for water fowl hunting was phased in beginning in 1986 and finalized in 1991. Lead shot is also now banned for shotgun hunting occurring near wetlands in national wildlife refuges. Starting in the fall of 1998, the USFWS banned the use of lead shot in waterfowl production areas. Additionally, many state-managed hunting areas require non-toxic shot for upland/small game hunting.

There are several alternatives to lead shot on the market today and still more alternatives are being developed. Before being used for waterfowl hunting, these alternatives must be approved by the USFWS. Bismuth, steel, tungsten/iron, and tungsten/polymer shots have been approved by the USFWS and additional alternative shot materials are in the USFWS approval process. Most of the ammunition manufacturers in the United States, as well as the military, have developed non-toxic alternatives to lead. Research in Europe may also result in additional non-toxic shot alternatives from which U.S. shooters may choose in the future. The following pages compare lead shot to non-toxic, alternative shot.

Summary of Lead Shot Alternatives†

Shot Material	Approximate Cost per 25 Round Box[1]	Ballistic Performance	Availability	Comments
Lead	$5.00/box $3.00 - $4.00/box of reloaded shells	Standard to which all alternatives are compared	Readily available	Lead is heavy and malleable
Bismuth* 97% Bismuth/ 3% tin	Bismuth shells are packed in 10 round boxes @ $15.00 - $25.00/ 10 round box	Similar to lead	Limited world supply of bismuth	Bismuth is a byproduct of lead and gold mining. There are currently many uses, including: medicine (Pepto-Bismol), cosmetics, pigments, and shotgun shot. The addition of tin makes bismuth more malleable and reduces frangibility. Bismuth shot is safe to use in older firearms.

† Product reference within this table is not an endorsement by EPA.

* Approved by USFWS for migratory waterfowl hunting.

[1] Costs will vary from store to store and were valid at the time of manual development.

Summary of Lead Shot Alternatives – Continued†

Shot Material	Approximate Cost per 25 Round Box[1]	Ballistic Performance	Availability	Comments
Steel*	$8.00 - $12.95/box $6.00/box of reloaded shells $15.00/box (copper-plated)	In test performance by the Cooperative North American Shotgun Education Program (CONSEP) in hunting situations, no significant differences were found between lead and steel shot at reasonable distances. Lead is more effective at longer ranges.	Readily available from both domestic and imported sources.	Steel shot is about 33% lighter then lead. Therefore, the initial velocity must be increased so that downrange pellet energy remains similar. In hunting situations, larger, and therefore heavier, steel shot is used. Few shooting competitions allow steel shot at this point, but the number is increasing. While steel target loads are available, shooter perception that steel will adversely affect guns and scoring seems to be the limiting factor in acceptance of steel shot for target shooting. Steel shot will not damage newer guns, but may cause ring bulge in older guns if a very tight choke is used. This problem has been resolved in the newer guns with the use of screw-in chokes.

† Product reference within this table is not an endorsement by EPA.

* Approved by USFWS for migratory waterfowl hunting.

[1] Costs will vary from store to store and were valid at the time of manual development.

Summary of Lead Shot Alternatives – Contiued†

Shot Material	Approximate Cost per 25 Round Box[1]	Ballistic Performance	Availability	Comments
Steel* (cont.)				Another concern with steel shot is safety. Because steel is much less malleable then lead, steel shot is likely to ricochet if it strikes something hard. Lead shot, on the other hand, will deform and flatten. In Europe, steel shot is banned for hunting because it can become embedded in trees. The steel shot in trees cut for lumber can cause damage to sawmill equipment and raise concerns about worker safety. Although steel shot can be reloaded, components are not readily available.
Tungsten/Iron* 40% tungsten/ 60% iron	$62.50/box (tungsten/iron shots are packed in 10 round boxes @ $25.00/10 round box)	Preliminary reports indicate that tungsten/iron shot is as effective as lead shot. However, the amount of shot in each cartridge is significantly less then in typical lead cartridges or even steel cartridges. The density of tungsten/iron is 94% that of lead.	Readily available	The tungsten/iron shot currently available is harder than steel. It would, therefore, cause similar damage to older guns.

† Product reference within this table is not an endorsement by EPA.

* Approved by USFWS for migratory waterfowl hunting.

[1] Costs will vary from store to store and were valid at the time of manual development.

Summary of Lead Shot Alternatives – Continued†

Shot Material	Approximate Cost per 25 Round Box[1]	Ballistic Performance	Availability	Comments
Tungsten/polymer* Various manufacturers have received final approval from the USFWS to market this type of shot.	Not available yet	Comparable to tungsten/iron	Currently not available	Two ammunition manufacturers are currently producing tungsten/polymer shot. This shot is more malleable than the tungsten/iron alloy and would, therefore, be less damaging to shotguns. A research and development company has developed a tungsten/polymer material as a substitute for lead in all its uses. According to this company, its tungsten/polymer can be formulated to be flexible or stiff, depending on the application. This material has been tested by the US Army in projectiles, but has not been used to manufacture shot. However, the company has initiated the process of applying to the USFWS for approval of this material as non-toxic shot.

† Product reference within this table is not an endorsement by EPA.

[1] Costs will vary from store to store and were valid at the time of manual development.

Summary of Lead Shot Alternatives – Continued†

Shot Material	Approximate Cost per 25 Round Box[1]	Ballistic Performance	Availability	Comments
Tungsten/steel Same as tungsten/Iron				
Tin USFWS granted temporary approval for 1999-2000 hunting season	Not available yet	Since tin is just being developed as an alternative to lead, performance information is not yet available. However, since the density of tin is less than steel, performance may be less effective than steel.	Currently not available	This material is just being developed as a lead shot alternative. However, it has similar problems as steel in that it is lighter then lead. The International Tin Research Institute in england is developing this product.

Other materials that are currently being experimented with as alternatives to lead are molybdenum and zinc. Not enough information is available to have included these alternatives in the above table.

† Product reference within this table is not an endorsement by EPA.

Summary of Lead Shot Alternatives - Conclusions

The table clearly illustrates that a number of non-toxic alternatives to lead shot exist such as steel and tungsten as well as alloys and synthetic polymers. As demand for shot from these metals increases from migratory waterfowl hunters, it is anticipated that the costs will come down. However, alternatives currently cost approximately two to twenty times more than lead shot.

The ban on lead shot in hunting situations impacts target shooting. The alternatives to lead shot that are now being developed for or are already approved by the USFWS for migratory bird hunting could be considered for use by target shooters.

Although alternatives to lead shot are now being used by hunters, it is rare that the alternatives are used by target shooters. The limiting factors appear to be the expense and performance. All the alternatives to lead are much more expensive, some prohibitively. Unfortunately, the least expensive alternative, steel, is also perceived to be less effective.

To encourage use of lead shot alternatives, some ranges sponsor shooting competitions using lead-free ammunition, but these are rare. The use of steel or other alternative shot is a recommended BMP in established sporting clays areas at which reclamation of lead shot is difficult to impossible.

Note: Switching to non-toxic shot may create additional issues. For instance, steel has an increased risk of ricochet. Switching to steel may require additional safety features and/or operating procedures.

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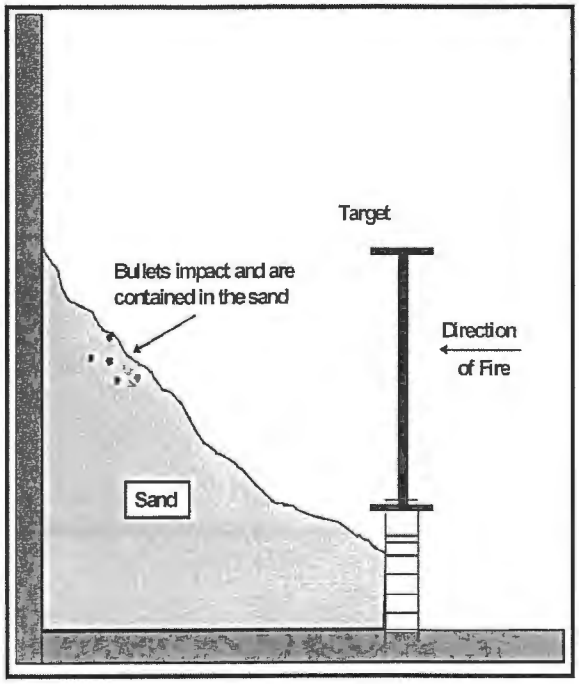
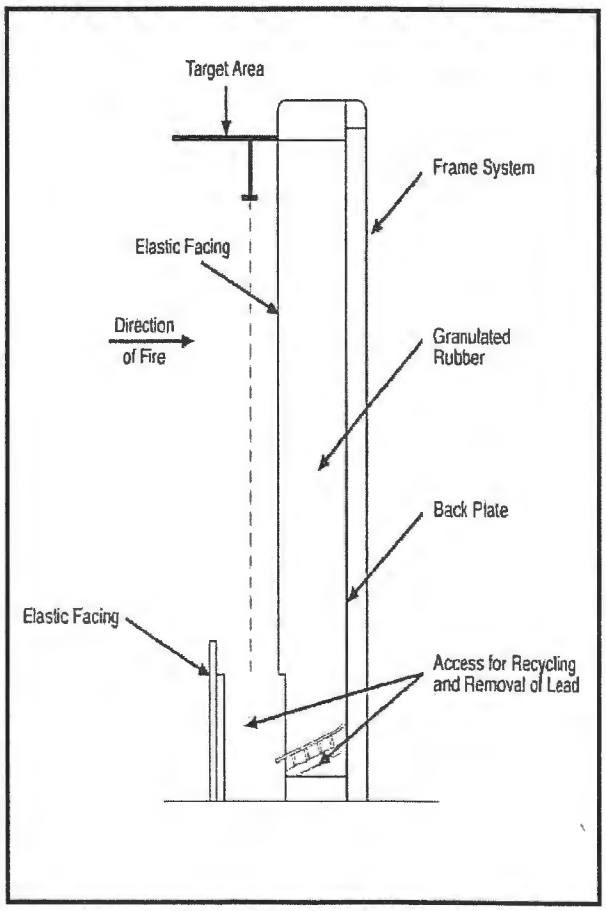
Appendix C: Sample Bullet Containment Devices

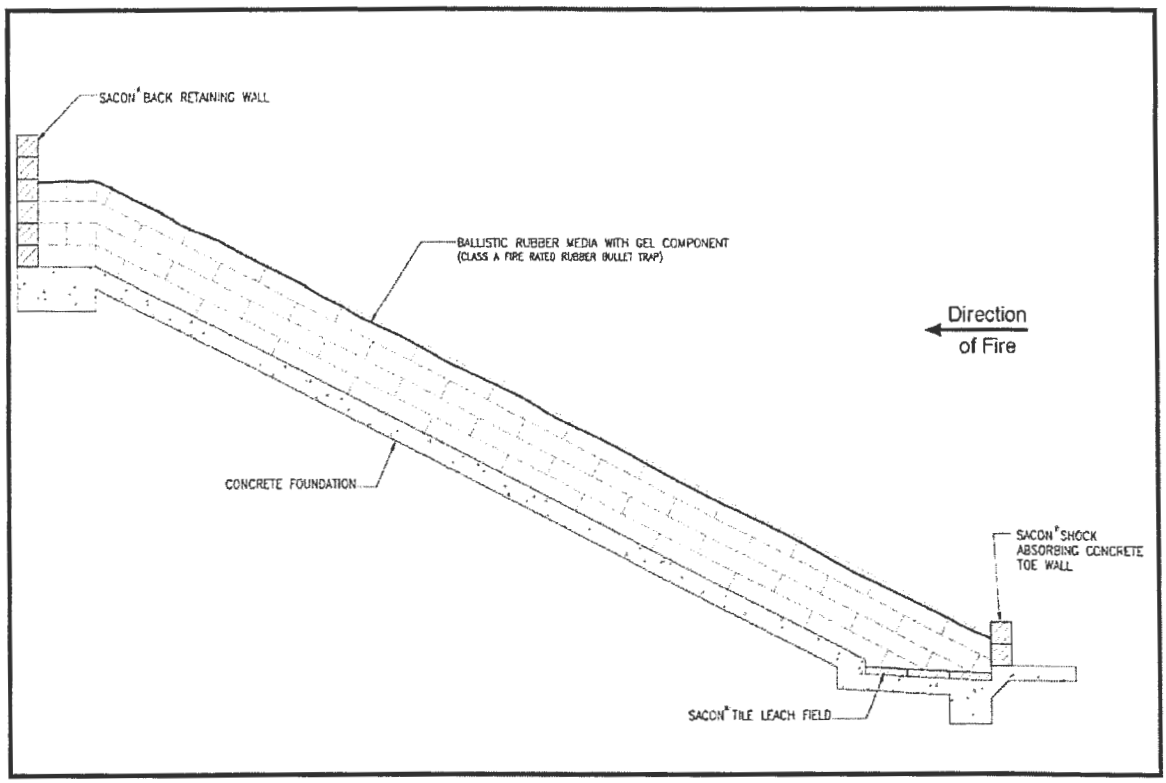
The bullet containment designs in this appendix are sample designs for the containment systems mentioned in this manual. Design systems may vary from different manufacturers. Reference to various individual bullet containment devices is included in this manual for informational purposes only. EPA does not endorse any particular bullet containment device, design, or product.



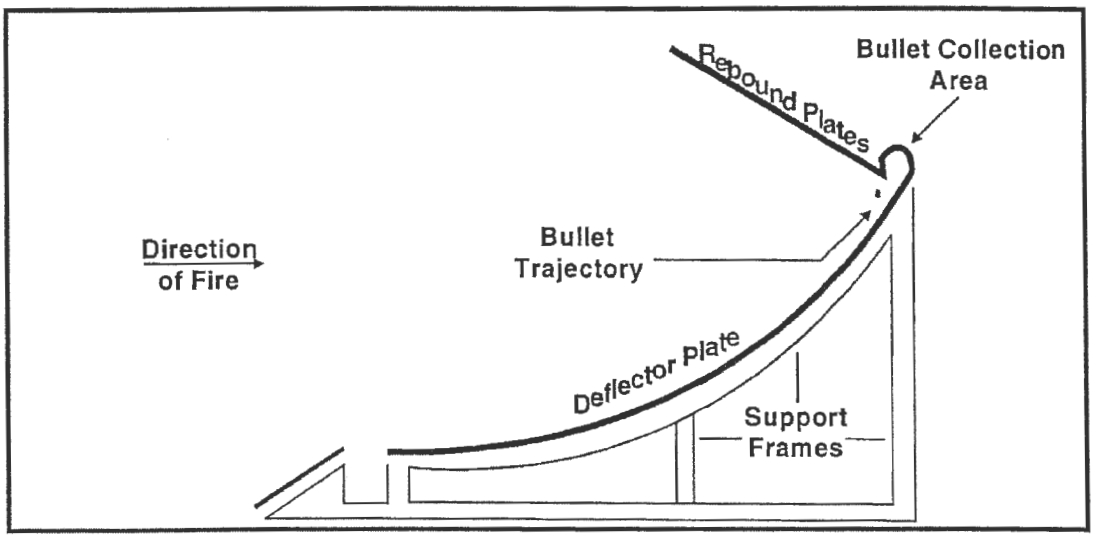
Sand Trap



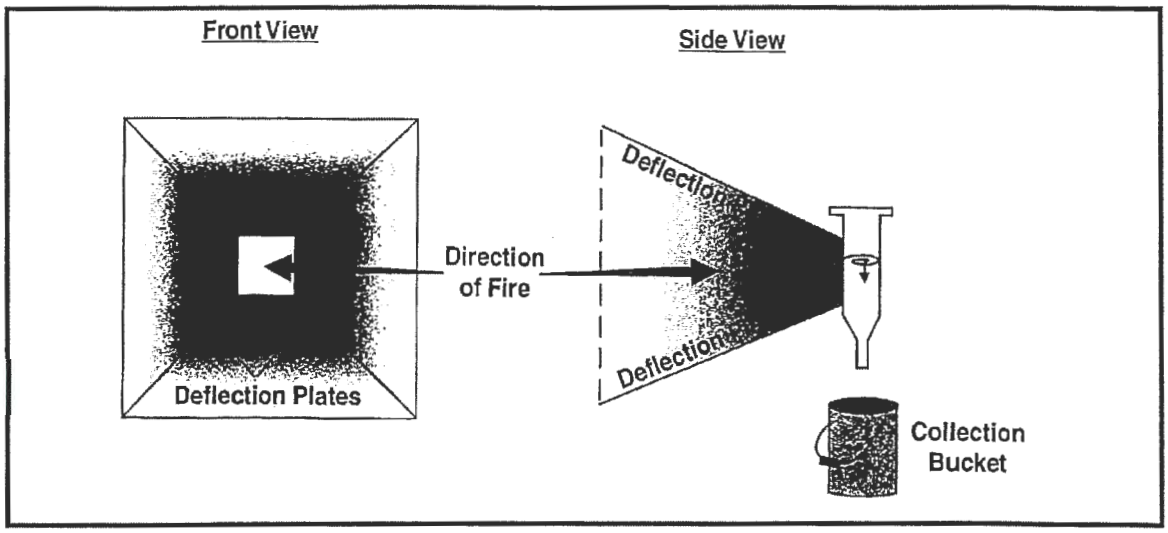
Rubber Granule Trap (Adapted from: *Bullet Trap Feasibility Assessment and Implementation Plan: Technology Identification Final Report*, U.S. Army Environmental Center, March 1996)



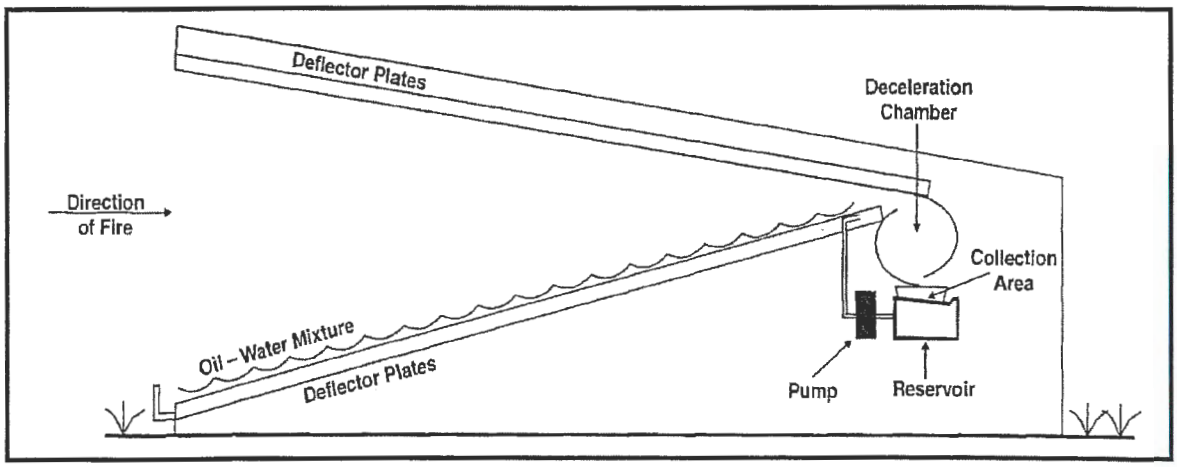
Gel-Cor Bullet Trap™ (Provided by Super Trap, Inc.)



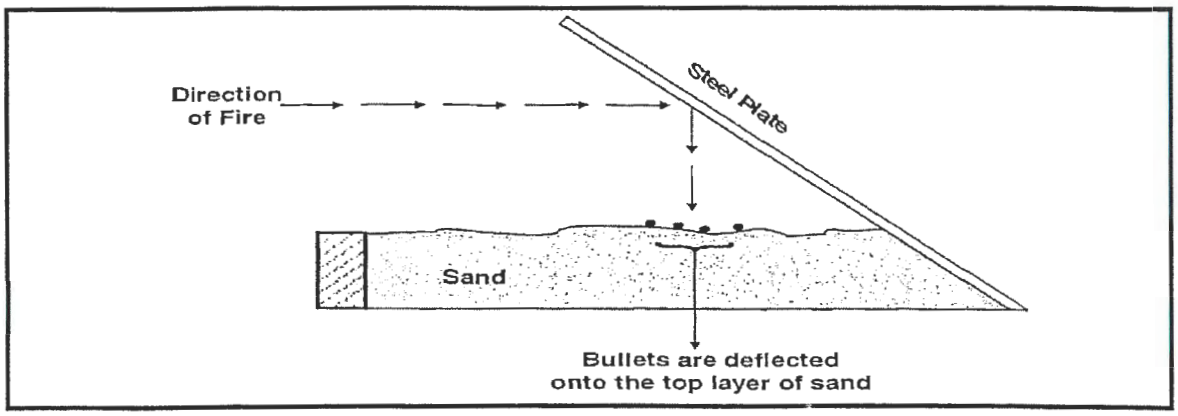
Escalator Trap (Adapted from: *Bullet Trap Technologies,* Action Target Educational Video Series)



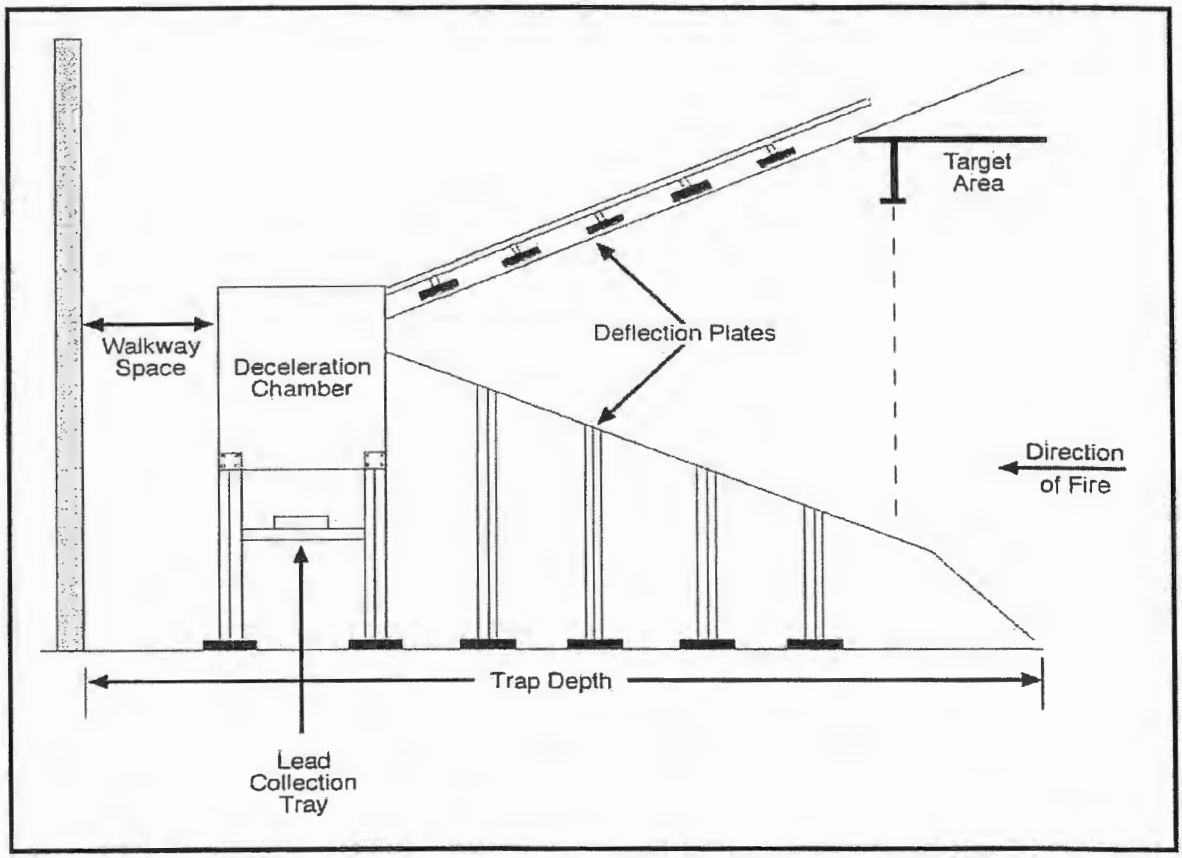
Vertical Swirl Trap (Adapted from: *Bullet Trap Feasibility Assessment and Implementation Plan: Technology Identification Final Report*, U.S. Army Environmental Center, March 1996)



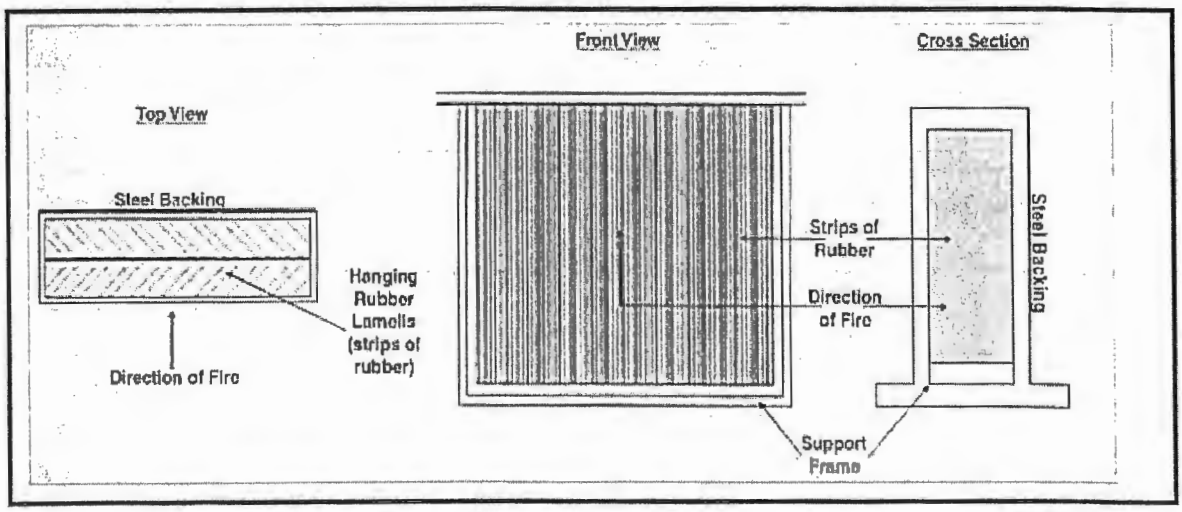
Wet Passive Trap (Adapted from: *Bullet Trap Feasibility Assessment and Implementation Plan: Technology Identification Final Report*, U.S. Army Environmental Center, March 1996)



Pitt and Plate (Adapted from: *Bullet Trap Feasibility Assessment and Implementation Plan: Technology Identification Final Report*, U.S. Army Environmental Center, March 1996)



Steel Bullet Trap (Adapted from: *Bullet Trap Technologies*, Action Target Educational Video Series)



Lamella Trap (Adapted from: *Bullet Trap Feasibility Assessment and Implementation Plan: Technology Identification Final Report*, U.S. Army Environmental Center, March 1996)

Appendix D: RCRA Regulatory Requirements and Interpretations

Timely separation of lead shot and bullets from soil at active ranges, recycling of the lead, and subsequent redeposition of the soil on the active range is exempt from RCRA regulation.

1. Reclaiming and Recycling Lead Shot

EPA's Office of Solid Waste issued guidance in 1997 indicating that lead shot, when recycled, is considered a scrap metal and is therefore exempt from RCRA regulation. A copy of the March 17, 1997 letter with this guidance is attached. Under the RCRA Subtitle C hazardous waste management regulations, lead shot would be considered scrap metal, which is exempt from hazardous waste regulations if it is recycled (see 40 CFR 261.6(a)(3)(ii)). Although storage of scrap metal being recycled is not affected by specific time limits such as the speculative accumulation provision (40 CFR 261.1(b)(8)), the scrap metal must legitimately be recycled to remain exempt under this provision. It should also be noted that lead shot may be subject to the authority of RCRA 7003, which addresses imminent hazards. However, use of best management practices is likely to prevent situations which would present an imminent hazard. Using such practices, together with following a clear, written policy governing the facility's recycling efforts, should also assist in assuring that the facility's practices can be demonstrated to be legitimate recycling.

2. Storage of Lead on Shooting Ranges Prior to Recycling

Some ranges have indicated that it may be desirable to store recovered lead shot and bullets on the range property for some periods of time prior to sale for recycling.

Provided that best management practices are followed in terms of storing and recycling the sorted lead, a range that follows such practices, and engages in legitimate recycling, should be able to store such material prior to recycling without RCRA regulatory controls (see discussion below). Best practices would suggest that the sorted lead, at a minimum, should not be exposed to the elements and should be managed so as to prevent releases to the environment. Best practices also indicate that the sorted lead should be stored in containers in good condition, regular inspections of the container condition should be conducted, and the records of inspections should be maintained and be readily available. Further, best practices also suggest that the sorted lead should be recycled in a timely manner and storage times should not exceed the time-frames or goals articulated in a clear, written policy.

3. Placement of Soil After Removal of Lead

For soil placed back on an active range after a BMP has been applied to remove the lead, the following regulatory approach has been followed. On February 12, 1997, EPA published the RCRA Subtitle C Military Munitions Rule in the Federal Register (62 Fed. Reg. 6621). The Military Munitions Rule considers range management to be a necessary part of the safe use of munitions for their intended purpose. Thus, the range clearance activity (recovery of lead shot and bullets) is an intrinsic part of the range operation. Therefore, the rule excludes range clearance activities (including the placement of soil back on the range) from RCRA Subtitle C regulation. Although the Military Munitions Rule did not apply to non-military ranges, EPA, in its response to comments on the proposed rule, clearly stated that "it felt that the 'range clearance' interpretation in the final Military Munitions Rule is consistent with the EPA's interpretations for non-military ranges." In addition, the EPA's Director of the Office of Solid Waste sent the New York State Department of Environmental Conservation a letter dated April 29,1997, confirming that the Military Munitions Rule range clearance principles apply equally to non-military ranges. A copy of the letter is attached.

4. Relocation of Backstop and Shotfall Zone Soil

Some ranges have indicated to the EPA that it may be desirable to transport and/or relocate a backstop in order to reorient or modify their range. This may occur when there is a need to reorient the range due to environmental concerns (e.g., shooting over water (wetland, stream, pond) or excessive runoff), alter the layout to improve shooter safety, or redesign to modify shooting conditions (e.g., adjusting number of shooting positions, increasing or decreasing target distance.) In some cases backstop material would not be moved off the range property, but to another area on the range property.

EPA's position is that range backstop materials are part of the range and are not wastes when they are moved or relocated, as long as the range continues to be used as a range and the backstop materials continue to be used as backstop materials. Hence, backstop materials that are still in use are not subject to the RCRA hazardous waste management regulations and need not be tested for hazardous waste characteristics. However, removal of lead from backstop materials that are to be relocated or moved is a normal practice of good range management in that it extends the usable life of the materials and reduces the possibility of releases of lead into the environment. If lead removal does not occur before moving the backstop material, the lead will become more dispersed throughout the material during movement and will thus be more difficult to recover in future reclamation events.

As a range management practice, it is environmentally preferable to use soil that may already contain lead and is on an active portion of the range, which will therefore undergo regular lead reclamation in the future, than to leave such soil in place and construct a new backstop with lead-free soil. Records of all movements of berm and shotfall zone soils, along with corresponding site plans, should be maintained indefinitely, as they will be necessary in evaluating cleanup needs during subsequent construction or range closure.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
March 17, 1997

Mr. Duncan Campbell
Environmental Protection Agency, Region V
RCRA Enforcement
77 West Jackson Boulevard
Chicago, Illinois 60604-3507

Dear Mr. Campbell:

Enclosed please find a memorandum on the regulatory status of lead shot, which includes a general discussion on the regulatory status of lead shot as scrap metal. I hope that this information is sufficient to address your specific concerns as they relate to the pile of lead shot at the Saxon Metals facility.

If you have any questions or would like to discuss this matter further, please contact me at (703) 308-8826.

Sincerely,
Jeffery S. Hannapel
Office of Solid Waste

Enclosure

To: Duncan Campbell, EPA Region V
From: Jeff Hannapel, EPA Office of Solid Waste
Date: March 13, 1997
Re: Regulatory Status of Lead Shot

Based on our conversations, it is my understanding that Saxon Metals received for recycling a shipment of approximately 30,000 pounds of lead shot from a commercial indoor shooting range. Smokeless gun powder is, presumably, commingled with the lead shot. The mixture appears to exhibit the ignitability characteristic of hazardous waste (as evidenced by the incident in which the material ignited when Saxon Metals was attempting to load it into the furnace with a front-end loader). You have asked our office to provide you with guidance on the regulatory status of the lead shot portion of the mixture, specifically whether it is considered a spent material or scrap metal.

The Agency has taken the position that the discharge of ammunition or lead shot does not constitute hazardous waste disposal because the Agency does not consider the rounds from the weapons to be "discarded." As you know, discard is a necessary criterion to be met

before a material can be considered a solid waste and subsequently a hazardous waste. (40 CFR §261.2(a).) The Agency's interpretation regarding discard is based on the fact that shooting is in the normal and expected use pattern of the manufactured product, i.e., the lead shot. Enclosed for your information is a September 6, 1988 letter from EPA to IDEM on this particular point.

In the federal regulations, the term, "scrap metal," is defined as "bits and pieces of metal parts (e.g., bars, turnings, rods, sheets, wire) or metal pieces that may be combined together with bolts or soldering (e.g., radiators, scrap automobiles, railroad box cars), which when worn or superfluous can be recycled." (40 C.F.R. §261.1.) In the Federal Register preamble for the final regulations on the definition of solid waste, EPA indicated that "scrap metal is defined as products made of metal that become worn out (or are off-specification) and are recycled to recover their metal content, or metal pieces that are generated from machine operations (i.e., turnings, stampings, etc.) which are recycled to recover metal." (50 Fed. Reg. 614, 624 (1985).) The lead shot portion of the Saxon Metals pile would be considered scrap metal pursuant to the regulatory definition of scrap metal.

EPA provided further clarification on the regulatory status of scrap metal in the Federal Register preamble to the definition of solid waste final regulations:

> [a]t proposal, scrap metal that was generated as a result of use by consumers (copper wire scrap, for example) was defined as a spent material. (This type of scrap is usually referred to as "obsolete scrap.") Scrap from metal processing, on the other hand (such as turnings from machining operations) was defined as a by-product. (It is usually called "prompt scrap.") Yet the scrap metal in both cases is physically identical (i.e., the composition and hazard of both by-product and spent scrap is essentially the same) and, when recycled is recycled in the same way - by being utilized for metal recovery (generally in a secondary smelting operation). In light of the physical similarity and identical means of recycling of prompt scrap and obsolete scrap, the Agency has determined that all scrap metal should be classified the same way for regulatory purposes. Rather than squeeze scrap metal into either the spent material or by-product category, we have placed it in its own category.

(50 Fed. Reg. at p. 624) Based on these regulatory passages, the lead shot portion of the pile would be considered scrap metal, and not a spent material. The lead shot is a product that is made of metal that can be recycled to recover metal content. Furthermore, the lead shot has not been "discarded" by virtue of its discharge at the shooting range, because the discharge is within the normal and expected use pattern of the manufactured product. Accordingly, lead shot would be considered scrap metal for regulatory purposes. Scrap metal is a solid waste, but it is exempt from the regulatory requirements of Subtitle C when it is recycled. (40 C.F.R. §261.6(a)(3)(ii).) As part of the Phase IV land disposal restrictions supplemental rulemaking (which was proposed January 25, 1996 and is expected to be finalized in April 1997), processed scrap metal and two categories of unprocessed scrap metal that is being recycled would be excluded from RCRA jurisdiction.

Please note that this discussion of the regulatory status is limited to the lead shot portion of the pile as you requested. To the extent that the entire pile exhibits the ignitability or reactive characteristic of hazardous waste, the mixture of materials would be considered hazardous waste and not scrap metal. The scrap metal designation for the lead shot would be applicable only to the extent that the lead shot could be segregated from the other materials in the pile.

I hope that this guidance on the regulatory status of lead shot recovered from shooting ranges provides you with the clarification that you needed. If you have any questions or would like to discuss this matter further, please contact me.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
APR 29 1997

Mr. John P.Cahill
Acting Commissioner
State of New York
Department of Environmental Conservation
Albany, New York 12233-1010

Dear Mr. Cahill:

Thank you for your letter of April 3, 1997 to Administrator Browner requesting a clarification of the Environmental Protection Agency (EPA) Final Military Munitions Rule regarding the extension of its range clearance principles to non-military ranges. Although the final rule addresses only military ranges, we agree with your view that the range clearance principles apply equally to non-military ranges [see comment no. 5 on page 36 of the enclosed excerpt from the Military Munitions Final Rule Response to Comments Background Document].

We are aware of the State of New York's active leadership role in the clean-up of private firing ranges. We appreciate your writing in support of the range clearance aspects of the final Military Munitions Rule and we will consider your suggestions that we issue broader guidance on the applicability of its principles to non-military ranges.

Sincerely yours,

Elizabeth Cotsworth, Acting Director
Office of Solid Waste

Enclosure

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Appendix E: Template for an Environmental Stewardship Plan for Management of Lead Shot/Bullets

Instructions

EPA encourages outdoor shooting ranges to adopt and implement the Best Management Practices (BMPs) found in this manual. To this end, it is recommended that ranges first prepare an Environmental Stewardship Plan (ESP or Plan), which gathers information about, and guides evaluation of, site specific conditions of each range. As such, the ESP assists in selection of appropriate BMPs.

This document serves as a template that may be used by sportsmen's clubs and shooting ranges in their preparation of an ESP. This template was adapted from Appendix C of the National Shooting Sports Foundation's manual, *Environmental Aspects of Construction and Management of Outdoor Shooting Ranges* (the NSSF manual.) This template is only a tool to assist in making ESP preparation easier and can, and in some cases should, be modified to incorporate specific information relative to your club and its ranges. It is intended to be used in conjunction with a full understanding of the NSSF, U.S. Environmental Protection Agency (EPA) and, for ranges in Florida, Florida Department of Environmental Protection (DEP) manuals for the safe management of lead at outdoor shooting ranges. This template is intended to encourage ranges to prepare ESPs and submit them to EPA or NSSF to obtain a Certificate of Recognition from EPA. In this regard, either the following template or the NSSF template is recommended for use in conjunction with EPA's Certificate of Recognition program.

An electronic copy of this template is available on EPA's shooting range website (http://www.epa.gov/region2/leadshot) in several formats.

Disclaimer: This template does not serve as a substitute for understanding the concepts and techniques discussed in the EPA manual or other manuals. This template is not to be used as a substitute for consultation with scientists, engineers, attorneys, other professionals, or U.S. EPA.

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Environmental Stewardship Plan for Management of Lead/Bullets at Outdoor Shooting Ranges

Club Name

Address
City/Town, State & Zip Code
Phone #:

Date

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(Additional figures, as appropriate)

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Table 1:
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(Additional Appendices, as appropriate)

Introduction

The XYZ Club, Inc. is located at 123 X Road in Anytown, USA…

Mission Statement

The XYZ Club, Inc. is committed to…

- *Purpose*:

The Purpose of this Environmental Stewardship Plan (i.e., the Plan) is to:

- Identify potential environmental concerns that may exist;
- Identify, evaluate, and prioritize appropriate actions to manage lead shot and bullets safely, as well as identifying and addressing environmental concerns;
- List short- and long-term steps needed for implementation;
- Develop an implementation schedule;
- Identify ways to measure the Plan's success;
- Evaluate annual progress made towards achieving environmental stewardship goals;
- etc.

- *Goal* – To minimize the release of lead into the environment.

Activities to Reach Goal:
Examples include:

- ▷ Avoid shooting over and into water and wetlands.
- ▷ Prevent off-site migration of lead through groundwater and surface water runoff.
- ▷ Conduct lead recovery.
- ▷ Discourage ingestion of lead by wildlife.
- ▷ Maintain soil pH between 6.5 and 8.5 in the shotfall zone.

Site Assessment

Description of Ranges and Support Facilities

The XYZ Club has an x position Trap Range, a y position Skeet Range, a z position Sporting Clays Course, and a q position Small Arms Range. These ranges are located in a rural setting and are oriented away from residential areas and surface water bodies.

[Briefly describe each range, its dimensions, orientation, vegetative cover, numbers of shooters and targets used per year, wildlife usage, etc.]

Existing Environmental Conditions

[Describe any known environmental conditions associated with the ranges. This might include type of soil, depth to groundwater, soil pH, drainage to surface water, unique animal or bird populations, etc. Refer to figures, tables, the results of surveys, inspections, professional opinions, etc.]

- *Trap and Skeet Fields*

- *Sporting Clays Course*

- *Rifle and Black Powder Range(s)*

- *Outdoor Handgun Range(s)*

Trap and Skeet Fields

Action Plan

[Briefly describe the management options selected.]

- *Potentially Applicable Management Options*

[See EPA or NSSF guidance manual for full listing of options]

Examples include:
- Vegetate sparse grass area of trap/skeet field.
- Reorient trap field to avoid lead shot entering wetlands.
- Reorient sporting clays stations to maximize the overlap of falling shot into the open field where it can be more easily recovered for recycling.
- Limit use of the trap/skeet range to only those stations that do not have wetland area within the shotfall zone.
- Apply lime to shotfall zones if soil test results indicate this would be beneficial.
- Prepare fields for lead reclamation.
- Get bids for lead reclamation project.
- Conduct lead reclamation within the trap/skeet shotfall zones.
- Change mowing frequency to closely mow grass in shotfall zones.
- Construct lean-tos at backstop berms.
- Construct a lime lined drainage swale for stormwater management.
- List additional Best Management Practices that may be appropriate to your club.

In addition to appropriate site-specific management options, the list should always include conducting lead reclamation within the berm for rifle and pistol ranges and conducting lead reclamation within the trap, skeet, and sporting clays shotfall zones.

- *Selection of Management Options to be Implemented*

Option x:
Option y:
Option z:

[Describe why the above options were selected and the general roles of club officers, the membership, and outside consultants, as applicable, in implementation.]

In order to implement the options selected, the following actions are necessary.

a) Management Actions: [Examples include: assign personnel responsible for initiating, conducting, and completing the alternatives selected above.]
b) Operational Actions: [Examples include: collect soil samples for pH analysis, consult with USDA's Natural Resources Conservation Service and/or the county Cooperative Extension Service regarding best suited vegetative management recommendations.]
c) Construction Actions: [Examples include: do site preparation work, get bids, institute mowing and vegetative management recommendations, reorient shooting position as appropriate.]

Plan Implementation

- *Schedule for Implementation*

Winter/Spring: [Examples include: pH survey, contact local officials for vegetation management recommendations, reorient shooting positions as appropriate, realign shooting positions as appropriate.]

Summer/Fall: [Examples include: prepare site for reclamation project, apply lime/fertilizer/seed, get bids for berm lean-tos/reclamation. As a rule of thumb, 50 pounds of lime per 1,000 square feet should raise soil pH by 1 once the residual acidity is overcome.]

- *Responsibilities*

[Specific duties (i.e., the trap/skeet chairman/chairmen will..., The club treasurer will..., The membership will provide the labor to...)]

Rifle, Black Powder, and Outdoor Handgun Range(s)

Action Plan

[Briefly describe the management options selected.]

Potentially Applicable Management Options

[See EPA or NSSF guidance manual for full listing of options]

Examples include:
- Culvert the stream through the shooting ranges.
- Vegetate the backstop berm(s) to minimize erosion.
- Construct a lime lined drainage swale for stormwater management.
- Apply lime to the berm and foreground if pH test determines it is necessary.
- Begin planning a lead reclamation project.
- Construct lean-tos at berms.
- List additional Best Management Practices that may be appropriate to your club.

Selection of Management Options to be Implemented

Option x:
Option y:
Option z:

[Describe why the above options were selected and the general roles of club officers, the membership, and outside consultants, as applicable, in implementation.]

In order to implement the options selected, the following actions are necessary.

a) Management Actions: [examples include: assign personnel responsible for initiating, conducting, and completing the alternatives selected above.]
b) Operational Actions: [examples include: collect soil samples for pH analysis, consult with USDA's Natural Resources Conservation Service and/or the county Service Forester regarding best suited vegetative management recommendations.]
c) Construction Actions: [examples include: do site preparation work, get bids, institute mowing and vegetative management recommendations, reorient shooting position as appropriate.]

Plan Implementation

- *Schedule for Implementation*

Winter/Spring: [examples include: pH survey, contact local officials for vegetation management recommendations, reorient shooting positions as appropriate, realign shooting positions as appropriate.]

Summer/Fall: [examples include: prepare site for reclamation project, apply lime/fertilizer/seed, get bids for berm lean-tos/reclamation.]

- *Responsibilities*

[Specific duties (i.e.: the small arms range chairman/chairmen will…,The club treasurer will…, The membership will provide the labor to…)]

Sporting Clays Course

Action Plan

- *Potentially Applicable Management Options*

[See EPA or NSSF guidance manual for full listing of options]

- *Selection of Management Options to be Implemented*

- *Options Selected*

Plan Implementation

- *Schedule for Implementation*

- *Responsibilities*

Measuring Success

By monitoring the success of the Plan, the club is best prepared to make whatever changes may be necessary to reinforce success and make the most of environmental stewardship efforts. Below are some examples of areas to monitor:

Lead Recovery

[Document the quantity (pounds) of lead recovered and recycled, along with the cost of conducting the activities.]

Vegetation

[The density of vegetation growth should be measured throughout the growing season, especially in areas of sparse growth where steps have been taken to increase the vegetative cover. This is can be done by taking periodic photographs (e.g., once a month) from the same places to document the impact of the Plan.]

Wildlife

[Keep a log of visual observations made regarding the frequency of range usage by the variety of species in your area.]

Soil and Runoff pH

[Track soil and runoff pH through semiannual monitoring and adjust the amount of lime applied to different areas of the range to maintain a pH level that will prevent lead from dissolving (i.e., a pH of 6.5-8.5).]

Erosion

[Again, keeping a photographic record of problem areas best prepares your club to document achievements and adjust the Plan as appropriate.]

Plan Review and Revisions

Review the Plan on an annual basis. Update the Plan as needed and schedule activities for subsequent years. Make recommendations for future club officers to consider when updating the Plan and designating future activities to be conducted (tell them what worked, what didn't work, and what still needs to be done.)

FIGURES

Figure 1
Facility diagrams

Figure 2
Resource maps (USGS topographic map, wetlands maps, soil survey maps, FEMA floodplain map, etc.)

Figure 3 (Optional)
Site photographs

Figure 4 (Optional)
Aerial photo of range and surrounding area

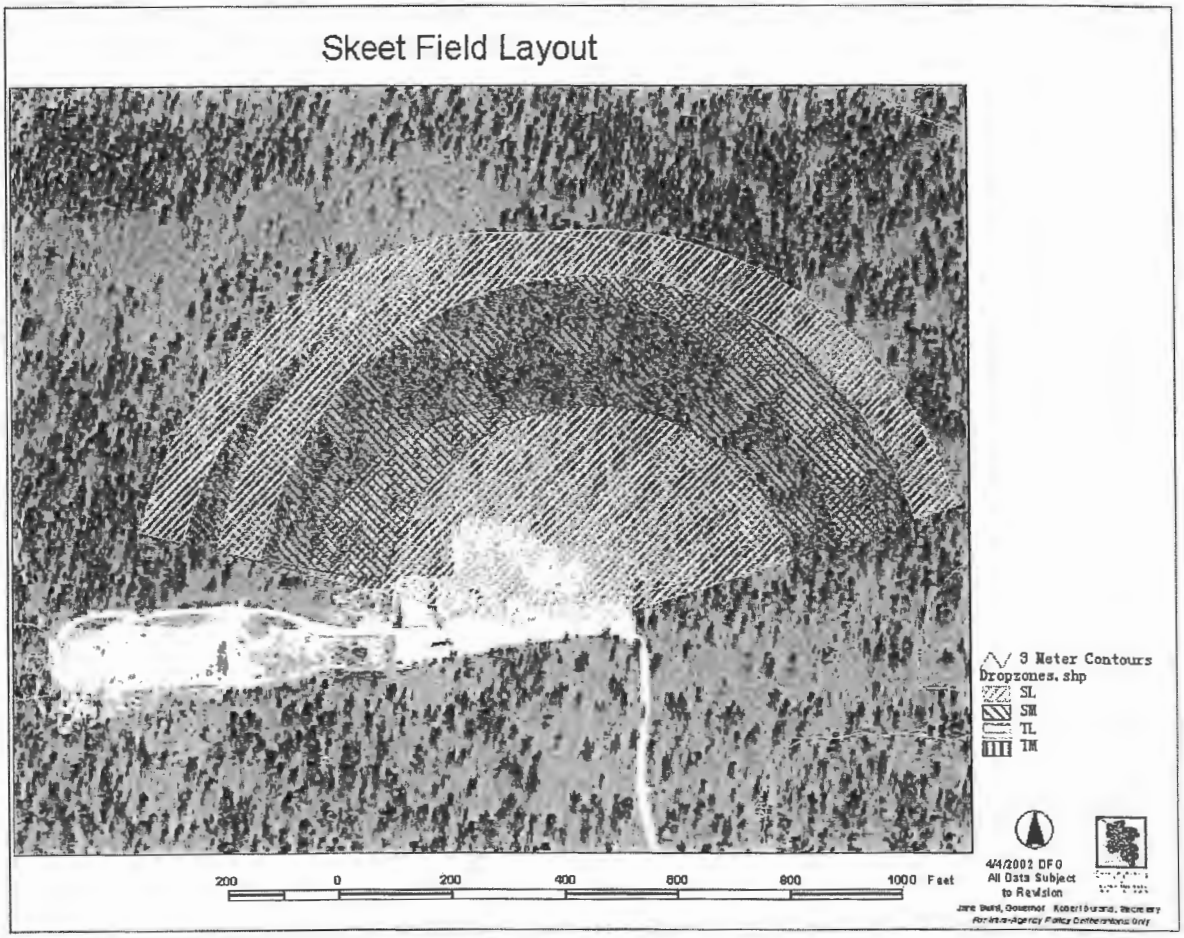
Appendix A
(Optional)

Appendix B
(Optional)

[Insert other figures as necessary to support the text]

Other figures may include an aerial photograph, and sketches of the Club property in general and/or specific ranges in particular.

Example:



[Insert Site Location Map Here]

Typically, a Site Location Map is cut from a USGS Topographic Map of you Club's area. The Club should be centered on the map. Indicate the property boundaries and layout of the range.

Appendix A

Information from USDA, Natural Resources Conservation Service [and/or county Cooperative Extension Service]

[concerning soil and vegetation management recommendations]

Appendix B (etc.)
[For other supporting documentation as needed.]

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U.S. Dept. of Energy Range Design Criteria (2012)

U.S. Environmental
Protection Agency
Region 2

EPA-902-B-01-001
Revised June 2005

OR 20-025
IM 20-047

United States Environmental Protection Agency
290 Broadway
New York, NY 10007-1866
Official Business
Penalty for Private Use $300
Forwarding and Address
Correction Requested

FIRST-CLASS MAIL
U.S. POSTAGE
PAID
MAILED FROM ZIP CODE 10007
PERMIT NO. G-35

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RANGE DESIGN CRITERIA

U.S. DEPARTMENT OF ENERGY
Office of Health, Safety and Security

AVAILABLE ONLINE AT:
http://www.hss.energy.gov

INITIATED BY:
Office of Health, Safety and Security

OR 20-025
IM 20-047

Notices

This document is intended for the exclusive use of elements of the Department of Energy (DOE), to include the National Nuclear Security Administration, their contractors, and other government agencies/individuals authorized to use DOE facilities. DOE disclaims any and all liability for personal injury or property damage due to use of this document in any context by any organization, group, or individual, other than during official government activities.

Local DOE management is responsible for the proper execution of firearms-related programs for DOE entities. Implementation of this document's provisions constitutes only one segment of a comprehensive firearms safety, training, and qualification program designed to ensure that armed DOE protective force personnel are able to discharge their duties safely, effectively, and professionally. Because firearms-related activities are inherently dangerous, proper use of any equipment, procedures, or techniques etc., identified herein can only reduce, not entirely eliminate, all risk. A complete safety analysis that accounts for all conditions associated with intended applications is required prior to the contents of this document being put into practice.

CERTIFICATION

This document contains the currently-approved firearms "Range Design Criteria" referred to in DOE O 473.3, *Protection Program Operations*.

Larry D. Wilcher

Larry D. Wilcher
Director
Office of Security
Office of Health, Safety and Security

6/4/2012
Date

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ATTACHMENT 1 -- RANGE DESIGN FIGURES....Attachment 1-1

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RANGE DESIGN CRITERIA

1. PURPOSE. This document contains design criteria for U.S. Department of Energy (DOE) live-fire ranges for use in planning new facilities and major rehabilitation of existing facilities. This document will be approved and maintained by the Office of Security, Office of Health, Safety and Security (HSS) as a stand-alone document on the HSS website: http://www.hss.doe.gov/SecPolicy/pfs.html.

2. PLANNING FACTORS. All applicable local, State, Federal, U.S. Environmental Protection Agency, Occupational Health and Safety Administration (OSHA), and National Environmental Policy Act requirements should be addressed and be reviewed annually (at least every 12 months) by the site to incorporate any requirements and/or changes that occur.

3. PLANNING OVERVIEW.

   a. General Considerations.

      (1) Live-fire range design should: (a) promote safe, efficient operation; (b) include provisions for ease of maintenance; and (c) be affordable to construct and maintain.

      (2) Live-fire ranges should be designed to prevent injury to personnel and to prevent property damage outside the range from misdirected or accidental firing and ricochets. They should also be designed to direct ricochets away from the firing line inside the range.

      (3) An open range may be established provided that enough distance and land area available to allow for surface danger zones (SDZs) appropriate for the weapons to be used. Lack of SDZs may require baffled ranges. Extreme weather conditions may necessitate indoor ranges.

   b. Type of Range.

      (1) Range requirements should be considered when determining the type and size of the range and the material to be used.

      (2) The range should be suitable for training and qualifications for all courses of fire used on the site as set forth in the HSS-approved Firearms Qualification Courses.

      (3) The range should be designed for shooting day and reduced-lighting DOE firearms courses, moving targets, multiple targets, and advanced shooting courses/activities (e.g., shooting at steel targets) that may be required by the site.

(4) When determining whether the facility will be an indoor, open outdoor, partially baffled, or fully baffled range, the decision-making process should include site weather conditions, available land, available funding, and environmental, safety, and health considerations. The following additional factors should be considered.

(a) How many shooters must be accommodated?

(b) Will emphasis be on training or competitive activities?

(c) What types of firearms and range of ammunition will be used? (See Table 1.)

(d) Will the facility be used exclusively by DOE or will it be open to other organizations?

(e) What special uses will be made of the facility; e.g., advanced training, special weapons, or explosives?

(f) What lighting will be required, and what lighting is desired?

(g) What administrative space will be needed?

(h) What types of target mechanisms will be used?

(i) Will spectator safety areas be needed?

(j) What types of acoustics will be needed?

(k) How will lead contamination be controlled?

(l) Where will bullet traps be needed?

(m) Where will firearms cleaning and maintenance be performed?

c. Site Selection Preparation. The site selected should accommodate the required facility. It should meet acceptable standards for safety and have sufficient space, access, and acceptable zoning and construction costs. Land acquisition costs, future land values, and possible restrictions should also be examined. To ensure the project is feasible the following data should be considered.

(1) Documents. Copies of specific site, environmental, and construction criteria; applicable mandated regulations from Federal, State, county, and local authorities; copies of ordinances, zoning regulations, soil conservation standards, health department requirements, and any other regulations that may pertain to the project should be obtained.

(2) Alternate Sites. Identify alternate sites, because one or more of the potential sites may be unsuitable or construction costs may be prohibitive.

(3) Technical Data. Gather technical data relevant to each site including zoning maps, aerial photographs, topographic maps, and onsite ground and aerial information.

d. Considerations. The criteria to be considered in this process are:

(1) environmental restrictions; e.g., Endangered Species Act, Wilderness Act, and air and water pollution criteria;

(2) access; e.g., is it adequate or should a roadway be constructed to the site;

(3) construction cost; e.g., berms, baffles, barriers, earth moving;

(4) other restrictive Federal or State statutes and local ordinances; and

(5) community growth, especially in areas where urban growth is rapid. Escalating property values may make it unwise to construct in a particular area.

e. Preliminary Design Stage.

(1) Prepare:

(a) a preliminary layout sketch of each site;

(b) a draft document, which should include specifications for applicable zoning, building codes, environmental, safety, and health considerations, and other pertinent restrictions;

(c) alternative preliminary site plans showing different range layouts;

(d) a planning cost estimate; and

(e) a risk analysis report.

(2) Submit all environmental, zoning and building permit applications for approval. Be prepared, via the draft document, to present and, if necessary, defend the proposal at public hearings before zoning boards, health officials, and other governmental bodies involved in issuing permits.

f. Final Design Stage.

(1) The preliminary site plans include a layout of the proposed range with its accompanying safety fan in a cross section and top view.

(2) The range master/manager, training manager, safety manager, industrial hygienist, appropriate operating personnel and public works engineer should review and approve the design requirements during the planning phase, before the construction drawings are started, and during the construction phase.

4. OUTDOOR RANGE DESIGN.

a. Site Selection.

(1) Outdoor range sites should be remote from other activities but accessible by road. SDZs should not extend across traveled roads, navigable waterways, railroads, or other areas.

(2) To protect against unauthorized access, SDZs should be controlled while firearms are being discharged. To prevent future encroachment, SDZs should be recorded on site maps.

(3) If other methods to control access to SDZs are not effective, then the zones should be fenced in. Natural barriers around the site; e.g., rivers, hills or a large drainage channel may be used to prevent encroachment and will ensure privacy. The best site is one with a natural backstop for projectiles to reduce the cost of constructing earth impact berms and to provide natural sound abatement.

(4) Outdoor ranges should be oriented to eliminate firing into the sun. The range should be oriented to the north or slightly to the northeast. The ideal direction is between due north and 25° northeast.

b. Range Planning.

(1) Firing into upward sloping land and land with natural backstops of hills or mountains is recommended.

(2) Firing platforms, access roads, and targets should be elevated above the flood level.

(3) The line of fire in rough terrain should be perpendicular to high ground. The line of fire on flat terrain should be free of knolls, ridges, and trees that reduce visibility.

(4) Known distance ranges should be as flat or evenly graded as possible. If the grade between the firing points and target does not exceed 2 percent, then the firing points may be below the target.

(5) Roads used for setting and servicing targets in impact areas and for maintenance of earth berm may be graded pathways. Roads in areas not subject to disturbance; e.g., vehicle parking areas, and roadways behind

firing lines or out of range of weapons, should be designed for anticipated vehicle weight and usage.

(6) The ground between the targets and firing line should be free of any hardened surface (smooth-surfaced walkways excepted) such as rocks or other ricochet-producing material.

(7) The surface may be sodded or planted with low-growing ground cover.

(8) The surface should be smooth, firm, and graded to drain away from the targets. A slight side-to-side grade of 1 percent to 2 percent should be provided for storm water runoff. For baffled ranges, the lateral slope should not exceed 2 percent because of the geometry of the baffle system.

(9) The overall size will be governed by the range distance and number of firing positions.

(10) Range distances from the firing line to the target are determined by the approved DOE qualification courses of fire for all weapons available for use by Protective Force (PF) personnel and by site-specific training courses of fire. The distances from the firing line to the target should be accurate to +.01 percent. It is important that any inaccuracy in the firing line-to-target distance is a greater, rather than lesser, distance (e.g., 101 yards for a 100-yard range instead of 99 yards).

(11) Shooters should have secure footing.

c. Surface Danger Zones. SDZs should be established to contain all projectiles and debris caused by firing ammunition and explosives (see Table 1). SDZ dimensions are dictated by the types of ammunition, types of targets, and types of firing activities allowed on the range. A basic SDZ consists of three parts: impact area, ricochet area, and secondary danger area (Figure 1). Figures 2 through 6 illustrate the application of the basic parts in the design of SDZs for various kinds of range activities.

(1) The primary danger area established for the impact of all rounds extends 5° to either side of the left and right limits of fire and downrange to the maximum range of any ammunition to be used on the range.

(2) The ricochet area is 5° to either side of the impact area and extends downrange to the maximum range of any ammunition to be used on the range.

(3) The secondary danger area is that area paralleling, and 100 yards outside of, the outermost limits of the ricochet area and extending downrange to the maximum range of any ammunition to be used on the range.

(4) Boundaries of SDZs must be posted with permanent signs warning persons of the danger of the live-fire range and prohibiting trespassing. The signs must be posted in a way that will ensure a person cannot enter the SDZ without seeing at least one legible sign (i.e., usually 200 yards distant or less).

(5) Limit of fire markers, both external and internal, must be placed to denote right and left limits of fire. Where cross firing is to be conducted, internal limit markers must be emplaced to denote internal right or left limits of fire from specific firing positions.

(6) Ranges may be located parallel to one another if in compliance with Figure 19 for separation.

(7) When there is insufficient distance to lay out a new range with the required SDZ or utilize other ammunition with a maximum range that does not exceed the SDZ, engineered or administrative controls can be used to control firing on that range. Permission to deviate from established SDZ requirements must be granted by the DOE cognizant security authority and supported by a safety risk analysis.

(8) Administrative controls such as use of the low-ready position or engineered controls such as muzzle traverse/elevation limiters can be used to control the firearm. Natural terrain such as a mountain or a hill provides an excellent backstop for firing. The terrain should be high enough to capture rounds fired at up to a maximum 15° muzzle elevation.

(9) To change the size and shape of an SDZ, baffles may be installed. Partial and full baffle systems consist of the following components: overhead baffles, a canopy shield over firing points, bullet impact berm, and side berms, sidewalls, or side baffles. A fully baffled range must be constructed so all direct fire can be contained within the range (see Figures 7 and 8).

d. Support Facilities. Range planners should consider the site-specific need for the following range support facilities.

(1) Targets.

(2) Target storage.

(3) Bunkers, trenches, and protective barriers for personnel protection.

(4) Range control towers.

(5) Toilets.

(6) Range poles, banners, markers, and signs.

(7) Communication systems.

(8) Access and range roads.

(9) Parking areas.

(10) Potable water.

(11) Target maintenance.

(12) Ammunition storage.

(13) Power.

(14) Sewer.

(15) All other necessary utilities.

Table 1. Maximum Range of Small Arms Ammunition

Maximum Range of Small Arms Ammunition	
Caliber	**Maximum range of small arms ammunition (distance in meters/yards)**
.22 long rifle	1400/1531
.38 revolver	
Ball, M41	1600/1749
Ball PGU-12/8	1900/2077
.40 pistol	
Ball	1783/1950
JHP	1908/2086
Frangible	1000/1093
.45 pistol	1500/1640
.45 submachine gun	1600/1749
.357 magnum	2160/2362
9mm pistol	1740/1902
9mm submachine gun	1920/2099
.44 magnum	2290/2504
.50 machine gun	
Ball, M33	6500/7108
AP, M26	6100/6671
12 gauge shotgun, riot 00 buckshot	600/656
.30 rifle and machine gun	
Ball, M23	3100/3390
AP, M2	4400/4811
.30 carbine	2300/2515
5.56mm rifle	
Ball, M193	3100/3390
7.62mm rifle and machine gun	
Ball, M80	4100/4483
Match, M118	4800/5249
40mm	
M79	400/437
Mk-19 40mm	2200/2406

e. Design Criteria.

(1) Firing Line Items. Provide the following components:

(a) Floor Surface. The surface should be smooth, firm, and graded to drain away from the targets. A slight side-to-side grade of 1 percent to 2 percent should be provided for storm water runoff. Transverse firing line grading should match target line transverse grading. The distance between the firing line(s) must be sufficient to support the type of training conducted. Firing lanes must be clearly marked on the surface to match the targets. Depending on the number of personnel to be supported and the funds available, the following surfaces should be considered:

1 ground firmly compacted with mown grass;

2 sand or fine gravel;

3 wood decking of sufficient thickness and support to prevent movement; and

4 concrete topped with appropriate cushioning material.

(b) Overhead Containment. On partially and fully baffled ranges, a ballistic canopy (see Figure 9) should be provided over all locations where a weapon may be expected to be discharged (firing line, by definition). Figure 9 represents one construction approach, but the canopy must contain the direct fire effects of the most energetic round fired on the range. This canopy should begin at least 3 feet behind the firing line. General structural requirements may dictate more distance. The canopy should extend forward a minimum distance of 13 feet minimum, which will work geometrically with the first overhead baffle to prevent a weapon from firing directly out of the range (see Figures 16 and 17). The canopy should be constructed of ballistic material with sacrificial cladding as described below. Sound reduction ceiling waffles should be considered. Weather roofing is required above the ballistic material and it must slope sufficiently to drain.

(2) Firing Point. The depth of the firing point is determined by the shooting activity; e.g., rifle firing requires more depth than pistol firing.

(a) The minimum depth of the firing point is the area required for the shooter, shooter's equipment, scorers, and range officers. For example, a pistol range might have a firing line approximately 6 to 10 feet deep, while a rifle range would have a firing line up to 20 feet deep. This variation is based on available space, type of

shooting, size of target frames and carriers, and the spacing of target frames or carriers.

(b) For rifle ranges, each firing point should be 9 feet wide (see Figure 10). Firing lanes for pistols and shotguns should be 5 feet center to center (see Figure 11).

(3) Ballistic Material. The purpose of this material is to absorb, deflect, or fragment projectiles. Material for baffles on partially and fully baffled ranges is shown in Figures 12 and 18. Wood that is used should be of middle grade exterior timber or plywood. Timber in contact with the ground must be pressure-treated for this purpose. Avoid exposed connectors if possible. Refer to Table 2, Thickness of Material for Positive Protection Against the Caliber of Ammunition Listed, for the thickness of various materials.

(4) Sacrificial Cladding. Provide ¾-inch thick plywood with a ¾-inch air gap on any surfaces (baffles, wing walls, metal connectors, etc.) that are within 11 yards of the firing line to prevent back splatter.

(5) Firing Line Cover Material. The firing line should be covered to protect the shooter and allow activities to be held regardless of the weather. On ranges with several firing lines, the cover is generally installed at the longest firing distance. The firing line covers described below are for shelter only and should not be confused with the ballistic firing line canopies required on baffled ranges. Material that can be used for firing line covers includes wood, concrete, steel, and plastic. Most covers are constructed from wood products and are a shed or gable roof design. In some cases, corrugated metal or fiberglass roofing material can actually increase sound levels at the firing line and in areas around the range. Therefore, to reduce noise, corrugated metal or fiberglass roofing material should not be used unless it is acoustically treated. The structure should be designed to include the following:

(a) The shed roof should have a 6-inch cavity filled with fiberglass insulation (or equivalent) and be enclosed on the bottom with ¾-inch plywood or insulation board. Although this will not provide a completely effective sound barrier, sound waves will strike and penetrate the inside layer of plywood, and the sound will be reduced;

(b) A plywood shed roof should have a 6-inch hollow core enclosed with a small grid mesh screen and a six-mil polymer barrier to retain the insulation. The intervening space should be filled with blown-in insulation to trap sound waves and reduce the drum effect of an open roof; and

(c) A gable roof has a large hollow area above the joists; however, additional sound damping materials should be installed to reduce the drum effect and the sound pressure level as they are reflected onto the firing line area. The underside of the roof surface will require a minimum of 4 inches of insulation to fill in between the rafters and a minimum of 3 inches of insulation above the ceiling and between the joists. This will reduce the drum effect caused when sound waves strike surface material (e.g., corrugated metal) and will absorb a portion of the reflected sound waves.

(6) Surface Material. Positions should be hard-surfaced (e.g., concrete, gravel, wood, asphalt, or sod).

(a) For ranges where prone shooting is conducted, gravel or similar materials may cause difficulty for the shooter. When the surface material is concrete or asphalt, shooting mats or padding will be required when the kneeling or prone positions are used.

(b) For ranges with multiple firing lines, hard-surfaced firing lines located downrange of another firing line should be recessed or shielded from bullet impact to avoid ricochets off exposed edges.

(7) Landscaping. The site should be landscaped to provide for erosion control, noise abatement, maintenance, appearance, fire protection, and safety.

NOTE: Any landscaping will complicate the removal of lead in the berms, especially on impact surfaces, and will create higher maintenance costs.

(a) Berms should be planted with grass to prevent erosion. Ground cover is acceptable on existing berms that have been maintained and where erosion is not a problem.

(b) When grass is selected as a ground cover, it should be appropriate for the geographic area and should readily grow and provide good coverage. The degree of shading caused by overhead baffles will determine the type of grass for the range floor. Use grasses and cover for earth berms that will not be accessed by moving equipment so that natural growth heights will be acceptable. In areas where the soil is poor or extremely sandy, plants such as Bermuda grass, ice plant, or vine root can be used to control soil erosion.

(c) Heavy landscaping may be used to cut down on noise transmission. Plants and trees may be planted behind the firing position shelters to alleviate noise transmission problems.

Soundproofing the firing line structures should be considered in problem areas. Trees should be kept away from firing lines to allow range control officers to see all shooters.

(d) For windbreaks, trees may be planted along the length of the range with partial side berms or wing walls where strong prevailing crosswinds are problems to shooting accuracy.

(e) Densely planted rows of fast-growing, compact, and thorny shrubs may be planted below the trees at ranges with partial berms or wing walls to abate noise, prevent encroachment, and alleviate crosswind problems.

(8) Target Line and Mechanisms. Components must be as follows:

(a) The target line should be a minimum of 30 feet from the toe of the impact berm. The distance between targets must be the same as the distance between firing positions.

(b) Target line bases must match grading with the firing line. Mechanical target support bases must be protected from the direct line of fire. They may be buried flush with the ground or placed behind a protective wall. Note that a small raised earth berm at this location generates significant ricochet. The complexity of the mechanism will dictate the protection requirement. See Figure 13 for wall or trench protection of high cost target line mechanisms.

(c) Target supports can be made of steel angles and channels, PVC pipe or wood. Do not use metal parts within 33 feet of the firing line where direct fire strikes are anticipated. Discharging weapons close to metal surfaces is extremely dangerous. Present the smallest surface area that is structurally sound to the line of fire to minimize ricochet. Design the target holders for easy and inexpensive replacement. Portable, self-supporting 2- by 4-inch wood frames or 2-inch by 2-inch wood plank placed into buried PVC pipe work well on simple ranges. The full face of the target must be visible to the shooter.

(d) Turning targets and the display time are at the discretion of the user. Commercially available, electrically motorized target carrier and electronic scoring systems should be considered where economically feasible.

(e) On open ranges, a single target line with multiple firing lines is preferred. On partially or fully baffled ranges, in most instances, a single firing line with multiple target lines will produce the most cost-effective range because of the firing line canopy. An

extremely advanced target mechanism may be significantly more expensive than multiple canopies.

(9) Impact Structures. The structure varies depending on the type of range. Natural terrain such as a mountain, cliff, or steep hill may be incorporated into impact structures provided the completed structure complies with the minimum design requirements. Acceptable structures by range type are listed below.

(a) For open ranges, the top elevation of the earth impact berm should be 26 feet above the range surface for ranges 100 yards long or longer and 16 feet above the range surface for ranges 50 yards long or less. The impact berm should extend 50 yards beyond where the target line ends for 100-yard-long ranges or until joining with the side containment, if provided for ranges 50 yards long or less.

(b) The suggested elevation may be met by designing a combination of earth berm and vertical baffle (see Figure 14). The earth berm portion should have a top elevation of 16 feet above the surface of the range. The vertical baffle should be constructed of ballistic material and designed to withstand local seismic and wind loads. This combination arrangement would reduce the footprint and the amount of material in the earth berm.

(c) The preferred slope of the impact berm face is 1 to 1 or steeper. The steeper the slope, the more likely the berm is to absorb projectiles. The top should be 10 feet wide. The impact slope should be constructed with a 3-foot layer of easily filtered soil (to reclaim the lead projectiles) free of boulders, trees, rocks, stones, or other material that will cause ricochet. The rear slope should be appropriate to the native soil and maintenance requirements.

(d) For partially and fully baffled ranges, the top elevation of the impact structure will vary depending on the overhead baffle and impact structure arrangement. The impact structure for a partially baffled range can be: standard impact berm, bullet trap, or hybrid. For fully baffled ranges, the impact structure must be a bullet trap. In all instances, the impact structure must connect to the side containment. The top of the berm should be at an elevation 5 feet above the point where the highest line of direct fire can strike the berm.

(e) Outdoor baffled bullet stops can be constructed by placing the last vertical overhead baffle over the last target line and placing a sloped baffle to connect from the top of the earth berm to the back of the last vertical baffle. The bottom of this lower-sloped overhead baffle should be 2 feet above the highest point on the

berm where direct fire might strike. See Figure 15 for material and construction details. Rainfall runoff from the sloped baffle onto the berm must be considered. (See "Use of Bullet Traps and Steel Targets" for Shoot House bullet trap information.)

(10) Side Containment. For partially and fully baffled ranges (Figures 7 and 8), the top elevation of the side containment must geometrically mate with the overhead baffles to be high enough to prevent any direct fire from exiting the range. Full-side height containment should extend 3 feet to the rear of the firing line. Locate the side containment at least 10 feet outside of the centerline of the outermost firing lane. Construction may be in the following forms.

(a) Earth Berm. Construct earth berms to an inside slope of 1 to 1.5. If native soil characteristics will not produce a stable slope at this angle, provide geotechnical fabric reinforcement in the fill. The top width of the berm should be at least 10 feet. No rocks are permitted in the top 3 feet of the inside surface. Generally, earth berms cannot be used on partially or fully baffled ranges; however, earth berms are permissible if the firing range is small and the overhead baffle and berm geometry intercept ricochets.

(b) Continuous Walls. Construct continuous walls of ballistic material to withstand local wind and seismic loads. Provide sacrificial cladding to 13 feet forward of the firing line and 3 feet behind the firing line. Continuous walls are preferred for fully baffled ranges.

Table 2. Thickness of Material for Positive Protection Against the Caliber of Ammunition Listed

Cover material	Caliber and thickness required to stop penetration		
	5.56 mm	7.62 mm and Cal. 30	Cal. 50
Concrete (5,000 lbf/in^2)	5 inches	7 inches	12 inches
Gravel-filled concrete masonry units	8 inches	12 inches	24 inches
Broken stone	14 inches	20 inches	30 inches
Dry sand	16 inches	24 inches	32 inches
Wet sand	25 inches	36 inches	48 inches
Oak logs (wired)	28 inches	40 inches	56 inches
Earth			
Packed or tamped	32 inches	48 inches	60 inches
Undisturbed compact	35 inches	52 inches	66 inches
Freshly turned	38 inches	56 inches	72 inches
Plastic clay	44 inches	65 inches	100 inches
NOTE: Figures are based on new material. Degradation may occur over time.			

(c) Wing Walls. Wing walls (side baffles) are discontinuous side protection set at 45° to the line of fire. Locate the wing walls so that they are overlapped by 6 inches based on any line of fire that may strike them. Construct the wing walls of ballistic material to

withstand wind and seismic loads. Additionally, provide sacrificial cladding on wing walls closer than 30 feet to the firing line.

(d) End Walls. End walls may be constructed at the firing lane edge on the firing line in lieu of extending side containment 3 feet behind the firing line. Walls should be long enough to close off any line of sight between the end of the side containment and the rear 3 feet mark. The end walls should be constructed of ballistic material with sacrificial cladding extending from the canopy to the firing line surface.

(11) Overhead Baffles. Overhead baffles must be located so that no direct fire can exit the range from any firing position. The first overhead baffle must be geometrically coordinated with the firing line ballistic canopy (see Figure 9). The elevation of the top of each succeeding baffle should be 6 inches higher than a line of fire that just clears beneath each preceding baffle (see Figure 16). Overhead baffles should be the same height and spaced apart down range to achieve the required geometry (see Figure 17). The last baffle should be placed so the line of fire will strike the impact structure no higher than 5 feet below the top elevation of the structure. On a fully baffled range, the last overhead baffle must be over the last target line.

(a) On partially baffled ranges, overhead baffles must extend laterally to within 1 foot of the side containment. On fully baffled ranges, the overhead baffle must tie into the side containment.

(b) The vertical dimension of an overhead baffle when it is vertical varies with the number and spacing of the baffles. Normally, the height is between 5 and 8 feet when considering structural support size and costs.

(c) The baffles must be constructed of ballistic material. Baffles within 11 yards of the firing line should be covered with sacrificial cladding. See Figures 12 and 18 for possible configurations.

(d) Space the structural columns as far apart laterally as possible to open firing lanes. If possible, do not construct columns within the range. Design columns or beams to withstand local wind and seismic loads, and provide protective steel plate on the faces of the columns exposed to the firing line in accordance with Figures 12 and 18. Provide sacrificial cladding if the column is within 10 yards of the firing line. Overhead baffles may be placed on a flatter slope and overlapped to function as firing line canopies if multiple firing lines are to be used (see Figure 17). This arrangement is cost-effective for baffled combat lanes.

5. INDOOR RANGE DESIGN.

a. Use of Indoor Ranges.

(1) Indoor ranges must be designed so projectiles cannot penetrate the walls, floor or ceiling, and ricochets or back splatter cannot harm range users. Considerations should be made for cleaning of all surfaces and handling of hazardous wastes.

(2) Lead exposure requirements must be reviewed for applicability.

b. Site Selection.

(1) Walls and Partitions. Indoor ranges must incorporate walls and partitions capable of stopping all projectiles fired on the range by containing or redirecting bullets to the backstop.

(2) Existing Buildings. If there are existing drawings of the facility, copies should be obtained from the original owner, architect, engineer, builder, or building permit. If original drawings of the building are not available, a sketch can be made of each floor of the building with a special emphasis on the load-bearing walls. The following considerations should be used when making the initial evaluation of an existing building.

(a) General Construction. Buildings constructed of wood products should be avoided. Modifications to reinforce the structure to support metal backstops or to reduce fire hazards may not be cost-effective.

(b) Exterior Walls. The type of exterior wall construction (e.g., masonry, wood, concrete, metal, combination, other) should be identified. Masonry buildings should be given primary consideration, especially those constructed on concrete slabs.

(c) Floors, Walls, and Ceilings. Floors, walls, and ceilings must be able to contain the sound in addition to the bullet fired.

1 The ideal wall is made of poured concrete a minimum of 6 inches thick.

2 To aid in range cleaning, concrete floors should be finished so they have a nonporous surface.

3 Ceilings should be 8 feet high and enclosed to reduce air turbulence created by ventilation systems.

4 Evaluate the structural support designs of older buildings for their ability to withstand new loading. Original design

considerations usually do not allow for installing heavy backstops and other range equipment.

5 To decide if modifications are necessary, slab buildings must be analyzed carefully to determine the capacity for floor loading. If there are no floor drains and it is economically feasible, modifications should also include adding one or more floor drains.

6 Ceiling joists may require strengthening to support baffles and shielding material.

(d) Electrical. Electrical needs may require the installation of heavy-duty wiring both internally and externally to accommodate the added power needs of range ventilation, heating, lighting, and target-carrier mechanisms.

(e) Plumbing. Plumbing does not usually require major modifications; however, heavy metals may be prohibited from area wastewater treatment collection systems. Therefore, an approved filtration system may be necessary for disposal of hazardous waste material; e.g., lead.

(3) Precast Buildings.

(a) Precast concrete companies can provide complete precast buildings (job site-delivered) if engineering specifications for steel placement are provided on a set of plans (drawings) for the proposed building.

(b) Precast assembly allows for installation of a roof design more suitable for an indoor range. Gabled or hip roof designs should not be used.

(c) Hollow, precast concrete panels provide an option to bar joists, eliminating bullet ricochet or splatter. A flat bar joist design is the recommended alternative to hollow, precast concrete panels.

(d) The flat roof design also provides support for heating, ventilating, and air conditioning (HVAC) equipment outside of the range, which saves space and reduces cost.

(4) New Construction. New indoor construction projects require the same guidelines as existing buildings; however, they offer the advantage of building a structure specifically for use as an indoor shooting range.

c. Range Planning. Design work for ventilation, wall structures, floors, ceiling, acoustics, backstops, and lighting will depend on how the range will be used.

(1) A determination for the type of building required includes the following considerations.

(a) Can the range be built in an existing building or is a new one required?

(b) How large should it be?

(c) How many shooters will it be expected to serve?

(d) Will it be used for competition?

(e) Should space be allowed for classrooms?

(f) How much will the facility cost?

(2) The planning process should include:

(a) obtaining ordinances, zoning regulations, building codes, soil conservation regulations and other information pertaining to legal requirements;

(b) for evaluation, identifying a site for a new building or several existing buildings that may have the suitable design characteristics; and

(c) gathering other technical information relevant to the project. This information includes zoning requirements, onsite information, and range design criteria. Local zoning codes or health department regulations normally will provide answers or solutions on how the project is to be handled.

d. Design Criteria. Based on the site selected, type of shooting, number of users, and site layout, the next step is to design the facility by preparing detailed drawings showing specifications and necessary dimensions. The four main considerations for indoor ranges are shooter needs, type of shooting activity, number of firing points, and number of users. Special consideration should be given to ventilation, lighting, safety baffles, and backstop design. The following standard and optional features for indoor ranges should be considered.

(1) Backstops and Outdoor Baffled Bullet Stops. See "Use of Bullet Traps and Steel Targets" for Shoot House bullet trap information.

(a) The design of a backstop or baffled bullet stop is a contributing factor to the service life of the unit. Steel should be installed according to the type of ammunition to be used and to proven angle configurations.

(b) The design criteria should be based on the planned use of the facility. Metal plates selected for use in a backstop or baffled bullet stops must resist repeated stress according to the degree of stress applied. Necessary characteristics are resistance to abrasion, resistance to penetration, surface hardness, thickness, and alloyed strength to resist metal fatigue.

(c) The main backstop is generally a fabricated steel plate or series of plates used to stop bullets fired on a range. Backstop configurations and plate thickness will change according to type of shooting activity.

(d) Steel backstops with sand or water pits are common; however, a few indoor ranges use earthen or sand backstops.

CAUTION: Earthen or sand-filled backstops are not recommended because they can create health hazards for maintenance workers from silica and lead dust. They also cause excessive wear on ventilation fans.

(e) Backstops must extend from side to side and from ceiling to floor to protect the end of the range completely from penetration by direct bullet strike and prevent ricochets, back splatter, and splatter erosion of side walls.

(f) Four basic backstop designs are used for indoor ranges: Venetian blind, escalator, Lead-a-lator®, and the angled backstop (45°) back plate. Other backstop designs exist and should be researched for applicable use.

1 Venetian Blind Backstop. Requires less space, but without proper installation and regular maintenance it can cause back splatter problems from exposed edges of each main segment of the backstop. Keeping the exposed edges ground to original specifications is time-consuming, difficult, and requires skilled personnel.

a To control back splatter, a curtain should be hung in front of the backstop. Tests have been conducted on materials including canvas, burlap, cardboard, insulation board, and synthetic rubber. Properly installed, these materials effectively stop back

splatter. Walls using insulation board or a synthetic rubber curtain are best.

b The main advantage of the venetian blind backstop is minimal space requirements. While an angled plate or an escalator will use 14 feet of space, the venetian blind uses only 5 feet.

2 Escalator Backstop. Sets up with flat steel plates laid out on a framework sloping away from the shooter. Between each series of plates, an offset allows a bullet sliding down the facing surface to drop into a hidden tray for easy cleanup. At the top or back of the backstop, a swirl chamber is provided to trap the bullets or bullet fragments as they exit the backstop surface. Once the bullet's flight ends in a spin-out chamber, the bullet or pieces fall into a cleanup tray.

3 Lead-a-lator®. A variation of the escalator-type backstop that uses a curved instead of flat piece of steel. The surface is concave and operates so that a bullet will follow the contour of the surface into a dry lead spinout chamber where it is trapped.

4 Angled Backstop (or 45° Inclined Plates). Uses a sand or water trap and has been the traditional alternative for indoor ranges.

a The angle of the plate should never exceed 45° from the ground. The 45° plate and pit backstop is relatively inexpensive, but there are several disadvantages. Sand traps require frequent cleaning to remove bullet fragments. Cleaning operations require workers to wear high-efficiency particulate air (HEPA) filter masks if material is removed dry. It is best to dampen the sand trap material before and during cleaning operations to eliminate dust. To maintain a healthier internal environment, frequent removal, disposal, and replacement of lead-laden sand is required. The surface should be continually raked to keep the sand level and to guard against splatter as lead buildup occurs.

b The cleaning operations are easier when a water trap is used. However, a water trap requires chlorine and other chemicals to retard algae growth and antifreeze in colder months to prevent freezing.

Installing a water pit requires a different approach to foundations and footings, especially in areas affected by earthquakes or freezing.

(2) General Range Cleaning. Both dry and wet methods can be used to clean the range. The method selected depends on the frequency of use. The wet method is preferred when floor drains are available, and keeping materials wet during cleaning operations reduces or eliminates release of microscopic dust particles. When dry methods must be used, workers must use the appropriate personal protective equipment (PPE) that has been established by local industrial hygiene personnel. After cleaning operations are complete, workers must shower and have work clothing laundered.

(3) Backstop Steel Plate Specifications.

(a) Steel plates supported by concrete or masonry should be anchored by expansion bolts or toggle bolts, as suitable for construction, with flush countersunk heads not more that 12 inches on center of all edges of each plate. Joints and edge lines should be backed with continuous ½-inch thick plate no less than 4 inches wide. Bolts should pierce both the facing and back plates. Expansion bolts should penetrate concrete not less than 2 inches. Steel plates must have milled edges at all joints.

(b) Joints must be butted flush and smooth. After the plates are erected, they must not have any buckles or waves. Exposed edges must be beveled at 42° to a fillet approximately ½-inch thick. There must be no horizontal joints in any steel plate work.

(c) Welding must meet the American Welding Society code for welding in building construction. Steel plates joined at, and supported on, structural steel supports must be spot-welded to steel supports not more than 6 inches on center.

(4) Baffles, Deflectors, and Shields. Baffles on indoor ranges protect lighting fixtures, HVAC ducts, ceilings, and target carrier apparatus. Baffles are designed to protect against the occasional errant bullet but not for repeated bullet strikes.

(a) To cover or protect vulnerable ceiling areas or range fixtures, baffles must extend the entire width of the range and downward. Spacing of baffles on a 50 to 75 feet range depends on the ceiling design. Range distance (firing line to target line) and height are factors. Ceilings must be impenetrable.

(b) Baffles or deflector plates must be used when modifying an existing building, especially in a building constructed of wood. This will prevent bullets from escaping or penetrating. Baffles should be a minimum of 10-gauge steel covered with a minimum of 1 inch of soft wood to prevent back splatter. The wood traps the projectile, whereas bare steel redirects it downward into the range area. A wood surface must be applied to overhead baffles, because ranges with untreated baffles usually show significant damage to concrete floors and often complete penetration through wood floors.

(c) Baffles should be installed at a 25° angle as measured from the horizontal plane of the ceiling. The baffle size and placement depends on what surface areas require protection. For example, ceiling baffles are wider than side baffles.

(d) Unlike baffles, deflectors are installed vertically and horizontally to redirect wide-angle shots into the backstop area. Deflector shields protect pilasters, leading edges of sand traps, bottom edges of backstops, doorways, windows, ventilation registers along the wall, etc. Deflectors are not covered with wood generally, but may be. These devices are also installed at a 25° angle either to the wall surface or floor.

(e) To protect ceiling areas, special impenetrable shields are installed above the firing line, especially in wood frame buildings.

1 Shields should extend the entire width of the range and 12 feet forward of the firing line. Floor shields may be required on wood floors.

2 Shields must be constructed from metal sheets according to planned use. For example, 10-gauge steel covered with a minimum of 1 inch of soft wood is effective in stopping most pistol calibers.

(5) Floors, Walls, and Ceilings. Indoor range facility floors, walls, and ceilings must be impenetrable; therefore, an existing building must have a structural analysis to determine loading factors that may exceed original design specifications. Wooden buildings may require modifications to support the increased weight. Specifications for new construction call for either poured-in-place concrete, pre-cast concrete, or dense masonry block. Solid cinder block should be used in place of hollow-core block. Specifications for modifying existing buildings call for adding additional materials to prevent bullet escape, which can be done with wood and steel laminated shields. Laminated shields can be constructed onsite by placing sheet-steel or steel plates between two sheets of ¾-inch plywood. While

this method is more expensive than the extended booth design, it allows for an open firing line and better visibility for the range officer. Walls should be treated beginning 3 feet to the rear of, and extending forward of, the firing line until all vulnerable surfaces are protected. Acoustical material should be applied to the surfaces to aid in sound control.

(a) Floors. The range floor should be constructed by using a single pour and a fine, uniform-aggregate mix of concrete. Reinforcement should be No. 4 steel rods placed 12 inches on center along with 6- by 6-inch 8/8-gauge welded wire fabric. This may vary according to soil conditions. Very large floor areas may require two or more pours with expansion joints between each slab.

1 The floor should be designed to slope down toward the target line, beginning at the firing line, ¼-inch per foot.

2 The floor should be no less than 4 inches thick.

3 Floor size is governed by design. Larger size will result in higher costs for ventilation, lighting, heating, and overall building design. The decisions should be based on expected number of users versus overall cost.

(b) Floor Guards. Floor guards are provided to protect leading edges or protrusions; e.g., drains, traps or other protrusions from the floor area. Floor guards are designed to redirect errant bullets into the backstop area, which minimizes range damage.

1 Floor guards are constructed from 10-gauge steel and may be covered with wood.

2 Floor guards are installed horizontally along the floor surface parallel to the firing line.

3 Floor guards typically slope away from the firing line at a 25° angle to the horizontal.

4 Floor guards should extend only as high as necessary to protect exposed surfaces.

(c) Floor Drains. Floor drains should be constructed of cast iron soil pipe. The drain pipe should be attached to a lateral drain located 1 foot forward of the backstop floor guard. The drain pipe must lead to a filtration system approved by the cognizant environmental, safety, and health organization on the site.

(d) Walls. Poured concrete or masonry is preferred for wall construction, but wood may be used. Wall thickness must conform to acceptable engineering standards and comply with Federal, State, county and local zoning codes. Usually, no less than 3-inch thick, reinforced walls should be constructed to prevent the exit of any projectiles.

NOTE: This specification usually requires the use of steel or similar material where wooden walls are used. The size depends on building design, geological conditions, and climate. Size includes the height, thickness, and length of the running wall.

(e) Ceiling. Ceiling material should reduce sound, protect lighting devices, reflect light and be impenetrable. Typically, ceilings include 10-gauge steel baffles, 2- by 4-feet white acoustic panels, and clear-light panels.

1 The ceiling should be a minimum of 8 feet above the floor level and have an acoustically treated, smooth surface to allow for positive air movement downrange.

2 Baffles to protect adjoining areas should be above a false ceiling or designed into the roof/ceiling structure.

(6) Shooting Booths. Commercial or locally built shooting booths may be desirable on pistol ranges; however, they are not recommended for rifle ranges. Shooting booth panels can provide an impenetrable barrier between shooters, reduce sound levels, restrict the travel of brass, and act as a spray shield when revolvers are used.

(a) Shooting booths should be omitted for ranges that use only rifles.

(b) A shooting booth should never extend more than 18 inches behind the firing line because greater extension may obstruct the range control officer's visibility.

(c) Bullets fired from any firearm used on the range must not be able to penetrate booth panels. The booth panel must be able to withstand the impact of a bullet fired at any angle to the surface and at point-blank range.

(d) Design criteria for the construction of booth panels are as follows:

1 Cover the 10-gauge steel plate with a nominal 2 inches of soft wood. In a series of tests using 10-gauge steel plate, firing all lead bullets at right angles, the plate covered with a nominal 2 inches of soft wood withstood direct hits from

all standard pistol calibers up to, and including, .44 caliber magnum;

2 Use special acoustical materials to ensure that panels reduce muzzle blast effects on all shooters and range personnel;

3 Ensure that panels do not restrict airflow;

4 Ensure that panels do not restrict the range officer's visibility of the firing line; and

5 Construct panels so they extend from the floor to a minimum height of 6 feet. Panels should be ceiling height.

(7) Target Carriers and Turning Mechanisms. An indoor range can be operated more efficiently and safely by installing a target transport system. This system may be a simple, hand-made device or a completely automatic, electrically powered system. Either one will enhance safety by eliminating the need to walk downrange to replace targets. Target carrier systems speed up range operations. A turning target mechanism is available that faces the target parallel to the line of sight and then turns the target 90° to the line of sight to begin the stated time period. The target carriers should position the targets in the approximate center of the backstop.

(8) Control Booth. Range control booths must allow for maximum visibility and provide for easy access into and out of the range and ready area. The control booth should provide seclusion from and immediate access to the range environment. This design protects the range officer from frequent exposure to high sound levels and lead emissions.

(9) Communications. A communications system capable of relaying range commands distinct and separate from the sounds generated by shooting activities is required. Communications systems must account for shooters who wear two pairs of hearing protectors and persons who have substantial hearing loss.

(10) Ventilation and Filtering Systems. This section deals with the design or redesign of ventilation systems for indoor firing ranges. Administrative or engineering controls must be instituted to prevent shooters from being exposed to airborne lead levels exceeding acceptable limits. Administrative controls are used either when engineering controls fail to reduce exposure or when range use exceeds HVAC system specifications. Administrative controls are especially applicable to reducing risks on existing ranges.

(a) Administrative controls used to reduce exposure levels on an indoor range must be rigidly followed and enforced, and compliance must be recorded in a log book for purposes of analysis and reference.

(b) The following administrative controls are provided and must be used where individuals are frequently exposed to airborne lead.

1 Provide range maintenance personnel with appropriate PPE; e.g., safety glasses and respirators.

2 Provide proper HEPA filter cleaning equipment. The equipment must be able to remove accumulated lead dust from floors, walls, and ledges and must include attachments capable of removing lead-laden sand from the backstop area.

(c) A ventilation system must be installed that will provide clean air in the user's breathing zone to reduce exposure to potentially dangerous materials to safe levels.

(d) Adopt administrative controls that monitor and control exposure time for a given user and/or assigned range personnel.

(11) Lighting.

(a) A visually safe facility should be free of excessive glare and major differences in light levels. Therefore, floors and ceilings should be designed to provide light reflection. In the event of a power outage, battery-powered emergency lighting must be provided for emergency exits.

(b) Rheostat-controlled lighting fixtures, which can reproduce near-daylight and low-light conditions, are best suited for indoor ranges. Range lighting involves three systems: general lighting, local lighting, and semi-direct lighting.

1 General lighting provides uniform light levels over the entire range area and adjoining areas and is usually installed in a symmetrical arrangement to blend with the architecture.

2 Local lighting supplements general lighting along the firing line to provide better visibility for those tasks associated with the loading and firing of firearms.

3 Semi-direct lighting distribution directs 60 to 90 percent of the lighting on the target with a small upward component to

reflect from the ceiling and walls to soften shadows and generally improve range brightness. When ceilings are white, lighting fixtures mounted too close together create excessive glare.

(c) Lamp specifications for general lighting must be adjustable to provide 0.2 to 50 foot-candles of luminance measured at a point 7 yards from the target line. Local lighting should produce 0.2 to 60 foot-candles of luminance on the firing line. Semi-direct lighting on the targets should achieve 0.2 to 100 foot-candles of luminance. Glare should be reduced or eliminated by incorporating pastel colors in the interior design.

(d) Lighting designs should also seek to balance the color of light emissions. For example, most fluorescent fixtures produce high levels of blue, which alone are not suitable for indoor ranges. If fluorescent fixtures are used, green tubes or other light sources should be installed to balance the colors.

(12) Plumbing. Plumbing requirements specify that there must be a fresh water supply for personal hygiene and for range cleaning chores. There also must be a waste removal system for normal waste material and material removed from the range. An approved filtration system must be provided for range cleaning waste. Floor drains should be connected to this alternate waste system. Restrooms, showers, and sinks should be connected to a regular sewer system.

(13) Sound Control. Sound control on indoor ranges includes two distinct components: airborne and structure-borne sound. For airborne sound, all leaks into outer areas should be sealed, which includes airtight insulation around doors, windows, HVAC ducts, walls, and ceilings. Structure-borne sound reduction is necessary to protect adjoining, occupied rooms. Acoustical material should be applied to walls, HVAC ducts, floor, and ceiling areas.

(14) Range Control. Range control provides rules and supervision that encourage safe and proper use of a range. Safety devices control the physical use of an indoor range and may include warning lights, alarm bells, switch locations, etc. For example, an indoor range with a door in the downrange area should be equipped with an alarm. The door could also be secured by a mortise lock or barred from within but must remain a fire exit. Fire codes generally prohibit bars on doors that would delay escape from a building. Emergency personnel must be able to access the doors. Any door that can be accessed from the outside must be marked with warning devices to indicate when the range is in use. When installing doors on indoor ranges, refer to Life Safety Code National Fire Protection Association (NFPA) 101.

(15) Target Carriers. Target carriers are used for the convenience of shooters to allow them to continue shooting without delay when target changes are necessary. For health considerations, target carriers keep shooters out of the high lead concentration areas and safely behind the firing line.

(16) Heaters. Protected heating units should be installed behind and above the firing position to provide a comfort zone for shooters.

(17) Gun Racks. Gun racks should be mounted behind the firing positions as an additional safety feature to reduce gun handling and to keep the range areas orderly. Appropriate material should be used to construct the gun racks, and the design must correspond to the weapons being used.

6. LIVE FIRE SHOOT HOUSE.

a. Introduction.

(1) A live fire shoot house (LFSH) is intended for use in advanced tactical training for Security Police Officers. Use of this facility includes individual tactics or Special Response Team force option training. All LFSHs must have an elevated observation control platform (EOCP). The following sections illustrate recognized construction methods for LFSHs. However, they do not eliminate the requirement for sound professional engineering design and validation.

(2) Administrative controls not directly related to design and construction must be in place during facility use. The administrative controls and engineering design allow for a reduction in physical barriers that prevent rounds from escaping the facility. Designed barriers must prevent a round fired with a vertical upward error of 15° from escaping the facility.

b. Site Selection.

(1) Site selection for an LFSH is similar to that for any range facility. Terrain features, noise, and availability of utilities and access roads must be considered, as already discussed in previous sections for indoor and outdoor ranges. The LFSH should be placed adjacent to other range facilities whenever possible so that it may utilize the same support facilities, access roads, etc.

(2) Facility design, target and shooter placement, and other administrative controls minimize the possibility of rounds being fired over the top of the walls and leaving the structure and mitigate the need for an SDZ outside the confines of the LFSH proper.

c. Design and Layout.

(1) The interior layout of the facility is based on the mission and training requirements of the site. Facility design should incorporate a wide variety of room configurations. Some of the room configurations that should be considered are: multiple floors, an L-shaped room, stairwells, rooms within a room, hallways, and closets.

(2) The floor plan design should accommodate the movement of target systems, bullet traps, and other equipment into and out of the LFSH.

(3) Exposure to airborne contaminants for a fully enclosed LFSH must be controlled by adequate ventilation. The lighting requirements are similar to those for indoor ranges.

d. Wall Construction.

(1) Wall Height. Exterior walls of the LFSH must be designed to absorb the most energetic projectile identified for use within the facility. Wall height must be a minimum of 8 feet. The wall height should allow a maximum error angle of 15° from horizontal standing shooting distance from the target and still enable a projectile to be contained by the wall, which can be described by the following equation: Wall Height is equal to the muzzle height plus 0.27 (tangent 15°) times the target distance. The following table assumes a muzzle height of 5 feet.

Distance from Muzzle to Ballistic Wall (Feet)	Wall Height (Feet)
11' 1"	8' 0"
13' 3"	8' 6"
14' 10"	9' 0"
17' 0"	9' 6"
18' 6"	10' 0"
20' 9"	10' 6"
22' 2"	11' 0"
24' 5"	11' 6"
25' 11"	12' 0"

If the distance from muzzle to ballistic wall exceeds the required wall height, other administrative, engineering or natural ballistic wall controls must be administered or considered such as shooter-to-instructor ratio, canopies, baffles, natural terrain, existing SDZ, standard operating procedures, and training.

(2) Ballistic Walls. Ballistic interior walls are the preferred method of construction. Where non-ballistic interior walls are used, additional administrative controls must be applied to target placement and team

choreography. Ballistic walls are required in all cases where containment of the round and protection of personnel is paramount.

(a) Footings. Footings must be designed using the engineering criteria that best ensures structural integrity and stability of wall construction.

(b) Composite Walls.

1 A combination of ¾-inch exterior grade plywood and steel is effective. Minimum thickness will be ¼-inch mild steel with an exterior-grade plywood separated by a minimum of ¾ inch with a maximum of 1½ inches from the steel surface.

2 Other combinations are possible. The main criterion is that the wall must stop any round fired and contain bullet fragments.

(3) Non-Ballistic Walls. These walls are constructed of materials that offer no protection to personnel or equipment in adjoining rooms. Material used for these walls must not contribute to or enhance ricochet or splatter. Additional administrative controls must be applied such as target placement and team choreography.

e. Doors. All doors must be constructed of wood with no glass. Additionally, at least a portion of the rooms must have working doors, some opening inward, some opening outward, and doors opening left and right.

NOTE: All devices in the LFSH, such as brackets and hangers, used to secure walls to floors or secure doors must be covered or protected to mitigate any tripping or ricochet hazards.

f. Ceiling or Roofs. Ceilings or roofs can be of value when the shoot house is required for year-round use in areas with severe weather conditions. Exposure to airborne contaminants must be controlled by adequate ventilation. The lighting requirements for fully enclosed shoot houses are similar to those for indoor ranges. When training exercises require target placement above the wall design, the ceiling or roof must be protected unless firing into an approved SDZ.

g. Floors.

(1) Floor construction must be selected for its ability to absorb direct fire, minimize ricochets, and provide a walking surface free of slipping/tripping hazards. Floors should provide the same ricochet protection as walls. Options include:

(a) exterior-grade plywood floor constructed in accordance with American Plywood Association guidelines over smooth finished concrete;

(b) concrete with brushed surface that minimizes slip and tripping hazards;

(c) asphalt;

(d) exterior-grade plywood;

(e) shredded bias-ply tires; and

(f) earth, free of rocks and debris that could cause ricochet.

(2) Construction joints between walls and floors must be designed to contain projectiles within the LFSH.

h. Bullet Traps.

(1) General Information.

(a) Targets used in LFSHs must be placed so that fire is directed into a bullet trap designed to capture the rounds.

(b) Bullet traps must be constructed to contain the most energetic projectile to be fired into them without dimpling/pitting the steel and contain splatter and fragments in all directions. The size and shape of a bullet trap may be altered, but materials may not be substituted.

(2) Specifications for construction. See "Use of Bullet Traps and Steel Targets" for Shoot House bullet trap information.

i. Elevated Observation Control Platform (EOCP).

(1) EOCPs enhance the ability to observe and control LFSH operations. Administrative controls must be considered when constructing the EOCP. Platform construction and location is based on the training to be conducted. EOCPs must be constructed in accordance with all applicable regulations for elevated work platforms.

(2) EOCPs must be constructed to:

(a) maximize instructors' observation and control of the entry team fire and movement;

(b) facilitate communication between instructors on the EOCP and the floor;

(c) position the lowest point of the horizontal walking surface higher than the 15° vertical error for any target engaged;

(d) provide ready access;

(e) integrate instructors' movement with team flow;

(f) maximize instructors' ability to see shooters clearly at all times; and

(g) have supporting structures placed so that they pose no additional hazards such as tripping, ricochet, splatter, etc.

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ATTACHMENT 1 -- RANGE DESIGN FIGURES

Figure 1. Surface Danger Zone for Small Arms Firing at Fixed Ground Targets

Figure 2. SDZ for Small Arms Weapons Firing at Moving Ground Targets

Figure 3. SDZ for Small Arms Firing at Fixed Ground Targets with Rocky Soil or Targets Causing Ricochet

Figure 4. SDZ for Firing M79, M203, and M19 40mm Grenade Launchers

Figure 5. SDZ with Impact Berm for Small Arms Firing at Fixed Ground Targets

Figure 6. Open Range with Impact Berm and Side Protection SDZ for Small Arms Firing at Fixed Ground Targets

Figure 7. SDZ for Partially Baffled Range (Small Arms Firing at Fixed Ground Targets)

Figure 8. SDZ for Fully Baffled Range (Small Arms Firing at Fixed Ground Targets)

Figure 9. Ballistic Overhead Canopy

Figure 10. Outdoor Rifle Range Layout

Figure 11. Pistol Range Layout

Figure 12. Ballistic Material

Figure 13. Ballistic Protection of Target Mechanism

Figure 14. Impact Berm for Open and Partially Baffled Ranges

Figure 15. Outdoor Baffled Bullet Stop

Figure 16. Baffled Range Profile

Figure 17. Baffled System Geometry

Figure 18. Overhead Baffle Ballistic Designs

Figure 19. Parallel Ranges

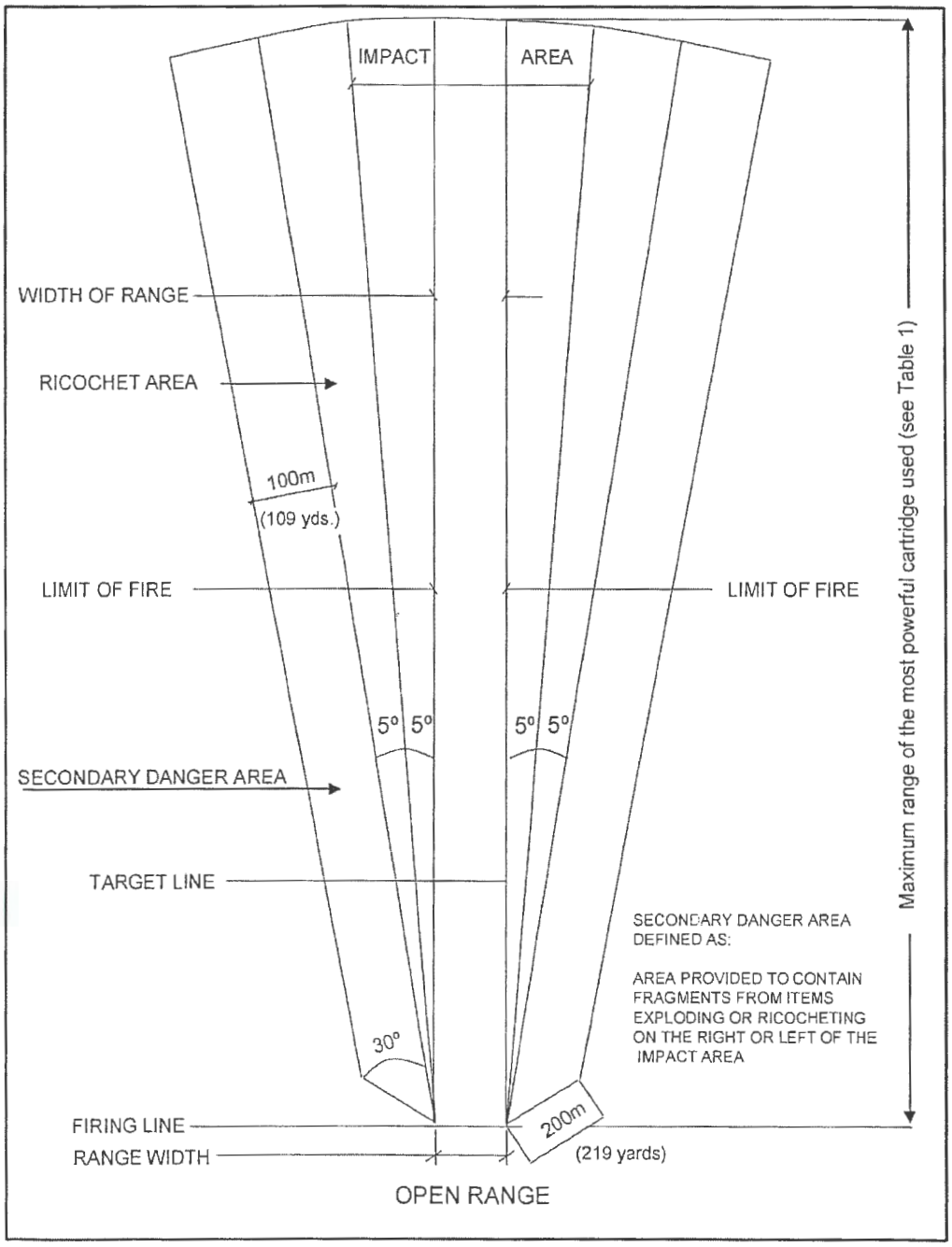


Figure 1
Surface Danger Zone for Small Arms
Firing at Fixed Ground Targets

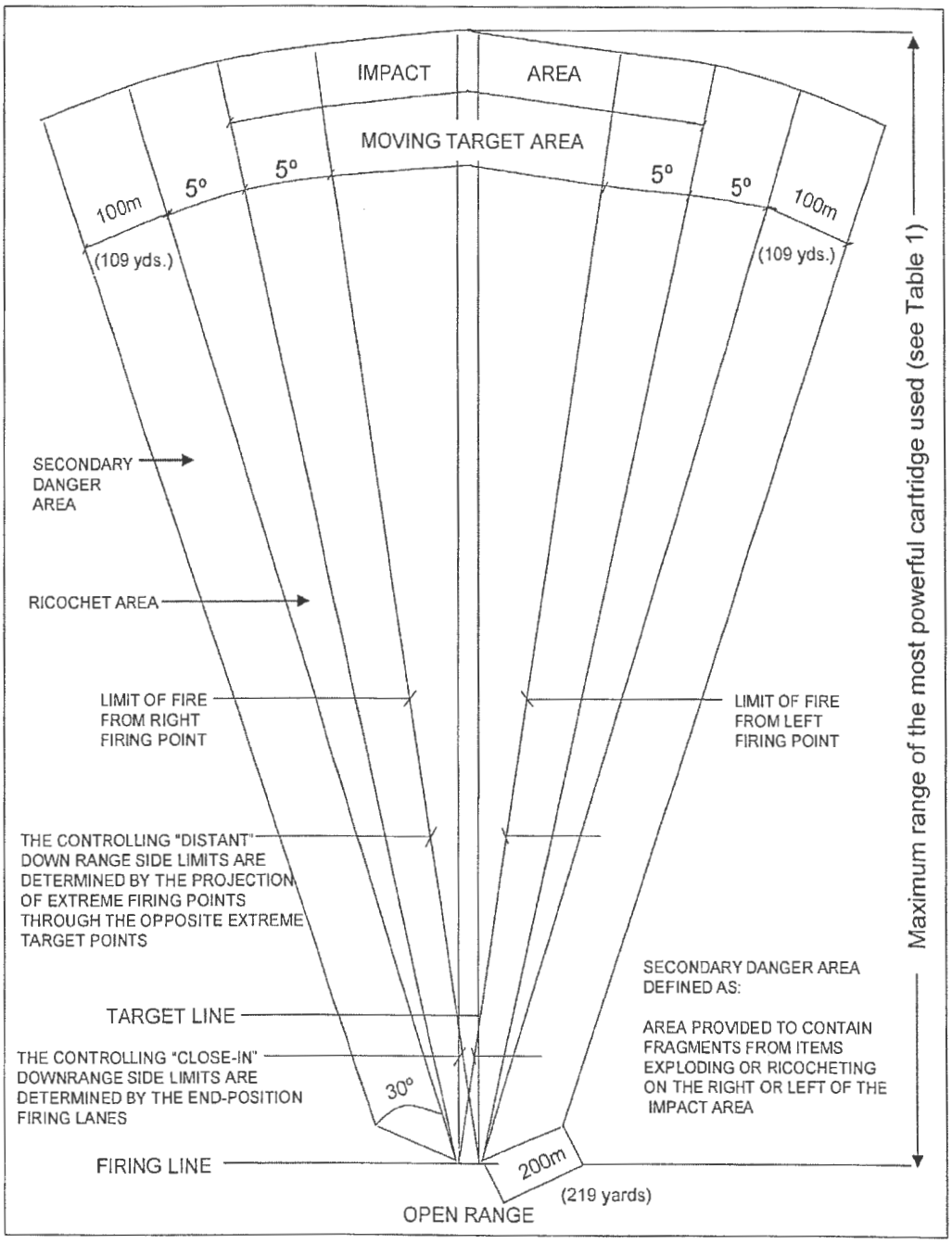


Figure 2
Surface Danger Zone for Small Arms Weapons
Firing at Moving Ground Targets

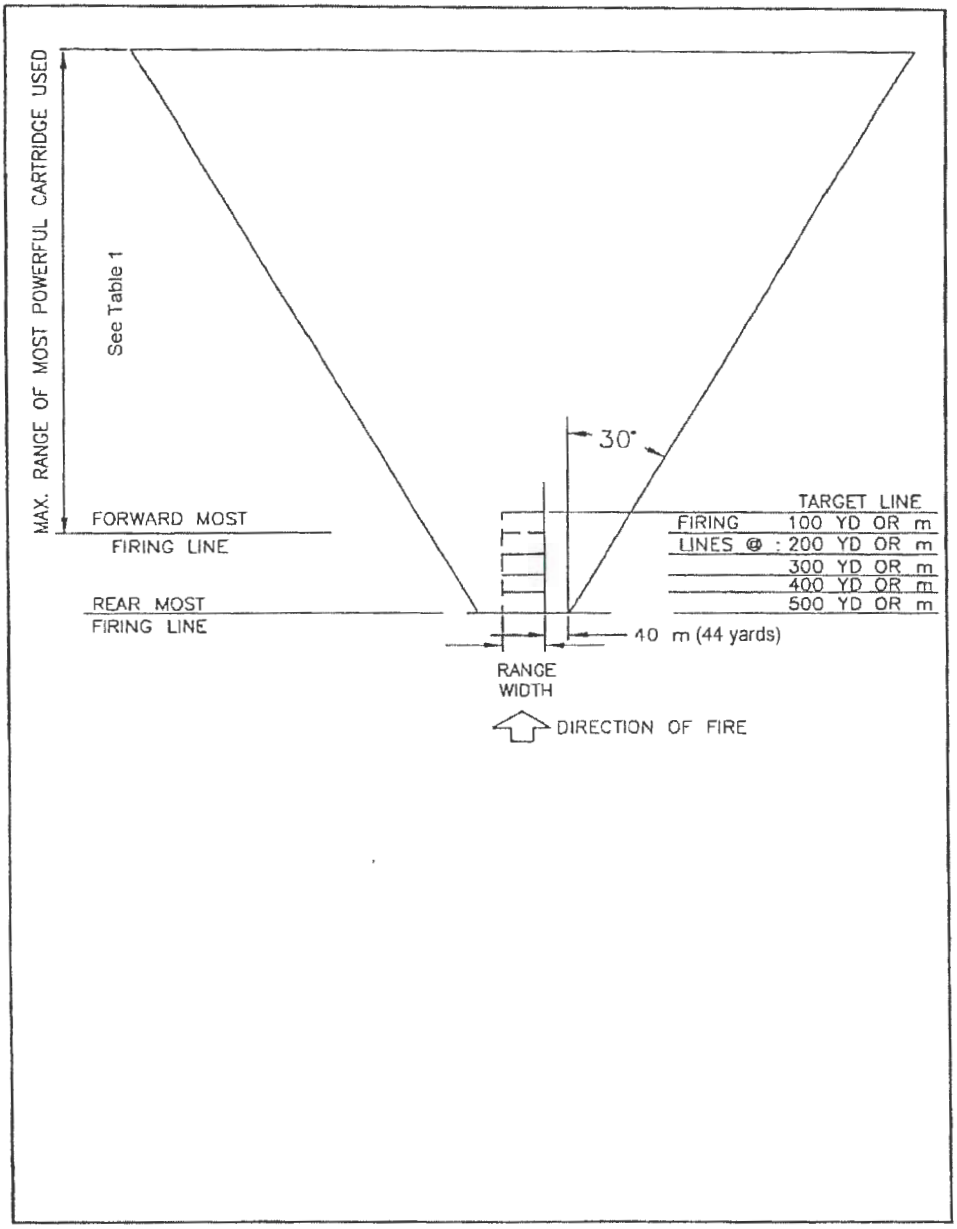
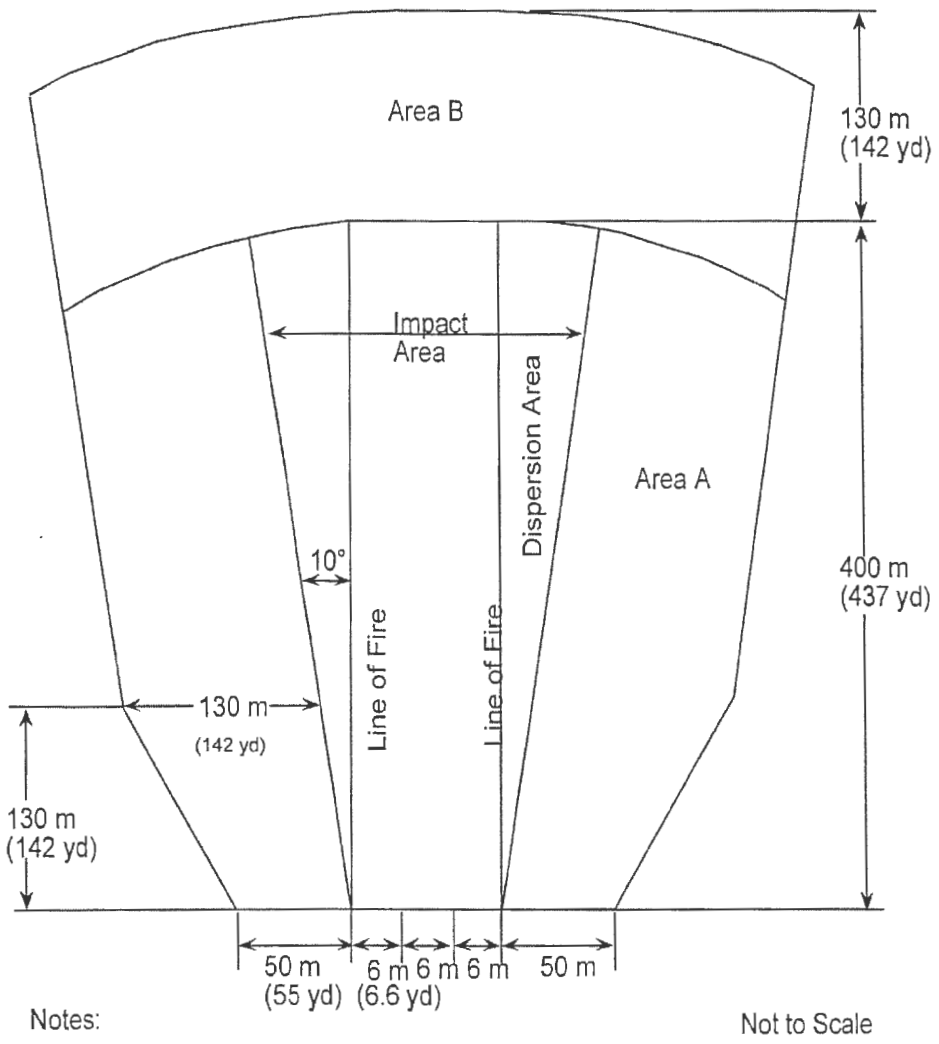


Figure 3
Surface Danger Zone for Small Arms Firing
At Fixed Ground Targets with Rocky Soil
Or Targets Causing Ricochet



Notes:

Not to Scale

1. Prohibit cross-lane firing when using multiple firing positions.
2. **Maximum range (400 m/437 yd) may be reduced when positive elevation control devices are used to limit range to impact distance.**
3. For MK19, 40mm machine gun, maximum range is 2200m (2406 yd.) and will not be reduced.

Figure 4
Surface Danger Zone for Firing
M79, M203, and M19 40mm Grenade Launchers

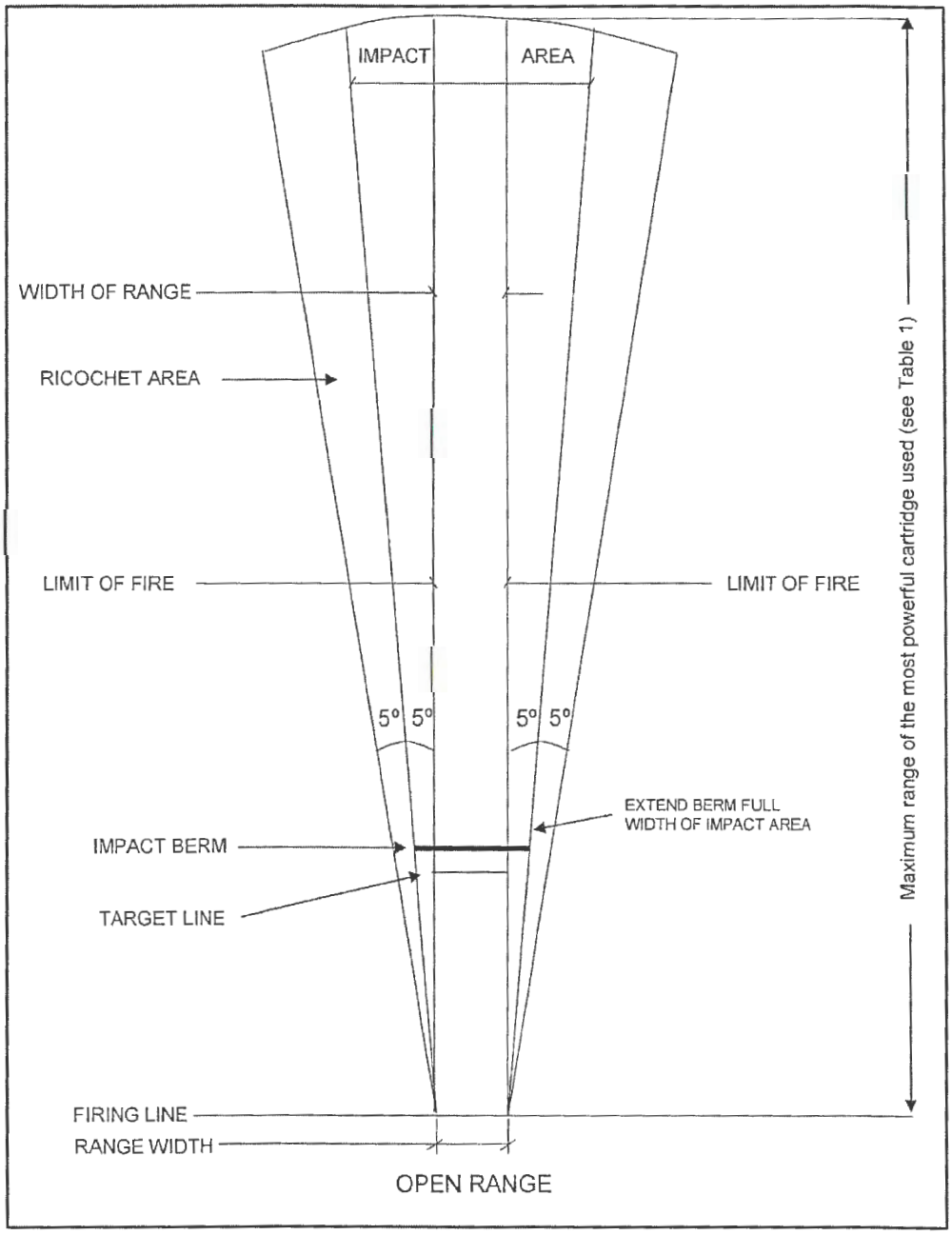


Figure 5
Surface Danger Zone with Impact Berm
for Small Arms Firing at Fixed Ground Targets

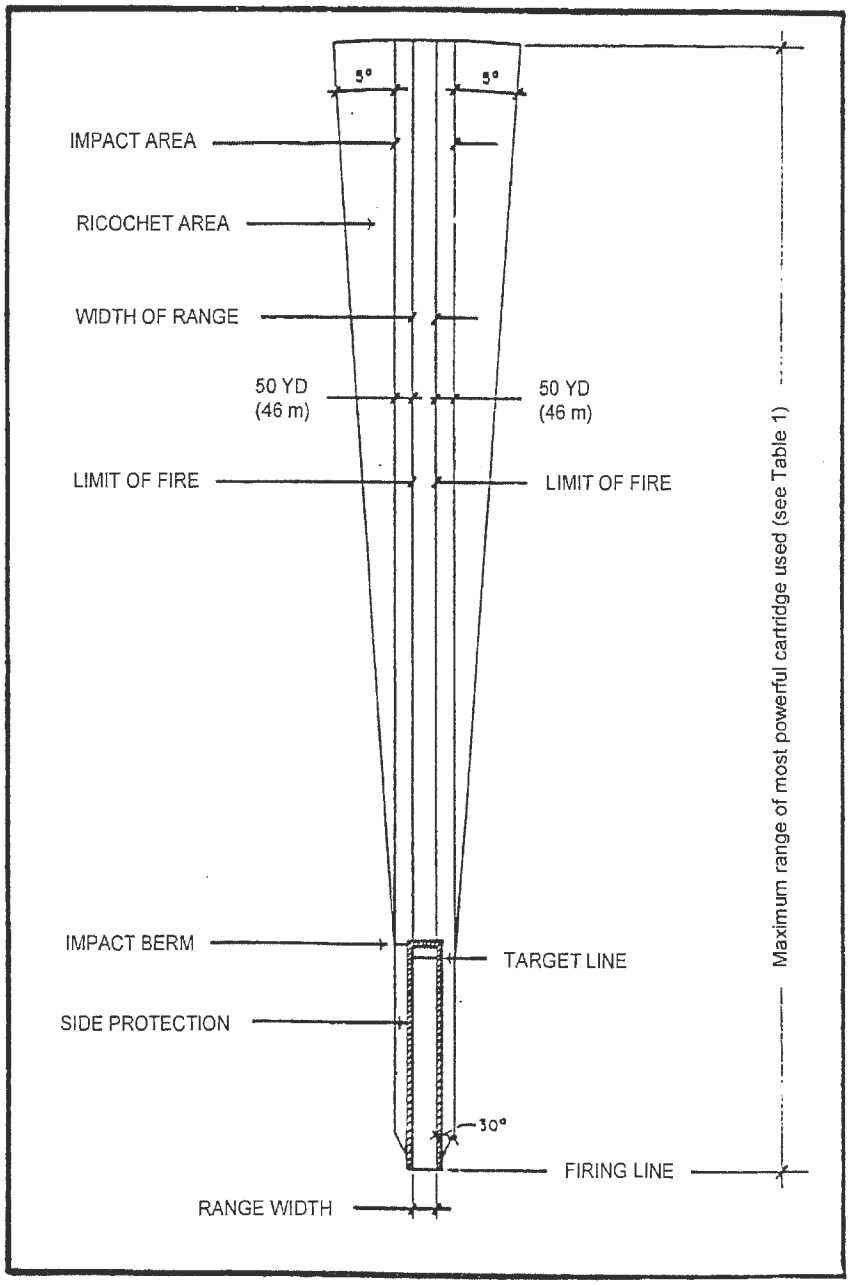


Figure 6

Open Range with Impact Berm and Side Protection Surface Danger Zone for Small Arms Firing at Fixed Ground Targets

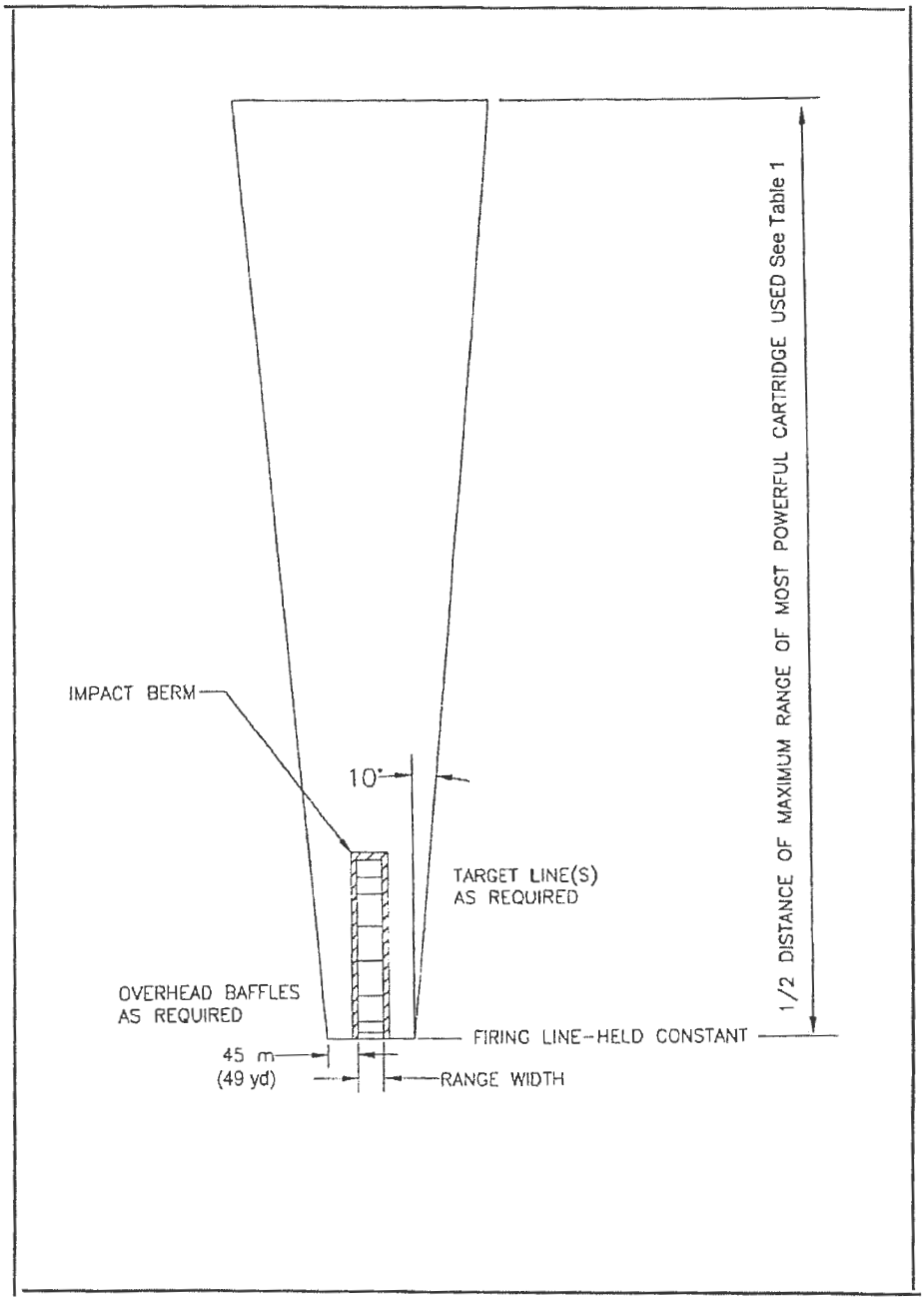


Figure 7
Surface Danger Zone for Partially Baffled Range
(Small Arms Firing at Fixed Ground Targets)

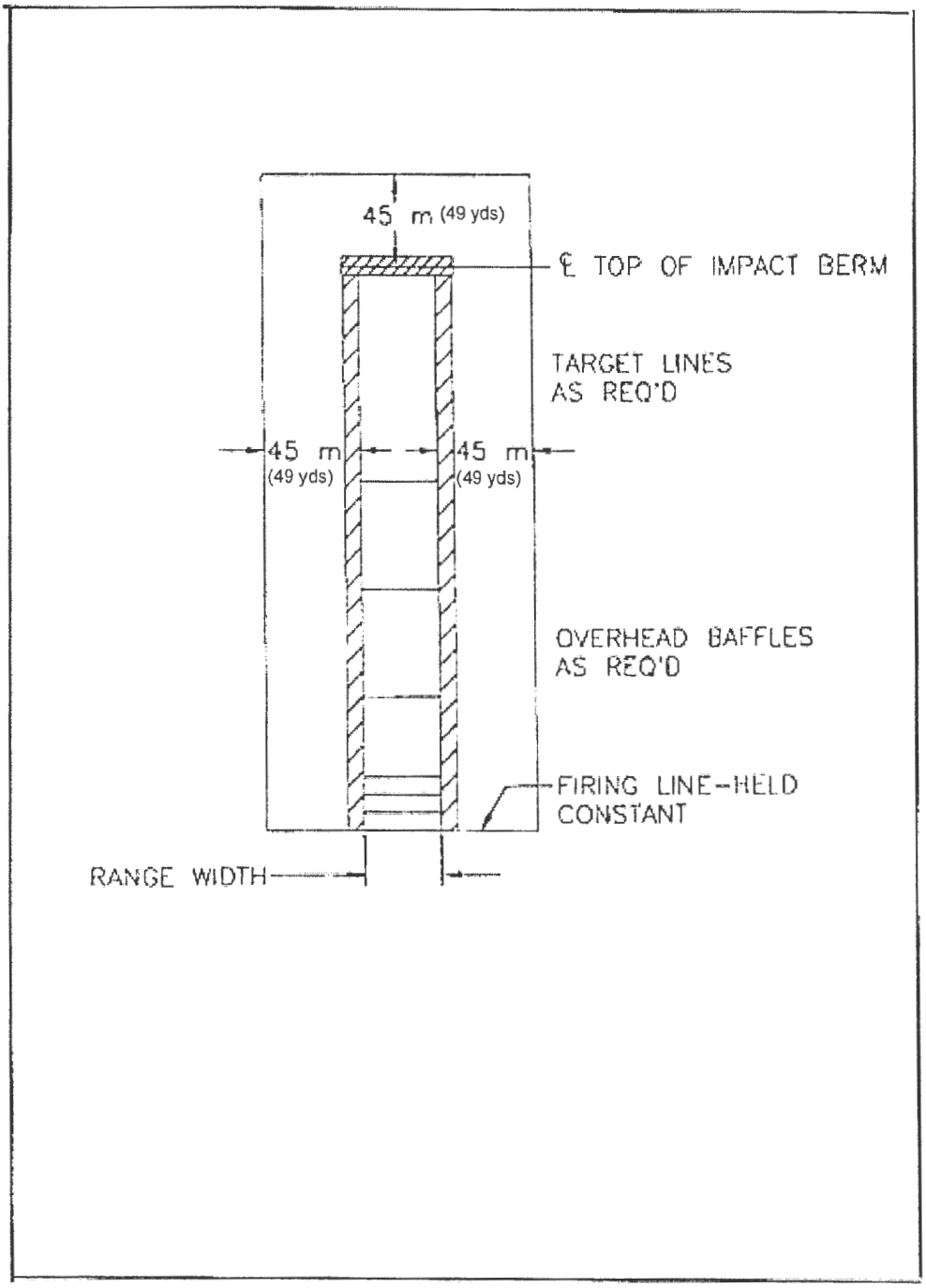


Figure 8
Surface Danger Zone for Fully Baffled Range
(Small Arms Firing at Fixed Ground Targets)

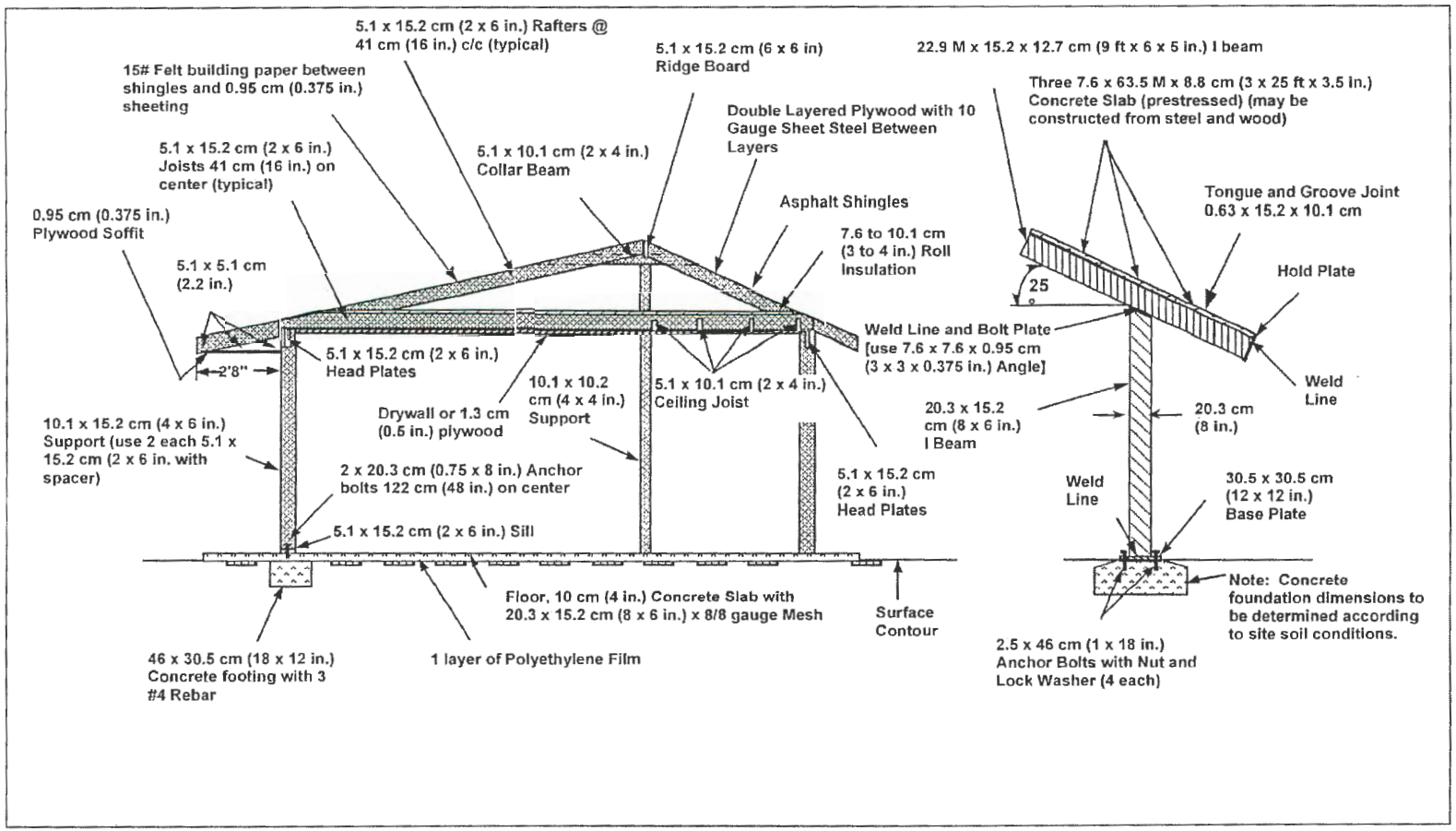


Figure 9
Ballistic Overhead Canopy

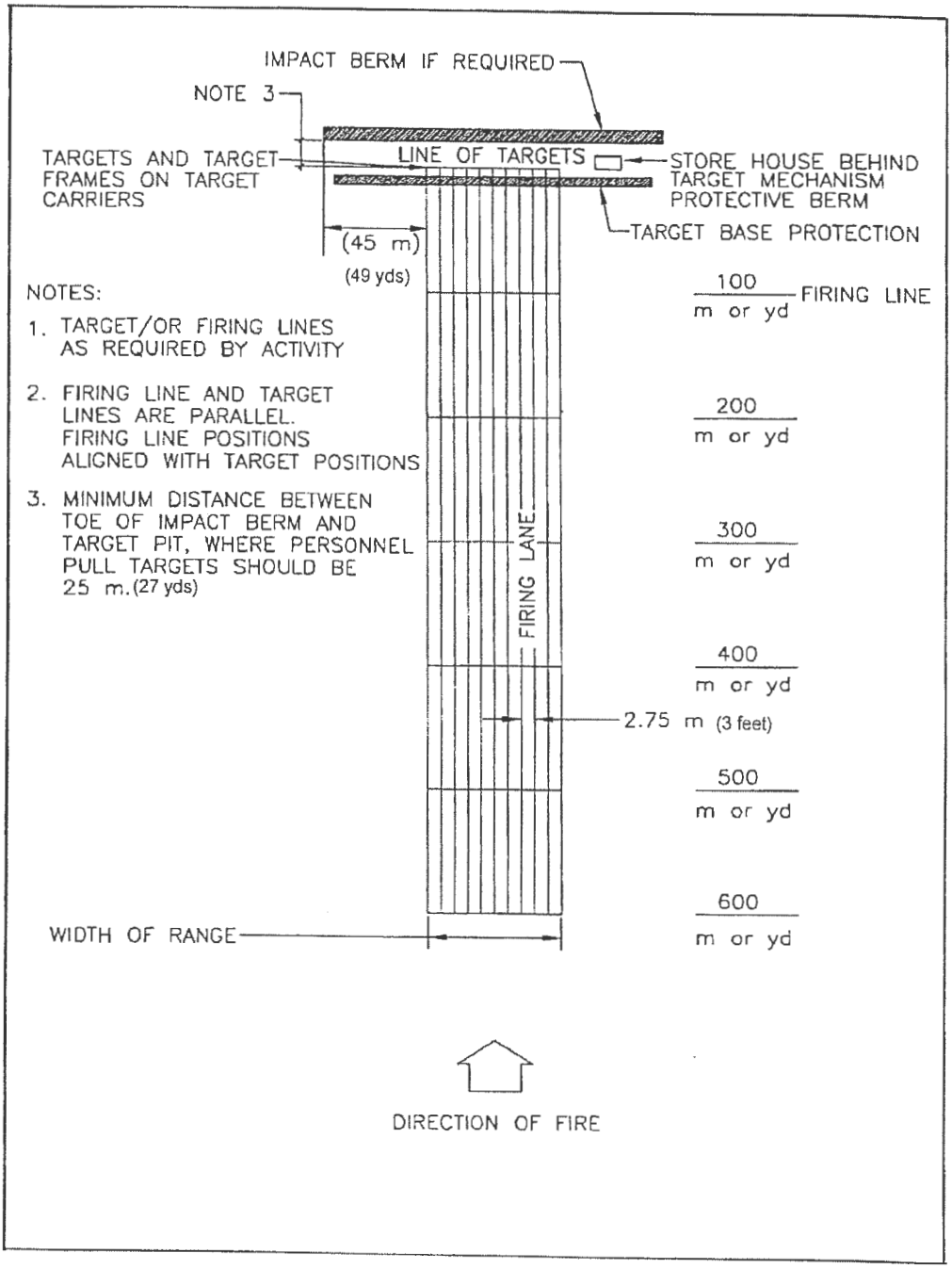


Figure 10
Outdoor Rifle Range Layout

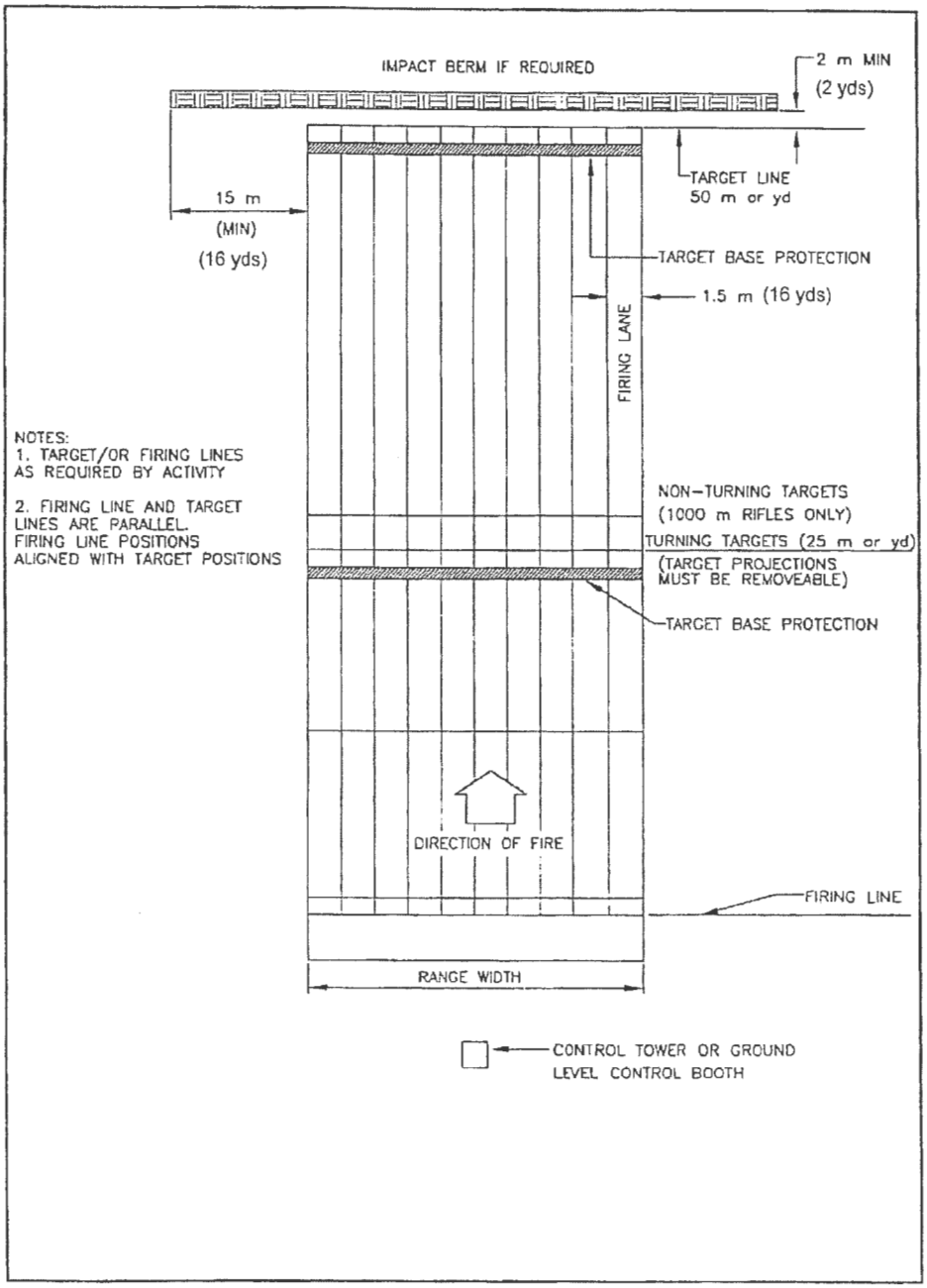


Figure 11
Pistol Range Layout

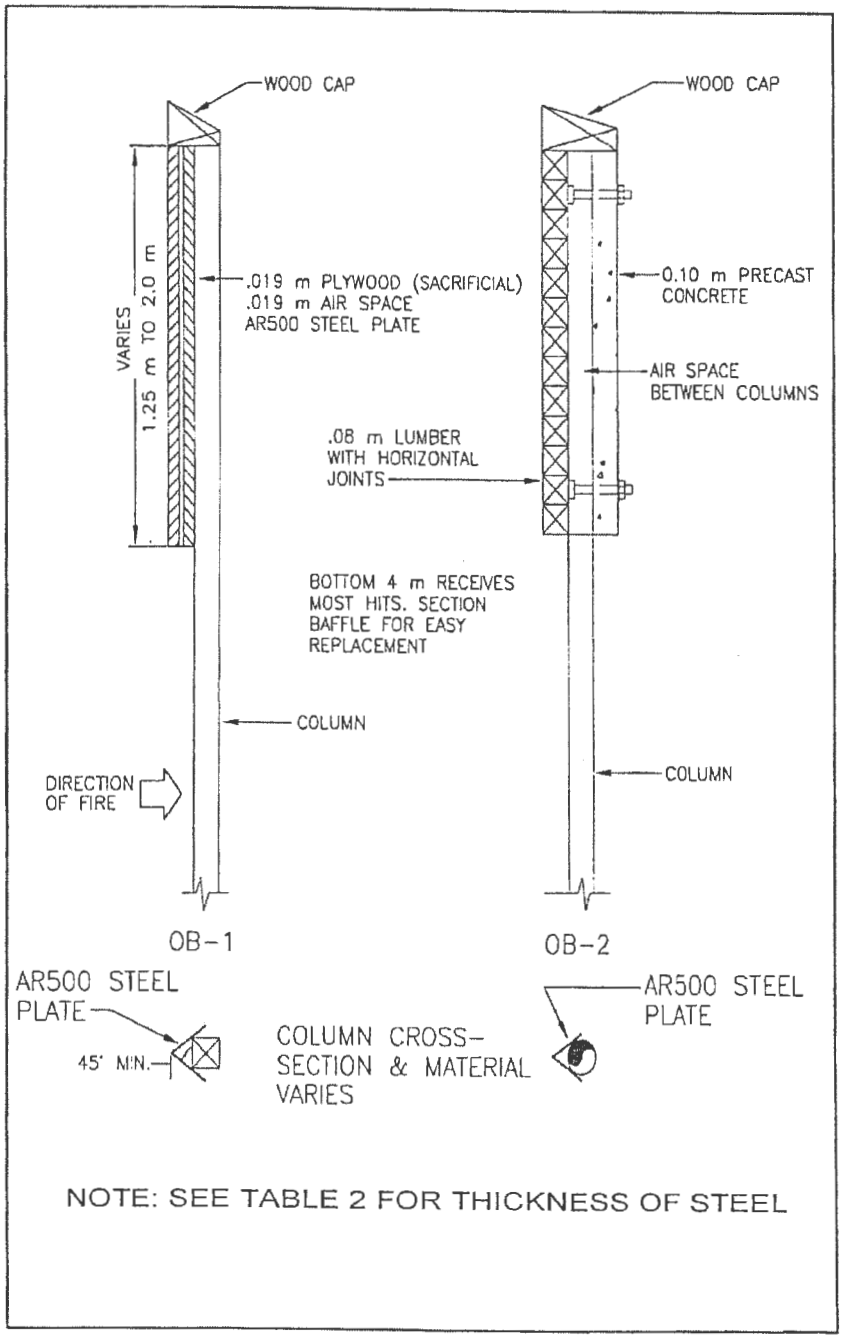


Figure 12
Ballistic Material

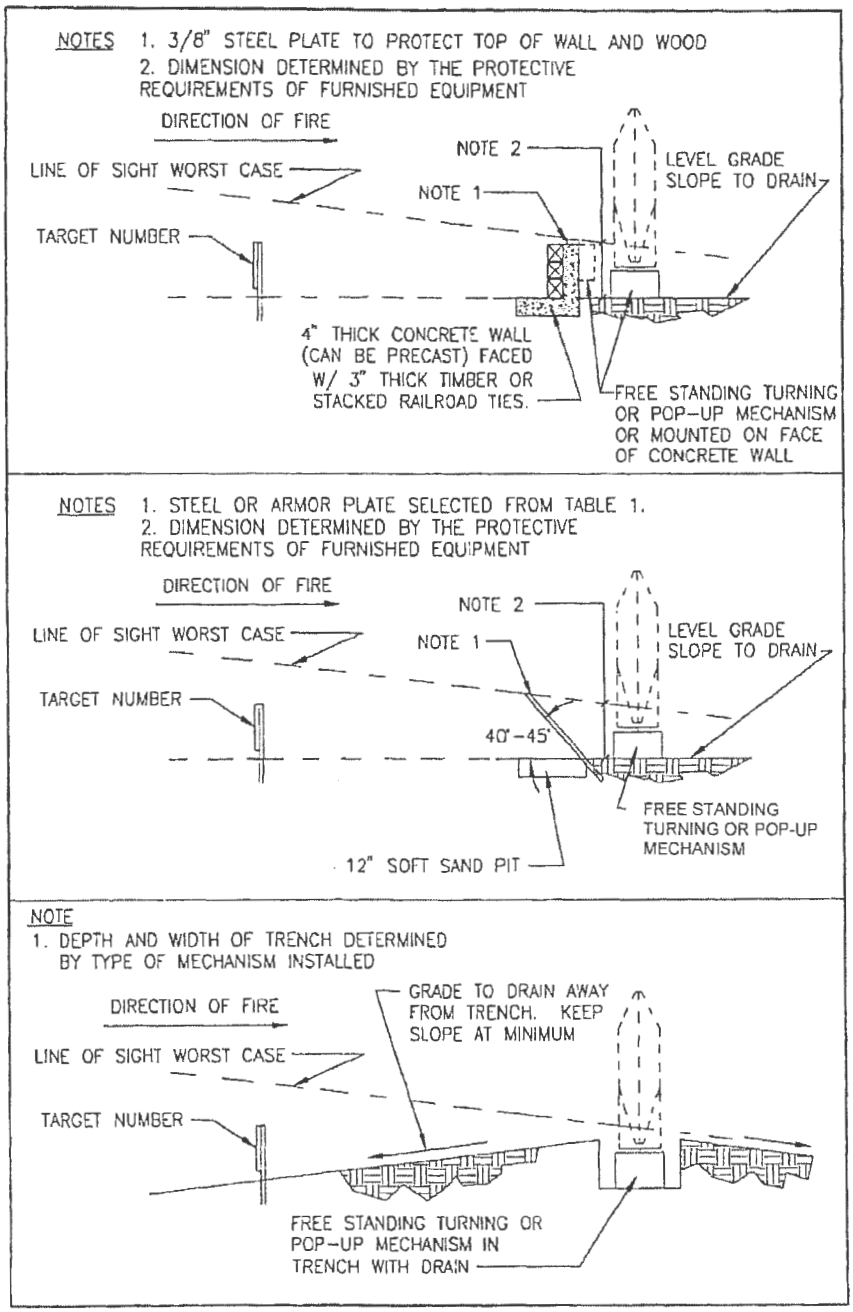
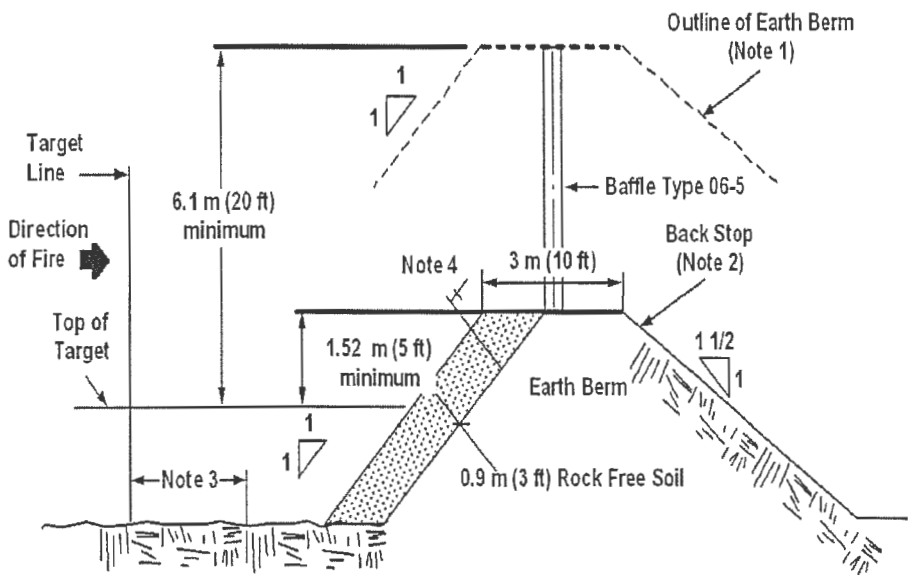


Figure 13
Ballistic Protection of Target Mechanism



Notes:

1. Outline of impact berm if all earth berm is used in lieu of combination earth berm/baffle.

2. Back slope may be increased or decreased dependent upon soil stability, erosion potential, or maintenance equipment.

3. Provide adequate distance between berm and target line for maintenance of target and slope of berm [minimum 9 m (10 yd)].

4. Preferred slope of impact berm face is 1:1 or steeper. For shallower slopes a bullet catcher is required. Top baffle must be placed as shown if used in lieu of all earth berm. Bullet catcher is 0.95 cm (3/8 in.) steel plate positioned above point of bullet impact at 90° angle to face of berm slope. Plate protrudes at least 0.6 m (2 ft) from face of berm.

Figure 14
Impact Berm for Open and
Partially Baffled Ranges

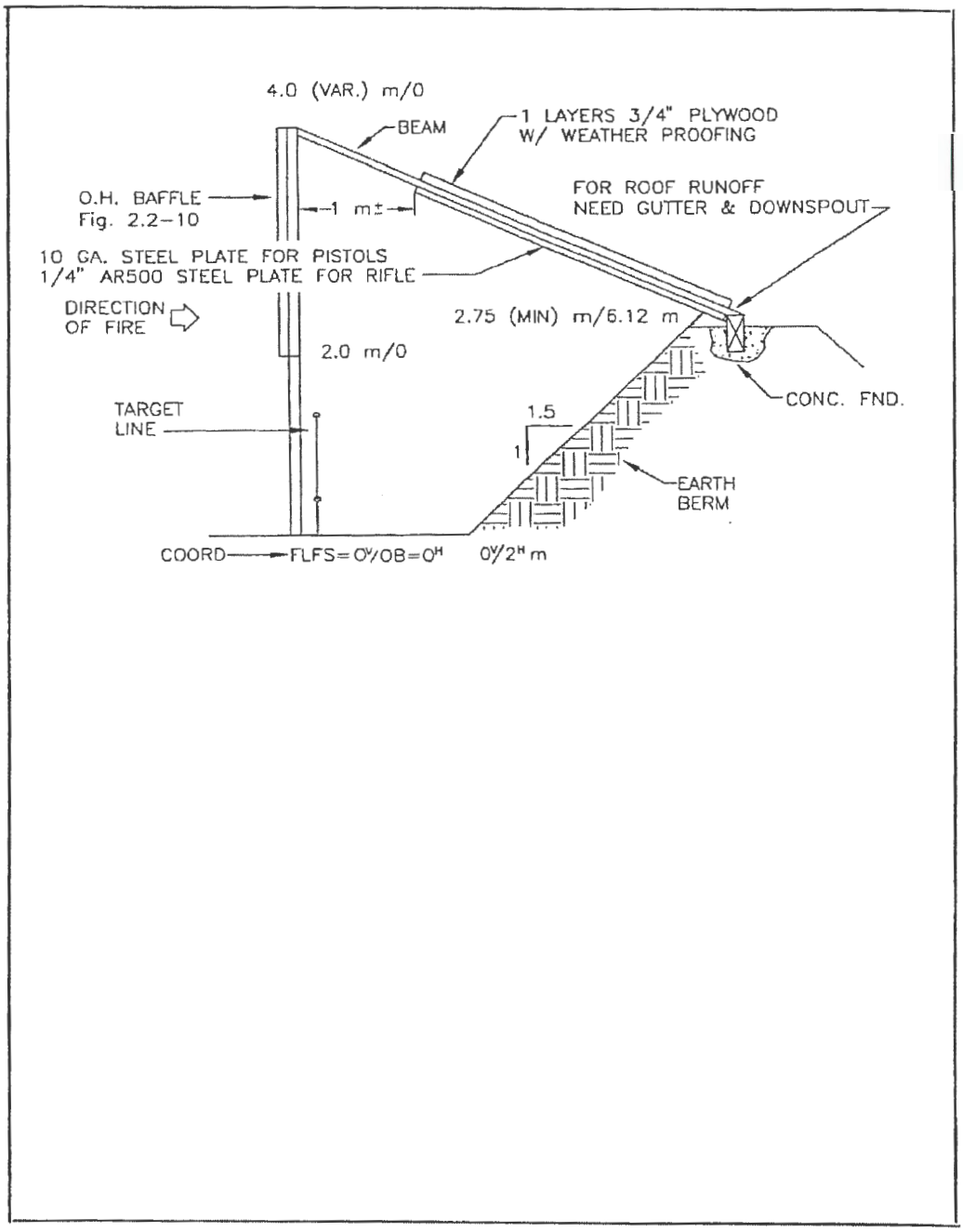
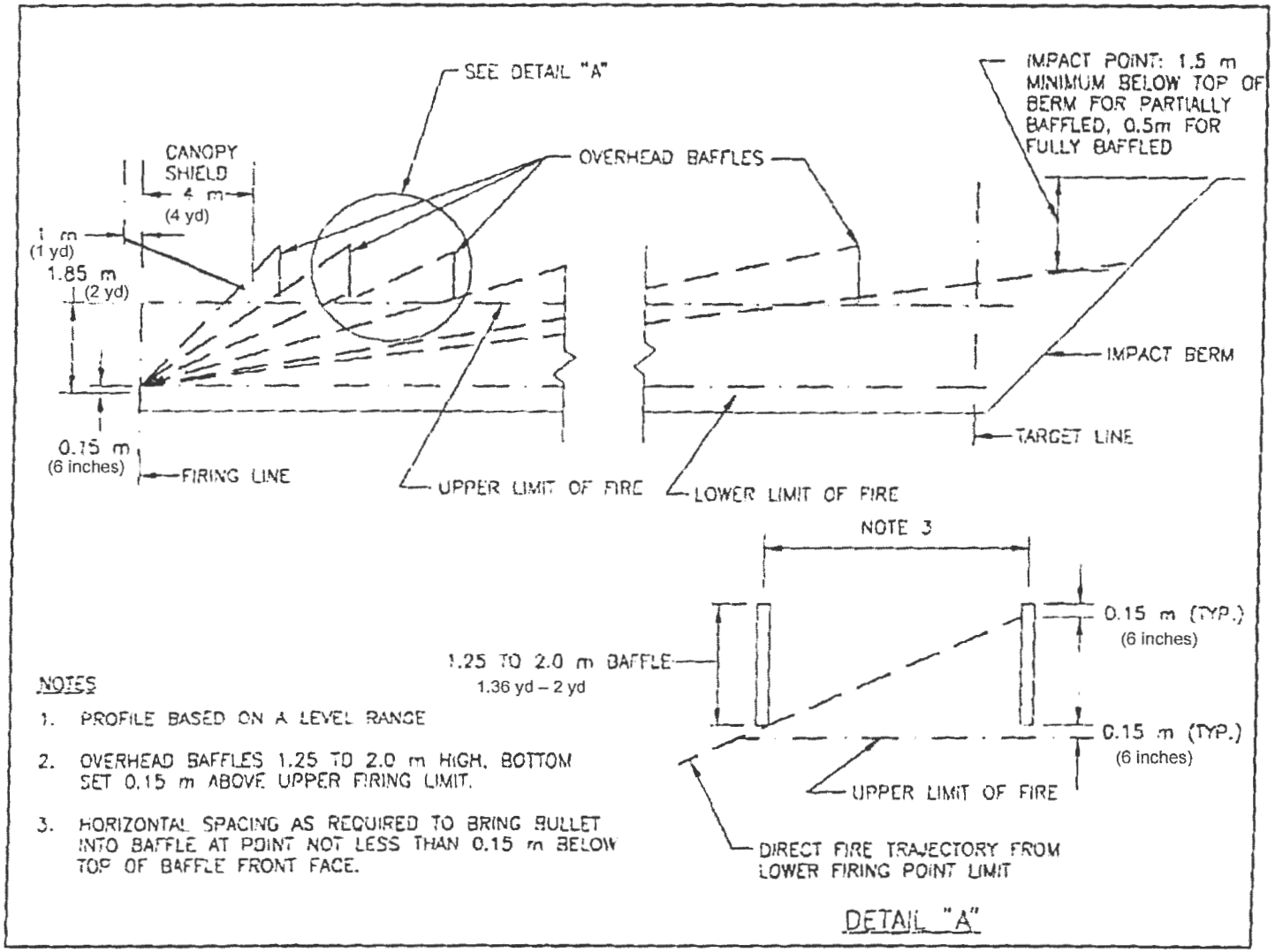


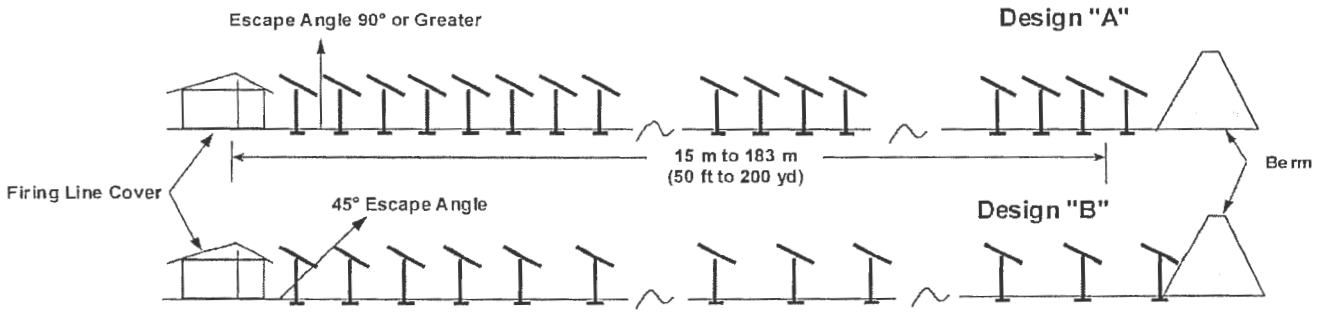
Figure 15
Outdoor Baffled Bullet Stop



NOTES

1. PROFILE BASED ON A LEVEL RANGE
2. OVERHEAD BAFFLES 1.25 TO 2.0 m HIGH, BOTTOM SET 0.15 m ABOVE UPPER FIRING LIMIT.
3. HORIZONTAL SPACING AS REQUIRED TO BRING BULLET INTO BAFFLE AT POINT NOT LESS THAN 0.15 m BELOW TOP OF BAFFLE FRONT FACE.

Figure 16
Baffled Range Profile



Notes:

1. These are typical examples of a baffled range.
2. Baffles are spaced according to the downrange area.
   a. Where inhabitants are less than 0.4 km (0.25 mi), use design "A."
   b. Where controlled areas extend beyond 0.4 km (0.25 mi), use design "B."
3. Baffle installation may not be required where terrain features such as mountains exist.
4. When baffles may be required as encroachment occurs, plan a program of installation over a 5-year period.
5. See Figure 9 for firing line cover details.

Figure 17
Baffle System Geometry

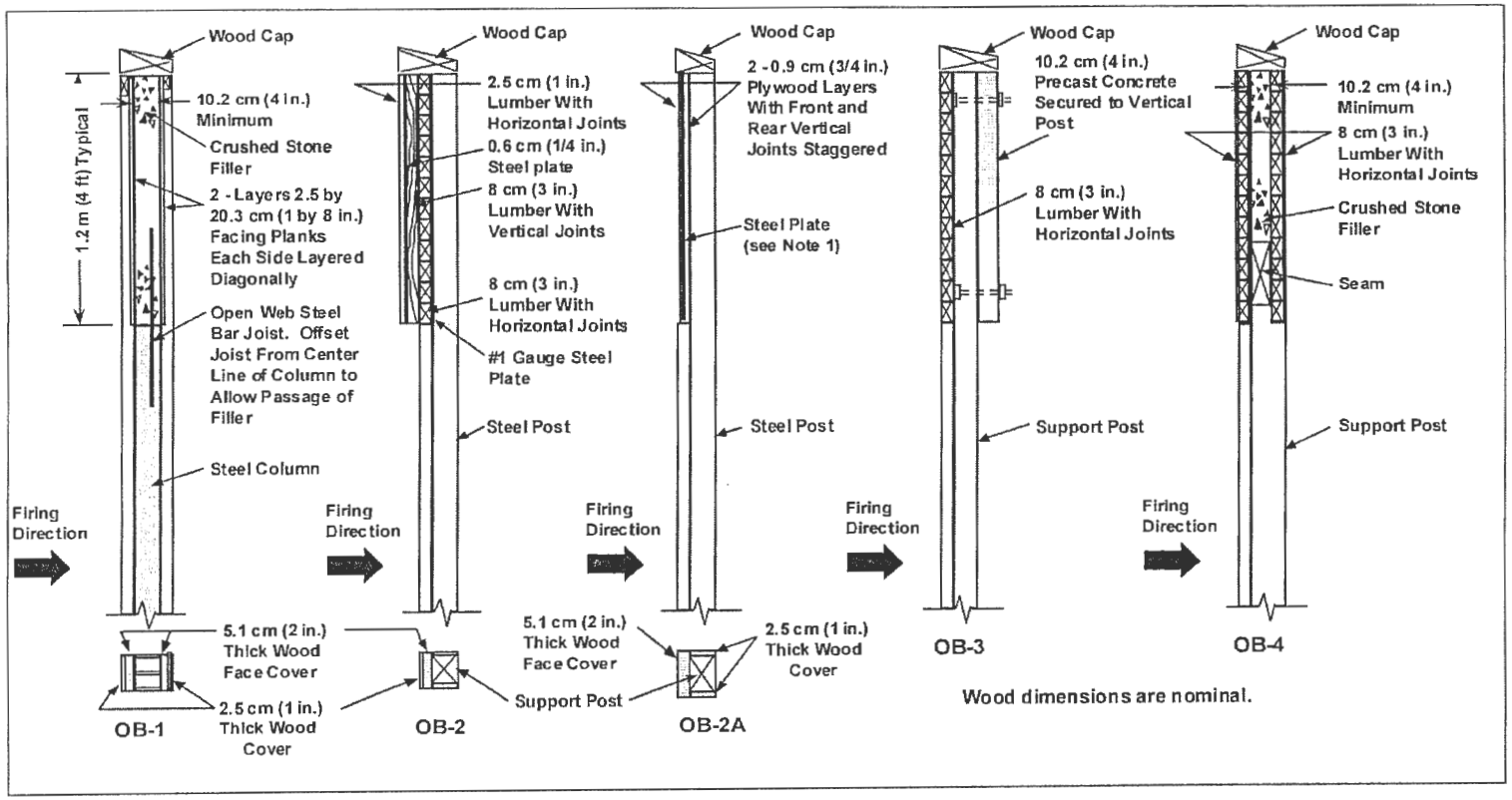
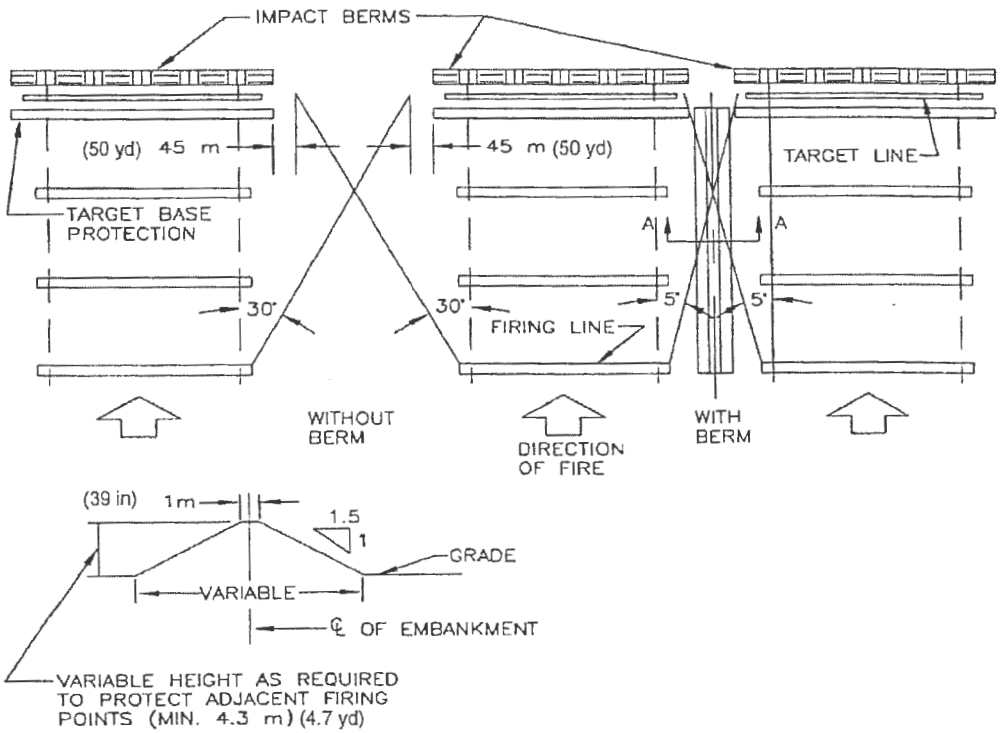


Figure 18
Overhead Baffle Ballistic Designs



NOTE: SURFACE DANGER ZONES FOR PARALLEL UNBERMED RANGES MAY OVERLAP AS SHOWN, BUT NOT CLOSER THAN 45 m (50 yd) TO THE ENTRY POIN FOR THE TARGET LINES ON THE ADJACENT RANGE. WHEN THIS IS NOT POSSIBLE AND THE REQUIREMENT EXISTS FOR SIMULTANEOUS OPERATION OF ADJACENT RANGES, A SEPARATING WALL OR BERM WILL BE REQUIRED. THE LENGTH OF THE WALL OR EMBANKMENT SHALL BE FROM THE MOST DISTANT FIRING LINE TO THE TARGET LINE. THE WALL MAY BE 200 mm (8 in) THICK CONCRETE, 300 mm (12 in) THICK GROUT-FILLED CONCRETE MASONARY UNIT, OR EQUIVALENT.

Figure 19
Parallel Ranges

Rutgers University Community Noise Enforcement Handbook (2012)

1

COMMUNITY NOISE ENFORCEMENT

June 2012

RUTGERS
THE STATE UNIVERSITY
OF NEW JERSEY
NOISE TECHNICAL ASSISTANCE CENTER
DEPARTMENT OF ENVIRONMENTAL SCIENCES

OR 20-025
IM 20-047

COMMUNITY NOISE ENFORCEMENT

A manual to accompany the certification course: "Community Noise Enforcement." The certification conferred by this course is recognized in jurisdictions throughout the United States and internationally

Editor
Eric M. Zwerling, M.S., INCE, ASA
Director, Rutgers Noise Technical Assistance Center

Rutgers Noise Technical Assistance Center
Rutgers, The State University of New Jersey
Department of Environmental Sciences
14 College Farm Road
Cook College
New Brunswick, NJ 08901-8551

Phone: (732) 932-9800 x 6137
Fax: (732) 932-8644
E-mail: zwerling@rutgers.edu
Website:
http://www.envsci.rutgers.edu/org/rntac/

State of Alaska
June 2012

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Introduction

Unregulated sources of noise can have impacts far beyond the obvious transitory nuisance, and complainants may be enduring more than simple annoyance. Exposure to loud noise has been shown to result in uncontrollable stress which can result in alterations in mood as well as hormonal and nervous system changes in healthy subjects (Brier, 1987; Babish, 2003). A lack of control over noise results in a variety of neurobiological and behavioral alterations, a phenomenon known as "learned helplessness" (Brier, 1987). It has been demonstrated that blood pressure is reproducibly elevated in response to intermittent loud noise (Sawada, 1993). The noxious stimulus of noise has been used as a laboratory model for producing stress because it results in the same biological and physiological responses as other stressors (Suter, 1992). Noise has been clearly implicated in sleep disturbance (Lukas, 1977), resulting in a cascade of negative effects (WHO, 2009). The stress, tension and fatigue associated with long-term exposure to noise has destroyed marriages, cost people their jobs and forced other people to sell their houses at significant losses (RNTAC, 1991-2012).

In 1974, the United States Environmental Protection Agency estimated that nearly 100 million Americans lived in areas where the daily average noise levels exceeded its identified safe L_{dn} (Day Night Level) of 55 dB (EPA, 1974). In 1990, that estimate had risen to 138 million people (Eldred, 1990). In a 2003 study, 23% of the population of the Netherlands, a densely populated jurisdiction similar to the urban and suburban areas of Anchorage and Wasilla, described themselves as "highly disturbed by noise during sleep," as compared to five years earlier when that number was 19% (WHO, 2009).

While most enforcement officers may have no jurisdiction over noise sources such as aircraft, road noise and railroads, we can still improve the quality of life for complainants who are exposed to a whole range of noise sources. It is equally as important to educate the regulated community as to what their legal responsibilities are. Once it has been demonstrated that a noise source is not in compliance with the applicable ordinance, there exists significant leverage to gain compliance.

The course "Community Noise Enforcement," and this manual by the same name, have been designed to aid enforcement officers, the regulated community and noise consultants to gain a clear understanding of applicable noise ordinance, and the requirements for their proper enforcement. They are both geared towards real-world enforcement situations, and the possible tactics that might be used to challenge the validity of an enforcement action. Attention to detail is vital.

The certification conferred by this course is required of all enforcement officers in the State of New Jersey, and is also recognized in jurisdictions across the entire United States and beyond.

We sincerely appreciate this opportunity to assist you in bringing a better quality of life to the residents of the State of Alaska.

Eric M. Zwerling, M.S., INCE, ASA
Director, Rutgers Noise Technical Assistance Center

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9

ASSORTED NOISE IMPACTS

NOISE PRODUCES ELEVATED BLOOD PRESSURE, FASTER HEART RATES AND INCREASED NEUROENDOCRINE HORMONE LEVELS

NOISE HAS BEEN USED BY THE PHARMACEUTICAL INDUSTRY TO INDUCE STRESS FOR DRUG TRIALS

NOISE CAN CAUSE REGULAR AND PREDICTABLE STRESS ON THE HUMAN BODY

PERCEIVED LACK OF CONTROL - THE "LEARNED HELPLESSNESS" SYNDROME

PEOPLE DO NOT GET USED TO NOISE - THE BODY CONTINUES TO REACT

NOISE EFFECTS THE QUANTITY AND QUALITY OF SLEEP

WHEN SLEEP IS DISTURBED, WORK EFFICIENCY AND HEALTH MAY SUFFER

NOISE MAY AGGRAVATE EXISTING DISEASE

THE SICK AND ELDERLY ARE MORE SENSITIVE TO DISRUPTIVE NOISE

THE FETUS IS NOT FULLY PROTECTED FROM NOISE

NOISE DISRUPTS THE EDUCATIONAL PROCESS & HINDERS LANGUAGE DEVELOPMENT

NOISE CAN OBSCURE WARNING SIGNALS, CAUSING ACCIDENTS TO HAPPEN

NOISE INTERFERES WITH CONVERSATION AND SOCIAL INTERACTION

NOISE DISRUPTS THE PEACEABLE ENJOYMENT OF ONE'S PRIVATE PROPERTY

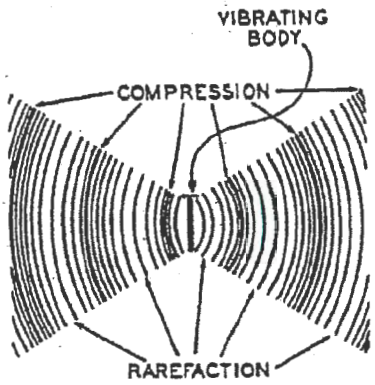
NOISE CAN CAUSE EXTREME EMOTIONS AND BEHAVIOR

ANTI-SOCIAL BEHAVIOR CAUSED BY NOISE MAY BE MORE PREVALENT THAN IS REALIZED

THERE ARE DOCUMENTED CASES OF NOISE-INDUCED ARSON - ASSAULT - MURDER - SUICIDE

SOUND

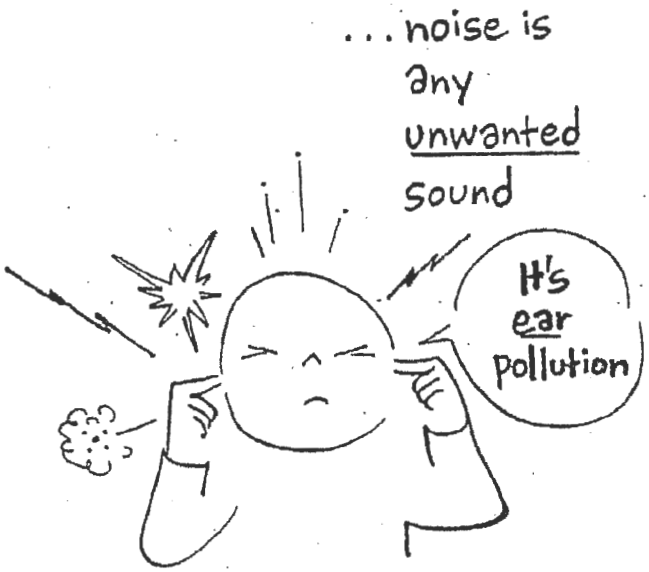
Sound waves are a series of compressions and rarefactions within a medium



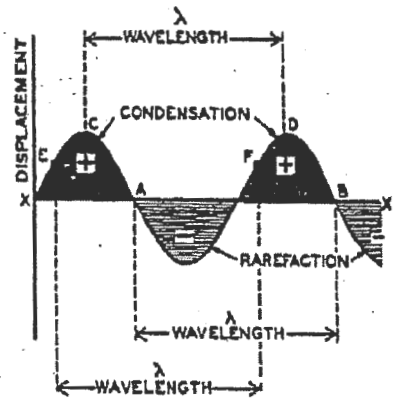
Propagation of a sound wave due to a vibrating body

NOISE

Occurs when these sound waves reach a sensitized receptor



PROPERTIES OF SOUND



Displacement-time graph of a sound wave

INTENSITY

The bigger the compression,
the larger the amplitude,
the more the energy,
the 'louder' it is.

dB- Decibel
The unit of measure and reporting

The decibel scale is logarithmic,
3 dB = a doubling of intensity.
However,
10 dB = a doubling of perceived loudness
(6 dB at the lowest frequencies).

$$SPL\ (dB) = 20 \log_{10} P_{Measured}/P_{Reference}$$

The average threshold of human perception
is 20 micropascals (μPa) or 0.0002 microbar
-this is set as the reference number-

Therefore,
0 (zero) decibels is the average threshold of human hearing,
not the absence of sound pressure.

0 dB threshold of hearing - - - 130,140 dB threshold of pain

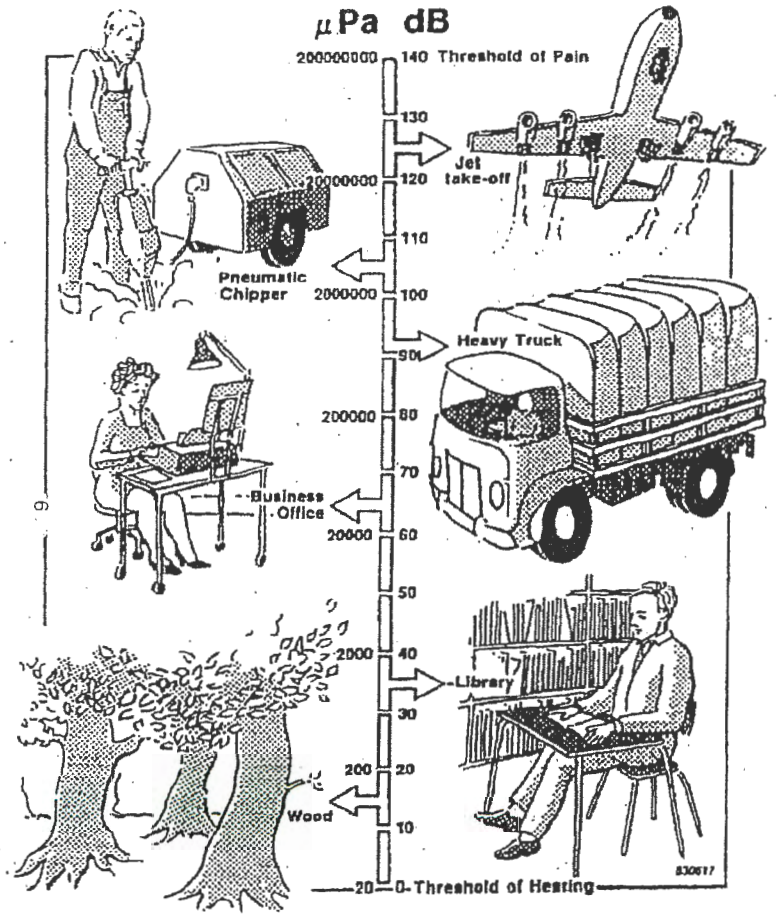


Fig. 5–3. Examples of some typical sound levels, expressed in micropascals on the left side of the scale and decibels on the right. (From Bruel & Kjaer, 1984, reproduced with permission.)

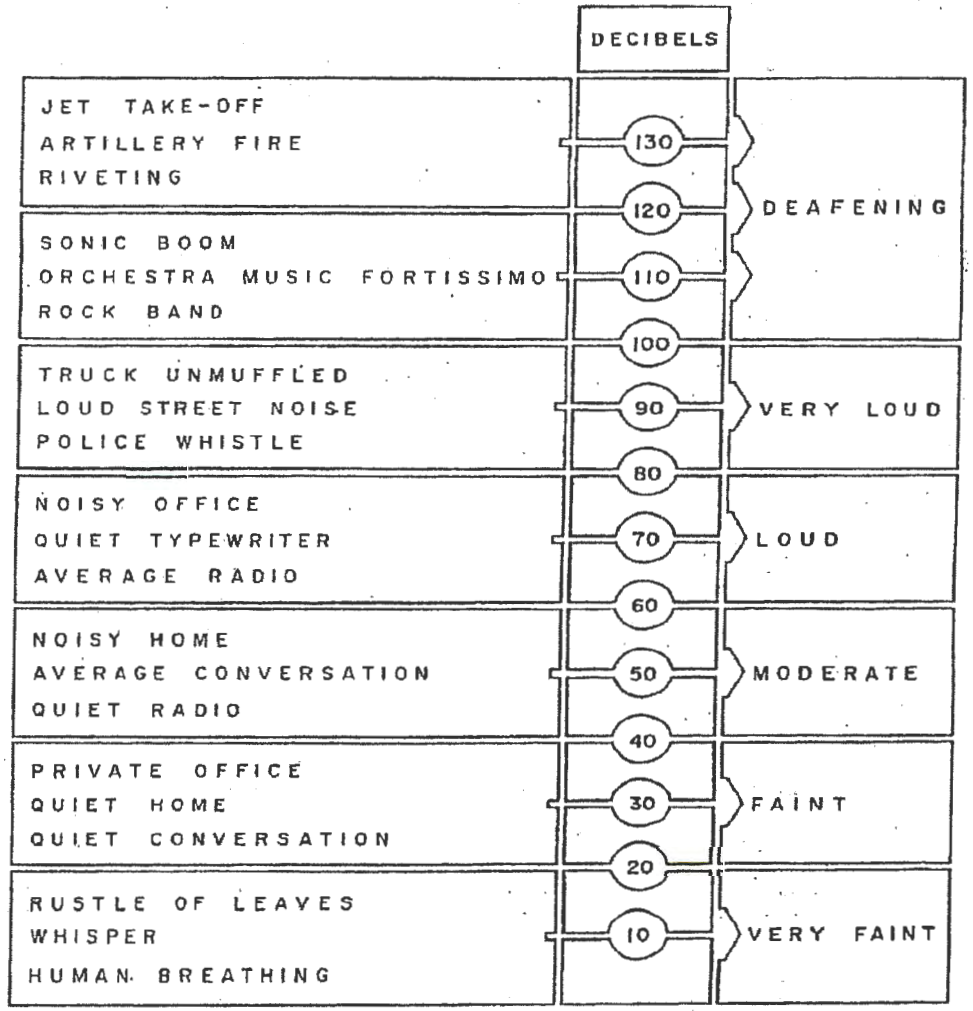


Fig. 3.5 Sound pressure levels of representative sounds and noises.

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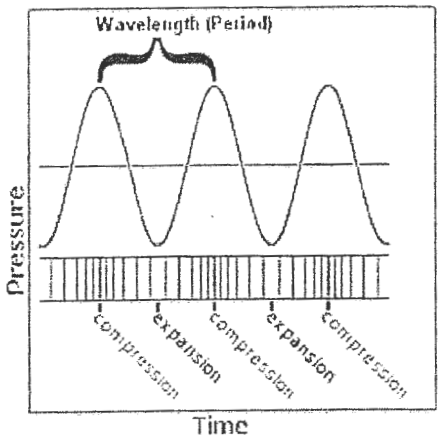
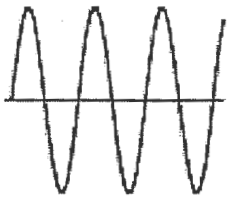
PROPERTIES OF SOUND
FREQUENCY (PITCH)

Unit of Measure
Hertz (Hz) – cycles per second

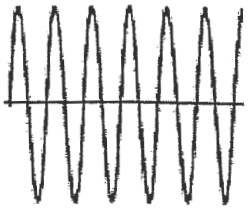
Range of Human Hearing – 20 Hz to 20,000 Hz

Humans are most sensitive to 1000 Hz to 4000 Hz





Lower Pitch



Higher Pitch

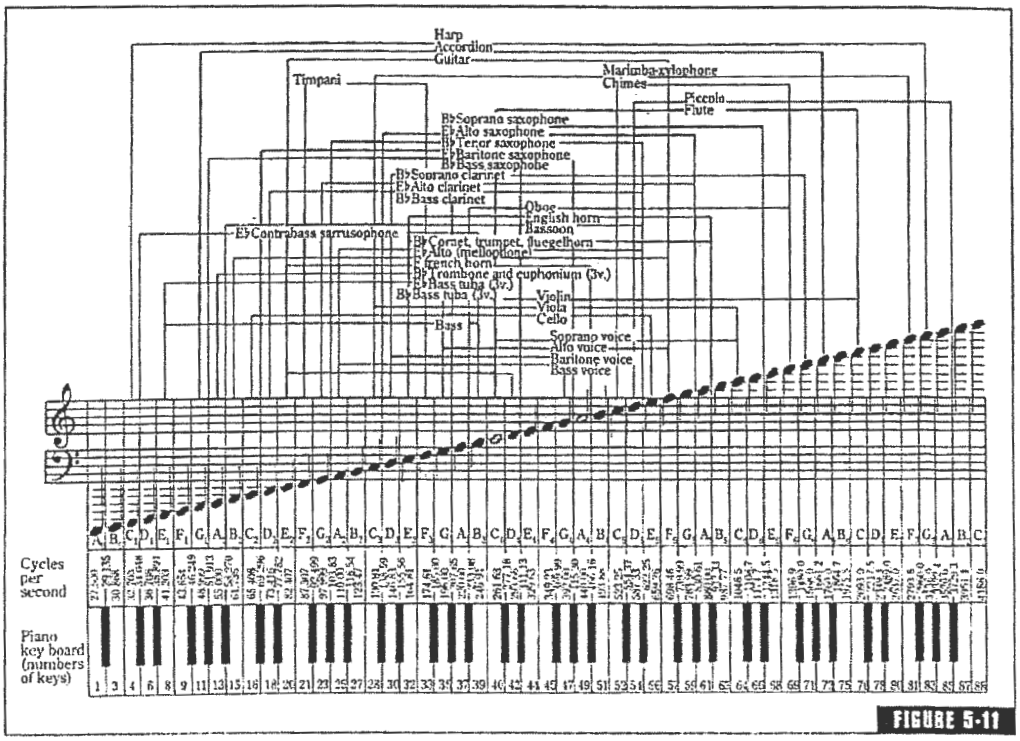
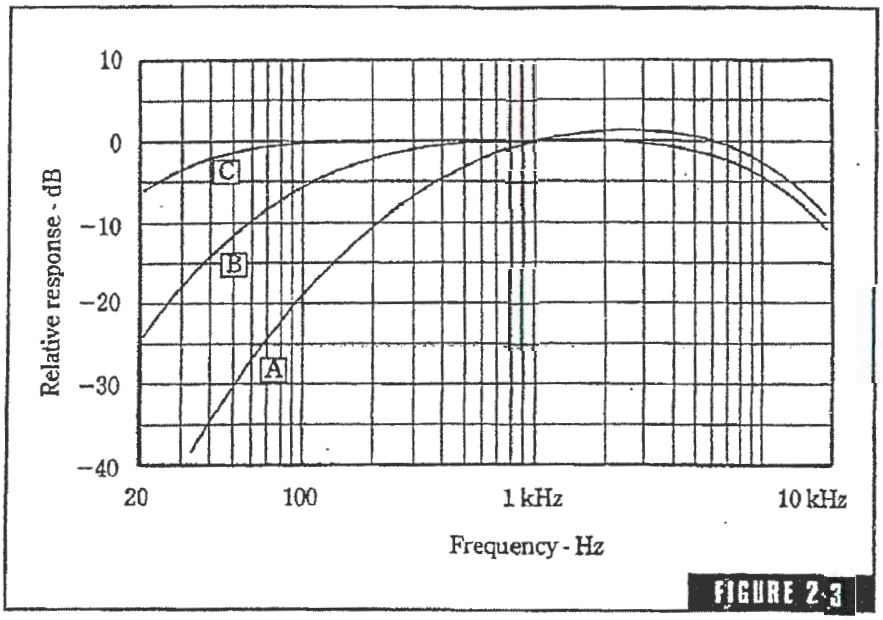


FIGURE 5-11

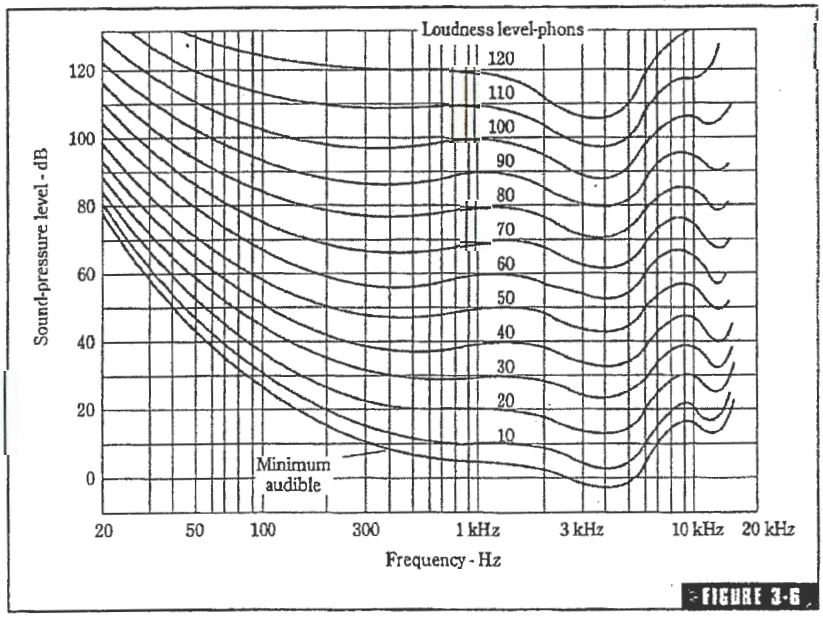
The audible frequency range of various musical instruments and voices. Only the fundamental tones are included; the partials go much higher. The very low piano and organ notes are perceived largely through their partials. Not shown are the many high-frequency incidental noises produced by the instruments. *C. G. Conn, Ltd., Oak Brook, Illinois.*

From: Master Handbook of Acoustics. F. A. Everest. McGraw Hill 2001.

FREQUENCIES, HUMAN RESPONSE AND WEIGHTING SCALES



A, B, and C weighting response characteristics for sound level meters. (ANSI S1 .4-1971.)



Equal-loudness contours of the human ear. These contours reveal the relative lack of sensitivity of the ear to bass tones, especially at lower sound levels. Inverting these curves give the frequency response of the ear in terms of loudness level. (After Robinson and Dadson.[8])

From: Master Handbook of Acoustics. F.A. Everest. McGraw-Hill. 2001.

The A-scale (dBA) is a weighting system which approximates human perception to sounds of moderate intensity. The A-scale discriminates against low frequencies. While humans are relatively insensitive to low frequency sound at low intensities, we are much more sensitive to those same low frequencies at higher intensities – when they are highly amplified.

Conversion of Sound Levels from Unweighted Sound Pressure (flat or Z-scale response) to A- and C-scale Weighting

1/3 and 1/1 Octave Bands

Frequency (Hz)	A Weighting (dB)	C Weighting (dB)
10	-70.4	-14.3
12.5	-63.4	-11.2
16*	**-56.7**	**-8.5**
20	-50.5	-6.2
25	-44.7	-4.4
31.5	**-39.4**	**-3.0**
40	-34.6	-2.0
50	-30.2	-1.3
63	**-26.2**	**-0.8**
80	-22.5	-0.5
100	-19.1	-0.3
125	**-16.1**	**-0.2**
160	-13.4	-0.1
200	-10.9	0
250	**-8.6**	**0**
315	-6.6	0
400	-4.8	0
500	**-3.2**	**0**
630	-1.9	0
800	-0.8	0
1,000	**0**	**0**
1,250	+ 0.6	0
1,600	+ 1.0	-0.1
2,000	**+ 1.2**	**-0.2**
2,500	+ 1.3	-0.3
3,150	+ 1.2	-0.5
4,000	**+ 1.0**	**-0.8**
5,000	+ 0.5	-1.3
6,300	-0.1	-2.0
8,000	**-1.1**	**-3.0**
10,000	-2.5	-4.4
12,500	-4.3	-6.3
16,000	**-6.6**	**-8.5**
20,000	-9.3	-11.2

*Note: Center frequencies of 1/1 octave bands appear in bold.

After: The Science and Applications of Acoustics. Daniel R Raichel. Springer. 2000.

METER AND WEATHER REQUIREMENTS

A. General Instrumentation Requirements:

1. **Sound Level Meter**
   - Must meet the specifications of ANSI S1.4-1983 or its successor
   - Type II (General Purpose) or Type I (Precision)

2. **Sound Level Calibrator**
   - Must meet the recommendation of the sound level meter manufacturer

3. **Windscreen**
   - Must meet the recommendation of the sound level meter manufacturer
   - May be spherical or cylindrical
   - Made of foamed polyvinyl, open-celled polyurethane or silk covered grid.
   - Should not distort microphone frequency response by more than:
     +/- 1.0 dBA Frequency: 20-4,000 Hz
     +/- 1.5 dBA Frequency: 4,000-10,000 Hz

4. **Wind Speed Indicator**
   - Pressure tube or rotating vane anemometer
   - Manufacturer must provide accuracy rating in MPH or percent
   - There are relatively inexpensive handheld weather meters available (ex. "Kestrel 3000 Wind Meter," [no endorsement implied]) which can quickly determine wind speed, temperature and relative humidity in the field.

B. Weather Conditions:

1. **Wind**
   - Always use windscreen. A sound level meter can misread wind pressure as sound pressure and introduce significant error. A windscreen can also provide some protection to the microphone from dust and accidental impacts.
   - Windspeed must be measured at the time and place of sound level measurements.
   - Do not take sound level measurements when the windspeed exceeds the manufacturer's recommendations for the meter and the specific windscreen employed. Generally, the limit is 12 MPH. Some manufacturers offer windscreens that can be used up to 25 MPH.

2. **Temperature**
   - At high temperatures the sensitivity of the meter can be permanently altered.
   - Low temperatures affect batteries and other electrical components
   - The meter should be calibrated when its internal temperature is close to the ambient temperature at which it will be used.
   - The ANSI standard states that measurements may not be taken when the ambient temperature is below 14°F or above 122°F .

3. **Humidity**
   - Most sound level meters can be operated up to 90-95% relative humidity.
   - Condensation can cause arcing which results in false readings. The error is not subtle, and will be obvious.

4. **Precipitation**
   - Measurements should not be taken under any condition which allows the meter to become wet, such as rain, snow or condensation, unless specifically equipped to do so.
   - Even if your jurisdiction's code does not prohibit measurements during precipitation, do not use the meter beyond the parameters recommended by the manufacturer (fog, rain, snow). If these parameters are met, readings may be taken while protecting the meter and the microphone. All readings must be taken in a similar manner.
   - Instruments are not waterproof. Waterproof housings are available for some units from the manufacturer for the meter and the microphone.
   - The ambient sound levels are significantly higher when it's raining down on horizontal sheet metal surfaces such as automobiles and air conditioners.
   - Wet pavement can cause higher sound level readings (tires, etc.).

5. **Electromagnetic Fields**
   - Do not take readings immediately next to electrical transformers, radio or television transmission towers, or power lines, unless the manufacturer states that the meter is properly shielded. These may contribute to internal electrical noise of the sound level meter.

KNOW YOUR METER.
READ YOUR MANUAL.

ALWAYS ASSUME THAT COUNSEL FOR THE DEFENSE HAS.

1. **Is a warm-up period required for the meter and the calibrator?**

- Older meters may require a warm-up period of up to 30 seconds.
- Newer meters usually require at most a five second warm-up.

2. **What scale must you employ for calibration?**

- Newer meters generally specify calibration on the A-scale.

3. **At what angle should you hold the microphone with relationship to the sound source?**

- The angle is specific to the microphone, and some meters can be supplied with a range of microphones.

4. **What is the stated accuracy of your meter?**

- ANSI S1.4-1983 specifies that a Type I meter should have an accuracy of +/- 1 dB or better, and a Type II meter should have an accuracy of +/-2 dB or better.
- Newer meters often exceed ANSI standards.
- Know that in court it may be assumed that the meter is reading high, at the maximum of the accuracy range. Take this into consideration when determining whether to proceed to prosecution.

5. **Octave Band Analysis**

- Does your meter automatically reset to "linear, "flat," or "Z-scale" when you engage the octave filter? Some do not, and if you do not manually select unweighted measurements, you may be taking A-weighted octave band sound pressure level measurements. These measurements can not then be used for enforcement purposes, without correction.
- Conversely, if necessary, make sure to reset your meter for A-weighting when returning to broadband measurements. Otherwise, you will be taking unweighted broadband measurements which will be unusable for enforcement purposes.

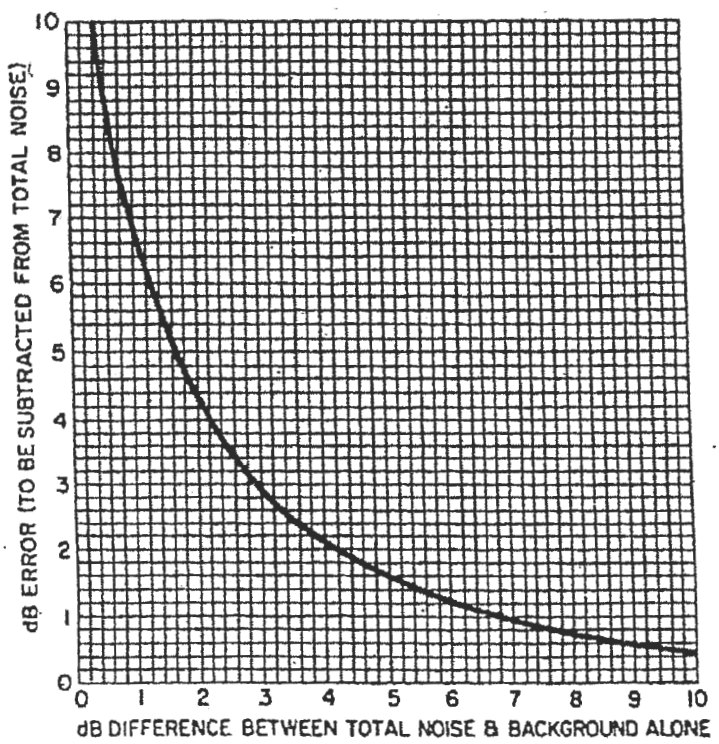
CALCULATING SOURCE SOUND LEVELS

How do you subtract out the ambient (background) sound?

Table 1
Correction for Ambient Sound Levels (ASL) in Decibels
Determining the Corrected Source Level (CSL) to Report on Form

Difference Between Total Sound Level and Ambient Sound Level (in dB)	Correction Factor to Be Subtracted From Total Sound Level (TSL) to Calculate Corrected Source Level (CSL)	Action
0-2	Source < Ambient, therefore unenforceable	Write "UE"
3	3 (but source would equal ASL)	Write "UE"
4,5	2	Do math
6-9	1	Do Math
10 or more	0	Report TSL as CSL

Adapted from:
Handbook of Environmental Acoustics. James P. Cowan, 1994.
Van Nostrand Reinhold, New York. ISBN 0-442-01644-1



From: Handbook of Noise Measurement. Arnold P.G. Peterson. 1980. GenRad, Concord, MA.

CALCULATING SOURCE SOUND LEVELS
FROM BACKGROUND AND TOTAL MEASUREMENTS
-or -*SUBTRACTION OF SOUND LEVELS*

When you're in the field, you take two types of measurements: ***ambient*** and ***total***. From these measurements you have to *calculate* the source sound level. The potential violation is based solely on the level of noise being emitted from a specific activity; you can't fine someone because they 're operating in a noisy neighborhood. Yet, you can't directly measure the sound level from the activity in question. That's why you have to subtract the ambient from the total to determine the source sound level.

Here's how it's done:

1. Subtract the ambient level from the total noise level. (total - background = "X").
2. Using Table I on the previous page, find "X" in the left hand column.
3. Match "X" to a number in the right hand column.
4. Subtract the number in the right hand column from the total noise level.
5. The number you now have is called the *CORRECTED (SOURCE) LEVEL*, and this is the number that you record on the Noise Report Form.

Example A

1. You have a total sound level of 69 dBA, and a ambient level of 63 dBA.

2. 69 dBA - 63 dBA = **6** dB. This is "X", the number you look for in Table I, left column.

3. 6 dB in the left column gives you 1 dB in the right column.

4. Subtract 1.0 dB from the TOTAL SOUND LEVEL to get the CORRECTED SOURCE SOUND LEVEL.

69 dBA - 1 dB = 68 dBA **the CORRECTED SOURCE LEVEL **

Example B

1. After measuring the ambient sound level decide which sample set or range you want to use as your ambient. A source-off measurement is always used if possible.

Example:	52 - 56 dBA	
	51 - 55 dBA	
	54 - 57 dBA	CHOOSE THIS ONE

(Continued)

CALCULATING SOURCE SOUND LEVELS
(Continued)

Now, remember - you must use the higher number in an ambient set, so the number that you'll use for all further calculations is 57 dBA

AMBIENT = 57 dBA

2. You will have a series of total sound measurements taken while the sound source is on, at the point of the complaint. Let's say one set of readings gives you a total range of 61 - 64 dBA.

3. To determine the corrected source level, perform the subtraction: 64 dBA - 57 dBA = 7 dB. Look at Table I, and you'll see that 7 dBA in the left column gives you 1 dBA in the right column.
64 dBA - 1 dBA = 63 dBA THIS IS THE CORRECTED SOURCE LEVEL

This is what is reported on the Noise Measurement Report, and compared to the permissible limits.

Example C:

Ambient 62 dBA
64 You choose this Ambient, the highest, then apply it to ALL of the Totals below.
63

Total		CORRECTED SOURCE SOUND LEVEL (dBA)
69 dBA	69-64 = 5	69 - 2 = 67
71	71-64 = 7	71 - 1 = 70
77	77-64 = 13	77
67	67-64 = 3	-- (Unenforceable)

IMPORTANT NOTES:

1) If "X" is 10 dB or greater, THEN NO CORRECTION IS NECESSARY. TOTAL = SOURCE.

2) If "X" is less than 3 dB, it means that the source sound level is at or below the background level. Many jurisdictions simply write "U.E." (unenforceable), or "--", or simply leave it blank.

3) *Do not include* your calculations to find "X" on your report form [it just clutters it up]..
Do include any calculations, if necessary, for arriving at the corrected source.

SEE SAMPLE REPORT FORM

DETERMINATION OF AMBIENT SOUND LEVELS

There are two critical reasons you need to accurately determine the Ambient Sound Levels (ASL).

- Some provisions set the Permissible Sound Level Limit (PSL) relative to the ASL.
- You must determine the Source Sound Level of the source under investigation and almost every sound source you will investigate occurs within a complex acoustical environment.

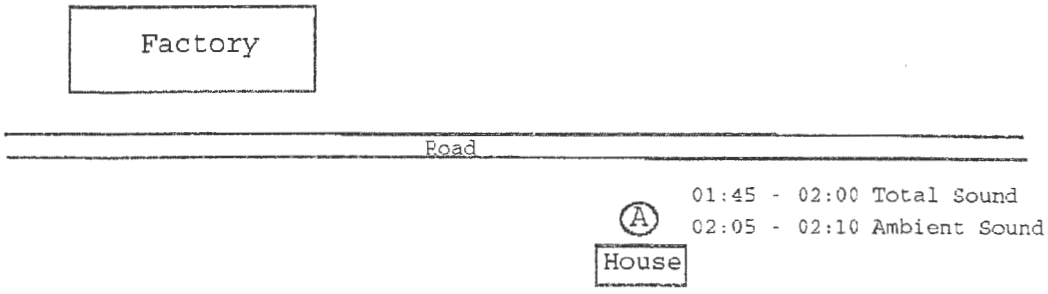
Your goal is to isolate and quantify the sound levels of that sound source, alone. In order to accomplish that, you must accurately assess and measure the ASL. The ASL is the sound level of all the sound sources that are relatively constant when observed from the location on the complainant's property from which the investigation will be conducted. These sound levels exclude sound from the source under investigation, as well as extraneous sounds which are relatively intense and of short duration (such as airplanes, unmuffled vehicles, etc.).

While taking your measurements, you have to note which sounds constitute the ASL, and which are to be classified as extraneous. Remember, the only ASL sounds that matter are those impacting on the precise location at which you are measuring the source sound level (Total Sound Levels) (TSL). It doesn't matter whether there's an active cement plant three blocks over if you can't hear it on the complainant's property.

OUTDOORS

Source-Off measurements are obviously the truest measure of the ASL. The approach is simple: you take a measurement of the sound levels when the sound source under investigation is not operating, at the same location on the complainant's property at which the TSL measurements were conducted.

If the hours of operation are known:



Source-off (SO) measurements are always preferable to any other method. Many strategies can be employed to collect such data:

- Very simply, ask the source to terminate operations for a few minutes. If they can, they have to

- If you know the hours of operation of the source, schedule the measurements so that you can take SO measurements prior to operations or after they terminate for the day (see illustration, previous page).

- If you can discern a duty cycle for the equipment, then take ASL measurements during a low- or off-cycle period. Air compressors turn off after re-pressurizing the tank. HVAC and refrigeration equipment is often controlled by a thermostat. Once demand is satisfied, the unit throttles down or off, affording an opportunity to measure ASL. Some equipment is completely demand operated, such as a garage door opener. If possible, position yourself where you can observe the location from where the demand will arise (in this case, a view of the driveway), and be prepared to conduct your ASL and TSL measurements based upon your observations.

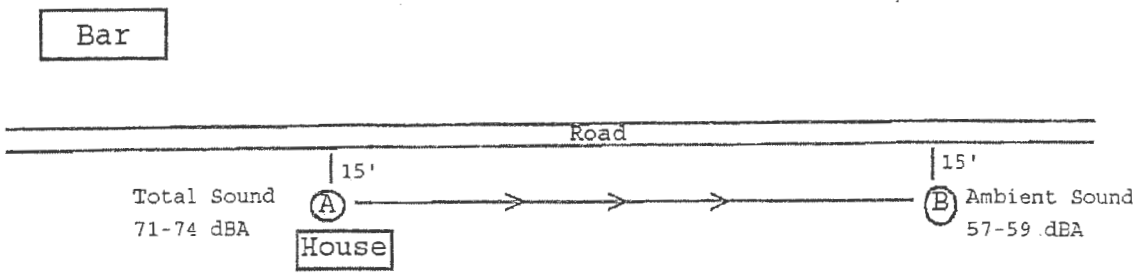
- If the duty cycle of a device is demand driven, it may be weather dependent, and thus more predictable. Any device that provides chilling or cooling may be forced to operate non-stop when the temperature and humidity are high, precluding the collection of SO data. Conversely, if the temperature and humidity are lower, the unit may occasionally cycle off providing an opportunity to collect SO data. If the investigation can wait, scheduling it based upon weather reports may well increase the possibility of SO measurements.

- A useful strategy is to ask the complainant to keep a log of their observations of the sound source and its emissions. Explain that the log will aid you, increasing the possibility of a fruitful investigation and that you need an opportunity to measure the source when it is operating at full load, and also the ambient levels when it is off. If the source is only intermittent in its operation, their records will increase the possibility that you will be there to measure it. Conversely, if the source tends to run relatively constantly, their log may allow you to predict a time when you will be able to collect SO measurements. Their records should include: their subjective evaluation of the relative sound level; day of the week; time of the day; weather conditions; and, any other conditions that they think may be relevant. These records may also assist in establishing a pattern for the purposes of prosecution.

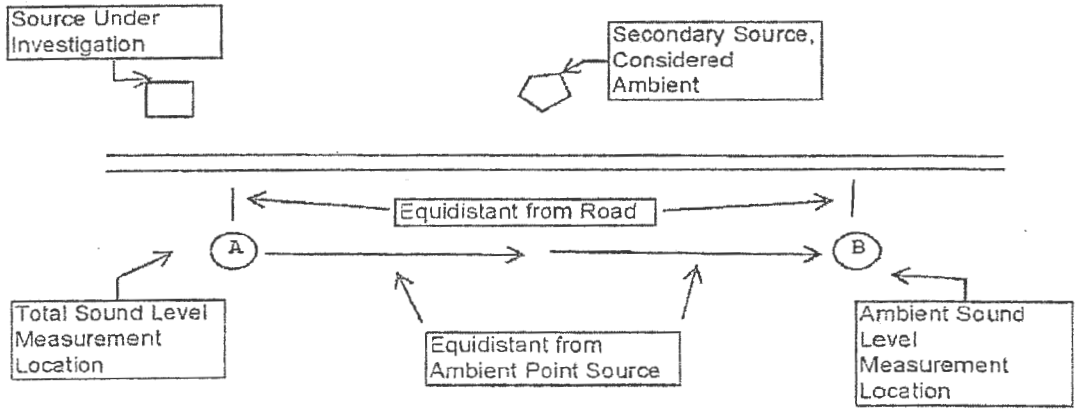
- Sources which emit fluctuating sound levels, such as music, will usually offer short periods of time when the sound levels drop considerably. This may occur: between sets; when a song is winding down; or, a relatively quiet vocal passage in an otherwise loud instrumental piece. Remain aware and vigilant for such an opportunity and jump on it when it presents itself.

- Source sound levels may increase significantly when a door is opened regularly, or a thermostatically-controlled fan opens louvers. You may find this at facilities such as a distribution center, bar, workshop, or garage. Even if the sound source inside is audible or loud when the building is closed, the sound levels may increase by more than the permissible limit when the door opens. If, every time they open the door, the sound levels jump by 15 dBA, then it is essentially irrelevant what the 'true' ASL is; the facility is in violation. Note how often the door is opened and for how long the sound level remains elevated.

Walk Away measurements are one of the methods that can be used when the sound source under investigation can not be turned off. If the primary source of ambient sound is steady traffic on the immediately adjacent road, you simply walk along the sidewalk, away from the source under investigation, remaining equidistant to the road (see illustration). Walk away, noting the drop in the sound level as the influence of the source sound emissions wane. Record the meter reading when it levels off. If you walk towards a new sound source of significant intensity that was not present at the location of the TSL measurements, then these measurements should not be used.



What do you do when there's a point source of ambient sound, such as a second bar or a chiller on a nearby building? It is critical that the ASL measurement location is the same distance from that
(cont'd)

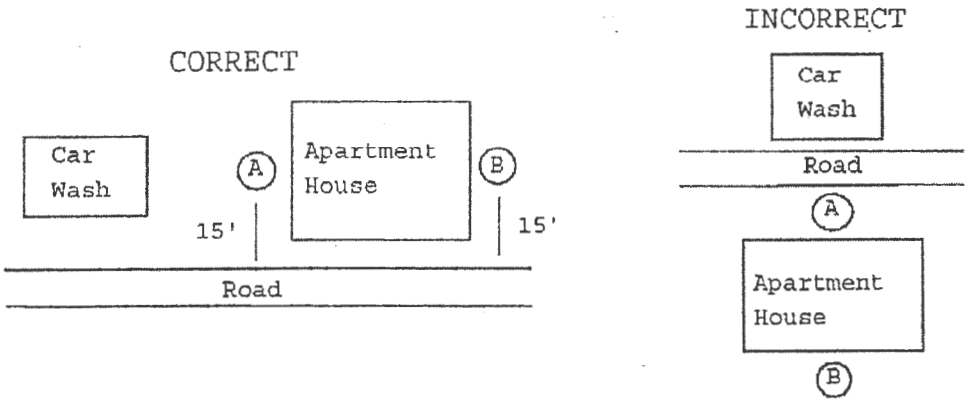


point source of ambient sound as was the location at which you conducted your TSL measurements. In the illustration above, the TSL measurements include the following sound sources: 1) the source under investigation; 2) the steady traffic on the roadway – an ambient source; and, 3) some point source of ambient sound, such as a nearby chiller. The ASL at this location consists of #2 and #3, and you must properly measure them. If you can't get a source-off measurement, then a walk-away can serve the purpose well. Walk away from the source under investigation, along the sidewalk, until you are perpendicular from the point source of ambient sound, and then walk the same distance beyond that source. Make sure that you are the same distance from the road, and this is the location from which the ASL measurements can be taken. Show the detail on your Report Form, and be prepared to articulate how this location for ASL measurement properly represented the ambient sounds impacting on the location at which you conducted your TSL measurements.

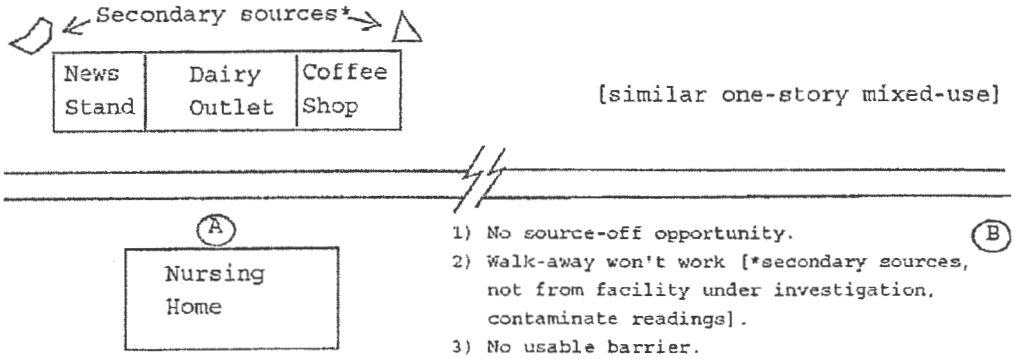
What if there's no road, only some point source of ambient sound? Simply take your ASL measurements on the 'other' side of the ambient point source; at the same distance you were when

you conducted your TSL measurements. Always think: "equidistance - - am I at the same distance from the ambient source?" Be prepared to articulate this in court.

Behind Barrier measurements work when the barrier blocks your line of sight to the source under investigation, but not to the primary source of ambient sound.



Similar Neighborhood measurements may be taken if all other methods are unsuccessful. You must make sure that you remain equidistant from the primary source of ambient sound (such as two blocks from a major road), and in an area where the makeup of the buildings is the same as in the location at the complainant's property.



INDOORS

The same basic requirements apply to ASL measurements conducted indoors as do to outdoor measurements.

- *Source-off measurements are always preferable to any other method.*

- The sound from the source under investigation should have as little influence as possible on measurements of ASL. That does not mean, however, that the source under investigation must be completely inaudible.

- The measurement of ASL must include all ambient sounds that were present when the measurements of Total Sound were conducted. For example, if the measurements of Total Sound included traffic outside or air handling inside, then the measurements of ASL must

contain these, as well. Thus, you can't use ASL measurements taken in a sheltered interior hallway if Total Sound measurements were taken in a bedroom whose single-pane windows overlook a busy street, filling the room with traffic noise.

- If a SO measurement is not possible, carefully consider what alternative location will yield acoustical conditions that are substantially the same as those at the location at which you measure the Total Sound Levels.

  If forced to choose between two poor choices – ASL measurements in a location which is too sheltered, or, ASL measurements in a location which is somewhat contaminated with sound from the source – choose the latter. You must err to the benefit of the potential violator. A higher ASL is to their benefit. That said, don't 'give away the store'.

REMEMBER - accurate measurement of the Ambient Sound Level is absolutely critical to assessing the sound levels emanating from the sound source under investigation, and determining the Permissible Sound Level Limit.

PROCEDURE
FOR THE COMPLETION OF
A NOISE MEASUREMENT REPORT

Alaska[1]

NOTE: The procedures outlined within this section should all be performed during an investigation, but they do not necessarily have to be performed in any given order. It is important for you to know what data must be collected for a valid investigation, and then gather that data in the order in which it presents itself during the flow of the investigation.

1. While not necessarily required to complete the field form, make sure you know what provision within your code applies to the source you're investigating. This is almost certain to influence your data collection in such critical areas such as: the measurement metric (dBA, dBC, Lmax, "plainly audible", etc.,); the duration of the measurements; and, the location of regulatory compliance measurements.

2. Survey the site on foot to confirm that the suspected source is the actual source (a walk-around), and to determine the best locations from which to measure neighborhood residual and background sound levels. If the suspected source is proven to be the source, draw a map of the site on the back of the report form, including the path of the walk-around, the source and the exact points of measurement.

3. Record the name and address of the property from which the sound is being emitted, including street number if possible. If the source is not a fixed property, attempt to describe it with identifying characteristics, such as license plate number, and vehicle make and model.

4. Fill in day and date of measurement

5. Fill in your name and agency

6. List the name and title of any responsible party who has been notified of the investigation. Attempt to notify a representative of the management of the facility.

7. Describe the noise sources under investigation, including the location of the noise source, the operation of the facility or noise source, and if this measurement represents the normal operation of the noise source. Note whether the sound emissions are continuous or non-continuous, and whether they arise from an amplified source or not. If amplified, is the source commercial or non-commercial? Is the source an extended hours liquor establishment? Do the source and the receptor share a common wall? **These factors may influence the required measurement methods and permissible limits** (see your code).

8. Describe any ambient sounds which are fairly constant, including their location. Once you have categorized a specific sound as being background (or ambient) you must be careful to include it in all of your measurements.

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[1] As this course is attended by two jurisdictions with distinctly different noise codes, it is not possible for these guidelines to be specific to any one code. Please make certain to follow the requirements of *your* code.

9. Describe any extraneous sound which are intermittent, intense and of short duration. These sounds are noted but are specifically excluded or ignored when taking either total or background sound level measurements.

10. Provide a description of the sound level measurement equipment being used including manufacturer, model number, serial number, and the date of last calibration.

11. Conduct and report the times of field calibration and battery checks, which must be before, after and at least as often as required by the jurisdiction's code. In general, it is best to calibrate every hour.

Such *field calibration checks are absolutely required for a valid noise measurement form.*

12. Report whether there was precipitation or if the ground is wet. Measure and report wind velocity, with the time.

13. Measure and report ambient sound levels. The ambient sound levels may be measured by one of the following methods:

- **Source off - the preferred method**
- Walk away
- Behind barrier
- Similar neighborhood

Ambient sound level is measured as follows:

Ambient sound level measurements shall be conducted while the source under investigation is not operating, at the same location at which source sound level measurements are made. If this is not possible, ambient sound level measurements may be taken at an alternative location which should be as close as feasible to the location where the source sound levels are measured, but so located that the sound from the source has as little effect on the background sound level measurements as possible. The primary source of ambient sound must be equidistant to the location of the source sound level measurements and any alternate location for ambient sound level measurements. Any ambient sound level measurements must be made prior to or following any set of source sound level measurements.

- Determine the appropriate settings for the meter:
  - measurement scale (dBA, dBC, etc.)
- Take a sound level measurement using one of the above methods.
- Note which ambient measurement method was used.
- Record the reading for the measurement (ex. 51.7 dBA Lmax).
- Note the location of the measurement and any relevant comments.
- Record finish time.
- Determine which ambient measurement is to be used for the purposes of correction based on the following criteria:
  - **Source off is always to be used, if it is available.** Use the highest source off, being careful to exclude measurements that may include extraneous sounds.
  - All other ambient measurement methods are equivalent, and the highest is used, again, excluding any that may contain extraneous sounds.
- Circle the ambient level used for correction purposes on the form.

14. Measure and report the Total Noise levels.

- Determine the appropriate settings for the meter:
  - measurement scale (dBA, dBC, etc.)
- Record starting time.
- **Make certain that you are measuring sound levels that represent the normal and usual operations of the source under investigation.** Do not include accidental impacts or the like. Be fair.
- Take several sound level measurements at the location that is appropriate for your specific investigation, as required by your code. Generally, this is at or within the property of a complainant.
- Record the specific location of the measurement (on the site map) and any relevant comments (on the form).
- Record the sound level for the measurement (ex. 71 dBC), and the specific times of the reading.
- Record finish time, and the duration of the measurement. Make sure the total duration of your measurements are sufficient to determine compliance with the specific provision of the code
- At each location, subtract (using the decibel subtraction technique) the maximum ambient level from the total noise level to obtain the corrected (source) level, as dictated by the provision you are enforcing.
  - You may only 'correct' A-scale total measurements with A-scale background measurements, and you may only 'correct' C-scale total measurements with C-scale background measurements.
- This calculated number is the source sound level and should be compared to the permissible limits in the ordinance being enforced, to determine if a violation exists.
- IMPORTANT NOTE: If the provision you are enforcing specifies a limit that sound source may not raise the Total Sound Level, or Ambient Sound Level, then you may not have to calculate the Corrected Source Level. You may only have to calculate the increase of sound levels between when the source is on and when it is off (i.e., simple subtraction). We will discuss this point extensively in the course.

15. Report your findings, specifically noting whether there was a violation of the code, and what provision was violated. Note whether the permissible limit was adjusted due to some characteristic of the sound such as duration.

A statement of impact may have value here, such as: "the sound was not only loud, the bass line of the music could be felt"; "the sound actually startled me when the unit kicked into operation"; "pedestrians crossed the street to avoid the noise"; "the sound level inside the bedroom exceeded the permissible limit, and not only could it have disrupted sleep, it even made conversation difficult" etc. Speak to the reasonableness of the noise, if you can

16. Sign form

17. Submit form for review and approval (if necessary), and enforcement action if appropriate.

The better prepared you are to go to court, the less likely it is to happen. A well executed and documented investigation can prove very intimidating.

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NOISE MEASUREMENT REPORT

Name/Address of Sound Source
LAKEVIEW LOUNGE & MARINA
732 LAKE ST
WASILLA, AK

Date of Measurement 2/3/13 **Day of Week** SAT
Investigator JINNY DECKBER
Name and Title of Responsible Party if Advised of Complaint:
MR. LOUDEN OBNORKSHUS, OWNER

Description and Location of Sound Sources to be Measured, Including Operation of Facility, and if this Represents the Normal Operation of the Facility:
BAR WITH AMPLIFIED MUSIC ON OUTDOOR OPEN DECK. COMPLAINANT STATES RECORDED MUSIC STARTS AT 7:00 PM, BANDS START AT 10:00 PM. OFTEN MUSIC CONTINUES UNTIL 2:30 AM.

Description and Location of Neighborhood Residual Sounds, Fairly Constant in Nature (included in all measurements):
STEADY TRAFFIC ON PARKS HWY.

Description and Location of Extraneous Sounds, Intermittent in Nature. Not from Source Facility (excluded from all measurements): UNMUFFLED VEHICLES ON PARKS HWY. ALL LOCAL TRAFFIC ON LAKE ST, S. WILLOW ST, PARK AVE, SUSITNA AVE. AIRCRAFT, BARKING DOG, TRAIN

Description of Instrumentation:

	Make, Model#, ANSI Type	Serial #	Last Certified
Sound Level Meter	ACME 247 TYPE II	3734	11/14/12
Sound Level Calibrator	ACME CAL 62	11596	11/14/12

Wind Screen (yes/no) Y Wind Meter (y/n) Y Other —
Time of Calibration/Battery Checks (Before, After, Every Hour) 01:16

Weather Conditions: Precipitation (y/n) N Ground Wet (y/n) N Temperature: 65° °F
Wind Velocity, With Time Taken 1.4-2.3 MPH 01:17 2.4-3.6 MPH 01:48

Measurement of Ambient Sound:

Time	Level (dB) C	Type of Residual (source off, etc.)	Location of Measurement/Comments
01:21	60	SOURCE OFF	A BETWEEN SONGS
01:25	59	" "	A " "
01:30	61	" "	A " "

Measurement of Total Sound:

Time	Level (dB) C	Corrected (Source) Level	Δ Above Ambient	Location of Measurement /Comments	
01:18	66	66-1 = 65	4	A	
01:19	69	69-1 = 68	7	A	
01:20	65	65-2 = 63	2	A	
01:22	72	72	11	A	LOUD PASSAGE
01:24	74	74	13	A	" "
01:27	65	65-2 = 63	2	A	QUIET SONG
01:28	64	—		A	QUIET SONG

Findings MUSIC WAS IN VIOLATION OF 8.52.015(D). LIMIT IS 3 dB(C) ABOVE AMBIENT AT THIS TIME OF NIGHT LEVELS OF AS MUCH AS 11, 13 ABOVE AMBIENT WERE DOCUMENTED

Case Disposition

Sound Measured By: Johnny Deckbel

Report Reviewed and Approved By (If Necessary): Bobby Bagbaso

INCLUDE SITE SKETCH ON REVERSE (with source, walk-around route, and exact measurement locations)

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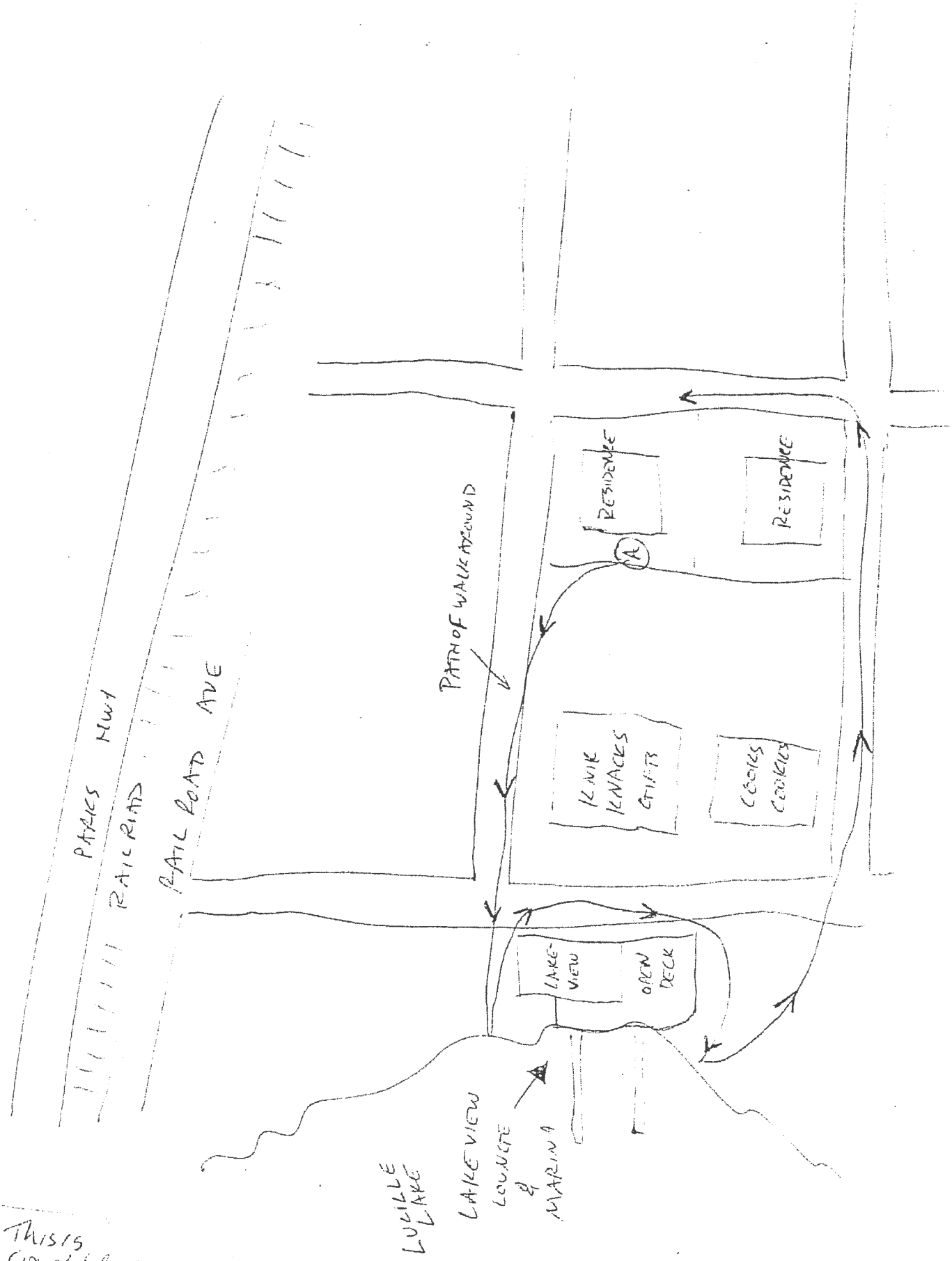

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OR 20-025
IM 20-047

32

NOISE MEASUREMENT REPORT

Name/Address of Sound Source
WEST MEADOW
IDITA PARK
500 W. NELSON AVE
WASILLA

Date of Measurement 7/27/13 **Day of Week** SAT
Investigator SALLY QUIET
Name and Title of Responsible Party if Advised of Complaint:
ROBERT REDLINE, OWNER

Description and Location of Sound Sources to be Measured, Including Operation of Facility, and if this Represents the Normal Operation of the Facility:
RADIO CONTROLLED MODEL CAR RACING LAPS IN OPEN MEADOW
COMPLAINTS RECEIVED FROM PEOPLE AT WONDERLAND, CHILDRENS
STORY TELLING AND AT THE POND NEXT TO WEBER DRIVE. MODEL CAR
IS LOUD AND WHINING, LIKE AN ANGRY WEED WACKER

Description and Location of Neighborhood Residual Sounds, Fairly Constant in Nature (included in all measurements):
GENERAL BUZZ OF PEOPLE TALKING LAUGHING, ETC. STEADY TRAFFIC
ON NELSON. LEAVES RUSTLING IN STEADY LIGHT WIND

Description and Location of Extraneous Sounds, Intermittent in Nature, Not from Source Facility (excluded from all measurements): ESPECIALLY LOUD PEOPLE, UNMUFFLED VEHICLES ON NELSON, ALL TRAFFIC
ON WEBER. SEAGULLS

Description of Instrumentation:

	Make	Model#	ANSI Type	Serial #	Last Certified
Sound Level Meter	NASH	1530	TYPE 1	737425	6/11/12
Sound Level Calibrator	NASH	CL		42251	6/11/12

Wind Screen (yes/no) Y Wind Meter (y/n) Y Other
Time of Calibration/Battery Checks (Before, After, Every Hour) 1:32 PM
Weather Conditions: Precipitation (y/n) N Ground Wet (y/n) N Temperature: 78 °F
Wind Velocity, With Time Taken 4-7 MPH 1:33 PM

Measurement of Ambient Sound:

Time	Level (dB)(A)	Type of Residual (source off, etc.)	Location of Measurement/Comments
1:45	57	SOURCE OFF	A STOPS RACING
1:52	55	SOURCE OFF	B FOR SOME REASON
1:59	56	SOURCE OFF	C

Measurement of Total Sound:

Time	Level (dB)(A)	INCREASE OF AMBIENT ~~Corrected (Source) Level~~	Location of Measurement /Comments
1:43	68	68-57= 11	A
1:44	71	71-57= 14	A
1:49	63	63-55= 8	B
1:50	65	65-55=10	B
1:54	62	62-56= 6	C
1:55	64	64-56= 8	C

Findings MODEL CAR IN VIOLATION OF 8.52.015(E) LIMITING INCREASE IN AMBIENT LEVELS OF 5 dB(A) EXCEEDANCES OF THIS LIMIT FOUND AT ALL LOCATIONS MEASURED. PEOPLE IN PARK CAME UP TO ME TO COMMENT & COMPLAIN ABOUT RC MODELS IN PARK

Case Disposition

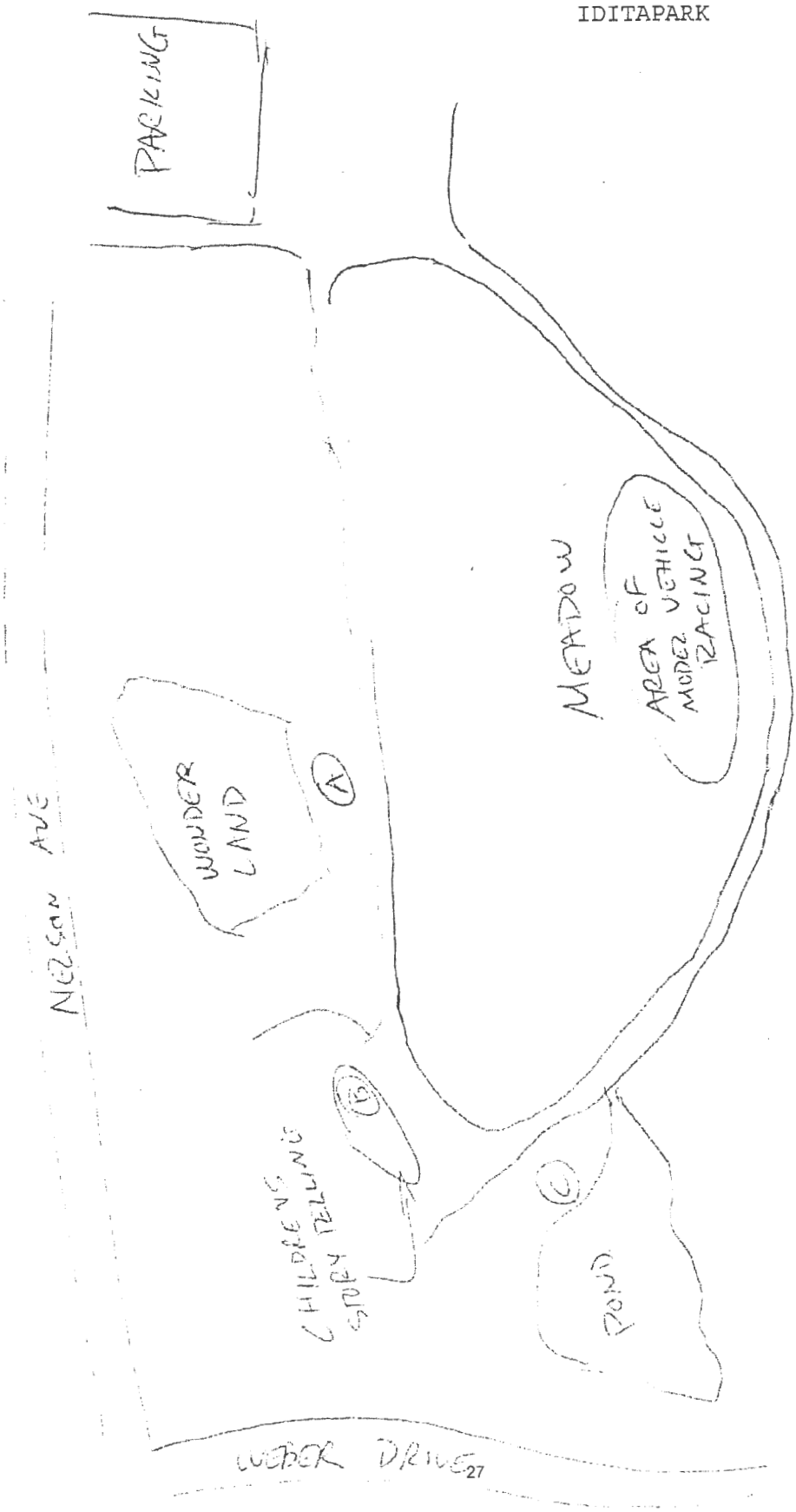
Sound Measured By: Sally Quiet

Report Reviewed and Approved By (If Necessary): Art Carney

INCLUDE SITE SKETCH ON REVERSE (with source, walk-around route, and exact measurement locations)

33

IDITAPARK



OR 20-025
IM 20-047

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NOISE MEASUREMENT REPORT

Name/Address of Sound Source
MUDF ATS MOTORWASH
1702 LAKE OTIS PKWY
ANCHORAGE

Date of Measurement 9/31/12 Day of Week WED
Investigator BOBBI METERMAN
Name and Title of Responsible Party if Advised of Complaint:
DOM DEZONISE MANAGER

Description and Location of Sound Sources to be Measured, Including Operation of Facility, and if this Represents the Normal Operation of the Facility:
CAR WASH WITH WATER JETS, FANS, BLOWERS AND SELF-SERVE VACCUMS.

Description and Location of Neighborhood Residual Sounds, Fairly Constant in Nature (included in all measurements):
STEADY TRAFFIC ON LAKE OTIS PKWY AND C 36TH AVE IN DISTANCE. CROWD NOISE FROM WATER POLO GAME ON LAKE OTIS. HVAC ON NORTHERN LIGHTS

Description and Location of Extraneous Sounds, Intermittent in Nature, Not from Source Facility (excluded from all measurements): UNMUFFLED VEHICLES ON LOCAL ROADS, ALL TRAFFIC ON STANFORD DRIVE CROWD YELLING AT SCORING IN POLO GAME ON LAKE OTIS. BARKING DOG

Description of Instrumentation:

	Make	Model#	ANSI Type	Serial #	Last Certified
Sound Level Meter	ANDERSON LX		TYPE I	115495	3/2/12
Sound Level Calibrator	ANDERCAL			74748	3/2/12

Wind Screen (yes/no) Y Wind Meter (y/n) Y Other —
Time of Calibration Battery Checks (Before, After, Every Hour) 2:45 PM 3:05 PM

Weather Conditions: Precipitation (y/n) N Ground Wet (y/n) N Temperature: 57 °F
Wind Velocity, With Time Taken <2MPH 2:46 PM <2MPH 3:07 PM

Measurement of Ambient Sound:

Time	Level (dB) A	Type of Residual (source off, etc.)	Location of Measurement/Comments
2:50	61	SOURCE OFF	A NO ACTIVITY
2:51	65	" "	A " "
2:56	63	" "	A " "

Measurement of Total Sound:

Time	Level (dB) A	Corrected (Source) Level	Location of Measurement /Comments
2:46	68	68-2=66	A
2:47	69	69-1=68	A
2:48	67	67-2=65	A
2:52	74	74	SELF SERVE VACCUM
2:53	76	76	" " "
2:54	80	80	" " "
2:59	69	—	LOW LEVEL ACTIVITY
3:00	82	82	BLOWER

Findings CAR WASH IN VIOLATION OF 15.70.030(A) PERMISSIBLE LIMIT IS 65 dB(A) COMMERCIAL SOURCE - RESIDENTIAL RECEPTOR

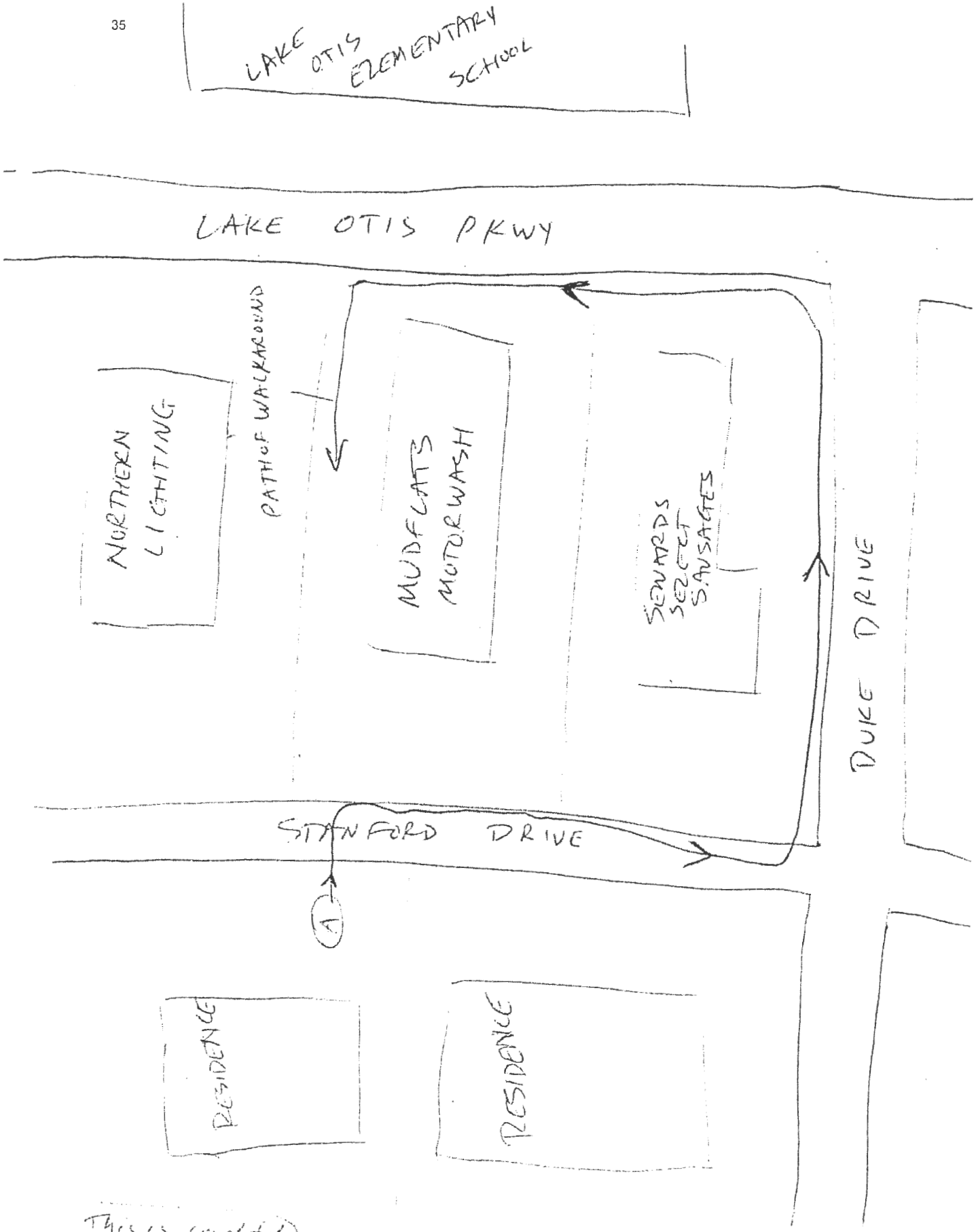
Case Disposition

Sound Measured By: Bobbi Meterman

Report Reviewed and Approved By (If Necessary): James T Kuk

INCLUDE SITE SKETCH ON REVERSE (with source, walk-around route, and exact measurement locations)

35



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NOISE MEASUREMENT REPORT

Name/Address of Sound Source
TUDOR CLEANERS
712 E. TUDOR RD
ANCHORAGE

Date of Measurement 8/17/12 **Day of Week** WED
Investigator
NANCY NOISESTUFFER
Name and Title of Responsible Party if Advised of Complaint:
IMA RUCKUS OWNER

Description and Location of Sound Sources to be Measured, Including Operation of Facility, and if this Represents the Normal Operation of the Facility:
DRY CLEANER WITH EXHAUST DIRECTED AT APARTMENT COMPLEX. SOUNDS LIKE STEAM ESCAPING WITH LOUD HISSING

Description and Location of Neighborhood Residual Sounds, Fairly Constant in Nature (included in all measurements):
STEADY TRAFFIC ON E. TUDOR RD. HUM OF ACTIVITY IN SACHMEYER SUPERMARKET PARKING LOT. HVAC ON ROOF OF SACHMEYER

Description and Location of Extraneous Sounds, Intermittent in Nature, Not from Source Facility (excluded from all measurements): TRUCKS WITH ENGINE COMPRESSION BRAKES (JAKE BRAKES) CAR DOORS SLAMMING IN APT PARKING LOT

Description of Instrumentation:

	Make	Model#	ANSI Type	Serial #	Last Certified
Sound Level Meter	KOHAKU	1650	II	4278932A	6/10/12
Sound Level Calibrator	KOCAL	125		429315A	6/10/12

Wind Screen (yes/no) Y Wind Meter (y/n) Y Other —
Time of Calibration/Battery Checks (Before, After, Every Hour) 6:35 PM

Weather Conditions: Precipitation (y/n) N Ground Wet (y/n) N Temperature: 67 °F
Wind Velocity, With Time Taken 6:48 PM 2-4 MPH

Measurement of Ambient Sound:

Time	Level (dB)	Type of Residual (source off, etc.)	Location of Measurement/Comments
6:54	60	BEHIND BARRIER	B
6:55	64	" "	B
7:01	(63)	SOURCE OFF	A CLEANER CLOSED AT 7:00 PM

Measurement of Total Sound:

Time	Level (dB)	Corrected (Source) Level	Location of Measurement /Comments
6:46	72	72-1 = 71	A
6:48	72	72-1 = 71	A
6:49	72	72-1 = 71	A
6:59	72	72-1 = 71	A

Findings CLEANER IN VIOLATION OF 15.70.030 (A). PERMISSIBLE LIMIT IS 65 (dBA) FOR RESIDENTIAL RECEPTOR FROM COMMERCIAL SOURCE.

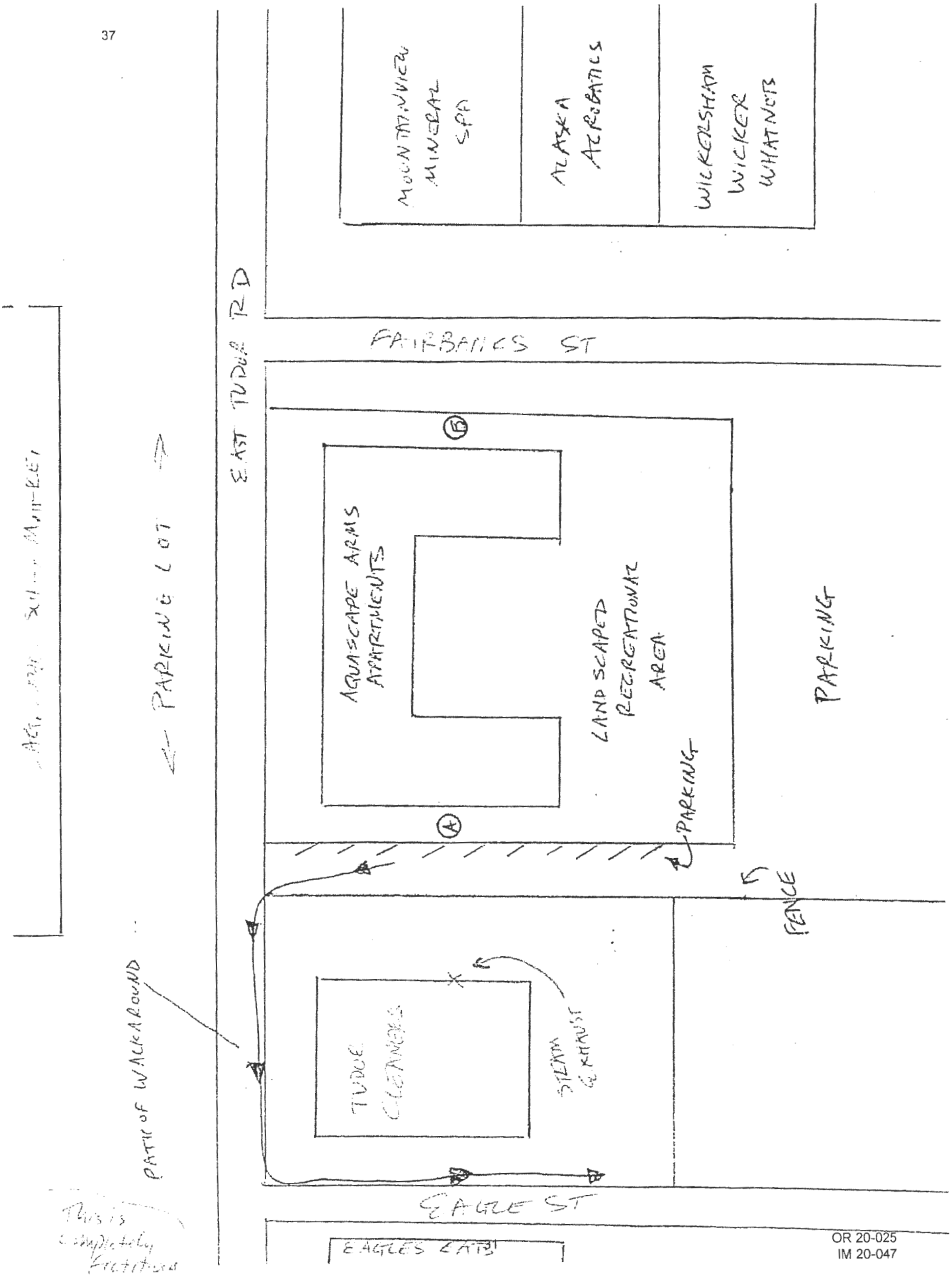
Case Disposition

Sound Measured By: Nancy Noisestuffer

Report Reviewed and Approved By (If Necessary): D R Evans

INCLUDE SITE SKETCH ON REVERSE (with source, walk-around route, and exact measurement locations)

37



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Excerpt from NRA Range Source Book (2012)

knowledge of the presence of a range, adjoining parcels have been rezoned for new housing developments, giving little, if any, forethought to future consequences.

3.03.1.2 One of the primary yet often overlooked considerations in developing a range project is the economic impact the facility will have on the community. How it affects the community should it locate nearby, or if it is forced to move to another site are critical issues. Local economies are important. Even though shooting is a recreational activity, the range becomes part of the local business community. Outside activities, such as tournaments, bring outside money into the economy thereby playing an important political role in the local community.

3.03.2 Existing Conditions

3.03.2.1 What are the existing conditions at the proposed or existing site? Study the environment to determine what impact is occurring. This is the reason an environmental analysis (EA) is necessary. Conducting an EA requires a thorough review to determine if there is any reason to implement a major and costly sound abatement program. It requires a complete description of what may or may not occur if the range is built. (See Section I, Chap. 3, paragraph 2.14 for guidance and procedures for conducting an environmental analysis.)

3.03.3 Future Conditions

3.03.3.1 As a general guide, the following categories were developed by the NRA based on field and text book work:

(1) Unacceptable: If the sound level exceeds 90 dB(A) for 1 hour out or 24 or exceeds 85 dB(A) for 8 hours out of 24 and the receiver is less than 1/4 mile from the sound source.

(2) Discretionary: Normally Acceptable, if the level exceeds 80 dB(A) for 8 hours out of 24 or if there are "loud" impulsive sounds (referring to sonic booms, artillery, etc.) on site and the distance from the property boundary and the receiver is one mile or more.

(3) Discretionary: Normally acceptable if the level does not exceed 75 dB(A) at the property boundary more than 6 hours out of 24 hours and distance from the boundary line and the receiver is over ½ mile.

(4) Acceptable: If the sound levels at the receiver do not exceed 65 dB(A) more than 8 hours out of 24 or activities do not extend into the nighttime hours of 10 p.m. through 7 a.m.

Active shooting is to take place during the daytime hours of 7 a.m. to 10 p.m., with curtailed, but not necessarily discontinued activities during evening hours of 7 p.m. to10 p.m. Shooting activities should not continue into nighttime hours, between 10 p.m. and 7 a.m. unless needed for mandatory low light training by law enforcement personnel.

3.03.4 Regulatory Controls

3.03.4.1 Governmental planning organizations offer services to local agencies to assist them in developing goals and policies for community "noise" control. They also provide general land use, environmental protection and open space recommendations. In July 1981, the U.S. Environmental Protection Agency developed a Community Noise Assessment Program designed to assist communities to assess, control and improve their noise environment. Even though this document focuses on larger more densely populated areas, it does provide some valuable tips for the range planner.

3.03.4.2 A number of states have laws relating to noise. Most of these noise laws are concerned with motor vehicle, snowmobile, or boating sounds. A few, such as Connecticut, Illinois, and New

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OSHA Noise Exposure Standard 1910.95

By Standard Number / 1910.95 - Occupational noise exposure.

- **Part Number:** 1910
- **Part Number Title:** Occupational Safety and Health Standards
- **Subpart:** 1910 Subpart G
- **Subpart Title:** Occupational Health and Environmental Control
- **Standard Number:** 1910.95
- **Title:** Occupational noise exposure.
- **Appendix:** A; B; C; D; E; F; G; H; I
- **GPO Source:** e-CFR

1910.95(a)

Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table G-16 when measured on the A scale of a standard sound level meter at slow response. When noise levels are determined by octave band analysis, the equivalent A-weighted sound level may be determined as follows:

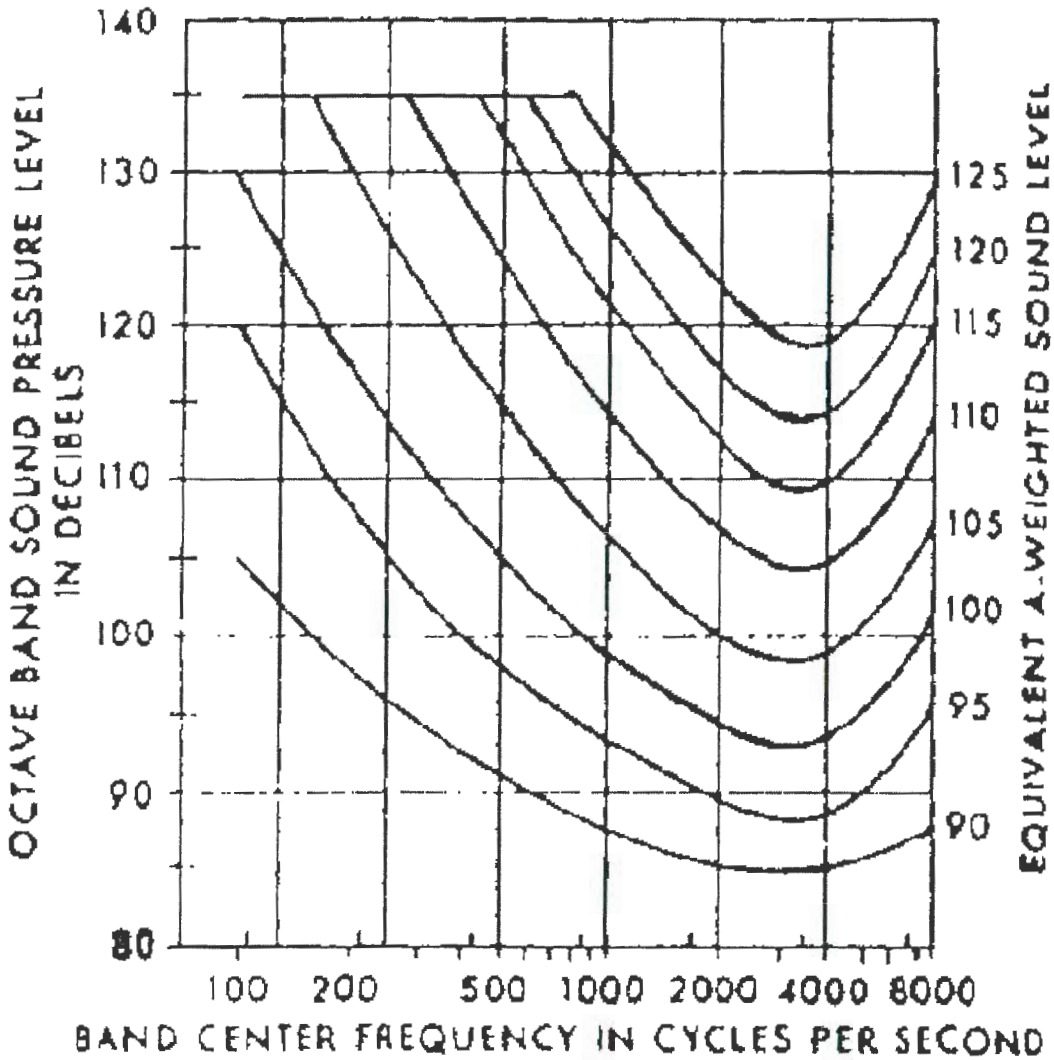

FIGURE G–9

Equivalent sound level contours. Octave band sound pressure levels may be converted to the equivalent A-weighted sound level by plotting them on this graph and noting the A-weighted sound level corresponding to the point of highest penetration into the sound level contours. This equivalent A-weighted sound level, which may differ from the actual A-weighted sound level of the noise, is used to determine exposure limits from Table 1.G-16.

1910.95(b)(1)

When employees are subjected to sound exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

1910.95(b)(2)

If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous.

TABLE G-16 - PERMISSIBLE NOISE EXPOSURES (1)

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

Footnote(1) When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

1910.95(c)

"Hearing conservation program."

1910.95(c)(1)

The employer shall administer a continuing, effective hearing conservation program, as described in paragraphs (c) through (o) of this section, whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with appendix A and Table G-16a, and without regard to any attenuation provided by the use of personal protective equipment.

1910.95(c)(2)

For purposes of paragraphs (c) through (n) of this section, an 8-hour time-weighted average of 85 decibels or a dose of fifty percent shall also be referred to as the action level.

1910.95(d)

"Monitoring."

1910.95(d)(1)

When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall develop and implement a monitoring program.

1910.95(d)(1)(i)

The sampling strategy shall be designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.

1910.95(d)(1)(ii)

Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, the employer shall use representative personal sampling to comply with the monitoring requirements of this paragraph unless the employer can show that area sampling produces equivalent results.

1910.95(d)(2)(i)

All continuous, intermittent and impulsive sound levels from 80 decibels to 130 decibels shall be integrated into the noise measurements.

1910.95(d)(2)(ii)

Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy.

1910.95(d)(3)

Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:

1910.95(d)(3)(i)

Additional employees may be exposed at or above the action level; or

1910.95(d)(3)(ii)

The attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of paragraph (j) of this section.

1910.95(e)

"Employee notification." The employer shall notify each employee exposed at or above an 8-hour time-weighted average of 85 decibels of the results of the monitoring.

1910.95(f)

"Observation of monitoring." The employer shall provide affected employees or their representatives with an opportunity to observe any noise measurements conducted pursuant to this section.

1910.95(g)

"Audiometric testing program."

1910.95(g)(1)

The employer shall establish and maintain an audiometric testing program as provided in this paragraph by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 decibels.

1910.95(g)(2)

The program shall be provided at no cost to employees.

1910.95(g)(3)

Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper functioning of the audiometers being used. A technician who operates microprocessor audiometers does not need to be certified. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

1910.95(g)(4)

All audiograms obtained pursuant to this section shall meet the requirements of Appendix C: "Audiometric Measuring Instruments."

1910.95(g)(5)

"Baseline audiogram."

1910.95(g)(5)(i)

Within 6 months of an employee's first exposure at or above the action level, the employer shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

1910.95(g)(5)(ii)

"Mobile test van exception." Where mobile test vans are used to meet the audiometric testing obligation, the employer shall obtain a valid baseline audiogram within 1 year of an employee's first exposure at or above the action level. Where baseline audiograms are obtained more than 6 months after the employee's first exposure at or above the action level, employees shall wear hearing protectors for any period exceeding six months after first exposure until the baseline audiogram is obtained.

1910.95(g)(5)(iii)

Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. Hearing protectors may be used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to workplace noise.

1910.95(g)(5)(iv)

The employer shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

1910.95(g)(6)

"Annual audiogram." At least annually after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.

1910.95(g)(7)

"Evaluation of audiogram."

1910.95(g)(7)(i)

Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift as defined in paragraph (g)(10) of this section has occurred. This comparison may be done by a technician.

1910.95(g)(7)(ii)

If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

1910.95(g)(7)(iii)

The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

1910.95(g)(7)(iii)(A)

A copy of the requirements for hearing conservation as set forth in paragraphs (c) through (n) of this section;

1910.95(g)(7)(iii)(B)

The baseline audiogram and most recent audiogram of the employee to be evaluated;

1910.95(g)(7)(iii)(C)

Measurements of background sound pressure levels in the audiometric test room as required in Appendix D: Audiometric Test Rooms.

1910.95(g)(7)(iii)(D)

Records of audiometer calibrations required by paragraph (h)(5) of this section.

1910.95(g)(8)

"Follow-up procedures."

1910.95(g)(8)(i)

If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift as defined in paragraph (g)(10) of this section has occurred, the employee shall be informed of this fact in writing, within 21 days of the determination.

1910.95(g)(8)(ii)

Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the employer shall ensure that the following steps are taken when a standard threshold shift occurs:

1910.95(g)(8)(ii)(A)

Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

1910.95(g)(8)(ii)(B)

Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.

1910.95(g)(8)(ii)(C)

The employee shall be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.

1910.95(g)(8)(ii)(D)

The employee is informed of the need for an otological examination if a medical pathology of the ear that is unrelated to the use of hearing protectors is suspected.

1910.95(g)(8)(iii)

If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 decibels indicates that a standard threshold shift is not persistent, the employer:

1910.95(g)(8)(iii)(A)

Shall inform the employee of the new audiometric interpretation; and

1910.95(g)(8)(iii)(B)

May discontinue the required use of hearing protectors for that employee.

1910.95(g)(9)

"Revised baseline." An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or physician who is evaluating the audiogram:

1910.95(g)(9)(i)

The standard threshold shift revealed by the audiogram is persistent; or

1910.95(g)(9)(ii)

The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

1910.95(g)(10)

"Standard threshold shift."

1910.95(g)(10)(i)

As used in this section, a standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

1910.95(g)(10)(ii)

In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging (presbycusis) to the change in hearing level by correcting the annual audiogram according to the procedure described in Appendix F: "Calculation and Application of Age Correction to Audiograms."

1910.95(h)

"Audiometric test requirements."

1910.95(h)(1)

Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests at each frequency shall be taken

separately for each ear.

1910.95(h)(2)

Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969, which is incorporated by reference as specified in Sec. 1910.6.

1910.95(h)(3)

Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in Appendix C: "Audiometric Measuring Instruments."

1910.95(h)(4)

Audiometric examinations shall be administered in a room meeting the requirements listed in Appendix D: "Audiometric Test Rooms."

1910.95(h)(5)

"Audiometer calibration."

1910.95(h)(5)(i)

The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 decibels or greater require an acoustic calibration.

1910.95(h)(5)(ii)

Audiometer calibration shall be checked acoustically at least annually in accordance with Appendix E: "Acoustic Calibration of Audiometers." Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of 15 decibels or greater require an exhaustive calibration.

1910.95(h)(5)(iii)

An exhaustive calibration shall be performed at least every two years in accordance with sections 4.1.2; 4.1.3.; 4.1.4.3; 4.2; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard Specification for Audiometers, S3.6-1969. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.

1910.95(i)

"Hearing protectors."

1910.95(i)(1)

Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

1910.95(i)(2)

Employers shall ensure that hearing protectors are worn:

1910.95(i)(2)(i)

By an employee who is required by paragraph (b)(1) of this section to wear personal protective equipment; and

1910.95(i)(2)(ii)

By any employee who is exposed to an 8-hour time-weighted average of 85 decibels or greater, and who:

1910.95(i)(2)(ii)(A)

Has not yet had a baseline audiogram established pursuant to paragraph (g)(5)(ii); or

1910.95(i)(2)(ii)(B)

Has experienced a standard threshold shift.

1910.95(i)(3)

Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer.

1910.95(i)(4)

The employer shall provide training in the use and care of all hearing protectors provided to employees.

1910.95(i)(5)

The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

1910.95(j)

"Hearing protector attenuation."

1910.95(j)(1)

The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The employer shall use one of the evaluation methods described in Appendix B: "Methods for Estimating the Adequacy of Hearing Protection Attenuation."

1910.95(j)(2)

Hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels as required by paragraph (b) of this section.

1910.95(j)(3)

For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or below.

1910.95(j)(4)

The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

1910.95(k)

"Training program."

1910.95(k)(1)

The employer shall train each employee who is exposed to noise at or above an 8-hour time weighted average of 85 decibels in accordance with the requirements of this section. The employer shall institute a training program and ensure employee participation in the program.

1910.95(k)(2)

The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

1910.95(k)(3)

The employer shall ensure that each employee is informed of the following:

1910.95(k)(3)(i)

The effects of noise on hearing;

1910.95(k)(3)(ii)

The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and

1910.95(k)(3)(iii)

The purpose of audiometric testing, and an explanation of the test procedures.

1910.95(l)

"Access to information and training materials."

1910.95(l)(1)

The employer shall make available to affected employees or their representatives copies of this standard and shall also post a copy in the workplace.

1910.95(l)(2)

The employer shall provide to affected employees any informational materials pertaining to the standard that are supplied to the employer by the Assistant Secretary.

1910.95(l)(3)

The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the Assistant Secretary and the Director.

1910.95(m)

"Recordkeeping" -

1910.95(m)(1)

"Exposure measurements." The employer shall maintain an accurate record of all employee exposure measurements required by paragraph (d) of this section.

1910.95(m)(2)

"Audiometric tests."

1910.95(m)(2)(i)

The employer shall retain all employee audiometric test records obtained pursuant to paragraph (g) of this section:

1910.95(m)(2)(ii)
This record shall include:

1910.95(m)(2)(ii)(A)
Name and job classification of the employee;

1910.95(m)(2)(ii)(B)
Date of the audiogram;

1910.95(m)(2)(ii)(C)
The examiner's name;

1910.95(m)(2)(ii)(D)
Date of the last acoustic or exhaustive calibration of the audiometer; and

1910.95(m)(2)(ii)(E)
Employee's most recent noise exposure assessment.

1910.95(m)(2)(ii)(F)
The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

1910.95(m)(3)
"Record retention." The employer shall retain records required in this paragraph (m) for at least the following periods.

1910.95(m)(3)(i)
Noise exposure measurement records shall be retained for two years.

1910.95(m)(3)(ii)
Audiometric test records shall be retained for the duration of the affected employee's employment.

1910.95(m)(4)
"Access to records." All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee, and the Assistant Secretary. The provisions of 29 CFR 1910.1020 (a)-(e) and (g)-(i) apply to access to records under this section.

1910.95(m)(5)
"Transfer of records." If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in paragraph (m)(3) of this section.

1910.95(n)
"Appendices."

1910.95(n)(1)

Appendices A, B, C, D, and E to this section are incorporated as part of this section and the contents of these appendices are mandatory.

1910.95(n)(2)

Appendices F and G to this section are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

1910.95(o)

"Exemptions." Paragraphs (c) through (n) of this section shall not apply to employers engaged in oil and gas well drilling and servicing operations.

[39 FR 23502, June 27, 1974, as amended at 46 FR 4161, Jan. 16, 1981; 46 FR 62845, Dec. 29, 1981; 48 FR 9776, Mar. 8, 1983; 48 FR 29687, June 28, 1983; 54 FR 24333, June 7, 1989; 61 FR 5507, Feb. 13, 1996; 61 FR 9227, March 7, 1996; 71 FR 16672, April, 3, 2006; 73 FR 75584, Dec. 12, 2008]

UNITED STATES
DEPARTMENT OF LABOR

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200 Constitution Ave NW
Washington, DC 20210
800-321-6742 (OSHA)
TTY
www.OSHA.gov

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Ordinance Serial No. 20-25

CODE ORDINANCE

Sponsored by:
Introduced:
Public Hearing:
Action:

MATANUSKA-SUSITNA BOROUGH
ORDINANCE SERIAL NO. 20-025

AN ORDINANCE OF THE MATANUSKA-SUSITNA BOROUGH ASSEMBLY ADOPTING MSB 17.68, OUTDOOR SHOOTING FACILITIES, IN ORDER TO ESTABLISH STANDARDS FOR COMMERCIAL, EDUCATIONAL, AND NONPROFIT OUTDOOR SHOOTING FACILITIES.

WHEREAS, the rationale and intent of this ordinance are found in IM NO. 20-047 which accompanies this ordinance.

BE IT ENACTED:

Section 1. Classification. This ordinance is of a general and permanent nature and shall become a part of the Borough Code.

Section 2. Adoption of Chapter. MSB 17.68 is hereby adopted as follows:

17.68 OUTDOOR SHOOTING FACILITIES

17.68.010 INTENT

17.68.020 DEFINITIONS

17.68.030 APPLICABILITY

17.68.040 APPLICATION PROCEDURES

17.68.050 GENERAL STANDARDS

17.68.060 OPERATING STANDARDS

17.68.070 APPEALS

17.68.080 TERMINATION OF PERMIT

17.68.090 TRANSFER OF PERMIT

17.68.100 NONCONFORMING USES

17.68.110 VIOLATIONS, ENFORCEMENTS, AND PENALTIES

17.68.010 INTENT

(A) It is the intent of this chapter to allow outdoor shooting facilities to operate within the Borough while minimizing the likelihood that people, domestic animals, or properties will be jeopardized.

17.68.020 DEFINITIONS

(A) For the purpose of this chapter, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

"Outdoor Shooting Facility" means real property used for commercial, educational, or non-profit shooting activities, typically involving rifles, shotguns, pistols, silhouettes, skeet, trap or black powder.

"Firing Position (Point)" means an area where firearms are discharged, having a specified width and depth that is occupied by a shooter, their equipment and, if appropriate, an instructor.

"Firing Lane" means the expected path of gunfire from the firing position to the target.

"Firing Line" means a line parallel to the targets behind which firearms are discharged.

"Surface Danger Zone (SDZ)" means a depiction of the mathematically predicted area a projectile will return to earth either by direct fire or by ricochet. The SDZ is the area extending from a firing point to a distance downrange based on the projectiles fired.

17.68.030 APPLICABILITY

(A) This chapter applies in all areas of the Borough including special land use districts and residential land use districts. Where this chapter is in conflict with the conditions of a special land use district or residential land use district, the most restrictive conditions shall apply.

(B) This chapter does not apply within the cities of Houston, Palmer, or Wasilla.

(C) This chapter applies to all outdoor shooting facilities except outdoor shooting facilities that are used exclusively for:

(a) archery or air guns;

(b) law enforcement or United States Military purposes; or

(c) fully enclosed facilities designed to offer a completely controlled shooting environment.

(D) This chapter does not regulate the discharge of firearms on private property where the property is not open to the public on a commercial, education, nonprofit, or membership basis.

17.68.040 APPLICATION PROCEDURES

(A) An application for an outdoor shooting facility permit may be initiated by a property owner or the owner's authorized agent and shall be filed on a form provided by the Borough.

(1) The application for an outdoor shooting facility permit shall be accompanied by an appropriate filing fee as established by the assembly, payable to the Borough.

(2) The application shall include the following:

(a) a certified site plan drawn to scale showing a complete layout of the range including location of backstops, firing lanes, firing positions, firing lines, side berms, target areas, and baffles;

(b) identification of all buildings within 1,000 feet of the firing positions;

(c) dimensions and construction materials of all backstops, baffles, firing lanes, and side berms; and

(d) maximum caliber of firearm to be allowed at the range, if any.

(e) certification by a professional civil engineer or other qualified professional registered in the state of Alaska under AS 08.48 that the facility is designed to meet the requirements of 17.68.050(A)(2)-(3).

(f) A site-specific environmental stewardship plan for managing shooting-associated materials, in accordance with EPA Best Management Practices.

(g) Surface danger zones as determined by a professional engineer registered in the state of Alaska under AS 08.48.

(B) The director or designated staff shall determine whether an application for an outdoor shooting facility is complete. The director shall provide the

applicant with a written explanation of application deficiencies within 10 working days of the date the application is received.

(C) Notification for outdoor shooting facilities shall be in accordance with MSB 17.03, public notification, except that the notification area will be one-half mile.

(D) Within 45 calendar days of receipt of a complete application the director shall approve the permit upon determination that the standards of this chapter have been met.

17.68.050 GENERAL STANDARDS

(A) In granting a permit under this chapter, the director shall make findings that all of the following standards have been met:

(1) Firing positions are located at least one thousand feet from all habitable buildings which are not on the same parcel.

(a) This standard only applies to buildings which were in existence at the time that application was made for the outdoor shooting facility.

(2) There are no habitable buildings within the surface danger zone.

(3) The proposed backstops are a minimum of twenty feet in height and are constructed behind all targets. The backstops shall be:

(a) impenetrable to all calibers used at the facility;

(b) designed to contain all projectiles within the designated shooting area;

(c) constructed of material that does not cause unintended ricochet of projectiles; and

(d) connected to each side berm.

(4) The proposed side berms shall:

(a) be constructed parallel to firing lanes:

(b) extend the length of the firing lanes, from the backstop to the firing line;

(c) be a minimum of eight feet in height;

(d) be designed to contain all projectiles within the designated shooting area;

(e) be impenetrable to all calibers used at the facility;

(f) be constructed of material that does not cause unintended ricochet of projectiles.

(5) The director may waive the requirement for side berms if it is determined they are not necessary because of natural topographic features.

(6) Shotgun-only ranges are exempt from paragraphs (3) through (5) of this subsection.

(7) Outdoor shooting facilities may not be designed in a manner that directs projectiles into or over waterbodies or wetlands.

17.68.060 OPERATING STANDARDS

(A) Hours of operation shall not to exceed 8:00 AM - 9:00 PM.

(B) No sound resulting from the outdoor shooting facility is allowed to exceed 90 dB(a) as measured at or within the boundary of the property of the receiving land.

17.68.070 APPEALS

(A) Appeals from a decision of the director granting or denying a permit under this chapter shall be filed and conducted in accordance with MSB 15.39.

17.68.080 TERMINATION OF PERMIT

(A) Except as otherwise specified by code, a permit issued under this chapter will become null and void under the following conditions:

(1) notification of termination of the permit for failure to comply with an order to correct violations of a permit;

(2) failure to initiate the use for which the permit was issued within five years of the date of the permit issuance;

(3) cessation of the use for which the permit was issued for a period exceeding five consecutive years.

17.68.090 TRANSFER OF PERMIT

(A) Except as otherwise specified by code, the privileges and requirements of a permit issued under this chapter shall run with the land.

(B) Within 90 days of recording the transfer of ownership of the subject land, the new owner must provide written notification and a signed acknowledgment that the new owner assumes responsibility for compliance with the requirements of the permit.

17.68.100 NONCONFORMING USES

(A) Within the borough there may be outdoor shooting facilities that have commenced actual construction or are in existence as of the effective date of this chapter. Such facilities which were lawful before the effective date of this chapter, but which would otherwise be prohibited, regulated or restricted under this chapter, are allowed to continue but shall not be expanded except as provided in this chapter.

(B) No nonconforming use shall be constructed or operated except in accordance with these regulations, except to the extent it was in existence or under actual construction as of the effective date of the ordinance codified herein or amendment thereto.

17.68.110 VIOLATIONS, ENFORCEMENTS, AND PENALTIES

(A) Remedies, enforcement actions, and penalties shall be consistent with the terms and provisions of MSB

1.45.

(B) In addition to other applicable penalties, failure to correct the violation of code, after reasonable notice, may result in revocation of the permit.

(C) Complaints received by the Borough of violations of state or federal law will be forwarded to the appropriate agency for enforcement.

(D) Authorized representatives of the borough shall be allowed to inspect the site and related records at reasonable times for the purpose of monitoring compliance with all permit conditions.

(E) The permittee shall assist and cooperate with authorized inspections upon reasonable notice from the borough.

Section 3. Effective date. This ordinance shall take effect upon adoption.

ADOPTED by the Matanuska-Susitna Borough Assembly this - day of -, 2020.

VERN HALTER, Borough Mayor

ATTEST:

_____

LONNIE R. McKECHNIE, CMC, Borough Clerk

(SEAL)

PUBLIC HEARING

QUASI-JUDICIAL

Resolution No. PC 20-06

Copson/Flaherty
Variance Request
6010 E. Rough Cut Circle

(Page 259 - 360)

PUBLIC HEARING

STAFF REPORT

MATANUSKA-SUSITNA BOROUGH

Planning and Land Use Department
Development Services Division
350 East Dahlia Avenue • Palmer, AK 99645
Phone (907) 861-7822 • Fax (907) 861-8158
www.matsugov.us

DEVELOPMENT SERVICES DIVISION STAFF REPORT

Date:	February 14, 2020
File Number:	176520190001
Applicant:	Adam Copson and Janet Flaherty
Property Owner:	Adam Copson and Janet Flaherty
Resolution No.:	Planning Commission Resolution 20-06
Request:	Setback variance from MSB 17.55
Location:	6010 E. Rough Cut Circle (Tax ID#6333B02L008)
Size of Property:	2.65 acres
Reviewed By:	Eileen Probasco, Planning & Land Use Director Alex Strawn, Development Services Manager
Staff:	Joseph Metzger, Planner II
Staff Recommendation:	Denial

EXECUTIVE SUMMARY

A setback variance application has been submitted requesting to allow an existing single-family residence and existing detached garage to remain in place. The single-family residence, at its closest location, is set back approximately 17.8 feet from the E. Rough Cut Circle right-of-way. The detached garage, at its closest location, is set back approximately 1.9 feet from the E. Rough Cut Circle right-of-way. In order to grant a variance, the Planning Commission must find that each of the requirements of MSB 17.65.020(A) have been met.

The applicant/owner has applied for a variance for the existing single-family residence and existing detached garage. The single-family residence would likely be eligible for legal nonconforming status under MSB 17.80 (Nonconforming Structures) based on the date of construction and that the structure has not been altered since its construction. The existing garage would not be eligible

for legal nonconforming status because the garage was constructed after December 7, 1993 (last day structures are eligible for legal non-conforming status under MSB 17.80).

LAND USE

Existing Land Use:

The subject parcel was created in 1971 and is part of the Wilderness Acres Subdivision. The parcel is 2.65 acres in size and is currently developed with a single-family residence and detached garage. The single-family residence was constructed in 1975 and the garage was constructed in 1997-1998. The current owners of the property purchased the property in 1993.

E. Rough Cut Circle culminates approximately two feet from the existing detached garage in the northwest portion of the property. A 33' roadway and utility easement overlies the western boundary. A 50' private roadway and utility easement run along the entire north lot line.

The applicant has applied for a Borough driveway permit, but no decision on the driveway has been rendered.

Surrounding Land Uses:

The subject lot is located in the Wilderness Access Subdivision. The subdivision is developed with residential properties and the lots range in size in from approximately 1.3 acres to approximately 9 acres.

REVIEW OF APPLICABLE CRITERIA AND FINDINGS

MSB 17.03 – Public Notification

On January 8, 2020 notices were mailed to all property owners within a 600-foot radius of the use. A total of 20 notices were mailed. The permit application notification was published in the January 8, 2020 issue of the Frontiersman. The application material was posted on the Borough web site for public review on January 8, 2020. The proposed use is within the South Lakes Community Council boundary, however, the South Lakes Community Council is inactive, so no notice was sent. Staff received two (2) comments from the public related to the proposed use, one of which is in opposition.

Discussion: A commenter makes mention of a driveway that encroaches on the neighboring lot that is used by the applicant as well as other homeowners in the area. The citizen is concerned with the use and degradation of the driveway that passes through their property. While there may be validity to this concern, this is a private/civil matter and does not pertain to this specific variance request.

Staff would like to note E. Rough Cut Circle right-of-way, which has not been constructed, culminates 1.9 feet from the applicant/owners existing detached garage. There is also a private 50-foot easement that transects applicants/owners property and adjoining landowners property to the north. This private roadway and utility easement is for the use of the lots to the east and northeast of the subject parcel.

Section 17.65.020 Requirements for Granting a Variance

(A) In order to grant a variance to the regulations of MSB title 17, the planning commission must find that each of the following requirements has been met:

(1) There are unusual conditions or circumstances that apply to the property for which the variance is sought.

Findings of Fact:

1. The subject lot is 2.65 acres in size.
2. The subject lot is part of the Wilderness Acres subdivision and was originally platted in 1971.
3. The application material indicates that the existing single-family residence was constructed in 1975.
4. The application material indicates that the existing detached garage was constructed in 1998.
5. The applicants/owners of the subject lot purchased the property in 1993.
6. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the detached garage is situated 1.9 feet from the E. Rough Cut Circle right-of way.
7. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the single-family residential home is situated 17.8 feet from the E. Rough Cut Circle right-of way.
8. According to the application material, the topography of the property has not been altered by the current or previous owners of the property.
9. According to the application material, the topography of the lot restricts where structures can be built.
10. The topography of the lot offers challenges, but it is not unreasonable to expect some excavation activities would be necessary to develop the lot.

Discussion: Staff realizes there are topographic features that limit the buildable locations on the property in its current condition. Staff also realizes that dirt work and excavation may also be necessary to prepare land for development.

Conclusion of Law: Based on the above findings, there are not unusual conditions or circumstances applicable to this property (MSB 17.65.020(A)(1)).

---

(2) The strict application of the provisions of this title could deprive the applicant of rights commonly enjoyed by other properties under the terms of this title.

Findings of Fact:

1. The existing single-family residence is approximately 1,056 square feet and is 44' x 24' in size.

2. The existing detached garage is approximately 864 square feet and is 36' x 24' in size.
3. The subject lot is 2.65 acres in size.
4. The northern part of the property is mostly flat and is comprised of uplands calculated to contain approximately 13,450 square feet of land.
5. The Wilderness Acres subdivision is developed with residences and most parcels contain attached or detached garages that are similar in size to the existing residence and existing garage.
6. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the detached garage is situated 1.9 feet from the E. Rough Cut Circle right-of way.
7. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the single-family residential home is situated 17.8 feet from the E. Rough Cut Circle right-of way.

Discussion: Staff calculated the current uplands on the northern part of the property where the development has occurred to be approximately 13,450 square feet. The total square footage of the single-family residence and detached garage is 1,920 square feet in size. It is staff's opinion that there is ample space to allow for the lawful placement of a single-family residence and detached garage on the uplands portion of the property in its current condition.

Conclusion of Law: Based on the above findings, the strict application of the provisions of this title would not deprive the applicants/owners of rights commonly enjoyed by others (MSB 17.75.020(A)(2)).

---

(1) The granting of the variance will not be injurious to nearby property, nor harmful to the public welfare.

Findings of Fact:

1. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the detached garage is situated 1.9 feet from the E. Rough Cut Circle right-of way.
2. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the single-family residential home is situated 17.8 feet from the E. Rough Cut Circle right-of way.
3. The application material indicates that the existing single-family residence was constructed in 1975.
4. The application material indicates that the existing detached garage was constructed in 1998.
5. Setbacks promote a variety of public purposes such as provisions for light and air, fire protection, traffic safety, prevention of overcrowding, rest and recreation, solving drainage problems, protecting the appearance and character of a neighborhood, and conserving property values.
6. The E. Rough Cut Circle right-of-way has only been partially developed.

Conclusion of Law: Based on the above findings, granting the variance will not be injurious to nearby property, nor harmful to the public welfare, as the existing residence and garage will not interfere with the flow of traffic on E. Rough Cut Circle (MSB 17.65.020(A)(3).

(4) The granting of the variance will be in harmony with the objectives of this title and any applicable comprehensive plans

COMPREHENSIVE PLAN

The Matanuska-Susitna Borough Comprehensive Plan (2005 Update) pertains to this property. Two of the plan's land use goals state:

> ***Goal (LU-1):*** *Protect and enhance the public safety, health, and welfare of Borough residents.*
> ***Policy LU-1:*** *Provide for consistent, compatible, effective and efficient development within the borough.*
>
> ***Goal (LU-2):*** *Protect residential neighborhoods and associated property values.*
> ***Policy LU2-1:*** *Develop and implement regulations that protect residential development by separating incompatible uses, while encouraging uses that support such residential uses including office, commercial and other mixed-use developments that are shown to have positive cumulative impacts to the neighborhood.*

Findings of Fact:

1. MSB Chapter 17.65 – Variances, was written to grant relief to property owners whose lots are impacted by existing land use regulations thereby making the lot undevelopable.
2. The existing single-family residence is approximately 1,056 square feet and is 44' x 24' in size.
3. The existing detached garage is approximately 864 square feet and is 36' x 24' in size.
4. The subject lot is 2.65 acres in size.
5. The northern part of the property is mostly flat and is comprised of uplands calculated to contain approximately 13,450 square feet of land.
6. The Wilderness Acres subdivision is developed with residences and most parcels contain attached or detached garages that are similar in size to the existing residence and existing garage.
7. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the detached garage is situated 1.9 feet from the E. Rough Cut Circle right-of way.
8. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the single-family residential home is situated 17.8 feet from the E. Rough Cut Circle right-of way.

Conclusion of Law: Based on the above findings, the proposed variance is consistent with the Matanuska-Susitna Borough Comprehensive Plan (2005 Update), but does not meet the intent of

MSB 17.65 as the applicants/owners have reasonable use of their property (MSB 17.65.020(A)(4)).

(5) The deviation from the requirement of this title that is permitted by the variance will be no more than is necessary to permit a reasonable use of the property.

Findings of Fact:

1. The existing single-family residence is approximately 1,056 square feet and is 44' x 24' in size.
2. The existing detached garage is approximately 864 square feet and is 36' x 24' in size.
3. The subject lot is 2.65 acres in size.
4. The northern part of the property is mostly flat and is comprised of uplands calculated to contain approximately 13,450 square feet of land.
5. The total square footage of the single-family residential structure and detached garage is 1,920 square feet.
6. The Wilderness Acres subdivision is developed with residences and most parcels contain attached or detached garages that are similar in size to the existing residence and existing garage.
7. The structures (home and garage) could have been built farther away from the public rights-of-way.
8. The garage could have been constructed in to be attached to the residential home, or to be smaller in size.
9. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the detached garage is situated 1.9 feet from the E. Rough Cut Circle right-of way.
10. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the single-family residential home is situated 17.8 feet from the E. Rough Cut Circle right-of way.

Conclusion of Law: Based on the above findings, granting a variance will be more than is necessary to permit a reasonable use of the property (MSB 17.65.030(A)(1)).

Section17.65.030 Cases Where Variance is Illegal

(A) A variance from this title may not be granted if:

(1) Special conditions that require the variance are caused by the person seeking the variance.

Findings of Fact:

1. The applicants/owners did not construct the single-family residential home.
2. The applicants/owners did construct the detached garage.

3. According to the application material, the applicants/owners have not changed the topography of the property.
4. According to the application material, the applicants/owners are seeking the variance due to topography and buildable area concerns.
5. The development of the single-family residential home was done in a fashion that hinders the lawful development of the site in its current condition due to the placement of septic piping and the proximity of the lot lines and rights-of-way.
6. The existing single-family residence is approximately 1,056 square feet and is 44' x 24' in size.
7. The existing detached garage is approximately 864 square feet and is 36' x 24' in size.
8. The subject lot is 2.65 acres in size.
9. The northern part of the property is mostly flat and is comprised of uplands calculated to contain approximately 13,450 square feet of land.
10. The Wilderness Acres subdivision is developed with residences and most parcels contain attached or detached garages that are similar in size to the existing residence and existing garage.
11. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the detached garage is situated 1.9 feet from the E. Rough Cut Circle right-of way.
12. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the single-family residential home is situated 17.8 feet from the E. Rough Cut Circle right-of way.

Discussion: As noted in the application material, the single-family residential home was constructed in 1975 and was not built by the applicant/owners. When the builder of the existing residential home developed the lot, they did so in a manner that hindered future lawful development on the property in its current condition. When the applicants/owners purchased the property in 1993 thru a warranty deed, they assumed the risks or potential risks the property has.

When the applicants/owners constructed the existing garage in 1997-1998, the garage was built in violation of MSB 17.55, which requires that structures be built at least 25' from any public right-of-way. It should be noted that the applicant/owner has not made any changes to the topography of the subject parcel.

Some lots of land are inherently better suited for development than others. While it is unfortunate that construction of the single-family residence in 1975 was done so in a fashion that restricted lawful future construction, poor planning on behalf of prior landowners or a developer of a lot of land, is not sufficient justification for a variance.

Staff recognizes the topographic challenges this lot has. Staff also recognizes that dirt work and excavation may be necessary for the development of a lot of land or for the addition of structures to a lot of land. This particular lot of land is encumbered by a 2/1 slope that drops approximately 75 feet in elevation over approximately 150 feet in length. Staff acknowledges it may not be feasible to fill in this entire area and make it nice and level for development, but staff feels that it is not unreasonable to expect some dirt work be performed could have been done to improve the land for development and assure that adequate setbacks were being provided.

Conclusion of Law: Based on the above findings, the person seeking the variance did cause the need for the variance, as they constructed the detached garage 1.9 feet from the E. Rough Cut Circle right-of-way (MSB 17.65.030(A)(1)).

---

(2) The variance will permit a land use in a district in which that use is prohibited.

Findings of Fact:

1. The subject parcel is not in a special land use district.
2. Residential structures and garages are allowed on this property.

Conclusion of Law: Based on the above findings, the variance, if granted, will not allow a land use in a district in which that use is prohibited, as residential structures and garages are allowed on this site (MSB 17.65.030(A)(2)).

---

(3) The variance is sought solely to relieve pecuniary hardship or inconvenience

Finding of Fact:

1. According to the application material, the variance is being sought because of the topography of the parcel and because of limited buildable areas.
2. The Wilderness Acres subdivision is developed with residences and most parcels contain attached or detached garages that are similar in size to the existing residence and existing garage.
3. According to the application material, the variance is not being sought solely to relieve pecuniary hardship or inconvenience.

Conclusion of Law: Based on the above findings, the variance is not solely to relieve pecuniary hardship or inconvenience (MSB 17.65.030(A)(3)).

STAFF RECOMMENDATIONS

Staff recommends denial of this variance request to allow an existing single-family residential home and detached garage to remain in place at 6010 E. Rough Cut Circle (Tax ID# 6333B02L008).

Photo’s taken by Joe Metzger, MSB Planner II, during a February 12, 2020 site visit.

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Looking to the east from east side of home

Looking to the east from east side of home

Looking to the south were slope begins

Looking south toward slope

Looking to the west from south side of home

1

Looking toward garage from E. Rough Cut Circle ROW

Looking toward Hyer Road from driveway access

View looking to the west from private easement on north side of property

Looking to the west from northeast property boundary

Northeast property corner

Looking to the west from northeast property corner

Looking south from E. Rough
Cut ROW

Looking south from E. Rough
Cut Circle ROW

Culmination of E. Rough Cut Circle ROW 1.9 feet from garage

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UNITED STATES POSTAL SERVICE®

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Up to 1,000 pieces (1 certificate for total number)

For each additional 1,000 pieces, or fraction thereof

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Postage: Mailers must affix meter, PC Postage®, or (uncanceled) postage stamps here in payment of total fee due.

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0000368428 JAN 08 2020

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Total Number of Pounds	Total Postage Paid for Mailpieces	Fee Paid
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Mailed For	Mailed By
Development Services	Shannon Call

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ANDERTON DAVID G& LINDA M
PO BOX 876805
WASILLA AK 99687-6805

56342B02L001 2
BELLAMY BENJAMIN P
5900 E YADON DR
WASILLA AK 99654

56333B02L001 3
BROTHERTON HARLEY A JR
PO BOX 872786
WASILLA AK 99687-2786

56333B02L009 4
CHMIEL MONIQUE
6001 E ROUGH CUT CIR
PALMER AK 99645-8431

56333B02L008 5
COPSON ADAM DALE
FLAHERTY JANET MARIE
1041 N TINA LN
PALMER, AK 99645

56333B02L019 6
FRANKE THEODORE G
FRANKE MARILYN S
421 N PIONEER VIEW CIR
PALMER AK 99645-5925

56333B01L001 7
G & K ALASKA INVESTMENTS LLC
PO BOX 876733
WASILLA, AK 99687-6733

56333B02L022 8
GARIC HAYES GENERAL
CONTRACTOR LLC
PMB 205
189 E NELSON AVE
WASILLA AK 99654

56333B02L012 9
HESS ANDY
TYLERHESS NANCEY
6250 E UPPER CT
PALMER AK 99645-8496

117N01E08A002 10
MCCLOSKEY CONRAD L
PO BOX 133
ELDORADO IL 62930

56342B02L002 11
MIKES LANDING LVG TR
EGGLETON MICHAEL E TRE
5800 E YADON DR
WASILLA AK 99654

56342B03L009 12
NOE RAYMOND D
350 N HYER RD
PALMER AK 99645-8434

56333B02L011 13
PETERSON WADE M
6030 E UPPER CT
PALMER AK 99645-8476

56333B02L007 14
PIERSKALLA NICOLAS&SHEILA
PO BOX 870755
WASILLA, AK 99687-0755

56342B01L001 15
ROBERTS GLENN & CLAUDIA FAM TR
ROBERTS GLENN D & CLAUDIA A TRES
550 N HYER RD
PALMER AK 99645-8488

56333B02L020 16
THOMPSON GRANT & DORCAS TR
THOMPSON G B SR & D J TRES
401 N PIONEER VIEW CIR
PALMER AK 99645-5925

56342B03L008 17
WALKER MICHAEL & ROSE M
5875 E HIDEAWAY CIR
WASILLA AK 99654

56333B01L002 18
WILKERSON CALVIN & TINA
6001 E UPPER CT
PALMER AK 99645-8476

56342B03L010 19
WOLCOTT MAIKU F & SUZANNE L
PO BOX 876665
WASILLA AK 99687-6665

56444B02L010B 20
ZITZMAN JOHN A & CATHERINE A
6040 E ROUGH CUT CIR
PALMER, AK 99645

tara0609
20
1/7/2020 9:56:49 AM

Joseph Metzger

From: Joseph Metzger
Sent: Wednesday, January 8, 2020 3:55 PM
To: 'allen.kemplen@alaska.gov'; 'tucker.hurn@alaska.gov'; 'melanie.nichols@alaska.gov'; 'kyler.hylton@alaska.gov'; 'sarah.wilber@alaska.gov'; 'mearow@matanuska.com'; 'rglenn@mta-telco.com'; 'jthompson@mta-telco.com'; 'row@enstarnaturalgas.com'; 'ospdesign@gci.com'; Eric Phillips; Jude Bilafer; Cindy Corey; Terry Dolan; Jim Jenson; Jamie Taylor; Nicole Wilkins; Karol Riese; Taunnie Boothby; Theresa Taranto; John Aschenbrenner; John Aschenbrenner; Sloan VonGunten; Jill Irsik; Michelle Wagner; Cheryl Scott; 'stephanieNowersDistrict2@gmail.com'
Subject: RFC Copson-Flaherty Variance -Comments Due February 3

MEMORANDUM

Date: January 8, 2020
To: Various Governmental Agencies
From: Joseph Metzger, Planner II
Subject: Request for Review and Comments Governmental Agencies
Project: Variance to minimum setback requirements of MSB 17.55
Location: 6010 E. Rough Cut Circle, (Tax ID# 6333B02L008); within Township 17 North, Range 1 East, Section 9, Seward Meridian.
Applicant: Adam Copson and Janet Flaherty

An application under MSB 17.65 – Variances, has been submitted for a variance to an exception to the minimum 25-foot right-of-way setback requirement under MSB 17.55. The variance would allow the existing single-family residence to remain 21.3 feet from the E. Rough Cut Circle right-of-way, and the existing garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way. The Planning Commission will conduct a public hearing on this request on March 2, 2020.

Application materials may be viewed online at http://www.matsugov.us by clicking on "All Public Notices & Announcements." Application material may also be reviewed at the Borough Permit Center. A direct link to the application material is here:

https://www.matsugov.us/publicnotice/copson-flaherty-variance-request-to-msb-17-55

Comments are due on or before February 3, 2020 and will be included in the Planning Commission packet for the Commissioner's review and information. Please be advised that comments received after that date will not be included in the staff report to the Planning Commission. Thank you for your review.

Respectfully,

Joe Metzger
MSB Planner II
907-861-7862

Accounts Payable
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AFFIDAVIT OF PUBLICATION

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BEFORE ME, THE UNDERSIGNED, A NOTARY PUBLIC, THIS DAY

PERSONALLY APPEARED BEFORE **JULLIE ZOOK** WHO, BEING

FIRST DULY SWORN, ACCORDING TO LAW, SAYS THAT SHE IS THE

LEGAL AD CLERK OF THE **FRONTIERSMAN**

PUBLISHED AT WASILLA AND CIRCULATED THROUGH OUT MATANUSKA SUSITNA

BOROUGH, IN SAID DIVISION THREE AND STATE OF ALASKA

AND THAT THE ADVERTISEMENT, OF WHICH THE ANNEXED IS A TRUE

COPY, WAS PUBLISHED ON THE FOLLOWING DAYS:

01/08/2020

AND THAT THE RATE CHARGED THEREIN IS NOT IN EXCESS OF

THE RATE CHARGED PRIVATE INDIVIDUALS.

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 8th DAY OF January, 2020.

NOTARY PUBLIC FOR STATE OF ALASKA

NOTARY PUBLIC
NANCY E DOWNS
STATE OF ALASKA
MY COMMISSION EXPIRES AUG. 25, 2023

MAT-SU BOROUGH/PAGE
1.8
ACCOUNT NUMBER 405249

PUBLIC HEARING

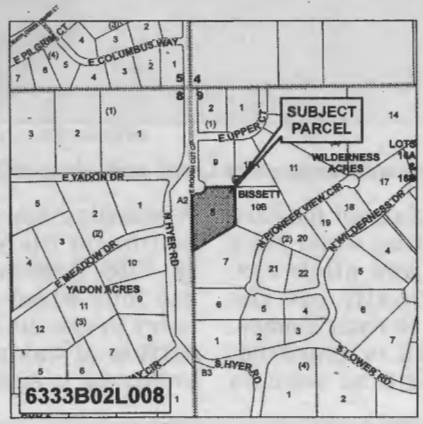
The Matanuska-Susitna Borough Planning Commission will conduct a public hearing concerning the following application for a variance to the minimum setback requirements of MSB 17.55, on Monday **March 2, 2020**, at 6:00 p.m. in the Borough Assembly Chambers located at 350 E. Dahlia Avenue in Palmer. This may be the only presentation of this item before the Planning Commission and you are invited to attend.

An application under MSB 17.65 – Variances, has been submitted for a variance for an exception to the minimum 25-foot right-of-way setback requirement under MSB 17.55. The variance would allow the existing single-family residence to remain 21.3 feet from the E. Rough Cut Circle right-of-way, and the existing garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way. The location of the request is 6010 E. Rough Cut Circle, (Tax ID# 6333B02L008); within Township 17 North, Range 1 East, Section 9, Seward Meridian.

The Planning Commission members may submit questions to the Planning Commission Clerk concerning the matter or request for more information from the applicant at the time of introduction. All questions and requests submitted by the Commission shall be in writing and copies will be provided to the applicant and made available to all interested parties and the public upon request. Answers to questions and additional material requests will be addressed in the staff report for the public hearing. Planning Commission members may not receive or engage in ex-parte contact with the applicant, other interested parties in the application, or members of the public concerning the application or issues presented in the application.

Application materials may be viewed online at www.matsugov.us by clicking on "All Public Notices & Announcements." Application material may also be reviewed at the Borough Permit Center. For additional information, you may contact Joseph Metzger, Planner II, at 861-7862. Written comments can be mailed to: MSB Development Services Division, 350 E. Dahlia Avenue, Palmer, AK 99645, or e-mail comments to Joseph.Metzger@matsugov.us. In order to be eligible to file an appeal from a decision of the Planning Commission, a person must be designated an *"interested party"*. See MSB 15.39.010 for the definition of *"interested party"*. The procedures governing appeals to the Board of Adjustment and Appeals are contained in MSB 15.39.010-250, which is available on the Borough home page: www.matsugov.us, in the Borough Clerk's office, and at various libraries within the borough.

Comments are due on or before **February 3, 2020** and will be included in the Planning Commission packet for the Commissioner's review and information. Please be advised that comments received from the public after that date will not be included in the staff report to the Planning Commission.



Publish: January 8, 2020 1-9-20

Copson-Flaherty – Variance request to MSB 17.55

An application under MSB 17.65 – Variances, has been submitted for a variance to an exception to the minimum 25-foot right-of-way setback requirement under MSB 17.55. The variance would allow the existing single-family residence to remain 21.3 feet from the E. Rough Cut Circle right-of-way, and the existing garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way.

Location: The subject property is Wilderness Acres, Block 2 Lot 8; 6010 E. Rough Cut Circle, (Tax ID# 6333B02L008); within Township 17 North, Range 1 East, Section 9, Seward Meridian.

Applicant: Adam Copson and Janet Flaherty

Public Hearing: The Planning Commission will conduct a public hearing concerning this application on Monday, ***March 2, 2020***, at 6:00 p.m. in the Borough Assembly Chambers located at 350 E. Dahlia Avenue in Palmer. This may be the only presentation of this item before the Planning Commission and you are invited to attend.

The application material may also be reviewed at the Borough Permit Center. If you have questions or want to submit comments, please contact Joseph Metzger, Planner II at 861-7862 or mail to MSB Development Services Division, 350 E. Dahlia Avenue, Palmer, AK 99645, or email: joseph.metzger@matsugov.us

Comments are due on or before ***February 3, 2020*** and will be included in the Planning Commission packet for the Commissioner's review and information. Please be advised that comments received from the public after that date will not be included in the staff report to the Planning Commission.

This map is solely for informational purposes only. The Borough makes no express or implied warranties with respect to the character, function, or capabilities of the map or the suitability of the map for any particular purpose beyond those originally intended by the Borough. For information regarding the full disclaimer and policies related to acceptable uses of this map, please contact the Matanuska-Susitna Borough GIS Division at 907-861-7801.

Date: 2/14/2020

1 inch = 200 feet

0 200 400 Feet

N

Matanuska-Susitna Borough
Permit Center

Date: 2/13/2020

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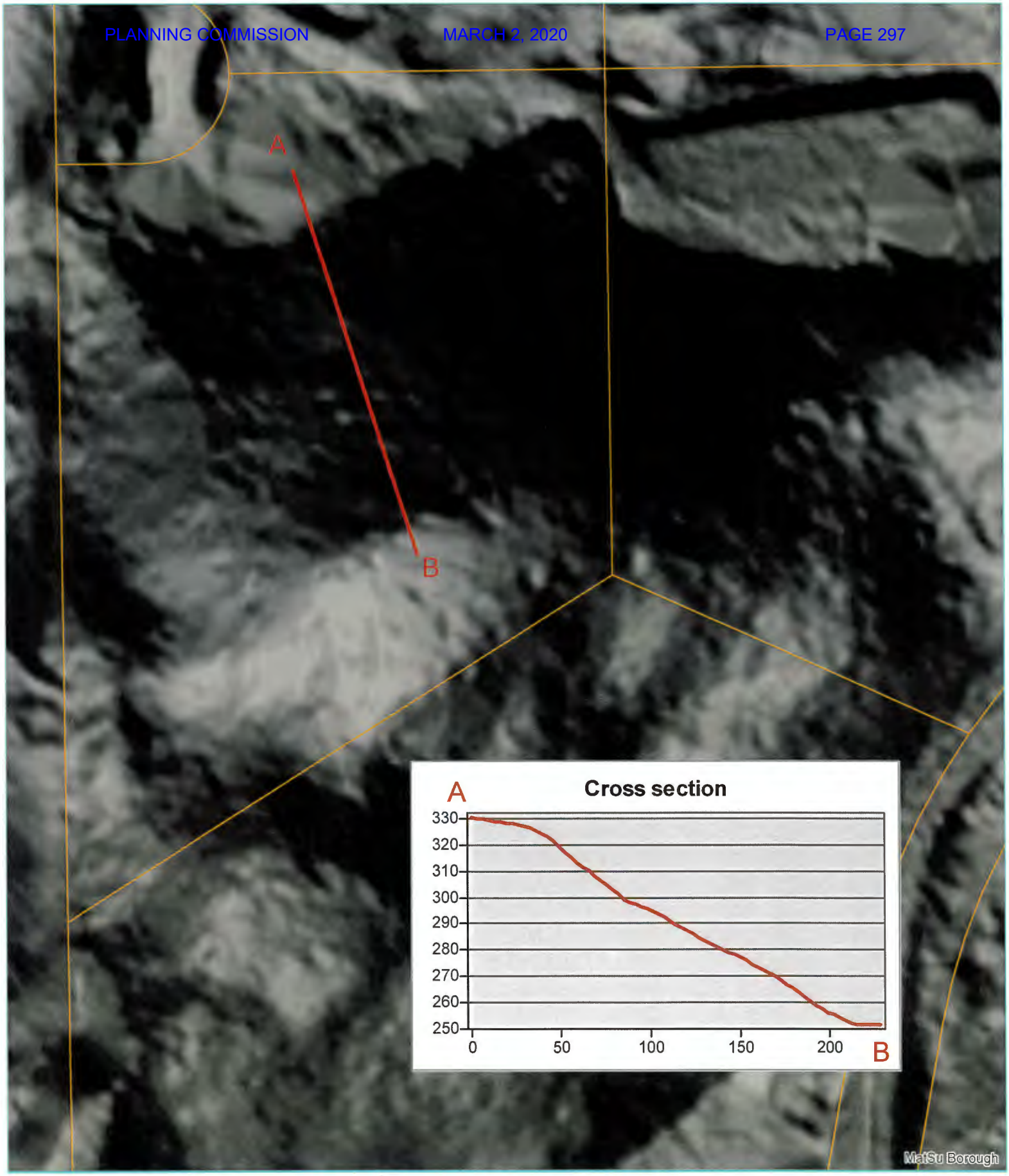

Matanuska-Susitna Borough
Permit Center

Date: 2/12/2020

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633B02L008

Map	WA-10	Sheet	1-2 of 2
		Date Built	1975 Eff yr
999 Loc		Remodeled	Addition

Bldg Type & Use	
Category	1100
Stories	1
Living Units	1
Basement	0
Frame	
Cabin___Res___Rec___Comm___	
Log	
Other	

Foundation	4.0
Conc Blk ✓ Poured	Piers
Wood Post	
Wood Sill	
AWW	
Other	

Basement	
Partial	
Full	
Outside Ent	
Fin. Walls	
Fin. Ceiling	
Fin Floors	
Heated	
Other	

Frame	4.0
Walls	
Floors	
Roof	

Exterior	4.0
Concrete	
Sheathing	
Insulation	
Siding T1-11	
Shakes	
Log ___ native___ S3S___	
Other	

Roof	4.0
Gab Flat Shed	
A'Frame Gam Hip	
Other	
Shakes	
Comp Shingle ✓	
Insulation	
Tar Paper	
Metal	
Build-Up	

Interior	4.0
Open Studs	
Insulation	
Sheetrock	
Wood Paneling	
Log	
Other	

Interior	# bdrm	# bath	ceil hgt
Basement			
1st Floor			
2nd Floor			
3rd Floor			
Attic			

Multi-Residential	1 bath	2 bath
1 Bdroom		
2 Bdroom		
3 Bdroom		
Efficiency		

Floors	4.5
Sub-Floor	
Kitchen	
Dining	
Living Rm	
Bed-Rooms	
Bath	

Heat	5.0
Stove	
Oil Furnace	
Gas Furnace P	(NG)
Coal Furnace	
Electric	
Space Heat	
Other	

Fireplace		
1st Floor	WS	FP
2nd Floor	WS	FP
Basement	WS	FP

Plumbing	4.5
Tubs	1
Jacuzzi	
Toilets	1
Basins	1
Shower Units	
Sauna	
Water Source	DW
Sewer Source	SS

Electrical	4.5
Wired	
Amps 100__ 200__	
Outlets P A G E	
Lighting P A G E	

Garage (Det) Att Bsmt Bl
PAGE #2. 1997
GARAGE
24×36 = 864

Porches / Decks
PO
4×6 = 24
PO
10×24 = 240SF

Other Bldgs	Area	Floor	Roof	Int	Heat	Plumb	Unit Cost	Age	Condition	Bldg Value

Grade 4.3

Building Value Calculation

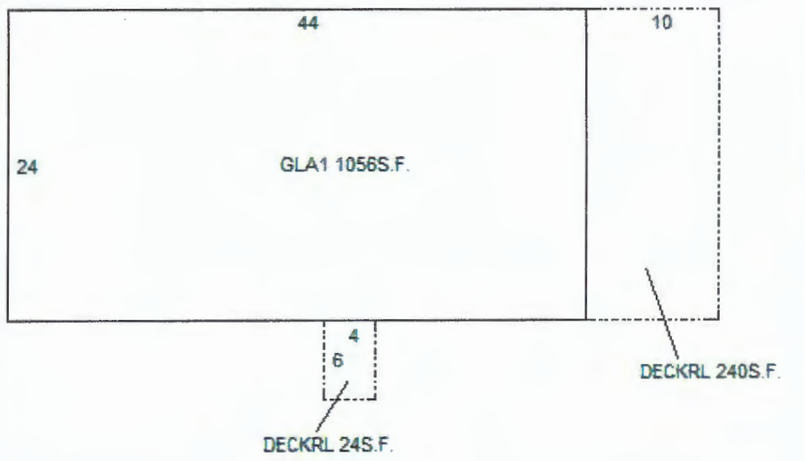
Item #	Area or Quality	Unit Cost (% comp)	Total
1.0	1056SF		

Building Area Calculations

Floor/Part	Width	Length	Area

Additions & Deductions

8E	G	1
8Y		1
9A	02	1
12E		240
PAGE #2		
11M		864



6333B02L008

Map	WA-10	Sheet	1-2 of 2
		Date Built	1975 Eff yr
999 Loc		Remodeled	Addition

Bldg Type & Use	
Category	1100
Stories	1
Living Units	1
Basement	0
Frame	
Cabin___Res___Rec___Comm___	
Log	
Other	

Foundation	4.0
Conc Blk ✓ Poured	Piers
Wood Post	
Wood Sill	
AWW	
Other	

Basement	
Partial	
Full	
Outside Ent	
Fin. Walls	
Fin. Ceiling	
Fin Floors	
Heated	
Other	

Frame	4.0
Walls	
Floors	
Roof	

Exterior	4.0
Concrete	
Sheathing	
Insulation	
Siding	T1-11
Shakes	
Log ___ native___ S3S___	
Other	

Roof	4.0
Gab Flat Shed	
A'Frame Gam Hip	
Other	
Shakes	
Comp Shingle ✓	
Insulation	
Tar Paper	
Metal	
Build-Up	

Interior	4.0
Open Studs	
Insulation	
Sheetrock	
Wood Paneling	
Log	
Other	

Interior	# bdrm	# bath	ceil hgt
Basement			
1st Floor			
2nd Floor			
3rd Floor			
Attic			

Multi-Residential	1 bath	2 bath
1 Bdroom		
2 Bdroom		
3 Bdroom		
Efficiency		

Floors	4.5
Sub-Floor	
Kitchen	
Dining	
Living Rm	
Bed-Rooms	
Bath	

Heat	5.0
Stove	
Oil Furnace	
Gas Furnace P	(NG)
Coal Furnace	
Electric	
Space Heat	
Other	

Fireplace		
1st Floor	WS	FP
2nd Floor	WS	FP
Basement	WS	FP

Plumbing	4.5
Tubs	1
Jacuzzi	
Toilets	1
Basins	1
Shower Units	
Sauna	
Water Source	DW
Sewer Source	SS

Electrical	4.5
Wired	
Amps 100__ 200__	
Outlets P A G E	
Lighting P A G E	

Garage (Det) Att Bsmt Bl
PAGE #2. 1997
GARAGE
24x36 = 864

Porches / Decks
RD
4x6 = 24
RD
10x24 = 240 SF

Other Bldgs	Area	Floor	F

Grade 4.3

Building Value Calculation

Item #	Area or Quality	Unit Cost (% comp)	Total
1.0	1056 SF		

Additions & Deductions

8E	G	1
8Y		1
9A	02	1
12E		240
PAGE #2.		
11M		864

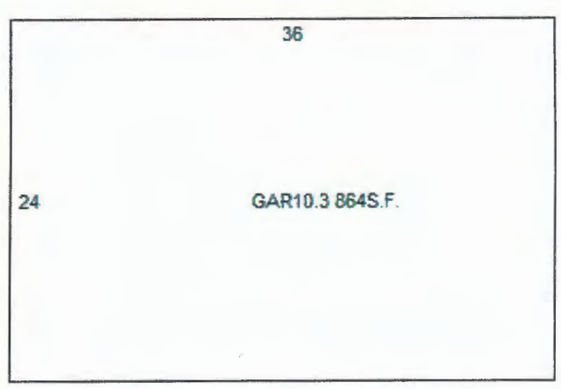


PHOTO PANEL

Percentage of Completion Schedule		
Excavating & Foundation	10%	10%
Framing	15%	25%
Exterior Siding & Paint	6%	31%
Windows & Doors	7%	38%
Roof Covering	4%	42%
Electrical Rough-in	2%	44%
Plumbing Rough-in	2%	46%
Insulation & Vapor Barrier	5%	51%
Heating	10%	61%
Sheetrock	5%	66%
Interior Finish & Paint	4%	70%
Kitchen Cabinets & Built-Ins	10%	80%
Plumbing Fixtures	4%	84%
Electrical Fixtures	3%	87%
Interior Doors & Trim	6%	93%
Flooring	7%	100%

Comments

8-28-14 - Redid Blue Card - CDE

Date

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VICINITY MAP

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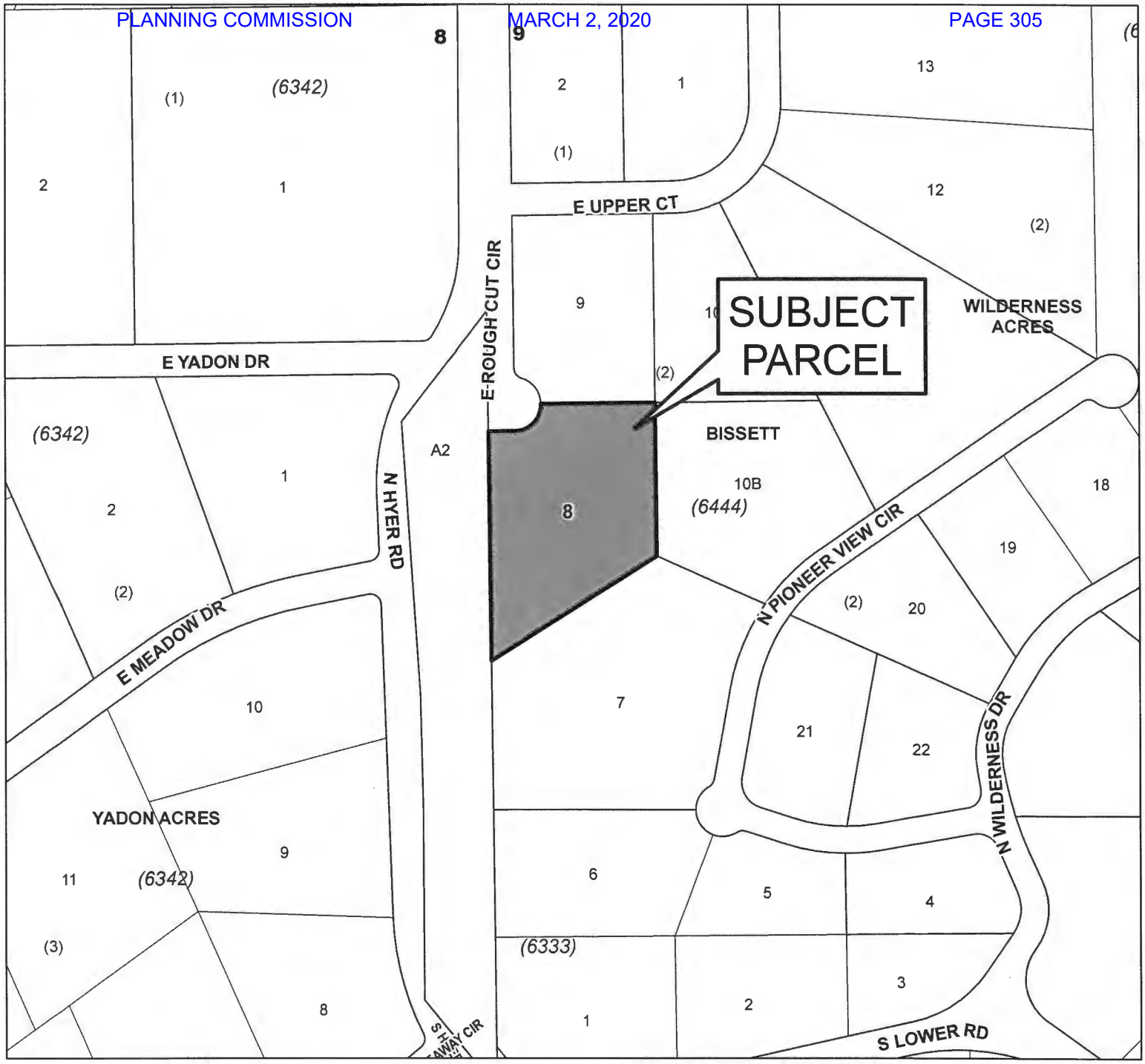
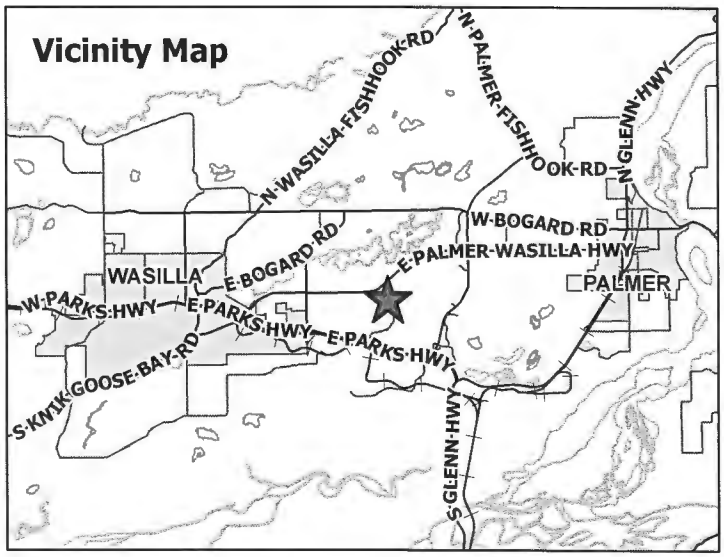


6333B02L008



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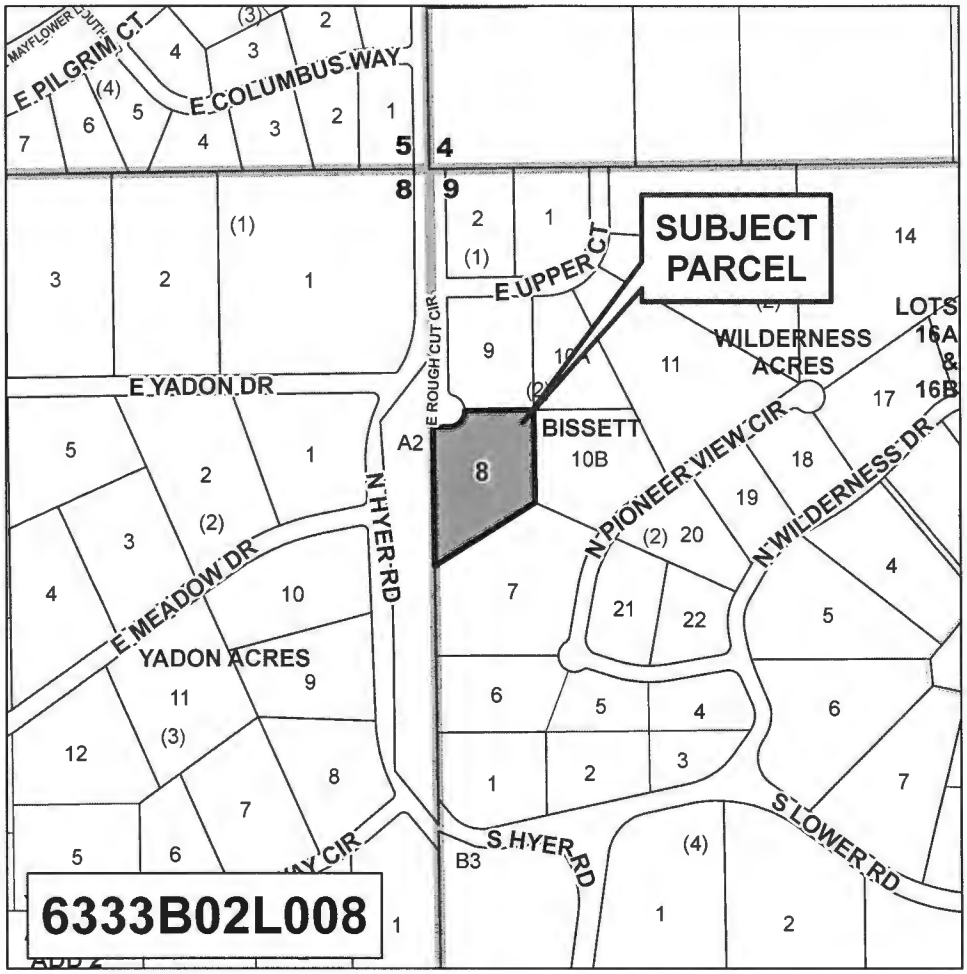
MSB Information Technology/GIS
December 31, 2019

0 1,000 Feet


SUBJECT PARCEL
6333B02L008
E PILGRIM CT
E COLUMBUS WAY
E UPPER CT
E YADON DR
E ROUGH CUT CIR
N HYER RD
E MEADOW DR
YADON ACRES
BISSETT
10B
A2
WILDERNESS ACRES
LOTS 16A & 16B
N PIONEER VIEW CIR
N WILDERNESS DR
S HYER RD
S LOWER RD
B3

SITE PLAN

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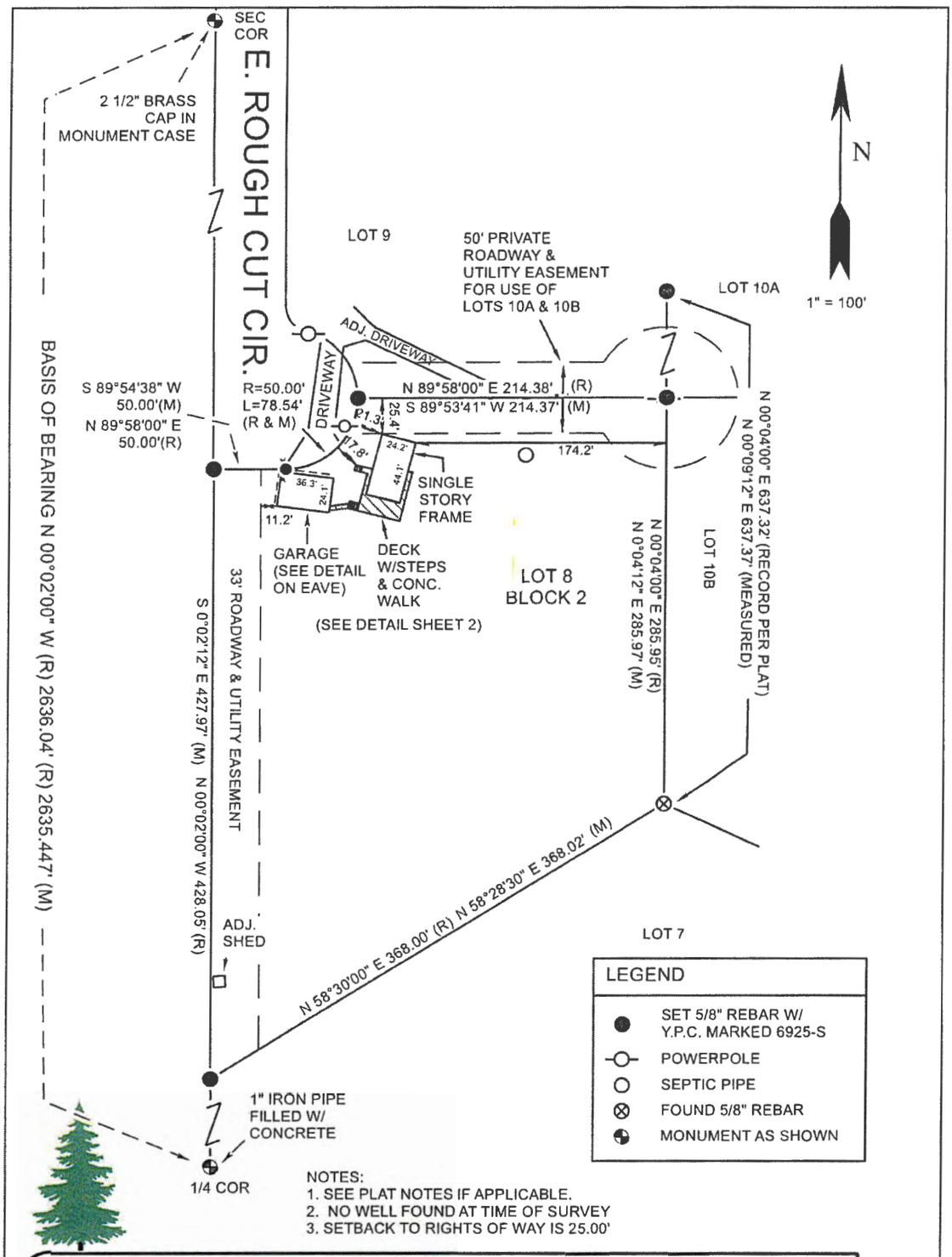

NOTES:
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2. NO WELL FOUND AT TIME OF SURVEY
3. SETBACK TO RIGHTS OF WAY IS 25.00'

DENALI NORTH

230 E. PAULSON AVE. SUITE 67
WASILLA, AK 99654
Phone (907) 376-9535

I HEREBY CERTIFY THAT I HAVE SURVEYED THE FOLLOWING DESCRIBED PROPERTY : LOT 8 BLOCK 2 WILDERNESS ACRES PLAT NO. 71-61

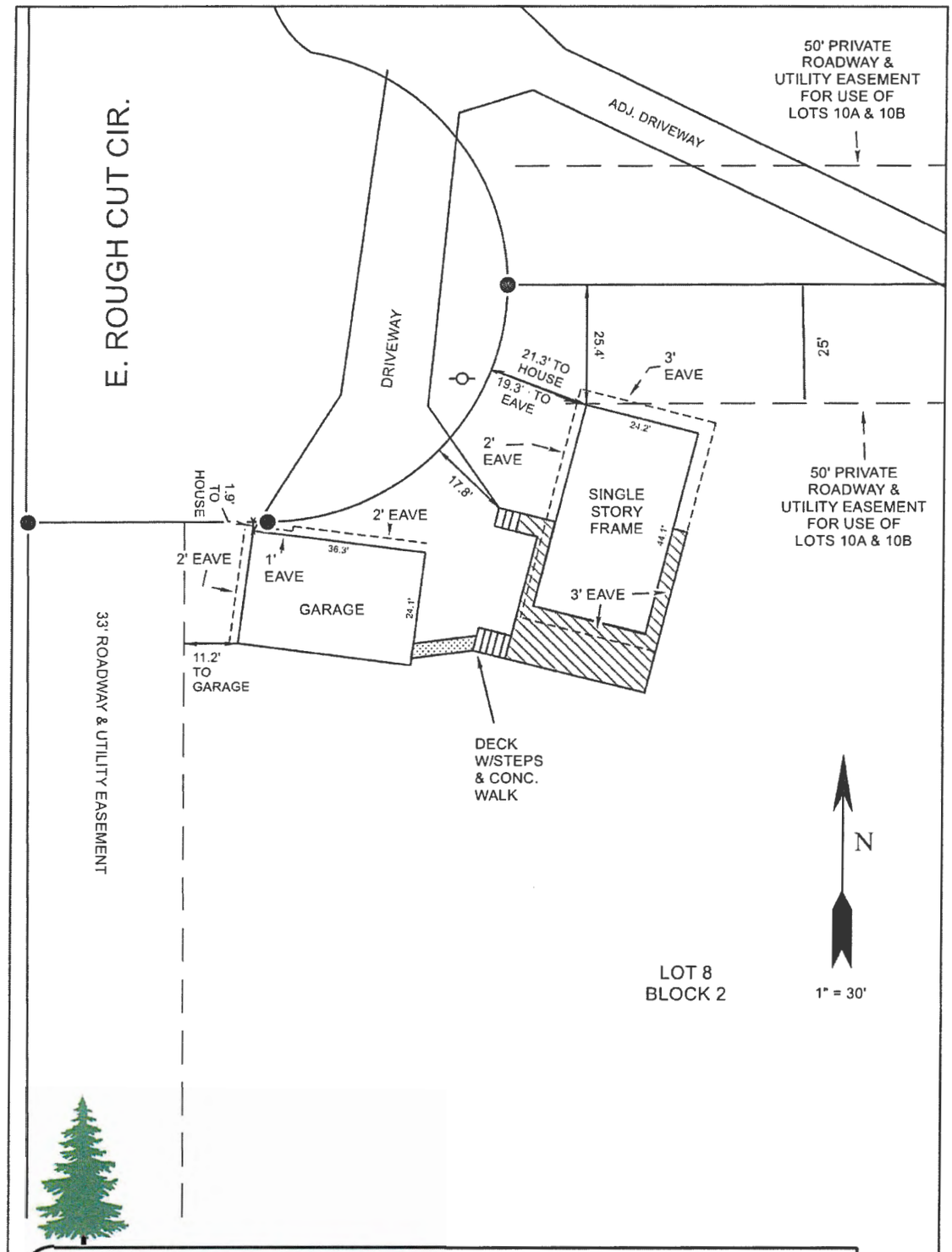
PALMER RECORDING DISTRICT, AND THERE ARE NO ENCROACHMENTS VISIBLE AT THE TIME OF THIS SURVEY, EXCEPT AS INDICATED.
DATED THIS 25TH DAY OF OCT 20 19 AT PALMER, ALASKA.
IT IS THE RESPONSIBILITY OF THE OWNERS OR BUILDERS TO DETERMINE THE EXISTENCE OF ANY EASEMENTS, COVENANTS OR RESTRICTIONS WHICH DO NOT APPEAR ON THE RECORDED SUBDIVISION PLAT. UNDER NO CIRCUMSTANCES SHOULD ANY DATA HEREON BE USED FOR CONSTRUCTION OR ESTABLISHING FENCE LINES.

STATE OF ALASKA
49TH
WAYNE N. WHALEY
LS-6925
REGISTERED PROFESSIONAL LAND SURVEYOR

WAYNE N. WHALEY LS-6925

JOB NO. 19-347		SHEET 1 OF 2		FIELD BOOK/PG(S). 300/35	
SCALE 100 Ft/In	PLOT PLAN	ASBUILT X	MAP	DRAWN HW	CKD. WW

Traverse PC



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STATE OF ALASKA
40TH
WAYNE M. WHALEY
LS-6925
REGISTERED PROFESSIONAL LAND SURVEYOR

JOB NO. 19-347		SHEET 2 OF 2		FIELD BOOK/PG(S). 300/35	
SCALE 30 Ft/In	PLOT PLAN	ASBUILT X	MAP	DRAWN HW	CKD. WW

Traverse PC

APPLICATION MATERIAL

MATANUSKA-SUSITNA BOROUGH

Planning and Land Use Department
Development Services Division
350 East Dahlia Avenue • Palmer, AK 99645
Phone (907) 861-7822 • Fax (907) 861-7876
Email: PermitCenter@matsugov.us

APPLICATION FOR A VARIANCE – MSB 17.65

Carefully read instructions and applicable borough code. Fill out forms completely. Attach information as needed. Incomplete applications will not be processed.

Application fee must be attached:
_____ **$1,000** for **Variance**
Prior to the public hearing, the applicant must also pay the mailing and advertising fees associated with the application. Applicants will be provided with a statement of advertising and mailing charges. Payment must be made ***prior*** *to the application presentation before the Borough Planning Commission.*

Subject Property Township: _____, Range: _____, Section: _____, Meridian____
MSB Tax Acct # 56333B02L008
SUBDIVISION: Wilderness Acres BLOCK(S): 2 , LOT(S): 8
STREET ADDRESS: 6010 E. Rough Cut Circle; Palmer, AK 9964
(US Survey, Aliquot Part, Lat. /Long. etc) _____

Ownership A *written authorization by the owner must be attached for an agent or contact person, if the owner is using one for the application.* Is authorization attached? o **Yes** o **No** X **N/A**

Name of Property Owner	**Name of Agent/ Contact for application**
Adam Copson/Janet Flaherty	
Address: 1041 N. Tina Ln. Palmer, AK 99645	Address:
Phne: Hm 745-0621 Fax	Phne: Hm Fax
Wk 745-8122 Cell 907-354-7130	Wk Cell
E-mail taben@mtaonline.net	E-mail
Janet's cell 354-7140	

Description	**Attached**
A variance from MSB 17.55 is being applied for and is specifically described.	X
Provide a detailed written description as to why the variance is required.	X

Drawings	**Attached**
A boundary survey and site plan of the proposed and/or existing development, of the particular parcel or parcels affected. (See attached survey standards checklist). The survey must be submitted under the seal of an Alaska registered professional land surveyor.	X
Structural elevation drawing(s) for the purpose of indicating the proposed height and bulk, view and other dimensions of the subject structure.	X

In order to grant a variance from MSB Title 17, the Planning Commission must find that each of the following requirements has been met (17.65.020). Explain how the request meets each requirement. Include information such as physical surroundings, shape or topographical conditions of the property which would support the granting of a variance.	**Attached**
1. What unusual conditions or circumstances apply to the property for which the variance is sought?	X
2. How the strict application of the provisions of this title will deprive you of the rights commonly enjoyed by other properties under the terms of this title.	X
3. Why the granting of the variance will not be injurious to nearby property, nor harmful to the public welfare.	X
4. How will the granting of the variance be in harmony with the objectives of this title and any applicable comprehensive plans?	X
5. How the deviation from the requirements of this title as permitted by the variance will be no more than is necessary to permit a reasonable use of the property.	X

A variance may <u>not</u> be granted if any of the conditions listed below are true. Explain why each condition is <u>not</u> applicable to this application.	**Attached**
1. The special conditions that require the variance are caused by the person seeking the variance.	X
2. The variance will permit a land use in a district in which that use is prohibited.	X
3. The variance is sought solely to relieve pecuniary hardship or inconvenience.	X

OWNER'S STATEMENT: I am owner of the following property:

MSB Tax parcel ID #(s) 56333B02L008 and,
I hereby apply for approval a setback variance on that property as described in this application.

I understand all activity must be conducted in compliance with all applicable standards of MSB 17.55 and MSB 17.65 and with all other applicable borough, state or federal laws.

I understand that other rules such as local, state and federal regulations, covenants, plat notes, and deed restrictions may be applicable and other permits or authorization may be required. I understand that the borough may also impose conditions and safeguards designed to protect the public's health, safety and welfare and ensure the compatibility of the use with other adjacent uses.

I understand that it is my responsibility to identify and comply with all applicable rules and conditions, covenants, plat notes, and deed restrictions, including changes that may occur in such requirements.

I understand that this permit and zoning status may transfer to subsequent owners of this land and that it is my responsibility to disclose the requirements of this status to the buyer when I sell the land.

I understand that changes from the approved variance may require further authorization by the Borough Planning Commission. I understand that failure to provide applicable documentation of compliance with approved requirements, or violation of such requirements will nullify legal status, and may result in penalties.

I grant permission for borough staff members to enter onto the property as needed to process this application and monitor compliance. Such access will at a minimum, be allowed when the activity is occurring and, with prior notice, at other times necessary to monitor compliance.

The information submitted in this application is accurate and complete to the best of my knowledge.

Janet M. Flaherty / Adam Copson / Janet Flaherty 9/19/19

Signature: Property Owner Printed Name Date

Signature: Agent Printed Name Date

Variance Application
MSB 17.65

Matanuska-Susitna Borough
Minimum Survey Drawing Standards

For Matanuska-Susitna Borough (MSB) 17.60 Conditional Uses, 17.65 Variances, MSB 17.80 Legal Nonconforming Structures, and any site plan or survey required to be provided under the seal of a registered surveyor. Additional data may be required. For more information contact the MSB Code Compliance Division at (907) 745-9853, E-mail: ccb@matsugov.us

CHECK LIST

1) Critical Lot Line(s)
- ✓ a. corners in
- ✓ b. record & measured distances shown
- ✓ c. new corners set

2) Setback Shown:
- ✓ a. furthermost protruding part of structure(s) including attached eaves, decks, cantilevers, etc. (at closest points of separation)
- ✓ b. dimensioned to 0.1 foot, with no +/-
- ✓ c. other dimensions required by applicable code.

3) Easements/Rights of Way
- ✓ a. all dedicated public easements on lot (identify by type); adjacent public rights of way (with name)
- ✓ b. verify section line easement (SLE)

4) Survey for MSB used is not a mortgage survey:
- ✓ a. no exclusion of use note
- ✓ b. no copyright
- ✓ c. north arrow
- ✓ d. scale
- ✓ e. show control used
- ✓ f. Basis of Bearing
- ✓ g. type and size of all monuments found or set
- ✓ h. legal description
- ✓ i. date of field survey
- ✓ j. seal, sign
- ✓ k. surveyor's printed name and address

5) Other specific information relevant to the application
- ✓ a. specific dimensions of structures, development
- ✓ b. dates of construction, additions
- ✓ c. identification of relevant decks, eaves, additions, "phases" of construction, use areas, areas where heights are different, etc.
- N/A d. water bodies onsite, adjacent to lot, or within 75 feet of a structure on the lot
- N/A e. other information required by the applicable MSB ordinance or required to administer the applicable code. Check relevant codes and instruction sheets for additional information.
- ✓ f. topography

MSB TAX ID#_____, T____, R____, S____, M__ MSB #_____
MSB Tax Map _____

#1- The topography of the land restricts where we can build. There is only 6 feet of land behind the garage before it drops off to a steep hill, the same is true for the south end of the garage. The space that is possible to build on is very limited, due to the topography of this property.

#2- We would not be able to build a structure for living or storage on this property. There is not enough flat useable land on this property. What we have built is similar to what others have built in the area.

#3- The variance would not have any negative effect on neighboring properties. The existing structures have been there since 1975 (the house), and 1998 (the garage).

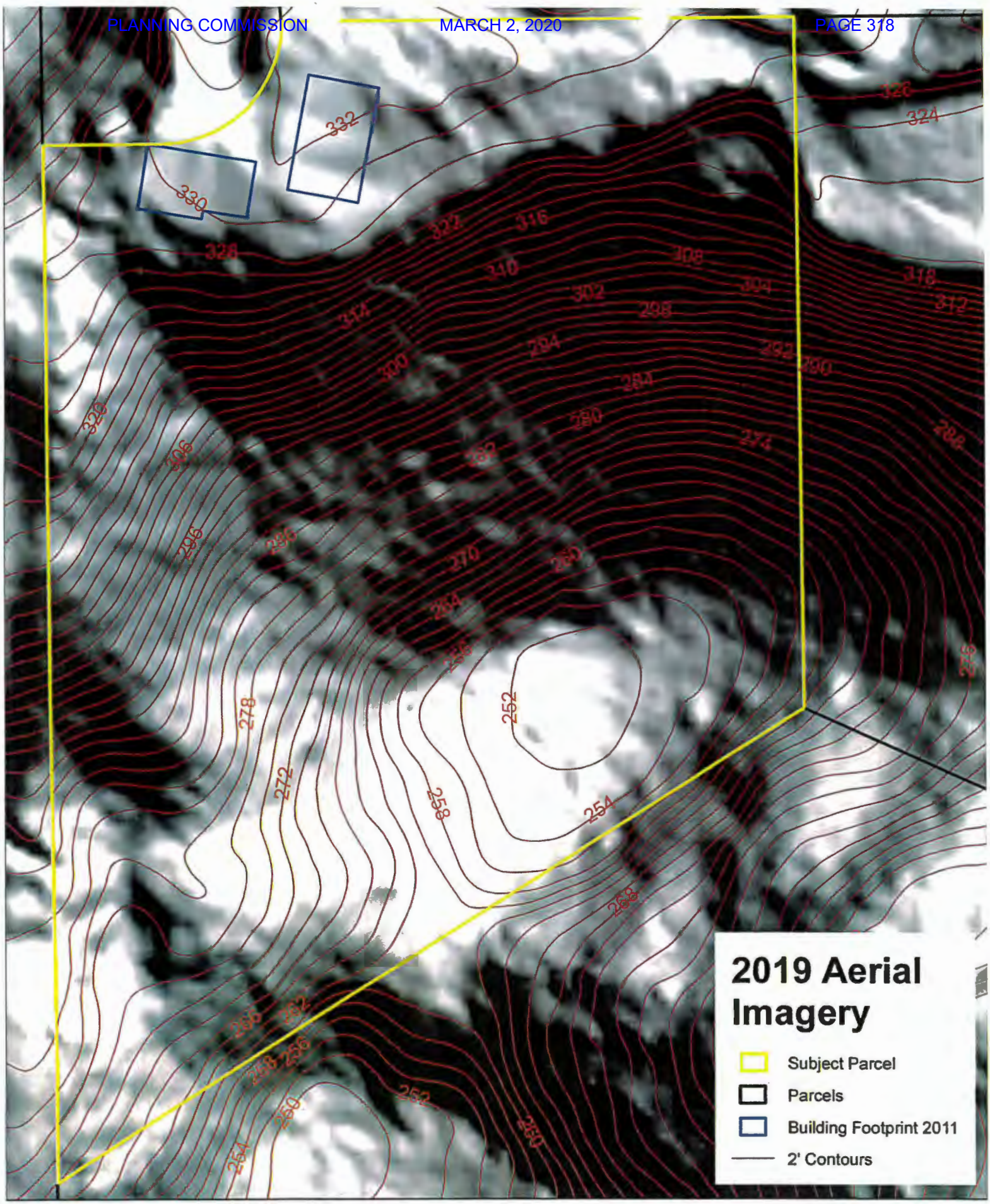
#4- We are using this property to it's highest and best use. Also, the approval of this variance will allow us to continue to do so.

#5- The structures that are on this property now, make the property comfortable, and enjoyable. We are asking for no more than what is already there.

#1- The topography of this property has not been changed by myself or any previous owners of the property.

#2- The only use for this property will be for a single family home, which is allowed on this property.

#3- There is no pecuniary interest in applying for this variance. The topography and building area, are the reason for this need for variance.



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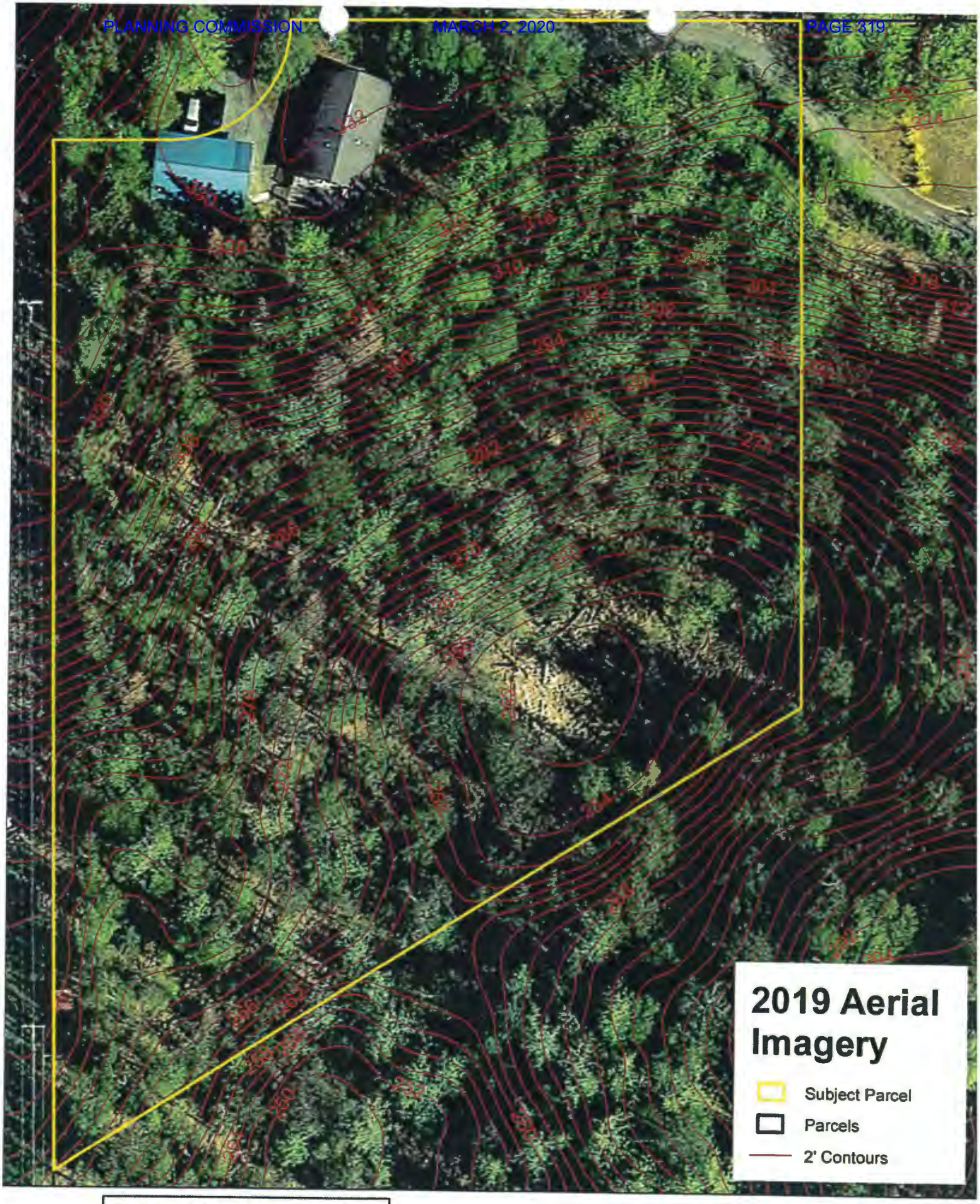
Date: 9/6/2019

1 inch = 50 feet

0 50 100 Feet



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0 50 100 Feet

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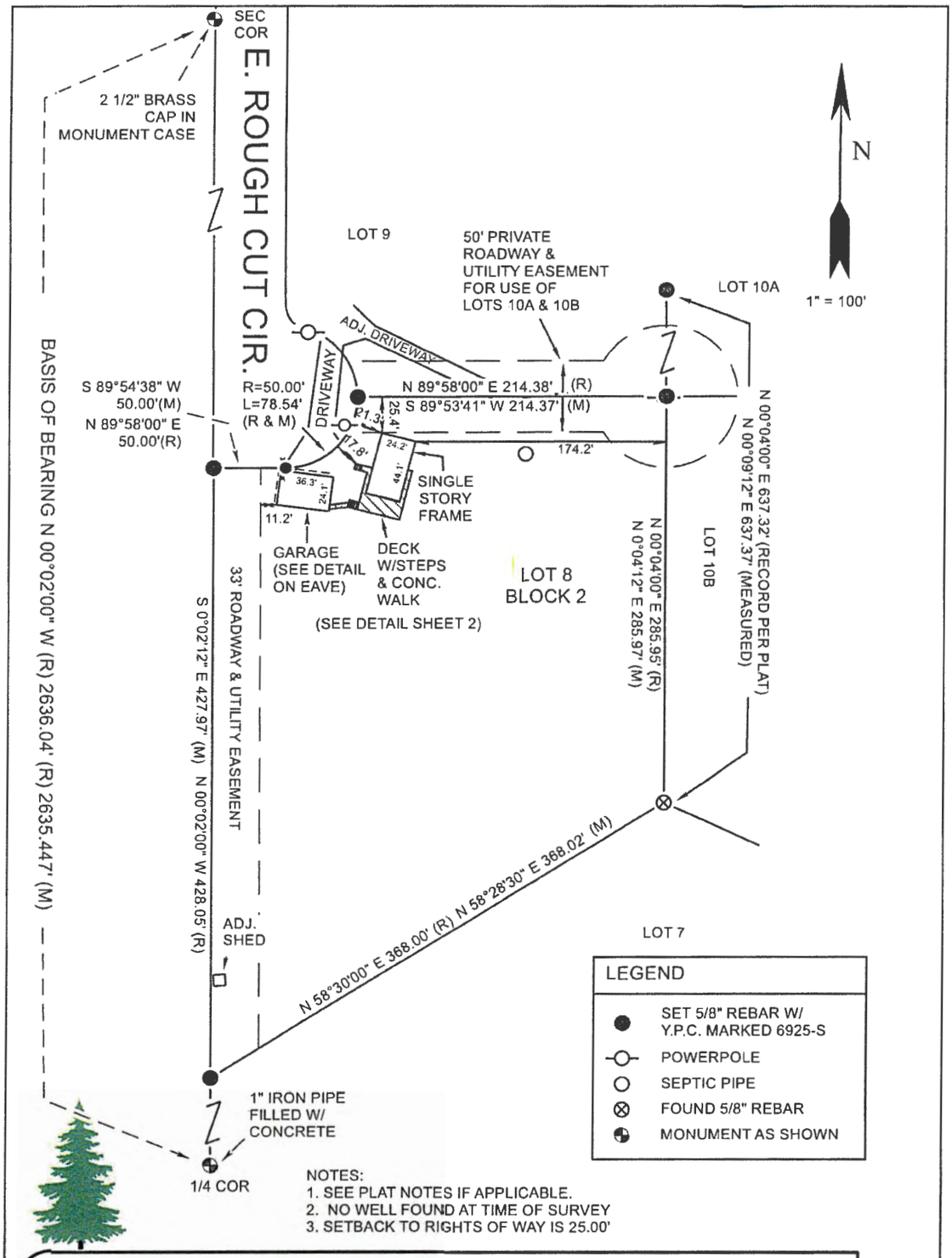

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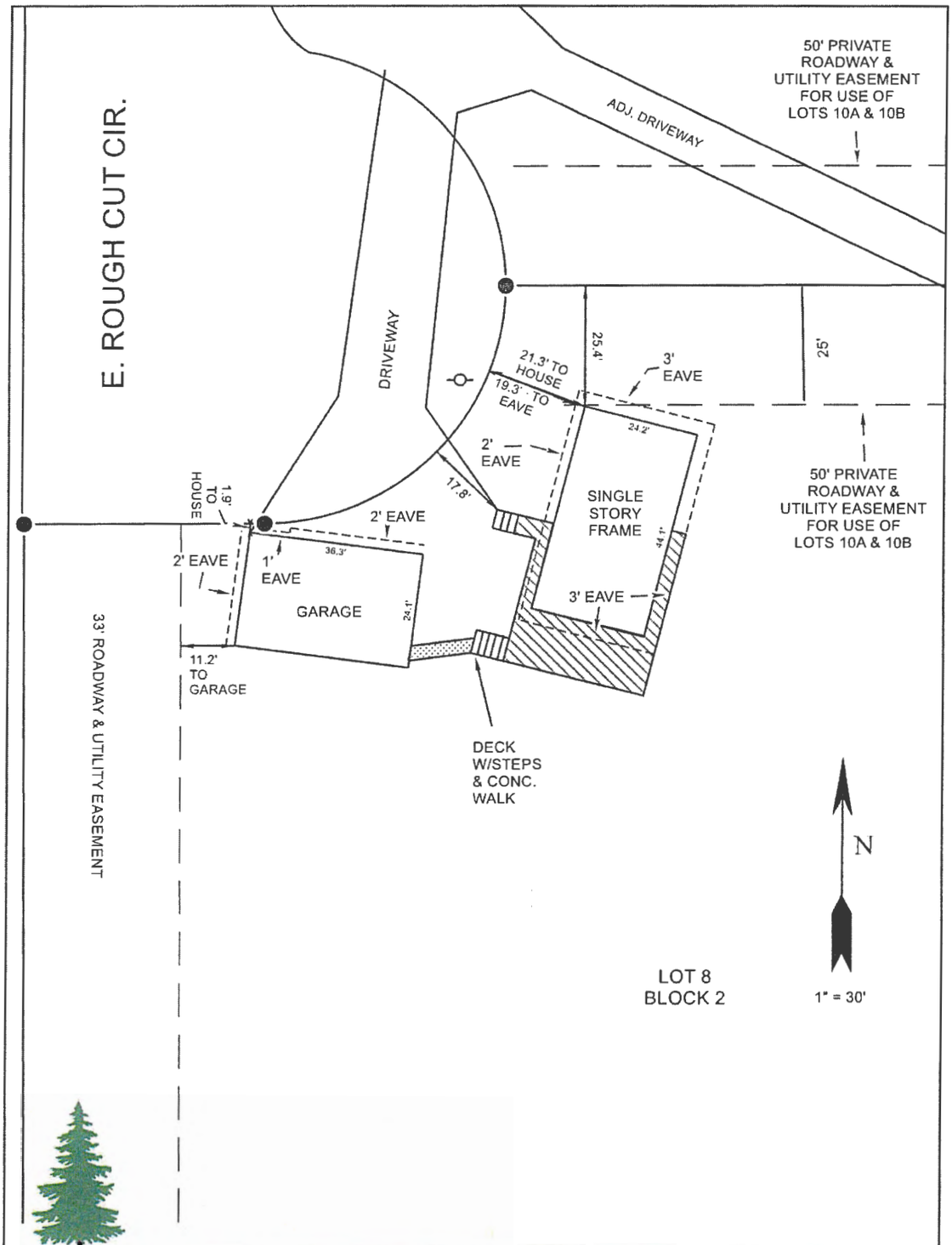
STATE OF ALASKA 49TH WAYNE N. WHALEY LS-6925 REGISTERED PROFESSIONAL LAND SURVEYOR

WAYNE N. WHALEY LS-6925

JOB NO. 19-347		SHEET 1 OF 2		FIELD BOOK/PG(S). 300/35	
SCALE 100 Ft/In	PLOT PLAN	ASBUILT X	MAP	DRAWN HW	CKD. WW

Traverse PC



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STATE OF ALASKA
40TH
WAYNE N. WHALEY
LS-6925
REGISTERED PROFESSIONAL LAND SURVEYOR

JOB NO. 19-347		SHEET 2 OF 2		FIELD BOOK/PG(S). 300/35	
SCALE 30 Ft/In	PLOT PLAN	ASBUILT X	MAP	DRAWN HW	CKD. WW

Traverse PC

Joseph Metzger

From: Joseph Metzger
Sent: Thursday, December 5, 2019 2:13 PM
To: 'taben@mtaonline.net'
Subject: 6010 E. Rough Cut Circle Variance Request

Good Afternoon Adam and Janet,

It was good speak with you on the phone earlier about your Variance request at 6010 E. Rough Cut Circle. As we discussed, please provide pictures of the house and garage that show all sides of each building. Please also submit photos that capture the general layout of the property and the topographical challenges if possible. Once we receive these photos and deem the application complete, we can begin the public notice process and get you scheduled for a Public Hearing.

If you have any questions or need clarification of anything, don't hesitate to contact me.

Respectfully,

Joe Metzger
MSB Planner II
907-861-7862

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CASTABLE CERAMICS
YOUR DENTAL LABORATORY SOLUTION
907-258-0165
Fax 907-272-6526
Anchorage, Alaska
info@castableceramics.com

RECEIVED
DEC 10 2019
MATANUSKA-SUSITNA BOROUGH
DEVELOPMENT SERVICES

Hi Joe,

It turns out it's easier for me to print and deliver, than to email. Sad but true!

Thanks,

Janet Flaherty
907-354-7140

Re: 6010 E. Rough Cut Cir
– Variance

MATANUSKA-SUSITNA BOROUGH

Real Property Detail for Account: 6333B02L008

Site Information

Account Number	6333B02L008	Subdivision	WILDERNESS ACRES
Parcel ID	64792	City	None
TRS	S17N01E09	Map WA10	Tax Map
Abbreviated Description (Not for Conveyance)	WILDERNESS ACRES BLOCK 2 LOT 8		
Site Address	6010 E ROUGH CUT CIR		

Ownership

Owners	COPSON ADAM DALE FLAHERTY JANET MARIE	Buyers	
Primary Owner's Address	1041 N TINA LN PALMER AK 99645	Primary Buyer's Address	

Appraisal Information

Year	Land Appraised	Bldg. Appraised	Total Appraised
2019	$47,700.00	$121,900.00	$169,600.00
2018	$47,700.00	$118,700.00	$166,400.00
2017	$47,700.00	$119,300.00	$167,000.00

Assessment

Year	Land Assessed	Bldg. Assessed	Total Assessed[1]
2019	$47,700.00	$121,900.00	$169,600.00
2018	$47,700.00	$118,700.00	$166,400.00
2017	$47,700.00	$119,300.00	$167,000.00

Building Information

Structure 2 of 2

Business	None	Residential Units	0
Use	Residential Garage	Condition	Standard
Design	Other	Basement	None
Construction Type	Frame	Year Built	1997
Grade	None	Foundation	Slab on Grade
Building Appraisal	$20900	Well	
Septic			

Structure 1 of 2

Business	None	Residential Units	1
Use	Residential Building	Condition	Standard
Design	One Story	Basement	None
Construction Type	Frame	Year Built	1975
Grade	04.3	Foundation	Concrete Block
Building Appraisal	$101000	Well	Well 1 - Drilled Well
Septic	Septic - 1 - Septic Tank		

Building Item Details

Building Number	Description	Area	Percent Complete
1	Wood Stove - 8Y	1 Sq. Ft.	100%
1	First Story	1056 Sq. Ft.	100%
1	Gas Heat	1 Sq. Ft.	100%
2	Garage (10.3) Area - 11M	864 Sq. Ft.	100%

Tax/Billing Information

Year	Certified	Zone	Mill	Tax Billed
2019	Yes	0006	15.889	$2694.78
2018	Yes	0006	15.809	$2630.62
2017	Yes	0006	15.81	$2640.27

Recorded Documents

Date	Type	Recording Info (offsite link to DNR)
6/17/1993	WARRANTY DEED (ALL TYPES)	Palmer Bk: 720 Pg: 17
9/7/1990	WARRANTY DEED (ALL TYPES)	Palmer Bk: 629 Pg: 216

Tax Account Status [2]

Status	Tax Balance	Farm	Disabled Veteran	Senior	Total	LID Exists
Current	$1,347.39	$0.00	$0.00	$0.00	$0.00	No

Land and Miscellaneous

Gross Acreage	Taxable Acreage	Assembly District	Precinct	Fire Service Area	Road Service Area
2.65	2.65	Assembly District 002	11-085	130 Central Mat-Su	009 Midway RSA

[1] Total Assessed is net of exemptions and deferments.rest, penalties, and other charges posted after Last Update Date are not reflected in balances.
[2] If account is in foreclosure, payment must be in certified funds.

Last Updated: 11/6/2019 12:00:38 AM

Matanuska-Susitna Borough

Legend

- Road Mileposts
- Roads
  - Highway
  - Major Road
  - Medium Road
  - Minor Road
  - Primitive Road
  - Private Road
- Alaska Railroad
- Mat-Su Borough Boundary
- Incorporated Cities
- Government Lot Lines
- Parcels
- Lakes and Rivers
- Streams
- Section Lines
- Flood Zone

1:4,514

0.1 0 0.07 0.14 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere

© Matanuska-Susitna Borough

Reported on 11/06/2019 04:14 PM

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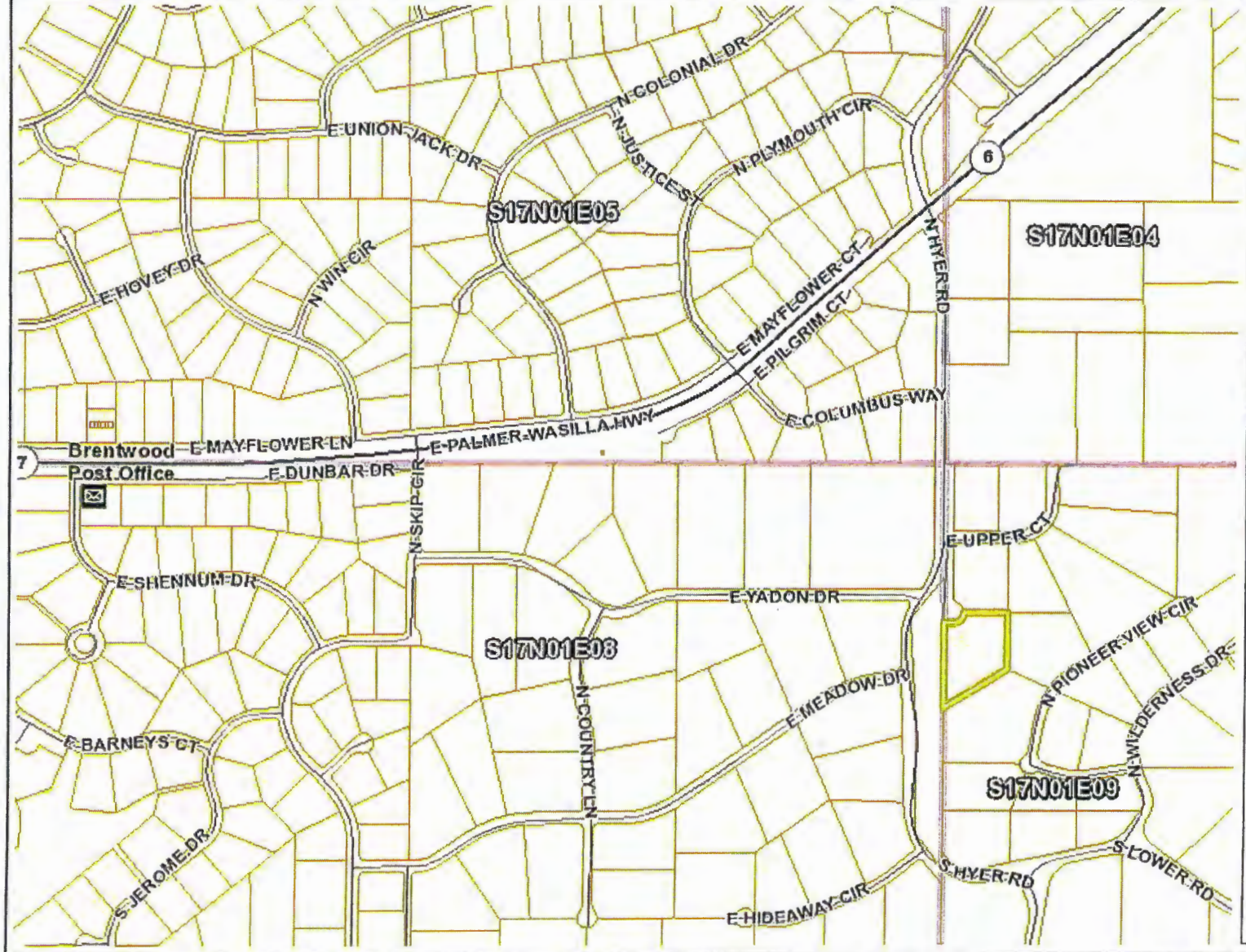
Notes

This map was automatically generated using Geocortex Essentials.

Matanuska-Susitna Borough



Legend

- Road Mileposts
- Roads
  - Highway
  - Major Road
  - Medium Road
  - Minor Road
  - Primitive Road
  - Private Road
- Alaska Railroad
- Mat-Su Borough Boundary
- Incorporated Cities
- Government Lot Lines
- Parcels
- Lakes and Rivers
- Streams
- Section Lines
- Flood Zone

1: 18,056

0.6 0 0.28 0.57 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere

© Matanuska-Susitna Borough

Reported on 11/06/2019 04:15 PM

THIS MAP IS NOT TO BE USED FOR NAVIGATION

This map is solely for informational purposes only. The Borough makes no express or implied warranties with respect to the character, function, or capabilities of the map or the suitability of the map for any particular purpose beyond those originally intended by the Borough. For information regarding the full disclaimer and policies related to acceptable uses of this map, please contact the Matanuska-Susitna Borough GIS Division at 907-861-7858.

Notes

This map was automatically generated using Geocortex Essentials.

PERMIT CENTER – FEE RECEIPT FORM

Property Location: 6333 B02 L008 Applicant: Flaherty

	USE PERMITS {100.000.000.341.300}	Fee
☐	**8.35** Public Display of Fireworks	$25.00
☐	**8.40.010** Liquor License - Alcohol & Marijuana Control Office (AMCO) Referrals for Matanuska Susitna Borough Review of Issuance, renewal or transfer (location, owner)	$100.00
☐	**8.41.010** Marijuana License - Alcohol & Marijuana Control Office (AMCO) Referrals for Matanuska Susitna Borough Review of Issuance, renewal or transfer (location, owner)	$100.00
☐	**8.52** Temporary Noise Permit	$500.00
☐	**8.55** Special Events Permit 500 – 1000 Attendees 1000+ Attendees	$500.00 $1,000.00
☐	**8.55** Special Events Permit Site Monitor Fee / Per Day	$300.00
☐	**17.02** Mandatory Land Use Permits- Residential Non-habitable Commercial/Industrial	$25.00 $150.00
☐	**17.04** Nancy Lake Special Land Use District CUP	$1,000.00
☐	**17.06** Electrical Generating & Delivery Facility Application	$500.00
☐	**17.08** Hay Flats Special Land Use District Exception Application	$1000.00
☐	**17.17** Denali State Park Conditional Use Permit	$1000.00
☐	**17.18** Chickaloon Special Land Use District CUP	$1000.00
☐	**17.19** Glacier View Special Land Use District; CUP	$1000.00
☐	**17.23** Port MacKenzie Development Permit	$1000.00
☐	**17.25** Talkeetna Conditional Use Permit	$1000.00
☐	**17.25** Talkeetna Conditional Use Permit – Variance	$1000.00
☐	**17.27** Sutton Special Land Use District CUP	$1000.00
☐	**17.28.030** Interim Materials District	$2000.00
☐	**17.29** Flood Damage Prevention Development Permit	$100.00
☐	**17.29** Flood Damage Prevention Development Permit –Variance	$500.00
☐	**17.30.040** Earth Materials Extraction Admin. Permit	$500.00
☐	**17.30.050** Earth Materials Extraction CUP	$1000.00
	17.36 Residential Planned Unit Development Application – Concept Plan – up to 50 Lots Additional Lots or tracts being created – Per Lot	 $500.00 $100.00
☐	**17.48** Mobile Home Park Permit Application	$500.00
☐	**17.52** Residential Land Use District App (Rezone)	$1,000.00
☐	**17.52** Conditional Use Permit Application	$1,000.00
☐	**17.55** Shoreline Setback Exception Application	$300.00
☐	**17.60** Conditional Use Permit Application	$1000.00

☐	**17.61** Commercial/Industrial Core Area Conditional Use Permit	**$1000.00**
☐	**17.62** Coal Bed Methane	**$1000.00**
☐	**17.63** Conditional Use Permit for Racetracks	**$1000.00**
☑	**17.65** Variance	**$1000.00**
☐	**17.67** Tall Structures - Network Improvement Permit Nonconforming Use Administrative Permit Conditional Use Permit	**$100.00** **$200.00** **$500.00** **$1000.00**
☐	**17.70** Regulation of Alcoholic Beverage Use Permit Application	**$1000.00**
☐	**17.73** Multi-Family Land Use Permit – add $25.00 for each additional unit beyond 5 units	**$500.00**
☐	**17.75** Single-Family Residential Land Use District CUP	**$1000.00**
☐	**17.76** Large Lot Single-Family Residential Land Use District Conditional Use Permit Application	**$1000.00**
☐	**17.80** Nonconforming Structures (Amnesty) Pre-Existing Legal Nonconforming (Grandfather)	**$300.00**
☐	**17.90** Regulation of Adult Businesses – Conditional Use Perm	**$1000.00**

MSB PERMIT CENTER
350 E DAHLIA AVE
PALMER AK 99645
907-8618630

Wed 11/06/2019 3:56 PM

Txn ID: #435cca30
Type: CREDIT
PURCHASE
Visa Credit
Number: **********2335
Card Type: VISA
Entry Mode: Chip
CVM: SIGNATURE
Mode: Issuer
AID: A0000000031010
TVR: 8080008000
IAD: 06010A0360A000
TSI: 7800
ATC: 01A8
TC: B1249809CFBC4F88
Response: APPROVED
Approval Code: 03913D

Sub Total: $1000.00
- - - - - - - - - - - - -
Total: $1000.00

THANK YOU

	RIGHT-OF-WAY FEES:	
☐	Driveway	**$50.00**
☐	Driveway Deposit {100.226.100}	**$150.00**
☐	Construction	**$200.00**
☐	Utility (Application Fee = $100 ~ Distance Fee $0.25/per linea	
☐	Encroachment	**$150.00**
☐	Construction Bond {100.227.000}	

	PLATTING PRE-APPLICATION CONFERENCE:	
☐	Pre-Application Fee	**$50.00**

	FEES:	
☐	Flood Plain Development Survey CD	**$10.00**
☐	CD/DVD/DVD-R	**$7.50**
☐	Construction Manual/Title 43	**$5.00**
☐	Plat Map/Tax Map Copies/Mylar	**$5.00**
☐	Color Maps	**$12.00**
☐	Xerox Copies (B/W = $0.25 ~ Color $1.00/page 11X17 Color	
☐	Advertising Fees	
☐	Cultural Resources Books or Maps	
☐	Citation Payment (If sent to collections – use total due from Courtview)	
☐	Thumb Drive 2GB = $5, 4GB = $8, 8GB = $10; 16GB = $15; 32GB = $20	

$_____ Amount Paid Date:_____ Receipt #_____ By:_____

Public Comments

Matanuska-Susitna Borough
Development Services Division
350 E. Dahlia Avenue
Palmer, Alaska 99645

RECEIVED
FEB 03 2020
MATANUSKA-SUSITNA BOROUGH
DEVELOPMENT SERVICES

56333B02L009 4
CHMIEL MONIQUE
6001 E ROUGH CUT CIR
PALMER AK 99645-8431

The Planning Commission of the Matanuska-Susitna Borough will consider the following:

Application: Variance to minimum MSB 17.55 setback requirements
MSB Code Section: MSB 17.65 – Variances
Applicant: Adam Copson and Janet Flaherty
Location: 6010 E. Rough Cut Circle, (Tax ID# 6333B02L008); within Township 17 North, Range 1 East, Section 9, Seward Meridian.
Request: An application under MSB 17.65 – Variances, has been submitted for a variance to an exception to the minimum 25-foot right-of-way setback requirement under MSB 17.55. The variance would allow the existing single-family residence to remain 21.3 feet from the E. Rough Cut Circle right-of-way, and the existing garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way.

The Planning Commission will conduct a public hearing concerning the following application for a variance on Monday, ***March 2, 2020*** **at 6:00 p.m.** in the Borough Assembly Chambers, 350 E. Dahlia Avenue, in Palmer. This may be the only presentation of this item before the Planning Commission and you are invited to attend. The Planning Commission members may submit questions to the Planning Commission Clerk concerning the matter or request more information from the applicant at the time of introduction. All questions and requests submitted by the Commission shall be in writing and copies will be provided to the applicant and made available to all interested parties and the public upon request. Answers to questions and additional material requests will be addressed in the staff report for the public hearing. Commission members may not receive or engage in ex-parte contact with the applicant, other interested parties in the application, or members of the public concerning the application or issues presented in the application.

Application materials may be viewed online at www.matsugov.us by clicking on "All Public Notices & Announcements." Application material is also available for review at the Borough Permit Center. For additional information, you may contact Joe Metzger, Planner II, at 861-7862. Written comments can be mailed to the MSB Development Services Division, 350 E. Dahlia Avenue, Palmer, AK 99645. You may e-mail comments to Joseph.Metzger@matsugov.us. In order to be eligible to file an appeal from a decision of the Planning Commission, a person must be designated as an "interested party." See MSB 15.39.010 for definition of "interested party." The procedures governing appeals to the Board of Adjustment and Appeals are contained in MSB 15.39.010-250, which is available on the Borough home page: www.matsugov.us, in the Borough Clerk's office, or at various libraries within the borough.

Comments are due on or before ***February 3, 2020*** and will be included in the Planning Commission packet for the Commissioner's review and information. Please be advised that comments received from the public after that date will not be included in the staff report to the Planning Commission.

Name: Monique Chmiel ***Mailing Address:*** P.O. Box 876582, Wasilla, AK 99687

Location/Legal Description of your property: 6001 E. Rough Cut Cir., Palmer, AK 99645

Comments: Please 2 page letter attached.

Note: Vicinity Map Located on Reverse Side

Monique Chmiel
6001 E Rough Cut Circle
Palmer, AK 99645
907-521-2296

RECEIVED
FEB 03 2020
MATANUSKA-SUSITNA BOROUGH
DEVELOPMENT SERVICES

Matanuska-Susitna Borough
Development Services Division
350 E Dahlia Avenue
Palmer, Alaska 99645

February 1, 2020

Re: Variance to minimum MB 17.55 setback requirements
6010 E Rough Cut Circle, (Tax ID# 6333B02L008); within Township 17 North, Range 1 East, Section 9, Seward Meridian

Dear Planning Commission,

I'm the current owner of 6001 E Rough Cut Circle and am requesting that the Planning Commission reject the variance above. The homeowner at 6010 E Rough Cut Circle (Lot 8) made a conscious decision to build their garage 1.9 feet from the E Rough Cut Circle right-of-way while ignoring the minimum 25-foot right-of-way setback requirement, then allowed their driveway to encroach onto my lot. Over the past few years, we have had to deal with numerous issues from Lot 8's renters:

1) **June 2016 to March 2018** – Lot 8's tenants were dealing drugs, had constant traffic to and from Lot 8 from Hyer Rd (as much as 20 different cars per week), creating tons of road maintenance issues. They had 2-3 parties per week with +12 vehicles piled into their driveway, backyard, plus encroaching onto the private driveway. I created and helped support an ongoing police report with the Alaska State Troopers and provided over 30 license plate numbers to AST for investigation. The MSB cited the owners in Feb/Mar 2018 because the party goers eventually blocked the roadway completely. The home owners asked them to move in March 2018.
2) **Aug 2018 - April 2019** – Lot 8's new tenants repeatedly destroyed a drainage system that we built located on our land (highlighted in yellow) and drove off the actual graveled private driveway depleating the borders of the access in negligence. We pleaded with the home owners over these issues several times to rectify the problem. This drainage system helped detour the rain water from Lot 8's driveway. When the drainage didn't exist, the area highlighted in yellow became rutted and full of pot holes in the summer or a sheet of ice in the winter. Eventually we had to install a concrete barrier next to the drainage to block that tenant from continusouly driving over it.

Attached is a more detailed drawing of the property lines: in red you can see my lot boundaries, in blue are the easements I own yet have given easements to others, plus in yellow is the private driveway on my land leading to my and the surrounding homes. Please note that the surrounding home owners (Lot 8, Lot 10A, and 10B) encroach onto my land to get to their homes.

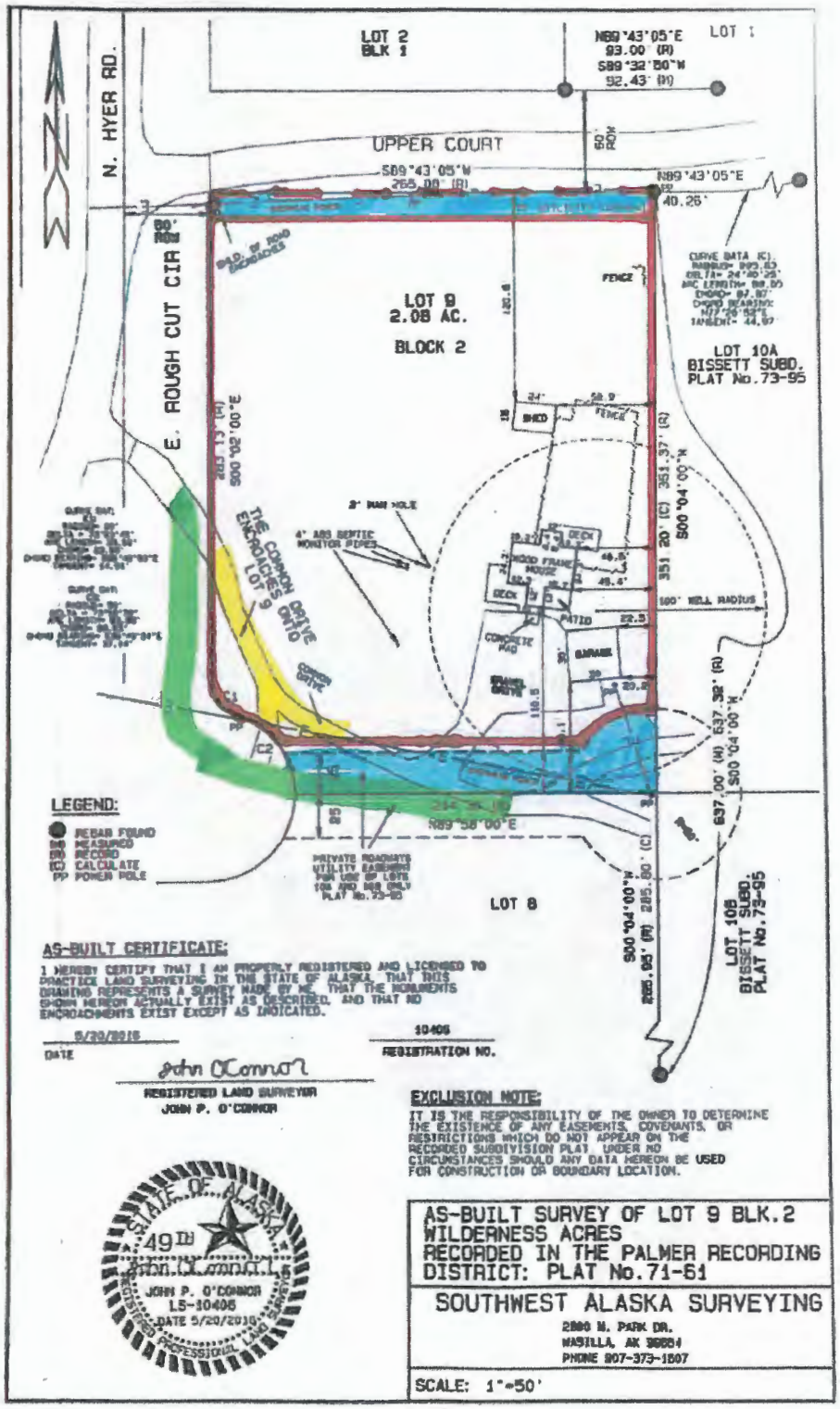
My main issue with Lot 8 is the encroachment onto my land and the continuous road maintenance. Unfortunately the maintenance costs/labor of the private driveway is passed on to me and my family. Such duties include road grating, filling potholes, snow plowing, sanding ice, and removing debris/trash. The surrounding lots do not contribute or offer any assistance. I pay taxes on this land and absorb the burdens while the other lot owners trespass and reap the benefits.

We would be in support of the variance request if -- *and only if* -- 6010 E Rough Cut Circle owners move their access onto the Rough Cut Circle right-of-way and cease using the private driveway on my property for their access. Please see suggested new route of access for them highlighted in green.

Thank you for your time and consideration.

Sincerely,

Monique Chmiel
907-521-2296



My lot boundaries

Areas I own, but have given easements to others

Driveway on my land

Suggested alternate access for Lots 10A , 10B, & 8

Joseph Metzger

From: Joseph Metzger
Sent: Monday, January 13, 2020 7:54 AM
To: 'caroberts@ak.net'
Subject: RE: MSB Variance 6333B02L008

Received, thank you for the comment.

Respectfully,

Joe Metzger
MSB Planner II
907-861-7862

From: caroberts@ak.net <caroberts@ak.net>
Sent: Saturday, January 11, 2020 1:36 PM
To: Joseph Metzger <Joseph.Metzger@matsugov.us>
Subject: MSB Variance 6333B02L008

[**EXTERNAL EMAIL** - CAUTION: Do not open unexpected attachments or links.]
Hello Mr. Metzger:

We have no objection to the MSB Notice for Variance to minimum setback requirements for the above referenced parcel aka/ 6010 Rough Cut Circle.

Glenn and Claudia Roberts
550 N. Hyer Road
Palmer, AK

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Agency Comments

Joseph Metzger

From: Theresa Taranto
Sent: Friday, January 10, 2020 11:55 AM
To: Joseph Metzger
Subject: RE: RFC Copson-Flaherty Variance -Comments Due February 3

FIRM 8110, X Zone
Core Area
No other comments.

Thank you,

Theresa Taranto
Mat-Su Borough
Development Services
Administrative Specialist

350 E Dahlia Ave.
Palmer, Alaska 99645
907-861-8574
www.matsugov.us

From: Joseph Metzger <Joseph.Metzger@matsugov.us>
Sent: Wednesday, January 8, 2020 3:55 PM
To: 'allen.kemplen@alaska.gov' <allen.kemplen@alaska.gov>; 'tucker.hurn@alaska.gov' <tucker.hurn@alaska.gov>; 'melanie.nichols@alaska.gov' <melanie.nichols@alaska.gov>; 'kyler.hylton@alaska.gov' <kyler.hylton@alaska.gov>; 'sarah.wilber@alaska.gov' <sarah.wilber@alaska.gov>; 'mearow@matanuska.com' <mearow@matanuska.com>; 'rglenn@mta-telco.com' <rglenn@mta-telco.com>; 'jthompson@mta-telco.com' <jthompson@mta-telco.com>; 'row@enstarnaturalgas.com' <row@enstarnaturalgas.com>; 'ospdesign@gci.com' <ospdesign@gci.com>; Eric Phillips <Eric.Phillips@matsugov.us>; Jude Bilafer <Jude.Bilafer@matsugov.us>; Cindy Corey <Cindy.Corey@matsugov.us>; Terry Dolan <Terry.Dolan@matsugov.us>; Jim Jenson <James.Jenson@matsugov.us>; Jamie Taylor <Jamie.Taylor@matsugov.us>; Nicole Wilkins <Nicole.Wilkins@matsugov.us>; Karol Riese <Karol.Riese@matsugov.us>; Taunnie Boothby <Taunnie.Boothby@matsugov.us>; Theresa Taranto <Theresa.Taranto@matsugov.us>; John Aschenbrenner <John.Aschenbrenner@matsugov.us>; John Aschenbrenner <John.Aschenbrenner@matsugov.us>; Sloan VonGunten <Sloan.VonGunten@matsugov.us>; Jill Irsik <Jill.Irsik@matsugov.us>; Michelle Wagner <Michelle.Wagner@matsugov.us>; Cheryl Scott <Cheryl.Scott@matsugov.us>; stephanieNowersDistrict2@gmail.com
Subject: RFC Copson-Flaherty Variance -Comments Due February 3

MEMORANDUM

Date: January 8, 2020
To: Various Governmental Agencies
From: Joseph Metzger, Planner II
Subject: Request for Review and Comments Governmental Agencies
Project: Variance to minimum setback requirements of MSB 17.55
Location: 6010 E. Rough Cut Circle, (Tax ID# 6333B02L008); within Township 17 North, Range 1 East, Section 9, Seward Meridian.

Applicant: Adam Copson and Janet Flaherty

An application under MSB 17.65 – Variances, has been submitted for a variance to an exception to the minimum 25-foot right-of-way setback requirement under MSB 17.55. The variance would allow the existing single-family residence to remain 21.3 feet from the E. Rough Cut Circle right-of-way, and the existing garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way. The Planning Commission will conduct a public hearing on this request on March 2, 2020.

Application materials may be viewed online at http://www.matsugov.us by clicking on "All Public Notices & Announcements." Application material may also be reviewed at the Borough Permit Center. A direct link to the application material is here:

https://www.matsugov.us/publicnotice/copson-flaherty-variance-request-to-msb-17-55

Comments are due on or before February 3, 2020 and will be included in the Planning Commission packet for the Commissioner's review and information. Please be advised that comments received after that date will not be included in the staff report to the Planning Commission. Thank you for your review.

Respectfully,

Joe Metzger
MSB Planner II
907-861-7862

MATANUSKA-SUSITNA BOROUGH

Planning and Land Use Department

Planning Division: Plat Review/Comments

350 East Dahlia Avenue • Palmer, AK 99645

Phone (907) 861-7833 • Fax (907) 861-7876

www.matsugov.us • planning@matsugov.us

Owner/Agent: Copson-Flaherty Variance

Nature of Request: An application under MSB 17.65 – Variances, has been submitted for a variance to an exception to the minimum 25-foot right-of-way setback requirement under MSB 17.55. The variance would allow the existing single-family residence to remain 21.3 feet from the E. Rough Cut Circle right-of-way, and the existing garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way. The Planning Commission will conduct a public hearing on this request on March 2, 2020.

Application material may also be reviewed at the Borough Permit Center. A direct link to the application material is here:

https://www.matsugov.us/publicnotice/copson-flaherty-variance-request-to-msb-17-55

Location: 56333B02L008.

Date/Due Date: 3 FEBRUARY 2020

MSB Staff Contact: JOSEPH METZGER

Planner completing this Review: Ted Eischeid, Ph. 861-8606, ted.eischeid@matsugov.us

Comm. Council: **Case#:** **RSA:**

Staff-Recommendation:

Approve XX Deny _____ (need's supervisor approval) Conditionally Approve _____

List Conditions (if applicable):

MATANUSKA-SUSITNA BOROUGH

Planning and Land Use Department

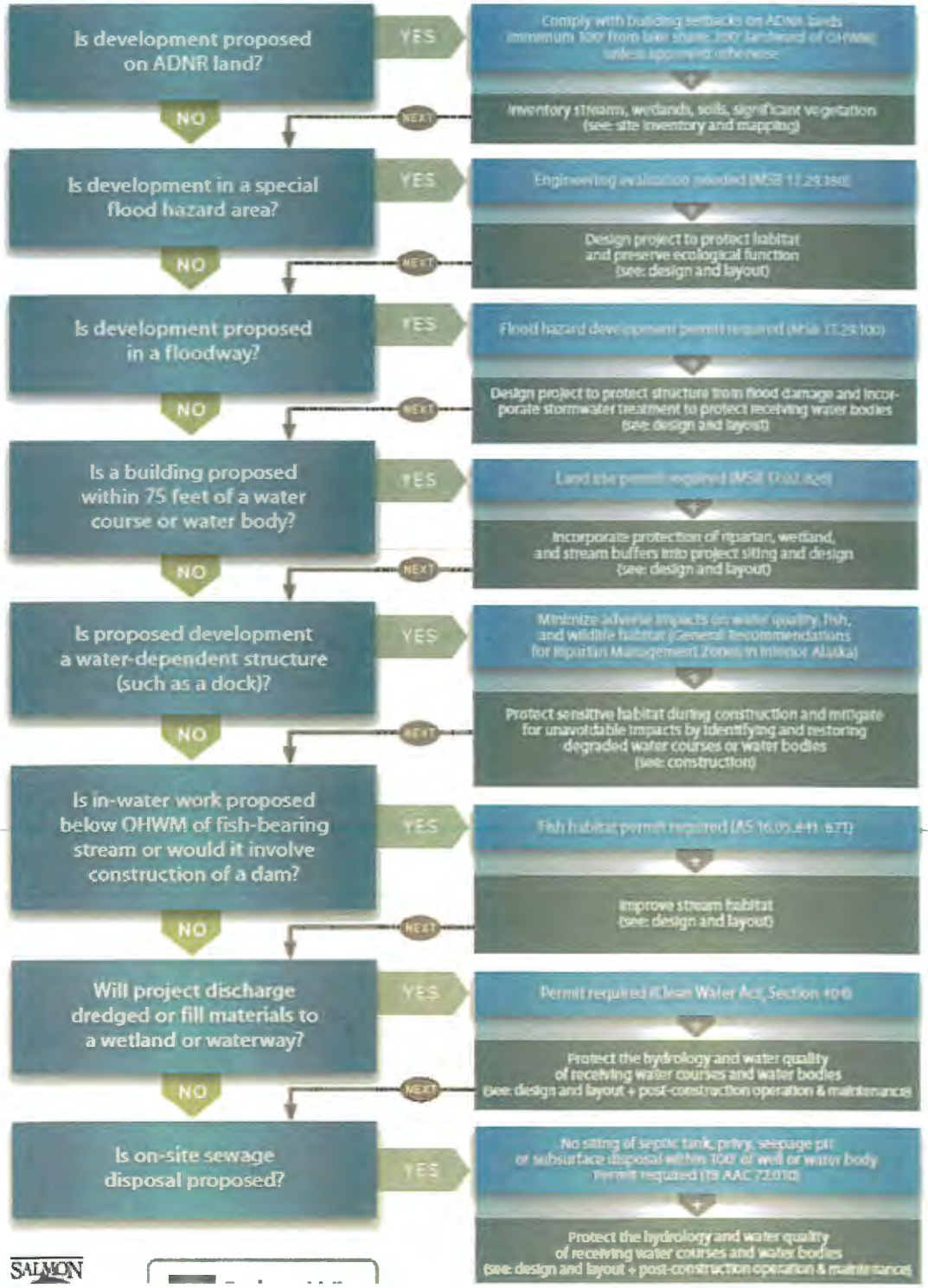
Planning Division: Plat Review/Comments

350 East Dahlia Avenue • Palmer, AK 99645

Phone (907) 861-7833 • Fax (907) 861-7876

www.matsugov.us • planning@matsugov.us

Navigating Regulatory Compliance for Development in the Mat-Su Basin



Pl

PLANNING COMMISSION RESOLUTION

By: Joe Metzger
Introduced: February 3, 2020
Public Hearing: March 2, 2020
Action:

MATANUSKA-SUSITNA BOROUGH
PLANNING COMMISSION RESOLUTION NO. 20-06

A RESOLUTION OF THE MATANUSKA-SUSITNA BOROUGH PLANNING COMMISSION APPROVING A VARIANCE TO MSB 17.55 TO ALLOW AN EXISTING SINGLE-FAMILY RESIDENCE AND AN EXISTING DETACHED GARAGE TO REMAIN IN PLACE AT 6010 E. ROUGH CUT CIRCLE (TAX ID# 6333B02L008); WITHIN TOWNSHIP 17 NORTH, RANGE 1 EAST, SECTION 9, SEWARD MERIDIAN.

WHEREAS, an application has been received for a Variance to MSB 17.55, to allow an existing single-family residence and an existing detached garage to remain in place at 6010 E. Rough Cut Circle (Tax ID# 6333B02L008); within Township 17 North, Range 1 East, Section 9, Seward Meridian; and

WHEREAS, in order to grant a variance, the Planning Commission must find that each requirement of 17.65.020(A) have been met; and

WHEREAS, the subject lot is 2.65 acres in size; and

WHEREAS, the subject lot is part of the Wilderness Acres subdivision and was originally platted in 1971; and

WHEREAS, the application material indicates that the existing single-family residence was constructed in 1975; and

WHEREAS, the application material indicates that the existing detached garage was constructed in 1998; and

WHEREAS, the applicants/owners of the subject lot purchased the property in 1993; and

WHEREAS, according to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the detached garage is situated 1.9 feet from the E. Rough Cut Circle right-of way; and

WHEREAS, according to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the single-family residential home is situated 17.8 feet from the E. Rough Cut Circle right-of way; and

WHEREAS, according to the application material, the topography of the property has not been altered by the current or previous owners of the property; and

WHEREAS, according to the application material, the topography of the lot restricts where structures can be built; and

WHEREAS, the existing single-family residence is approximately 1,056 square feet and is 44′ x 24′ in size; and

WHEREAS, the existing detached garage is approximately 864 square feet and is 36′ x 24′ in size; and

WHEREAS, the Wilderness Acres subdivision is developed with residences and most parcels contain attached or detached garages that are similar in size to the existing residence and existing garage; and

WHEREAS, setbacks promote a variety of public purposes such as provisions for light and air, fire protection, traffic safety, prevention of overcrowding, rest and recreation, solving drainage

problems, protecting the appearance and character of a neighborhood, and conserving property values; and

WHEREAS, the E. Rough Cut Circle right-of-way has only been partially developed; and

WHEREAS, MSB Chapter 17.65 - Variances, was written to grant relief to property owners whose lots are impacted by existing land use regulations thereby making the lot undevelopable; and

WHEREAS, the total square footage of the single-family residential structure and detached garage is 1,920 square feet; and

WHEREAS, the applicants/owners did not construct the single-family residential home; and

WHEREAS, according to the application material, the applicants/owners are seeking the variance due to topography and buildable area concerns; and

WHEREAS, the subject parcel is not in a special land use district; and

WHEREAS, residential structures and garages are allowed on this property; and

WHEREAS, according to the application material, the variance is not being sought solely to relieve pecuniary hardship or inconvenience; and

WHEREAS, the Planning Commission has reviewed this application with respect to standards set forth in MSB 17.65; and

WHEREAS, the Planning Commission conducted a public hearing on March 2, 2020 on this matter.

NOW, THEREFORE, BE IT RESOLVED, that the Matanuska-Susitna Borough Planning Commission hereby approves the setback variance to allow an existing single-family residence and an existing detached garage to remain in place.

ADOPTED by the Matanuska-Susitna Borough Planning Commission this ___ day of _____, 2020.

_____
COLLEEN VAGUE, Chair

ATTEST

_____
MARY BRODIGAN, Planning Clerk

(SEAL)

YES:

NO:

By: Joe Metzger
Introduced: February 3, 2020
Public Hearing: March 2, 2020
Action:

MATANUSKA-SUSITNA BOROUGH
PLANNING COMMISSION RESOLUTION NO. 20-10

A RESOLUTION OF THE MATANUSKA-SUSITNA BOROUGH PLANNING COMMISSION ADOPTING FINDINGS OF FACT AND CONCLUSIONS OF LAW TO SUPPORT DENIAL OF RESOLUTION 20-06.

WHEREAS, Resolution N0. 20-06 was for approval of a setback variance to allow an existing single-family residence to remain at its closest location, 17.8 feet from the E. Rough Cut Circle right-of-way and an existing detached garage to remain 1.9 feet from the E. Rough Cut Circle right-of-way; at 6010 E. Rough Cut Circle (Tax ID# 6333B02L008); within Township 17 North, Range 1 East, Section 9, Seward Meridian; and

WHEREAS, the Planning Commission conducted a public hearing on March 2, 2020 on this matter; and

WHEREAS, the Planning Commission's vote on the motion failed to garner a majority vote on March 2, 2020.

NOW, THEREFORE, BE IT RESOLVED, that the Matanuska-Susitna Borough Planning Commission denied the setback variance based on the following findings of fact and conclusions of law:

1. The subject lot is 2.65 acres in size.

2. The subject lot is part of the Wilderness Acres subdivision and was originally platted in 1971.

3. The application material indicates that the existing single-family residence was constructed in 1975.

4. The application material indicates that the existing detached garage was constructed in 1998.

5. The applicants/owners of the subject lot purchased the property in 1993.

6. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the detached garage is situated 1.9 feet from the E. Rough Cut Circle right-of way.

7. According to an as-built survey prepared by Wayne N. Whaley, PLS, and dated October 25, 2019, at its closest point the single-family residential home is situated 17.8 feet from the E. Rough Cut Circle right-of way.

8. According to the application material, the topography of the property has not been altered by the current or previous owners of the property.

9. The topography of the lot offers challenges, but it is not unreasonable to expect some excavation activities would be necessary to develop the lot.

10. The existing single-family residence is approximately 1,056 square feet and is 44′ x 24′ in size.

11. The existing detached garage is approximately 864 square feet and is 36′ x 24′ in size.

12. The northern part of the property is mostly flat and is comprised of uplands calculated to contain approximately 13,450 square feet of land.

13. The Wilderness Acres subdivision is developed with residences and most parcels contain attached or detached garages that are similar in size to the existing residence and existing garage.

14. Setbacks promote a variety of public purposes such as provisions for light and air, fire protection, traffic safety, prevention of overcrowding, rest and recreation, solving drainage problems, protecting the appearance and character of a neighborhood, and conserving property values.

15. The E. Rough Cut Circle right-of-way has only been partially developed.

16. The total square footage of the single-family residential structure and detached garage is 1,920 square feet.

17. The structures (home and garage) could have been built farther away from the public rights-of-way.

18. The garage could have been constructed to be attached to the residential home, or to be smaller in size.

19. The applicants/owners did not construct the single-family residential home.

20. The applicants/owners did construct the detached garage.

21. According to the application material, the applicants/owners are seeking the variance due to topography and buildable area concerns.

22. The development of the single-family residential home was done in a fashion that hinders the lawful development of the site in its current condition due to the placement of septic piping and the proximity of the lot lines and rights-of-way.

ADOPTED by the Matanuska-Susitna Borough Planning Commission this ___ day of _____, 2020.

_____
COLLEEN VAGUE, Chair

ATTEST

_____
MARY BRODIGAN, Planning Clerk

(SEAL)

YES:

NO:

PUBLIC HEARING

LEGISLATIVE

Resolution No. PC 20-05

Amending MSB 43.05.015
2020 Subdivision Construction Manual

(Page 361 - 444)

PUBLIC HEARING

MATANUSKA-SUSITNA BOROUGH
Planning and Land Use Department
350 East Dahlia Avenue • Palmer, AK 99645
Phone (907) 861-7833 • Fax (907) 861-7876
www.matsugov.us • planning@matsugov.us

MEMORANDUM

DATE: January 21, 2020

TO: Planning Commission

FROM: Eileen Probasco, Planning Director

RE: Planning Commission Resolution 20-05
Recommending Assembly approval of the 2020 Subdivision Construction Manual

In April of 2016 the Mat-Su Borough Assembly signed Resolution 17-003 supporting the rewrite of the 1991 Subdivision Construction Manual (SCM). Department of Public Works and Planning staff then began work on a draft update. Once created, a group of subject matter experts was formed to review the document, consisting of local Land Surveyors, Civil Engineers, Developers, Homebuilders, Board Members and borough staff. Their review meetings began in June of 2018. They met 27 times over the next 18 months, with all but three meetings being full day meetings. The 2020 Subdivision Construction Manual is the results of that effort.

Major changes to the document are:

- Removed Sections on *Subdivision Agreements* and *Inspection Fees* (these are addressed elsewhere in code).
- Removed Driveways from the SCM and created a new MSB Chapter 11.12 Driveways
- Changed the title of the *Nonresidential Road Section* to *Major Road Corridors* and added Frontage/Backage and Connector Street Standards.
- Combined all of the Residential Street Design Criteria into one table for ease of use.
- Increased Roadway width for Residential, Residential Subcollector and Residential Collector Roads for added safety.
- Increased ADT from 6 daily trips to 10.
- Major rewrite of the *Drainage* Section.
- Added a Section on *Easements*.
- All drawings updated and placed within the body of the manual rather than in an appendix. *(finalization of drawings is underway and will be included in the document upon their completion.)*

Upon completion of the final draft, the SCM Working group adopted their Resolution 20-01 with the following recommendations:

- Assembly approval of the 2020 Subdivision Construction Manual
- Assembly approval of an ordinance creating MSB 11.12 Driveways
- Assembly consideration of a variety of other actions to address transportation issues in the valley.

A tentative schedule for completion of the project is included with the packet.

Staff recommends approval of Planning Commission Resolution 20-05.

Matanuska-Susitna Borough
Public Works Department

Subdivision Construction Manual

(Roads, Drainage, and Utilities)

January 23, 2020

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Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ADFG	Alaska Department of Fish and Game
ADT	Average Daily Traffic
ADOT&PF	Alaska Department of Transportation and Public Facilities
ATM	Alaska Test Method
DPW	Department of Public Works of the Matanuska-Susitna Borough
IFC	International Fire Code
ITE	Institute of Transportation Engineers
LRTP	Long Range Transportation Plan
MSB	Matanuska-Susitna Borough
N/A	Not applicable
NTP	Notice to proceed
OHWM	Ordinary high water mark
OSHP	Official Streets and Highways Plan
PUE	Public use easement
ROW	Right-of-way
VPD	Vehicles per day

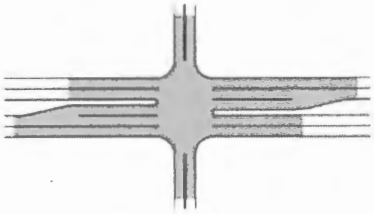
Definitions

Access Point	The location along a road at which a driveway or road intersects.
Arterial	A road that provides a high level of mobility within the transportation network. Arterials are access controlled with a minimal number of intersections or interchanges.
Average Daily Traffic	The total number of vehicle trips during a given time period (in whole days greater than one day and less than one year) divided by the number of days in that time period.
Backslope	On a roadway section in a cut, the portion of the roadside that slopes up from the roadside ditch and away from the roadway to the top of the cut, see Figure A-3.
Catchment Area	The total area contributing stormwater runoff to a particular point, site, or structure.
Collector	A road that links local roads with arterials and performs some duties of each. Collectors are access controlled with a moderate number of intersections and driveways.
Curve Return	The curve located at the corner of an intersection, connecting the roadway edge of one road to the roadway edge of an intersecting road or driveway.
Detention	The temporary storage of runoff, for later controlled release.
Drainage Pattern	The configuration of a drainage system including manmade and natural features within a catchment area.
Driveway	A vehicular access way between a road and a parking area within a lot or property.
Embankment	Earthen material that is placed and compacted for the purpose of raising the grade of a roadway.
Engineer	An individual who is registered as a Professional Civil Engineer in the State of Alaska.

Feasible Reasonable and capable of being done or carried out.

Foreslope On a roadway section, the portion of the roadside that slopes down and away from the roadway, see Figure A-3.

Functional Area The physical area of an intersection and the area extending both upstream and downstream which includes perception reaction distance, maneuver distance, and storage length.



Intersection The general area where two or more roads join or cross.

Local Road A road that provides access to abutting property, rather than to serve through traffic. Local roads are not access controlled and can have frequent intersections and driveways.

Lot Frontage A property line that abuts the right-of-way that provides access to the lot.

Ordinary High Water Mark The elevation marking the highest water level which has been maintained for a sufficient time to leave evidence upon the landscape. Generally, it is the point where the natural vegetation changes from predominately aquatic to upland species.

Positive Drainage Clear, unobstructed flow of water away from structures and roadways without localized ponding.

Public Use Easement Provides the rights for ingress, egress, roadways, right-of-way, public utilities, and slopes for cuts and fills. The rights are to the public in general, and public utilities governed by permits required under federal, state, and local laws and regulations. May also be known as a public access easement or right-of-way.

Regulated Stream Any watercourse along which the flood hazard areas have been mapped and approved by the Federal Emergency Management Agency; any stream which harbors fish, as determined by the Alaska Department of Fish and Game; or any stream designated as regulated by MSB.

Retention The prevention of runoff. Stormwater, which is retained, remains indefinitely, with the exception of the volume lost to evaporation, plant uptake, or infiltration.

Right-of-way	A strip of land reserved, used, or to be used for a street, alley, walkway, airport, railroad, or other public or private purpose.
Road	A general term denoting a public thoroughfare used, or intended to be used, for passage or travel.
Road Prism	The foundation that supports the roadway; see Figure A-3.
Roadway	The portion of a road that includes driving lanes and shoulders, see Figure A-3.
Segment	A portion of road between two significant intersections or an intersection and its terminus.
Shoulder	The portion of a roadway contiguous to any traveled way for lateral support of surface courses, see Figure A-3.
Street	A general term usually denoting an urban or suburban road.
Stub Road	A road segment, typically short in length, which terminates at the boundary of a subdivision or site plan, the purpose of which is to ultimately connect to abutting property when it is developed.
T-intersection	A three leg intersection in the form of a "T".
Through Street	A road given preferential right of way; roads which intersect a through street are controlled, such as with a stop sign or yield sign.
Water Body	A permanent or temporary area of standing or flowing water. Water depth is such that water, and not air, is the principal medium in which organisms live. Water bodies include, but are not limited to: lakes, ponds, streams, rivers, sloughs, and all salt water bodies.

Introduction

This manual is intended to accomplish the following goals:

(1) To establish standards for the design and construction of transportation networks throughout the Matanuska-Susitna Borough.
(2) To provide information and guidelines for the design, construction, and upgrade of roads, drainage facilities, and utilities within rights-of-way.
(3) To develop and maintain a safer and more efficient transportation system.
(4) To minimize operation & maintenance efforts.

Section A. Street Design

A01 General

These provisions establish appropriate standards for the design of roads. The purpose of these provisions is to:

(1) promote the safety and convenience of motorized and non-motorized traffic;
(2) promote the safety of neighborhood residents;
(3) minimize the long term costs for maintenance and repair;
(4) protect the residential qualities of neighborhoods by limiting traffic volume, speed, noise, and air pollution;
(5) encourage the efficient use of land; and
(6) minimize the cost of road construction and thereby restrain the rise in housing costs.

A02 Applicability

These standards apply to the design and construction of all subdivision improvements within the Matanuska-Susitna Borough (MSB), with the exception of those streets within cities that exercise road powers by ordinance.

A03 Street Classifications

Roads within the MSB fall within one of the following functional classifications, in accordance with the Long Range Transportation Plan (LRTP): Interstate, Principal Arterial, Minor Arterial, Major Collector, Minor Collector, and Local Road. Functional classification of a road is based on its function, design, and current potential use. The applicant may request review of the functional classification of existing roads abutting or affecting the design of a subdivision or land development during the preapplication process.

This section provides design guidance for roads falling under local road and minor collector functional classifications.

A03.1 Residential Street

Residential streets are local roads intended to carry the least amount of traffic at the lowest speed. The Residential street will provide the safest and most desirable environment for a residential neighborhood. Developments should be designed so that all, or the maximum number possible, of the homes will front on this class of street.

A03.2 Residential Subcollector Street

Residential Subcollector streets are local roads that carry more traffic than Residential streets.

A03.3 Residential Collector Street

Residential Collector streets are the highest order of residential streets and are a type of minor collector. In large residential developments, this class of street may be necessary to carry traffic from one neighborhood to another or from the neighborhood to other areas in the community. Residential Collector streets should provide the fewest direct accesses as possible.

A03.4 Mountain Access Road

Mountain Access Roads may be used in areas where the average cross slope exceeds 15 percent or to traverse terrain features in excess of 25 percent. Maintenance of Mountain Access Roads will be at the discretion of DPW. School bus access should be considered as school bus routes require all grades less than 10 percent. Mountain Access Road standards allow for steeper grades and switchbacks, but should otherwise be designed to Residential, Residential Subcollector, or Residential Collector standard as required by this section.

A03.5 Pioneer Road

Pioneer Roads may only be used where allowed by MSB or other applicable code. This classification establishes minimum requirements for roads providing physical access, but should otherwise be designed to Residential, Residential Subcollector, or Residential Collector standard as required by this section. No MSB maintenance will be provided for Pioneer Roads. Pioneer roads may be constructed offset from the centerline of the ROW to facilitate future expansion of the road.

A03.6 Alleys

Alleys are permitted provided legal and physical access conforms to MSB or other applicable code. No MSB maintenance will be provided for Alleys.

A03.7 Other Street Types

The above classifications may be further typed as one of the following streets. These other street types should be designed to Residential, Residential Subcollector, or Residential Collector standard as required by this section.

(a) Frontage Street – streets parallel and adjacent to a major road corridor which provides access to abutting properties and separation from through traffic. See Section B for additional design standards.

(b) Backage Street – streets that provide access to lots located between the Backage Street and a major road corridor. See Section B for additional design standards.

(c) Connector Street – the portion of a street that connects a frontage or backage street to a major road corridor. See Section B for additional design standards.

(d) Divided Street – streets may be divided for the purpose of accommodating environmental features or avoiding excessive grading. In such a case, the design standards shall be applied to the appropriate street classification and a single lane width with a shoulder on each side.

A04 Access Criteria

A04.1 Residential Street

(a) A Residential street provides access to abutting properties.

(b) The anticipated average daily traffic (ADT) volume on Residential streets shall not exceed 400. A loop street shall be designed such that the anticipated ADT at each terminus of the loop street does not exceed 400, see Figure A-1.

(c) Residential streets may intersect or take access from an equal or higher order street. Both ends of a loop Residential street are encouraged to intersect the same collecting street and be designed to discourage through traffic.

(d) Residential streets with only one inlet/outlet shall provide access to no more than 20 lots and not exceed 1000 feet in length (measured from the intersection point to the center point of the turnaround).

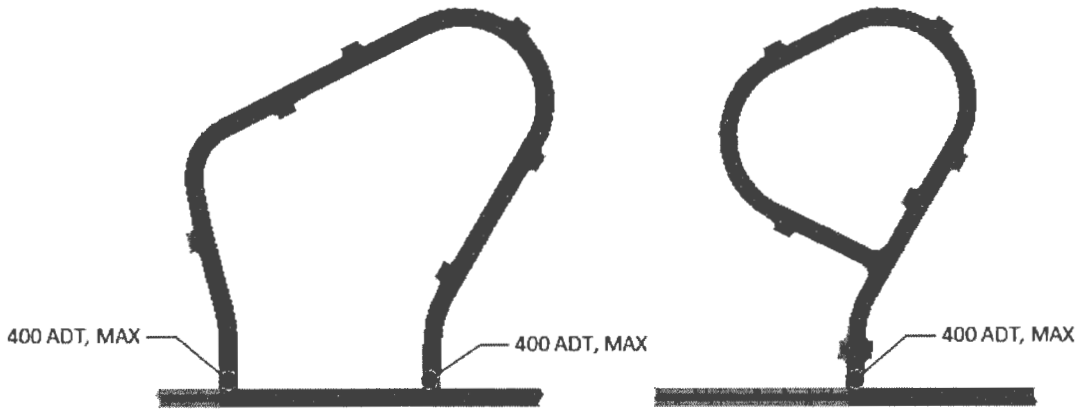


Figure A-1: Loop Residential Streets

A04.2 Residential Subcollector Street

(a) A Residential Subcollector street provides access to abutting properties and may also move traffic from Residential streets that intersect it. Residential Subcollector streets are required when the ADT anticipated on the street will exceed the limits for Residential or when a street with only one inlet/outlet provides access to more than 20 lots or exceeds 1000 feet in length.

(b) The anticipated ADT on Residential Subcollector streets shall not exceed 1000. A loop street shall be designed such that the anticipated ADT at each terminus of the loop street does not exceed 1000, see Figure A-2.

(c) Residential Subcollector streets shall be designed to exclude all external through traffic that has neither origin nor destination on the Residential Subcollector or its tributary Residential streets. Adjacent parcels may acquire access if proven landlocked by legal or terrain features or if such Residential Subcollector access can be demonstrated to be beneficial to the public.

(d) Residential Subcollector streets shall take access from a street of equal or higher classification.

(e) Traffic calming elements should be considered for the design of Residential Subcollectors, such as avoiding long, straight segments and reducing the length of roadway from farthest lot to a collector.

(f) Residential Subcollector streets shall be provided with two continuous moving lanes within which no parking is permitted.

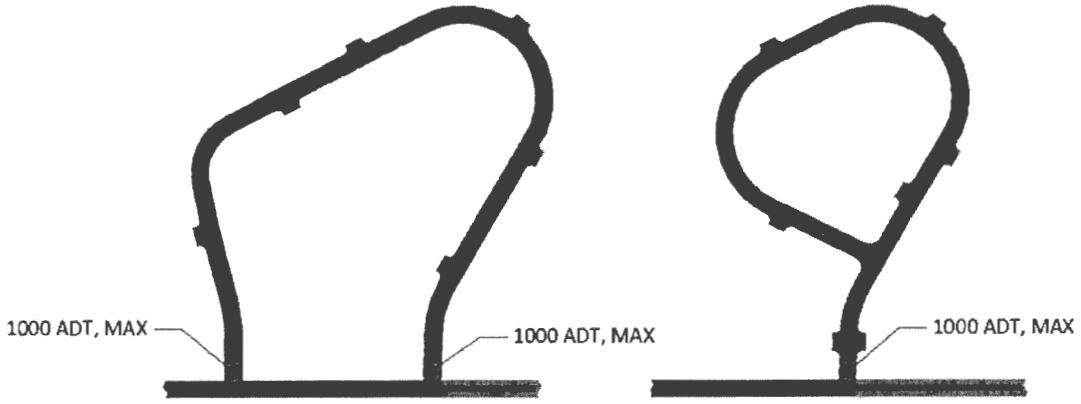


Figure A-2: Loop Residential Subcollector Streets

A04.3 Residential Collector Street

(a) A Residential Collector street carries residential neighborhood traffic, but restricts or limits direct residential access. Residential Collector streets are required when the ADT anticipated on the street will exceed the limits for Residential Subcollectors.

(b) Residential Collector streets should be designed to have as few residential lots directly fronting them as possible. When efficient subdivision design or physical constraints make this not possible, the average access point spacing shall be a minimum of 250 feet. Average access point spacing is calculated per segment and is equal to the segment length divided by the number of potential access points on both sides of the street. Undeveloped lots with only access to Residential Collector streets are counted as having at least one access point. When the average access point spacing on a segment of an existing Residential Collector street is less than 250 feet, the average access point spacing shall not decrease due to the subdivision.

(c) Space shall be provided on these lots for turnaround so that vehicles will not have to back out onto Residential Collector streets.

(d) Proposed access points on Residential Collector streets shall be shown on the preliminary plat.

(e) Residential Collector streets shall be laid out to encourage connectivity within the transportation network.

(f) If the anticipated ADT will exceed 3000, the street shall be classified at a higher level than Residential Collector by DPW.

(g) Every Residential Collector shall be provided with no fewer than two access intersections to streets of equal or higher classification. If it is shown by the applicant that two accesses are not feasible, Residential Collector streets shall be provided with access to one street of equal or higher

classification and be designed to accommodate a future second connection to a street of equal or higher classification, or otherwise be approved by DPW.

(h) All Residential Collector streets shall be provided with two continuous moving lanes within which no parking shall be permitted.

A04.4 Access through Existing Streets

The anticipated ADT on existing Residential streets used to access a proposed subdivision may exceed 400, but shall not exceed 800, if:

(a) alternate road corridors are not available or feasible;
(b) horizontal geometry or access density prohibits upgrade to a higher standard road; and
(c) the traffic impacts are mitigated.

A04.5 Traffic Impact Mitigation for Access through Existing Streets

Traffic impact mitigation on existing residential streets can include but is not limited to:

(a) Traffic control devices (signage, striping) on segments where potential ADT exceeds 440
(b) LED street lighting, speed feedback signs, widened shoulders, inside corner widening for offtracking, or all-way stop intersections on segments where potential ADT exceeds 600.

A05 Design Criteria

The design criteria for Residential, Residential Subcollector, and Residential Collector streets, and Mountain Access and Pioneer roads are set forth in. Any unspecified design criteria shall meet or exceed the design criteria for the roadway design speed in the latest edition of *A Policy on Geometric Design of Highways and Streets* (AASHTO).

Table A-1: Residential Street Design Criteria

	Unit	Residential	Residential Subcollector	Residential Collector	Mountain Access[1]	Pioneer[1]
Average Daily Traffic	VPD	≤400	401 – 1000	1001 – 3000	–	–
Typical Section						
ROW Width[2]	ft	60	60	60	60	60
Lane Width	ft	10	10	11	10	10
Shoulder Width	ft	2	2	2	0[3]	0[3]
Roadway Width	ft	24	24	26	20	20
Foreslope[4]	h:v	3:1	3:1	4:1	2:1	3:1
Backslope[5]	h:v	2:1	2:1	2:1	2:1[6]	2:1
Crown, gravel	%	3	3	3	3	3
Crown, pavement	%	2	2	2	2	–
Engineering Criteria						
Design Speed	mph	25	30	35	--	--
Posted Speed	mph	20	25	30	--	--
Stopping Sight Distance	ft	155	200	250	--	--
Horizontal Alignment						
Minimum Centerline Radius	ft	225	350	550	–[7]	–
with DPW Approval	ft	190	275	400	–	–
Minimum Tangent Between Curves	ft	100	100	100	100	100
Maximum superelevation	%	N/A	N/A	4	N/A	N/A

[1] Where a value is not given, Mountain Access and Pioneer Roads shall meet the criteria of the anticipated street classification.

[2] ROW required for new dedications; width of existing ROW may vary.

[3] Where grades exceed 7 percent, the shoulder width shall be 2 feet for a total roadway width of 24 feet.

[4] Slope for the first 7.5 feet from the shoulder; may be steepened to 2:1 thereafter. Install guardrail when required by the latest edition of the *Roadside Design Guide* (AASHTO).

[5] 2:1 Back slopes may be steepened to 1.5:1 if cuts exceed 5 feet and appropriate slope stabilization, as determined by the design engineer, is used. Retaining walls may be used to replace or augment backslopes.

[6] Or backslope recommended by the design engineer based on actual conditions.

[7] Switch backs are allowed provided cul-de-sac criteria is met or turning radius is 40 feet with a 2% grade.

	Unit	Residential	Residential Subcollector	Residential Collector	Mountain Access[1]	Pioneer[1]
Vertical Alignment						
Maximum Centerline Grade	%	10	10	10	15[8]	10
Minimum Rate of Vertical Curvature[9]; Crest		12	19	29	–	–
Minimum Rate of Vertical Curvature [9]; Sag		26	37	49	–	–
Minimum Flow Line Grades	%	0.5	0.5	0.5	1.0	0.5
Intersections						
Minimum ROW Corner Radius	ft	30	30	30	30	30
Minimum Curve Return Radius[10]	ft	20	25	30	–	–
Maximum Grade on through street within 50 feet of intersection	%	7	7	4	9	7

[8] Up to 15% grade with no more than 200 linear feet of over 10% grade with a minimum of 100 linear feet of less than 10% grade for runout between steeper sections. Maximum grade in a horizontal curve is 10%.

[9] Rate of vertical curvature (K) is the length of curve (L) in feet per percent algebraic difference in intersecting grades (A); K = L / A

[10] 40-foot minimum curve return radius at intersections with higher order streets.

A06 Typical Section

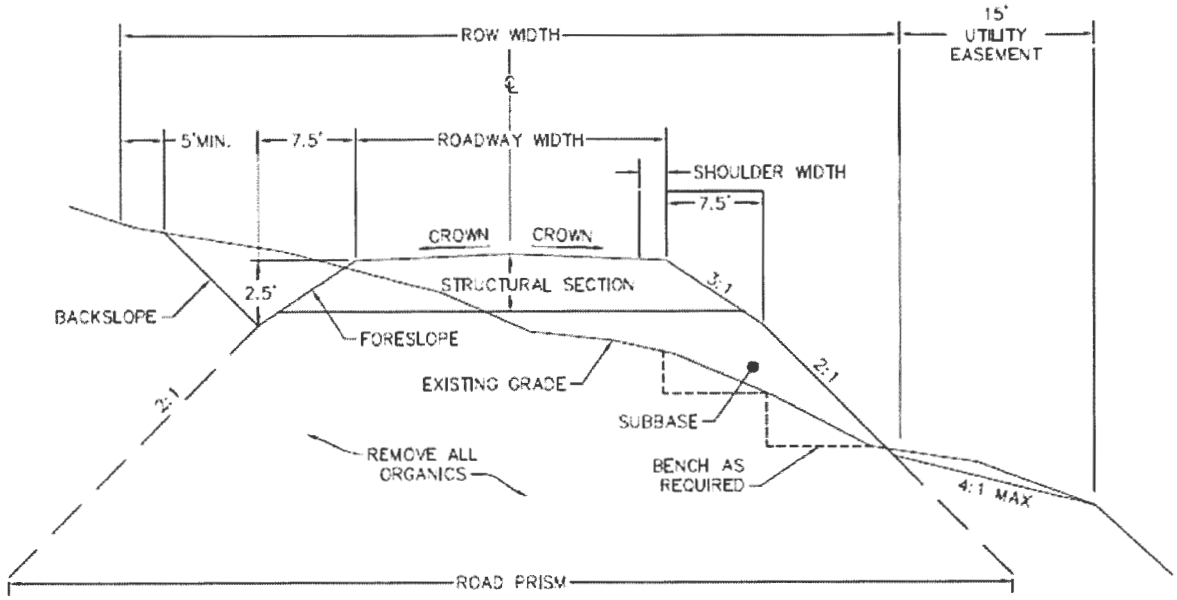


Figure A-3: Typical Section

A07 Turnarounds

Streets that exceed 200 feet in length (measured from the intersection point to the end of required construction) shall terminate with a constructed turnaround.

A07.1 Cul-de-sac Turnarounds

(a) A cul-de-sac turnaround with a drivable surface diameter (shoulder to shoulder) of 85 feet centered in a ROW diameter of 120 feet shall be provided at the terminus of Residential and Residential Subcollector streets.

(b) Cul-de-sac turnarounds shall meet the configuration and dimensions shown in Figure A-4.

(c) The grade throughout the surface of a cul-de-sac shall not exceed 4 percent.

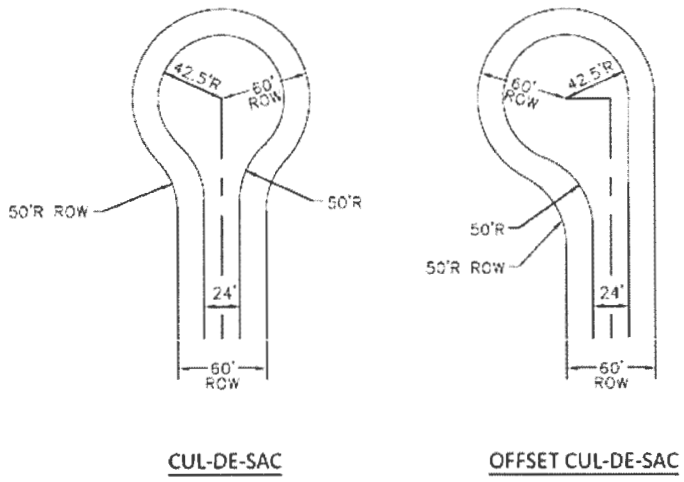


Figure A-4: Cul-de-sac Options

A07.2 Alternate Turnarounds

(a) DPW may permit a street to terminate with an alternative turnaround that meets fire code when such a design is required by extreme environmental or topographical conditions, unusual or irregularly shaped tract boundaries, or when the location of the turnaround is intended to become an intersection.

(b) Alternate turnarounds shall meet the configuration and dimensions shown in Figure A-5.

(c) The grade throughout the turnaround surface shall not exceed 4 percent.

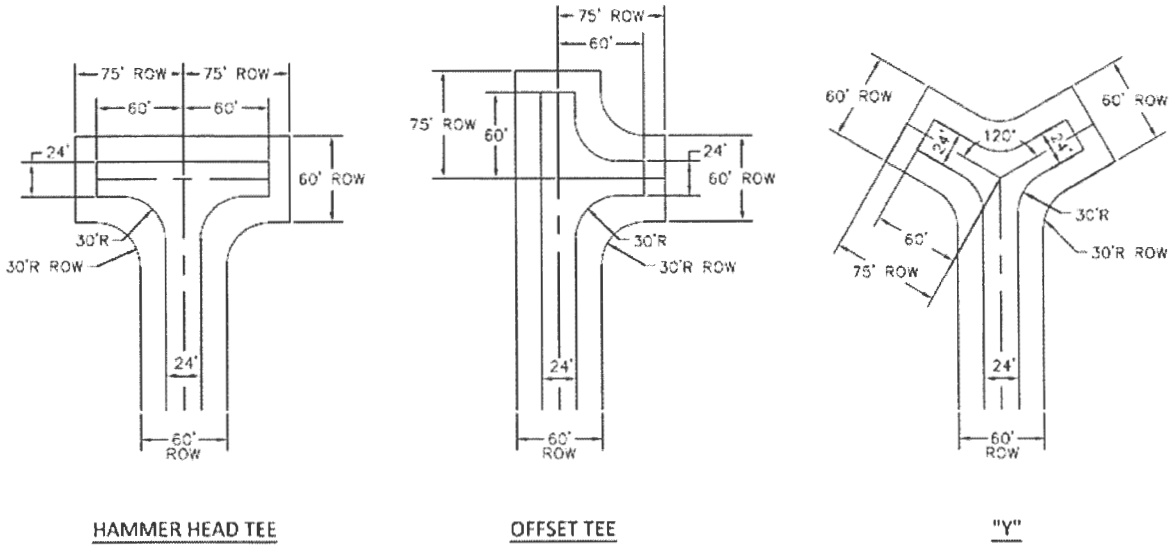


Figure A-5: Alternate Turnarounds

A08 Stub Streets

A08.1 Stub Street Construction

No construction is required if physical access is provided to all lots by adjoining streets as required by MSB or other applicable code.

A08.2 Temporary Turnarounds

All stub streets requiring construction will meet the requirements of A07. A temporary easement will be provided for the turnaround which will automatically terminate upon extension of the street and physical removal of the turnaround.

A09 Intersections

A09.1 Intersection Sight Distance

(a) Whenever a proposed street intersects an existing or proposed street of higher order, the street of lower order shall be made a stop controlled street, unless alternate intersection control is used as allowed by this subsection.

(b) Stop controlled streets shall be designed to provide intersection sight distance as specified in this subsection, Table A-2, and Figure A-6.

(c) The entire area of the intersection sight triangles shown in Figure A-6 shall be designed to provide an unobstructed view from point A at 3.5 feet above the roadway to all points 3.5 feet above the roadway along the lane centerlines from point B to point C and point D to point E.

(d) Sight distances less than the recommended shall only be used when there are topographical or other physical constraints outside of the applicant's control.

(e) The minimum sight distances listed in Table A-2 are for a passenger car to turn onto a two-lane undivided street and minor road approach grades of 3 percent or less. For other conditions, the minimum sight distance should be calculated by the applicant's engineer according to *A Policy on Geometric Design of Highways and Streets* (AASHTO).

(f) Sight distances less than the minimum, where no other options exist, will require alternate intersection control or warning signs as determined by the applicant's engineer and approved by DPW.

(g) Intersection sight triangles shall be located in their entirety within ROW or a sight distance maintenance easement.

(h) Yield controlled intersections shall conform to sight distance requirements according to *A Policy on Geometric Design of Highways and Streets* (AASHTO).

(i) Intersections with state or other municipal ROW are subject to their respective requirements and review.

Table A-2: Recommended and Minimum Intersection Sight Distance

Design Speed or Posted Speed Limit (whichever is greater)	S_d Recommended	S_d Minimum
MPH	ft	ft
25	370	280
30	450	335
35	580	390
40	750	445
45	950	500
50	1180	555
55	1450	610
60	1750	665
65	2100	720

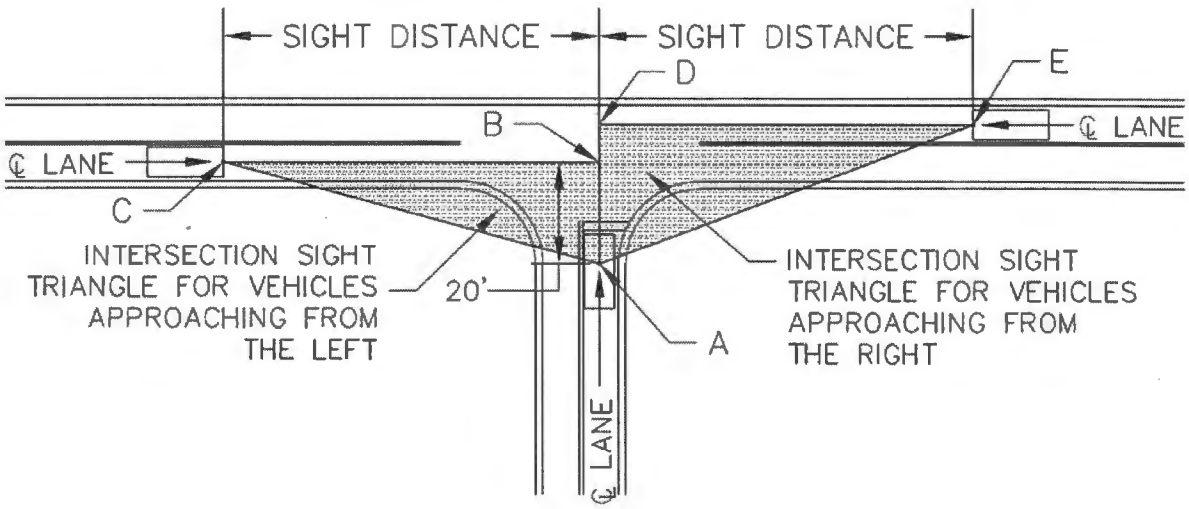


Figure A-6: Intersection Sight Distance

A09.2 Intersection Spacing

(a) Minimum centerline to centerline distance between intersections on the same side or opposing sides of the through street shall be:

(1) 155 feet on Residential streets;

(2) 200 feet on Residential Subcollector streets;

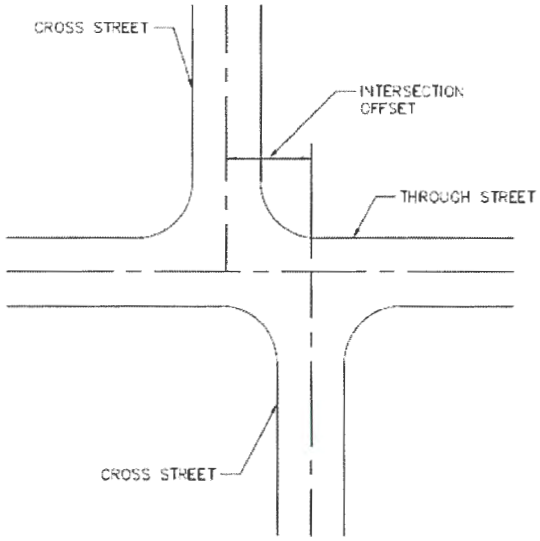
(3) 300 feet on Residential Collectors and Minor Collectors; or

(4) 650 feet on higher order streets where other access standards do not exist.

(b) If the above spacing along the through street cannot be met, intersections shall be aligned directly across from each other. Intersections on opposing sides of the through street may be offset up to 30 feet, with a preference for a left-right offset, as shown in Figure A-7.

(c) Where pre-existing conditions do not allow for the above spacing and no other legal access exists, alternate spacing or offset most closely meeting (a) or (b) above may be allowed.

(d) Additional intersections should be avoided within the functional area of major intersections with turning bays and approach tapers. Exceptions require DPW approval based upon constraints and no other feasible alternatives.



LEFT-RIGHT OFFSET CONFIGURATION

Figure A-7: Intersection Offset

A09.3 Minimum Intersection Angle

Streets should intersect with a straight segment at an angle as close to 90° as possible, but no less than 70°, for a minimum of 75 feet from the intersection point, as shown in Figure A-8.

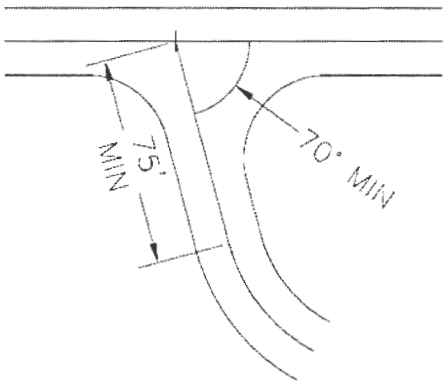


Figure A-8: Intersection Angle

A09.4 Landing

Controlled streets shall be provided with a 30-foot landing, conforming to Figure A-9, at its approach to a through street. The landing shall be sloped to match the crown of the through street. Vertical curves shall not be located in the landing to the extent feasible.

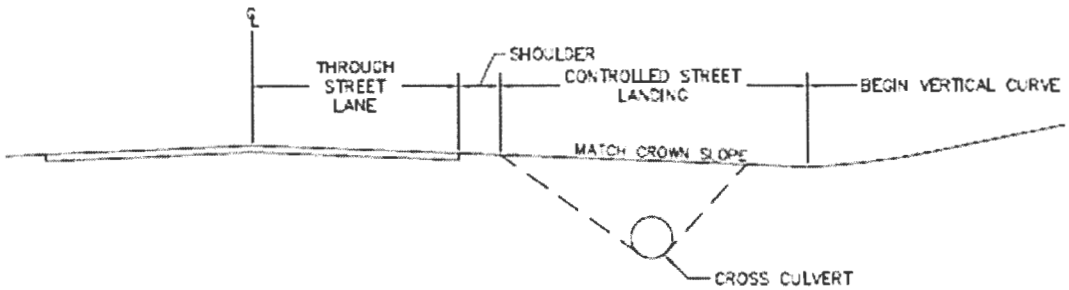


Figure A-9: Controlled Street Landing Profile

A09.5 Paved Apron

A proposed street which intersects an existing paved street shall be provided with a paved apron from the edge of the existing pavement to the end of the curve return plus 10 feet.

A10 Driveways

Driveways are not usually required to be constructed within the ROW at time of road construction. However, if an applicant chooses to construct driveways, driveway permits are required. The applicant may permit all driveways with one application. A driveway permit application can be obtained from the MSB Permit Center. Driveways onto state or other municipal ROW are subject to their respective requirements and review.

A11 Trailhead

Trailhead parking lot layout shall conform to applicable local, state, and federal requirements.

A12 Bicycle and Pedestrian Paths

Bicycle and pedestrian paths constructed within public ROW shall conform to the current edition of *Guide for the Development of Bicycle Facilities* (AASHTO), and any other applicable local, state, and federal requirements.

A13 Signage

Signs shall be provided and installed by the applicant in conformance with the latest edition of the *Alaska Traffic Manual* (ADOT&PF) and the *Alaska Sign Design Specifications* (ADOT&PF) prior to plat recordation.

(a) Each street within a subdivision shall be identified and signed at its point of egress and ingress. Cul-de-sac streets will be signed and identified at their point of ingress
(b) Intersection control signs shall be provided at designated intersections within the confines of the subdivision and at the intersection with the access road, if applicable.
(c) Speed limit signs shall be provided where practical.
(d) If a constructed stub street provides access to two or fewer lots and has no turnarounds a sign indicating a dead-end street shall be posted.
(e) If a dedicated stub street is not constructed, no signs are required.
(f) Install signs according to the criteria in Figure A-10, Figure A-11, and Figure A-12.
(g) Signs within state or other municipal ROW are subject to their respective requirements and review.

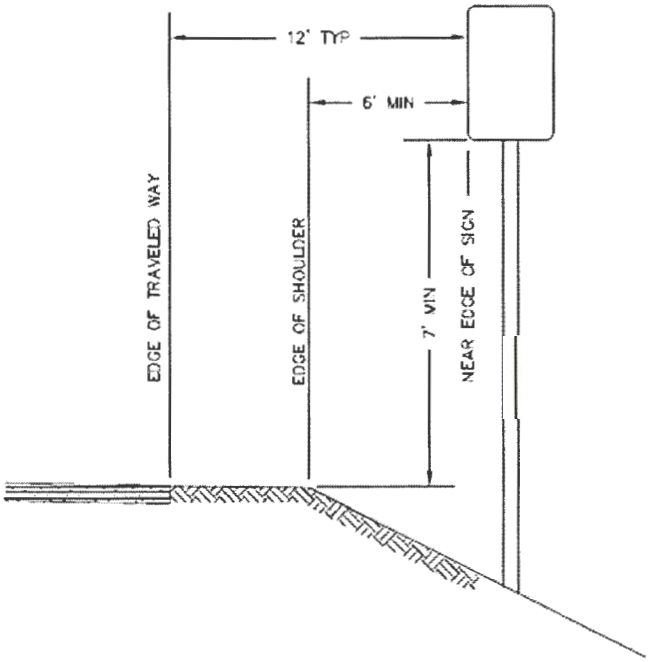


Figure A-10: Sign Placement

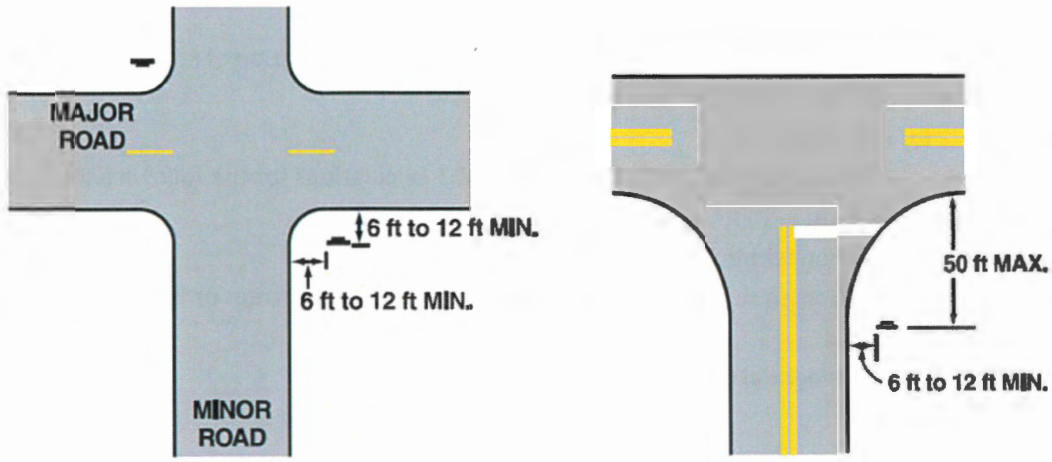
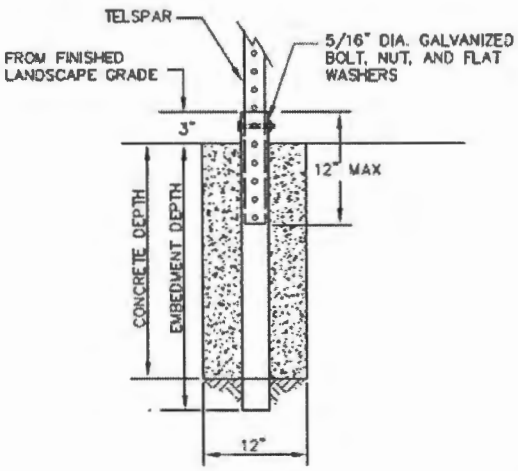


Figure A-11: Stop Sign Location



PERFORATED STEEL TUBES (P.S.T.) (12ga. – .105" Wall Thickness)			
SIGN SURFACE AREA SQ. FT.	POST SIZE	EMBEDMENT DEPTH	CONCRETE DEPTH
7' OR LESS	2" X 2"	27"	24"
GREATER THAN 7'	2 ½" X 2 ½"	33"	30"

Figure A-12: Concrete Foundation for Sign Post

A14 Railroad Crossings

All access requiring a crossing of the Alaska Railroad shall be subject to the *Alaska Policy on Railroad/Highway Crossings* (Alaska Railroad).

A15 Average Daily Traffic

(a) The following formula shall be used to determine the required classification of streets:
ADT = Number of lots x 10 for single-family residential use.

(b) See Section G for other land uses.

(c) For subdivisions of five or more lots, submit potential ADT calculations for the following locations with the preliminary plat:

(1) at each intersection within the subdivision,

(2) at each intersection en route to an existing Residential Collector street or higher classification, and

(3) at an existing Residential Collector street or higher classification.

A16 Design Deviations

Every effort will be made to comply with the standards of this section. Design deviations will be considered to address extenuating circumstances including but not limited to: existing substandard ROW, environmental conditions, or existing utilities or other structures. Design deviation requests shall be in writing and should contain supporting information, justification, and suggested solutions. Design deviations may be allowed by DPW only for matters that do not fall under the jurisdiction of a Board or Commission. In no circumstances will a roadway width less than 20 feet or foreslopes steeper than 2:1 be allowed. Residential Collector streets shall be no less than 24 feet wide.

Section B. Major Road Corridors

B01 General

Major road corridors include major collectors, arterials, and interstates. This section provides references to and guidelines for the design and construction of major road corridors within the MSB.

B02 Right-of-way and Surface Widths

Classification	Minimum ROW Width (ft)	Standard Lane Width (ft)	Number of Lanes	Shoulder Width (ft)
Major Collector	80	12	2 - 3	4
Arterial	100	12	3 - 4	4 – 8
Interstate	200	12	4 - 6	12

B03 Frontage, Backage, and Connector Street Standards

Subdivisions adjacent to planned or existing major road corridors shall plan for future frontage or backage streets when any of the following conditions apply, unless it is shown by the applicant to be not necessary or feasible for future development and public safety with non-objection from the road authority.

(a) Subdivisions accessing roads that are classified by ADOT&PF as Interstates.
(b) Subdivisions accessing roads that are or are projected to grow above 20,000 vehicles per day (VPD).
(c) Subdivisions accessing roads that are or are projected to have four or more lanes or median control per the LRTP or OSHP.
(d) Subdivisions that require a second access route.
(e) To gain access to an existing or planned signal.
(f) Where access to a minor arterial or collector as a connector road is feasible.

B03.1 Separation Distances

Minimum ROW to ROW separation distance between major corridors and frontage or backage streets shall be:

(a) 0 feet for locations with no connector street to the major road corridor;
(b) 100 feet for locations with a connector street to the major road corridor that lie between section lines and planned or existing intersections with other major road corridors;
(c) 300 feet for locations where the connector street to the major road corridor is on a section line or planned or existing major road corridor.

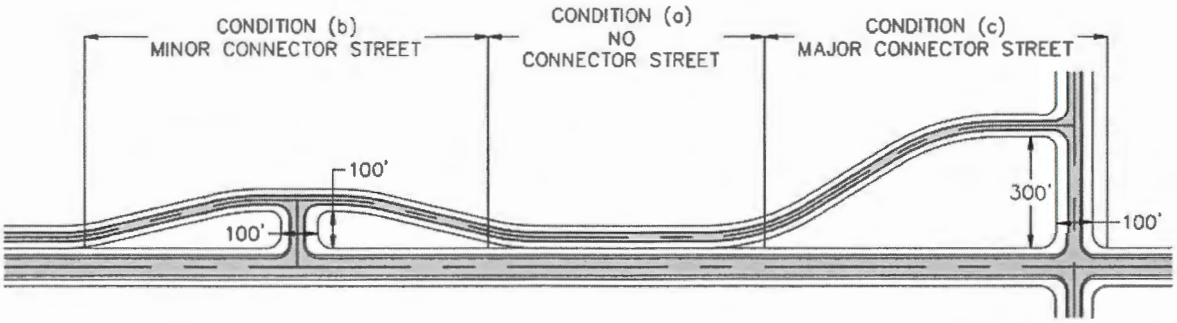


Figure B-1: Frontage Street Configurations

B03.2 Design Standards

(a) Frontage streets
  (1) Minimum centerline radii may be reduced near intersections with through connector streets.

(b) Connector streets
  (1) 100-foot ROW width desirable.
  (2) Minimum 40-foot radius curve returns at the major road corridor.
  (3) Minimum 4-foot wide shoulders for 100 feet from the edge of roadway of the major road corridor.
  (4) Minimal direct access.

B03.3 Dedication and Setbacks

Dedicate ROW or additional building setbacks to allow for the frontage, backage, and connector street standards in this manual. The applicant shall prove that frontage, backage, and connector street dedications or building setbacks are in a practical location where road construction is feasible in accordance with this manual. The applicant shall be required to submit plan, profile, and cross-sections if existing grades along the proposed route exceed 10 percent, existing cross slopes exceed 15 percent, or if existing utilities or other physical features appear to create impediments to a road design meeting standards of this manual.

B04 Access Standards

(a) The average access point spacing on major road corridors, where other access standards do not exist, shall not exceed the minimums listed in Table B-1, based on the posted speed limit. Average access point spacing is calculated per segment and is equal to the segment length divided by the number of access points on both sides of the street. Undeveloped lots with only access to the major road corridor are counted as having at least one access point.

(b) When the average access point spacing on a segment of an existing major road corridor is less than the minimum listed in Table B-1, the average access point spacing shall not decrease due to the subdivision.

Table B-1: Average Access Point Spacing

Posted Speed Limit (mph)	Minimum Average Access Point Spacing (feet)
30	250
35	300
40	360
45	425
50	495
55	570

B05 Future Corridors

Routes proposed for future upgrade or construction as designated in the LRTP or OSHP shall have building setbacks established which will prohibit the location of any permanent structure within the future corridor, unless it is shown to be unnecessary. Label the proposed road corridor and the building setback line on the Final Plat. The area within the proposed road corridor shall be excluded from useable septic area calculations. The area within the proposed road corridor and building setbacks shall be excluded from useable building area calculations.

B06 References

The following publications shall be used for design and construction standards of these classes of streets that are not otherwise established herein:

(a) *A Policy on Geometric Design of Highways and Streets*, AASHTO (current edition).
(b) *Standard Specifications for Highway Construction*, ADOT&PF (current edition);
(c) *Standard Modifications to the ADOT&PF Standard Specifications for Highway Construction*, MSB (latest revision)
(d) *Alaska Highway Preconstruction Manual*, ADOT&PF (latest revision)

Section C. Construction Requirements

C01 General

This section establishes minimum construction requirements. Prior to any ground disturbing activities, call the Alaska Dig Line for utility locates in accordance with AS 42.30.400.

C02 Road Construction

C02.1 Clearing

Cut and dispose of all trees, down timber, stumps, brush, bushes, and debris. Cut trees and brush to a height of not more than 6 inches above the surrounding ground. Clear the ROW, slope easements, and sight distance triangles. Where ROW exceeds 60 feet, clear a minimum of 60 feet. Clear utility easements, if used, for utilities constructed with the development.

C02.2 Grubbing

Remove and dispose of all stumps, roots, moss, grass, turf, debris, or other deleterious material within the fill and cut catch limits of the road plus 5 feet on each side, within the ROW, and cleared utility easements for underground utilities.

C02.3 Disposal

Dispose of clearing and grubbing debris in an area designated by the applicant outside of all ROW, platted utility easements, and platted private road corridors. Organic debris 3 inches in diameter by 8 inches long, or smaller, may be left in place, outside of the road prism.

C02.4 Slit Trenches

Slit trenches are not allowed in the ROW. Utility easements may be used as a borrow source above a 2:1 extension of the road prism, as shown in Figure A-3. Topsoil or other organic non-deleterious material may be disposed within the utility easement. Compact the disposal area with heavy equipment and grade the surface with positive drainage no steeper than 4:1 and no lower than the ditch line. Submit an as-built drawing showing the horizontal locations of borrow extraction along the road corridor with the Final Report.

C02.5 Embankment Construction

(a) Construct the road with the required structural section, see Figure C-1, and dimensions, see Table A-1 and Figure A-3, as determined by its classification.

(b) Prepare the subgrade. Remove all organics from the area below the road prism and dispose in locations where embankment is not proposed. Bench existing slopes that are steeper than 4:1, measured at a right angle to the roadway, where roadway embankment is to be placed.

(c) Place material meeting, or verify in-situ material meets, the requirements for Subbase specified in subsection C07 to a minimum depth of 20 inches with the upper 6 inches having no material with

a diameter larger than 6 inches. Place embankment in horizontal layers not to exceed 24 inches (uncompacted) for the full width of the embankment and compact as specified before the next lift is placed.

(d) Place 4 inches of Surface Course meeting the requirements specified in subsection C07. Finish with a 3 percent crown, and compact as specified.

(e) Compact the entire road prism to not less than 90 percent of the maximum dry density. Compact the top 24 inches to not less than 95 percent of the maximum dry density. Determine compaction in accordance with the *Standard Specifications for Highway Construction* (ADOT&PF) and any MSB Standard Modifications. Compaction tests on the subbase layer shall be taken at representative locations along the roadways as follows:

  (1) a minimum of three;

  (2) at least one per segment;

  (3) one additional test per 1000 linear feet, or portion thereof, when the combined length of roadway exceeds 1000 linear feet;

  (4) at least one out of every three within three feet of the shoulder, and the remainder in the center of a driving lane.

(f) For paved roadways, substitute Surface Course with a minimum of 2 inches of Base Course and 2 inches of HMA Type II, Class B in accordance with Appendix A. The width of the pavement shall be equal to two lane widths and finished with a 2 percent crown. Pavement edges shall be backed with additional Base Course graded and compacted flush with the pavement surface and tapered to the edge of the roadway. The pavement shall be washed or swept immediately following shouldering work.

(g) Remove all loose material exceeding 6 inches in diameter from the ditches and foreslopes. Where slopes are 3:1 or steeper and longer than 10 feet measured along the slope face, trackwalk perpendicular to the slope, or the equivalent, to form 1-inch wide grooves parallel to the road no more than 12 inches apart.

(h) Permanently stabilize backslopes 3:1 or steeper. Stabilization can be part of a subdivision agreement. Stabilization may be allowed to establish during the warranty period.

C02.6 Unsuitable Subgrades

When structurally unsuitable material such as peat, saturated material, or permafrost are present within the ROW, provide an appropriate structural design for approval by DPW, according to Section F, prior to construction. Place embankment to a depth that will produce a stable road surface with a final grade 18 inches above the surrounding ground.

C03 Roads Outside of a Road Service Area

Roads outside of a Road Service Area are not subject to the requirement for Surface Course.

C04 Pioneer Road Construction Requirements

Pioneer roads, whether proposed or existing, shall meet the requirements of Figure C-1,

Table A-1, and Figure A-3. Place material meeting, or verify in-situ material meets, the requirements for Subbase specified in subsection C07 to a minimum depth of 12 inches. Additional road embankment may be required to provide a stable road surface. Surface Course is not required. Pioneer roads may be constructed offset from the centerline of the ROW to facilitate future expansion of the road. Cross drainage culverts, minimum 18 inch diameter, will be installed where determined necessary and 24 inch ditches will be provided for drainage.

C05 Winter Construction

Winter construction may be allowed. DPW will not accept any roads until all ground has thawed and any settlement areas corrected.

C06 Alternate Methods and Materials

Use of alternate materials and road construction methods that will more appropriately fit the conditions of the specific road locations, following general engineering practices, may be proposed by the applicant or their engineer in writing. Final acceptance of such plans must be approved by DPW.

C07 Materials

C07.1 Subbase

(a) Is aggregate containing no muck, frozen material, roots, sod, or other deleterious matter;
(b) has a plasticity index not greater than 6 as tested by Alaska Test Method (ATM) 204 and ATM 205; and
(c) meets the requirements of Table C-2, as determined by ATM 304.

C07.2 Base Course

(a) Crushed stone or crushed gravel, consisting of sound, rough, durable pebbles or rock fragments of uniform quality;
(b) free from clay balls, vegetable matter, or other deleterious matters;
(c) meets the requirements of Table C-1; and
(d) meets the requirements of Table C-2, as determined by ATM 304.

C07.3 Surface Course

(a) Is a screened or crushed gravel, consisting of sound, rough, durable pebbles or rock fragments of uniform quality;
(b) free from clay balls, vegetable matter, or other deleterious matters; and
(c) meets the requirements of Table C-2, as determined by ATM 304.

Table C-1: Aggregate Quality Properties for Base Course

Property	Test Method	Base Course
L.A. Wear, %	AASHTO T 96	50, max
Degradation Value	ATM 313	45, min
Fracture, %	ATM 305	70, min
Plastic Index	ATM 205	6, max
Sodium Sulfate Loss, %	AASHTO T 104	9, max (5 cycles)

Table C-2: Aggregate Gradations

Sieve Designation	Subbase	Base Course	Surface Course
1 1/2 inch			100
1 inch		100	
3/4 inch		70 to 100	70 to 100
3/8 inch		50 to 80	50 to 85
No. 4	20 to 60	35 to 65	35 to 75
No. 8		20 to 50	20 to 60
No. 50		6 to 30	15 to 30
No. 200	0 to 10	0 to 6	7 to 13

(Percent Passing By Weight)

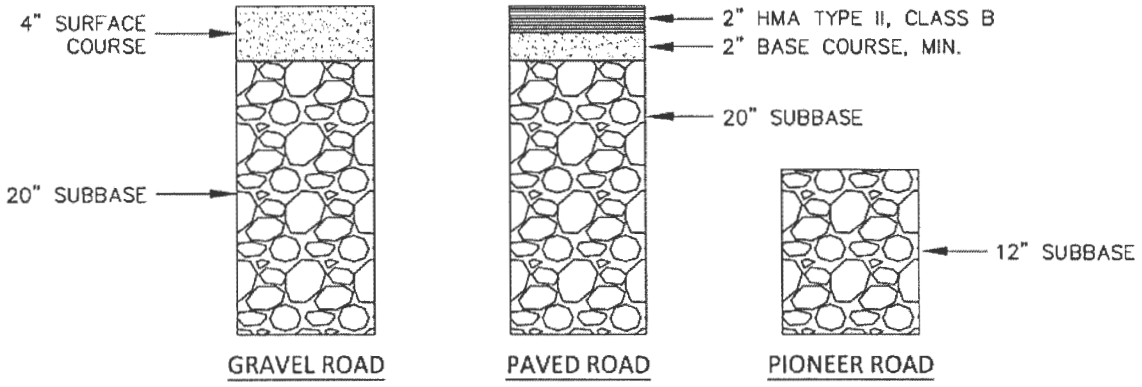


Figure C-1: Structural Sections

Section D. Drainage

D01 General

The purpose of this section is to ensure that stormwater management is provided with land development activities. Responsible stormwater management is the treatment, retention, detention, infiltration, and conveyance of stormwater and other surface waters without adversely impacting adjoining, nearby, or downstream properties and receiving waters.

D02 Requirements

A preliminary drainage plan is required when road construction or disturbing land to create useable area for a subdivision is proposed. A drainage report is required for projects that include road construction, disturb 10,000 square feet of land or more, fill in wetlands, disturb land within 100 feet of the ordinary high water mark (OHWM) of a water body, disturb land within a mapped flood hazard area, or change the location, direction, quantity, or type of runoff leaving a site. See subsection D06 for specific requirements regarding fish passage culverts. It is the applicant's responsibility to comply with all other applicable federal, state, and local codes and regulations.

D02.1 Preliminary Drainage Plan

Submit a preliminary drainage plan, prepared by an engineer or other qualified professional registered in the State of Alaska, with the preliminary plat or ROW construction permit application. The preliminary drainage plan shall show the project site at a legible scale plottable on 11" by 17" paper or larger and depict the following:

(a) Existing and proposed property lines, plottable easements disclosed in the title report, the OHWM of water bodies with 100-foot upland offset, and existing mapped flood hazard areas.

(b) Existing topography with horizontal and vertical accuracy meeting US National Map Accuracy standards, with 5-foot contour intervals if the ground slope is less than 10 percent and 10-foot contour intervals if the ground slope is greater than 10 percent.

(c) Existing features that convey or retain drainage, including but not limited to: water bodies, wetlands, natural valleys, swales, ditches, check dams, culverts, and pipe systems.

(d) Proposed drainage pattern and features, both constructed and natural, on site. Identify conveyance types, flow directions, and any drainage changes that may affect adjacent property.

(e) Proposed stream crossings and anticipated culvert sizes. Identify fish-bearing streams.

D02.2 Drainage Report

(a) Submit a drainage report, prepared by an engineer or other qualified professional registered in the State of Alaska, as part of the construction plan submittal in subsection F01.2. The drainage report shall include the following:

(b) The drainage plan as specified in D02.1 (may be shown on two plans for clarity), updated to include:

(1) Pre-development and post-development catchment area boundaries; and

(2) Locations of peak flow, peak velocity, and where runoff leaves the project site.

(c) Description of methods, assumptions, and data sources used or made, including but not limited to:

(1) Rainfall data used (from NOAA's Precipitation Frequency Data Server or the Palmer Airport IDF curves in Figure D-1, whichever is more appropriate for the local conditions).

(2) Assumed post-development land cover conditions.

(3) Method used to determine runoff quantities, time of concentration, peak flows, etc.

(d) Catchment area maps used or created to evaluate down-gradient conditions.

(e) Identify design elements, with supporting runoff calculations, necessary to show compliance with the drainage design criteria set forth in D03.

(f) Fish passage culvert plans, if applicable.

D03 Drainage Design Criteria

(a) Design a drainage system for the project site to meet the criteria listed in Table D-1.

(b) Retain natural drainage patterns to the extent possible.

(c) Changes to drainage patterns must not adversely affect adjacent property or ROW.

(d) Base the size and capacity of the drainage system on runoff volumes and flow rates assuming full development of the subdivision and a 10 percent increase to runoff from the catchment area.

(e) Utility easements may be crossed by drainage features, but cannot be used to retain or detain water. Drainage easements are required where the ROW is not sufficient to accommodate drainage needs. See subsection E01.2.

(f) Drainage to state or other municipal ROW are subject to their respective requirements and review.

Table D-1: Drainage Sizing and Analysis Criteria

Design Requirement	Purpose	Criteria
Conveyance Design	Size conveyances to pass design peak flows.	Drainage ditches: 10-year, 24-hour Non-regulated streams: 10-year, 24-hour Regulated streams: 100-year, 24-hour
Wetland Retention	Retain function of original wetlands	In areas where wetlands are disturbed, drainage must be designed to preserve the pre-development function of the remaining wetlands. For jurisdictional wetland areas, comply with United States Army Corps of Engineers wetlands development retention requirements.
Water Quality Protection	Treat first flush pollutant loading Ensure channel stability for all project conveyances	Treat the initial 0.25 inch of post-developed runoff for each storm event. Control flows in conveyance channels so that transport of particles sized D50 and greater will not occur for the post-development 10-year, 24-hour storm.
Extended Detention	Protect streams and channels from damage from smaller, more frequent storm flows	Provide 12 to 24 hours of detention for the post-development project runoff in excess of pre-development runoff volume for the 1-year, 24-hour storm.
Flood Hazard Protection	Control project peak flow to minimize downstream impacts	Maintain the post-development project runoff peak flow from the 10-year, 24-hour storm to less than 1.10 times pre-development runoff peak flow at all project discharge points. If post-development discharge is greater than pre-development discharge, evaluate down-gradient conditions for and mitigate adverse impacts for a distance of 1 mile downstream from the project as measured along the flow path or to the receiving water body, whichever is less,
Project Flood Bypass	Prevent an increased risk of flood damage from large storm events.	Design or identify an unobstructed, overland flow path for runoff to overtop or bypass project conveyance routes for the post-development 100-year, 24-hour storm.

D04 Drainage Ditches

Normal ditch depth shall be 30 inches and according to the typical section shown in subsection A06. The ditch depth may be reduced at local high points of the ditch, provided the flow line offset is maintained and with DPW concurrence. Alternate ditch design along Residential and Residential Subcollector streets may be considered, if evidence is provided that the following conditions exist:

(a) Ditches are a minimum of 18" deep;
(b) The design peak flow required by Table D-1 is demonstrated to be conveyed within ditches with a minimum freeboard of 12 inches;
(c) Adequate drainage routes are provided and constructed within the ROW or designated drainage easements;
(d) Flow lines are established at least 8 feet from the edge of roadway.
(e) Ditches are deepened to provide cross drainage through 24" corrugated metal culverts (18" with DPW approval).
(f) Cross sectional area of ditch is at least 15 square feet.

D05 Culverts

D05.1 General Culvert Design Criteria

The following criteria apply to all cross road culverts for runoff or seasonal drainage:

(a) The minimum culvert slope is 0.5 percent.
(b) Culverts longer than 100 feet require appropriate maintenance access and DPW approval
(c) Cross road culverts shall have a minimum diameter of 18 inches.
(d) Culverts shall be sized to convey the design peak flow required by Table D 1, based on the larger of the two computed sizes using inlet control and outlet control.
(e) Culverts shall be corrugated metal pipe (CMP).
(f) Install culverts in accordance with the manufacturer's recommendations for the anticipated traffic loads.

D05.2 Stream Crossing Culvert Criteria

The following criteria apply to all stream crossing culverts:

(a) Prior to preliminary plat submittal, contact the Alaska Department of Fish and Game (ADFG), Division of Habitat to determine if a stream reach harbors fish. If so, stream crossing culverts shall be designed, constructed, and maintained according to D06.
(b) Stream crossing culverts shall be placed as close to the pre-existing channel alignment as possible. Avoid placing culverts at pools and stream bends.
(c) Road alignment shall be as close to perpendicular to the stream channel as possible.
(d) Culvert slope shall be within 25 percent of the natural stream slope. For example, if the natural stream slope is 1.0 percent, the minimum design slope of the culvert would be 0.75 percent and the maximum design slope would be 1.25 percent.

(e) Culvert outlet and inlet protection shall be used as necessary to reduce the risk of scour and perching.
(f) Stream crossings shall be composed of a single pipe or arch for the main stream channel.
(g) Overflow culverts may be used but should be placed at a higher elevation so that flows up to the OHWM pass through the primary culvert.
(h) Stream crossings shall maintain the connectivity of wetlands adjacent to stream channels and shall accommodate sheet flow within such wetlands.
(i) Stream crossing culverts shall not interfere with the functioning of floodplains and shall be designed to convey the design peak flow required by Table D-1. If the stream crossing culvert is not designed to accommodate the 100-year flow, a route must be established to safely convey flows exceeding the design peak flow without causing damage to property, endangering human life or public health, or causing significant environmental damage.
(j) In cases of crossings within high entrenchment ratio environments, the ratio of the flood prone width to the OHWM width is greater than 2.2, floodplain overflow culverts may be beneficial to floodplain connectivity and can be used to pass the design flow. Minimum width requirements for the primary culvert still apply.
(k) Stream crossing culverts shall have a minimum diameter of three feet.
(l) Stream crossing culvert pipes and arches shall be metal.
(m) Culverts longer than 100 feet require appropriate maintenance access and DPW approval
(n) Install culverts in accordance with the manufacturer's recommendations for the anticipated traffic loads.

D06 Fish Passage Culverts

These criteria provide general design guidance for road crossings of fish-bearing streams to maintain the full hydrologic functioning of the water body they are crossing. Site-specific conditions, such as multi-thread channels, may require alternate design approaches.

D06.1 Pre-design Conference

Schedule a fish passage pre-design conference with DPW prior to permit submittals. The pre-design conference is to:
(a) determine required permits;
(b) coordinate interagency requirements;
(c) determine any site-specific design requirements; and
(d) establish a plan review process.

D06.2 Stream Simulation Method

Stream simulation methodologies shall be used for the design of all fish-bearing stream crossings. The stream simulation method uses reference data from a representative section, or reference reach, of the specific water body crossed. This method attempts to replicate the natural stream channel conditions found upstream and downstream of the crossing. Sediment transport, flood and debris conveyance, and fish passage are designed to function as they do in the natural channel.

Reference Reach

(a) Select a reference reach on the water body being crossed that is outside any anthropogenic influence, such as an existing culvert. In most cases of new crossings, the reference reach can be at the crossing location.

(b) The length of the reference reach should be a minimum of 20 times the reference bankfull width and no less than 200 feet.

(c) If there is not a suitable reference reach on the water body being crossed, a reference reach may be chosen from another water body with similar geomorphic and hydrologic characteristics. The reference reach characteristics should meet the following criteria in comparison to the water body being crossed:

  (1) The reference reach bankfull width should be at least one half and no more than two times that of the water body being crossed;

  (2) The reference reach bankfull discharge should be at least one half and no more than one and one half times the bankfull discharge of the water body being crossed; and

  (3) The stream order of the reference reach should be within one stream order of the water body being crossed.

(d) For a reference reach from another water body, the geomorphic characteristics of the crossing shall be scaled using ratios of the bankfull conditions.

(e) The reference reach bankfull dimensions should be determined in the field by surveying a detailed cross section at the upper 1/3 of a representative riffle.

(f) Reference data shall include, at a minimum:

  (1) channel width at the OHWM,

  (2) bankfull width,

  (3) bankfull cross-sectional area,

  (4) bankfull slope based on the longitudinal profile,

  (5) substrate, and

  (6) potential for floating debris.

Culvert Size, Slope, and Substrate

In addition to D05.2, the following criteria apply to fish passage culverts:

(a) Under normal flow conditions, the channel within or under the fish passage culvert shall not differ from the reference reach condition in regards to the channel width at the OHWM, cross-sectional area, slope, substrate, and ability to pass floating debris.

(b) The width of fish passage culverts shall not be less than the greater of 1.2 times the channel width at the OHWM and 1.0 times the bankfull width.

(c) Fish passage culverts shall have a minimum diameter of five feet.

(d) The use of smooth wall culverts is prohibited.

(e) The use of trash racks or debris interceptors is prohibited

(f) Round culvert pipes shall have a minimum invert burial depth of 40 percent of the culvert diameter into the substrate. Arch or box culverts shall have a minimum invert burial depth of 20

percent of the culvert's rise into the substrate, unless scour analysis shows less fill is acceptable. The minimum invert burial depth is 1 foot.

(g) The gradation of the substrate material within a fish passage culvert shall be designed to be a dense, well-graded mixture with adequate fines to ensure that the majority of the stream flows on the surface and the minimum water depth is maintained.

(h) Substrate material within or under the fish passage culvert shall remain dynamically stable at all flood discharges up to and including a 50-year flood. Dynamic stability means that substrate material mobilized at higher flows will be replaced by bed material from the natural channel upstream of the crossing. For crossings without an adequate upstream sediment supply, the substrate material within the crossing shall be designed to resist the predicted critical shear forces up to the 100-year flood. For culverts with a slope of 6 percent or greater, substrate retention sills may be required to allow the bed load to continuously recruit within the culvert.

(i) Substrate material within or under the fish passage culvert shall incorporate a low flow channel. The low flow channel should mimic the reference reach where possible. If the low flow channel dimensions are not discernable from the reference reach, the low flow channel should have a cross sectional area of 15 to 30 percent of the bankfull cross sectional area and a minimum depth of 4 inches for juvenile fish and 12 inches for adult fish. The low flow channel should be defined by rock features that will resist critical shear forces up to the 100-year flood.

(j) Constructed streambanks are recommended inside fish passage culverts to protect the culvert from abrasion, provide resting areas for fish, and provide for small mammal crossing. If streambanks are constructed through a crossing, the streambanks shall be constructed of rock substrate designed to be stable at the 100-year flood. The streambank width should be a minimum of 1.5 times the maximum sieve size of the streambed material (D100). The crossing width shall be increased to allow for the channel width plus the streambanks.

(k) If substrate retention sills are used, they shall have a maximum weir height of one half of the culvert invert burial depth. Substrate retention sills shall be spaced so that the maximum drop between weirs is 4 inches. The use of sills without substrate is not allowed.

(l) Other state and federal requirements may apply.

D06.3 Hydraulic Method

Hydraulically designed culverts are discouraged for fish-bearing stream crossings, though may be approved by DPW and ADFG in circumstances where stream simulation is not practical. In addition to D05.2, the following criteria apply to hydraulically designed culverts:

(a) The hydraulic method uses the swimming capability and migration timing of target design species and sizes of fish to create favorable hydraulic conditions throughout the culvert crossing. Information and design software for this methodology is available from ADFG, Division of Sport Fisheries (Fishpass) and the US Forest Service (FishXing).

(b) The design fish shall be a 55-milimeter (2.16-inch) juvenile coho salmon for anadromous streams and a 55-milimeter (2.16-inch) Dolly Varden char for non-anadromous streams. These criteria may change based on ongoing research by federal and state agencies.

(c) Fish passage high flow design discharge will not exceed the 5 percent annual exceedance flow or 0.4 times the 2-year peak flow, whichever is lower and has the most supporting hydrologic data.

(d) Fish passage low-flow design discharge shall ensure a minimum 6-inch water depth or natural low flow and depth within the reach the crossing occurs. In cases where local conditions preclude natural low flow characteristics, backwatering or in-culvert structures should be considered.

(e) In cases where flared end sections with aprons are necessary and fish passage is required, water depths and velocities that satisfy fish passage criteria must be demonstrated across the apron in addition to within the culvert.

(f) Fish passage criteria for culverts crossing tidally-influenced streams must be satisfied 90 percent of the time. Tidally-influenced streams may sometimes be impassable due to insufficient depth at low flow and low tide. If the tidal area immediately downstream of a culvert is impassable for fish at low tide, the exceedance criterion shall apply only to the time during which fish can swim to the culvert.

(g) Other state and federal requirements may apply.

D07 Rainfall Data

D07.1 Rainfall Distribution

The following IDF curves and hyetograph, derived from data measured at the Palmer airport, may be used for runoff calculations.

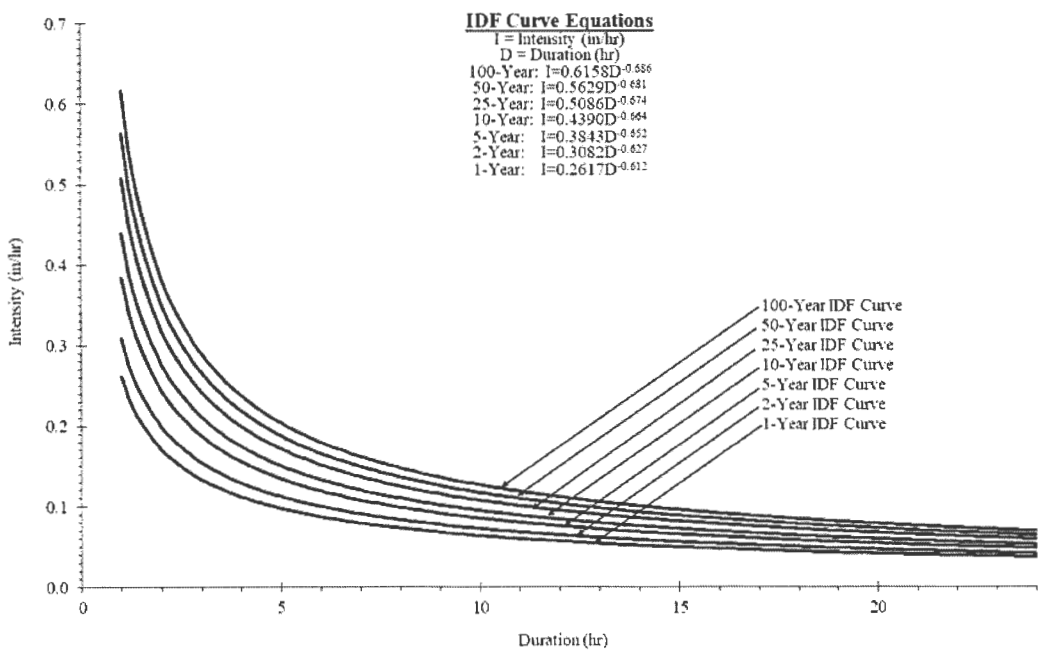


Figure D-1: Intensity-Duration-Frequency Relationships for the Matanuska-Susitna Borough
Source: Palmer Municipal Airport, 1999 to 2008, Stantec – 2009

Table D-2: Recurrence Interval Hyetographs (in/hr) for the Matanuska-Susitna Borough

Time (hr)	1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
1	0.01	0.02	0.02	0.02	0.02	0.02	0.02
2	0.02	0.02	0.02	0.02	0.02	0.02	0.02
3	0.02	0.02	0.02	0.02	0.02	0.02	0.03
4	0.02	0.02	0.02	0.02	0.02	0.03	0.03
5	0.02	0.02	0.02	0.02	0.03	0.03	0.03
6	0.02	0.02	0.02	0.03	0.03	0.03	0.03
7	0.02	0.02	0.03	0.03	0.03	0.03	0.04
8	0.03	0.03	0.03	0.03	0.04	0.04	0.04
9	0.03	0.03	0.04	0.04	0.04	0.05	0.05
10	0.04	0.04	0.04	0.05	0.05	0.06	0.06
11	0.05	0.05	0.06	0.06	0.07	0.08	0.08
12	0.06	0.07	0.07	0.08	0.09	0.10	0.10
13	0.26	0.31	0.38	0.44	0.51	0.56	0.62
14	0.08	0.09	0.10	0.12	0.13	0.14	0.15
15	0.04	0.04	0.05	0.05	0.06	0.06	0.07
16	0.03	0.04	0.04	0.04	0.05	0.05	0.05
17	0.03	0.03	0.03	0.04	0.04	0.04	0.04
18	0.02	0.03	0.03	0.03	0.03	0.04	0.04
19	0.02	0.02	0.03	0.03	0.03	0.03	0.03
20	0.02	0.02	0.02	0.02	0.03	0.03	0.03
21	0.02	0.02	0.02	0.02	0.03	0.03	0.03
22	0.02	0.02	0.02	0.02	0.02	0.02	0.03
23	0.02	0.02	0.02	0.02	0.02	0.02	0.02
24	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	0.90	1.01	1.16	1.28	1.43	1.55	1.67

Note: Total values of rainfall calculated by adding un-rounded average rainfall intensities for each time step.
Source: Palmer Municipal Airport, 1999 to 2008, Stantec – 2009

Section E. Easements

E01 General

E01.1 Common Access Easements

When a shared driveway is required for two or more lots, a common access easement shall be dedicated for the exclusive use of the subject lots, unless otherwise accommodated. The MSB is the permitting authority within common access easements. The common access easement shall be sized to reasonably accommodate separation of the shared driveway to the individual lots.

E01.2 Drainage Easements

Drainage easements are required where the ROW is not sufficient to accommodate drainage needs. Drainage easements can overlap with other platted easements and shall begin or terminate at the ROW. Drainage easements shall be a minimum width of 20 feet, and a minimum average length of 20 feet outside of any overlapping easements or of sufficient size and area shown to facilitate construction and maintenance.

E01.3 Slope Easements

Slope easements are required to contain all cut and fill slopes steeper than 2.5:1 that extend outside of the ROW, plus at least 5 feet outside the cut or fill catches.

E01.4 Sight Distance Maintenance Easements

Sight distance maintenance easements are required where intersection sight triangles extend outside of the ROW.

E01.5 Snow Storage Easements

Snow storage easements are required where the ROW is not sufficient to accommodate anticipated snow removal needs. Snow storage easements shall be located where the storage of snow would not impede sight distance.

E01.6 Utility Easements

Unless lots are otherwise served by alternate utility easements or agreements, at least one 15-foot utility easement adjacent to the ROW is required to allow for utility installation and maintenance. Additional utility easements may be required as deemed reasonably necessary by utility companies to serve the subdivision or protect existing facilities. The applicant is responsible for satisfying any conflicts that may occur in the request for easements from any utility company during the platting process.

Platted utility easements are to be clear of wells, septic systems, structures, or encroachments, as defined by MSB or other applicable code; unless the applicant has obtained an encroachment permit from the MSB and a "Non-Objection to Easement Encroachment" from each utility.

Utility easements are to be fully useable for utility installation where installation equipment can safely work. Whenever possible, utility easements should not be placed in swamps, steep slopes, or other unusable areas.

Section F. Development Implementation

F01 General

This section describes the procedure that is to be followed before constructing any improvements required for recording a subdivision plat. The applicant's engineer shall be the primary point of contact throughout this process.

It is the applicant's responsibility to determine, acquire, and follow permits required by other agencies. Approval from MSB does not supersede other agencies' permit requirements.

F01.1 Preliminary Plat Submittal

The preliminary plat submittal is to be accompanied by:

(a) ADT calculations per A15;
(b) Preliminary drainage plan per D02.1;
(c) Road plan and profile for sections of road where proposed grades exceed 6 percent where cuts and fills exceed 5 feet in height measured from the centerline, or where slope easements will be required, and cross sections at the maximum cut and fill sections. Road plan and profile shall include the vertical curves or grade breaks on either side of the subject sections;
(d) Road plan, profile, and cross-sections if required by B03.3; and
(e) Intersection sight distance evaluation, if requested, according to A09.1.

F01.2 Construction Plans

Submit construction plans to DPW at least seven calendar days before the preconstruction conference. All plan drawing submittals shall be at a scale of 1 inch = 50 feet or more detailed, plottable on 11" by 17" paper. Construction plans shall include the following:

(a) Drainage Report, according to D02.2;
(b) Plan & Profile of proposed roads (if required by F01.1);
    (1) Existing topography with horizontal and vertical accuracy meeting US National Map Accuracy standards, two-foot contour intervals within the proposed road corridors.
(c) Asbuilt survey of visible improvements and above ground utilities within and adjacent to the subdivision;
(d) Copy of agency accepted permit applications required for the improvements prior to construction, including but not limited to ADOT&PF Approach Road Permit, DNR Section Line Easement authorization, MSB Flood Hazard Development permit, and USACE wetland fill permit; and
(e) Plans for any proposed improvements within the ROW that are outside of the scope of this manual (e.g. retaining walls or guard rail) or do not conform to the standards set forth herein, conforming to ADOT&PF design criteria and standards.

F01.3 Preconstruction Conference

The preconstruction conference is for the purpose of reviewing and approving the Subdivision Construction Plan for the required improvements. The engineer may request scheduling of a preconstruction conference with DPW after the preliminary plat has been approved by the Platting Board, the Notification of Action (NOA) has been received, and the construction plans have been submitted. Scheduling of preconstruction conference requests may be delayed during the month of October. The applicant, or designated representative, and the engineer must attend the preconstruction conference. In addition to the construction plans, the following items will be provided at or prior to the preconstruction conference:

(a) Cost estimate of required improvements for the determination of the inspection fee according to the most recently adopted Schedule of Rates and Fees;
(b) Proof of compliance with the Alaska Pollutant Discharge Elimination System Program;
  (1) Acceptable proof includes a Notice of Intent (NOI), a Low Erosivity Waiver (LEW), or a determination by a qualified person that neither is needed.
(c) Rough plan and time line for construction;
(d) Copy of any issued permits required for the improvements prior to construction;
(e) Off-site material source and quantities; and
(f) On-site clearing, grubbing, and topsoil disposal plan, location map.

The Subdivision Construction Plan must be signed by the applicant, or designated representative, and the engineer. Upon acceptance of the Subdivision Construction Plan by DPW and payment of the inspection fee, the Platting Division will issue a Notice to Proceed (NTP). See Appendix B for an example of the Subdivision Construction Plan.

Some construction plans or permit approvals may take longer to develop or obtain, such as fish passage culvert plans and associated permits. Those finalized plans and issued permits may be submitted later but must be received and reviewed by DPW before construction begins within the respective areas.

F01.4 Interim Inspections

The applicant's engineer shall supervise all phases of construction. Notify DPW of changes to the Subdivision Construction Plan, such as adding or deleting a cross culvert, changes in culvert size, adding or deleting a drainage facility, grade changes of more than 1 percent or that would result in grades of over 6 percent or cuts or fills of over 5 feet in height measured from the centerline, or changes to foreslopes or backslopes. The changes should be approved by DPW prior to completion of construction. Periodic interim inspections may be conducted by DPW. Interim inspections may be requested by the engineer.

F01.5 Pre-Final Inspection

When the engineer has determined that construction of the improvements will be substantially complete according to the Subdivision Construction Plan, the engineer will request a Pre-Final Inspection. The Pre-Final Inspection request must be received by September 30th and shall include a

description of work yet to be completed. The Pre-Final Inspection will be scheduled to occur within 14 calendar days of the request and shall be attended by the engineer and DPW. A punch list will be developed, if any work items remain, at the Pre-Final Inspection.

F01.6 Final Inspection

When construction of the improvements and punch list items are complete according to the Subdivision Construction Plan, the engineer will request a Final Inspection of the improvements. The Final Inspection request must be received by October 15th. Final Inspections will cease October 31st, or when winter conditions prohibit inspection, whichever comes first. The Final Inspection will be scheduled to occur within 14 calendar days of the request and shall be attended by the engineer and DPW.

F01.7 Final Report

Upon DPW approval of the Final Inspection, the engineer shall submit a written Final Report to the Platting Division. The Final Report shall include:

(a) Stamped and signed narrative describing at a minimum:
  (1) road construction process and equipment used,
  (2) material source and disposal areas,
  (3) road embankment and subbase used,
  (4) road topping or pavement used,
  (5) compactive effort,
  (6) road dimensions and shaping (length, roadway width, material thicknesses, pavement width, crown, cul-de-sac or t-turnaround dimensions and slope, foreslope, backslope, maximum centerline grade, etc.) for each road constructed,
  (7) drainage, ditch depth, location of drainage easements, and
  (8) road standard certification (Pioneer Road, Residential Street, etc.) for each road constructed;
(b) Stamped and signed final drainage plan, (minimum 11"x17");
(c) As-built drawing showing the horizontal locations of borrow extraction along the road corridor;
(d) Compaction test reports;
(e) Gradation tests, if required; and
(f) Photos of each stage of construction.

DPW will review the report and provide comments, if necessary, within 14 calendar days.

F01.8 Construction Acceptance

Upon approval of the Final Report, DPW will issue a Certificate of Construction Acceptance.

F01.9 Warranty

All improvements are to be guaranteed until October 31st of the calendar year following issuance of the Certificate of Construction Acceptance. Roads within a Road Service Area may be accepted for

maintenance at the end of the warranty. Pioneer Roads are not eligible for maintenance. Maintenance of Mountain Access Roads is at the discretion of DPW.

During the warranty period, the applicant is responsible for any road maintenance including, but not limited to: snow removal, maintaining a smooth road surface and crown, maintaining stabilized foreslopes and backslopes, and maintaining positive drainage. If any deficiencies arise during the warranty, DPW will issue a punch list to the applicant by September 1st to allow time for completion of repairs. The applicant must notify DPW of completion of repairs by October 15th for the roads to be eligible for maintenance on November 1st.

The warranty period for improvements following completion of a subdivision agreement may be lessened to one calendar year. The applicant shall request a punch list from DPW no more than one month before the end of the one-year warranty.

If the subdivision plat has not recorded within 6 months of the date of the Certificate of Construction Acceptance or if warranty repairs are not completed by October 15th, the warranty will be extended an additional year and the warranty process will be repeated.

Maintenance may be denied and the Certificate of Construction Acceptance revoked if deficiencies are not corrected to the satisfaction of DPW. A notice may be recorded indicating to the public that the MSB is not responsible for road upkeep and maintenance until such a time that the deficiencies are corrected.

Section G. Commercial and Industrial Subdivisions

G01 General

Commercial and Industrial subdivisions shall be designed using trip generation rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual, and to meet the standards of AASHTO, International Fire Code (IFC), and any other applicable standards or code.

Section H. Utilities

H01 General

These standards apply to the design and construction of utility facilities within the MSB. All utility installation within existing or proposed ROW or utility easements must comply with the provisions of MSB or other applicable code, or as otherwise approved by the permitting authority.

H02 Utility Location Guidelines

H02.1 Underground Utility Facilities:

(a) The location of utility facilities placed within the ROW shall be coordinated with the permitting authority.

(b) Backslopes or foreslopes which extend into a utility easement should not exceed 4:1. These limits are necessary for construction equipment for utility installation.

(c) Utility facilities paralleling the road shall not be located within 10 feet of the roadway, unless otherwise approved by the permitting authority.

(d) Underground road crossings shall be buried a minimum of 48 inches below finished grade. Backfill shall be compacted according to the requirements of Section C, or as otherwise approved by the permitting authority.

(e) Conduit road crossings, if used, shall be installed in accordance with each utility company's standards and applicable code.

(f) Standard burial depth of longitudinal utilities is 36 inches below grade. The applicant should delineate areas, such as where driveways and drainage easements are planned, where deeper burial may be needed.

H02.2 Above Ground Utility Facilities:

(a) Above ground pedestals, poles, and utility facilities shall not be located within 10 feet of the roadway, unless an alternate design meets clear zone requirements.

(b) Above ground pedestals, poles, and utility facilities shall not be located within intersection sight triangles.

(c) Unless otherwise authorized by the permitting authority, above ground pedestals, poles, and utility facilities shall not be located within the ROW nearer than 40 feet from the point of intersection of the extension of the property lines at any existing or proposed intersection on Residential Collector streets or higher classification.

(d) Above ground pedestals, poles, and utility facilities shall not be located within a common access easement or drainage easement, within 20 feet of a common access point, or within 10 feet of a roadway cross culvert.

(e) Permanent 5-foot high snow marker poles, grey with white retroreflective sheeting or yellow, shall be installed on all pedestals and vaults.

(f) All guy wires installed within the ROW or utility easements adjacent to, or near to a roadway shall have a minimum 8-foot long yellow delineator installed above the anchor.

(g) Pedestals located within the ROW shall be located within the outer 1 foot of the ROW.

H02.3 Separation of Utilities:

(a) Recommend 5-foot horizontal separation between power poles and buried utilities.

(b) Recommend minimum 1-foot physical separation between all underground utilities.

(c) Separation of storm, sewer, and water utilities shall meet the requirements of the Alaska Department of Environmental Conservation.

References

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Appendix A

MSB Special Provision to the ADOT&PF Standard Specifications for Highway Construction

SECTION 401

HOT MIX ASPHALT PAVEMENT

Special Provision

Replace Section 401 with the following:

401-1.01 DESCRIPTION. Construct one or more courses of plant-produced Hot Mix Asphalt (HMA) pavement on an approved surface, to the lines, grades, and depths described in the scope of work and shown on the maps at each location.

MATERIALS

401-2.01 ASPHALT BINDER. Conform to Subsection 702-2.01. If binder performance grade is not specified, use PG 52-28. Asphalt binder may be conditionally accepted at the source if a manufacturer's certification of compliance is provided, according to Subsection 106-1.05, and the applicable requirements of Section 702 are met.

401-2.02 LIQUID ANTI-STRIP ADDITIVE. Use anti-strip agents in the proportions determined by ATM 414 and included in the approved Job Mix Design (JMD). At least 70 percent of the aggregate must remain coated when tested according to ATM 414. A minimum of 0.30 percent by weight of asphalt binder is required.

401-2.03 JOINT ADHESIVE. Conform to Subsection 702-2.05.

401-2.04 JOINT SEALANT. Conform to Subsection 702-2.06.

401-2.05 WARM MIX ASPHALT. Conform to Subsection 702-2.07.

401-2.06 ASPHALT RELEASE AGENT. Conform to Subsection 702-2.08.

401-2.07 AGGREGATES. Conform to Subsection 703-2.04. Use a minimum of three stockpiles of crushed aggregate (coarse, intermediate, and fine). Place blend material, if any, in a fourth pile.

401-2.08 RECYCLED ASPHALT PAVEMENT. Recycled asphalt pavement (RAP) may be used in the production of HMA. The RAP may be from pavements removed under the Contract, or from an existing stockpile. Conform to Subsection 703-2.16

401-2.09 JOB MIX DESIGN. Provide target values for gradation that satisfy both the broad band gradation limits shown in Table 703-4 and the requirements of Table 401-1, for Type II, Class B HMA.

TABLE 401-1

HMA MARSHALL DESIGN REQUIREMENTS

DESIGN PARAMETER	CLASS "B"
HMA (including Asphalt Binder)	
Stability, Pounds	1200 Min
Flow, 0.01 Inch	8 – 16
Voids in Total Mix (VTM), %	3.0 – 5.0
Compaction, Number of Blows Each Side of Test Specimen	50
Asphalt Binder	
Voids Filled with Asphalt (VFA), %	65 – 78
Asphalt Content, Min %	5.0
Dust-Asphalt Ratio*	0.6 – 1.4
Voids in Mineral Aggregate (VMA), %, Min	12.0
Liquid Anti-Strip Additive**, %, Min	0.30
RAP, %, Max	25.0

*Dust-Asphalt ratio is the percent of material passing the No. 200 sieve divided by the percent of effective asphalt binder (calculated by weight).
**By Weight of Asphalt Binder

The Contractor shall provide a JMD following the requirements specified in this section. Submit the JMD to the Engineer at least two working days prior to the pre-paving meeting. Submit samples to the Engineer upon request for JMD verification testing.

All Contractor-furnished JMDs must be sealed by a Professional Engineer registered in the State of Alaska. The Professional Engineer shall certify that the JMD was performed according to the specified procedures, and meets all project specifications.

Changes in the source of asphalt binder, source of aggregates, aggregate quality, aggregate gradation, or blend ratio shall dictate that the Contractor submit a new JMD for approval.

CONSTRUCTION REQUIREMENTS

401-3.01 PRE-PAVING MEETING. Meet with the Engineer for a pre-paving meeting in the presence of project superintendent and paving supervisor at least five (5) working days before beginning paving operations. Submit a paving plan and pavement inspection plan at the meeting. When directed by the Engineer, make adjustments to the plan and resubmit.

Include the following elements in the paving plan and address these elements at the meeting:

a. Sequence of operations
b. List of equipment that will be used for production, transport, pick-up (if applicable), laydown, and compaction
c. Procedures to produce consistent HMA
d. Procedures to minimize material and thermal segregation

e. Procedures to minimize premature cooling
f. Procedures to achieve HMA density
g. Procedures for joint construction including corrective action for joints that do not meet surface tolerance requirements
h. Quality control testing methods, frequencies, and sample locations for gradation, asphalt binder content, and density, and
i. Any other information or procedures necessary to provide completed HMA construction that meets the contract requirements.

Include the following elements in the pavement inspection plan and address these elements at the meeting:

a. Process for daily inspection, and
b. Means and methods to remove and dispose of project materials.

401-3.02 CONTRACTOR QUALITY CONTROL. Perform quality control (QC) of HMA materials in accordance with Subsection 106-1.03. The Contractor shall employ a qualified person or company to perform process control testing.

401-3.03 WEATHER LIMITATIONS. Place HMA on a stable and non-yielding roadbed. Do not place HMA when the base material is wet or frozen, or when weather conditions prevent proper handling or finishing of the mix. Do not place HMA leveling course when the roadway surface temperature is colder than 40° F.

401-3.04 EQUIPMENT, GENERAL. Use equipment in good working order and free of HMA buildup. Make all equipment available for inspection and demonstration of operation a minimum of 24 hours before placement of HMA and test strip HMA.

401-3.05 ASPHALT MIXING PLANT. Meet AASHTO M 156. Use an HMA plant capable of producing at least 100 tons of HMA per hour noted on posted DEC air quality permit, designed to dry aggregates, maintain consistent and accurate temperature control, and accurately proportion asphalt binder and aggregates. Calibrate the HMA plant and furnish copies of the calibration data to the Engineer at least 24 hours before HMA production.

Provide a scalping screen at the asphalt plant to prevent oversize material or debris from being incorporated into the HMA.

Provide a tap on the asphalt binder supply line just before it enters the plant (after the 3-way valve) for sampling asphalt binder. Provide aggregate and asphalt binder sampling locations meeting OSHA safety requirements.

Belt conveyor scales may be used to proportion plant blends and mixtures if the scales meet the general requirements for weighing equipment and are calibrated according to the manufacturer's instructions.

401-3.06 HAULING EQUIPMENT. Haul HMA in trucks with tight, clean, smooth metal beds. Keep beds free of petroleum oils, solvents, or other materials that would adversely affect the mixture. Apply a thin coat of approved asphalt release agent to beds as necessary to prevent mixture adherence. Provide

trucks with covers attached and available for use. When directed by the Engineer, cover the HMA in the hauling vehicle(s).

Do not haul HMA on barges.

401-3.07 ASPHALT PAVERS. Use self-propelled asphalt pavers with heated vibratory screed assemblies to spread and finish HMA to the specified section widths and thicknesses without introducing thermal or material segregation.

Equip the paver with a receiving hopper having sufficient capacity for a uniform spreading operation and a distribution system to place the HMA uniformly in front of screed. Use a screed assembly that produces a finished surface of the required smoothness, thickness, and texture without tearing, shoving, or displacing the HMA. Heat and vibrate screed extensions. Place auger extensions within 20 inches of the screed extensions or per written manufacturer's recommendations.

Equip the paver with a means of preventing segregation of the coarse aggregate particles from the remainder of the HMA when carried from the paver hopper back to the augers.

The use of a "Layton Box" or equivalent towed paver is allowed on bike paths, sidewalks, and driveways.

401-3.08 ROLLERS. Use both steel-wheel (static or vibratory) and pneumatic-tire rollers. Use rollers designed to compact HMA and capable of reversing without shoving or tearing the mixture. Select rollers that will not crush the aggregate or displace the HMA. Equip vibratory rollers with separate vibration and propulsion controls.

Equip the rollers with an infrared thermometer that measures and displays the surface temperature to the operator. Infrared thermometer may be hand-held or fixed to the roller.

Utilize a pneumatic roller in the complement of rollers to compact the leveling course. Use fully skirted pneumatic-tire roller having a minimum operating weight of 3000 pounds per tire.

401-3.09 RESERVED.

401-3.10 PREPARATION OF EXISTING SURFACE. Prepare existing surfaces according to the Contract. Prior to placing HMA, clean existing surfaces of loose material and uniformly coat contact surfaces of curbing, gutters, manholes and other structures with tack coat material meeting Section 402. Treat cold joint surfaces according to 401-3.17. Allow tack coat to break before placement of HMA on these surfaces.

Cut existing pavement, as designated by the Engineer, in a neat line with a power driven saw to provide a clean, straight joint. A thin tack coat of asphalt binder shall be sprayed on all cold joints prior to placing any fresh HMA against the joint. Cutting and removing the asphalt and tack coat is subsidiary to 401(1) item.

Before applying tack coat to an existing paved surface, clean and patch the surface. Remove irregularities to provide a reasonably smooth and uniform surface. Remove and replace unstable areas with HMA. Clean the edges of existing pavements, which are to be adjacent to new pavement, to permit

the adhesion of asphalt materials. Clean loose material from cracks. Fill the cleaned cracks, wider than 1 inch, with HMA tamped in place. Wash, sweep, or wash and sweep the paved surface clean and free of loose materials.

Preparation of a milled surface:

1. Prelevel remaining ruts, pavement delaminations, and depressions having a depth greater than 1/2 inch with an approved HMA.
2. Notify the Engineer of pavement areas that appear thin or unstable. Where milling operation creates thin or unstable pavement areas, or where it breaks through existing pavement, remove thin and unstable pavement, and 2 inches of existing base material, compact and replace with an approved HMA.

401-3.11 PREPARATION OF ASPHALT. Provide a continuous supply of asphalt binder to the asphalt mixing plant at a uniform temperature, within the recommended mixing temperature range.

401-3.12 PREPARATION OF AGGREGATES. Dry the aggregate so the moisture content of the HMA, sampled at the point of acceptance for asphalt binder content, does not exceed 0.5 percent (by total weight of mix), as determined by ATM 407.

Heat the aggregate for the HMA to a temperature compatible with the mix requirements specified.

Adjust the burner on the dryer to avoid damage to the aggregate and to prevent the presence of unburned fuel on the aggregate. HMA containing soot or fuel is unacceptable per Subsection 105-1.11.

401-3.13 MIXING. Combine the aggregate, asphalt binder, and additives in the mixer in the amounts required by the JMD. Mix to obtain at least 98 percent coated particles when tested according to AASHTO T195.

For batch plants, put the dry aggregate in motion before addition of asphalt binder.

Mix the HMA within the temperature range determined by the JMD.

Upon the Engineer's request, provide daily burner charts showing start and stop times and temperatures.

401-3.14 TEMPORARY STORAGE OF HMA. Silo type storage bins may be used, provided the characteristics of the HMA remain unaltered.

Signs of visible segregation, heat loss, changes from the JMD, change in the characteristics of asphalt binder, lumpiness, and stiffness of the mixture, are causes for rejection.

Do not store HMA on barges.

401-3.15 PLACING AND SPREADING. Use asphalt pavers to distribute HMA, including leveling course and temporary HMA. Place the HMA upon the approved surface, spread, strike off, and adjust surface irregularities. The maximum compacted lift thickness allowed is 3 inches.

When multiple lifts are specified in the Contract, do not place the final lift until all lower lifts throughout that section, are placed and accepted.

Do not place HMA abutting curb and gutter until curb and gutter are installed, except as approved by the Engineer.

Do not pave against new Portland cement concrete curbing until it has cured for at least 72 hours.

When practicable, adjust elevation of metal fixtures before paving the final lift, so they will be between 1/4 and 1/2 inch below the top surface of the final lift. Metal fixtures include, but are not limited to manholes, valve boxes, monument cases, hand holes, and drains.

When the section of roadway being paved is open to traffic, pave adjacent traffic lanes to the same elevation within 24 hours. Place approved material against the outside pavement edge when the drop off exceeds 2 inches.

Use hand tools to spread, rake, and lute the HMA in areas where irregularities or unavoidable obstacles make mechanical spreading and finishing equipment impracticable.

Place HMA over bridge deck membranes according to Section 508 and the membrane manufacturer's recommendations.

Do not mix HMA produced from different plants for testing or paving.

401-3.16 COMPACTION. Thoroughly and uniformly, compact the HMA by rolling. In areas not accessible to large rollers, compact with mechanical tampers or trench rollers. Compact HMA immediately after it is placed and spread, and as soon as it can be compacted without undue displacement, cracking or shoving. Perform initial breakdown compaction while the HMA surface mixture temperature is greater than 235° F and finish compaction before the surface temperature reaches 150° F.

Prevent indentation in the mat, do not leave rollers or other equipment standing on HMA that has not sufficiently cooled.

The Lower Specification Limit for density is 92.0 percent of the Maximum Specific Gravity (MSG) as determined by ATM 409. The MSG from the approved JMD is used for the first lot of each type of HMA. The MSG for additional lots is determined from the first sublot of each lot.

401-3.17 JOINTS. Place and compact the HMA to provide a continuous bond, texture, and smoothness between adjacent sections of the HMA.

Minimize the number of joints. Do not construct longitudinal joints in the driving lanes unless approved by the Engineer in writing at the pre-paving meeting. Offset the longitudinal joints in one layer from the joint in the layer immediately below by at least 6 inches. Align the joints of the top layer at the centerline or lane lines. Where preformed marking tape striping is required, offset the longitudinal joint in the top layer not more than 6 inches from the edge of the stripe.

Form transverse joints by saw-cutting back on the previous run to expose the full depth of the course or by using a removable bulkhead. Skew transverse joints 15 to 25 degrees.

For all joints below the top lift, uniformly coat joint surfaces with tack coat material meeting Section 402.

Uniformly coat the joint face of all top lift joints with a joint adhesive. Follow joint adhesive manufacturer's recommendations for temperatures and application method. Remove joint adhesive applied to the top of pavement surface. If infrared joint heaters are used and passing joint densities are achieved in each of the first three joint densities taken, then joint adhesive is not required.

The Lower Specification Limit for top lift longitudinal joint density is 91.0 percent of the MSG of the panel completing the joint. MSG will be determined according to ATM 409. Top lift longitudinal joints will be evaluated for acceptance according to Subsection 401-4.03.

For top lift panels that have a longitudinal joint density less than 91.0 percent of the MSG, seal the surface of the longitudinal joints with joint sealant. Apply joint sealant according to the manufacturer's recommendations while the HMA is clean, free of moisture and prior to final traffic marking. Place the sealant at a maximum application rate of 0.15 gallons per square yard, and at least 12 inches wide centered on the longitudinal joint. After surface sealing, inlay by grinding pavement striping into the sealed HMA. Use grooving equipment that grinds a dry cut to groove the width, length, and thickness of the striping within the specified striping tolerances.

Correct improperly formed joints that result in surface irregularities according to a corrective action plan.

Complete all hot lapped joints while the mat temperature is over 230° F as measured by the Engineer, within 3 inches of the joint. Tack coat and joint adhesive are not required for hot lapped joints.

401-3.18 SURFACE REQUIREMENTS AND TOLERANCE. The finished surface of all HMA paving must match dimensions shown in the Contract for horizontal alignment and width, profile grade and elevation, crown slope, and pavement thickness. Water must drain across the pavement surface without ponding. The surface must have a uniform texture, without ridges, puddles, humps, depressions, and roller marks. The surface must not exhibit raveling, cracking, tearing, asphalt bleeding, or aggregate segregation. Leave no foreign material, uncoated aggregate, or oversize aggregate on the HMA surface.

The Engineer will test the finished surface after final rolling at selected locations using a 10-foot straightedge. The Engineer will identify pavement areas that deviate more than 3/16 inch from the straightedge, including joints, as defective work. Perform corrective work by removing and replacing, grinding, cold milling or infrared heating such areas as required. Do not surface patch. After the Contractor performs corrective work, the Engineer will retest the area. Submit correction methods to the Engineer for approval before correction work commences.

Perform corrective actions according to one of the following or by a method approved by the Engineer:

1. Diamond Grinding. If the required pavement thickness is not decreased by more than 1/4 inch, grind to the required surface tolerance and cross section. Remove and dispose of all waste

materials. Apply joint sealant and sand to exposed aggregates per the manufacturer's recommendations.

2. Overlaying. Mill or sawcut the existing pavement to provide a vertical transverse joint face to match the overlay to the existing pavement. Apply tack coat on the milled surface and joint adhesive to all vertical joints and overlay the full width of the underlying pavement surface. Use the same approved HMA for overlays. Place a minimum overlay thickness of 2.0 inches.
3. Mill and Fill. Mill the existing pavement to provide a vertical transverse joint face. Apply tack coat to the milled surface and joint adhesive to all vertical joints prior to inlaying new HMA to match the existing pavement. Use the same approved HMA. Place a minimum thickness of 2.0 inches.

401-3.19 REPAIRING DEFECTIVE AREAS. Remove HMA that is contaminated with foreign material, is segregated (determined visually or by testing), flushing, or bleeding asphalt. Remove and dispose defective HMA for the full thickness of the course. Cut the pavement so that edges are vertical and the sides are parallel to the direction of traffic. Coat edges with a tack coat according to Section 402. Place and compact fresh HMA so that compaction, grade, and smoothness requirements are met.

401-3.20 ROADWAY MAINTENANCE. Inspect daily according to pavement inspection plan. Remove and dispose of project materials incorrectly deposited on existing and new pavement surfaces inside and outside the project area including haul routes.

The Contractor is responsible for damage caused by not removing these materials and any damage to the roadway from the removal method(s).

Repair damage to the existing roadway that results from fugitive materials or their removal.

401-3.21 TEMPERATURE REQUIREMENTS. The Engineer may reject HMA that is mixed, hauled, spread and placed, or compacted at a temperature outside the temperature range determined by either the JMD, by a control test strip, or by the Specifications. Rejected HMA is deemed unacceptable according to Subsection 105-1.11. The Engineer will determine whether the unacceptable HMA shall either be corrected, or removed and replaced.

At the Engineer's discretion, the Contractor may be allowed to compact HMA that is already placed and spread but is outside the temperature range. If the compacted HMA fails the Engineer's tests for acceptance, it must be removed and replaced according to Subsection 105-1.11.

401-3.22 SHOULDERS. After the paving is complete, if the Engineer determines that the shoulder is too narrow, additional gravel, D-1 material, or both shall be brought in to widen the shoulder. The pavement shall be washed, swept, or both immediately following shoulder work. The haul, placement, and sweeping will be subsidiary to 301(1) item.

All pavement edges shall be backed with base course (D-1), surface course (E-1), or processed material graded flush with the pavement surface. This work shall be accomplished as directed by the Engineer after it is determined that the new HMA has cured sufficiently to avoid damaging the edge. Cul-de-sacs and other areas where a grader cannot reach shall be backed by hand raking. The pavement shall be washed, swept, or both immediately following this work. This work will be subsidiary to 401(1) item.

401-4.01 METHOD OF MEASUREMENT. Section 109 and the following:

1. Hot Mix Asphalt. HMA will be measured by the ton in accordance with Section 109, Measurement and Payment. HMA quantities on the bid form include a 10% contingency. Contractor will be required to monitor depth (yield) and waste to not exceed the 10% contingency. Contractor will not be compensated over the HMA amount listed on the bid form unless work is added by a field directive and issued by the Engineer. Asphalt binder, tack coat, and anti-stripping additive will not be measured separately for payment, but are included in the HMA pay item.

2. Leveling Course. By Lane-Station (12-foot width) or by weight. Asphalt binder, tack coat, and anti-stripping additive will not be measured separately for payment, but are included in the Leveling Course pay item.

401-4.02 ACCEPTANCE SAMPLING AND TESTING. HMA will be accepted for payment based on the Engineer's approval of the JMD, and placement and compaction of the HMA to the specified depth, finished surface requirements and tolerances. The Engineer reserves the right to perform any testing required in order to determine acceptance.

Sampling and testing include the following:

1. Asphalt Binder Content. HMA samples shall be taken randomly by the Contractor in the presence of the Engineer from behind the paver screed before initial compaction, or will be taken randomly by the Engineer from the windrow, according to ATM 402 or ATM 403, at the discretion of the Engineer. The location (behind the paver screed or windrow) will be determined at the pre-paving meeting. Random sampling locations will be determined by the Engineer.

   Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if requested. Asphalt binder content will be determined according to ATM 405 or ATM 406, at the discretion of the Engineer.

2. Aggregate Gradation. Aggregates tested for gradation acceptance will have the full tolerances from Table 401-2 applied.

   a. Drum Mix Plants. Samples will be taken from the combined aggregate cold feed conveyor via a diverter device, from the stopped conveyor belt or from the same location as samples for determination of asphalt binder content, at the discretion of the Engineer. Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if requested. The aggregate gradation for samples from the conveyer system will be determined according to ATM 304. For HMA samples, the gradation will be determined according to ATM 408 from the aggregate remaining after the ignition oven (ATM 406) has burned off the asphalt binder. Locate diverter devices for obtaining aggregate samples from drum mix plants on the conveyor system delivering combined aggregates into the drum. Divert aggregate from the full width of the conveyor system and maintain the diverter device to provide a representative sample of aggregate incorporated into the HMA.

b. Batch Plants. Samples will be taken from dry batched aggregates according to ATM 301 or from the same location as samples for determination of asphalt binder content, at the discretion of the Engineer. Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if requested. The aggregate gradation for dry batch samples will be determined according to ATM 304. For HMA samples, the gradation will be determined according to ATM 408 from the aggregate remaining after the ignition oven (ATM 406) has burned off the asphalt binder.

3. Density. The Engineer will determine and mark the location(s) where the Contractor takes each core sample.

   a. Mat Cores. The location(s) for taking core samples is determined using a set of random numbers (independent of asphalt binder and aggregate sampling set of random numbers) and the Engineer's judgment. Take no mat cores within 1 foot of a joint or edge. Core samples are not taken on bridge decks.

   b. Longitudinal Joint Cores. The Engineer will mark the location(s) to take the core sample, centered on the visible surface joint, and adjacent to the mat core sample taken in the panel completing the joint.

   Take core samples according to ATM 413 in the presence of the Engineer. Cut full depth core samples, centered on the marks and as noted above, from the finished HMA within 24 hours after final rolling. Neatly core drill one six-inch diameter sample at each marked location. Use a core extractor to remove the core - do not damage the core. The Engineer will immediately take possession of the samples. Backfill and compact voids left by coring with new HMA within 24 hours. The Engineer will determine density of samples according to ATM 410.

4. Retest. When test results have failed to meet specifications, retest of acceptance test results for asphalt binder content, gradation, and density may be requested provided the quality control requirements of Subsection 401-3.02 are met. Deliver this request in writing to the Engineer within 7 days of receipt of the final test of the lot. The Engineer will mark the sample location for the density retest within a 2-foot radius of the original core. The original test results are discarded and the retest result is used. Only one retest per sample is allowed. When gradation and asphalt binder content are determined from the same sample, a request for a retest of either gradation or asphalt binder content results in a retest of both.

5. Asphalt Binder Grade. The lot size for asphalt binder is 200 tons. If a project has more than one lot and the remaining asphalt binder quantity is less than 150 tons, it is added to the previous lot and that total quantity will be evaluated as one lot. If the remaining asphalt binder quantity is 150 tons or greater, it is sampled, tested and evaluated as a separate lot.

   If the bid quantity of asphalt binder is between 85 – 200 tons, the bid quantity is considered as one lot and sampled, tested, and evaluated according to this subsection. Quantities of asphalt binder less than 85 tons will be accepted based on manufacturer's certified test reports and certification of compliance.

   Sample asphalt binder at the plant from the supply line in the presence of the Engineer

according to ATM 401. The Engineer will take immediate possession of the samples. Take three samples from each lot, one for acceptance testing, one for Contractor requested retesting, and one held in reserve for referee testing if requested. Meet Subsection 702 requirements for asphalt binder quality.

6. Asphalt Binder Grade Retest. Retest of acceptance test results may be requested provided the quality control requirements of Subsection 401-3.02 are met. Deliver the request in writing to the Engineer within 7 days of receipt of notice of failing test. The original results are discarded and the restest result is used for acceptance. Only one retest per sample is allowed.

   If the contractor challenges the result of the retest, the referee sample held by the Engineer will be sent to a mutually agreed upon independent AASHTO accredited laboratory for testing. The original acceptance test result, the retest acceptance test result, and the referee sample test result will be evaluated according to ASTM D3244 to obtain an Assigned Test Value (ATV). The ATV will be used to determine if the asphalt binder conforms to the contract. The Contractor shall pay for the referee sample test if the ATV confirms the asphalt binder does not meet contract requirements.

MSB DPW O&M

Appendix B

Subdivision Construction Plan

Date _____

SUBDIVISION CONSTRUCTION PLAN

Subdivision Name _____

Platting Case File # _____

RSA # _____

Developer/Petitioner _____

Phone # _____ email _____

Engineer _____

Phone # _____ email _____

Surveyor _____

Phone # _____ email _____

Contractor _____

Phone # _____ email _____

Required Submittals

- ☐ Cost Estimate
- ☐ Drainage Plan
- ☐ SWPPP (if disturbing more than 1 acre)
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

THE FOLLOWING IS THE PLAN FOR THE REQUIRED IMPROVEMENTS:

1) The Developer's Professional Civil Engineer (PE) shall be the spokesperson for implementation and completion of this PLAN.
2) The PE shall submit the required data and reports in a timely manner. All submittals must be sent/delivered to the Borough's Platting Office.
3) The PE shall supervise all phases of the PLAN and be the point of contact for all contractor and subcontractor work on the PLAN.
4) Any proposed changes to this PLAN must be approved by the Borough's Public Works Department prior to the changes being made.
5) Upon acceptance of all improvements and approval of the Final Report by the Borough's Public Works Department, a Certificate of Construction Acceptance will be issued to the Developer and the warranty period will begin.

Where will driveway approaches be constructed? _____

Will winter construction be performed? _____

Is a subdivision agreement anticipated? _____

Will paving be performed? _____

Will a community water or sewer system be installed? _____

Permits to be acquired: _____

_____

_____

_____

Types of utilities to be installed: _____

Note: If utilities are not installed prior to road construction, the Developer shall coordinate with the utility to either install conduits at the proposed crossing locations or ensure through their Engineer that the road crossings are excavated and backfilled properly. It is strongly encouraged that the road surfacing material be placed AFTER the utilities have been installed.

Planned Work Schedule

Clearing and Grubbing _____
Installation of Utilities _____
Subbase Construction _____
Drainage Improvements _____
Import and Grading top 6" _____
Property Corners set by PLS _____

Additional Comments:

AGREEMENT:
It is hereby agreed that the above PLAN is acceptable and will be implemented for the required improvements. It is further agreed that no deviation will be made to the above PLAN without signed acceptance by the Professional Civil Engineer and the Borough Public Works Representative.

_____

Developer's Signature Date

_____

Professional Civil Engineer's Signature Date

_____

Surveyor's Signature Date

_____

Contractor's Signature Date

_____

Borough Public Works Representative's Signature Date

By: Eileen Probasco
Introduced: February 3, 2020
Public Hearing: March 2, 2020
Action:

MATANUSKA-SUSITNA BOROUGH
PLANNING COMMISSION RESOLUTION NO. PC 20-05

A RESOLUTION OF THE MATANUSKA-SUSITNA BOROUGH PLANNING COMMISSION SUPPORTING AN ORDINANCE AMENDING MSB 43.05.015(B)(3) TO ADOPT THE 2020 SUBDIVISION CONSTRUCTION MANUAL.

WHEREAS, the Assembly adopted Resolution 17-003 requesting an update of the 1991 subdivision construction manual; and

WHEREAS, the MSB planning department, capital projects department and public works department worked together and created a "first revision" public review draft document and distributed it for public review and comment; and

WHEREAS, as a result of the first revision draft, an informal working group was formed, consisting of subject matter experts including MSB staff, RSA and TAB representatives, utilities, engineers, surveyors, road builders and developers; and

WHEREAS, the working group met 26 times between July 2018 and January 2020 and created a second revision draft document, for further review and submittal to the appropriate boards; and

WHEREAS, the working group adopted their resolution 20-01 recommending approval of the 2020 Subdivision Construction Manual, an ordinance creating MSB 11.12 Driveway Standards, and that the

Assembly consider a variety of other actions concerning land use, subdivisions, transportation issues and road funding at a future date.

NOW, THEREFORE, BE IT RESOLVED, that the Matanuska-Susitna Borough Planning Commission hereby recommends adoption of an ordinance amending MSB 43.05.015(B)(3) to adopt the 2020 Subdivision Construction Manual.

BE IT FURTHER RESOLVED, that the commission supports the additional recommendations of the subdivision construction manual working group as outlined in their resolution.

ADOPTED by the Matanuska-Susitna Borough Planning Commission this ___ day of ___, 2020.

_____
COLLEEN VAGUE, Chair

ATTEST

_____
MARY BRODIGAN, Planning Clerk

(SEAL)

YES:

NO:

MATANUSKA-SUSITNA BOROUGH
SCM UPDATE WORKING GROUP
RESOLUTION 20-01

A RESOLUTION OF THE MSB SUBDIVISION CONSTRUCTION MANUAL UPDATE WORKING GROUP RECOMMENDING ADOPTION OF THE 2020 SUBDIVISION CONSTRUCTION MANUAL AND ADDITIONAL RECOMMENDATIONS.

WHEREAS, the Assembly adopted Resolution 17-003 requesting an update of the 1991 subdivision construction manual; and

WHEREAS, the MSB planning department, capital projects department and public works department worked together and created a "first revision" public review draft document and distributed it for public review and comment; and

WHEREAS, as a result of the first revision draft, an informal working group was formed, consisting of MSB staff and TAB representatives, utilities, engineers, surveyors, road builders and developers; and

WHEREAS, the working group met 26 times between July 2018 and January 2020 and created a second revision draft document, for further public review and submittal to the Local Road Service Area Advisory Board, Transportation Advisory Board, Platting Board, and Planning Commission; and

WHEREAS, the working group is committed to ensuring that quality residential development and road construction occurs in the borough; and

WHEREAS, the working group strove to create a document that would:

1. Keep the cost of housing affordable in the valley,
2. Ensure that future roads are designed and constructed in a way that will not inhibit efficient maintenance;
3. Ensure that connectivity of subdivision roads is considered during subdivision design;
4. Reduce the cost burden of road maintenance and upgrades .

NOW, THEREFORE, BE IT RESOLVED, that the MSB SCM working group recommends assembly adoption of the 2020 Subdivision Construction Manual.

BE IT FURTHER RESOLVED that the working group recommends adoption of an ordinance amending MSB Title 11 Roads, Streets, Sidewalks and Trails, to add a section that specifically addresses driveways.

BE IT FURTHER RESOLVED that the working group recommends further actions that the assembly should take, including but not limited to:

1. Reinstitute the mandatory land use permit.
2. Fund an update to the current Official Streets and Highways Map.
3. Create a more detailed Design Criteria Manual that would include regulations for current and future borough roads as well as bridges, etc.
4. Continue to review the subdivision code and subdivision construction manual to identify areas for improvement.

5. Review options for improving the structure for funding of road construction and maintenance including but not limited to:
   a. Implement some type of an impact fee or transaction fee that could be designated for road maintenance/ improvements, to supplement the current RSA tax structure.
   b. Review the current RSA tax structure for more funding flexibility (i.e. fewer RSA's covering the same area).
   c. Pursue adoption of road powers by putting the question on the ballot.

BE IT FURTHER RESOLVED that if substantial changes are proposed to the document following its distribution for review, the SCM working team reserves the opportunity to review the changes prior to final assembly approval

ADOPTED by the MSB SCM working group this 14th day of January, 2020.

Gary LoRusso, PLS, Keystone Surveying

Pio Cottini, PLS, Cottini Land Surveying

Jess Hall, Hall Quality Homes

Dan Elliott

Dan Elliott, Local RSA Advisory Board and TAB Member

Josh Cross, PE, PTOE, Kinney Engineering LLC, and TAB Member

Curt Holler, PE, Holler Engineering

Signature Pending

Dave Miller, Summit Development

Robert Yundt, Robert Yundt Homes, and Mat-Su Homebuilders Past Chair

Bill Klebesadel

Bill Klebesadel, PE, Pioneer Engineering and previously City of Wasilla

Matt Garner, Borough Right-Of-Way Inspector

Jamie Taylor

Jamie Taylor, PE, Borough Civil Engineer

Fredric Wagner, PLS, Platting Officer

Eileen Probasco, Planning Director

Adopted: 01/10/17

MATANUSKA-SUSITNA BOROUGH
RESOLUTION SERIAL NO. 17-003

A RESOLUTION OF THE MATANUSKA-SUSITNA BOROUGH ASSEMBLY SUPPORTING THE RE-WRITE OF THE BOROUGH'S 1991 SUBDIVISION CONSTRUCTION MANUAL.

WHEREAS, the Matanuska-Susitna Borough was formed in 1964 and is charged by the state of Alaska to perform land use and planning, which includes subdivision of lands; and

WHEREAS, in 1988 the Subdivision Construction Manual was adopted as the document guiding road construction, drainage, and utilities during construction of residential subdivisions; and

WHEREAS, in 1991 the manual was amended to modify some of the original construction standards, and was amended again in 2007 to incorporate standards for culvert construction on anadromous streams; and

WHEREAS, the 1991 version with culvert amendments is still the document being used; and

WHEREAS, since the manual's adoption, the Borough's transportation system has been developed, one subdivision at a time, with minimal coordination on a regional level; and

WHEREAS, several unsuccessful attempts have been made to update the manual over the past 20 years; and

WHEREAS, the Borough population, along with the number of subdivisions, has grown significantly since the construction manual was created, and

WHEREAS, state and federal requirements and design guidelines for road construction have changed greatly since the manual was crafted; and

WHEREAS, advancements in engineering and technology over the past 25 years allow for a greater range of roadway and utility construction options that are not addressed in the 1991 manual; and

WHEREAS, the Borough's road system efficiency and safety have been challenged by lack of coordination and connection of subdivision roads and outdated road construction requirements, which can lead to increased taxpayer costs for separate road upgrade projects; and

WHEREAS, emergency response can be slowed substantially by roads that have not been constructed to appropriate standards; and

WHEREAS, future growth must be anticipated and accommodated by current subdivision construction; and

WHEREAS, the Borough is working on a revised road classification schedule, which should be reflected in the manual; and

WHEREAS, the cost of maintaining Borough roads is increasingly challenging, often due to poor design and construction oversight.

NOW, THEREFORE, BE IT RESOLVED, that the Assembly hereby supports revision of the 1991 subdivision construction manual.

BE IT FURTHER RESOLVED, that the following issues, to name a few, have been identified as requiring revision:

- consider the Borough's updated road classification information;
- incorporate most recent data from State and Federal requirements and codes;
- incorporate fire and life safety codes regarding roadways and subdivision access;
- clarify confusing/conflicting language;
- modify and clarify drainage requirements as needed;
- modify and clarify utility requirements as needed;
- update requirements for intersections, temporary turnarounds, and cul-de-sacs;
- revisit final road inspection and acceptance requirements;
- revisit stub roads and connectivity;
- revisit standards for pioneer and mountain access roads;
- modify and clarify traffic impact analysis requirements as needed;
- modify and clarify right-of-way width requirements as needed;
- discuss need for pedestrian facilities with road development to increase safety for residents and students;
- review driveway standards;
- review urban versus rural road standards; and
- update diagrams.

BE IT FURTHER RESOLVED, that the Assembly supports the manual being revised in-house, with an internal working team consisting of members of the Planning Department, Capital Projects

Department, Department of Public Works, and Department of Emergency Services.

ADOPTED by the Matanuska-Susitna Borough Assembly this 10 day of January, 2016.

VERN HALTER, Borough Mayor

ATTEST:

LONNIE R. McKECHNIE, CMC, Borough Clerk

(SEAL)

PASSED UNANIMOUSLY: Sykes, McKee, Colligan, Mayfield, Doty, and Kowalke

NEXT STEPS FOR SCM and Chapter 11.12 Driveways – Target dates

January 17, 2020	Post on Planning's web page and distribute final draft for information and review to: TAB, LRSAAB, Platting Board, PC and Assembly (alternate date – Monday January 20)
January 24, 2020	TAB Meeting – adopt resolution (opportunity for special meeting if more time is needed)
February 20, 2020	Local RSA Advisory Board – adopt resolution (opportunity for March 19 meeting if more time is needed)
February 6, 2020	Platting Board Worksession
February 20, 2020	Platting Board Resolution adoption (opportunity for March 5 meeting if more time is needed)
February 3, 2020	Planning Commission Introduction
March 2, 2020	Planning Commission Public Hearing and Resolution adoption (opportunity for March 16 if more time is needed)
March 17, 2020	Assembly Introduction
April 7, 2020	Assembly Public Hearing and Adoption

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PUBLIC HEARING

LEGISLATIVE

Resolution No. PC 20-07

MSB 11.12
Driveway Standards

(Page 445 - 482)

PUBLIC HEARING

MATANUSKA-SUSITNA BOROUGH
Planning and Land Use Department
350 East Dahlia Avenue • Palmer, AK 99645
Phone (907) 861-7833 • Fax (907) 861-7876
www.matsugov.us • planning@matsugov.us

MEMORANDUM

DATE: January 21, 2020

TO: Planning Commission

FROM: Eileen Probasco, Planning Director

RE: Planning Commission Resolution 20-07. Recommending Assembly approval of an Ordinance adopting MSB 11.12 Driveway Standards.

In April of 2016 the Mat-Su Borough Assembly signed Resolution 17-003 supporting the rewrite of the 1991 Subdivision Construction Manual (SCM). A group of subject matter experts was formed to review the document, consisting of local Land Surveyors, Civil Engineers, Developers, Homebuilders, Board Members and borough staff. Their review meetings began in June of 2018. They met 27 times over the next 18 months, with all but three meetings being full day meetings. The 2020 Subdivision Construction Manual is the results of that effort.

One of the major changes to the document was that the section on Driveways was removed from the Subdivision Construction Manual and a new MSB Chapter 11.12 Driveways was created.

The draft ordinance was reviewed and approved by the SCM working group, posted on the project web page and advertised on the Planning Department and MSB Facebook pages.

Staff recommends approval of Planning Commission Resolution 20-07.

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By: Eileen Probasco
Introduced: February 3, 2020
Public Hearing: March 2, 2020
Action:

MATANUSKA-SUSITNA BOROUGH
PLANNING COMMISSION RESOLUTION NO. PC 20-07

A RESOLUTION OF THE MATANUSKA-SUSITNA BOROUGH PLANNING COMMISSION RECOMMENDING ASSEMBLY APPROVAL AN ORDINANCE ADOPTING MSB 11.12 DRIVEWAYS STANDARDS IN ORDER TO ENSURE DRIVEWAYS WITHIN BOROUGH RIGHT-OF-WAYS MINIMIZE NEGATIVE IMPACT TO DRAINAGE, MAINTENANCE, AND SAFETY OF THE TRAVELING PUBLIC.

WHEREAS, in April of 2016 the Mat-Su Borough Assembly signed Resolution 17-003 supporting the rewrite of the 1991 Subdivision Construction Manual (SCM); and

WHEREAS, a group of subject matter experts was formed to review the document, consisting of local Land Surveyors, Civil Engineers, Developers, Homebuilders, Board Members and borough staff; and

WHEREAS, their review meetings began in June of 2018. They met 27 times over the next 18 months, and finalized the 2020 Subdivision Construction Manual; and

WHEREAS, one of the major changes to the document was that the section on Driveways was removed from the Subdivision Construction Manual and a new MSB Chapter 11.12 Driveways was created; and

WHEREAS, the draft ordinance was reviewed and approved by the SCM working group, posted on the project web page and advertised on the Planning Department and MSB Facebook pages.

NOW, THEREFORE, BE IT RESOLVED, that the Matanuska-Susitna Borough Planning Commission hereby approves Resolution 20-07, recommending adoption of an ordinance adopting MSB 11.12 driveways standards in order to ensure driveways within borough right-of-ways minimize negative impact to drainage, maintenance, and safety of the traveling public.

ADOPTED by the Matanuska-Susitna Borough Planning Commission this ___ day of ___, 2020.

_____
COLLEEN VAGUE, Chair

ATTEST

_____
MARY BRODIGAN, Planning Clerk

(SEAL)

YES:

NO:

DRAFT

CODE ORDINANCE

Sponsored by:
Introduced:
Public Hearing:
Action:

MATANUSKA-SUSITNA BOROUGH
ORDINANCE SERIAL NO. 20-___

AN ORDINANCE OF THE MATANUSKA-SUSITNA BOROUGH ASSEMBLY ADOPTING MSB 11.12 DRIVEWAYS STANDARDS IN ORDER TO ENSURE DRIVEWAYS WITHIN BOROUGH RIGHT-OF-WAYS MINIMIZE NEGATIVE IMPACT TO DRAINAGE, MAINTENANCE, AND SAFETY OF THE TRAVELING PUBLIC.

BE IT ENACTED:

Section 1. Classification. This ordinance is of a general and permanent nature and shall become a part of the Borough Code.

Section 2. Adoption of section. MSB 11.12 is hereby adopted to read as follows:

11.12.010 INTENT

11.12.020 DEFINITIONS

11.12.030 APPLICABILITY

11.12.040 APPLICATION PROCEDURES

11.12.050 GENERAL STANDARDS

11.12.060 LOW VOLUME DRIVEWAY STANDARDS

11.12.070 HIGH VOLUME DRIVEWAY STANDARDS

11.12.080 TRAFFIC IMPACT ANALYSIS

11.12.090 TRAFFIC IMPACT MITIGATION

11.12.100 WAIVER OF STANDARDS

11.12.110 NONCONFORMING DRIVEWAYS

11.12.120 VIOLATIONS, ENFORCEMENTS, AND PENALTIES

11.12.010 INTENT

(A) This chapter is intended to establish a permit process and standards for driveways within Borough right-of-ways. Minimum standards are provided for proper placement and design of driveways in order to ensure drainage, maintenance, movement and safety of the traveling public.

(B) All driveways are considered encroachments under MSB 11.10 and are subject to the requirements therein.

(C) Issuance of a permit under this chapter grants the permittee no right, title, or interest within Borough right-of-ways. The Borough reserves the right to deny, modify, or revoke any permit issued under this chapter.

11.12.020 DEFINITIONS

(A) For the purpose of this chapter, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

"Combination truck" means a vehicle falling under classes 8 through 13 of the Federal Highway Administration vehicle classification definitions.

"Corner clearance" means the distance between an intersection and driveway, not including tapers or curve returns.

"Curb cut" means a ramp built into the curb of a sidewalk or pathway to allow the driveway to ramp down from the curb height to the pavement surface.

"Curve return" means the curve located at the end of a driveway connecting the driveway edge to the roadway edge.

"Design year" means the year that is 10 years after the opening date of a development.

"Driveway" means a type of encroachment, as defined by MSB 11.10.010(A), that provides access to Borough right-of-ways or easements.

"Driveway width" means the distance across the driveway at the furthest point of curvature from the roadway, typically within the right-of-way, measured at right angles to the centerline of the driveway surface.

"Edge clearance" means the distance measured from the property corner to near edge of the driveway surface at the property boundary or outside edge of the right-of-way line, not including tapers or curve returns.

"Functional area" means the physical area of an

intersection and the area extending both upstream and downstream which includes perception-reaction distance, maneuver distance, and storage length.

"Lot" means the least fractional part of subdivided lands having limited fixed boundaries and having an assigned number, or other name through which it may be identified.

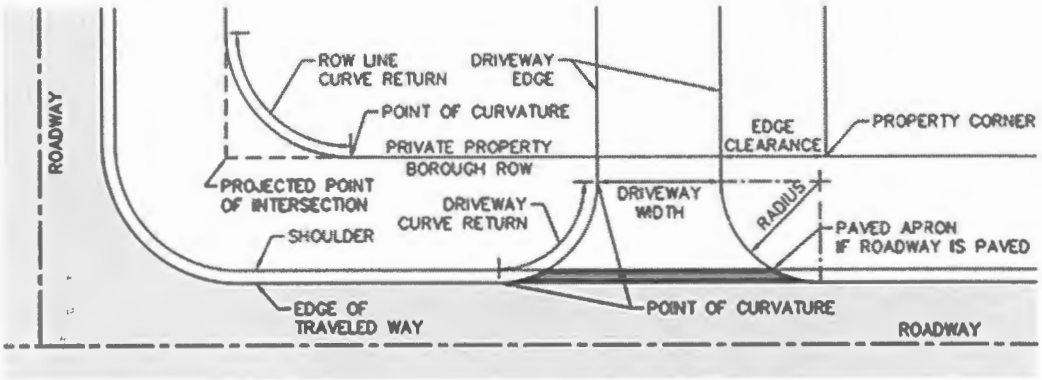
"Parcel" means a lot or contiguous group of lots in single ownership or under single control, usually considered a unit for purposes of development.

"Passenger vehicle" means a vehicle falling under classes 1 through 3 of the Federal Highway Administration vehicle classification definitions.

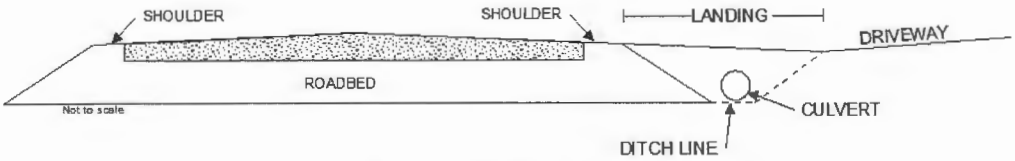
"Single-unit truck" means a vehicle falling under classes 4 through 7 of the Federal Highway Administration vehicle classification definitions.

(B) The following diagrams are a visual representation of terms used within this chapter:

(1) Plan view of a driveway:



(2) Profile view of a driveway:



(C) In instances where a word is not included in this section nor in the applicable section, reference will be made first to MSB 17.125, followed by the most recent publication of "The Illustrated Book of Development Definitions" then to "The Zoning Dictionary" by Lehman and Associates, then to "Webster's New Universal, Unabridged Dictionary."

11.12.030 APPLICABILITY

(A) The following require a driveway permit from the Borough:

(1) Existing, unpermitted driveways;

(2) Construction of new driveways;

(3) Physical modifications to existing

driveways; or

(4) Change in land use requiring a different standard from that which the driveway permit was issued.

(B) A permit is not required for driveways constructed or reconstructed by Borough or state projects.

(1) Any physical modification thereafter requires a permit under this chapter.

11.12.040 APPLICATION PROCEDURES

(A) An application for a driveway permit may be initiated by a property owner or the owners' authorized agent. An application for a driveway permit shall be filed on a form provided by the Borough.

(1) The application for a driveway permit shall be accompanied by an appropriate filing fee as established by the assembly, payable to the Borough.

(2) The application shall include the following:

(a) street being accessed;

(b) driveway dimensions;

(c) pathway or sidewalk dimensions;

(d) culvert type, diameter, and length;

(e) expected completion date;

(f) driveway surface type;

(g) estimated peak hour and average daily traffic generated by the use;

(i) Residential developments can assume a trip generation rate of 1 peak hour trip per dwelling unit,

(ii) Other developments shall use the most recent edition of the Institute of Transportation Engineers Trip Generation Manual, and

(iii) At the discretion of the Borough, local trip generation rates determined by a qualified professional may be used as a substitute for the Institute of Transportation Engineers Trip Generation Manual;

(h) driveway sight triangles for driveways that access a parcel containing uses which generate more than 10 vehicles per hour (VPH) during the peak hour;

(i) driveway plan and profile prepared and stamped by a professional civil engineer or other qualified professional registered in the state of Alaska under AS 08.48, if required by this chapter;

(i) The driveway plan and profile

shall contain sufficient information to demonstrate that all the applicable standards of this chapter are met; and

(i) traffic impact analysis prepared and stamped by a professional civil engineer registered in the state of Alaska, if required by MSB 11.12.080.

(B) Following review of the application, the Borough will grant approval to construct or deny the proposed driveway based on whether or not it meets the standards of this chapter.

(C) Upon approval to construct, the applicant may construct the driveway as approved, and shall notify the Borough upon completion.

(D) The Borough will issue final approval of the driveway if the Borough finds that it meets the requirements of this chapter.

11.12.050 GENERAL STANDARDS

(A) The standards within this subsection apply to all driveways regardless of land use.

(1) Driveways shall not cause adverse drainage onto the roadway.

(2) The landowner shall be responsible for maintenance of the driveway, including but not limited

to culvert cleaning and thawing to ensure proper drainage.

(a) Snow removed from the driveway shall not:

(i) be placed in, or pushed across the roadway;

(ii) obstruct traffic signage or address numbers;

(iii) obstruct sight triangles; or

(iv) be placed in the right-of-way in a manner that interferes with drainage or normal maintenance activities.

(3) The driveway landing shall have a negative 2 percent slope away from the road to the extent feasible.

(a) Where a negative slope away from the roadway is not feasible due to topographical constraints, the driveway shall be constructed in a manner that prevents water from flowing onto the roadway.

(4) Length of the driveway landing, as measured from the outside edge of the road shoulder, shall be a minimum of 10 feet.

(a) For uses that regularly utilize larger vehicles, up to 30 feet may be required to allow larger vehicles to come to a complete stop before entering the roadway.

(5) The first 10 feet of the driveway landing shall be installed perpendicular to the roadway to the extent feasible. A driveway may intersect the roadway at an angle up to 60 degrees, upon approval by the Borough, if required by physical constraints.

(6) Any fill or cut slopes created within the right-of-way that are greater than 2:1 are not allowed unless designed by a professional civil engineer or other qualified professional registered in the state of Alaska under AS 08.48.

(7) A minimum 16-gauge thickness, 12-inch diameter, corrugated metal pipe culvert shall be installed with at least one foot of culvert visible at the toe of the foreslopes on each side of the driveway or with sloped end sections flush with the foreslopes.

(a) If it is determined that a 12-inch culvert is likely insufficient to accommodate drainage, the Borough may require a larger culvert and may also require an engineering analysis to determine the size of

the culvert needed to adequately handle flow from events that have a 10% chance of occurring in any given year.

(b) If the driveway crosses a stream reach which harbors fish, as determined by the Alaska Department of Fish and Game, then the culvert shall be installed in accordance with the fish passage culvert section of the MSB subdivision construction manual.

(c) Culverts shall be sloped to match the ditch gradient at a minimum of 0.5 percent in the direction of flow.

(d) Culverts shall be placed in the ditch line or set back up to 4 feet from the ditch line where practical.

(e) The Borough may waive the requirement for a culvert if the Borough determines one is not needed to accommodate drainage.

(8) Driveways shall be installed and maintained in accordance with the following table unless there are topographical or other physical constraints outside of the applicant's control:

Standard Driveway Sight Distance (feet)									
	Largest type of vehicle frequently accessing roadway	Speed limit (mph)							
		20	25	30	35	40	45	50	55
Left Sight triangle	Passenger vehicle	225	280	335	390	445	500	555	610
	Single-unit truck	280	350	420	490	560	630	700	770
	Combination truck	340	425	510	595	680	765	850	930
Right Sight Triangle	Passenger vehicle	195	240	290	335	385	430	480	530
	Single-unit truck	250	315	375	440	500	565	625	690
	Combination truck	310	390	465	545	620	695	775	850

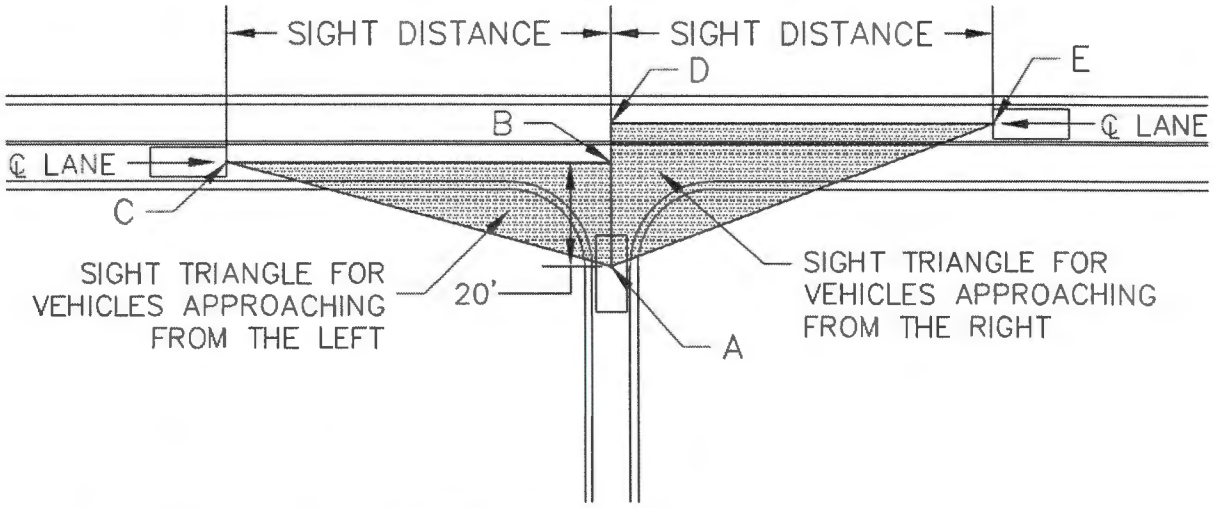
(a) The standard sight distances listed above are for vehicles turning onto a two-lane undivided street. For other conditions, the minimum sight distance should be calculated using the most current version of AASHTO's: A Policy on Geometric Design of Highways and Streets.

(b) Minimum sight distance in the following table shall only be used when standard sight distance cannot be obtained because of topographical or other physical constraints outside of the applicant's control:

Minimum Sight Distance (feet)								
Average grade of sight distance triangle	Speed limit (mph)							
	20	25	30	35	40	45	50	55
-10%	130	180	235	295	365	440	525	610
-9%	130	175	230	290	355	430	510	595
-8%	125	170	225	285	350	420	495	580
-7%	125	170	220	280	340	410	485	570
-6%	120	165	215	275	335	400	475	555
-5%	120	165	215	270	330	395	465	545
-4%	120	160	210	265	325	385	455	530
-3%	120	160	205	260	315	380	450	520
-2%	115	160	205	255	310	375	440	510
-1%	115	155	200	250	305	370	435	505
0%	115	155	200	250	305	360	425	495
1%	115	155	195	245	300	355	420	485
2%	110	150	195	240	295	350	415	480
3%	110	150	190	240	290	345	405	470
4%	110	150	190	235	285	340	400	465
5%	110	145	190	235	285	340	395	460
6%	110	145	185	230	280	335	390	450
7%	110	145	185	230	275	330	385	445
8%	105	145	185	225	275	325	380	440
9%	105	140	180	225	270	320	375	435
10%	105	140	180	220	270	320	370	430

(c) If minimum sight distance in the previous table cannot be obtained because of topographical or other physical constraints outside of the applicant's control, alternate mitigation such as hidden driveway or advisory speed signs shall be installed in accordance with the latest version of the Alaska Traffic Manual.

(d) The entire area of the sight triangles shown in the following figure shall be designed to provide an unobstructed view from point A at 3.5 feet above the roadway to all points 3.5 feet above the roadway along the lane centerlines from point B to point C and point D to point E:



(9) The cost of redesign and construction of public infrastructure and utilities impacted by the driveway installation shall be the responsibility of the permittee.

(10) The minimum corner clearance for a driveway to a corner lot shall be 60 feet from the projected point of intersection or property corner, as measured from the driveway edge.

(a) In no case shall a driveway be located within the curve return of a constructed roadway

or right-of-way.

(11) Edge clearance shall be equal to or greater than the radius of the driveway curve return.

(a) Edge clearance is measured from the property corner to near edge of the driveway surface at the right-of-way line.

(12) For the purpose of this chapter, classification of roadways shall be determined by the Public Works Director and shall be based on current constructed roadway standard, current functional classification of the road, and the intended functional classification in accordance with the Long Range Transportation Plan and the Official Streets and Highways Plan.

(13) Curb cuts shall be installed in accordance with the State of Alaska Standard Plans.

(14) All pedestrian walkway crossings shall conform to Americans with Disabilities Act standards for Transportation (2006 US DOT) and the Alaska Traffic Manual.

11.12.060 LOW VOLUME DRIVEWAY STANDARDS

(A) This section applies to driveways that access a parcel containing uses which generate less than or

equal to 10 vehicles during the peak hour.

(1) Driveway Dimensions.

(a) Driveway width shall be a minimum of 10 feet and a maximum of 25 feet.

(b) The radius of the driveway curve return shall be a minimum of 6 feet and a maximum of 20 feet.

(c) Driveways with dimensions that fall outside the standards of this paragraph shall be designed by a professional civil engineer or other qualified professional registered in the state of Alaska under AS 08.48 and shall be designed to ensure:

(i) the driveway is the minimum width necessary to accommodate the proposed use;

(ii) snow storage equal to or greater than the driveway width at the edge of the roadway is available within the right-of-way in the direction of anticipated snow removal fronting the property to the extent feasible.

(iii) vehicles do not encroach into the opposing lane on collector or higher classification roads; and

(iv) the driveway meets all other

standards within this chapter.

(2) Driveways to corner lots or lots that border two or more roadways shall gain access from the street of lowest classification when streets of multiple classifications bound a lot.

(3) Driveways fronting on paved roadway surfaces shall have a minimum 2-foot paved apron the entire width of the portion of the driveway that intersects the roadway.

(4) Minimum distance between driveways on the same side of the street shall be in accordance with the following table:

Roadway Classification	**Distance**
Arterial roadways	75 feet
Collector roadways	50 feet
Local roadways	35 feet

(a) driveway spacing shall be measured parallel to the centerline of the roadway between the intersection of the inside edges of two adjacent driveways and the right-of-way line.

(i) driveway spacing on cul-de-sacs or other turnarounds shall be measured along the edge of

the right-of-way.

(b) adjacent driveway curve returns shall not overlap.

11.12.070 HIGH VOLUME DRIVEWAY STANDARDS

(A) This subsection applies to driveways that access a parcel containing uses which generate more than 10 vehicles per hour (VPH) during the peak hour.

(1) Driveways under this subsection shall be designed by a professional civil engineer or other qualified professional registered in the state of Alaska under AS 08.48.

(2) Minimum 18-inch diameter culverts with sloped end sections are recommended.

(3) Driveway dimensions.

(a) Driveway width shall be a minimum of 24 feet wide.

(b) The radius of the driveway curve return shall be a minimum of 20 feet.

(i) Driveway curve returns may be less than 20 feet in certain circumstances such as angled or one-way driveways. However, the edge clearance shall be a minimum of 20 feet.

(4) Driveways to corner lots or lots that

border two or more roadways may be required to gain access from the street of lower classification when streets of multiple classifications bound a lot.

(5) Driveways fronting on paved roadway surfaces shall have a paved apron to the furthest point of curvature from the roadway.

(6) Signage and striping, if used, shall conform to the latest version of the Alaska Department of Transportation and Public Facilities (ADOT&PF) Alaska Traffic Manual and shall be maintained by the landowner.

(7) Separation from intersections and between high volume driveways shall be in accordance with the following table:

Minimum separation from intersections and between driveways (feet)										
Classification of road being accessed	Posted speed limit or 85th percentile speed of Road being accessed (mph)	Total trip generation of subject parcel (vph)								
		10-99			100-249			250+		
		Classification of cross street / trip generation of use of neighboring parcel			Classification of cross street / trip generation of use of neighboring parcel			Classification of cross street / trip generation of use of neighboring parcel		
		Local / 10-99 vph	Collector / 100-249 vph	Arterial 250+ vph	Local / 10-99 vph	Collector / 100-249 vph	Arterial / 250+ vph	Local / 10-99 vph	Collector / 100-249 vph	Arterial / 250+ vph
Local	15-30	35	70	150	70	150	150	150	150	300
Collector	25-30	70	70	150	70	150	300	150	300	600
	35-45	70	150	150	150	300	300	150	300	600
Arterial	35-45	150	150	300	150	300	600	300	600	1200
	50-55	300	300	600	300	600	600	600	600	1200

(a) Minimum separation from intersections and between driveways applies to the same side and opposite sides of the street.

(i) Driveways that are not able to meet separation distance from other existing driveways due to design or physical constraints may be located closer as recommended by the engineer and approved by the Borough.

(b) Separation from intersections and between high volume driveways is measured along the right-of-way line from the driveway edge to the nearest edge of traveled way or driveway edge.

(c) Driveway access within the functional area of an intersection should be avoided when possible.

(d) Driveways on opposite sides of the street shall:

(i) be aligned directly across from each other to the extent feasible with a lane offset no greater than six feet; or

(ii) meet the separation distances established by the table within MSB 11.12.070(A)(7).

(e) If the requirements of subparagraph d are not feasible, a lesser separation distance may be

considered if the opposing driveways do not have overlapping left turns.

(f) Separation distances do not apply to driveways on opposite sides of streets that have a non-traversable median.

(g) Lesser separation distances may be considered for one-way driveways, right in/right out driveways, or if other mitigating factors are provided.

(h) Developments which produce greater than 100 vehicles per hour may access the first 600 feet of a local road but may only be approved upon consideration of traffic on residential properties.

(B) This subsection applies to driveways that access a parcel containing uses which generate more than 50 vph during the peak hour.

(1) STOP signs are required.

(2) Painted STOP bars are required when accessing a paved roadway where there is a non-motorized facility.

(3) Pathways and sidewalks shall be relocated in front of STOP bars in accordance with ADOT&PF Central Region details.

(4) Turn lanes may be required if warranted by

State or National guidelines.

11.12.080 TRAFFIC IMPACT ANALYSIS

(A) Driveways that access a parcel containing uses that generate traffic in excess of 100 vehicle trips during any hour of the day require a traffic impact analysis which examines critical movement level of service (LOS) at the driveway and nearby roads and intersections.

(1) The Borough may require a traffic impact analysis for uses that generate less than 100 vehicle trips per hour upon determination that the traffic generated will detract from the safety of the roadway.

(a) in determining whether the access will detract from safety of the roadway the borough shall consider known issues such as:

(i) sight distance

(ii) accident history

(iii) bus stops

(iv) road width

(b) a determination that the access will detract from safety of the roadway shall be issued in writing by the borough.

(2) The traffic impact analysis and driveway

design shall be prepared by a professional civil engineer registered in the State of Alaska under AS 08.48.

(3) Level of service and operational analysis for a traffic impact analysis prepared under this section must be performed in accordance with the latest version of the Transportation Research Board's Highway Capacity Manual. The minimum acceptable LOS at intersections and on road segments both on the development's opening date and in the design year is:

(a) LOS C, if the LOS on the date of application is LOS C or better; or

(b) LOS D, if the LOS on the date of application is LOS D or poorer; however, if the LOS is poorer than LOS D, a lower minimum LOS is acceptable if the operation of the highway does not deteriorate more than 10 percent in terms of delay time or other appropriate measures of effectiveness from the LOS before the development's opening date.

(4) A traffic impact analysis prepared under this section must address:

(a) intersections on roadways where traffic on any approach is expected to increase, as a

result of the proposed development, by at least five percent of the approach's capacity;

(b) segments of roadways between intersections where total traffic is expected to increase, as a result of the proposed development, by at least five percent of the segments' capacity;

(c) roadways and intersections where the safety of the facilities will deteriorate as a result of the traffic generated by the development;

(d) each driveway that will allow egress from or ingress to a roadway for the proposed development;

(e) parking and circulation routes within the proposed development, to the extent necessary to ensure that traffic does not back up onto a roadway; and

(f) pedestrian and bicycle facilities that are part of the roadway to which a permit applicant seeks access.

(5) A traffic impact analysis prepared under this section must consider:

(a) projected traffic at the development's anticipated opening date, excluding the traffic generated by the development; and

(b) projected traffic at the development's anticipated opening date, including the traffic generated by the development.

(6) A traffic impact analysis prepared under this section for a development expected to generate 250 or more vehicle trips during the peak traffic hour of the adjacent roadway must, in addition to the projected traffic volumes before and after the completion of the proposed development, consider:

(a) the projected traffic in the design year for the proposed development, excluding traffic generated by the development; and

(b) the projected traffic for the design year for the proposed development including the traffic generated by the development.

11.12.090 TRAFFIC IMPACT MITIGATION

(A) A traffic impact mitigation plan shall be submitted in association with the traffic impact analysis required under MSB 11.12.080.

(B) The traffic impact mitigation plan shall identify improvements, to be made by the permittee, to a highway or intersection in order to maintain an acceptable LOS if a roadway or intersection has an:

(1) acceptable LOS, under MSB 11.12.080(A)(3), without traffic generated by the development; and

(2) unacceptable LOS, under MSB 11.12.080(A)(3), with traffic generated by the development:

(a) at the opening date of the development; or

(b) in the design year of the development, for a development expected to generate 250 or more vehicle trips during the peak hour of the adjacent roadway on the opening date of the development.

(C) A traffic impact mitigation plan shall be submitted if a roadway has an unacceptable LOS under MSB 11.12.080(A)(3) without traffic generated by the development, either at the opening date of the development or in the design year of the development.

(1) The permittee shall make improvements to the roadway so the operation of the roadway does not deteriorate more than 10 percent in terms of delay time or other appropriate measures of effectiveness with the addition of the traffic generated by the development at the opening date of the development or in the design year.

(D) A traffic impact mitigation plan prepared under this section must identify all of the following:

(1) Locations where road improvements are necessary to mitigate traffic impacts, including locations where the LOS is less than acceptable under MSB 11.12.080(A)(3):

(a) due to the development at either the opening date or the design year; or

(b) at either the opening date or the design year without the development and improvements are necessary to prevent the LOS from deteriorating further.

(2) Road improvement alternatives that will achieve an acceptable LOS or minimize degradation of service below an already unacceptable LOS:

(a) on the opening date of the development; and

(b) in the design year of the development, for a development expected to generate 250 or more vehicle trips during the peak hour of the adjacent roadway on the opening date of the development.

(3) Bicycle or pedestrian access improvements necessary to accommodate bicycle and pedestrian traffic as negotiated between the Borough and the applicant.

(4) Improvements needed for internal circulation and parking plans.

(E) The Borough will review and comment upon a traffic impact mitigation plan prepared under this section and submitted for a proposed development. The Borough will, in its discretion, request clarification or further analysis of the impacts that it considers necessary to adequately consider the risks presented to the traveling public by the proposed development. If alternative means are proposed by an applicant for mitigation of the traffic impacts of a proposed development, the Borough will select the alternative that provides the greatest public benefit, at the least private cost, and that meets the appropriate LOS on an impacted roadway. If the Borough accepts a means of mitigation, the mitigation must be completed by the permittee as part of a permit issued under this title.

(F) The traffic impact mitigation plan shall ensure:

(1) internal circulation and parking layout provides sufficient queuing distance within the development between the roadway and potential internal block points so that no traffic backs up onto the

roadway; and

(2) impacts to pedestrian and bicycle traffic are mitigated.

(G) The Borough will, in its discretion, relax the requirements for mitigation under this section, if it finds in writing that the:

(1) roadway and intersection only marginally achieve an acceptable LOS under MSB 11.12.080(A)(3) without the traffic generated by the development and would likely fall below an acceptable LOS within five years;

(2) traffic generated by the development results in an unacceptable LOS under MSB 11.12.080(A)(3); and

(3) cost of mitigating the impacts is disproportionate to the cost of the development.

11.12.100 WAIVER OF STANDARDS

(A) The Borough may waive specific standards of this chapter based on physical constraints associated with the property and adjacent roadway, or mitigating factors associated with a traffic impact mitigation plan.

11.12.110 NONCONFORMING DRIVEWAYS

(A) Driveways which were permitted by the Borough prior to the date of adoption of this ordinance, but which do not otherwise meet standards of this chapter, are allowed to remain in the location that they were permitted except for when a permit is required under MSB 11.12.030(A)(4).

(B) Existing driveways which were given approval to construct, but which were not given final approval by the Borough as of the date of adoption of this chapter, are allowed to remain and may be approved under the standards that were in place at the time approval to construct was given. In cases where the standards in place at the time approval to construct was given are in conflict with this chapter, the lesser standards apply.

11.12.120 VIOLATIONS, ENFORCEMENT, AND PENALTIES

(A) Except as otherwise specified in this chapter, violations of this chapter are infractions.

(B) Remedies, enforcement actions, and penalties shall be consistent with the terms and provisions of MSB 1.45.

(C) Failure to correct a violation of any permit condition is a violation of Borough code.

Section 3. Effective date. This ordinance shall take effect

January 1, 2021.

ADOPTED by the Matanuska-Susitna Borough Assembly this - day of -, 2020.

_____
VERN HALTER, Borough Mayor

ATTEST:

_____
LONNIE R. McKECHNIE, CMC, Borough Clerk

(SEAL)

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CORRESPONDENCE & INFORMATION

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CORRESPONDENCE & INFORMATION

MATANUSKA-SUSITNA BOROUGH
Planning and Land Use Department
350 East Dahlia Avenue • Palmer, AK 99645
Phone (907) 861-7833 • Fax (907) 861-7876
www.matsugov.us • planning@matsugov.us

MEMORANDUM

DATE: March 2, 2020

TO: Planning Commission

FROM: Eileen Probasco, Planning Director

SUBJECT: **Resolution 20-05**, A Resolution supporting an ordinance amending MSB 43.05.015(B)(3) to adopt the 2020 Subdivision Construction Manual.
Resolution 20-07, A Resolution recommending assembly approval of an ordinance adopting MSB 11.12 Driveway Standards.

The subdivision construction manual has been in the process of being updated for the past 18 months, and is now working through final review of the appropriate boards and commissions. The draft ordinance creating MSB 11.12 Driveway Standards is also working through final review process, and minor amendments are still being considered. In an attempt to ensure enough time for these boards to adequately review and comment on the two documents, staff is recommending the planning commission remove these two items from the agenda for the March 2 Planning Commission meeting. Once these two documents are reviewed by other boards and commissions, staff will come forward with the revised documents for introduction and public hearing on the PC agenda.

RECOMMENDATION:
Staff recommends the commission remove Resolution 20-05 and 20-06 from the public hearing agenda for March 2, 2020.

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COMMISSION BUSINESS

Upcoming PC Agenda Items

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COMMISSION BUSINESS

MATANUSKA-SUSITNA BOROUGH
Planning and Land Use Department
350 East Dahlia Avenue • Palmer, AK 99645
Phone (907) 861-7833 • Fax (907) 861-7876
Email: planning@matsugov.us

MEMORANDUM

DATE: February 21, 2020

TO: Planning Commissioners

FROM: Eileen Probasco, Director of Planning and Land Use

SUBJECT: Items tentatively scheduled for future PC Meetings or Administrative Actions and Updates on PC items sent to the Assembly

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March 16, 2020 *(MSB Assembly Chambers)*

Introduction for Public Hearing Quasi-Judicial

- **Resolution PC 20-08**, a Conditional Use Permit request in accordance with MSB 17.60 – Conditional Uses, for the operation of a marijuana cultivation facility, located at 108 E. Schrock Road (Tax ID# 18N01W15C009); within Township 18 North, Range 1 West, Section 15, Seward Meridian. Public Hearing: April 6, 2020. (*Applicant: Michael Gallagher, on behalf of Bubba Greens, Staff: Joe Metzger*)
- **Resolution PC 20-09**, a Conditional Use Permit request in accordance with MSB 17.60 – Conditional Uses, for the operation of a marijuana retail facility, located at 5675 E. Blue Lupine Drive (Tax ID# 1807B01L011); within Township 17 North, Range 1 East, Section 17, Seward Meridian. Public Hearing: April 6, 2020. (*Applicant: Chad Ragsdale, on behalf of MCC Flight, Staff: Joe Metzger*)

Introduction for Public Hearing Legislative

(*None*)

Agency/Staff Reports

(*None*)

Land Use Classifications

- **Resolution PC 20-11**, recommending Assembly approval of land classification of two parcels as Reserved Use for a future fire station and future school facilities, and eight parcels for conveyance through borough land sales or other allowed methods of disposal in accordance with Title 23 and adopted Land & Resource Management Policy and Procedures (MSB007557). (*Staff: Nancy Cameron*)

Public Hearing Quasi-Judicial

(*None*)

Public Hearing Legislative

- **Resolution PC 20-12**, recommending Assembly adoption of MSB 17.68, Outdoor Shooting Facilities, in order to establish standards for commercial, educational, and nonprofit outdoor shooting facilities. (*Staff: Alex Strawn*)

Unfinished Business

(*None*)

New Business

(*None*)

Commission Business

- Adjudicatory (*if needed*)
- Upcoming Planning Commission Agenda Items (*Staff: Alex Strawn*)

April 6, 2020 *(MSB Assembly Chambers)*

Introduction for Public Hearing Quasi-Judicial

(*None*)

Introduction for Public Hearing Legislative

(*None*)

Agency/Staff Reports

(*None*)

Land Use Classifications

(*None*)

Public Hearing Quasi-Judicial

- **Resolution PC 20-08**, a Conditional Use Permit request in accordance with MSB 17.60 – Conditional Uses, for the operation of a marijuana cultivation facility, located at 108 E. Schrock Road (Tax ID# 18N01W15C009); within Township 18 North, Range 1 West, Section 15, Seward Meridian. (*Applicant: Michael Gallagher, on behalf of Bubba Greens, Staff: Joe Metzger*)
- **Resolution PC 20-09**, a Conditional Use Permit request in accordance with MSB 17.60 – Conditional Uses, for the operation of a marijuana retail facility, located at 5675 E. Blue Lupine Drive (Tax ID# 1807B01L011); within Township 17 North, Range 1 East, Section 17, Seward Meridian. (*Applicant: Chad Ragsdale, on behalf of MCC Flight, Staff: Joe Metzger*)

Public Hearing Legislative

(*None*)

Unfinished Business

(*None*)

New Business

(*None*)

Commission Business

- Adjudicatory (*if needed*)
- Upcoming Planning Commission Agenda Items (*Staff: Alex*)

Upcoming PC Actions

Quasi-Judicial

- Alaska Car Crushing – Junkyard CUP Modification, 6919000L001 and L002. (*Staff: Mark Whisenhunt*)
- D&S Alaskan Trail Rides, Inc. – Denali SpUD, 29N05W33D012 and 29N05W33D0028. (*Staff: Joe Metzger*)
- Nu Aspen LLC – Talkeetna SpUD, 5352B12L014A. (*Staff: Joe Metzger*)
- Nu Aspen LLC – Regulation of Alcoholic Beverages, 5352B12L014A. (*Staff: Joe Metzger*)
- Canna Get Happy – Marijuana Retail Facility, 17N01W11A020. (*Staff: Joe Metzger*)
- Arctic Hydroponics - Marijuana Cultivation Facility, 22N04W01A004. (*Staff: Joe Metzger*)
- Moonstone Farm – Alcoholic Beverage Dispensary, 17N01E16C012. (*Staff: Mark Whisenhunt*)
- Twin Lakes – Variance MSB 17.65, 6323000L005. (*Staff: Joe Metzger*)

Legislative

- Subdivision Construction Manual 2020 (*Staff: Eileen Probasco*)
- MSB 11.12 Driveway Standards (*Staff: Eileen Probasco*)
- Title 17 Consolidation (*Staff: Eileen Probasco*)
- Onsite Consumption (*Staff: Alex Strawn*)
- Wetlands Mitigation (*Staff: Eileen Probasco*)

Other Upcoming Administrative Actions (Not going to the PC)

- Aldeman – Multifamily Permit; 17N01W18B011. (*Staff: Joe Metzger*)
- Birdsell #1 – Nonconforming Structures, 6040B03L016. (*Staff: Joe Metzger*)
- Donald Patterson – Multifamily Development Permit, 1009B02L011. (*Staff: Adam Bradway*)
- Hinderman - Nonconforming Structures, 6043B01L006. (*Staff: Joe Metzger*)
- Carefree Acres – Multifamily Development Permit, 1009B02L011. (*Staff: Adam Bradway*)
- Finger Lakes Heights – Nonconforming Structures, 6111000T003. (*Staff: Joe Metzger*)
- Trapper Creek Bluegrass Festival – Special Event, 25N05W15C003. (*Staff: Joe Metzger*)
- Prospect Peak – Nonconforming Structures, 2350B02L008. (*Staff: Mark Whisenhunt*)
- Beaver Green – Nonconforming Structures, 6024000L013. (*Staff: Joe Metzger*)

- Bridgeway Community – Multifamily Development Permit, 17N02W11B005. (*Staff: Joe Metzger*)
- Ashmore – Nonconforming Structures, 18N01E34A001. (*Staff: Joe Metzger*)
- LaLonde – Pre-existing Legal Nonconforming Status Determination – 6363B01L006A-2. (*Staff: Joe Metzger*)

PC Decisions Currently Under Appeal

- **Resolution 18-30**, a Conditional Use Permit (CUP) in accordance with MSB 17.60 – Conditional Uses; allowing the operation of a junkyard/refuse area, located at 743 West Sunrise Drive (Tax ID#: 640500L006); within Township 18 North, Range 2 West, Section 33, Seward Meridian. Appealed to Alaska Superior Court. (*Applicant: Dewayne Creech for Creech's Junkyard, Staff: Mark Whisenhunt*)
- **Resolution PC 19-17**, a Conditional Use Permit in Accordance with MSB 17.60 – Conditional Uses; allowing for the operation of a marijuana retail facility, located at 1204 N. Hyer Spur (Tax ID# 7775000L002); within Township 17 North, Range 1 East, Section 4, Seward Meridian. Appealed to the BOAA. Planning Commission decision upheld by BOAA on September 11, 2019. Appealed to Alaska Superior Court. (*Applicant: Teri Zell, on behalf of Higher By Bad Gramm3r, LLC; Staff: Joe Metzger*)
- **Resolution PC 19-18**, a conditional use permit in accordance with MSB 17.30, Conditional Use Permit for Earth Material Extraction, located at 56218 S. Parks Highway (Tax ID# 22N04W06B003); within Township 22 North, Range 4 West, Section 6, Seward Meridian. A CUP would allow for the removal of approximately 1,000,000 cubic yards of earth materials through 2029. The Planning Commission failed to garner enough votes to approve the permit. Planning Commission decision overturned by the BOAA on October 29, 2019. Appealed to Alaska Superior Court. (*Applicant: Emily McDonald on behalf of Don Jean Pit, Staff: Joe Metzger*)

Updates on PC items going to the Assembly (Pending)

None

Updates on PC items that went to the Assembly (Complete)

Planning Commission		Assembly	
Reso		**ORD/Reso #**	**IM**
Resolution PC 19-25, recommending assembly approval of an Aviation Activity Notice Area in accordance with MSB 17.10.110, known as Wasilla Creek Airpark; within Township 18 North, Range 1 East, Section 12, Tract B (Tax ID# 740400T00B), Seward Meridian; 7555 E. Nangle Street. (*Staff: Christopher Cole*)		ORD # 20-011	IM 20-018
Actions:	11/18/19 – PC Introduction 12/16/19 – PC Public Hearing – Amended/Approved 01/21/20 – Assembly Introduction 02/04/20 – Assembly Public Hearing - Failed		

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