THE INTERESTS OF COMPETING GOVERNMENT AND PIÑON CANYON, COLORADO

A Case Study on Small World Networks and the encroachment of military land on agricultural land in Southeast Colorado as a consequence on intergovernmental relationships.

Richard Daniel Mestas

A dissertation submitted in partial fulfillment
of the requirements for the degree of Doctor of Public Administration

School of Public Affairs

University of Baltimore Baltimore, Maryland

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\text { School of Public Affairs } \\
\text { University of Baltimore } \\
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## For Mary Margaret

My Beloved, My Hero, My POSSLQ

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Map from the LaJunta Tribune Democrat courtesy PCEOC

## Foreword

## A Little about this Dissertation and Me

I undertook this research to fulfill certain requirements for the degree of Doctor of Public Administration at the University of Baltimore. Using narrative and network analyses, this dissertation seeks to tell a story, draw a picture, and then animate the picture to enhance readers' understanding of the complex and often polarizing intergovernmental relationships surrounding the Army's proposed expansion of its Piñon Canyon Maneuver Site in Southeastern Colorado.

One of my central goals is to explain how the government agents within the Piñon Canyon network are linked, where influence resides, and how power is exchanged from agent to agent. I have observed over the years that bureaucracies are a lot like people: they can be stubborn, finicky, aggressive, lazy, and most of all, have either a long memory or no memory at all. In a sense, this research treats bureaucracies like people, with all of the dynamics that make us human.

I grew up in Colorado and own land not far from the area known today as Piñon Canyon. I spent part of my youth herding cattle, bucking hay and doing other farm work. I later served as Associate Dean of University of Nebraska, College of Technical Agriculture-Curtis and remain adjunct faculty at the University of Nebraska-Lincoln. These experiences give me solid footing in the world of agriculture.

Currently, I am a program manager at the National Intelligence University in the Department of Defense. I am a graduate of the U.S. Naval War College and an Army veteran with service in the first Gulf War. These experiences give me solid footing in the world of national security.

## A Quick Overview of my Case Study

These two sectors-agricultural and national defense-are at the heart of the Piñon Canyon controversy. I consider this to be an ideal public administration case study because it deals with several foundational aspects of the profession, including: federalism and intergovernmental relations; strategic management; policy analysis; decision making; organizational theory and
change, as well as public budgeting. But the intractable problem of Piñon Canyon is also important because it shines a light on the increasingly complex and potentially polarizing relationships between bureaucrats at all levels, and the public they serve.

The Piñon Canyon Maneuver Site (PCMS) in Southern Colorado is an Army training range for mechanized units from Fort Carson, which lay farther to the north, between Colorado Springs and Pueblo. The existing site was established in 1983.

During 2006 and 2007, the Army announced a proposed expansion of the site, to increase its size from 235,000 acres to approximately 635,000 acres.

The proposed expansion area includes large portions of the Comanche National Grassland, the Apishapa State Wildlife Area, a few small communities, school districts, and several area ranches, with potential impacts on thousands of people. That means the Army's plan directly affects other federal entities, as well as state, county, district, and municipal interests, in addition to businesses and individual citizens.

Along Colorado's southern border is the City of Branson, which has a population of 74. However, its school district enrolls 493 children-children city leaders believe would be negatively impacted by the proposed expansion. For this reason, the Branson School District sits at the opposite pole from Fort Carson and the Pentagon within the circle or network of Piñon Canyon stakeholders.

Part of what is driving the need to enlarge Piñon Canyon is urban encroachment on Fort Carson. Since the late 1950s, the base finds itself increasingly surrounded by development-a trend which has become even more pronounced during the past 10 years. The City of Pueblo continues to push northwards in the direction of Colorado Springs, placing further stress on the fort.

Compounding encroachment is the technological transformation of the military, which enables smaller units to cover larger swaths of land. While the acreage at Fort Carson and Piñon Canyon was suitable for training last century, the more lethal weapons of the 21st-century travel farther and faster and require vaster exercise and operating areas.

The military already has a large footprint in Southern Colorado. In addition to the PCMS, there are the Pueblo Chemical Depot, Fort Carson, Peterson Air Force Base, Schriever Air Force Base, Cheyenne Mountain, and the United States Air Force Academy. So, when one of two feuding land managers at Fort Carson leaked a map showing the proposed expansion could reach east clear to the Kansas border and all the way south to Oklahoma, it created a firestorm. Although the expansion depicted by the map had never been vetted at Army headquarters in Washington, D.C., nor even seriously considered at Fort Carson, it seemed to confirm some citizens' worst suspicions.

Chapter 1, "Conflict and the Piñon Canyon Maneuver Site," explores the history of the area and the related issues in greater depth. You may also be interested in the "Afterword", which sums up current status of the proposed expansion.

Can New Methods be used to Effectively Study Intergovernmental Relationships?

The policy analyst Emery Roe (1994) once said that "many public policy issues have become so uncertain, complex, and polarizedtheir empirical, political, legal and bureaucratic merits unknown, not agreed upon, or both-that the only thing left to examine are the different stories policymakers and their critics use to articulate and make sense of that uncertainty, complexity, and polarization."

In light of Roe's assertion that traditional analytical methods are failing us in situations like Piñon Canyon, I wanted to examine whether new methods could be used to study these intergovernmental relationships and their influence on resulting public policy. That led me to formulate the following three hypotheses, which would allow me to look at the application of more suitable methods for addressing complex problems:

1) Small World Networks have value in identifying centers of influence and their potential actors in the pro/con intergovernmental issues surrounding Piñon Canyon encroachment.
2) Network theory application may be a more suitable method of discerning whether there can be mutually agreeable and successful models for collaboration or compromise, or not.
3) Applying Small World Networks to Piñon Canyon results in better understanding of the patterns of potential cooperation and conflict, and where they exist.

## My Framework

My theoretical framework was inspired by the Benzene molecule I studied years ago in undergraduate chemistry. I explain more about this in Chapter 3, but to comprehend my framework, you need only understand that Piñon Canyon is the nucleus of my case study and is surrounded by a network of governments. These governments are capable of bonding with, or linking to, a number of other agents at other levels, from federal to state, and so forth.

Additionally, the methods I selected for analyzing Piñon Canyon demonstrate a cyclical nature, where narrative policy analysis feeds social network analysis, which gives birth to an agentbased model, which in turn helps to tell a new story.

Delimitations of my research included topology, which focuses on shape, nodes and links; topography, which considers placement and position of agents on the network map; and, typology, which looks at the who, what, why, where and when of the networked bureaucracies.

In order to understand the dynamics of an intergovernmental network, it is important to consider each bureaucracy's scope of authority and jurisdiction. In Colorado, this meant considering the impacts of federalism, Home Rule, Dillon's Rule, the Colorado Revised Statutes, the corporate status of school districts, and the role of non-governmental organizations. These authorities undoubtedly inform the actions of street-level bureaucrats and their ability to invoke marble-cake governance.

Chapter 3, "A Different Case Study Path," brings the supporting structures of my theoretical framework together.

## What I Learned from Reviewing the Literature

Since Piñon Canyon is an ongoing issue, there is a wealth of information to draw from, although no book-length publications or full histories are yet available. Therefore, my sources included news reports, government reports, stakeholder interviews, historical documents, subject matter experts, correspondence, my personal network and the Internet.

In collecting my literature, I consulted overarching theoretical experts like Agranoff, Barabasi, Goldsmith and Eggers, Strogatz
and Milgram. I also dug into current scholars and subject matter experts such as Doe, Gilbert, Knoke and Yang. For more specifics, see the full literature review in Chapter 2.

Major points noted in the foundational literature include: Network Science can be used across types to include bureaucracies; collaborative public management is an evolving strategy; street-level bureaucrats can drive networks; and, there are direct paths between and through agents.

The subject matter literature aided me in understanding the idiosyncrasies of the agents and the historical themes supporting Piñon Canyon as a stand-alone issue. Significant anthropological and natural resource writings dominate the literature, while the history of the proposed expansion is unwritten outside of government reports.

The Narrative Policy Analysis
I began my study of Piñon Canyon with a narrative analysis, as outlined in Chapter 4 of this dissertation.

Stories are the narrative tales. In this case, the Army started this controversy and therefore, the Army owns the master narrative.

Stories have a beginning, middle, and end. The Army's story begins with its need to transform its forces post-Vietnam and again after the Cold War, which evolved to an encroachment problem, and ends with the expansion problem.

The counter-story is set forth by the organization Not One More Acre. The opposition group's counter-story is that the Defense Department, already a large landowner in the region, does not need to expand further.

The organization Piñon Canyon Expansion Opposition Coalition employs a series of non-stories that do not directly counter the Army's master narrative, but which instead evoke the values of agriculture, ranchers' historic ties to the land, and threats to the environment. Another non-story is the potential loss of property tax revenues to local school districts.

It is important to understand and differentiate the literary term "non-story" from the policy term "non-issue." Non-stories are
circular in nature and have no beginning, middle or end. The Coalition's non-stories have proven effective in derailing the Army's master narrative and taking the service off message.

Bureaucratic critiques, sometimes cast in a story format, are similar to non-stories, in that they do not address the master narrative, but merely critique it. Examples include GAO reports and protests by both Otero and Las Animas Counties that the Army has not yet provided enough or the right information to justify the expansion.

The Social Network Analysis
Having completed my Narrative Policy Analysis, I then performed Social Network Analysis, as described in Chapter 5 of this document. Social Network Analysis consists of methods used to analyze social networks or social structures made up of individual nodes and links. Whereas the Narrative Policy Analysis explained the story, the Social Network analysis explains the environment, or draws the picture, by using observational data and models to determine if situations match reality.

I began by looking at existing network models to see if any of them fit the Piñon Canyon debate. I reviewed the graphs, studied the matrices, and assessed the utility of their visual displays.

I chose NetLogo, available through Northwestern University, as my modeling environment. It is free, multi-agent programmable, and widely used by researchers.

Most models in NetLogo's library are based on some variable of randomness, which had to be either minimized or addressed. NetLogo is easy to learn so this obstacle was simple to overcome.

I looked at scale-free networks, but they only show which agents are on which side, ignoring whether any are actually in the middle or multiple links across. These networks were initially dismissed as unsuitable but later reconsidered.

The primary model of interest was the Small World Network because I was curious to see if bureaucracies behaved like small worlds. The Small World effect first observed by Stanley Milgram is a phenomenon found in nature and technology.

The model is mostly focused on average path lengths and clustering coefficients between agents. Average path lengths show the number of steps it takes to get from one member of the network to another, while the clustering coefficient demonstrates the ratio of existing links connecting a node's neighbors to each other, to the maximum possible number of such links (Wilensky, 2005).

While each of these measurements is interesting in itself, they were not the dynamics at play in Piñon Canyon, where I wanted to illustrate centers of influence and power. The Small World Network is very close to what I needed to analyze Piñon Canyon; however, the model's inability to demonstrate diffusion made me want to study other networks. Diffusion pertains to directed links and the transfer of value from one node to the next.

## Agent-Based Modeling

Taking into consideration the strengths and weaknesses of the various networks I looked at, the next logical step was to morph the good and attempt to eliminate the bad from the three models in order to optimize the analysis. This quote from Tim Liao (1994) at the University of Illinois sums up my quest:

There are two general approaches to the study of social behavior: Collect observational, survey, or other forms of data and analyze them, possibly by estimating a model; or begin from a theoretical understanding of certain social behavior, build a model of it, then simulate its dynamics to gain a better understanding of the complexity of a seemingly simple social system.

In the Piñon Canyon Model I developed, each stakeholder is represented as a node in the network. The effort to create an agent-based model is captured in Chapter 6. Validation of the model can be found in Appendix D.

## My Findings

Here's what I found:

- New models provide different frameworks/outcomes bringing forth an important strategic tool.
- Controversial debates can be analyzed using network models.
- Models for collaboration or compromise among bureaucracies are difficult to find due to the fluidity of the issue and limitations of the study.

The first finding affirms my hypothesis that Small World Networks have value in identifying centers of influence and their potential actors in the pro/con intergovernmental issues surrounding Piñon Canyon encroachment.

The second finding again affirms my hypothesis that Network Theory application may be a more suitable method of discerning whether there can be mutually agreeable and successful models for collaboration or compromise, or not.

My third hypothesis, that Applying Small World Networks to Piñon Canyon results in better understanding of the patterns of potential cooperation and conflict and where they exist, is only partially true, as I had to enhance the model.

Thus, we see that Narrative Policy Analysis can be combined with Network Analysis to study a public administration problem in a different light.

For my complete findings, see Chapter 7.
What Happened Inter-governmentally

My analyses demonstrated the real world position of Branson in the network and showed that Branson School District, as a small government, does not alone have the power to stop the Army.

The collaboration between the ranchers and small governments, like the Branson School District, provided an increase of power in the bureaucratic struggle against the Army.

My analyses also indicated Pueblo City and County are probably the tipping points in the bureaucratic arena.

Suggestions for Further Research
My suggestions for further research include: the study of "networks of networks"; the impact of power and its assignment; the research challenges involved in network research and finally,
the dynamics of centrality within intergovernmental relationships.

In Conclusion

Network Analysis as applied to the Piñon Canyon Case Study can be applied to public administration and utilized to study the behaviors of, and between, large and small bureaucracies.

Narrative Policy Analysis complemented by Social Network Analysis helps enrich the Piñon Canyon study and identify centers of influence, thus showing where competing interests collide and where collaboration might be possible.

By leveraging tools such as NetLogo, a model was built to help the reader understand how each of the actors is networked with others.


#### Abstract

When applied to public administration, networks may be utilized to study the behaviors of and between large and small bureaucracies. Traditional methods of analyzing intergovernmental conflict are often not as informative as network analysis. Network analysis is capable of demonstrating characteristics that traditional analysis does not show. In order to examine intergovernmental relationships and how these networks affect public policy, one must study scenarios where governments and their competing interests collide. The proposed expansion of the Piñon Canyon Maneuver Site in Southeastern Colorado, under consideration since 2004 and as yet unresolved, is such a case. The intent of this dissertation is to "tell a story," "draw a picture" and then "animate the picture" about the complex and often polarizing intergovernmental relationships surrounding Piñon Canyon, to help the reader understand how each of the actors is linked and networked with others.


## Piñon Canyon expansion

Potential expansion of the Piñon Canyon Maneuver Site by more than 400,000 acres would make it the Army's largest training site.


Source: Fort Carson
Thomas McKay | The Denver Post
Figure 1-1. The Army planned expansion as reported in the Denver Post on February 14, 2007. Available at:
http://www.denverpost.com/portlet/article/html/imageDisplay.jsp?c ontentItemRelationshipId=1437393

## CHAPTER 1:

## INTERGOVERNMENTAL CONFLICT AND THE PIÑON CANYON MANEUVER SITE

"If you want to gather honey, don't kick over the beehive."
-Dale Carnegie
How to Win Friends and Influence People

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In recent years, research and case studies on intergovernmental problems have looked at polarizing issues to search for trends or behavioral characteristics but rarely apply or identify improved methods of analysis. The idea to understand behavior and then build a model to gain a new understanding can help extract information from within the bureaucracy.
This opening narrative explains the origins of the intergovernmental tug-of-war surrounding the proposed expansion of a military training range to help readers understand how various intergovernmental actors are linked, across geography and time. This research will use the Office of the Assistant Secretary of the Army for Installations and Environment at the Pentagon and the Branson Colorado School District in Las Animas County, Colorado as the polar governments in order to give explanation to the networked bureaucracy between them. It will not, however, argue the merits or shortcomings of the proposed expansion itself, other than to explain the main arguments of both sides.
The policy analyst Emery Roe (1994) once said that "many public policy issues have become so uncertain, complex, and polarized-their empirical, political, legal and bureaucratic
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merits unknown, not agreed upon, or both-that the only thing left to examine are the different stories policymakers and their critics use to articulate and make sense of that uncertainty, complexity, and polarization."

In light of Roe's assertion that traditional analytical methods are failing us in situations like Piñon Canyon, I wanted to examine whether new methods could be used to study these intergovernmental relationships and their influence on resulting public policy

In 1983 the United States Army acquired approximately 235,000 acres of training space in Southeast Colorado to supplement the main post training ranges of Fort Carson, Colorado. This area is known as the Piñon Canyon Maneuver Site (PCMS) or simply, Piñon Canyon. Much of the land for this second-largest Department of the Army maneuver range was gotten through condemnation of private lands (Department of the Army Report, $7^{\text {th }}$ Infantry Division and Fort Carson, Integrated Cultural Resources Management Plan, 2002-2006, p. 195 and 1983 Land Acquisition Documents - Appendix I).

As rural Southeast Colorado was still reeling from the economic recession of the $1970^{\prime}$ s, with the Soviet Union and United States still staring each other down, few pushed back at the time. But in 2006, when the Army came to the table for a 400,000-acre second helping of the region's ranch lands, nearly everyone did.

In 2004, as militias and militant groups entered the spring fighting in Iraq and it seemed the war would last longer than originally thought, the 7th Division's Integrated Training Area Management (ITAM) Office at Fort Carson prepared a report on the potential acquisition of additional training lands adjacent to the Piñon Canyon Maneuver Site. This report was based on The Piñon Canyon Maneuver Site (PCMS) Revision to Section 7 for Fort Carson's Range and Training Land Program (RTLP) Development Plan, September 2003, which identified the multi-phased acquisition of 6.9 million acres of land, owned by private land owners and the U.S. Forest Service Analysis of fAlternatives Study: Piñon Canyon Maneuver Site, Colorado", 2004) While the basic idea for expansion could be seen to have strategic merit, this plan, loosely written and depicting Southeast Colorado as a blank slate to be filled in by Army planners, was not vetted outside of Fort Carson. (Army Interview 2011) Over the course of several months, the plan gained a lot of traction but also generated some dissension within Fort Carson. Because Army officials had made no effort to gauge local opinion with respect to the proposed expansion, they were unaware of the disgruntled emotions of several people and entities in Las Animas County who had concluded the original land acquisition in 1983 was a raw deal. When parts of the ITAM Office's report were selectively leaked, a firestorm erupted.

Over the next several years, a dramatic struggle of wills took place, pitting governments against each other and sometimes against themselves. Basic to the problem of Piñon Canyon is that
the survival instinct of bureaucratic organizations conflict with their need to cooperate. Fueled by media and political drama, the case has become a spectacle in the administrative world.

By 2011, the controversy surrounding the expansion had evolved into a bitter dispute on more than a political level. During the course of this research, private citizens as well as elected and appointed officials refused to talk to me or stated that they wouldn't want to "touch this with a ten-foot pole." However, others on both sides of the issue did speak to me, confident of their personal convictions.

It is important in considering this matter to have a sense of Piñon Canyon's remoteness. Whenever one explains a remote position in space there is the need to begin with a single reference point-a landmark, so to speak. The Rocky Mountain Front Range and the prairie foothills are full of such landmarks, though they are located in what most Americans consider "flyover country."

In northeastern New Mexico lies Capulin Volcano which last erupted some 55-65,000 years ago. This extinct cinder-cone volcano is approximately four miles in circumference at the base with a crater diameter of 1,450 feet and an elevation of 8,182 feet at the highest point, slowly rising from around 6,800 feet at its base (Hunner and Lael 2002) Two Texas cattle dealers, Charles Goodnight and Oliver Loving, drove cattle north directly past Capulin Volcano from Texas to New Mexico (Hunner and Lael 2002) and from there to Colorado and Wyoming. The path they took
later became known as the Goodnight-Loving Trail and their adventures later became fictionalized in Larry McMurtry's Pulitzer Prize-winning novel Lonesome Dove.

A quick drive in the car about 22 miles north of Capulin and just shy of two miles into the State of Colorado is the town of Branson. Branson is roughly equidistant from the hospitals in Trinidad, Colorado and Raton, New Mexico, as well as Interstate 25, which runs north and south through both. Most people's routine business takes them to Trinidad, since it is the county seat and has the advantage of the closer Wal-Mart.

There is a large flat mesa to the south of Branson covered with juniper, cedar and piñon trees, along with assorted scrub plants and grass. Even though you are at about 6,300 feet in elevation you do not sense the altitude. The geography seems to pull you back to the south towards New Mexico, rather than to the west where the Colorado Rocky Mountains stand somewhere beyond the horizon.

A variety of animals and plants populate this high desert ecosystem. Mule deer, Pronghorn Antelope, turkey, coyotes and even an occasional black bear and Roadrunner can be seen on the many gravel roads that run past Branson. North and east of town the ground is flatter still, as it stretches out towards the Great Plains where for centuries the Plains Indians hunted bison in the grasslands farther to the north.

Within Ecoregional and global contexts, the landscape is representative of a Temperate Steppe, as defined in Bailey's

Ecoregion classification system (Bailey, 1998). Temperate Steppe is a dry environment, where evaporation exceeds precipitation and with periods of extreme cold in the winter. This Ecoregion constitutes approximately 4\% of the world's total land mass, and is distributed geographically through the inter-mountain western region of the United States and the southwestern and central plateau regions of Asia, including portions of the Ukraine, Kazakhstan, Mongolia and China (Doe, et al., 2008). The region's correlation with potential global "hot spots" is part of what makes Piñon Canyon attractive to Army planners.

## Branson School District

There is not a lot in the town of Branson, in the way of people, commerce or industry. Branson is remote and ties itself to the railroad and the cattle industry artery established by Loving and Goodnight just to the west of town. Branson is about cattle. Branson has a population of 74 , which means that any single area rancher has more cattle than Branson has people. Though it is some 175 miles south of Fort Carson, 23 miles due south of the southern border of the Piñon Canyon Maneuver Site and 1,450 miles west of Washington D.C., the City of Branson-and more particularly, the Branson School District-sees itself on the front lines in a war against the Pentagon.

But both Branson and the Pentagon have also become entangled with the cities of Colorado Springs, Pueblo, Trinidad, La Junta, and a web of other governments, politicians, and nongovernmental organizations and agencies with varying financial,
political, educational, occupational, historical, and survival interests at stake.

Branson School District is an anomaly in itself. It serves a township or Census County Division of around 165 people yet has an enrollment of 493 students: 31 in local classrooms and 462 "virtual students" in on-line programs (National Center for Education Statistics, 2011). The school district created Branson School Online as an accredited, diploma-granting, K-12 public school governed by a locally elected Board of Education, which is empowered by Colorado Revised Statutes. This online school is open to all Colorado students who wish to pursue their public school education (Bransonschoolonline.com).

Branson has managed to adapt and survive when other school districts across the nation, hit hard by the economy of the 20002010 decade, have simply folded. The credit goes to its engaged and forward-thinking school administration.

In the 1920's, Branson had a newspaper, a bank, three grain elevators and about 1,000 residents. In the $1930^{\prime}$ s, the town was nearly wiped out by dust storms (Sangres.com). Across the entire Great Plains nearly a million people left their farms from 1930 to 1935 (Egan, 2006). Today, the rural out-migration that began in the 1930's has devastating consequences for communities left behind (Carr and Kefalas, 2009 p.2). This problem is compounded by the fact that $70 \%$ of U.S. agricultural lands are expected to change hands in the next 20 years (USDA CREES, 2008), further destabilizing rural areas. Senior farmers and ranchers are
retiring without transferring their businesses because, in many cases, they can't find younger buyers with the requisite capital. Small towns are hemorrhaging their youth to colleges, economic opportunities elsewhere, and the military. (Sleight, 2010)

It is interesting to note that although rural Americans make up just one-sixth of the U.S. population, they comprise $45 \%$ of membership in the U.S. Armed Forces (Vilsack, 2010).

The small community of Branson is tied to the military in more than one way and both indeed have a lot at stake with respect to the land north of town. The latest plans would bring the expansion right through town, displacing families and eliminating tax revenues. The Branson School District feels that if the town is to survive and stay relevant in the $21^{\text {st }}$ century, it has no choice but to wage war against the Army.

The District has launched a series of letters to the garrison commander at Fort Carson requesting a "government-togovernment" meeting regarding the proposed expansion. This activist school board, made up entirely of agricultural interests, has tapped-possibly unknowingly-into a little-known bureaucratic "Hail Mary" strategy called "marble cake governance".

Under "marble cake governance" partnerships are formed across varying sectors of government and nongovernmental actors. This is as opposed to traditional "layer cake governance" where different tasks are taken on by different sectors (Klitgaard and Treverton, 2003). In its letters to the Fort Carson Commander, Branson School District invoked its authority to coordinate with
all federal agencies regarding the Army's plans, including the Department of Justice. Branson has portrayed itself as a "hybrid government eroding the line between public, nonprofit and the private sector" in its engagement with the Army (Klitgaard and Treverton, 2003).

Mixed into this struggle, beyond the land and tax revenue, is a complex public opinion dynamic; in 2012, people love soldiers and people love farmers almost to the same degree people hate the military-industrial complex and hate big agriculture. Both the ranchers and-somewhat surprisingly-the Army have for the most part managed to avoid associating themselves with the corporate and industrial networks that shadow both of them.

## The Pentagon

The Pentagon is a huge complex, but its footprint on the land is actually about the same size as the City of Branson's (Figure 1-2). It takes no more than seven or eight minutes to walk between its two farthest points. While known for its size, the Pentagon can actually feel like quite an intimate place.


Figure 1-2. Branson, $C O$ and the Pentagon viewed from equal altitudes of 3,300 feet. Courtesy Google Earth.

In the basement of the Pentagon, not very far from where Flight 77 smashed into its western wall on September 11, 2001, is a warren of cubicles supporting the Secretary of the Army's Chief of Legislative Liaison. That is where some of the policy decisions regarding land are made. Land and real estate issues are not taken lightly by the Army, a department that appears to have land everywhere. In Southern Colorado alone reside Fort Carson, Piñon Canyon and the Pueblo Chemical Depot. There are Army properties in practically every state and congressional district, be they bases, dams, hospitals, or recruiting stations, ranging from small buildings to large installations.

On the third floor of the world's largest professional building is the Office of the Assistant Secretary of the Army for Installations and Environment, referred to as OASA (IE\&E). OASA (IE\&E) provides strategic direction for Army installations and facilities in all matters relating to infrastructure, energy and the environment. Along with an array of other offices in the Pentagon, OASA (IE\&E) compiles and analyzes information and recommendations from the installations to project the future needs of the Army's fighting forces. Much of what goes into this process is feedback from soldiers' actual combat experiences, along with cost projections of moving troops, climate, conditions and the need to sustainably manage military lands.

While Branson is full of hard-working farmers and ranchers, the Pentagon cubicles are full of hard-working analysts, many of whom are decorated veterans of earlier wars. While they
understand determining the future of the military is not an exact science, they give it their best shot. They do qualitative and quantitative research and splash that together with some crystal ball reading.

There are just a handful of people working on property issues everywhere from Alaska to the Florida Keys. The task of tracking construction in Texas one minute and the sale of land in North Carolina the next is complicated by hundreds of soldiers and bureaucrats in the field who may not have the same agenda or priorities. Piñon Canyon is one of many controversies that can emerge out of the blue, suddenly going viral in the press or blogosphere.

On April 1, 2011, for instance, while relocating several thousand employees in the Washington D.C. area due to congressional Base Realignment and Closure (BRAC) decisions, the office came under an unexpected barrage of complaints about the wastefulness of a sculpture of "a fairy riding a toad at a bus stop" (Bedard, P.,US News, 2011). The fact that the story broke on April Fool's Day was unfortunate; an even more unfortunate circumstance was that the toad-riding fairy was a real public art submission local officials had required the Army to accommodate but which the service had little control over. This did not prevent phone calls from Capitol Hill from setting the Army switchboard alight. Issues and controversies created by soldiers, private citizens, bureaucrats, or some anonymous benefactor are handled and dealt with daily at the Pentagon.

## Piñon Canyon Maneuver Site

Geographically speaking, Las Animas County is to Colorado what Texas is to the United States. As the largest county, is it a massive expanse of land with varying climates and vast natural resources. The western part of the county evokes John Denver's "Rocky Mountain High" paradise, with snow-capped cathedral-spire peaks giving birth to cascading, crystal-clear streams that ultimately find the ocean far away. The eastern part resembles the badlands of Remington and Russell's idealized, epic American West. The county has a rich and colorful history, encompassing Bat Masterson, the Ludlow Massacre, a world-renowned sex change pioneer, and a social détente between the Mexican and Italian cultures that rule the Southern Colorado Front Range from Pueblo to the New Mexico border. The area along the Purgatory River bottom is populated by thick and plentiful brush piñon trees interspersed with large Cottonwoods. This was the Mountain Route of the Santa Fe Trail.

Depending on your point of view, there is really a lot out there or nothing at all.

The Piñon Canyon Maneuver Site is accessed from US 350, the only hard-surface artery running between the communities of Trinidad and La Junta, Colorado. The federal-looking entrance itself surprises you, featuring the obligatory military equipment and painted rocks along what is an otherwise deserted highway. The building complex, which is visible from the road, resembles a

Midwest middle school on steroids, with several outlying warehouses.

If you drive past the entrance east towards La Junta and Rocky Ford, the Rocky Mountains quickly shrink in your rearview mirror and you find yourself smack in the middle of the prairie and the Comanche National Grasslands. With the exception of the railroad tracks, the occasional red, white, and blue tin signs on barbed-wire cattle fences, and the aforementioned entrance, there is not much evidence that you are next to a major military installation. Actually, Piñon Canyon brings to mind what is said about the more famous Area 51: it's a no-name base in the middle of nowhere.

Piñon Canyon itself was always a remote area, known mostly for being a cheap alternative for teen-aged couples to "make out" instead of spending money at the drive-in east of Trinidad. It was also a popular outlying party spot for students from the local schools and junior college wanting to escape the monotony of small-town life. The environs were rarely visited by local sheriffs' deputies or state patrol, unless somebody was injured after hitting a deer. Even many hunters found the area too remote.

The land around Piñon Canyon, as in Branson and the rest of the county, supports a diverse ecosystem with large numbers and variety of big and small game. Many schools in the region drew their mascots' names from the local flora and fauna, whether antelopes, wildcats, farmers, eagles, and even watermelons-hence, the Rocky Ford High School Meloneers. The forest, rangeland and
mineral resources seem to appear and disappear at random in this area, and there have been bitter battles over the vast amounts of gas and oil that sit well below the surface.

While there was some controversy in 1983 about the Army's plan to move a training range out east of Trinidad, there was an equal amount of excitement. At that time, Trinidad's economy was in free fall following the recession of the 1970's and local coal mines were beginning to shut down. The national migration to cities in the $20^{\text {th }}$ century was hard on Trinidad and especially Las Animas County. During the forty-year period between 1940 and 1980, Las Animas County lost over half its population (Census.gov) and unemployment remained high in the early 1980's.

It was under these conditions that Trinidad and Las Animas County entered into an agreement with the Army regarding the establishment of the Piñon Canyon training range.

During Piñon Canyon's initial development, there was speculation within surrounding communities that military convoys would pass through the towns, exciting merchants and annoying a few citizens. The dreams that the Las Animas County business community pinned on the original expansion were big ones, with the potential of new jobs and soldiers stopping in Trinidad on their way to training.

But two things soon happened to dampen the dreams: first, the Army prohibited soldiers from stopping military convoys on their way to Piñon Canyon and second, the Army encouraged the State Highway Department to build a bridge and highway on the
north end of Trinidad, which prevented any military traffic from entering the city in the first place (Figure 1-3). Since the installation's inception, the only two related economic developments worth mentioning are the bridge to avoid Trinidad and the use of the hospital after a wind storm tore through a training exercise in 1989, injuring nearly 100 soldiers. The anticipated economic benefits never materialized for the business community or the ranchers. According to former U.S. Representative Marilyn Musgrave and John Salazar, Many of [the area's] ranchers dealt with the Army when the site was created. In the 1980's, the Army promised economic benefits for the towns surrounding the site because troops would do business in the area. However, the reality today is troops travel between Ft. Carson and Piñon Canyon in tight convoys and don't stop at local businesses (Marilyn Musgrave, John Salazar letter, Pueblo Chieftain, July 22, 2007.

A running joke among townsfolk is, "We were told the installation would be a bridge to economic development; instead, the only bridge was one built on the highway on the outskirts of Trinidad that enabled Army personnel to bypass the town entirely" (Elder, 2009)

The Army subsequently reneged on additional promises made to the communities when Piñon Canyon was carved out of the region in the early 1980s, including no live-fire exercises, payments in lieu of lost tax revenue, and no future expansion (Garrett and

Roper, 2006). Citizens who believed the project might help offset the economic downturn and the closure of area coal mines grew disappointed.

The economic downturn and steel market crash of the early 80's not only devastated Pueblo but left cities like Trinidad clinging to economic promises of all kinds. As time passed, small towns across Southern Colorado began to turn into ghost towns. The historical big brother city of Pueblo was too busy nursing its own wounds to help.


Figure 1-3. U.S. 350 Bypass and bridge connecting Interstate 25 with U.S. 350 north of Trinidad, Colorado, which routes military convoys past the town. Courtesy Google Maps.

So in 2006, when citizens heard the Army was considering expanding PCMS beyond its original boundaries, the news brought a lot of unpleasant memories to the surface. And when more details were leaked showing the Army had completed studies to acquire almost seven million acres in total, from I-25 to the Kansas
border and from Highway 50 south to the New Mexico and Oklahoma borders, it hit like a bombshell (Figure 1-4).

As before, the proposed expansion would require purchase and condemnation of a number of surrounding ranches, many of which have been passed down in the same families for multiple generations. Many Southern Coloradans feel the ranches are vital to the region's character and economy.

The plans caught the residents of Las Animas, Otero and Pueblo Counties off guard but this time, unlike the 1980s, the population mobilized quickly and immediately pushed back (Roper, 2006).

The Piñon Canyon opposition movement has now become something of a cause célèbre in the eyes of local citizens: a modern-day David and Goliath drama. In reality, though, it is a Goliath and Goliath drama, pitting two huge political interests against each other.

Area ranchers-who combine political might with the libertarianism that lies just under the surface of many Western communities-have put the Army on the defensive by tapping into the powerful Colorado Cattlemen's Association, Congress, and the agriculture industry.

PCMS turned into a public relations disaster for the Army. Because of leaked documents and other uncovered conflicts internal to the service, the Army has created its own Vietnamlike quagmire, with no idea of where to go and how to win. The Army is in danger of losing a valuable constituency in Southern

Colorado, with ranchers claiming they are living in a climate of fear: They are fearful of having land seized, fearful that land and water will be destroyed and wasted, fearful that the Army will come in and destroy their way of life.


Figure 1-4. Proposed land acquisition from $7^{\text {th }}$ Division Analysis of Alternatives Study, Piñon Canyon Maneuver Site, Colorado, May 2004 .

Despite locals' concerns, the Army says the plan to expand Piñon Canyon to over seven million acres was "never a realistic option or possibility" but rather the "brainchild of the Range Control folks who one day decided to put their wildest dreams on paper" (Department of the Army Interview, 2011) The study did, however, give traction to the idea of exploring the acquisition of around 400,000 acres. But it was the original narrative-the
report that over 17,000 citizens in Southeastern Colorado would be displaced-that took hold (Table 1-1). The Army lost control of its message, along with any momentum it had to acquire the desired land.

| Phase <br> \# | County | Private Land (estimate) | Public <br> Land (estimate) | Total Acres by Phase | Displaced Population (estimate) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1A | $\begin{array}{r} \text { Las } \\ \text { Animas } \end{array}$ | 79592 | 0 | 79592 | 150 |
| 1B | $\begin{array}{r} \text { Las } \\ \text { Animas } \end{array}$ | 35492 | 0 | 35492 | 67 |
| 2A | $\begin{array}{r} \text { Las } \\ \text { Animas } \end{array}$ | 131067 | 0 | 131067 | 247 |
|  | $\begin{array}{r} \text { Las } \\ \text { Animas } \end{array}$ | 29484 | 0 |  | 55 |
| 2B | Otero | 101407 | 179145 | 310036 | 934 |
| 3A | $\begin{array}{r} \text { Las } \\ \text { Animas } \end{array}$ | 54908 | 0 | 54908 | 109 |
| 3B | Las Animas | 198304 | 0 | 198304 | 374 |
| 4 | Las Animas | 420000 | 0 | 501337 | 792 |
|  | Otero | 81337 | 0 |  | 749 |
| 5 | Baca | 1637120 | 667161 | 5603592 | 4517 |
|  | Bent | 566240 | 0 |  | 1931 |
|  | $\begin{array}{r} \text { Las } \\ \text { Animas } \end{array}$ | 1578947 | 163150 |  | 2748 |
|  | Otero | 368174 | 0 |  | 2641 |
|  | Prowers | 622800 | 0 |  | 1949 |
|  | Totals | 5904872 | 1009456 | 6914328 | 17263 |

Table 1-1. $7^{\text {th }}$ Division estimated displaced population count, ( $7^{\text {th }}$ Division, Fort Carson) May 2004

Perhaps the most compelling aspect of the Piñon Canyon debate is the intergovernmental posturing and fighting. Not only are government administrations fighting each other at different levels, they are also fighting at their respective levels. The Pueblo County Board of Commissioners is vocal about its
opposition to the expansion of Piñon Canyon (Tucker, J., 2008)while the El Paso County Board of County Commissioners-the neighboring county to the north-favors the plan (Hisey, D., 2007) The Department of the Army is pushing the program while the Department of Agriculture is skeptical. Members of Congress are battling each other and even small towns are coming together to fight interests in Colorado Springs, the largest city in El Paso County. This has put the state government into a corner, as it struggles to support a large area of the state and its networked constituency against the second largest employer in the state of Colorado.

The issues and controversies surrounding the expansion have grown into a complex web of people, politics, policies, prejudices and power. This web connects actors from small places such as Branson, Hoehne, and Kim, Colorado to the august halls of the Pentagon. This network of government entities extends from City Hall in Trinidad to the County Courthouse in La Junta and the Capitol Building in Denver.

The controversy continues to be fluid. During the 15-day period between April 22 and May 6, 2009, two events gave both sides pause. On April 22 Keith Eastin, the Assistant Secretary of the Army, who had not made many friends in Southern Colorado and whose top priority had been expanding PCMS, announced his retirement. PCMS opponents took this as a sign they were winning. But on May 6, Scott McInnis, the former $3^{\text {rd }}$ District Congressman and likely Republican gubernatorial candidate, sent a letter to
then-Governor Bill Ritter urging him to veto legislation that would prevent the Army from buying any Colorado State Board land around Piñon Canyon (Bartles, Denver Post 2009). The tug of war continued.

Then, just a few weeks later, the Army officially canceled plans to add a fifth combat brigade to Fort Carson, eliminating 4,800 new jobs and jeopardizing hundreds of millions of dollars in new infrastructure (Denver Post)raising the ire of the Colorado Springs Business Community.

More recently, in a March 29, 2011 letter to Senators Michael Bennet and Mark Udall, Secretary of the Army John McHugh stated the Army has no plans to expand the boundaries of Piñon Canyon and has not requested any money for acquisition of private land for the next five years (Denver Post). At the same time, Senator Udall confirmed that Fort Carson will get an aviation brigade with about 2,700 soldiers and more than 100 helicopters (KKTV.com).

However, this has not resolved the Army's need for additional training ranges for its soldiers at Fort Carson, and it is difficult to say where this issue will head next. While the Army, the ranchers and the Branson School District may continue to battle each other, the problem is more likely to be addressed through collaboration.

Gifford Pinchot, the first chief of the U.S. Forest Service, offered two very relevant insights over a century ago. In a very utilitarian vein he said, "...where conflicting interests must be
reconciled, the question will always be decided from the standpoint of the greatest good of the greatest number in the long run" Pinchot, 1905) In more general advice to government leaders he stated, "Find out in advance what the public will stand for; if it is right and they won't stand for it, postpone the action and educate them" (Pinchot, 1905) The Army would have benefitted from studying Gifford Pinchot as the Service did not gauge public sentiment until well after its initial proposal. It also failed to heed subsequent congressional direction to do so and still has not undertaken the thorough education of the communities involved.

During times of financial hardship, the political
environment surrounding an issue that balances economic development against natural resources normally tilts the scale in favor of economic development. This is not necessarily the case in Colorado, though, where commitment to environmental issues runs deep. An excellent example is the 1976 Olympic Winter Games, awarded to Denver by the Olympic Committee. The landmark vote in November 1972 to authorize public expenditures needed to host the games wasn't even close, with 514,228 against and 350,964 for. A 59.4\% majority said they weren't willing to spend tax dollars to have the Games in their state, despite potential economic benefits (Sanko, 1999)

The intergovernmental landscape has Branson and the Army at opposite poles with several Municipal County, District, State, and Federal bureaucracies in between. The bureaucratic center of
mass is in the Colorado Springs/Pueblo area with the State of Colorado and its various agencies trying to clutch a middle ground.

The two sectors-agricultural and national defense-that are at the heart of the Piñon Canyon controversy are very powerful entities that cross social and political planes. This paper aims to give the reader a comprehensive understanding of the intergovernmental problem and the underlying drivers behind the polar bureaucracies, while applying these insights to a narrative and network framework for an understanding of the phenomena at play.

In Chapter 1, we have explored the history of the area and the related intergovernmental issues in depth. In chapter 2 , an analysis of the literature looks at Piñon Canyon and the different paths of analysis. Chapter 3, "A Different Case Study Path," brings the supporting structures of my theoretical framework together with what I learned from reviewing the literature.

Chapters 4, 5 and 6 will look at Piñon Canyon through the lenses of Narrative Analysis, Social Network Analysis and Agent Based Modeling with my findings in Chapter 7. Tying the finding back to the foundational and subject matter literature will show how modeling not only guides the analysis but opens a number of doors for further research.

## CHAPTER 2: LITERATURE REVIEW

## NETWORK CLASHES AND GOVERNING BY NEWTWORK

"When we try to pick out anything by itself, we find it hitched to everything else in the Universe."

John Muir
My First Summer in the Sierra, 1911

## Can Network Science help?

The literature review of this paper explore the potential of network science to assist in addressing the conflicting aims between the actors within the intergovernmental system surrounding the proposed expansion of the Piñon Canyon Maneuver Site. Using Network Science and Theory to further develop the case study, the relationships between the intergovernmental actors-federal, state, county, municipal-will be analyzed to discern the patterns of potential cooperation and conflict and where they exist; i.e., whether there can be mutually agreeable and successful models for collaboration or compromise.

The literature on the Piñon Canyon Maneuver Site Expansion referenced in this case study explores the narrative of the competing interests as well as the importance of network science on the environment, given the conflicting aims between the actors within the intergovernmental system. The literature for this study focuses on two areas:

1) Network theory and science as it relates to bureaucracies, foundational literature) and
2) Piñon Canyon as a stand-alone political issue. (Subject matter literature)

Public Administration case studies usually focus on sets of actors and competing interests. A particular individual, program or event is studied in depth for a defined period of time (Leedy and Ormrod, 2010), wherein the case study is really a study of a small world. All of the events and people in the small world are somehow connected. They are connected through what is known as a "small world network." A small world network demonstrates how certain subjects are connected through a winnowing of paths, out of thousands or even millions of other subjects, via the smallworld effect (Lewis, 2009). This small world becomes in essence the context for the case study. Network science, being visual mathematical studies of complex structures, helps administrators understand their properties at various points in time and space.

Instead of utilizing small world networks to study individual people, why not use small world networks to study the behaviors of and between large and small bureaucracies? Using Small World Networks and applying the study of relationships between intergovernmental actors-federal, state, county, municipal-results in better understanding of the patterns of potential cooperation and conflict and where they exist; i.e., whether there can be mutually agreeable and successful models for collaboration or compromise.

Two very important terms in network science are topography and topology. Topology is the mathematical study of links and
nodes and the virtual arrangement of these elements in a network and, more importantly, is concerned with those features of geometry which "remain unchanged after twisting, stretching or other deformations of a geometrical space" (Nicas, 2009). Topography is simply "the map" along with its shapes and features. This can be referred to as the terrain of the environment or, for this case study, the political terrain.

Mapping the topography of a case study, especially understanding the nodes in the middle, will provide models where political tipping points may be identified. Further, designing the topology as a quantitative geometric problem can help the Public Administration Professional develop a different perspective of political problems. Once the shapes of the objects involved are mapped one can understand the way they are put together. To appreciate political relationships in government across its varying levels and how those relationships connect and drive public policy, one must employ a scenario where governments and competing interests collide.

## Present state of scholarship related to the topic

A search via World-Cat and the Internet found several papers and works on military encroachment. There are limited articles and papers on military encroachment and federalism; however, none could be found on network theory, encroachment and intergovernmental relationships. As the Department of Defense changes force structure through operational tempo and
transformation, the potential for cities to encroach on military installations and vice versa will be high.

Issues facing the military and communities alike should be studied from varying points of view to minimize potential conflict. Since graphs are visual representations of social networks (Knoke, 2008), applying graphs to intergovernmental relationships provides the potential for such studies to be a significant contribution to scholarship.

Central to the case study is why and how networks become important in bureaucracies. Robert Atkinson (2003) states that, "In the networked world, government will shift from managing programs to guiding and funding networks". (p.15) In addition Koliba (2012) stresses that "Governance networks are distinguished from other forms of social networks because of the characteristic of network actors and the kinds of functions and collective actions they take on." (p. 71)

Networks allow the bureaucracy to have farther reach and provide an avenue for collaboration. Managers often work in environments where they find themselves facilitating and operating in multi-organizational networked arrangements to solve problems that can't be solved by a single organization (O'Leary, Gazley, McGuire, and Bingham, 2009 p. 1) and government innovators must shop for necessary resources to increase the reach of their networks (Goldsmith and Eggers, 2004 p. 34). Because of this reach and collaboration, networks can become complex very quickly.

Public managers are beginning to need periodic table-like and logarithmic charts to predict outcomes. While network management intersects quantitative and qualitative methods, the lines between the two become blurry. Agranoff and McGuire (2003) stated that network management offers an important class of collaborative management models, so that "Our understanding of network management is derived mainly from theoretically examining, rather than empirically cataloging, its tasks". (p.35) The theoretical examination may be nothing more than understanding the intergovernmental exchanges and where they arise. However, public managers must understand the environment as there may or may not be an important relationship between the conditions that cultivate networks and the places they are needed (Moore, 2009 p. 213).

Intergovernmental management through networks must be goal oriented as well, though the goal can change from one level to another or between rival agencies. Goldsmith and Eggers (2004) stress the importance of mission, strategy and determining what is delegated to the network in the first place as well as the dilemma of accountability and the hierarchy of responsibilities. For example, should the state pressure counties to follow its intentions? Paul Posner (2009) elaborates, "...the 'hidden hand' of government often at play in public service networks has frequently gone unheralded". (p. 89)

The "hidden hand" works in spite of barriers, and the reach of a government agency be may felt both where it is intended and
where it is not. An agency will limit itself if it is too inwardly focused and guards its turf, as explained by Snyder and Briggs (2004): "Conventional government bureaucracies-designed to solve stable problems for established constituencies through centrally managed programs and policies-are hampered by important limitations in this environment." (p. 172) The hidden hand also plays into Ronald Burr's structural hole theory of social networks as explained by Koliba (2012):
"Structural holes exist where ever there is a lack of tie between two or more relevant actors, making them somewhat ubiquitous. They are important to network managers when an opportunity exists to fill a hole by building links. (pp. 82-83)

Intergovernmental networks may be used to identify tipping points in pro-and-con intergovernmental issues like Piñon Canyon and encroachment, or other similar situations where agencies are forced to interact, such as with FEMA in the wake of an emergency. The follow-up question is how does an agency leverage its influence to get others to act? Examining management patterns may reveal more about organizational style as opposed to related inter-organizational collaboration. Managerial behavior can change as a result of a discriminative stimulus that occurs before the behavior (Manz and Sims, 1981) in contrast to learning by consequence, which many consider the prevailing method. The culture of an organization is critical to its ability to manage outside of its organization. According to Rachel

Fleishman (2009), "Although several different theories have been proposed to explain why organizations participate, there is no consensus on which motivations are most important and under what conditions some may be more salient than others." (p. 32) The link from networks and organizations to collaboration also presents an important link for public managers as "organizational structures, clientele characteristics, and environmental factors do make important differences in improving program outcomes" (Ryu and Rainy, 2009 p. 191).

When applying theory and science to public problems in order to understand phenomena a manager would have to look at an issue and see the situation to determine its relevance. Public managers need to understand the appropriate time and place to consider exploring networks to solve problems. The power of networked government lies in its pragmatism (Kettl, 2009 p. 1). Specifically, the manager would need to see certain conditions to move toward the direction of network analysis. Goldsmith with Kettl (in Moore, 2009) stated that conditions under which a network would develop include:
-Government's performance is glaring;
-The technical requirements for dealing with a problem and the institutional arrangements governing the social response are out of sync;
-Some features of a problem could best be attacked by a loosely coupled network rather than by a large hierarchical organization. (p. 213)

These are conditions that provide a good start and move to the engagement of partnerships to create networks and accomplish goals. Kamensky, Burlin, and Abramson (2004) state that, "there are certain preconditions that need to be present for networks and partnerships to be successful; Successful collaborative ventures are premised on the existence of trust, a mutual obligation to succeed, and the ability to build consensus." (p. 12)

In other words, there is the need to win hearts and minds as a precondition for moving policies forward, such as environmental initiatives or base expansions. There is also a momentum factor involved in policy management. Posner (2009) states that, "The criteria for assessing networks rest less on an ability to deliver specific outcomes and more on how networks encourage the formation and sustainability of positive interactions across the multiple players sharing the network (p. 238-239)." However, Eggers (2009) warns that to move to a network model, a major dilemma is that a hierarchical approach is easier than a networked approach. In addition, a hierarchal approach makes it easier to protect self-interests. Meyerson gives an example of individual states competing for their share of the economic pie. This also relates to the case for counties in the Piñon Canyon debate, as "The framers did not believe that altruism would govern commercial relations" (Meyerson, 2002 p. 115) .

In addition to the momentum of an issue, the sustainability of an issue also proceeds in relationship to the ability to reach out and touch others, no matter where they are. Agranoff (2003) notes that:

While not every observer would agree that institutions/ organizations have become quite so delinked it is clear that deep understanding of today's social relationships include multiple networks of relationships within and between social organizations, ranging for some people from local to global in scope. (p. 6)

When looking at the "delinked" the policies began to fall in the intergovernmental and inter-sector area. The authority chains become blurred in that neither federal nor state authorities have effective authority to control policy decisions (Waugh, 2009 p. 275). "Trying to determine each level of government role in intergovernmental relationships will help a public manager understand the framework and develop the appropriate skills rather than utilization of the traditional stovepipe approach" (Kamensky et al. 2004 p. 19).

The actors within the network structure and their influence on the network are yet another aspect to consider. As in the real world, certain individuals have power and influence. The connections and social structure can be studied to address the impact of smaller social structures and the dependence of one actor on others in that network. In other words, just as the mobs are important, the centers of influence should be identified.

Burke (1997) addresses the importance of centers of influence by stating,

> The primary focus of network exchange research is to increase our understanding of the distribution of power in exchange networks-networks of individuals, each of whom can exchange with selected others. Central to the concept of dependence is the idea that actors may have alternative sources for whatever resource they need. Thus, each actor exists within a network of other actors with resources, and the network structure (i.e., who can exchange with whom) determines the existence and number of alternative sources each actor has. (p.134)

This idea begs additional questions such as, who has the influence? Is there a way to identify the stakeholders and separate them from the center of influence?

In 1967 Adams tried to simplify this concept by applying some simple guidelines for characterizing closeness between groups. He stated that "The two basic structural divisions of the social network are, very simply, kin and non-kin." This was written in a time before Facebook and MySpace, but shows what may have been tendencies demonstrated in early social network research. While these ideas are clearly more social science, they demonstrate a few of the qualitative aspects of network theory.

## Network Theory

Understanding networks, intergovernmental relationships and frameworks is all tied to graphs. While trying to understand the
tug of war between the few against the many the research flow went from the politics, to the environment, to chemistry, to networks and then to, of all places, Tupperware-and the bureaucracies that surround and color the issue like a spaghettistained plastic bowl sitting in the cupboard.

A review of the literature on network theory should start in two places; first, the practical and second, the theoretical. While one can see networks nearly everywhere, the practical impact of networks can be best visualized by looking at Tupperware. Like competing governments, women competed against neighbors for the same market and leverage in the community. Growth of both depends on gaining the upper hand in competing networks within a community or small world.

Norman Squires conceptualized and implemented the "party plan method" of direct selling. He did this first at Fuller Brushes, then at Tupperware (Clarke, 1999). Later, Brownie Humphrey Wise mastered the method (Clarke, 1999) and the business world took notice of networks. In the $1950^{\prime} \mathrm{s}$, home-party selling was a new alternative to door-to-door cold selling and took advantage of women's social networks (Kahn-Leavitt, 2004). The principles were simple and Squires and Wise built a company that by 2008 produced over $\$ 2$ billion in sales and over $\$ 161$ million in profit-all built around network theory (Clark, 2009). Tupperware was built on networks. The direct sales were based upon "a particularly viable form of sales in geographical areas and social groupings with strong female networks and
kinship structures" (Clarke, 2009 p. 83). Today, many businesses such as cable television, Internet providers, and credit cards offer incentives for customers to sign up networks of friends. MySpace, Twitter, Linked-In and Facebook are just a few of the companies doing business based simply on the power and profusion of networks.

The review of the theoretical literature on networks should rightfully begin with Stanley Milgram. While at Harvard University, Milgram conducted experiments that studied the average number of "nodes" between people in social networks living in the United States; this later came to be associated with "Six Degrees of Separation". Milgram (1967) reported that "chains varied from two to ten intermediate acquaintances, with the median at five". While at the City University of New York, Milgram and Jeffery Travers of Harvard University expanded the research on the so-called "Small World Experiment" which "demonstrated the feasibility of the 'small world' technique, and took a step toward demonstrating, defining and measuring interconnectedness in a large society" (Travers and Milgram, 1969 p. 441). The research was groundbreaking at the time because it suggested that human society is a small world-type network characterized by short path lengths (Watts, D. J. and Strogatz S. H. 1998) Small worlds are central to network science and network theory not only for their explanation of how people are linked, but also the illustration of simple and quick expressways within what otherwise appears to be a chaotic population.

There are several mathematical functions and models for small world networks to explain information flow, connectivity, and dualities. Much of network theory surrounded the Internet or other communication technologies, such as phone and fax networks. In its modern genesis, network theory and systems theory were almost one and the same.

Network theory developed but remained only an interesting sidebar of social science research until 1998, when Duncan J. Watts and Steven Strogatz from Cornell University published the first network model showing the utility of the small world phenomenon and proposed an emergence process-called a generative procedure-for constructing small world networks (Lewis, 2009). The study demonstrated that networks created in nature and those that are man-made both have properties exhibited in the small world. Their article states, "Ordinarily, the connection topology is assumed to be either completely regular or completely random. But many biological, technological and social networks lie somewhere between these two extremes" (Watts and Strogatz, 1998 p. 440). The term "topology" is important to consider here because it refers to the network as a study of a shape that is continuous and able to morph beyond that of standard slope or bell-curve. The graph is no longer a representation of an idea or trend, but rather a road map of where actors live in a community. Watts and Strogatz (1998) go into great technical detail about the small world phenomenon and carefully explain the neighborhoods and other map-like features of their study. Once
beyond the technical aspects one can actually see the neighborhood they describe. For example, "The idealized construction above reveals the key role of short cuts. It suggests that the small-world phenomenon might be common in sparse networks with many vertices, as even a tiny fraction of short cuts would suffice" (p. 441). As with backstreets or an alley, the networks take on a lot of the topographic features of a community.

Are neighborhoods systems or networks? The reason to focus on networks and to differentiate networks from systems may center on systems being an assemblage of nodes and related devices concerned with the same function whereas networks may or may not be concerned with the same function, though they are still connected. Watts (1999) wrote in another study that: The motivation for the small-world problem comes from social networks, but it turns out to be a much more general effect that arises under quite weak conditions in large, sparse, partly ordered, and partly random networks. Its existence is not predicted in current network theories yet it seems likely to arise in a wide variety of real networks, especially in social biological and technical systems. One consequence of this result that it is highly likely that the phenomenon exists in the real social world-a notion only supported by limited data but consistent with anecdotal experience. (p. 524)

Network science, especially regarding how it relates to small worlds, falls somewhere between building a circuit board and predicting the weather. The effect of partly ordered and partly random networks is important to consider because as the science develops it is not important whether there will be firm laws governing networks but rather the use of the science to help predict the governing of networks.

As networks are non-linear and three dimensional, the mathematical dynamics involved in explaining them are highly complex. Mapping small world networks into geometric forms that remain constant under transformations is difficult because relationships within networks change. For example, one person may become acquainted with another through a common friend and develop a bond stronger than the original acquaintance. The political characteristics of relationships are reflected in cliques and other variables. A study could be focused on parents and offspring as easily as it could between professions. Beshers and Laumann (1967) explain:

In sociometric research the links between individuals, such
as friendship or communication, may be viewed as defining a network. If we group the individuals by some characteristic, such as occupation, then we may assign weights to the links among these groups. We can define paths over these weighted links and distributions of paths as before. We can also seek to infer gaps among the occupations from these distributions. One is that the influence of time lags
varies substantially; for example, one's best friends today may stem from recent acquaintances. One's neighbor, one's wife, and one's father are traded in less easily in approximately that order and are therefore results of prior social factors. This influence of time lags is complicated by the other difficulty-the changing occupational distributions that result from economic structural effects. (p. 234)

Strogatz (2001) further addresses the problems of such non-linear dynamics by stating:

The speculations that these architectures are dynamically advantageous (for example, more synchronizable or errortolerant) need to be sharpened, then confirmed or refuted mathematically for specific examples. Other ripe topics include the design of self-healing networks, and the relationships among optimization principles, network growth rules and network topology. In the longer run, network thinking will become essential to all branches of science as we struggle to interpret the data pouring in from neurobiology, genomics, ecology, finance and the World-Wide Web. (p. 274)

When networks take on fractal properties the mathematics also becomes trickier. Briggs (1992) explains this fractal nature and its impact, saying "Nonlinear systems-including many dynamical systems and all chaotic systems-are extremely sensitive to small
changes, because the feedback to their inextricable parts can amplify small changes into large results." (p. 19) Briggs goes on to say that network thinking, " (p. 30)," will be handicapped by the stability of networks or lack thereof. Strogatz (2004) adds that in these network phenomena that ultimately networks, like nature, organize themselves "in fractals, when an arbitrary small piece of a complex shape is a microcosm of the whole. (p. 255)" Meyerson (2002) also describes government as a fractal when saying: "Our federalist system can be seen as a kind of fractal structure. A picture of the governing design for the nation would reveal, rather than a simple government structure, the selfsimilar pattern associated with fractals." (p. 195)

Tichy, Tushman and Fombrun (1979) discuss the instability of networks over time asking, "Why do they change, and by how much...and how frequently do they change under different sets of conditions?" (p. 507) Political networks can be more challenging due to the shifting sands of loyalty and voters being simply temperamental. As fractals are found in nature, networks are held together in patterns and bonds. The planet is held together in a process of bonding and people can be looked at within the same environment. Bonds, along with links and nodes, vary in strength. Political sands as a metaphor are really nothing more than shifting dunes. Homogeneity, especially political homogeneity, is difficult to express as a mathematical validity to describe the trends of the few representing the many. In the analysis of networks which combines the data from several places in time and
space, the varying sets of conditions become even more important. Eulau and Siegel (1981) discuss the problems of finding the current that pushed group thought or even mob mentality: The political homogeneity of face-to-face relationships has been noted often, but its etiology is little understood. There are several hypotheses as to why it is that people in contact with each other come to think and act alike, the best known being the "social absorption" and the "mutual attraction" hypotheses. The absorption hypothesis holds that people in frequent and continuing contact feel "pressured" to behave as others in the social situation do, regardless of whether such behavior is consensually validated or imposed, and that, as a result, they conform to social norms. The attraction hypothesis holds that people who are "similar" are attracted to each other and, in seeking each other out, come to form relationships which as a result are homogeneous. The first set holds that people in contact with each other come to share political orientations either because they are "socially absorbed" into their interpersonal context or because they are "mutually attracted" because of common characteristics in the first place. The second set holds that people specifying the partisan identification of their primary zone do so either because they "project" their own identification on others or "introject" the identification of their primary zone associates. Because of the small
sample and sub-samples involved, all of the "findings," though theoretically plausible, can only be considered suggestive for replication with much larger samples. (p. 507)

These factors are important to consider because it may be easy to explain trends without actual scientific data. Studying the fractal nature of networks-where connectivity reaches from the group to individual levels-may better explain the trends in relationships along with their orientations.

Newman (2003) expands on the problems of data collection and the problem of going between levels of data: Traditional social network studies often suffer from problems of inaccuracy, subjectivity, and small sample size. With the exception of a few ingenious indirect studies such as Milgram's, data collection is usually carried out by querying participants directly using questionnaires or interviews. Such methods are labor-intensive and therefore limit the size of the network that can be observed. Survey data are, moreover, influenced by subjective biases on the part of respondents; how one respondent defines a friend for example could be quite different from how another does. (p. 6)

Looking at the players within the network and the sheer amount of data involved can cripple research-this is advice that must be heeded.

Returning to the original theme that networks represent something real, how would they be described in nature? Can network science be used to not only accurately predict but build a mathematical model? Miller and Page (2007) addressed the properties of social connections and how they can be represented: While networks-and, more importantly, the interactions among agents they facilitate-have long been considered by social scientists, especially sociologists, a wave of recent interest has been prompted by computational and mathematical models created by complex system researchers. Rather than focusing on any particular network, this new work considers the generic properties of social connections.

The nature of networks is also critical to study. If one were to look at a network in terms of a living organism, then in many ways network science parallels chemistry. Linus Pauling (1998) explains that structure factors and symmetry are important in chemistry because they help explain the atomic arrangement. This is very true for networks. He explains that structural features of molecules and crystals are governed by considerations of symmetry in this example: "A three bladed propeller can be rotated about its axis through $120^{\circ}$ and it appears unchanged from its original condition, if the three blades are identical...." (p. 869)

In science, elements form chemical bonds to form compounds that become stable in nature. The links and nodes are represented by molecules, smaller atoms and bonds. Once the atoms are
connected they stack. As one would find in chemical bonds, there is a process responsible for the attractive interactions between nodes and links-in the case of chemistry, atoms and molecules that form compounds; in the case of social science or network theory, forming centers of influence. The stacking of atoms and molecules side by side to build a crystal results in a second type of symmetry, called translation symmetry or lattice symmetry (Pauling, 1998) because it builds itself upon a ladder in varying directions like networks would. There should also be similar laws governing the energy required to build and break them, and the energy needed to hold them together.

Molecular geometry, network science, spatial geometry and molecular structure provide the three-dimensional arrangement needed to study the properties in science. Albert-László Barabási (2003) also makes this connection to chemistry by comparing social networks to chemical reactions. While researching molecular databases at the Argonne National Laboratory and studying whether complex networks have small world properties, he noted that, "cells are small worlds with three degrees of separation". (p. 186) Barabási also touches on another important concept of fractal structure that underlies the design of models such as the Internet. Transitioning these concepts from public administration to chemistry and other sciences is not too difficult; as with bonds that bring chemicals together, there are also many bonds in the government world.

## Piñon Canyon

This study about a military base, its expansion, and its complex set of actors began on an entirely different idea. It started with an idea about a battle between two counties, El Paso County, Colorado (population estimate: 622,858) and Las Animas County, Colorado (population estimate: 17,353), related to the proposed expansion. That then begged a question; What kind of job did the Army do in preparing a collaborative environment to ensure the success of the project? As stated in a September 2009 National Academy of Public Administration report, "The Military Departments are responsible for cooperative planning at the state and local level. This includes submitting plans for changes on installations that could affect neighboring areas to the affected local community and state governments for comment" under Executive Order 12372 (National Academy of Public Administration [NAPA], 2009).

Across the nation, encroachment and Base Realignment and Closure (BRAC) issues are linked to a vast network of intergovernmental issues ranging from the economic to the environmental. These issues often take center stage and challenge all levels of government to adapt.

Developing a case study where the topography can be viewed to better understand the morphing topology of public policies through many levels of government-given the conflicting aims between the actors within the intergovernmental system and where other objectives and interests come into play-provides the basis
for this dissertation. Piñon Canyon is more than a place on a map; it is place in a network that stretches from the Pentagon to hundreds of dusty ranches on the eastern plains of Colorado.

The merit of the Piñon Canyon expansion itself is a peripheral issue and the study of who is right or wrong will not be addressed. The research focuses only on the relationships and mapping the topography to better understand the topology or, said in simpler terms, who is on the map at any given time and where do they move based upon the conditions?

The public policy issues that address Piñon Canyon are fluid and evolving over time. Although highly visible in the State of Colorado, Piñon Canyon does not have a lengthy bibliographic history outside of media and government reports. Most of the literature that is meaningful, containing current scientific theories, and timely is more related to general encroachment and BRAC issues and found in government publications, reports and scholarly papers; there are limited books to be found. The literature addressing the intergovernmental system and the networks in which they reside dominates the literature.

The research regarding network theory is very important to Piñon Canyon Maneuver Site and is central to the research. Goldsmith and Eggers (2004) state that, "The ancient Greeks, for example, outsourced tax collection to tax farmers and leased out the state mines to concessionaires." (p. 9) This concept is important because the Army could lease land within the confines of the PCMS to cattle ranchers and other interests to ensure the
success of the expansion. In addition, Goldsmith and Eggers address the selection of partners and determining which may be the best for government. The critical idea that governments choose which other levels of government to partner with will also determine who benefits most from the expansion.

Scholarly work on military geography is limited but is addressed in publications that focus on encroachment and development. Rachael Woodward (2004) states that, "The issue of relativism in environmental impact should be recognized. Military activities are not alone in shaping the environment; intensive agriculture and heavy industry, for example also have profound and deleterious impacts on the natural environment." (p. 74)

Probably the best source regarding the anthropological and historical background of Piñon Canyon comes from Dr. Bonnie Clark at the University of Denver. Dr. Clark has developed an extensive Website and research on the issue. In addition to the controversy and the anthropological relationship between people and the land, she has also brought a clear historical perspective on the settling of the land itself:

In the 1820s, Americanos showed up, many traveling along the Santa Fe trail, which ran from the Mississippi River to Santa Fe and then to Mexico City. The Santa Fe Trail runs parallel to the Purgatory River and traveling the trail was an important way that both Hispanic and Anglos learned about the region. In the mid-19th Century this area was part of the territory conquered by the $U S$ in the Mexican-

American war, but throughout the rest of that century Hispanics continued to move north into the region, as Anglos began to join them from north and east. Settlers from both groups largely supported themselves through raising livestock, which remains the backbone of the region's economy. As historian Sarah Deutsch so distinctly put it, here the Hispanic and Anglo frontiers didn't meet, they interlocked. From an archaeological and anthropological viewpoint, you couldn't ask for a richer data set for exploring issues of ethnic and national identity, place-based knowledge, and the creation of multicultural community (Clark, 2007 p. 3-4).

Clark also teamed up with Minette Church to discuss the more specific anthropological aspects of the area. The southeastern plains of the area lie between two branches of the Santa Fe Trail's Mountain Route and Cimarron Cut-off traveled for centuries by the Native American tribes that roamed the land. The value of the region is explained:

The addition of approximately 418,600 acres to the Piñon Canyon Maneuver Site will affect an estimated 5,900 prehistoric sites. Roughly one-third of these sites are along canyons of the Purgatoire and Apishapa rivers - areas that stand in stark contrast to the relatively featureless intervening grasslands. High prehistoric site densities have been encountered along the canyons; common site types include open artifact scatters, rock art panels, rock
shelters, substantial circular habitation structures, tipi rings, and lithic procurement locations. Evidence suggests an intensive occupation between A.D. 100 and 1450 by peoples who manufactured pottery, grew corn, and foraged. Few sites have been excavated (Church and Clark, 2007).

Much of the scholarly work done on the Piñon Canyon Maneuver Site involves geological, anthropological, and environmental papers. For example, Shaw and Diersing (1989) conducted a study on the use of tracked vehicles that "will become a basis for determining the amount of use an area can receive" which points to the fragility of the area's ecosystem. These discussions are supported by several other related journal articles including by Larry Loendorf (2005) of New Mexico State University, who states: "Some of the drawings in Piñon Canyon provide new insight into how hunter-gatherers survived ...some drawings on boulders that show animals and nets". (NMSU Website, 2005) The boulders with this art are near a basalt dike, and Loendorf believes the hunters drove animals into nets placed over a break in this dike. While similar rock art has been found in Utah, the Piñon Canyon site is the farthest east in which such drawings have been found. (Loendorf 2005)

In a tangential relationship to the Piñon Canyon debate, there is the interaction between governments and the BRAC process. Brian Kehl (2003) asserts politics was not removed from the BRAC process as exemplified by Fort Carson, which is becoming a winner under BRAC as a direct result of the political process.

There only exists a small body of research on the politics of BRAC in general. Optimal Stationing of Army Forces (OSAF) is an optimization-based decision-support model adopted by the Army to support its 2005 BRAC proposal, written by Dell, Ewing, and Tarantino (2008). The research states that as a result of BRAC: By 2011 the Army will close 400 installations (13
installations that primarily house active-duty soldiers, 176 Army Reserve centers, and 211 National Guard armories) and realign 56 active units. These BRAC actions will impact 43 states, cost more than $\$ 13$ billion to implement, and generate an expected 20-year net savings of $\$ 7.6$ billion. (Dell, Ewing, and Tarantino (2008) p 421).

Ewing, Tarantino and Parnell also produced studies that looked into the best decision methods in working BRAC and forcematrix issues. The Piñon Canyon site is ultimately a site to train soldiers. The Pentagon must come up with a long-term idea of what types of war it will be fighting and in what types of circumstances. The analysis into the decision-making process to acquire these training areas is also important to consider. They state that, "Recent world events have not altered the need to transform the military infrastructure to meet future needs. In fact, these recent events have exacerbated the need to rapidly accomplish transformation and reshaping (Ewing et al., 2005). Both the Army and Naval War Colleges offer studies on BRAC, as well. At the Army War College, Lathroum-then Acting Undersecretary of Defense for Acquisition-looked at the BRAC
process and studied how the best decision-making process could be brought to the table. At Fort Carson, for example, if other installations were to close, what would be the best method for handling a surge of troops and resources in a limited area?

The Secretary of Defense provided seven BRAC principles to guide the armed services in the development of their recommendations. These principles were: Recruit and Train; Quality of Life; Organize; Equip; Supply, Service, \& Maintain; Deploy \& Employ (Operational); and Intelligence. Lathroum (2006) explains the process in greater detail:

With the above analytic framework in place, the analytic process addressed data collection through the establishment of recommendations. The first step in this process was the collection of capacity data that provided current, maximum and surge capacity of installations and DOD facilities. This data helped to identify the domain in which each analytical team operated. The second step in the process was the collection and analysis of military value data. Military value was quantified by applying attributes, weights, and metrics to the set of questions derived from the four military value selection criteria. Military judgment was not precluded from this portion of the analysis. This was achieved through the qualitative and subjective assessment of the application of the BRAC Principles through the military value criteria. (Lathroum, 2006, p. 8)

At the Naval War College, Mackubin (2008) discusses a critical link to BRAC: Transformation. Mackubin's argument is worth noting because he brings into the discussion of modern operational art the concept of "Time/Space/Forces" and how the tug of war between what is needed and what is wanted is not only a political struggle internal to the Pentagon, but also a struggle of ideas and direction:

They (the Pentagon) will be able to distribute forces more widely by increasing information sharing via a secure network that provides actionable information at all levels of command. This, in turn, will create conditions for increased speed of command and opportunities for selfcoordination across battle-space. Critics claim that this proves the Pentagon does in fact seek a technological El Dorado. (p. 65)

It should also not be overlooked that the Piñon Canyon debate, while focusing on the military, is also an agriculture and natural resources debate. The Piñon Canyon Maneuver Site contains many occurrences of plant Species of Special Concern and DoD Species at Risk, some of which represent the highest quality locations known for these species in the world (Neid, Decker, Handwerk, Panjabi and Spackman, 2007). Many agriculture scientists are concerned about the impact of training on the land and the military's response to how it is impacted: Military land managers' informal reasons for either allowing or not allowing grazing seem to have little
empirical basis. They could allow grazing to maintain savanna and grassland and reduce the risk of fire, thus benefiting military training. The use of grazing animals to maintain vegetative structure is often preferred over the use of more intensive means such as herbicides, mowing, or burning. Grazing also brings in funds to support management, creates a stronger tie with the local community, and allows local residents to benefit from the land, all of which add support for grazing as a management tool. Research has not examined the training and grazing interaction (Guretzky and Anderson, 2006, p.51).

A bloc of the review of literature must be devoted to the large number of Policy Documents that are the government reports, letters, and studies done at all levels. Drawing on the review and analysis of the problem, policy documents become critical to understanding the problem and its context.

The Government Accountability Office document, GAO-09-171 Defense Infrastructure, Additional Information Is Needed to Better Explain the Proposed 100,000-Acre Expansion of the Piñon Canyon Maneuver Site January 2009 is the primary GAO document used by the expansion opposition to attack the Army's methodology. In addition, Government Accountability Office document, GAO-09-32, Army's Approach for Acquiring Land Is Not Guided by Up-to-Date Strategic Plan or Always Communicated Effectively, criticizes the Army's approach to dealing with the public on issues of dealing
with land owners and their represented governments. Specific to Piñon Canyon:

> Army officials and community groups said that the Army did not adequately explain its reasoning for the proposed expansion at Piñon Canyon. In this case, the public at times relied on rumors and leaked documents. These information sources often did not provide clear, complete, or accurate data. Without a consistent and clear DoD-wide practice that both addresses concerns about early disclosure of land acquisitions and permits some flexibility to engage the public, the Army and other services are likely to experience communication problems similar to those encountered at Piñon Canyon (p.1). These reports were very detailed in illustrating the see when new training ranges or land ready for use to meet training requirements were necessary to be communicated.

As part of the relevant literature with respect to agriculture, the words of conservationist Aldo Leopold should be kept in mind-especially as they address the key issue of economics. Leopold (1939) stated, "Conservation implies selfexpression in the landscape, rather than blind compliance with economic dogma" (p. 316). Much of what advances or delays any environmental initiative is based on commerce. This discussion can also correlate to National Defense. Thomas Barnett (2004) explains in The Pentagon's New Map, the U.S. has spent the last 30 years "moving progressively away from
warfare against states or even blocs of states and toward a new era of warfare against individuals" (p. 92). In the political spectrum, governments, whether Branson or the Army are now waging war against individual bureaucracies.

Finally, within the narrative analysis, the application of social hermeneutics to the Piñon Canyon story makes the case study more manageable by interpreting and providing context for what was learned through interviews. Fischer (1993) states that "All of us commonly use stories to make and support arguments, and the close relationship between close stories and arguments is embedded in the English Language" (p. 167).

In addition, Fischer explains that "the narrative form can offer a powerful tool to an analyst seeking a hermeneutic explanation" (p. 172). This process is essential to giving the intergovernmental struggle a coherent plot.

As the literature gives a framework to build the case study, it becomes clear that bridging the history and the theory will be an important part of the methodology. The process of telling a story/drawing a picture/animating the picture will be a useful addition to achieving this goal.

## CHAPTER 3: METHODS

## A DIFFERENT CASE STUDY PATH: Narrative Policy Analysis/Social Network Analysis/Agent Based Models

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"There are two general approaches to the study of social behavior: Collect observational, survey, or other forms of data and analyze them, possibly by estimating a model; or begin from a theoretical understanding of certain social behavior, build a model of it, then simulate its dynamics to gain a better understanding of the complexity of a seemingly simple social system."
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## -Tim F. Liao <br> Department of Sociology <br> University of Illinois

To clarify the role and purpose of research, an explanation is in order. Network science will be applied to a public administration problem to determine if models can be used to understand what happens in a controversial environment. The network design will fit into the whole research process by framing a scenario that can be analyzed using limited data with predictive variables or comprehensive data. It is important to emphasize the value of combining explanatory, exploratory and descriptive research in a complex problem.

The use of multiple research strategies in this case study is to triangulate methodologies that address a complicated intergovernmental problem. The research utilizes descriptive, explanatory and exploratory research to build the case study. In short:

Narrative Policy Analysis explains the "story".

Descriptive research illustrates the problem, context, and situation and demonstrates, to a degree, the ripple effect of bureaucracies and how each action by one entity has wider implications across the scope of the issue.

Social Network Analysis explains the "environment". Explanatory research defines the phenomena at play, by utilizing observational data and studying models to determine if the problem matches reality.

Agent Based Modeling draws a picture of the "environment"

Exploratory research provides preliminary work and direction for further research in determining and designing hybrid models to address intergovernmental issues.

The descriptive component of the research explores, "What does an intergovernmental issue look like between bureaucracies?" and how does their influence shift and morph within the story. Though there is exploration in the Narrative Policy Analysis it deals more with meta-narratives and non-stories as public policy phenomena. Quantitative measurement can be applied to the network models but not the narrative analysis. The Social Network Analysis can be achieved both quantitatively and qualitatively through graphs and matrices. The exploration phase of the research in Social Network Analysis does not analyze the mean, median, or mode, but is be more concerned with direction, value
(power), and frequency. It also explores in a narrative sense the suitability of one model over another. The Agent Based Model is the primary exploratory descriptive research component.

## Research Design and Multimethodology

Using a Benzene molecule, and its properties in nature, it was easy to see the parallels between social and molecular networks. In chemistry links are molecules formed by protons, neutrons and electrons that make them more stable. Benzene is an organic chemical compound with a cyclic nature. It is composed of 6 carbon atoms in a ring, with 1 hydrogen atom attached to each carbon atom. This concept is the formulation of the theoretical framework.

## Theoretical Framework



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Figure 3-1 Theoretical Framework

Surrounding the nucleus of Piñon Canyon, are three shared bonds of analysis. Narrative policy analysis feeds the social
network analysis, which gives birth to a model, which in turn tells a new story in this analytic cycle. Surrounding this nucleus are the networks of other governments, which can be bonded to other entities.

Bureaucracies associated with PCMS compose a limited universe. There are a over 100 bureaucracies and elected officials that have an interest in Piñon Canyon. Since this study focuses on bureaucracies, most elected officials were eliminated and a total of 51 organizations were identified. Some elected officials such as county commissioners and school board members could be and were used to represent the body (county government, school district, etc.) as a whole. The 51 identified were narrowed to 46 by eliminating five whose interests were equal to another stakeholder-such as the Department of Defense land and resource management office, which is equivalent to the Department of the Army land and resource management office-and an additional six whose interests were duplicated by another agency and/or unrealistically outside of the scope of the expansion. That brought the final stakeholder count to 40 . No comprehensive list of stakeholders existed to provide the basis for a sampling frame; therefore much of the stakeholder list was obtained through interviews and research. Because the bureaucracies are of varying size and influence, identifying the comprehensive list was necessary to find a starting point.

This study interviewed a number of stakeholders. Many bureaucracies either did not wish to participate or simply did
not return multiple calls or requests by letter. Interviewing was conducted between January and September 2011. In addition to the primary stakeholders several Subject Matter Experts were consulted as secondary sources.

Secondary data collection was done through interviews with journalists, academic researchers based in Colorado, other political offices such as that of the lieutenant governor, and by research over the Internet. Internet research provided a wealth of information simply by searching "Piñon Canyon" and "Selected Agency" to collect an agency's public position in addition to public meeting minutes on the issue.

This chapter describes the research design of the sample and the methodology used to collect and weight the data. As network science evolves, especially as applied to the social sciences, the hypothesis presented in this paper is designed to explore the merits and utility of the craft to address complicated issues. It may also be applied to the necessity of incorporating network science in public administration curricula in colleges and universities.

## Descriptive Research and Categories

The main characteristic of this research is the attempt to control the variables. Since there is a known universe the situation is explained as comprehensively as possible (Chapter 1). There is the ability to introduce variables for the descriptive research by adjusting for possible unknown scenarios. The survey (Appendix A) utilized was not intended to be the sole instrument
to explain why and how. The survey studied the dynamics of relationships contributing to the narrative analysis and identifying centers of influence, rather than with cause-effect relationships. The cause-effect relationships happen more in the political arena than in the day-to-day bureaucratic environment.

Explanation of the phenomenon is tied to the categories of the agents in the research. (Tongia and Wilson, 2007) While a great deal of the research deals with topography and topology another phenomena must be addressed, and that is typology. Typology, which is the result of the classification of things according to their characteristics, is necessary to ensure that the agents studied are suitable for the research. Classification of agents involved in the phenomena demonstrates that similar organizations are studied. For example, elected officials used in this research would skew the classification and the results-so like agents are studied with similar agents. The models will reflect an epistemological process that explores the relationships between the agents and resulting phenomena.

It is very important to understand the decision to focus on the bureaucracies and not elected officials. The decision was based on four reasons:

## 1) Elected officials can change every election and the transitory nature of politicians makes them less useful as research subjects.

2) The bureaucracies are entrenched. The requirements to drive the policies of the elected officials have three subpossibilities:
A) Bureaucrats support elected officials;
B) Bureaucrats oppose elected officials but enforce political policy;
or
C) Bureaucrats oppose elected officials and interfere with political policy.
3) Political positions taken by elected officials are readily available, making collective political influence not a variable, but a variable zone with a different set of values.
4) Typology of agents.
```
    When constructing research the value of classification
becomes evident. The Piñon Canyon scenario is comprised of
stakeholders that are individuals, families, clubs, activists,
and lobbyists. Some non-governmental agencies, such as the
Cattlemen and Opposition group, are included because their
membership is comprised of representatives of other stakeholders;
therefore, they can be considered shadow bureaucracies.
    The products of the classification, i.e. the classes, are
also called types. Szostak (2004) designed a simple typology
theory-5W Who, What, Why, Where, When-to classify theories which
will be used here to classify agents. Utilizing the theory to
address the stakeholders in the Piñon Canyon issue can be
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identified as PI(f)-Political Bureaucracies(Szostak)-and presented as:

Who are the agents? The agents for this study are
bureaucracies and non-governmental agencies that exert influence on public policy. Their actions are shaped in the arena of public opinion and politics.

What do the agents do? The agents exert influence on each other and the general public. They have a constituency and answer to higher political powers. Their influence is not duplicated by another group and is autonomous.

Why do the agents do this? The agent serves a constituency and is dependent on its own self-interest. The agent has a customer base that is local and whose primary support is local. It is in the agent's nature to network with another agent if it serves its own purpose.

Where does the process occur? The process occurs in the political and public arenas.

When does the process occur? For this research, the process occurs from any starting point in time where a significant announcement was made or leaked by the Army. After a period of two years the issue tends to reach equilibrium. Also this research is covering the period from 2007-2010.

How close the network process comes to an ideal standard is gauged to the case study. The case study utilizing the network science is meant to be a practical approach to measure the effectiveness of utilizing network science and as model for decision making.

## Explanatory Research

As a multimethodology case, Piñon Canyon has a built-in need to investigate a problem that has not been clearly defined. The explanatory research of this dissertation focuses on the why questions. For example, the research can be used to measure the power or influence of characters over time. In dealing with an intergovernmental struggle it is important to develop explanations about why governments conflict, why governments align with some agents but not others, and if there are centers of influence that can be centers of compromise. The goal of the Piñon Canyon explanatory research is to answer these questions.

In order for the reader to appreciate the complexities of a public administration problem and to supplement the exploratory and descriptive research, this case study looks to identify what actual phenomenon is occurring. This is accomplished through the Agent-Based Model. The utility of the explanatory research would then be revealed in the utility of the model.

The objective of the exploratory research is to construct a clear connection and foundation behind network theory in an intergovernmental scenario. Not only will this section of the
research explain the phenomenon at play, it drives the development of the model testing hypothesis and validity of its predictions. This section of the research advances the theories at play utilizing proved and existing methods.

## Working Hypotheses and Exploratory research

The case study design incorporates three methods of analysis sharing the same research question. The hypotheses raise the guiding questions to this paper and drive the methods. The guiding questions are as follows:

1) Can network theory/network science be applied to the study of intergovernmental relationships?
2) Can network science be applied to "close the gap" between competing interests in the intergovernmental arena? 3) What does a network between competing governments look like?
3) How can the network theories of "Connectivity, Exchange, and Locality" be applied to a public administration problem?

The research problem is as follows:
How does the expansion of the Piñon Canyon Maneuver Site illustrate the rivalry between levels of government, given the potentially conflicting aims between the U.S. Army and its readiness mission in the intergovernmental system in which it resides, where competing objectives and interests come into play? In short, Can new methods be used effectively to study the political relationships in government, across its varying levels, and how those relationships connect and drive Public Policy?

The first sub problem is to determine and identify any centers of influence between two components of government that rival each other. This can be at differing levels, such as federal and state, or at the same level, such as between counties. In utilizing a multimethodology approach, this sub problem will be addressed through narrative analysis of the descriptive research.

The second sub problem is to apply existing models to map the competing interests involved with the Piñon Canyon Maneuver Site. The topography can be transferred to a working model of the network. In utilizing a multimethodology approach this sub problem will be addressed through social network analysis of the explanatory research.

The third sub problem is to construct a model, then map, analyze, and interpret the collected data to evaluate the application of the theory against reality. Utilizing network science will answer how intergovernmental systems work when confronted with a problem. In utilizing a multimethodology approach this sub problem will be addressed through the application of Agent-Based Modeling and a simulation of the model in order to determine if the model reflects reality as result of exploratory research.

## Formal Hypotheses and Exploration/Prediction

Three hypotheses are presented for this research. They are:

1) Small World Networks have value in identifying centers
of influence and their potential actors in the pro/con
intergovernmental issues surrounding Piñon Canyon encroachment.
2) Network theory application may be a more suitable method of discerning whether there can be mutually agreeable and successful models for collaboration or compromise, or not.
3) Applying Small World Networks to Piñon Canyon results in better understanding of the patterns of potential cooperation and conflict, and where they exist.

The hypotheses tie to the concept of Morton Grodzin's "tipping points" and how they impact "Marble-Cake governance" (Grodzin, 1966). Introducing the dynamic of networks into these ideas also helps explain how the separation of national and state functions as well as those governments devolved from the state interact.

As the hypotheses presented are also tied primarily to network science, it is extremely important to understand the methodologies that were used to arrive at the final models. First is the use of Narrative Policy Analysis.

## Methodology

The multimethodology used in this case study is actually designed to be universal in nature. Narrative Policy Analysis bridges the humanities and social sciences; Social Network Analysis focuses on a social science applied to a political
science; Agent-Based Modeling bridges social sciences with math and the natural sciences.

To summarize the methodology:
Narrative Policy Analysis: Explains the "story"
Social Network Analysis: Draws a picture of the
"environment"
Agent Based Modeling: Animates the "environment"
The research strategy employed by this paper will build the case study combining the multimethods approach of Policy Narrative Analysis and Social Network Analysis with statistical topography built on Agent-Based Modeling. According to Gray (2004), "The case study method is ideal when a 'how' or 'why' question is being asked about a contemporary set of events over which the researcher has no control.

The case study compares and contrasts the positions of the Army and, in this study, the Branson School District-representing the first bureaucratic defensive line of the ranchers-and the bureaucracies between them on the explicit issue, as well as a variety of intersecting interests including: land; minerals; tax bases; economic sacrifice; burden sharing; agriculture necessity; national security; patriotism; the wars in Afghanistan and Iraq; effectiveness of military training and tactics; and the relationship between the military and agricultural economic engines.

The case study also introduces a revolutionary and vivid depiction of the relationships between bureaucrats and
bureaucracies with respect to a complex and controversial issue. Simple qualitative or quantitative research cannot present a clear picture of an issue as complex as Piñon Canyon.

The methodological path in the study of Piñon Canyon presents a number of challenges and opportunities. It became critical to develop an approach that does not limit the explanation of the phenomena surrounding what lies between the ranchers and the Army, yet at the same time is not so complicated that the research is meaningless or confusing to build upon. The approach should also tie the variables together simply and clearly. Spreading the variables-in this case agents-across methods achieves a result where different actors can be analyzed based on the type of phenomena they are engaged in.

Presenting Piñon Canyon in the context of a case study "illuminates a decision or set of decisions: why they were taken, how they were implemented, and with what result" (Schramm, 1971) and "investigates a contemporary phenomenon in depth and within its real life context, especially when the boundaries between the phenomenon and context are not clearly evident" (Yin, 2009). In the case of this study, decisions will be analyzed in the context of their relationships with other decision makers.

Unfortunately, complicated issues require complicated approaches. The first step in understanding a complicated issue is to step back, take a look at the issue and describe what it is. Narrative Policy Analysis is a good tool to address such
circumstances. According to Roe (1994), "Narrative Policy analysis is designed to analyze especially complex issues".

The objective of Narrative Policy Analysis is twofold: "first to underscore the important and necessary role that policy narratives have in public policy everywhere and, second, to establish ... analytical approaches that allow one to reformulate intractable policy problems in ways that make them more amenable to conventional policy approaches" (Roe, 1994).

By utilizing this approach, the "story" of the ranchers and the Army is able to be compared and contrasted to the correlating "meta- narratives" and any "non-stories" that are driving the two entities in opposite directions. The narrative will also help stress the sequence of events against the competing ideas presented by both sides.

Once the stories are understood, the next approach is to understand what type of environment the ranchers and Army are competing in. The use of Social Network Analysis simplifies the bureaucracies into actors, explaining each party's relations and exploring possible models from the simple to the complex. As each "actor" is tied to a "relation," a map can be drawn to understand the context of the entire controversy.

Statistical topography is the simple collection of data and mapping the results in time and space. The maps are usually complicated but can be understood with computerized assistance. Agent-Based Modeling is, according to Gilbert (2008), "a computational social science," creating a simplified
representation of social reality. Models will be used to theorize potential outcomes to political issues dependent on the strengths of relationships found in the study.

In addition, the role of network theory will be applied to study the relationships between governments and entities. Various models will be used to demonstrate and predict the outcome and direction of government strategies.

Networks are usually thought of as simple nodes and links on a graph paper. In research, points on a graph often represent real people, but the sterile dots that eventually morph into lines quickly diminish the individuality of people (or in this case, bureaucracies) represented by the dots, and lock otherwise fluid governments and their policies into a fixed point in space. Network science in many ways attempts to distinguish those points in space to demonstrate the strength between each one and its neighbors, along with information regarding the primary environment. Networks, whether they are in the form of grids, railroads, computers or especially people, bring order to chaos.

Academic researchers widely think of social networks and small world networks in terms of relationships among actors that demonstrate ongoing problems. This is accurate but the substantive nature of relationships among governments is a complex problem when unlocking the nature of the public sector. As stated in the forward of this paper:

In order for anyone to appreciate the political
relationships in government across its varying levels and
how those relationships connect, drive, and shape public policy it is important to understand that bureaucracies are a lot like people...they can be stubborn, finicky, aggressive, lazy, and most of all, have either a long memory or no memory at all. In a sense, this research treats bureaucracies like people with all of the dynamics that make us humans.

Individuals with competing interests form various political relationships which form various political bodies, administrations and/or governments. Network science is a method that can be utilized to study these complex designs and patterns and to treat each government as an individual, rather than a group of political players.

The exercise can be then applied and analyzed in either direction to larger, more complex political systems, or down to a few competing individuals. The dynamic behavior of administrations and governments, and their relationships with other levels, can be utilized not only to explain simple directional trends but also the relationships that drive and influence the trends.

## Specific focus and design of the project

The design that will lay the basis for the research will incorporate three different methods focused on identifying factors that may contribute to a political condition or administrative solution (pro/con). By comparing subjects-the various government entities involved-through the extensive

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collection of data, conclusions can be drawn to generalize the behavior of governmental networks. Utilizing a research method where political processes meet network process is important, especially for the quantitative aspects of the research. The purpose of using mixed methods is to quantify data in a qualitative investigation (Leedy and Ormrod, 2010, 97). The narrative of Piñon Canyon will be qualitative and conclusions based on quantitative models.

In order to "quantify data for a qualitative investigation", a sample population and the subsequent analytic techniques need is identified. For this case, the population was collected via a hybrid of "convenience" and "purposive" sampling. Convenience sampling takes subjects readily available and purposive samples are chosen for a specific purpose (Leedy and Ormrod, 2010). Since the subjects sample will represent their particular component of government (county, state, city, agency, etc.) random sampling would be counter-productive.

The survey instrument itself focuses on questions of influence and power. By surveying these variables, centers of influence can be identified and mapped on a graph. Once these centers are identified, further analysis will be conducted to relate the qualitative aspects to the quantitative aspects.

Because of political sensitivity surrounding some of the interviewees, some requested non-attribution, which was granted. There were also a number of "secondary sources" interviewed, such
as newspaper reporters and elected officials not in the bureaucratic chain of research.

The quantitative aspects to be collected and measured are focused on the principles of "Connectivity, Exchange, and Locality" (Committee on Network Science for Future Army Applications, 2005) in that:

Connectivity: Strength and volume
Exchange: Number of links and relationships and to whom

Locality: Where in time and space do they exist?

The generation of models in the case study will help drive the theories and hypotheses surrounding the guiding questions of the research. The methods of measurement for the quantitative aspects will focus on the collected data via interviews and available reports. The experimental control will focus specifically on relationships between groups and not opinions on the subject matter. Modeling of the data will be done through standard statistical, mathematical and geometric principles and utilizing applied Agent-Based models.

Agent-Based Modeling is a computational method that enables researchers to create, analyze, and experiment with models composed of agents within an environment (Gilbert, 2008). Using this method it will be possible to see how the agents interact based on the environment or virtual world. The method will play an important role in studying the relationship and strengths between the actors in the case study. Using Agent-Based Modeling
with the data will help determine if the hypotheses presented for this research actually follow the dynamics of small world networks.

Graphs are important tools for communicating data. In the simplest terms, graphs are illustrative models of mathematical events used to visualize the relations between objects. Graphs are tools to show the user what the math is doing, or the mathematical explanation of what is being learned. Graphs are used to show and to aid understanding.

In order to drive policy there has to be some degree of political harmony. Varying levels of governments have to synchronize their efforts across each other to drive public policy and solve public problems. At every level of governmentfrom federal to municipal-competing interests collide. These collisions, as in chemistry and physics, drive issues in varying directions while forming bonds between the colliding bodies. In the intergovernmental system in which governments reside, network science can be applied with graph theory to study if solutions and momentum can explain the behaviors of both large and small bureaucracies. Using network science and theory to study the relationships between policies and the intergovernmental actors in the federal, state, county and municipal arenas, along with resultant patterns of potential cooperation and conflict, helps discern whether there can be mutually agreeable and successful models for political and civic success-or not.

An example of using graph and network science to study the political and administrative relevance will help bring clarity to its purpose and importance. Say an individual wanted to depict how much various cities spent on park improvements and the number of parks. Utilizing a simple scatter diagram representing values of two variables under study one can visualize the data (Figure 3-1) and get a simple picture of park improvement spending among cities.


Figure 3-2. A simple picture of park improvement spending. Taking another step, the data can be drawn into a single line to represent the trend among cities for how much they spend on park improvements (Figure 3-2). These data are a little more helpful in that the data are now simpler to read and understand; yet with respect to complex issues these single lines can lead to over-simplification.


Figure 3-3. Graphs using a single line to show the trend in park spending; the one on the right may be too simplified to be useful.

Rather than utilizing the traditional method to explain the trend of the data, the scatter diagram representing values of two variables under study can be looked at another way, to see if perhaps anything can be learned by looking at cities as county seats and which counties they belong to (Figure 3-3). While there may be little to be learned without knowing all of the variables, there is a lot to be seen on the surface of such a graph and visualization of the network.


Figure 3-4. A graph showing park spending trend data by city and county may enhance understanding of the issue.

The above graph is a just a simple example based on a hypothetical scenario, but the lesson for the analyst is that there are other simple ways to express information and navigate around data. Applying this science to public administration can be quite useful. As network science emerges as a field, the tools that public managers have at their disposal are vast and, thanks to technology, powerful. The field is maturing at a rapid pace in a time of exploding technological capabilities. Navigating a graph without technology versus with technology is similar to navigating with a sextant versus a global positioning device.

This is an important concept to remember: as with all statistics that make generalizations about populations, graphs are used to drive certain points home. The problem with graphs as with any statistical exercise is that they can be used to exaggerate as easily as they can be used to explain. Hence graphs are simply a visual means of communication. Because graphs may have many flaws, the scientific use of these graphs to explain networks must have detailed information in order not to mislead the reader or researcher.
"Networks are graphs that represent something real," states Ted Lewis (2009) in his text Network Science. To take this idea one step further is to look at not only what is real, but what is true. As the historian Shelby Foote once noted, "Facts are the bare bones from which the truth is made". Graphs can indeed show what is real but do they always show what is true?

Finding a case study to apply network science in an intergovernmental environment is a complicated task in itself. Governments often turn and twist to maneuver political gain. Under federalism, especially, the dance is never the same. If network science is really "a science" it shouldn't matter which case study is used; however, the complexity of the case may demonstrate how useful it is at other levels. The case study in question should be chaotic enough to require investigation to understand the order behind it. In short, there should be conflicting issues and conflicting governments; conflicting values and conflicting lifestyles; conflicting ends and conflicting means.

Piñon Canyon, while having a large number of stakeholders at various levels, is by no means unique. There are countless public policy disputes that are equally or even more complicated. Piñon Canyon provides an excellent scenario because it illustrates what any bureaucracy from Branson, Colorado and Washington D.C. will do and will fail to do.

## CHAPTER 4: NARRATIVE ANALYSIS

"Talk is cheap, and so is criticism"
-Emery Roe
Narrative Policy Analysis Theory and Practice
(Duke University Press, 1994, p.145)

The first sub problem is to determine and identify any centers of influence between two components of government that rival each other. This can be at differing levels, such as federal and state, or at the same level, such as between counties. In utilizing a multi-methodology approach this sub problem will be addressed through Narrative Analysis. Emery Roe (1994) suggests that Narrative Analysis is beneficial when ...public policy issues have become so uncertain, complex, and polarized-their empirical, political, legal, and bureaucratic merits unknown, not agreed upon, or both-that the only things left to examine are the different stories policymakers and their critics use to articulate and make sense of the uncertainty, complexity, and polarization (P. $3)$.

Explaining policy analysis through narrative techniques connects the "perception of the agents" to the "administrative problem" and gives the researcher the ability to control the variables; or, in this case, tie the content (message or story) to the agents. In this narrative, the agents are competing levels of government: the U.S. Army, and other public entities-such as the Branson School Board-representing the interests of local ranchers.

A narrative is nothing more than a collection of stories along a chain of events. Some narratives take on the role of master narratives that are embedded in the culture while others take on the role of sub narratives or "the story behind the story." The Army's master narrative, outlined in full below, has to do with ensuring the national defense by training soldiers to fight, win and return home alive. The ranchers' master narrative, or counter story, has to do with defending their way of life.

The narrative of the Army as a whole is framed in a 235year succession of stories from Valley Forge to the Civil War, World War I, World War II, Korea, through Vietnam, to the contemporary campaigns in Southwest Asia. The narrative of the Branson School District as a whole is tied to the pioneers, oneroom school houses, Goodnight-Loving, the railroads, and through its children to the future. Each agent hopes its story will drive public opinion and make it clear that the storyteller is working in the nation's or the community's best interest.

It is also important to ascertain at various points in the narrative who is telling or narrating the agents' stories, as surrogates sometimes have a role to play.

Finally, there is the metanarrative, which results from a comparison of the opposing stories. It is hoped that through such comparisons common ground might emerge, to enable movement "on issues that were dead in the water in their older agendas" (Roe, 1994, p. 52).

Roe's (1994) four basic steps to narrative policy analysis can thus be summarized as follows:

1. Define the story and identify the narrative policy.
2. Identify other narratives that do not conform or run counter to the dominant policy narrative.
3. Compare the two sets of narratives in order to generate a metanarrative "told" by the comparison.
4. Determine how the metanarrative recasts the problem in a way to make it more amenable (pp. 3-4).

From this point on in the chapter and throughout the Narrative Analysis, the reader will be introduced to each stakeholder. This process will help the reader understand the centers of influence that are highlighted later in the Social Network Analysis and the building of the model. The terms Army and Department of the Army are used interchangeably and both refer to the U.S. Army at large, headquartered at the Pentagon; Fort Carson is used to indicate the garrison commander at the installation in Colorado Springs, Colorado.
I. Define the story and identify the narrative policy.

Army policy drove the initiative to expand Piñon Canyon as well as the related storyline, which goes like this:

As the Vietnam War was winding down in the $1970^{\prime} \mathrm{s}$, the Army began a peacetime transition from fighting to training. The Cold War with the Soviet Union was still in full swing and contingencies were also being planned for the next war. The generation of officers who had fought in World War II was
retiring fast, so lessons learned from the jungles of Vietnam and the hills of Korea were dominant.

The Army needed to place its pieces on the training and doctrinal chessboard. The dynamics of conventional war were changing; technology combined with greater lethality in new weapons platforms meant smaller forces could fight across increasing large swaths of land. A modern Army brigade can cover an area equivalent to that covered by a much bigger World War II Division (3-4 brigades plus 6-8 support battalions), so more room is needed to maneuver in training. Because of its wide-open spaces and for other reasons, Fort Carson, Colorado became a strategic location. A comprehensive study determined that the installation needed to expand by one-to-two hundred thousand acres as the result of additional Department of the Army requirements placed on the post.

Fort Carson is primarily in El Paso County and extends into northern Pueblo County. It is bordered by the City of Colorado Springs to the north and by the Rocky Mountains to the west. These immutable facts led the Army to look in the direction of the two remaining compass points; i.e., south and east. Directly to the east of Fort Carson are Interstate 25 and Fountain Creek, two major obstacles to contiguous growth. Colorado Governor Richard Lamm, who had established a reputation as a strong environmentalist, was confronted with the expansion of Fort Carson during his time in office. He was advised by the state's
agricultural industry, and appointed a committee to review the training requirements.

The City of Pueblo, a major political force in the State of Colorado, was at the time the third most populous city in the state. Pueblo had built its fortunes as a blue collar "Steel City". While Denver may be the capital of Colorado, Pueblo is the capital of Southern Colorado. It is the economic, political, and educational center in that quarter of the state.

In the preceding decade, Pueblo was the second most populous city behind Denver but was eclipsed by an explosion of military growth in Colorado Springs. This caused some resentment in Pueblo. So when the Army's first initiative in response to the study proposed extending the Fort Carson installation immediately south to Lake Pueblo and U.S. Highway 50 , it was met with strong resistance. It was in this climate that the Army was forced to look elsewhere.

Additional options were pursued, such as the Pueblo Army Depot. Ultimately, the area east of the ghost town of Thatcher in Las Animas County emerged as the most promising alternative. Renamed Piñon Canyon, the initial site was planned for 245,000 to 250,000 acres. Roughly half of the needed area was acquired through the condemnation of private-mostly ranch-lands and the Army completed purchase of the additional land in 1983. Training began on site in 1985.

For the next several years the amount of training at Piñon Canyon continued to grow, with the most intensive training
occurring between 1990 and 1998. Then training subsided once the wars in Southwest Asia began in 2003, as a significant number of units were deployed overseas.

In 2004, as the entrance of militias and militant groups marked the spring fighting in Iraq, the Integrated Training Area Management (ITAM) Office for the 7th Division's G-3 (Operations Office) at Fort Carson prepared a new report centering on the potential acquisition of training lands adjacent to the Piñon Canyon site. Officials believed that, although loosely drawn, the plan had strategic merit, in light of Army transformation efforts mandating additional training space for more maneuverable forces, and further restrictions on operations and training at Fort Carson due to encroachment. (The policy section below offers evidence for this rationale.)

Over the course of several months, elements of the plan gained a following within Fort Carson but also generated some dissension. Before long-and prior to any consultation with citizens, local governments, or the State of Colorado-portions of the plan were selectively leaked. The leaked material included a map suggesting the Army sought to annex seven million acres of land adjoining the PCMS.

The Army dismissed the document as nothing more than planners "putting their wildest dreams on paper," but the seven-million-acre storyline-rather than the critical need for land to train soldiers-was the one that stuck in people's minds. Although the Army subsequently scaled back its proposal, to over 418,000
acres to, most recently, just over 100,000 acres, its backtracking has failed to eliminate the earlier impression of an attempted federal land grab.

For the most part, the Army has told its own story, without the aid of the military-industrial establishment of Colorado Springs or other likely supporters. As the initiative continued to lose momentum, the Army's messaging shifted from its intended storyline about the need for training to meet its national defense mission and protect soldiers' lives, to castigating the citizenry of Southeastern Colorado as anti-Army and antipatriotic. This shift served to drive the federal and local governments even farther apart.

## The Policy

As noted above, there are two major drivers for the expansion of Piñon Canyon, both of which relate to training. The drivers are transformation and encroachment.

The Army's current transformation policy has its genesis in a concept called AirLand Battle. AirLand Battle was the framework that formed the basis of the Army's war-fighting doctrine against the Soviet Union until its collapse in 1991, as well as during the First Gulf War. AirLand Battle replaced the aging World War II tactics and emphasized coordination between land, air and naval forces to create a fluid battle space that would paralyze superior forces by taking out logistical and supply arteries. To get a mental picture AirLand Battle, think of the American Eagle
injuring the Soviet Bear by air and then devouring the helpless force on the ground once it was paralyzed.

As noted, changes in lethality and distance brought by advances in military technology also had strategic implications for AirLand Battle doctrine. As a result, the Army is finalizing Army Training Transformation and converting all active and Reserve component units to Infantry Brigade Combat Teams (IBCT). An IBCT is entirely self-contained with combat and support units, and can be deployed alone as a single force. The teams also act as rapidly deployable modular forces, more able to adapt to a wide variety of combat situations.

This doctrine envisions land and air units working in harmony, and requires a lot more training space than was needed in the past. In total, according to the Army, the ideal doctrinal maneuver box for an IBCT is approximately 113,000 acres (TC 25-1 Training Land, U.S. Army, 2004a).

The Army has defined training needs for the Piñon Canyon Maneuver Site as:

Full Spectrum of Support

Realistic Training

Dominant Land Forces

Night Training

Terrain

Lessons Learned

Live Fire Ranges (U.S. Army PCMS Website 2011)

These needs relate to the narrative and stakeholders as follows:

## Full Spectrum of Support

Full spectrum of support operations primarily impact environmental groups and government agencies such as the U.S. Forest Service, the Colorado Division of Wildlife and the Colorado Department of Natural Resources. The three primary types full spectrum of support training operations identified by Fort Carson are Peace Support and Stability Operations, Low-intensity Conflict, and High-intensity Conflict.

Peace support and stability operations, or Military Operations Other than War (MOOTW), are operations that involve nation building and humanitarian aid. Such training operations tend to require an urban landscape and limited use of open range. Use of training ranges tends not to harm the environment or wildlife. Noise and use of weapons is minimized though the use of power generation equipment is widespread.

Low-intensity conflict operations can be categorized as counter-insurgency or police actions against a lightly armed force. Such training operations involve extensive use of motorized vehicles and can call for limited use of ordnance. There may be some impact on wildlife and natural resources, especially if the training is of long duration.

High-intensity conflict training operations simulate largescale battlefield engagements against an equally equipped opposing force, such as a North Korean, Chinese, or Soviet (Russian)-type threat. Such exercises would certainly have the
attention of the Department of Natural Resources, Division of Wildlife, U.S. Forest Service, and local governments' emergency responders to combat wildfires or casualties from accidents.

## Realistic Training

Realistic training, simulating a battlefield environment, impacts surrounding areas with dust and noise. Area ranchers would be concerned about the impact on livestock grazing nearby. Environmental and pollution issues would impact primarily Las Animas and Baca counties.

## Dominant land forces

The ability to cover a large area is critical for realistic training. Depending on the type of and location of the training, the impact outside of the area could be minimal. Use of dominant land forces primarily impacts ranchers with livestock in the area.

## Night Training

Colorado Springs and Pueblo are sources of light pollution affecting the main post of Fort Carson. At the Piñon Canyon site, though, the site is remote and possesses excellent dark skies for training at night. The cities of Rocky Ford, La Junta, Trinidad, and Walsenburg, though nearer to Piñon Canyon, display a softer horizon glow than the cities of Pueblo and Colorado Springs which are 50-90 miles away. Night training on the installation involves the occasional use of flares and flood lights, disrupting wildlife and livestock.

## Terrain

The land around Piñon Canyon does indeed offer a variety of terrain on which to train, from rolling hills to steep canyons. In combination with the mountainous terrain of Fort Carson, the site gives the Army lots of options to choose from. As with mixed training uses, the Department of Natural Resources, Division of Wildlife, Forest Service, and Colorado State Historic Preservation are all concerned with impacts on the terrain. Lessons Learned

As the Army's experiences from Iraq and Afghanistan are cataloged and put to the test in training scenarios, high-tech intelligence gathering, Special Forces operations, and small unit tactics are now also considered critical to future mission success. The lessons learned provide soldiers with experience to prepare them for situations they may encounter in the operational environment.

## Live Fire Ranges

The evolution of combat experience drove the requirement for expeditionary forces capable of sustained operations. Enemies in the current wars in Southwest Asia are quite different from those in most previous wars. The elusive combatants in Iraq and Afghanistan find refuge in villages or remote areas, forcing units such as the brigades stationed at Fort Carson to rely more on technology and quick reaction than the concept of mass troops. The advent of technology has in some ways turned Carl von Clausewitz's Principles of War on their heads. Army Officers sometimes use the acronym "MOOSE MUSS" to remember Maneuver,

Objective, Offensive, Security, Economy of Forces, Mass, Unity of Command, Surprise, and Simplicity. As technology becomes a force multiplier (affecting mass), the actual forces or "boots on the ground" find themselves stretched thin mopping up the battle space.

Fort Carson has four IBCTs under the $4^{\text {th }}$ Infantry Division, plus attached and supporting units. If each brigade had six maneuver boxes-its own maneuver box, plus one for attached units, and an "at rest" maneuver box to allow each ecosystem to rehabilitate over time-the space needed would equal 678,000 acres. That means the Army would require more than 400,000 additional acres at Piñon Canyon to meet its needs. Following the outcry over the report suggesting the Army wanted seven million acres, the service in 2006 floated a proposal for 418,000 acres to be added to Piñon Canyon's 235,806 acres, for a total training area of 653,806 acres. This was also in addition to Fort Carson's 137,300 acres, the use of which is limited due to proximity of civilian interests along its fence lines.

The main post at Fort Carson is quickly becoming encroached upon by both Pueblo and Colorado Springs. In a 2009 National Academy of Public Administration report, Fort Carson was featured as an example of an installation with major encroachment issues (National Academy of Public Administration, 2009). Since World War II, the population history of Colorado Springs and Pueblo from the Census Bureau is:

| Year | Colo Spgs Pop | Pueblo Pop |
| :---: | :---: | :---: |
| 1940 | 36,789 | 52,162 |
| 1950 | 45,472 | 63,685 |
| 1960 | 70,194 | 91,181 |
| 1970 | 135,060 | 97,453 |
| 1980 | 214,914 | 101,686 |
| 1990 | 281,140 | 98,640 |
| 2000 | 360,890 | 102,121 |
| 2010 | 416,427 | 106,595 |

As shown, Colorado Springs surpassed Pueblo in population during the 1960's and in fewer than 50 years, has become nearly four times the size of its more southerly neighbor. The growth in Colorado Springs is directly correlated with the increase in military missions based in El Paso County. The only major military employer in Pueblo County, the Pueblo Chemical Depot missile maintenance facility, lost most of its missions in the 1970s. Today, it stores left over chemical munitions in several hundred earthen igloos on the site.

1956


1999
Figure 4-1. Graphics showing the expanding populations and land mass of Pueblo, Colorado Springs and Fort Carson, Colorado, from 1956 to 1999. Source: Strengthening National Defense: Countering Encroachment through Military-Community Collaboration, 2009, National Academy of Public Administration.

The National Academy (2009) identified 12 encroachment
challenges. Impacts on the main installation of Fort Carson and surrounding communities are clear and can be summarized as:

## (1) Create intense noise that extends into communities

The major maneuver units at Fort Carson are considered "Modular Brigades" that consist of an assortment of Infantry, Calvary, Field Artillery, Aviation, and Armor (Tank) units. These units are known to be extremely loud in combat and in training. Their major purpose is to either break fortified areas or simply blow them up. A single unit can be heard miles away in Pueblo.

Colorado Springs borders Fort Carson to the north and noise often echoes off the mountains of the Colorado Front Range, Cheyenne Mountain and the foot hills of Pikes Peak.

## (2) Increase risks of airplane crashes or exposure to unexploded ordnance

Training for war employs a lot of scenarios that involve aircraft. For communities next to a military or commercial airport, there is risk. When ordnance is added to the equation, the risk factor naturally increases. People do not want to live with such risk. Colorado Springs is known to have unstable air for aircraft, due to the elevation and thermals that rise off the sparsely vegetative ecosystem that dominates the area.

## (3) Contaminate the environment and damage ecosystems

Use of large equipment over a limited terrain will cause damage to the environment through a variety of causes such as erosion, fuel spills, deforestation, and litter. This damage can quickly contaminate or harm nearby lands and waterways. The threat of surface runoff to aquifers in Colorado Springs is a major concern. , . The Fountain Creek which flows into the Arkansas River in Pueblo could be significantly threatened.

## (4) Endanger protected species

The use of munitions, heavy equipment, and concentrations of bivouacked troops drive animals, insects, and vegetation from their natural habitat and invite replacement species that can be harmful and invasive. The Front Range of Colorado is known to be prone to wildfires and dust storms. Fort Carson and Colorado

Springs also reside in a state with an activist environmental movement.

## (5) Stress on public infrastructure and services

The double-edge of the sword of a large military presence in Colorado Springs is the stress on the infrastructure. The economy of Colorado Springs is based primarily on military installations. The military, aerospace and electronics industries employ one-fifth of the work force. The infrastructure, especially around the installation, is stressed. This is especially noticeable in the shortage of water and urban sprawl. Further, the cost of living in Colorado Springs has historically been between 5-8\% higher than in Pueblo (http://www.city-data.com/city/Colorado-Springs-Colorado.html).

## (6) Generate citizen complaints

Because Colorado Springs has historically been a military community, the number of citizen complaints has been relatively low. As the community diversifies and becomes larger, more groups with opposition to the military are starting to gain traction. Such opposition was reflected in the 2008 election of local peace activist Dennis Apuan, to Colorado Legislative House District 17, which encompasses portions of southwestern Colorado Springs and the Fort Carson installation. The opposite of military encroachment is civilian encroachment. Civilian communities' impact on Fort Cason can be characterized as:
(1) Expand development or other activities in ways that constrict the use of military training areas

The Interstate25 corridor between Colorado Springs and Pueblo is beginning to build up and over the past five years a 24,000-acre development known as "Pueblo Springs Ranch" is being developed north of the city and directly east of Fort Carson. The development is designed to accommodate growth and projects a 50year growth plan.


Figure 4-2. Map showing planned 24,000-acre residential development at Pueblo Springs Ranch, east of Fort Carson. Source Pueblo Chieftain

## (2) Permit development that can present obstacles to low-flying aircraft

As mentioned above, the altitude of Colorado Springs can
create several hazards for aircraft. This does not mean that
there would be no aviation training at this altitude. It would mean that training should take place elsewhere. Related to the Piñon Canyon issue is the Air force's planned expansion of training flights across the state (Pueblo Chieftain, 2011)
(3) Interfere with night-time training through light pollution

Colorado Springs has grown considerably since Fort Carson was established. Since military units need to train in both urban and non-urban environments, light pollution has become a major training obstacle at main post.
(4) Degrade electronic navigation and communication frequencies used by the military

Interference and limitations to the use of electronics at Fort Carson come not only from the surrounding communities but from the density of surrounding sister military installations. Cheyenne Mountain, Peterson Air Force Base and Schriever Air Force Base are all heavy users of electronic (especially hightech) communications platforms.

## (5) Fail to support needed public infrastructure for DoD activities

Colorado Springs has so far maintained strong support of infrastructure for Fort Carson; the city of Pueblo remains more of a question. As the training demands on the installation grow, Pueblo will have a huge say in the future of the main post. (6) Through development, force the migration of endangered species onto military property

The development of surrounding areas not only impacts endangered species but other wildlife, as well, such as deer and ducks looking for water and habitat. Development pushes these animals onto local military reservations with more open space. North of Fort Carson at the Air Force Academy, natural resources specialists work to manage a herd of deer through annual hunting seasons. These policies are in place to keep the herd thinned because of traffic and health hazards.

The Army believes all of this is mounting evidence of dramatically reduced opportunities for training at Fort Carson main post and a dramatically increasing need for more land at PCMS on which to train large units.

## II. Identify other narratives that do not conform or run counter to the dominant policy narrative.

The ranchers' master narrative consists of three parts-a counter story, a non-story, and a non-story critique-told through a number of storytellers, including the Branson School Board, the Colorado Cattlemen's Association, the Piñon Canyon Expansion Opposition Coalition (PCEOC), and a group known as Not One More Acre (NOMA).

## The Counter Story

The potential for negative economic outcomes in communities in the path of the proposed expansion, including the town of Branson, forms the core of the counter story.

The storyline is that expansion of the PCMS would have devastating effects on the economy of Southern Colorado and these
effects would ripple throughout the state. Most especially, the Army's purchase or condemnation of private lands would take value out of a massive portion of the state, by precipitating losses in both agricultural production and tax payments (property and income) to local governments.

According to the narrative, the impact on the City of Pueblo would be more devastating than the drawdown of the steel mills in the 1970s, as numerous financial and economic ties to Southeastern Colorado would disappear. While some economic benefit might accrue to Colorado Springs from a more stable future for the Army at Fort Carson, little benefit would trickle down to Pueblo and the local economy there would soon crumble. Once Colorado Springs becomes the economic hub, Pueblo would become Colorado's Detroit.

Citizens are led to expect a decrease in fees collected by the Colorado Land Board, which leases land in each county to generate funds for education; the decrease or loss of said fees, would affect educational opportunity for students across Colorado. It is this line of reasoning that compelled the Branson School Board to correspond with the Pentagon, and to take the Army to task for failing to consult with the community regarding the proposed expansion of PCMS.

Counter story narrators offer Hoehne School District (RE-3) as "Exhibit $A$ " in their defense. The town of Hoehne sits 32 miles west and north of Branson and about 20 miles west of PCMS. The school district received the lowest grade in Colorado's state
financial audit released in August 2011. According to the Pueblo Chieftain, Hoehne's woes stem from overspending and plummeting property-tax revenue to the Hoehne School District; revenue fell by $\$ 211,000$-about $6 \%$ of the district's operating budget-in Fiscal Year 2010 alone. Superintendent Christine Barela said "declining property values and delinquent property tax payments combined to reach that sum" (Chieftain, 2011). The tax base means a lot to small rural school districts.

In September 1983, Hoehne School District (then designated R-3) Superintendent Dennis Trump initially rejected a check for \$114,157.47 from the Army, meant to offset the liability arising from "said reduction of the school district's tax base due to land acquisition" (Trump Letter, 1983). The said "land acquisition" was to establish the PCMS. Details were later ironed out and the school district accepted the money on 47 different properties in its district (Las Animas County Tax Records, 1981 Tax Schedule). The 47 properties combined to 208,170.69 acres, purchased for $\$ 26,527,067.87$, or about $\$ 127$ per acre (Piñon Canyon Acquisition Data, courtesy of the Dept. of the Army). Branson promises to be less cooperative than Hoehne was.

The counter story is, in part, a retelling of cautionary tales from the creation of PCMS in the early 1980s. The insinuation is: the Army lied to you before and they will again, if that's what it takes to get your land. According to Dr. Grady Grissom, a Princeton-and-Stanford educated partner in Rancho Largo Cattle Company, headquartered in Walsenburg, Colorado, "the
citizens of Southern Colorado were essentially bulldozed by the Department of Defense in 1983" (Grissom, 2011).

These comments from the Piñon Canyon Expansion Opposition Coalition Website (2011), which refer to the current expansion proposal, underscore this theme:

The Piñon Canyon expansion has been going through the planning process for the last eight years, but people living in Southeastern Colorado didn't have a clue that the Army was planning to "sustain" Fort Carson by seizing their land and forcing them from their homes.

This seems to put forth a clear message that the Army is not interested in people, but only in people's land.

Reading into the master narratives of the Army, one acquires a solid understanding of the arguments for expansion. For example, having the ability to recognize the significance of how large a training box is necessary to properly train a brigade, allows the question to be answered with simple arithmetic. The reader is also made aware that the military-civilian encroachment issue around the City of Colorado Springs impacts tens of thousands of people, something that must be resolved. The message becomes difficult to follow when counter stories paint the Army's narrative not as a story, but as a conspiracy. The ranchers have, in fact, hijacked the narrative; in turn, the Army's primary and secondary arguments have gone off course.

## The Non Story

There are several non-stories associated with Piñon Canyon. The Army's suggestion that the ranchers of Southern Colorado lack patriotism could be considered one of these, yet it is void of
meaning from an analytical point of view. Problem statements that are joined for form larger narratives are an example of such a non-story. These groups of stories form a chain of cause-andeffect relationships that spiral from one participant and problem to another problem with another participant, which in turn is creating a new problem with a third participant, and the chain continues on indefinitely.

The suggestion that the expansion will force the relocation of thousands of people shifts the narrative from the counter story to the non-story. The non-story highlights the integrity of individual ranchers and families, and their deep roots in the land-these are values which resonate in the state's centennial farming and ranching communities.

The assertion that ranch families will be uprooted from their homes if the expansion goes through parallels the biblical tales of Moses and the Israelites and the stories of slaves who were removed involuntarily from Africa. In this non-story, there are echoes of Little House on the Prairie and My Antonia and other foundational stories of the American West. The message is clear: Ranchers, your way of life is under attack from the U.S. Army!

The ranchers' non-story, leveraging the agrarian tenet of sustainable wealth or profitability, is deeply embodied in western culture. The ability of farmers and ranchers to acquire wealth is not to be confused with lust after money or greed, but more tied to the concept of gentry and people born to the land.

The 1956 movie "Giant", with Rock Hudson, James Dean and Elizabeth Taylor, is an example of this concept.

It should not be lost that ranchers are entrepreneurs and businessmen, and are part of a huge agricultural industry. Though there is romanticism associated with the cowboy life, beef is big business and an intricately networked entity in itself.

The non-story reflects how closely the ranchers tie themselves to the land, with sometimes biblical fervor. Many ranchers feel that at the beginning of time, it was God or Providence that bestowed the land upon them, and they will surrender it to no man or government: "And give you the blessing of Abraham, to you, and to your descendants with you; that you may inherit the land on which you are a stranger, which God gave unto Abraham" (Genesis 25:8).

The tenet of independence is also part of the ranchers' narrative and ties back to the minutemen of revolutionary Concord, who left their plows in the field to arm themselves. Patriotism is not in short supply around Southern Colorado. The ranchers view themselves as the true patriots who feed the planet and care for the land, while painting the Army as a giant corporation bent on taking liberties away.

Lifestyle characteristics are also components of the ranchers' story. The lifestyle argument is part of the GoodnightLoving story and speaks to the ranchers' rights to pursue happiness. In order for the ranchers to live and raise their families as they wish, they must list free from government
interference. In addition, when the Army takes away viable lands for military purposes, it is seen to be taking away land-based opportunities from future generations.

Such stories are non-stories, because they have no discernible beginning or end; once told, they continue to spiral and to defy analytical processes. It may be surprising to some that the threatened displacement of over 17,000 people is a nonstory, but this demonstrates how very effective such arguments can be when forcing one side to respond the non-story, causing that side to go off message. The story of generations of land owners, while emotionally compelling, can also backfire-making the ranchers appear not as agrarian gentry but as privileged aristocrats who control the people around them and want to own forever the land God bestowed upon them. The family angle also is a non-story, in that it approaches the argument from the same standpoint.

## The Critique

The critique of the Army's master narrative is a straightforward one: the service hasn't built an air-tight case for expanding Piñon Canyon. Members of the Colorado congressional delegation point to the Army's unwillingness to respond to questions from the Government Accountability Office regarding its proposal. The Army has back-tracked from plans for seven million acres to 100,000 acres (Pankratz, The Denver Post, 2009) in its latest documents. Recently, the U.S. District Court vacated the Fort Carson commander's Record of Decision regarding
possible environmental impacts resulting from ramped-up training on acreage it already owns at Piñon Canyon. According to Jim Harrell (Prendergast,2011), Vice President of Instruction at Otero Junior College in Otero County and a board member of the anti-expansion group Not One More Acre, each of these events, and others, validates community members' suspicions about the genuine need for expansion leaving a "genuine dark cloud hanging over the region.".

The ranching community contends a sound agricultural base is as critical to national security as the training of soldiers. Modern agricultural practices have increased the number of people each farmer can feed. But as agricultural production has become globalized, political powers have become comfortable with the United States importing its food as it does oil. According to ranchers, encroachment on agricultural lands and the shrinking of the industry threatens the nation's economy and well-being.

The ranchers' environmental argument is directed at maintaining a healthy Short grass Prairie Ecosystem, likening cattle to modern-day buffalo that actually help the environment in Southeastern Colorado. Their argument is that it is better to have cattle eating and spreading manure on the prairie than to have tanks and other tracked vehicles tearing up the ground and polluting land and water. The ranchers quote from a speech given by Robert F. Kennedy, Jr., and reported in the Chicago Tribune on May 16, 2003: "The federal government is America's biggest polluter and the Department of Defense is the government's worst
offender" (PCEOC Website, 2011). The bottom line of the story?the military and agriculture don't mix.

## 3) Compare the two sets of narratives in order to generate a metanarrative "told" by the comparison.

The metanarrative can be understood as the "story between the stories." Analyzing opposing narratives makes the differences between them sharper. As a result of this increased clarity, opportunities for resolution may be found.

The Army seeks additional lands to conduct training a soldier may need in battle to protect the citizens of Southeastern Colorado and their cherished way of life. A survey commissioned by the Army and conducted by Booz Allen Hamilton in the communities of La Junta, Pueblo, Trinidad, and Walsenburg found that $91 \%$ of those surveyed supported the proper training of soldiers and "Stakeholders and residents in the PCMS area stated that they are very patriotic." Others indicate there are "unresolved issues" from the initial expansion that retard progress on the matter.

This appears to run counter to a statement by the new commanding general of Fort Carson suggesting, "The long fight over Piñon Canyon is starting to give Colorado the reputation of being 'anti-military' (Roper, 2011).

Is it possible, instead, that the citizens are not antimilitary, but simply want and need a fuller explanation of the Army's intentions? This would correlate with the Branson School

Board's demand to enter into consultations with its much larger federal counterpart. It is interesting that the tiny Branson School District, rather than one of the relatively larger municipal or political districts in the area, has taken on the role of narrator here. It has taken on an activist role in the debate to capitalize on the ranchers' strategic communication efforts through the Cattlemen, PCEOC and NOMA. Has the District invoked the argument that the Army failed to coordinate with local governments to not only forestall a loss in revenues, but to catalyze action by other area governments?

On the face of it, it would appear that the Pentagon has the upper hand against a small school district in the middle of nowhere. However, when it comes to bureaucratic fist-fighting, the two sides are more equally matched than one might think. Both boast highly educated bureaucrats backed by skilled legal counsel, and both labor in the shadows of significantly larger entities; to wit, big agriculture and the military-industrial complex.

Respondents to the Booz Allen Hamilton survey also value individual property rights (97\%) and ranching and agriculture (96\%), as well as the economic benefits derived from strong ties to the land.

As the total amount of land is limited and land is seen as being able to be used either for training or for ranching, competing values emerge.

Perhaps nowhere are these competing values more evident than in the City of Pueblo. Many Puebloans work at Fort Carson or
for defense contractors or defense-related industries that support the Army in the region. But many businesses in Pueblo also derive income from transactions with the ranching communities to the south, and may Puebloans esteem the ranching culture, too. The city would be loath to take sides against or offend either the military or agriculture sectors.

## 4) Determine how the metanarrative recasts the problem in a way to make it more amenable.

It is possible to recast the problem? Yes. We have now established a metanarrative that highlights agreement on the need for national defense to protect Southern Coloradans' cherished way of life, underscores the need of the Army to arm citizens with additional information for decision making, points up competing values with respect to use of the land, and which portrays Pueblo as a linchpin community.

The Army needs to make its case better, but its ability to do so is impeded by a lack of trust. Can other entities-say the American Legion, the American GI Forum or other veterans' advocacy groups with standing in the area-help to bring opposing forces together to ensure citizens have the facts on which to base decisions?

Can the land really only be used for either military training or agricultural purposes? Why not both? There are numerous precedents, including nearby at the Pueblo Depot and elsewhere nationwide, for crops to be grown and cattle grazed on federal reservations like Piñon Canyon. This only requires some
creativity. In several locations the Army leases land to or from ranchers. Can an agreement be designed for the ranchers to lease the land to the Army and then somehow maintain a herd on that land?

Does the City of Pueblo have the capacity to play the role taken on earlier by the Branson School Board; i.e. that forcing the Army to the table? As a larger community with feet in both the agricultural and military camps, could Pueblo be the linchpin in resolving the stalemate? It certainly has a lot at stake in the matter. The ranchers argue that in terms of sustainment, the Army focused primarily on El Paso County and nowhere else. In order to meet the social, economic, and environmental demands of the residents, both Branson and Colorado Springs need to be at the table, as well.

The narratives of the ranchers and the Army have some similarities, even, insofar as projecting forces to defend our interests and the ability to feed ourselves are both matters of national security. The narrative which shapes the controversy also drives the course of political events.

Both the ranchers and the Army have framed the metanarrative in terms of "us versus them." By explaining the metanarrative in terms of "The Army did this" and the "Ranchers are that" only drives the argument into a quagmire that ensures it will never get resolved, with both sides in a lose-lose situation.

The metanarratives that set the stage for the emergence of an amenable solution are not the master narratives put forth. The emergence of hard-line position, especially by the ranchers, is both part of the culture and part of the image they wish to project. The cowboy culture of suspicion and defiance towards the government has been documented elsewhere. As far as ranchers are concerned, patriotism doesn't have to wear a uniform.

While farmers and cowboys are often not thought of as militant, they have a long history of militancy. The American Agriculture Movement that brought huge tractor rallies to Washington, D.C. in 1978 and 79 was born in Campo, Colorado, roughly 80 miles east of Branson. The Farm Aid concerts that started in the mid-80s were also born out of agricultural activism of the late 1970s.

The method in which the sides may come together will most likely be driven by the larger Southern Colorado community; their understanding of the metanarratives will determine what they will accept in the southeast quadrant of the state. The political realities of the people and their feelings have been lost in the conflicting stories and may have little in common with the ranchers' or Army's desires. Since 1983, the Army has built few ties to the bureaucracies that connect the "perception of the agents" to the "administrative problem". There are a lot of stakeholders; however, the largest center of influence is clearly Pueblo and Pueblo County. Perhaps it is they who could bring the Army, Branson and the ranchers together.

The hope for compromise is not lost. The Piñon Canyon Expansion Opposition Coalition that is leading the charge against expansion, states clearly in its Response to the Army Report Required by the National Defense Authorization Act; Section 2831 that:
"Our opposition to a 100,000 acre expansion is not a refusal to compromise. Instead it is insistence that the DoD lives within their means and utilize their current resources efficiently to give our soldiers the training that they deserve." While there is strong sentiment by PCEOC that leasing is not a viable solution, there may be other creative means to expand training without eminent domain.

## CHAPTER 5: SOCIAL NETWORK ANALYSIS

## "Emptiness can affect the unwary." -Bernard DeVoto <br> The Western Paradox - A Conservation Reader Yale University Press, 2001, p. 281.

The second sub problem is to apply existing models to map the competing interests involved with the Piñon Canyon Maneuver Site. The topography can be transferred to a working model of the network. This sub problem will be addressed through social network analysis.

The two indispensable elements of any social network are actors and relations (Knoke and Yang, 2008). Actors are the groups or, in this case, the bureaucracies involved. Each bureaucracy, Las Animas County, U.S. Forest Service, etc. are actors. As in every other type of quantitative research, an actor is a single unit of data or a subject; a collection of subjects is a population; a sub collection of subjects is a sample, and so on. In graph theory they are known as "nodes" and later on in Netlogo as "turtles." In short, for this research turtles will be referred to as stakeholders, and vice versa.

The stakeholders in a bureaucratic network are similar to individuals. Each has its own interest and the interests of close relationships. As the relationships become more distant the bonds tend to be weaker, unless there is a mutual interest that benefits both. The scalability of a bureaucratic network is a reflection of this phenomenon. This is true in the Piñon Canyon
study. There is a value in the relationships that trumps where one bureaucracy physically sits from another.

## Stakeholders

Some stakeholders can be consolidated. The Office of Colorado Natural Resources, for example, can serve as a blanket for some minor state stakeholders with minimal impacts. This allowed the list to be consolidated to 40 stakeholders, each of which was assigned a distinct turtle, or, agent, number (see Appendix H) .

A relation is defined as a type of connection or contact between actors. In this study, as in NetLogo, they will be referred to as "links." Relationships or links can be directed or non-directed. The directed link shows a flow of influence or power in a certain direction. They tend to have a positive and negative end if they are active. "Positive" and "negative" are used to describe the flow of influence and not the nature of the relationship. For example, an actor may gain influence from two other actors; therefore, the relationship is directed to the receiving actor as noted below:

In this example the center agent is the center of influence The design elements used in the research are intended to show how the Piñon Canyon actors exert influence across governmental boundaries. Bureaucracies are tricky to measure in that there needs to be a method to confirm that the person interviewed represents the entire organization. Secondary sources
have been utilized to verify the primary collection (see Appendix H) .

Data collection for this study was done through several methods. The first method was to collect a wide range of "secondary sources" via newspapers, the internet, government reports, meeting records etc. The Piñon Canyon issue is well documented, especially in Colorado, making secondary source collection relatively easy. The second method of collection involved interviews of government officials. Interviews of elected officials were avoided, though not eliminated entirely. Because most elected officials have made their positions on the proposed expansion of Piñon Canyon widely known, the focus of interviews was directed at career bureaucrats whose positions are less likely to change with political tides. Based on the methods, a simple design of relationships based on roles, position and influence could be created.

The sampling units comprised in this research were easy to identify. This Piñon Canyon issue sits in a limited universe. From the beginning, it was easy to determine that the U.S. Forest Service was a stakeholder and therefore an actor and the Colorado Department of Corrections was not an actor. The collection of sampling units became a process of elimination between major actors, minor actors, potential actors and non actors. This study is limited to major and minor actors. This delineated approach keeps the research from engaging in secondary and tertiary issues.

Knoke and Yang (2008) recommend a specific relational form and content to study such that, "Relational form is a property of actor relations that exists independently of any specific content (intensity, frequency) while relational content captures the meaning of the relationship from the actor's viewpoint (type of tie)." At each level of government-municipal, county, state federal-the intensity and frequency display similar characteristics. For this research the type of tie to be studied is "influence directional relations" where linkages between actors are directed to multiple actors in the network.

## What kind of model does Piñon Canyon fit?

There are a number of models and methods for analyzing Piñon Canyon. In order to represent network data, Knoke and Yang suggest graphs and matrices. They state that, "Graphs present visualizations of social networks whereas matrices use mathematical algebraic representations of network relations." Since this research is ultimately focused on agent based modeling, matrices will be utilized to support the models through computer analysis.

An important component left out of social network theory and science is the concept of valence. Though the idea of value directed graphs is common, they tend to study the value direction and occasionally reciprocity, dyadic or binary relationship. In chemistry, valence is the quality that determines the number of atoms or groups that a single atom will unite with. This is a units combining capacity. It would appear that a bureaucracy
could unite with an unlimited number of partners. In the case of the Army with its huge resources, the above statement would certainly be true. What about smaller bureaucracies or those with limited missions?

Taken a step further, networks may also have covalent bonds with other agents in the network to stabilize the relationship. Covalence is the number of shared links and the nature of them. In chemistry, for example, a carbon atom may have four stable orbitals that allow it to combine with other carbons and hydrogen to form a benzene ring (Figure 5-1):


Taking the valence concept from chemistry and applying the design elements to the model elements, some basic network models can be explored. A benzene ring from Chemistry provides a nice graph to represent an intergovernmental network on four levels: federal/state/county/municipal.

Basic Models (Figure 5-2)


The benzene ring provides a good visual representation of the universe that can be expanded into the model below (Figure 53).


The benzene ring demonstrates a number of limitations such because it shows location and not intensity, frequency, valence and type of tie. While the model is governed by structural features of symmetry, the need to find a suitable model that demonstrates intensity, frequency, valence, and type of tie becomes evident.

Another route for studying the Piñon Canyon network is to design a tree binary or tree to show data structure that emulates a hierarchical structure with a set of linked nodes. In an order directed tree, the graph is similar to a family tree with each node represented as children or parent nodes demonstrating direction and order.

The tree data structure is handy to represent directed graphs; however, the lattice tends to be represented as abstract nodes of sources and targets. Different lattice strategies would make this model confusing quickly.


Figure 5-4
Example of Binary Tree Example of tree network between poles There are three social network models utilized in this study. A simulation environment is necessary to create and execute a model to determine how policies morph. NetLogo (Wilensky, 1999) was chosen as the simulation environment because
it is widely used, easily available, and runs on most computer operating systems.

The dilemma now comes to the type of model Piñon Canyon fits.

## Progressive transition between regular and random graphs

(a) Small-World Network (SWN)

(b) Scale-Free Network (SFN)

(c) Random Network (RN)


Figure 5-5 Progressive Transition between regular and random graphs from Huang, C.Y., Sun, C. T., and Lin H. C., (2005)

Watts and Strogatz proposed a one-parameter model, which interpolates between an ordered finite dimensional lattice and a random graph. The algorithm behind the model is: Starting with a regular ring lattice with nodes in which every node is connected to its first neighbors and second neighbors on either side randomly rewire each edge of the lattice with a probability such that self-connections and duplicate edges are excluded.

Generating a Scale Free Network begins with a small number of nodes, and during each iteration, a new node is introduced and
connected to pre-existing nodes according to a probability based on each node's vertex degree.Random Networks are generated by adding links between pairs of randomly chosen nodes as seen in figure 5-5.

The models used from NetLogo are:

Preferential Attachment
Diffusion on a Directed Network
Small Worlds

NetLogo's modeling environment for social phenomena allows researchers to explore model behavior under various conditions. As an environment which enables researchers to manipulate models, it is a suitable format for analysis.


Figure 5-6. NetLogo generated "Preferential Attachment" random model

A number of network models are provided in the models library in NetLogo. The first model experimented with is the Preferential Attachment model. Preferential Attachment or "scalefree networks" are networks in which the distribution of the number of connections of each node is not a normal distribution;
instead, it follows what is a called a power law distribution (Wilensky, 2005).

In the Preferential Attachment model, each step, adds a new node. "A new node picks an existing node to connect to randomly, but with some bias" (Wilensky, 2005). Barabási (1999) explains: Random network models assume that the probability that two vertices are connected is random and uniform. In contrast, most real networks exhibit preferential connectivity. For example, a new actor is most likely to be cast in a supporting role with more established and better-known actors. Consequently, the probability that a new actor will be cast with an established one is much higher than that the new actor will be cast with other less-known actors. Similarly, a newly created Web page will be more likely to include links to well-known popular documents with alreadyhigh connectivity, and a new manuscript is more likely to cite a well known and thus much-cited paper than its lesscited and consequently less-known peer.

Barabási's explanation makes clear why each side in the Piñon Canyon controversy would align itself to high profile supporters. Public support is important, but it must be the right public support; i.e., the City of Pueblo supporting the ranchers would be more meaningful than the cattlemen supporting the ranchers.

The Army-represented by the Star-and the ranchersrepresented by the cow-are built in a simple model that is easily manipulated. Scale-free networks are beneficial in that it is easy to distinguish which agents are on what side. The agents can also be resized to demonstrate centers of influence.

The Erdős-Rényi model, named for Paul Erdős and Alfréd Rényi, is somewhat similar to the Preferential Attachment model, insofar as it would generate a random graph demonstrating the connected component of a network formed by randomly connecting two existing nodes per time step. This process, however, can be modified in NetLogo by manipulating the probability connecting the nodes, causing the fragmented components to attract towards a designated agent. This process is helpful to emphasize that each component is closely connected with the rest, but fails to demonstrated opposition.

Scale-free networks are troublesome in the Piñon Canyon case due to the lack of representation of valence. Agents are held together by bond or "links" and the scale free model really only shows which agents are on which side, ignoring whether any are actually in the middle or if there are links across. Due to the limitation of the Preferential Attachment model, it will require modifications to be a suitable model.

The second model studied is NetLogo's "Diffusion on a Directed Network." As Wilensky (2005) describes it, "this model demonstrates diffusion of a quantity through a directed network." The quantity moves among nodes in the network only along
established, directed links between two nodes. The simple rules that drive this diffusion lead to interesting patterns related to the topology, density, and stability of the network.


Figure 5-7. NetLogo Diffusion on a Directed Network, before and after.

Diffusion on a Directed Network is a much better model in that it demonstrates directed links and the transfer of value from one node to the next. The primary limitation is that the valence/covalence of each agent is limited to four in the map directions of north south east and west.

Returning to chemistry, effusion and diffusion are characteristics commonly associated with gases passing through a channel, but in the social sciences the definition covers the transfer of characteristics from one element to another. Correlating this idea to social networks is easy, as the size of the node can correspond to the amount of influence. While this model provides many of the needed characteristics, it is restricted to a lattice shape that makes it difficult to:
a) Assign specific bureaucracies to points on a lattice based on a relationship.
b) Attach or demonstrate relationships across the lattice.
c) Match the number of agents with the number of nodes on the lattice since the model is designed on a grid and is restricted.

Limitations of the Diffusion on a Directed Network model may cause one to reject as a suitable model, though components of this can be incorporated into another working model.

One of the most commonly studied networks is the small world network. A small world network is a mathematical graph in which nodes that are not neighbors of one another can be reached from every other, or connected, based on a small number of links that can be created or already exist.

The small-world effect, first observed by Stanley Milgram, is the rapid decline in average path length as a small number of random links are added to structured networks (Lewis, 2009). In 1998 Steven Strogatz and his student, Duncan Watts, published the first comparative study of complex networks. The analysis revealed that the "small world" phenomenon is a unifying feature of diverse networks found in nature and technology (Strogatz, 2003). The small world network generated by Watts-Strogatz (WS) will be utilized as the base model. There are some limitations to the WS model that will be discussed further, but it is important to understand the basic dynamics of the model. The model is a scalable random graph generator that produces graphs with smallworld properties. This small world effect demonstrates short average path lengths, rewiring probabilities, and high clustering.


Figure 5-8. Small world networks set up with 12 agents; the number 7 agent in the second is linked to all other agents.

The example above utilizing NetLogo demonstrates a small world network set up with 12 agents. The second example shows the number 7 agent (12 o'clock is always zero) linked to all of the other agents. In this example, all agents in the set up are separated by a minimum of 3 degrees of separation in the first graphic, and then two degrees of separation in the second graphic. There are some assumptions to this model in that the model assumes that each agent is connected with the two nearest agents on either side.

A small world network is generated from two agents. In network science, a regular graph vertex has the same number of neighbors, if all local degrees are the same number (Lewis, 2009). A 1-regular graph consists of disconnected edges, and a 2-regular graph consists of disconnected cycles such that:

For an ${ }^{r}$-regular graph on $n_{n o d e s, ~}^{M=1 / 2 n r}$

Simple networks can be displayed such that:

For $r>n / 2$ there do not exist any disconnected r-regular graphs on $n$ vertices.


Figure 5-9. Weisstein, E.W., "Regular Graph" from MathWorld.
The network emerges starting with a 2-regular network or: -—.by randomly rewiring pm links, where pis the rewiring probability and $m$ is the number of links. Basic to all Network Science is this important relationship between the agents and the links. As will be demonstrated the link and the agents are more than just lines and dots. They can and will have properties, like real networks, that demonstrate size, strength, and fluidity. In deciding to use a model, create a hybrid or build a new model, the properties of the variables must be understood. Are all of the variables equal and links the same?

One problem is that $W$ W does not have two important properties observed in the Piñon Canyon scenario network: the diffusion capability mentioned above, and the ability to maneuver the agents along the sides.

Yet a third issue is that the $W$ W model is mostly interested in average path lengths and clustering coefficients. Average path lengths show the number of steps it takes to get from one member of the network to another while the clustering coefficient demonstrates the ratio of existing links connecting a node's neighbors to each other to the maximum possible number of such links. (Wilensky, 2005) While each of these measurements is interesting in itself, they do not address the dynamics at play in Piñon Canyon in relation to determining centers of influence and power. The small world network is very close to what is needed to analyze Piñon Canyon but its inability to demonstrate diffusion will require the model to be.


Figure 5-10. WS graph of stakeholders.

For instance, a WS graph for the stakeholders would look like the above, utilizing a NetLogo graph where the $x$ and $y$ corner coordinates (cor) are min-pxcor -17; max pxcor 17, minpycor -17 and max pycor 17 and center $x y$ coordinates are 0,0 as seen above. Networked in WS format, the original 47 agents would appear as follows:


Figure 5-11. Networked in $W$ W format, the original 47 agents would appear as at the left. The cow has four connections in the 2regular network shown on the right.

For this example, the Colorado Cattlemen will be identified as agent 42 out of 47 agents and, for identity purposes shape is identified as a cow. Notice how the cow has four connections in this 2-regular network: between its neighbors (41 to 42 and 42 to 43) and its neighbor's neighbor closest to the cow (40 to 42 and 42 to 43). There appears to be a fifth connection (highlighted in red) which is actually 43's connection to 42's closest connection.

While WS gives a nice model to start, the first difficulty is soon encountered.

The limitations of $W$ W include that it is more random when determining its effect. The randomness is scalable ranging from very low entropy to entropy comparable to that of a random network (Lewis, 2009). Because the model that needs to be built should be less random, the $W$ S needs to be controlled and built where the user can place links between nodes, rather than the links be placed randomly to measure the influence.

The second problem is the model produces an unrealistic valence (bond)/distribution of the number of edges incident to the vertex of the graph that can't be controlled. As in chemistry, an atom can bond only with so many other atoms. In building an intergovernmental model, the valence is unknown therefore the model calls for greater ability to experiment.

Social structure in networks is more than relationships, it is about geography. According to Knoke and Yang (2008),"...the most common question about social networks is 'who knows whom?' but perhaps the most relevant question is 'Who knows who knows whom?' In the case of bureaucracies this question becomes 'Who knows who works with whom?'"

Also, the model has to be studied for bias. In the study of organizations, Small World Networks have what appears to be an inclination to force a partner to hold a relationship with one entity and possibly not others that may be equally close. Therefore it forces an entity to present or hold a relationship
at the expense of a possibly equally valid alternative relationship. The bias displayed also forces relationships down paths around a circle. In other words, relationships have the initial misleading appearance of being directional.

Knoke and Yang (2008) stress the susceptibility of Social Network Analysis to have trouble with reliability and validity of the network analysis, in addition to missing and excluded data. This can be demonstrated a number of ways and there may be "genuine changes in networks" over the course of time, such that "Due to the unique characteristics of social network data, particularly in egocentric analyses, informant reliability and validity measures differ greatly from conventional measures for other types of data" (Mardsen, 1993).

The idea that social networks can change and more importantly change quickly, emphasizes the point that Social Network Analysis is more valuable for ongoing monitoring rather than a one-time study. As with the stock market, the real utility is to monitor the graphs over time for changes in behavior.

## Summary of Social Network Analysis

Graphs illustrate paths and circuits, and the three Netlogo models all demonstrate a variety of strengths for use in a Public Administration problem. The paths and circuits are valuable to the researcher in visualizing the behavior of the relationships. Along with the matrices of the research, each Netlogo method
probably could stand on its own merit. The problem with utilizing a single method is in the limitations of what can be described in relation to the behavior.

Relationship strength is most notable in the Preferential Attachment model. This model demonstrates centers of influence very clearly and pulls the actors to one side or the other. Pulling the actors to one side is helpful to determine the influence of one side of the argument but can be problematic when the actor may be stuck in between.

Relationship direction is best displayed on the Diffusion on a Directed Network model. The patterns related to the topography, topology, density, lattice and stability of the network are best observed in this model. Wilensky (2008) states that this:
...model uses directed links, which can be used to create asymmetric relationships between agents. If you used undirected links, the behavior of this model would more closely resemble the DIFFUSE command, where the value of all the nodes would eventually become the same.

The diffuse command would only be helpful in a scenario where it could be assured that issues would become acceptable to all parties. As most public policy controversies go, they may reach equilibrium but they rarely diffuse.

Centrality and Centers of Influence are most apparent in the Preferential Attachment and Diffusion on a Directed Network models. Understanding where relationships are centered and where
influence ultimately goes is key to understanding how the dynamics of public policy shift and morph.

Structure and valence are the primary strengths of the Small Worlds Model. The visual model proposed by Duncan Watts and Steve Strogatz while measuring the ranges of the fraction of nodes, the average path and the clustering coefficient illustrates how quickly relationships can change. The range of values is more directly comparable in this model allowing the Network to be observed in manageable conditions.

There are a number of models to look at outside of the models reviewed in this chapter that can analyze relationships. For example an intergovernmental network can be studied in the context of individual relationships between Government and Business and Press and Politicians as seen in figure 5-12.


Figure 5-12 Relationship matrix

```
Taking the step further an entire table can be built
```

showing where the agents fall on the matrix as in Figure 5-13.


Figure 5-13 Attempt to align actors between Pentagon and Ranchers.

This concept (though somewhat unsuccessful) is an important
first step in analyzing Social Networks, as it is necessary to
represent the data using either graphs or matrices. The methods
shown below (Lewis) were used in applying the Small World Network
model to Piñon Canyon.

Graphs
Matrices
Relationship Measures
Centrality and Prestige
Cliques
Structural Equivalence
Visual Displays
Blockmodels

Here, my primary interests are Centrality and Prestige, as
well as Cliques that help form cohesion. In Addition the following determinants and parameters I selected based on Lewis's (2009) general principles of characteristics that apply to modern networks will be applied in the next chapter.

## Determinants and Parameters

- Structure
- Emergence
- Dynamism
- Autonomy
- Bottom-up evolution
- Topology
- Power
- Stability

Tendency
Time
Evolution
Behavior
Scalability
Place
Influence
Pressure

Taking these strengths and weaknesses into consideration, the next logical step is to morph the good and attempt to eliminate the bad from the three models in order to optimize the analysis. This takes this research to the next level in Chapter Six.

## CHAPTER 6 AGENT BASED MODELING

```
"The cowboys have a way of trussing up a steer or a pugnacious bronco which fixes the brute so that it can neither move nor think. This is the hog-tie, and it is what Euclid did to geometry."
-Eric Bell,
in R Crayshaw-Williams
The Search for Truth
```

In the previous chapter, Piñon Canyon was observed using existing models with accepted mathematical properties; all of the models was found wanting in some aspect or aspects. So, the third sub problem is to construct a model, then map, analyze, and interpret the collected data to evaluate the application of the theory. In utilizing a multi-methodology approach, this sub problem will be addressed through the application of agent based modeling and a simulation of the model in order to determine if the model reflects reality as result of the exploratory research. It now becomes necessary to define and understand what a network is. Lewis (2009) in the textbook Network Science, Theory and Applications, defines a network as:

```
G(t) = {N(t), L(t), f(t) : J(t)}
Where t = time, simulated or real
    N = nodes, also known as vertices or actors
    L = links, also known as edges
    f: N x N = mapping function that connects
    nodepairs, yielding topology
    J = algorithm for describing behaviors of
    nodes and links versus time.
    G = algorithmic set that defines the
    structure (or simply: the network)
```

The theoretical definition proposed is simple yet allows the user to view the network in much more technical terms if desired. The definition also provides a starting framework from which to build the model.

The problem in dealing with complex and complicated public administration dilemmas is finding a suitable analytical method to describe, study, or solve the dilemma. Choosing an Agent Based Simulation method becomes convenient if one wishes to build a model where individual representatives and actions can be observed by cause and effect. The model will not be designed to reflect a constant, but rather the effects of relationships and where they exist.

While it is important to know how people or organizations feel, it is more important to predict how they will act and interact based on likely scenarios. The action and reaction of an organization can sway a political process in either direction. The influence of the agent and its position in the network are also important phenomena for observation.

While the definition: $G(t)=\{N(t), L(t), f(t): J(t)\}$ gives the reader the mathematical parameters for the network, it is also necessary to understand the theoretical parameters. The social network analysis in the previous chapter demonstrated that three standard models for networks which, while having interesting strengths and abilities, do not fit an intergovernmental process very well. Rather than trying to pigeonhole the scenarios into different models by matching the
disparate entities into a small number of categories, mathematical parameters must match the theoretical parameters.

Lewis (2009) sets forth general principles of
characteristics that should apply to modern networks:

1. Structure
2. Emergence
3. Dynamism
4. Autonomy
5. Bottom-up evolution
6. Topology
7. Power
8. Stability

Utilizing these theoretical characteristics, a model of the Piñon Canyon network will be built utilizing NetLogo.

## 1. Structure

Drawing the topology, or the continuity and connectivity of the "Small World", is as critical as showing the topography, which is the position of the agent generally in terms of position (latitude and longitude) on the graph. The network of agents then is designed to become a collection of "living" cells that make a larger living organism.

Starting with the "Small World" model developed by Duncan Watts and Steve Strogatz (1998), for structure and lattice stability, the model was then combined with Diffusion on a Directed Network (Wilensky, 2005), to show changes in influence. The model was then morphed from the circular "Small World" to a Benzene shape because the shape offers a better representation of connections. The Benzene shape also differentiates it from other models. The Benzene Ring now becomes G. The individual links established through research are added as keys onto the model.


| LJCoC | DoIFW | HeSD |
| :---: | :---: | :---: |
| TSD | ACHP | CCA |
| COSP | HCC | PCO |
| Wal | EPA | BSD |
| CDW | PChC | NOMA |
| CDoT | USFS | LCoC |
| CSCoC | BLM | CAg |
| CS | LChC | SPGF |
| ASDIE | CBLC | BCC |
| ASA | PuCoC | CSHP |
| FC | CLJ | CDNR |
| FFC | OtCoC | CRF |
| EPC | NRCS | TDAD |
| $2010-2011$ | Network | PUB |

Figure 6-1: NetLogo Piñon Canyon Small World Network with 40 nodes in NetLogo.

The small world network will be used as "G" in our network equation. As it displays structural and behavioral properties it will be referred to as "G(t)", as the network evolves over the passage of time. It should be emphasized that whereas the ErdősRényi model is a random network of random graphs-starting with $N$ nodes that connect each pair of nodes with probability p, creating a graph with approximately pN(N -1)/2 edges distributed randomly-the Piñon canyon model is a scale free network where agents may have a varying number of edges or ability to connect.

## 2. Emergence

The impact of time on a network leading to changes is an important analytical characteristic. Lewis (2009) describes emergence of a network property as a "synchronization issuestable networks transition from one state to another until they
reach a fixed point, and stay there." The idea set forth is that a random network will evolve to a non-random network; further, that the network "changes by a factor of 10 as consequence of a dynamic network achieving stability." Emergence becomes a puzzle in a network that exists and may already be stable.

While Lewis describes emergence in terms of "exchange of links" (2009) over time, there is another dynamic at play not having to do with the exchange of links but with the diffusion of a quantity through a directed network. Utilizing the NetLogo model of Diffusion on a Directed Network, the characteristic of emergence doesn't change the lattice but impacts the appearance in relation to the topology and stability of the network. The Piñon Canyon model is built with a stable lattice since the known connections are established.

It is at this point that the Small World Network is joined with Diffusion on a Directed Network. The introduction of the diffusion capability to the small world lattice brings the two most important components of the model together: A lattice and the ability to view changes in the agents. Given the previous definition: $G(t)=\{N(t), L(t), f(t): J(t)\}$, emergence is time or (t).

## 3. Dynamism

Dynamism is the simplest characteristic to achieve. Since the network is a "living" function, it must have the mathematical properties to shape and morph. The ability of a graph to morph is described as $J(t)$ or the algorithm for describing behaviors of
nodes. Starting from an initial state with initial inputs the instructions describe what computation that, when executed, will produce an "output". This component is introduced in NetLogo as the commands. As the model is given commands, the model will act upon the information provided.

The commands for the Piñon Canyon Model are laid out in Appendix G. The dynamic behavior is as complex as the researcher desires. The dynamic behavior is a result of the evolution of the model and how the system morphs over time. What makes this new model noteworthy is the fact that it represents a possible method to track bureaucratic opinion and behavior, which is a point of departure from investigations that track only public opinion. Bureaucracies can now be followed and addressed as policies take shape as a consequence of "social network analysis.". How the network behaves is dependent on the links within the network.

## 4. Autonomy

Based on primary sources (interview) and secondary sources (interviews with press, academics, and collection of print sources), the Piñon Canyon network is explained in Appendix E. The table in Appendix $E$ is nothing more than $N$ (nodes) and L (links). Establishing the autonomy through structure and function is an expectation of quality in a model; that, in turn, is directly tied to its dynamic behavior. The ability of the network agents- past and current quantity-to decay, reach equilibrium or morph depending on added agents, can be represented as size along with the amount of quantity that has
passed through a link in a given step, to reflect the global or total quantity in the system; in this case, quantity equates to political influence. The first step is to display the model with links.


Figure 6-2 Piñon Canyon Network, based on Table 6-1

The network layout-circle turtles (world-width / 2 - 2)
is designed to hold a universe of 40 turtles when the grid size
$=3$ and the number of nodes $=15 .(25+15=40)$ The model also must
conform to limitations in that there must be a maximum quantity
held by a single agent in the system, and a limitation
(capability) to have a maximum quantity that has passed through a
link in the system. It also becomes necessary to arrange the
model so that opposing sides are opposite and the structure demonstrates the primary direction of links (Table 6-3).


Figure 6-3. Piñon Canyon Network arranged in a Benzene model highlighting directional links.

The portion of the formula where $f: N X N$ is the mapping function that connects nodepairs, yielding topology that allows the flow of power from agent to agent. While the Piñon Canyon model is designed to show current stakeholders instead of the addition or subtraction thereof, the autonomy can be described more in terms of change of agents over time, rather than the number of agents over time. It is in this concept that the autonomy requirements are met.

## 5. Bottom-up Evolution

Lewis (2009) explains that networks grow from the bottom or local level up to the tip or global level. He states that, "Even if an initial structure of a network is the result of
premeditated design, networks evolve and change as a result of their dynamism." (Lewis 2009). This characteristic was actually explained in the Narrative Analysis. As the complexity of the Public Administration problem developed for the Army, a number of stakeholders-Branson, Trinidad, Not One More Acre-started to organize and attach to the structure.

## 6. Topology

The Piñon Canyon model is a snapshot of a network at a given time. Lewis statement that topology is a "consequence of Darwinism" leads to the conclusion that networks evolve from small to large. This is true for many systems however, in a small world and limited universe the topology will remain quite limited.

The topology designed for the Piñon Canyon model involves actors at the municipal, county, district, state, nongovernmental, and federal levels. There are limitless models to design in such a scenario. The Benzene Ring was chosen because the network has some characteristics similar to chemical properties.

Benzene electrons tend to be localized and stable. The Piñon Canyon network is designed on this principle- not internally, but for external issues. For example, the Colorado State Land Board is concerned with other military-public land encroachment issues in addition to Piñon Canyon. This would be indicated in an external link from the existing network to the Air Force at Buckley Air Force Base or the National Guard around Camp George West, creating a "network of networks" (Figure 6-4).

These would in turn link to another network with a different set of stakeholders. Though the issues may be very similar or nearly exact, the network would not be the same.


Figure 6-4. Network of networks on similar encroachment issues: Piñon Canyon, Lowery Air Force Base, Camp George West.

As in organic chemistry, the carbon atoms of the Benzene Ring have covalent properties. This can be internal to the network or external to a connected network. The networks can also display orbital dynamics that share connections. The nodes (N) in the network that share links are characterized by the orbits sharing pairs of electrons between atoms. The relationship becomes a stable balance between the nodes when they share links as in covalent bonding; this emphasizes the stability and importance of the agents' relationships to each other. In chemistry, covalence is greatest between atoms of similar needs. In Social Networks, covalence describes the tendency of an agent or a functional group to attract others towards itself.

Covalence in the Piñon Canyon Network also in Appendix E is a listing of shared links between Agents. It is important to notice that in the network only five of the 40 (12.5\%) agents exhibit covalence with $100 \%$ of links. The model also incorporates
a shared link (not listed) from Fort Carson to Trinidad as an experiment in the dynamics of the network.

Derivatives of covalent bonds include covalent networks in chemistry. A covalent network solid is a chemical compound in which the atoms are bonded by covalent bonds in a continuous network. These covalent network bonds are considered a macromolecule. They display properties of hardened minerals where the bonds hold the entire network fixed.

These network solids hold no free electrons and consist of uncharged atoms that do not have the ability to connect elsewhere. This can be an example of a network at stalemate. As with a chemical network solid, the strong covalent network holds a hardened lattice that can only be melted with a high outside source of energy. Examples of network solids include quartz, diamond and carbon graphite.

The term "covalence" in regard to networks is important as it allows agents to share numbers of pairs of links between its neighbors or anyone else in the network.

The idea of covalent bonding in networks is also important because the sharing of bonds between agents is key to intergovernmental relations as a whole. Pairs of bonds may also be located between agencies to represent partnerships. Multiple pairs represent multiple partnerships, can be identified in double, triple, and quadruple bonds, and so forth. While the idea of shared bonds provides a qualitative picture of the network, further research and analysis are needed to understand the nature
of these links to be able to predict the behavior of the network. When a directed link is formed the relationships can be classified and drawn in order to successfully predict future centers of influence and behavior. Now that the relationships are known they can be programmed into NetLogo.


Figure 6-5. Final NetLogo Model

## 7. Power

Lewis states that the power of a network is "proportional to the square of the number of nodes it contains" (Lewis, 2009). The maximum number of links with $n$ nodes is $n(n-1) / 2$ or in the model built: 40(40-1)/2 or 780 links. In the Piñon Canyon model the power is in the influence of an agent and its ability to share that influence or focus it in a central location.

Lewis refers to Metcalfe's law to help define his definition of power. Metcalfe's law declares the value of a network is proportional to the square of the number of connected
users of the system $\left(n^{2}\right)$ (Lewis 2008). In other words, the power of a node is proportional to the links that it has. In this case, based on the research gathered, the top 20\% of agents displaying the most power based on links (Direct (D) plus Covalent (CV)) are:

1. Pueblo County (11 D/4 CV = 15)
2. Las Animas County (6 D/6 CV = 12)
3. City of Colorado Springs (5 D/4 CV = 9)
4. Pueblo Chamber of Commerce (5 D/4 CV = 9)
5. Colorado Springs Chamber of Commerce (5 D/4 CV = 9)
6. Commanding General Fort Carson (4 D/4 CV = 8)
7. Piñon Canyon Expansion Opposition Coalition (4 D/\$ CV =8)
8. Colorado State Land Board (7 D/1 CV = 8)

The most interesting component of this perspective is the influence of the Chamber of Commerce in Colorado Springs and Pueblo. While it is not surprising that a coalition of businesses whose primary goal is to further the interests of businesses in the area is influential, it is interesting to note that they are networks in themselves.

It is also interesting that Pueblo County has the most influence. The County Commission is the primary entity overseeing provision of government services, land use management, engineering/public works, roads and bridges, housing and human services, ad veterans' and social services (Pueblo County Commissioners, 2011). The idea that the commission exerts influence over an area outside of the county points to the interconnectivity of issues in Southeastern Colorado.

This piece of data points to a concept called exclusion. As described by Tongia and Wilson, "...most network models fail to capture the costs or loss of value of exclusion from the network.

Intuitively, as a network grows in size and value, those outside the network face growing disparities" (Tongia and Wilson, 2007). This concept is directly tied to the power of the network; i.e., where are the stakeholders outside of the network located?

A possible explanation and theory is that the entirety of the Pueblo County government and its political machine has manifested itself in the county commission. Tongia and Wilson also assert that "populations excluded from a network will often resort to alternative or parallel networks." This is most likely the explanation of how a government that is not a primary player in the debate becomes the most influential player. Other interests have brought themselves together-much like the ranchers in Branson and the school district did-to find an outlet for their concerns.

## 8. Stability

A dynamic network is defined as being stable if the rate of change in its nodes and links, or its topology, either diminishes as time passes or is bounded by oscillations within finite limits (Lewis 2008). The Piñon Canyon Model as built is indeed a dynamic network. As each experiment progresses over time, any influence each agent does not keep for itself is divided evenly among its out-link-neighbors, until it reaches a point of equilibrium.

Multiple experiments can be run in NetLogo. This is done under the BehaviorSpace command. BehaviorSpace is an integrated command within NetLogo that allows parameter sweeping (Wilensky, 1999). According to Kim, Reuther, and Kepne (2011), "Parameter
sweep applications are a class of application in which the same code is run multiple times using unique sets of input parameter values. This includes varying one parameter over a range of values or varying multiple parameters over a large multidimensional space."

With the BehaviorSpace model run many times, the model's results can be systematically recorded based on changing variables in each model run. Exploring the model's "space" of possible behaviors to determine which agents benefit over time demonstrates the stability of the model. At this point, it becomes necessary to run a stability experiment.

The experiment was run with the following variables: diffusion rate of 12 , where diffusion rate is the speed at which influence passes from one agent to another. On a scale of 1-100, 12 was chosen based on the tendency of bureaucratic networks to be slower than social or business networks.

The increments for diffusion were chosen to be based on factors of $12(12,24,35,48)$ instead of ten as the duodecimal system (place-value notation radix-12 or base-12). In number theory, the number 12 is the smallest number with six factors (1, 2, 3, 4, and 6). It is also the smallest to include as factors all first four numbers (1, 2, 3, and 4). Twelve is a more functional number than 10 as 10 's divisibility factors (1, 2 and 5) are three against 12 's five. The use of 12 also allows a maximum diffusion rate of 48 , instead of the ten-based 50,
allowing the agent to diffuse less than half of its power at any given time.

At any diffusion rate in the Piñon Canyon model, the model would stabilize at the same equilibrium point, just at different times. This variable allows the researcher to control the speed as a whole. Netlogo allows the incorporation of each agent to vary the flow, though it was decided that for purposes of simplicity, the rate would apply to the model as a whole.

The leap from model architecture to ethnographic
understanding is tricky. The research is not designed to measure influence but to search for functions to observe behavior. The various ways the numbers influence each other can be measured.

With the BehaviorSpace function running the model many times, the results of each mode can be recorded to give an idea of how influence changes based on the number of agents interacting with each other. This can be measured by the "Linkchance" variable. Link-chance introduces a number of random links into the model that can produce "what-if" scenarios. Measuring for link chances of $0,1 \%, 12 \%, 24 \%, 36 \%$ and $48 \%$ the possibility of intergovernmental collaboration increases exponentially among actors with the results influenced by interactions among actors and then by interactions with each other. The model exhibited the following behaviors over 365 days with a diffusion rate of 12:


The above model was run 10 times with the variables locked to validate that each result was exactly the same. The test run was successful. Both the Army and Branson had initial spikes-the Army down/Branson up-but overall each gained value as the model approaches equilibrium.

While it is obvious that a gain in value for both agents indicates that both agents are gaining influence from other actors, it isn't obvious where they are gaining influence from. This is where the visual aspects of network models hold value in that one can see how other agents diminish-and who they are-as opposed to just numbers changing on a chart. Now it becomes important to add a random variable of unknown connections and observe how the agents influence changes when compared against each other.


Average Value Rate 365 Days "link-chance" 1\%


Average Value Rate 365 Days "link-chance" 1\%

Running the mode-Branson/Army agents-100 times against each other at 1\%:

| average final | 6.595400166 | average final | 2.395219016 |
| :--- | :--- | :--- | :--- |
| average min | 5.104910304 | average min | 1.925788528 |
| average max | 6.959822285 | average max | 2.778724807 |
| average mean | 6.09717826 | average mean | 2.512676755 |



Figure 6-7 Run of the Model/Final Value 100 Runs at 1\%

$$
\text { An initial final average value difference of } 4.802399247
$$

(6.980004327-2.17760508) is now 4.20018115 (6.595400166-
2.395219016) a slightly increased gap with Branson and the Army each losing a small amount of influence.

ARMY
Branson SD


Average Value Rate 365 Days "link-chance" 12\%


Average Value Rate 365 Days "link-chance" 12 \%

Running the mode-Branson/Army agents-100 times against each other at 12\%:

| average final | 4.320538784 | average final | 2.821044401 |
| :--- | :--- | :--- | :--- |
| average min | 4.018675952 | average min | 1.879741346 |
| average max | 6.160135232 | average max | 2.926627664 |
| average mean | 4.395209735 | average mean | 2.760869315 |



Figure 6-8 Run of the Model/Final Value 100 Runs at 12\%

The gap between the Army and Branson has now shrunk to
1.499494383. At only a $12 \%$ random link chance, the two governments have quickly erased the $1 \%$ spread of 4.20018115 . As the two sides enter a more fluid environment the need to build relationships and collaborative agreements becomes more obvious.


Average Value Rate 365 Days "link-chance" 24\%


Average Value Rate 365 Days "link-chance" $24 \%$

Running the mode-Branson/Army agents-100 times against each other at 24\%:

| average final | 3.427766208 | average final | 2.833707736 |
| :--- | :--- | :--- | :--- |
| average min | 3.334069844 | average min | 1.864635456 |
| average max | 6.042496291 | average max | 2.875060654 |
| average mean | 3.560152226 | average mean | 2.751718004 |



Figure 6-9 Run of the Model/Final Value 100 Runs at 24\%
At a $24 \%$ random link chance, the Army and Ranchers are now very close at 0.594058472 difference (3.427766208-2.833707736). The question to ask in such a design is if a $24 \%$ random-link chance is an actual possibility or a valid measurement. These questions will be addressed later.

ARMY
Branson SD


Average Value Rate 365 Days "link-chance" 36\%


Average Value Rate 365 Days "link-chance" 36\%

Running the mode-Branson/Army agents-100 times against each other at $36 \%$ :

| average final | 3.053024184 | average final | 2.804430165 |
| :--- | :--- | :--- | :--- |
| average min | 3.029661114 | average min | 1.862207404 |
| average max | 6.002187721 | average max | 2.855539701 |
| average mean | 3.183045341 | average mean | 2.738689699 |



Figure 6-10 Run of the Model/Final Value 100 Runs at 36\%


Average Value Rate 365 Days "link-chance" 48\%


Average Value Rate 365 Days "link-chance" $48 \%$

Running the mode-Branson/Army agents-100 times against each other at 48\%:

| average final | 2.805694553 | average final | 2.766188507 |
| :--- | :--- | :--- | :--- |
| average min | 2.782620229 | average min | 1.836314311 |
| average max | 6.018000287 | average max | 2.840906351 |
| average mean | 2.927877026 | average mean | 2.714854857 |



Figure 6-11 Run of the Model/Final Value 100 Runs at 48\%

As expected, as an increased number of random connections are introduced into the model, the influence of the two actors approaches each other in value. The model shows that over a
period of 365 days, the model is very active for around 120 days and then stabilizes. This exposes a obvious problem of the model. Because the Branson School District gains influence while the Office of the Secretary of the Army for Installations and Environment loses influence as random connections are introduced, this calls into question the variable of time.


Figure 6-12 Running Behavior Space
After running the model for a test of 365 days, the
following values are observed. (See Appendix)


Figure 6-13 Each agent Value after 365 runs

The data observed indicate that Agents 11, 8, 7, 10, and 32 have the greatest influence. These agents are: Fort Carson, Colorado Springs, Colorado Springs Chamber, Assistant Secretary of the Army, and Las Animas County. Pueblo County appears to have less influence however it is important to note that it has 11 connections, only 3 less than agents 11, 8, and 7 combined.

## The Problem

Based on the data gathered, the values and the relationships were researched in 2010 and 2011. The model was run for 365 days. When did the 365 days start? Obviously this network did not start in 2010 or 2011 but at some previous point the
network probably goes back four or five years. It also assumes that the stakeholders jumped in the pool at the same time, which is also unrealistic. By the time the research on this paper started the controversy was well under way. At first glance this model is a condensed historical analysis and most likely an inaccurate analysis time-wise-at least from a bureaucratic perspective.

A second problem is determining what the numbers mean. There are shared interests at play and networks are not simple "us versus them" pictures. While both bureaucracies' strength acted as suspected, the variable of Branson being local to the issue and the Pentagon being distant is a hard characteristic to judge.

This does not make the model useless. On the contrary, it becomes a living tool to simulate how influences change as bureaucracies change. Once an administrator is aware of where the agents are, one can gauge or forecast changes in influence, behavior and relationships before they happen. It also allows the administrator to study where alliances need to be formed in order to further a cause or agenda.

## Attributes of a Network and NetLogo Summary

In determining whether the Piñon Canyon Model is a valid
network, it is necessary to evaluate the model on accepted standards of networks. The simplest reflection would be against the following:
(1) They consist of nodes connected by links.
(2) Nodes exchange resources across the links.
(3) Nodes only interact through direct linkage.
(National Research Council, 2005)

The Piñon Canyon model indeed satisfies the requirements.
Each agent is a node, resources are exchanged across links in the form of influence, and the nodes only interact through direct linkage or as random links are introduced. The National Research

Council goes on to describe the attributes of a network as:
-Connectivity. A network has a well-defined connection topology in which each discrete entity ("node" in graphtheoretic terminology) has a finite number of defined connections ("links") to other nodes. In general, these links are dynamic.

- Exchange. The connection topology exists in order to exchange one or more classes of resource among nodes. Indeed, a link between two nodes exists if and only if resources of significance to the network domain can be directly exchanged between them.
-Locality. The exchanged resource is delivered, and its effects take place, only in local interactions (node to link, link to node). This locality of interaction entails autonomous agents acting on a locally available state (National Research Council, 2005).

Utilizing a more defined requirement, again, the Piñon Canyon model meets the three attributes of connectivity, exchange, and locality.

To summarize the Piñon Canyon Model itself and for the NetLogo software procedures, the format offered by Wilensky (2008) will be followed:

## WHAT IS IT?

This Piñon Canyon model demonstrates diffusion of influence through a directed small world network. The influence moves between nodes in the network along established, directed links between two nodes obtained by research in 2010 and 2011 from
interviews and secondary research collected in Colorado and Washington D.C.

The rules that drive this diffusion of influence between agents are meant to represent activity and patterns related to the topology, density, and stability of the network as well as the small world phenomenon at play (Stonedahl and Wilensky, 2008and Watts and Strogatz, 1998).

## HOW IT WORKS

In each tick, each node shares some percentage (defined by the DIFFUSION-RATE slider) of its "value" quantity with its neighbors in the network (Stonedahl and Wilensky, 2008). In addition, the model measures two components:

Power Military: Calculated by finding the on-going quantity of the designated military agent; this shows, on average, the agent's strength of influence in the network.
Power Agriculture: Calculated by finding the on-going quantity of the designated agriculture agent; this shows, on average, the agent's strength of influence in the network.

The amount of value is divided equally and sent along each of the outgoing links to each other designated node. The model as a directed network also notes value given back and forth (covalence), through which means the stronger bonds are highlighted.

The size of each node shows how much "value" that node has, where the area of the node is proportional to its value. The brightness of a link represents how much value just flowed through that edge (Stonedahl and Wilensky, 2008).

HOW TO USE IT

You may select the speed on the speed slider on top in the gray section. It is recommended to start on "normal speed" for initial observation and then slow the model down on subsequent runs. There are two methods to use this model.
(METHOD 1) Select Grid Size 3; number of nodes 15; diffusion rate 12; link-chance 0, which should be the default. Create the network by selecting the following buttons in order: Set-up/Select Shape/Order Turtles/Benz. This will produce the network. Select the 2010-2011 Network button, and hit Go.
(METHOD 2) Select Grid Size 3; Number of nodes 15; diffusion rate 12; link-chance 0 , which should be the default. Create the network by selecting the following buttons in order: Set-up/Select Shape/Order Turtles/Benz. This will produce the network. Hit Go and select the Individual Network button and observe the network as it is built.

The REWIRE-A-LINK button causes one link to disappear, and a new one to appear elsewhere in the grid. The KEEP-REWIRING button causes a continual rewiring of links to occur.

The histogram displays the number of nodes whose values fall into certain ranges to view the distribution of influence among the total nodes.

## THINGS TO NOTICE

As time passes, the network tends toward an equilibrium state (Stonedahl and Wilensky, 2008).

THINGS TO TRY

```
By running the model in Method 2 , it is possible to build a network based on several scenarios and introduce actors at various time to see how the model changes. It is also easy to change the links between actors, erase links between actors, or add new links between actors.
```


## EXTENDING THE MODEL

This model can be adapted to a number of scenarios and situations where intergovernmental issues arise and are in conflict. The extent to which relationships matter or are irrelevant is easy to spot in this model.

## NETLOGO FEATURES

```
    This model uses NetLogo's DIFFUSE command, which causes all
patches to share with their links portions of the value running
through them. The ability to control variables is available in
the command center.
```


## CHAPTER 7 CONCLUSION AND FINDINGS

## SETTLING DIFFERENCES

```
"It is common sense to take a method and try it: If it fails, admit it frankly and try another. But above all, try something."
Franklin D. Roosevelt
Address at Oglethorpe University, May 22, 1932
```


## Overview of findings

The objective of the dissertation was to examine the application of alternative methods of analysis in an intergovernmental problem that is complex, and polarized. Using narrative and network analyses, this dissertation told a story, drew a picture, and then animated the picture to enhance readers' understanding of the intergovernmental relationships surrounding the Army's proposed expansion of its Piñon Canyon Maneuver Site in Southeastern Colorado. The dissertation examined the issue within the context and lens of narrative analysis and social network analysis to see which side of the argument is supported by the bureaucracies involved. After the analysis, the next step was to "build a model, to simulate the dynamics in order to better understand the complexity of the system" (Liao, T. as quoted in Gilbert, 2008). Central to my goal was to explain how the government agents within the Piñon Canyon network are linked, where influence resides, and how power is exchanged from agent to agent.

As stated in the opening, "In light of Roe's (1994) assertion that traditional analytical methods are failing us in situations like Piñon Canyon, I wanted to examine whether new
methods could be used to study these intergovernmental relationships and their influence on resulting public policy." That led me to formulate the following three hypotheses, which would allow me to look at the application of more suitable methods for addressing complex problems:

1) Small World Networks have value in identifying centers of influence and their potential actors in the pro/con intergovernmental issues surrounding Piñon Canyon encroachment.
2) Network theory application may be a more suitable method of discerning whether there can be mutually agreeable and successful models for collaboration or.
3) Applying Small World Networks to Piñon Canyon results in better understanding of the patterns of potential cooperation and conflict, and where they exist.

The results of the Multi-method analysis undertaken as part of this dissertation affirm the above hypotheses and therefore, provide support for the use of alternative methods in the application of intergovernmental problems.

The Piñon Canyon case is significant for several reasons. The research supports the claim that social network frameworks and methods can be applied to bureaucracies. The case study, as presented, supports the claim that significant value can be found in the application, theory and methods using agent based models. There should be a great deal of opportunity for future research
into the social network analysis of bureaucracies and agent based modeling.

There are significant challenges to this process and the use of these methodologies pose hurdles in their proper use. Additional research into the more intricate behavior of networks needs to be conducted, understood, and taught. While the process may seem complicated to the novice, the methods are quickly learned.

The guiding questions of the analysis were designed to lead up to the hypotheses and relate to the multi-methodology approach. Using Narrative Analysis, Social Network Analysis and Agent Based Modeling helped keep the construct of the problem in place. The issue is in a limited universe networked between Southern Colorado, Pueblo, Colorado Springs, Denver and Washington D.C., and replicated with much different cases nationwide. The value of the analysis in utilizing this methodology is in how it frames the problem as a story, compares and explains the environment and then draws the picture. Reviewing each of the guiding questions:

1) Can Network Theory/Network Science be applied to the study of Intergovernmental Relationships?
2) Can Network Science be applied to "close the gap" between competing interests in the Intergovernmental arena?
3) What does a network between competing governments look like?
4) How can the network theories of "Connectivity, Exchange, and Locality" be applied to a Public Administration problem?

It is clear Network Theory/Network Science can be applied to studying stakeholder relationships in the intergovernmental
arena and as a valuable tool for determining where gaps among competing interests might be closed. The appearance of networks between competing governments is limited to the researcher's creativity; of the three guiding questions, this has the least clear answer.

Finally, the network theories of "Connectivity, Exchange, and Locality" were addressed in terms of network attributes. The network model contains a well-defined connection topology in which each node has a finite number of defined links to other nodes for connectivity. The model has a topology that exists in order to exchange one or more classes of resources among nodes and satisfies the exchange requirement. The locality requirement is satisfied by node-to-link, link-to-node interaction.

The research shows strong evidence of the feasibility of applying network science to public problems utilizing concepts drawn from social network theory that, in turn, construct working models as a valid and reliable methodology. To explore the utility of the modeling, the analysis pursued three sets of hypotheses-the first focused on identity, the second on application, and the third on topology.

## Literature Review

The literature on the Piñon Canyon Maneuver Site Expansion used in this case study focused on two areas:

1) Network theory and science as it relates to bureaucracies(Foundational Literature),
and
2) Piñon Canyon as a stand-alone political issue (Subject Matter Literature).

In collecting my literature, I consulted overarching theoretical experts like Agranoff, Barabasi, Goldsmith and Eggers, Strogatz and Milgram. I also dug into current scholars and subject matter experts such as Doe, Gilbert, Knoke and Yang.

Major points noted in the foundational literature include: Network Science can be used across types to include bureaucracies; collaborative public management is an evolving strategy; streetlevel bureaucrats can drive networks; and, there are direct paths between and through agents.

Under network theory and especially in the areas of intergovernmental relations and government by network, there was strong evidence to support the second hypothesis. There has been extensive research into the expansion of network theory into bureaucracies and its utility in finding centers of collaboration and compromise. The idea of applying small worlds to bureaucracies is less pronounced in the literature though the purpose of this research was to study these exact phenomena. The third hypothesis was supported by the literature in a tangential manner in that the published research on both networks and patterns exist but connecting the two to a public administration problem was not as strong as the second hypothesis. From the foundational literature, $I$ processed a lot about the evolving nature of collaboration and how it relates to network strategy.

The subject matter literature aided me in understanding the idiosyncrasies of the agents and the historical themes supporting Piñon Canyon as a stand-alone issue. Significant anthropological and natural resource writings dominate the literature, while the history of the proposed expansion is unwritten outside of government reports.

Researching Piñon Canyon as a standalone political issue served to generate insight to the narrative analysis surrounding the competing interests and connections within the bureaucratic complex. Using a literature review to support a narrative analysis was critical in understanding the idiosyncrasies of the groups. In order to build a network, a greater understanding of the issues at play between the actors as well as the importance of Network Science was necessary to understand the environment. Without understanding the environment and the narrative, it is much harder to locate the patterns of potential cooperation and conflict and where the patterns exist. Whether there can be mutually agreeable and successful models for collaboration or compromise is critical to understanding the issue in the first place. The subject matter literature helped gain an excellent grasp of relevant historical themes and government documents.

- Aids in understanding of the idiosyncrasies of the agents - Historical themes support Piñon Canyon as a stand alone issue
-Significant anthropological and natural resource literature dominates
- History of the proposed expansion is unwritten outside of government reports

The application of the literature review to the hypotheses strengthens the overall study. The literature from newspapers and as documented in archival records clearly supported Piñon Canyon as a stand-alone political issue, especially with respect to the first hypothesis of identifying tipping points in the pro/con intergovernmental issues of Piñon Canyon and encroachment. The second hypothesis surrounding the ability to leverage one side of a policy debate and whether there can be mutually agreeable and successful models for collaboration or compromise, has strong evidence but has not been proven. The third hypothesis was supported by the literature review by providing a better understanding of the patterns of potential cooperation and conflict and where they exist.

## Narrative Analysis

The Narrative Analysis was conducted in order to understand the problem through interviews, journalistic history and physical artifacts. Results from the Narrative Analysis followed a similar pattern to those of the Literature Review. The first hypothesis of identifying tipping points in the pro/con intergovernmental issues of Piñon Canyon and encroachment was strongly supported by the collection of stories. The second hypothesis surrounding the ability to leverage one side of a policy debate and whether there can be mutually agreeable and successful models for collaboration or compromise again had strong supporting evidence but has not
been proven. The third hypothesis of providing a better understanding of the patterns of potential cooperation and conflict and where they exist was clearly supported by the Narrative Analysis, as it was by the Literature Review. Stories are the narrative tales. In this case, the Army started this controversy and therefore, they own the master narrative. Stories have a beginning, a middle, and an end. The Army's story begins with its need to transform its forces postVietnam and again after the Cold War, which evolved to an encroachment problem, and ends with the expansion problem. The counter-story is set forth by the organization Not One More Acre. The group's counter-story is that the Defense Department, already a large landowner, does not need to expand. The organization Piñon Canyon Expansion Opposition Coalition employs a series of non-stories that do not directly counter the Army's master narrative, but which instead evoke the value of agriculture, ranchers' historic ties to the land, and threats to the environment. Another non-story is the potential loss of property tax revenues to local school districts. Nonstories are circular in nature and have no beginning, middle or end. The Coalition's non-stories have proven effective in derailing the Army's master narrative and taking the service off message.

Bureaucratic critiques, sometimes cast in a story format, are similar to non-stories, in that they do not address the master narrative, but merely critique it. Examples include GAO
reports and protests by both Otero and Las Animas Counties that the Army has not justified the expansion.

## Social Analysis

Utilizing participant information and the observation of network science, the study applied the Piñon Canyon issues to three network models. All three models demonstrated strong evidence to support all three hypotheses. Because of the limitations of the models used and difficulty to map the collected research to an appropriate model, none of the hypotheses were proven or disproven. The research simply showed that an intergovernmental controversy does not fit a simple small world network, diffusion along a directed network, or preferential attachment model though the diffusion network came the closest.

## Agent Based Model

Building an Agent Based Model on participating direct observations of this model strongly supported all three hypotheses. The Piñon Canyon model demonstrated very strong evidence in identifying tipping points and went beyond in the identification of centers of influence. The indications were strong that a public administrator could research an issue to leverage a debate by collaborating with other entities in the network. Unfortunately, mutually agreeable and successful models for collaboration or compromise are difficult to prove due to the fluidity of the issue. The evidence was strong in that application of Small World Networks to Piñon Canyon, especially
when combined with diffusion along a directed network, resulted in better understanding of the patterns of potential cooperation and conflict and where they exist. While more properties of a diffused network were applied, the concept of a small world is still at play.

## Application of General Chemistry

Repeatedly during the course of the research parallels between general chemistry principles and network science appeared. The most enlightening aspect of this research was not in seeking a new methodology to apply to an issue but how nearly every step in building a network correlated to the behavior of protons, neutrons, and electrons. While trying to understand the inner workings of networks the concept of valence and covalence kept reemerging. Valence is a measure of the number of bonds formed by an atom of a given element and covalence is the sharing of pairs of electrons between atoms or, in this case, between agents sharing links. A bureaucracy sharing agents in a network may be as common as their ability to share links. This is a concept that warrants further research.

## Centrality and Centers of Influence

The concept of "centers of influence" was clear and obvious from the very beginning. It is interesting to see in the literature and interviews for the narrative that the concept of centers of influence was not thoroughly thought through, or even taken into consideration, by several actors. While many bureaucrats and administrators understood the need and necessity
to collaborate and cooperate, they engaged in the behavior as targets of opportunity presented themselves, rather than as part of a strategy. This was probably one of the most surprising aspects of the research findings.

## Findings/What Happened Inter-governmentally?

The analyses demonstrated the real world position of Branson in the network and showed that Branson School District, as a small government, does not alone have the power to stop the Army. The study also showed that the Army remains powerful and continues to be the dominant actor in the intergovernmental arena. This finding does not dismiss or diminish the influence of the Branson School District. Because the ranchers were able to enlist not only the support but the advocacy of smaller governments, they are able to mount an impressive offense against the Army. The strategy of the ranchers, whether intended or not, is evolving to a coalition of governments that can eventually wear down, stop or possibly (though unlikely) remove the Army from Southern Colorado.

The collaboration between the ranchers and several small governments, like the Branson School District, provided an increase of power in the bureaucratic struggle against the Army. This allowed small coalitions to move vertically and horizontally through the bureaucratic maze in order to broker coalitions. Because Fort Carson and the concentration of power in Colorado Springs have strong historical ties, the Army did not engage much outside of El Paso County.

In addition, the State of Colorado is in a difficult situation that leaves it stuck between a consolidated massive political and bureaucratic machine in El Paso County and a much smaller, well-networked machine across a massive portion of the state. The analysis demonstrated that the state has not taken the initiative or an active role on behalf of either side unless it was mission essential to a particular agency.

My analyses also indicated Pueblo City and County are the likely tipping points in the bureaucratic arena. The evidence of this was demonstrated not only in the Narrative Analysis but in the behavior of the bureaucracies/their relationships and the ability-especially Pueblo County-to be well networked and tied closely together as a City-County entity.

While the intergovernmental networks didn't behave like traditional social networks when applied to models they did tie to their self-interests to relationships similar to social units. Their social structures were determined by such interactions and the ties that measured the convergence of the various actors in the network. Pueblo County's relationships were characteristic of social networks in that the smaller governments tied themselves to the larger center of influence. The intergovernmental relationships demonstrated explain some of the intergovernmental phenomena as a social phenomena.

## Research Challenges

Lynne Hamill, a Visiting Fellow at University of Surrey in

Guildford, United Kingdom wrote in the Journal of Artificial
Societies and Social Simulation that she was "faced with basic questions to which there appeared to be no obvious answers and no guidance" in terms of Agent Based Modeling and that "guidance and standard practices" should be developed (Hamill, 2008). The problem with validity is clear. Hamill's focus on:

1) How many agents?
2) How many runs?
3) How to aggregate results?
4) What statistics to use?
was important to consider in order to accept some form of best practices and address the use of proper statistical techniques.

The first question as to the number of agents was addressed in Chapter 3 by limiting the model to bureaucracies and addressing the selection via the products of the classificationcalled types (Szostak, 2004). Utilizing the typology theory (5W Who, What, Why, Where, When) to identify agents simplified the process. By the additional step of eliminating duplicate agents and "acting non-actors" a number of agents was selected that satisfied both the model and narrative.

The second question pertaining to the number of runs was overcome by knowing that the model did not have random variables initiated as a necessity. The random variable for link-chance and introduction of other scenarios was built in as an additional tool to forecast unforeseen events.

The process to aggregate results is up to the user. The purpose of building the model was to give an administrator a starting point. This problem goes hand in hand with the model
becoming a historical analysis explained in Chapter 6. Understanding that either the model is built to the narrativethat is, as events happen-or built to understand where the actors are, and to enabling experimentation with possible future scenarios, is the most helpful utility. Aggregating the results would be similar to trying to aggregate an individual because a network represents a living entity.

## In Conclusion

The Piñon Canyon Case Study was subjected to several types of analysis, ranging from the traditional narrative policy analysis through an agent-based network analysis using a model adapted by the author via NetLogo. This multi-stage analysis yielded the following intergovernmental findings.

The U.S. Army remains a dominant intergovernmental player in the Piñon Canyon developments. Its place in the overall Colorado intergovernmental structure at both the State and Local government insures that its actions; both positive and negative will affect the intergovernmental conflict and cooperation in the area.

A variety of local government entities, especially the Branson School District, have proven adept at slowing if not stifling the Army's proposed expansion at Piñon Canyon at least for the moment. They have been successful by building coalitions with a variety of other locally interested parties. This finding certainly stresses the importance of intergovernmental coalition building in the resolution of intergovernmental issues.

Finally, the network analysis employed here suggests that as the Piñon Canyon controversy further develops there are intergovernmental actors such as Pueblo County and the Colorado Land Board that are "tipping point" actors in this contest. They are actors, while leaning in one direction or another, who have not made their interest clear to date, but when they do so, their influence could move the Piñon Canyon debate in one direction or another.

The statistics used in the Piñon Canyon model were traditional for the quantitative needs of the research. While network science as a methodology is more a mathematical process, the purpose of this research was a hybrid of the utility of tools and a case study. The value of this research is the use of underused analytical tools to address real world problems.

Additional suggestions for further research include: the study of "networks of networks" or how does the bureaucratic network interact with the business network, political/civic network, press, etc.; the impact of power and its assignment; the research challenges involved in network research and finally, the dynamics of centrality within intergovernmental relationships.

Yet, the key contribution of this dissertation has been to go beyond the Narrative Policy Analysis that has been traditionally used in case study analyses of intergovernmental conflict or cooperation. The Agent Based Network Analysis employed in this dissertation can help future researchers bring
to bear a richer and more productive analysis of intergovernmental issues.

As intergovernmental structures and issues become more complex, it is essential that we use more advanced methodological tools to understand such complexity. It is this author's contention that the Agent Based Modeling analysis tool employed in this dissertation will help future public administration researchers better understand some of the pressing and dynamic issues of the $21^{\text {st }}$ century.

## AFTERWORD-A DANGEROUS GAME

"...bear meat would help them get used to the weather. Even if it didn't, a bearskin might come in handy."
"Yes, and them darn bears probably think a little man meat would come in handy."
-Soupy's observation to Po Campo wintering in Montana
Larry McMurty's Lonesome Dove
Having analyzed the issues surrounding Piñon Canyon from a scholarly standpoint, I now offer some personal commentary on the current status of the proposed expansion.

The November 30, 2011 edition of the Pueblo Chieftain reported that Colorado Governor John Hickenlooper was lobbying Army Secretary John McHugh to find an alternate use for a state prison facility slated for closure. Located near the town of Las Animas, the Fort Lyon prison had previously housed a VA clinic and before that, a naval sanatorium. Closure of the facility means the loss of 200 jobs in an area where well-paying jobs are hard to come by. The governor was quoted as saying:

I told Secretary McHugh that if the Army ever hopes to make more use of the Piñon Canyon (Maneuver Site) in the future, that helping to solve the economic problem of keeping Fort Lyon open would be a major step forward.

In other words, the Army could improve its image in Southeastern Colorado-and perhaps move the Piñon Canyon football down the field-by saving the jobs at Fort Lyon. Or, read more menacingly, the Army should not expect movement on Piñon Canyon unless it is willing to help keep the residents of Las Animas employed. The governor's gambit will most likely be interpreted by the Pentagon as a form of "payola" or "pay to play".

In January 2012, Secretary of Defense Leon Panetta announced dramatic reductions in DOD forces and facilities, with the Army expected to take the brunt of the cuts
(http://usnews.msnbc.msn.com/_news/2012/01/26/10244240-panetta-military-cuts-to-hit-all-50-states). Because the Army is being forced to substantially reduce end-strength, units at Fort Carson may now be at risk for disestablishment or relocation.

Prior to Hickenlooper's and Panetta's announcements, the Army had already grown concerned that opposition groups were switching their tactics from simply blocking the expansion of Piñon Canyon to preventing use of even the existing acreage at the site. In light of activists pursuing this more aggressive goal, it is possible the service will conclude its days at PCMS are numbered
and it would be better to throw in the towel in Colorado and draw down the force structure at Fort Carson.

There are several examples of cautionary tales for Coloradans to consider, from Fort Ord, California to Naval Weapons Station in Earle, New Jersey. A 1989 tax debate involving Colts Neck and Tinton Falls Township surrounding the education of Navy dependents continues to this day while base missions are BRAC'ed or quietly moved elsewhere. Fort Ord with contaminated groundwater, soil, solid waste is years from clean-up after hundreds of millions of dollars spent since closing in 1994.

Some in Southern Colorado feel they wouldn't lose much with the Army's departure from Piñon Canyon. Jim Herrell of the opposition group Not One More Acre is one of them. "I don't think the military has bought two candy bars and a tank of gas in La Junta since the $1980^{\prime} s,^{\prime \prime}$ he said recently (Prendergast, 2011). But the military is Colorado's second-largest employer, and the Army's presence-or lack thereof-has impacts far beyond La Junta and Otero County.

Despite this, my research indicated that many components of state government are AWOL from the Piñon Canyon debate. I think this is a mistake and that the state can and should take a more active role in resolving the issues.

Both Agriculture and the Military are important to Colorado. If either side were to win outright-The Army controlling millions of acres or the Army leaving-the consequences would ultimately devastate the economic health of the state. My research also indicated that interests in the City of Pueblo and Pueblo County could be key to bringing opposing stakeholders together.

Agriculture and the military are vital to national security, and I would argue both sectors are vital to Colorado's future prosperity. I spent part of my teenage experience working on ranches to earn money. I remember the hard work herding cattle and can still name each of the three different horses $I$ was thrown from. I am a Combat veteran like all three of my brothers, my father, grandfather, and great grandfather. All of us are veterans of America's wars of the 20th century, came back alive, a testament to both our rural upbringing and military training.

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Appendix A: Informational Interviews Summary

## Introduction

Stakeholder and Subject Matter Expert interviews were conducted as part of the analysis collection techniques to develop the model. The purpose of the stakeholder interviews was to assess the collaboration and networking awareness of stakeholders and to collect information on key issues, current activities between bureaucracies related to Piñon Canyon issue. The research conducted 23 interviews with a variety of stakeholders and subject matter experts. Two interviews were in progress when the subjects withdrew. An additional interviewee accepted then pulled out. These interviews, while providing a great deal of information were struck from the research and are not part of this study. The stakeholders were selected based on their knowledge of the Piñon Canyon issue and the complex divisions among the competing bureaucracies.

## Methods

Permission was obtained to implement the stakeholder interviews from the Institutional Review Board (IRB) at the University of Baltimore (UB). Upon completion of the completing the IRB certification process, a draft stakeholder interview script and set of the informational interview questions was developed. The purpose of the research is not to determine the strength or weakness regarding either side of the argument but to help understand how the bureaucracies work with or against each other. By designing a broad interview process, a model can be built to show how each interacts over a period of time.

The interview questions focused on the following:

1) What are the primary strengths and weaknesses of the expansion argument?
What level of government (Fed/state/county/municipal) carries the most influence in determining an outcome?
2) Who (government entity or agency) most closely understands the immediate needs of your point of view regarding PCMS?
3) Who has the most influence? The least?
4) Which elected officials from all levels of government do you feel most support your point of view?
5) How does that support manifest itself?
6) Where do you see this issue, five years from now?
7) In your opinion, what are the relationships like among the various levels of government? (Are they cooperative? Hostile? Distant? Close?)
8) How do the political decisions that affect you at the following levels influence your support?
9) How do you perceive the federal government in relationship to other governments involved? (United? Split? Unknown?) 10) How do you perceive the state government in relationship to other governments involved? (United? Split? Unknown?) 11) How do you perceive the county government in relationship to other governments involved? (United? Split? Unknown?)

Las Animas / Otero / Pueblo / El Paso
12) How do you perceive the city government in relationship to other governments involved? (United? Split? Unknown?)
Trinidad / La Junta / Pueblo / Colorado Springs
The Stakeholder interviews were conducted over the phone and in person. After initial contact with each agency the list was narrowed to ensure that the subject stakeholder was an expert from their agency.

This process of ensuring the list was refined helped the keep the scope of the research fixed on the relevant bureaucracies.

## Stakeholder Interview Process

The following Stakeholders were interviewed:

| STAKEHOLDER | INTERVIEW <br> DATE | LOCATION | METHOD |
| :---: | :---: | :---: | :---: |
| City of Trinidad | $5 / 17 / 2011$ | Trinidad, CO | In Person |
| USDA-NRCA | $5 / 17 / 2011$ | Trinidad, CO | In Person |
| USDA-USFS | $8 / 31 / 2011$ | Washington D.C. | Phone |
| U.S. Army Fort Carson | $5 / 18 / 2011$ | Fort Carson, CO | In Person |
| Not One More Acre | $8 / 16 / 2011$ | Welcome, MD | Phone |
| Piñon Canyon <br> Opposition Coalition | $8 / 15 / 2011$ | Washington D.C. | Phone |
| Branson School <br> District | $5 / 14 / 2011$ | Welcome, MD | Phone |
| City of Pueblo | $8 / 31 / 2011$ | Welcome, MD | Phone |
| Colorado Oil and Gas <br> Conservation <br> Commission | $8 / 22 / 2011$ | Washington D.C. | Phone |
| Office of Colorado <br> Department of <br> Agriculture | $5 / 16 / 2011$ | Denver, CO | In Person |
| Office of Colorado <br> Board of Land <br> Commissioners | $5 / 16 / 2011$ | Denver, CO | In Person |
| Colorado Department of <br> Wildlife | $9 / 19 / 2011$ | Washington D.C. | Phone |
| Department of the Army | $8 / 26 / 2011$ | Arlington, VA | In Person |

Once a stakeholder agreed to participate, subject was provided with a description of the project and basic interview script. This allowed each subject to prepare for the interview and allow areas that the subject could follow-up outside of the interviews.

## Interview Content

Each interviewee answered each of the base questions. General followup to questions was conducted on each response. Interviewees were provided the opportunity to comment or emphasize issues that were important to their respective position.

Interview results
The following summarizes the major questions from the stakeholder interviews.

1) What are the primary strengths and weaknesses of the expansion argument?
What level of government (Fed/state/county/municipal) carries the most influence in determining an outcome?

Nearly all of the respondents indicated the primary strengths of the expansion argument centered on the need for soldiers to train. The overwhelming theme regarding weakness focused on the Army's actual need for the land. The Federal Government was determined to be the primary influence on if the expansion happens though the term "Federal Government" usually referred to Congress.
2) Who (government entity or agency) most closely understands the immediate needs of your point of view regarding PCMS?

Not surprisingly, most of the stakeholders associated themselves with like bureaucracies; County to County or State to State. The one agency that was most outside of that model was the NRCS that associated themselves to the ranchers.
3) Who has the most influence? The least?

The Stakeholders provided a wide variety of the most influential stakeholder in the network. While the interviewees all acknowledged the initiative of a collection of small local groups the idea of collaboration was not indicated to be a clear strategy.
4) Which elected officials from all levels of government do you feel most support your point of view?

Nearly each interviewee could identify by name which politicians on the state and federal level were on which side of the argument. As the names of politicians locally were discussed the support of the elected officials became less clear between cities.
5) How does that support manifest itself?

Support for or against an issue was always manifested in public statements or support of legislation.
6) Where do you see this issue, five years from now?

The stakeholders at all levels were unanimous that this issue was not going away in five years and would probably change very little. The issue is beginning to morph from the ranchers that the military will still take over 400,000 or more acres while Army analysts feel that the activists will attempt to close the facility permanently.
7) In your opinion, what are the relationships like among the various levels of government? (Are they cooperative? Hostile? Distant? Close?)

Both extremes frame the relationship between federal and local (SE Colorado) as polite but hostile. The State Government was viewed as cooperative but distant by the local (SE Colorado) agencies. The State agencies viewed most relationships at all levels as tense but cooperative. The federal stakeholders were more likely to indicate that the State was not very active.
8) How do the political decisions that affect you at the following levels influence your support? (Local/ State/ Federal)

Each agency leaned towards decisions made at their respective level as the most influential. There was one notable exception that one of the opposition organizations indicated the federal government (Congress) was critical and a huge influence.
9) How do you perceive the federal government in relationship to other governments involved? (United? Split? Unknown?)
10) How do you perceive the state government in relationship to other governments involved? (United? Split? Unknown?)

These questions provided a lot of interest. Each stakeholder was able to identify the competing interests between Agriculture and the Military. While most understood the spilt interests in the various constituencies, most felt weary about the influence of the military and agricultural business interests getting involved and the ultimate shape the outcome-though there was indication on both sides that the introduction of this dynamic may have already come into play.
11) How do you perceive the county government in relationship to other governments involved? (United? Split? Unknown?) Las Animas / Otero / Pueblo / El Paso
12) How do you perceive the city government in relationship to other governments involved? (United? Split? Unknown?)
Trinidad / La Junta / Pueblo / Colorado Springs

Most of the respondents gravitated to Pueblo as the critical stakeholder in the governmental relationship network. It was described during multiple conversations that, "As Pueblo goes, so goes all of Southeast Colorado." Each of the respondents felt that Trinidad, La Junta and Colorado Springs were solidly united behind their respective constituencies.

## Subject Matter Interviews

| EXPERT <br> CONSULTATION <br> SOURCE | CONSULT <br> DATE(S) or <br> INTERVIEW | SOURCE <br> LOCATION | EXPERTISE |
| :---: | :---: | :---: | :---: |
| Colorado State <br> University | $5 / 19 / 2011$ | Denver, CO | Natural Resources and <br> Piñon Canyon history |
| Department of <br> Defense | $8 / 25 / 2011$ | Arlington, <br> VA | Pentagon Network |
| Pueblo Chieftain | $9 / 1 / 2011$ | Washington <br> D.C. | Journalistic and <br> Political Climate |
| University of <br> Nebraska | $5 / 2010-$ <br> $1 / 2012$ | Curtis, NE | Rural Affairs |
| US Army Officer <br> (0-6/COL) | $5 / 2010-$ <br> $10 / 2011$ | Washington <br> D.C. | Army Doctrine |
| Las Animas County <br> Rancher | $5 / 14 / 2010$ | Las Animas <br> County, C0 | Ranchers Networks |
| Office of the <br> Lieutenant <br> Governor of <br> Colorado | $5 / 19 / 2011$ | Denver, CO | Political Climate |

The purpose of these interviews or consults was to obtain a better understanding of either technical or historical issues relating to the expansion. Some of the subjects were consulted over a long period while others were subject to a single interview.

## SUMMARY OF FINDINGS

The Subject Matter Experts were highly valuable in filling in holes on the overall issue of Piñon Canyon. Understanding much of the historical and controversial framework provided by Colorado State University and the Pueblo Chieftain was critical to the Narrative Analysis.

Overall, there were no unusual revelations during the interviews. The findings were consistent with intergovernmental relationships between bureaucracies anywhere in the United States. The interviews were also
helpful in identifying critical stakeholders in the shadows of this controversy.

APPENDIX B IRB and Questionnaire

The Interests of Competing Government and Piñon Canyon, Colorado: A Case Study on Small World Networks and the encroachment issues relating to military land and agricultural land in Southeast Colorado as a consequence on intergovernmental relationships

You are asked to participate in a research study conducted by Richard D. Mestas and faculty chair John J. Callahan, Ph.D. from the Department of Public Administration at The University of Baltimore in Baltimore, MD. This research is conducted as a dissertation in partial requirements of the Doctor of Public Administration Degree. Your participation in this study is entirely voluntary.

## PURPOSE OF THE STUDY

The purpose of this dissertation is to develop a case study on Piñon Canyon Colorado, a military installation and its proposed expansion on surrounding agricultural lands, while applying the principles of Small World Networks to understand the dynamics of the intergovernmental issues at play.

## PROCEDURES AND INTERVIEW QUESTIONS

If you volunteer to participate in this study, you will be asked to respond to the following questions based on a list of agencies provided:

1) What are the primary strengths and weaknesses of the expansion argument?

What level of government (Fed/state/county/municipal) carries the most influence in determining an outcome?
2) Who (government entity or agency) most closely understands the immediate needs of your point of view regarding PCMS?
3) Who on the list has the most influence? The least?
4) Which elected officials from all levels of government do you feel most support your point of view?
5) How does that support manifest itself?
6) Where do you see this issue, five years from now?
7) In your opinion, what are the relationships like among the various levels of government? (Are they cooperative? Hostile? Distant? Close?)
8) How do the political decisions that affect you at the following levels influence your support?
9) How do you perceive the federal government in relationship to other governments involved? (United? Split? Unknown?)
10) How do you perceive the state government in relationship to other governments involved? (United? Split? Unknown?)
11) How do you perceive the county government in relationship to other governments involved? (United? Split?

Unknown?)
Las Animas
Otero
Pueblo
El Paso
12) How do you perceive the city government in relationship to other governments involved? (United? Split? Unknown?)

Trinidad
La Junta
Pueblo
Colorado Springs

## CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will be disclosed only with your permission or as required by law. Confidentiality will be maintained upon request.

## PARTICIPATION AND WITHDRAWAL

You can choose whether or not to be in this study. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you do not want to answer.

## POTENTIAL RISKS AND DISCOMFORTS

There are no physical or emotional risks involved with this study.

## POTENTIAL BENEFITS OF THE RESEARCH.

By advancing Network Science into the field of intergovernmental relationships, paths can be identified to follow the strength and stamina of political ideas. Utilizing Small World Networks the Public Administrator can better understand the power of public ideas and how they shift and morph.

## IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about this research, please contact Dissertation Chair:

Dr. John Callahan
Executive in Residence,
School of Public Affairs
The University of Baltimore
Office Number: LAP 410
1420 N. Charles St.
Baltimore, MD 21201
Phone Number: 410-837-6174, on-campus 6174
Email: jcallahan@ubalt.edu

## RIGHTS OF RESEARCH SUBJECTS

The University of Baltimore Institutional Review Board has reviewed my request to conduct this project. The University of Baltimore has established the Institutional Review Board (IRB) in compliance with federal regulations governing research involving human subjects funded by the US government. All research involving human subjects conducted by faculty, staff or students at the University must comply with the federal regulations set forth in 45 CFR 46 . If you have any concerns about your rights in this study, please contact the Thomas Mitchell, Chair Institutional Review Board, at the Office Sponsored Research, Office of the Provost at the University of Baltimore at: 410.837.5348

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

Printed Name of Subject

Signature of Subject

Signature of Witness

## Date

## Date

Approved by the University of Baltimore Institutional Review Board (IRB) on July 8, 2010.

Appendix C Land Maps

Figure C. Land Ownership


## Central Shortgrass Prairie

Map created by The Nature Conservancy
Map create
2006-10-12
Projection: UTM Zone 13
Datum: GCS NAD 83


Central Shortgrass Prairie Ecoregional Assessment Final Report November 2006 page 8
Available at:
http://www.cnhp.colostate.edu/download/documents/2006/CSP_F
inal_Report_2006.pdf


SE Colorado Land Cover
Source: Colorado Department of Natural Resources, Water Supply and Needs Report for the Arkansas Basin, June 2006 Available at: http://cwcb.state.co.us/water-management/basin-
roundtables/documents/arkansas/arkbasinwatersupplyneeds.pdf

Timeline of important management, environmental and training events at U.S. Army Piñon Canyon Maneuver Site, 1980-2008.


Doe, W., Jones, D., Milchunas, D., Block, P., Beavers, A., 2008 Adaptive, Management for Mission and Environment: Stewardship ar the U.S. Army Piñon Canyon Maneuver Site, Colorado, 1983-2008, Center for Environmental Management of Military Lands, Ft. Collins, CO, Colorado State University

Map from the LaJunta Tribune Democrat courtesy PCEOC Available at:
http://www.pinoncanyon.com/images/ljtd_enhncd_map.jpg


Appendix D
Model Validation Army 10
Model Validation Branson 30
Model Behavior Space 265 Runs

| BehaviorSpace results (NetLogo 4.1.3) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 3-12-12 Pinon Canyon Final II.nlogo |  |  |  |  |  |
| Army |  |  |  |  |  |
| 03/12/2012 10:44:08:753-0400 |  |  |  |  |  |
| min-pxcor | max-pxcor | min-pycor | max-pycor |  |  |
| -11 | 11 | -11 | 11 |  |  |
| [run number] | 1 | 2 | 3 | 4 | 5 |
| link-chance | 0 | 0 | 0 | 0 | 0 |
| diffusion-rate | 12 | 12 | 12 | 12 | 12 |
| number-of-nodes | 15 | 15 | 15 | 15 | 15 |
| grid-size | 3 | 3 | 3 | 3 | 3 |
| [reporter] | [val] of turtle 10 | [val] of turtle 10 | [val] of turtle 10 | [val] of turtle 10 | [val] of turtle 10 |
| [final] | 8.172026119 | 8.172026119 | 8.172026119 | 8.172026119 | 8.172026119 |
| [min] | 5.194759569 | 5.194759569 | 5.194759569 | 5.194759569 | 5.194759569 |
| [max] | 8.172026119 | 8.172026119 | 8.172026119 | 8.172026119 | 8.172026119 |
| [mean] | 7.113161384 | 7.113161384 | 7.113161384 | 7.113161384 | 7.113161384 |
| [steps] | 365 | 365 | 365 | 365 | 365 |
|  |  |  |  |  |  |
| [all run data] | [val] of turtle 10 | [val] of turtle 10 | [val] of turtle 10 | [val] of turtle 10 | [val] of turtle 10 |
|  | 6 | 6 | 6 | 6 | 6 |


| BehaviorSpace results (NetLogo 4.1.3) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 3-12-12 Pinon Canyon Final II.nlogo |  |  |  |  |  |
| Branson |  |  |  |  |  |
| 03/12/2012 10:47:01:361-0400 |  |  |  |  |  |
| min-pxcor | max-pxcor | min-pycor | max-pycor |  |  |
| -11 | 11 | -11 | 11 |  |  |
| [run number] | 1 | 2 | 3 | 4 | 5 |
| link-chance | 0 | 0 | 0 | 0 | 0 |
| diffusion-rate | 12 | 12 | 12 | 12 | 12 |
| number-of-nodes | 15 | 15 | 15 | 15 | 15 |
| grid-size | 3 | 3 | 3 | 3 | 3 |
| [reporter] | [val] of turtle 30 | [val] of turtle 30 | [val] of turtle 30 | [val] of turtle 30 | [val] of turtle 30 |
| [final] | 2.626558406 | 2.626558406 | 2.626558406 | 2.626558406 | 2.626558406 |
| [min] | 2 | 2 | 2 | 2 | 2 |
| [max] | 3.494908155 | 3.494908155 | 3.494908155 | 3.494908155 | 3.494908155 |
| [mean] | 2.960913979 | 2.960913979 | 2.960913979 | 2.960913979 | 2.960913979 |
| [steps] | 365 | 365 | 365 | 365 | 365 |
|  |  |  |  |  |  |
| [all run data] | [val] of turtle 30 | [val] of turtle 30 | [val] of turtle 30 | [val] of turtle 30 | [val] of turtle 30 |
|  | 2 | 2 | 2 | 2 | 2 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 2 | 1.403548513 | 2.113128411 | 1.142478807 | $7.32 \mathrm{E}-20$ | 0.388229393 | 0.130576503 | $5.45 \mathrm{E}-21$ | 7.962976114 |
| 3 | 1.403548513 | 1 | 0.896888146 | $7.32 \mathrm{E}-20$ | 0.388229393 | 0.130576503 | $5.45 \mathrm{E}-21$ | 3 |
| 4 | 5 | 2.484902147 | 1.290756236 | 1 | 1 | 2 | 1 | 7.962976114 |
| 5 | 1.54092759 | 2.241555182 | 1.187672876 | 0.028460838 | 0.444153469 | 0.253995626 | 0.02276867 | 7.213654709 |
| 6 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| 7 |  |  |  |  |  |  |  |  |
| 8 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 9 | 5 | 1 | 1 | 1 | 1 | 2 | 1 | 3 |
| 10 | 4.586545455 | 1.163428571 | 0.99 | 0.91 | 0.974545455 | 1.871428571 | 0.88 | 3.306 |
| 11 | 4.225910857 | 1.307252156 | 0.977864935 | 0.8272 | 0.950712727 | 1.757468571 | 0.7744 | 3.589001455 |
| 12 | 3.910824943 | 1.434012783 | 0.964846899 | 0.751168 | 0.928184801 | 1.655984408 | 0.681472 | 3.849526526 |
| 13 | 3.635082048 | 1.545910793 | 0.95187438 | 0.681472 | 0.906723711 | 1.565174236 | 0.59969536 | 4.088411196 |
| 14 | 3.393378668 | 1.644850679 | 0.939617982 | 0.617686221 | 0.886153526 | 1.483517263 | 0.527731917 | 4.306706643 |
| 15 | 3.181175862 | 1.732480993 | 0.928544287 | 0.559395832 | 0.866346574 | 1.409729409 | 0.464404087 | 4.505602081 |
| 16 | 2.994583317 | 1.81022903 | 0.918959866 | 0.506200455 | 0.847212339 | 1.342725971 | 0.408675596 | 4.686364978 |
| 17 | 2.830261618 | 1.879330923 | 0.911047085 | 0.457716668 | 0.828688549 | 1.281590192 | 0.359634525 | 4.850295329 |
| 18 | 2.685339788 | 1.940857708 | 0.90489313 | 0.413579704 | 0.81073407 | 1.225546775 | 0.316478382 | 4.998691207 |
| 19 | 2.557345656 | 1.99573788 | 0.900513401 | 0.373444491 | 0.793323269 | 1.17393958 | 0.278500976 | 5.132823342 |
| 20 | 2.444147017 | 2.044776886 | 0.897870293 | 0.336986181 | 0.776441578 | 1.126212824 | 0.245080859 | 5.253916877 |
| 21 | 2.343901846 | 2.088673956 | 0.896888146 | 0.303900265 | 0.760082033 | 1.081895245 | 0.215671156 | 5.363138794 |
| 22 | 2.255016156 | 2.128036626 | 0.89746509 | 0.273902368 | 0.7442426 | 1.040586756 | 0.189790617 | 5.46158977 |
| 23 | 2.176108269 | 2.163393255 | 0.899482327 | 0.246727802 | 0.72892414 | 1.001947202 | 0.167015743 | 5.550299486 |
| 24 | 2.105978501 | 2.195203821 | 0.902811332 | 0.222130938 | 0.714128883 | 0.965686886 | 0.146973854 | 5.630224562 |
| 25 | 2.043583411 | 2.223869211 | 0.907319384 | 0.199884441 | 0.699859308 | 0.931558587 | 0.129336991 | 5.70224849 |
| 26 | 1.988013902 | 2.249739234 | 0.912873719 | 0.179778418 | 0.68611734 | 0.89935085 | 0.113816552 | 5.76718304 |
| 27 | 1.938476563 | 2.273119514 | 0.919344608 | 0.161619504 | 0.672903813 | 0.868882319 | 0.100158566 | 5.825770718 |
| 28 | 1.894277774 | 2.294277428 | 0.926607557 | 0.145229921 | 0.660218113 | 0.839996986 | 0.088139538 | 5.878687974 |
| 29 | 1.854810122 | 2.313447225 | 0.93454482 | 0.130446517 | 0.648057984 | 0.81256018 | 0.077562794 | 5.926548874 |
| 30 | 1.819540799 | 2.330834433 | 0.943046373 | 0.117119818 | 0.636419448 | 0.786455209 | 0.068255258 | 5.969909065 |
| 31 | 1.78800166 | 2.346619658 | 0.952010467 | 0.105113098 | 0.6252968 | 0.761580521 | 0.060064627 | 6.009269869 |
| 32 | 1.759780703 | 2.360961862 | 0.961343858 | 0.094301465 | 0.614682683 | 0.737847339 | 0.052856872 | 6.045082381 |
| 33 | 1.734514754 | 2.374001188 | 0.9709618 | 0.084570995 | 0.604568185 | 0.715177655 | 0.046514047 | 6.077751512 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 34 | 1.711883173 | 2.385861402 | 0.980787848 | 0.075817897 | 0.594942986 | 0.693502568 | 0.040932362 | 6.107639891 |
| 35 | 1.691602436 | 2.396652 | 0.99075354 | 0.067947721 | 0.585795506 | 0.672760875 | 0.036020478 | 6.13507159 |
| 36 | 1.673421462 | 2.406470034 | 1.000797992 | 0.060874608 | 0.57711307 | 0.652897895 | 0.031698021 | 6.160335652 |
| 37 | 1.657117572 | 2.415401689 | 1.010867429 | 0.054520596 | 0.568882075 | 0.63386449 | 0.027894258 | 6.183689394 |
| 38 | 1.642492999 | 2.423523648 | 1.020914684 | 0.048814952 | 0.561088151 | 0.615616237 | 0.024546947 | 6.205361485 |
| 39 | 1.629371853 | 2.430904278 | 1.03089869 | 0.043693566 | 0.55371632 | 0.59811274 | 0.021601314 | 6.225554788 |
| 40 | 1.617597497 | 2.43760466 | 1.040783968 | 0.039098378 | 0.546751138 | 0.581317057 | 0.019009156 | 6.244448986 |
| 41 | 1.607030261 | 2.44367948 | 1.050540119 | 0.034976847 | 0.540176841 | 0.565195214 | 0.016728057 | 6.262202975 |
| 42 | 1.597545447 | 2.449177807 | 1.060141352 | 0.031281467 | 0.533977463 | 0.549715808 | 0.01472069 | 6.278957061 |
| 43 | 1.589031598 | 2.454143767 | 1.069566013 | 0.027969312 | 0.528136957 | 0.534849664 | 0.012954208 | 6.294834947 |
| 44 | 1.581388978 | 2.458617137 | 1.078796163 | 0.025001621 | 0.522639291 | 0.520569562 | 0.011399703 | 6.309945539 |
| 45 | 1.574528243 | 2.462633854 | 1.08781717 | 0.022343417 | 0.517468543 | 0.506849995 | 0.010031738 | 6.32438458 |
| 46 | 1.568369282 | 2.466226466 | 1.096617336 | 0.019963159 | 0.512608981 | 0.493666976 | 0.00882793 | 6.338236118 |
| 47 | 1.562840191 | 2.469424523 | 1.105187559 | 0.017832418 | 0.508045126 | 0.480997873 | 0.007768578 | 6.351573827 |
| 48 | 1.557876379 | 2.472254922 | 1.113521013 | 0.015925585 | 0.503761819 | 0.468821268 | 0.006836349 | 6.364462198 |
| 49 | 1.553419775 | 2.474742206 | 1.121612867 | 0.014219606 | 0.499744262 | 0.457116843 | 0.006015987 | 6.376957597 |
| 50 | 1.549418132 | 2.476908825 | 1.12946003 | 0.012693732 | 0.495978065 | 0.445865279 | 0.005294069 | 6.389109217 |
| 51 | 1.545824408 | 2.478775372 | 1.13706091 | 0.011329307 | 0.492449276 | 0.435048174 | 0.00465878 | 6.400959923 |
| 52 | 1.542596228 | 2.48036078 | 1.144415215 | 0.010109553 | 0.489144407 | 0.424647973 | 0.004099727 | 6.412547008 |
| 53 | 1.539695392 | 2.481682502 | 1.151523761 | 0.009019399 | 0.486050454 | 0.414647904 | 0.003607759 | 6.423902863 |
| 54 | 1.537087457 | 2.482756671 | 1.158388309 | 0.008045304 | 0.483154913 | 0.405031925 | 0.003174828 | 6.435055572 |
| 55 | 1.534741348 | 2.483598229 | 1.165011416 | 0.007175112 | 0.480445784 | 0.395784682 | 0.002793849 | 6.446029443 |
| 56 | 1.532629023 | 2.484221058 | 1.171396305 | 0.006397914 | 0.477911579 | 0.386891467 | 0.002458587 | 6.456845472 |
| 57 | 1.530725173 | 2.484638079 | 1.177546751 | 0.005703922 | 0.475541323 | 0.378338181 | 0.002163557 | 6.46752176 |
| 58 | 1.52900695 | 2.48486135 | 1.183466982 | 0.005084358 | 0.47332455 | 0.370111306 | 0.00190393 | 6.478073873 |
| 59 | 1.527453728 | 2.484902147 | 1.189161587 | 0.004531353 | 0.471251297 | 0.362197871 | 0.001675458 | 6.488515173 |
| 60 | 1.526046887 | 2.484771038 | 1.194635443 | 0.004037854 | 0.469312096 | 0.354585434 | 0.001474403 | 6.498857092 |
| 61 | 1.524769621 | 2.484477947 | 1.199893645 | 0.003597544 | 0.467497965 | 0.347262051 | 0.001297475 | 6.509109391 |
| 62 | 1.523606765 | 2.484032213 | 1.204941452 | 0.003204763 | 0.465800398 | 0.340216259 | 0.001141778 | 6.519280372 |
| 63 | 1.522544637 | 2.483442635 | 1.209784234 | 0.002854445 | 0.464211347 | 0.333437056 | 0.001004765 | 6.529377076 |
| 64 | 1.521570904 | 2.482717525 | 1.214427432 | 0.002542054 | 0.462723214 | 0.326913876 | 8.84E-04 | 6.539405452 |
| 65 | 1.52067445 | 2.481864742 | 1.218876519 | 0.002263534 | 0.461328829 | 0.320636581 | $7.78 \mathrm{E}-04$ | 6.549370501 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 66 | 1.519845267 | 2.480891726 | 1.223136971 | 0.002015252 | 0.460021442 | 0.314595435 | $6.85 \mathrm{E}-04$ | 6.559276411 |
| 67 | 1.519074348 | 2.479805535 | 1.227214243 | 0.001793964 | 0.4587947 | 0.308781094 | 6.03E-04 | 6.569126667 |
| 68 | 1.518353601 | 2.478612867 | 1.231113742 | 0.001596764 | 0.457642637 | 0.303184586 | $5.30 \mathrm{E}-04$ | 6.578924152 |
| 69 | 1.517675758 | 2.477320089 | 1.234840814 | 0.00142106 | 0.456559653 | 0.297797301 | $4.67 \mathrm{E}-04$ | 6.58867123 |
| 70 | 1.517034304 | 2.475933256 | 1.238400726 | 0.001264531 | 0.4555405 | 0.292610973 | 4.11E-04 | 6.598369827 |
| 71 | 1.516423408 | 2.474458133 | 1.241798657 | 0.001125106 | 0.454580263 | 0.287617671 | $3.61 \mathrm{E}-04$ | 6.608021489 |
| 72 | 1.515837857 | 2.472900212 | 1.245039685 | 0.001000934 | 0.453674349 | 0.282809779 | $3.18 \mathrm{E}-04$ | 6.617627447 |
| 73 | 1.515273003 | 2.471264727 | 1.248128782 | 8.90E-04 | 0.452818465 | 0.278179991 | $2.80 \mathrm{E}-04$ | 6.627188659 |
| 74 | 1.51472471 | 2.469556671 | 1.251070807 | 7.92E-04 | 0.452008608 | 0.273721295 | 2.46E-04 | 6.636705857 |
| 75 | 1.514189308 | 2.467780807 | 1.253870504 | $7.04 \mathrm{E}-04$ | 0.451241045 | 0.269426959 | $2.17 \mathrm{E}-04$ | 6.64617958 |
| 76 | 1.513663548 | 2.465941678 | 1.256532496 | $6.26 \mathrm{E}-04$ | 0.450512305 | 0.265290525 | $1.91 \mathrm{E}-04$ | 6.655610213 |
| 77 | 1.513144566 | 2.464043625 | 1.259061286 | 5.57E-04 | 0.449819155 | 0.261305797 | $1.68 \mathrm{E}-04$ | 6.664998005 |
| 78 | 1.512629846 | 2.462090787 | 1.261461255 | $4.95 \mathrm{E}-04$ | 0.449158598 | 0.257466826 | $1.48 \mathrm{E}-04$ | 6.6743431 |
| 79 | 1.512117188 | 2.460087118 | 1.26373666 | $4.40 \mathrm{E}-04$ | 0.448527849 | 0.253767906 | $1.30 \mathrm{E}-04$ | 6.683645553 |
| 80 | 1.511604677 | 2.458036393 | 1.265891639 | $3.91 \mathrm{E}-04$ | 0.447924329 | 0.250203559 | $1.14 \mathrm{E}-04$ | 6.692905349 |
| 81 | 1.511090659 | 2.455942214 | 1.26793021 | $3.48 \mathrm{E}-04$ | 0.447345651 | 0.24676853 | $1.01 \mathrm{E}-04$ | 6.702122419 |
| 82 | 1.510573715 | 2.453808017 | 1.269856271 | $3.09 \mathrm{E}-04$ | 0.446789609 | 0.243457775 | 8.86E-05 | 6.71129665 |
| 83 | 1.510052635 | 2.451637085 | 1.271673605 | $2.75 \mathrm{E}-04$ | 0.446254166 | 0.240266454 | $7.79 \mathrm{E}-05$ | 6.720427894 |
| 84 | 1.509526405 | 2.449432544 | 1.273385878 | $2.44 \mathrm{E}-04$ | 0.445737441 | 0.237189922 | $6.86 \mathrm{E}-05$ | 6.729515984 |
| 85 | 1.50899418 | 2.447197378 | 1.274996647 | $2.17 \mathrm{E}-04$ | 0.445237704 | 0.234223721 | $6.04 \mathrm{E}-05$ | 6.738560733 |
| 86 | 1.508455272 | 2.444934432 | 1.276509358 | $1.93 \mathrm{E}-04$ | 0.444753364 | 0.231363573 | 5.31E-05 | 6.747561949 |
| 87 | 1.507909134 | 2.442646413 | 1.277927351 | $1.71 \mathrm{E}-04$ | 0.444282958 | 0.228605369 | $4.67 \mathrm{E}-05$ | 6.756519431 |
| 88 | 1.507355342 | 2.440335902 | 1.279253862 | $1.52 \mathrm{E}-04$ | 0.443825146 | 0.225945169 | $4.11 \mathrm{E}-05$ | 6.76543298 |
| 89 | 1.506793585 | 2.438005354 | 1.280492027 | $1.35 \mathrm{E}-04$ | 0.443378699 | 0.223379189 | $3.62 \mathrm{E}-05$ | 6.774302401 |
| 90 | 1.506223654 | 2.435657104 | 1.281644882 | $1.20 \mathrm{E}-04$ | 0.442942496 | 0.220903797 | $3.18 \mathrm{E}-05$ | 6.783127504 |
| 91 | 1.505645426 | 2.433293373 | 1.28271537 | $1.06 \mathrm{E}-04$ | 0.44251551 | 0.218515505 | $2.80 \mathrm{E}-05$ | 6.79190811 |
| 92 | 1.505058859 | 2.430916268 | 1.28370634 | $9.45 \mathrm{E}-05$ | 0.442096809 | 0.216210966 | $2.47 \mathrm{E}-05$ | 6.800644047 |
| 93 | 1.504463981 | 2.428527793 | 1.284620552 | 8.39E-05 | 0.441685542 | 0.213986965 | $2.17 \mathrm{E}-05$ | 6.809335158 |
| 94 | 1.50386088 | 2.426129847 | 1.285460679 | $7.44 \mathrm{E}-05$ | 0.441280938 | 0.211840416 | $1.91 \mathrm{E}-05$ | 6.817981296 |
| 95 | 1.5032497 | 2.423724229 | 1.286229311 | $6.61 \mathrm{E}-05$ | 0.440882299 | 0.209768356 | $1.68 \mathrm{E}-05$ | 6.82658233 |
| 96 | 1.502630631 | 2.421312645 | 1.286928956 | 5.87E-05 | 0.440488994 | 0.207767937 | $1.48 \mathrm{E}-05$ | 6.835138142 |
| 97 | 1.502003903 | 2.418896708 | 1.287562042 | $5.21 \mathrm{E}-05$ | 0.440100453 | 0.205836428 | $1.30 \mathrm{E}-05$ | 6.843648629 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 98 | 1.501369781 | 2.416477944 | 1.288130924 | $4.62 \mathrm{E}-05$ | 0.439716165 | 0.203971202 | $1.15 \mathrm{E}-05$ | 6.8521137 |
| 99 | 1.500728561 | 2.414057792 | 1.288637879 | $4.10 \mathrm{E}-05$ | 0.439335669 | 0.202169738 | $1.01 \mathrm{E}-05$ | 6.860533281 |
| 100 | 1.500080561 | 2.411637613 | 1.289085116 | $3.64 \mathrm{E}-05$ | 0.438958558 | 0.200429614 | 8.87E-06 | 6.868907311 |
| 101 | 1.499426122 | 2.409218687 | 1.289474773 | $3.23 \mathrm{E}-05$ | 0.438584464 | 0.198748503 | 7.81E-06 | 6.877235745 |
| 102 | 1.498765601 | 2.406802222 | 1.289808922 | $2.86 \mathrm{E}-05$ | 0.438213063 | 0.197124169 | 6.87E-06 | 6.885518548 |
| 103 | 1.498099367 | 2.404389351 | 1.290089568 | $2.54 \mathrm{E}-05$ | 0.43784407 | 0.195554465 | $6.04 \mathrm{E}-06$ | 6.893755701 |
| 104 | 1.497427801 | 2.401981139 | 1.290318658 | $2.25 \mathrm{E}-05$ | 0.437477232 | 0.194037328 | $5.32 \mathrm{E}-06$ | 6.901947197 |
| 105 | 1.496751289 | 2.399578587 | 1.290498073 | $2.00 \mathrm{E}-05$ | 0.437112329 | 0.192570773 | 4.68E-06 | 6.910093041 |
| 106 | 1.496070222 | 2.397182631 | 1.290629638 | $1.77 \mathrm{E}-05$ | 0.43674917 | 0.191152896 | $4.12 \mathrm{E}-06$ | 6.918193252 |
| 107 | 1.495384994 | 2.394794147 | 1.290715122 | $1.57 \mathrm{E}-05$ | 0.43638759 | 0.189781866 | $3.62 \mathrm{E}-06$ | 6.926247857 |
| 108 | 1.494695999 | 2.392413951 | 1.290756236 | $1.40 \mathrm{E}-05$ | 0.436027447 | 0.188455922 | 3.19E-06 | 6.934256896 |
| 109 | 1.494003628 | 2.390042808 | 1.29075464 | $1.24 \mathrm{E}-05$ | 0.435668623 | 0.187173374 | $2.81 \mathrm{E}-06$ | 6.942220419 |
| 110 | 1.49330827 | 2.387681427 | 1.29071194 | $1.10 \mathrm{E}-05$ | 0.435311017 | 0.185932594 | $2.47 \mathrm{E}-06$ | 6.950138487 |
| 111 | 1.492610309 | 2.385330466 | 1.290629695 | 9.73E-06 | 0.434954548 | 0.184732021 | $2.17 \mathrm{E}-06$ | 6.958011168 |
| 112 | 1.491910123 | 2.382990538 | 1.290509412 | 8.63E-06 | 0.434599151 | 0.183570152 | $1.91 \mathrm{E}-06$ | 6.965838541 |
| 113 | 1.491208084 | 2.380662208 | 1.290352553 | 7.65E-06 | 0.434244773 | 0.182445542 | $1.68 \mathrm{E}-06$ | 6.973620691 |
| 114 | 1.490504554 | 2.378345997 | 1.290160534 | $6.78 \mathrm{E}-06$ | 0.433891376 | 0.181356804 | $1.48 \mathrm{E}-06$ | 6.981357715 |
| 115 | 1.489799887 | 2.376042385 | 1.289934726 | $6.01 \mathrm{E}-06$ | 0.433538934 | 0.180302602 | $1.30 \mathrm{E}-06$ | 6.989049713 |
| 116 | 1.489094429 | 2.373751814 | 1.289676459 | 5.33E-06 | 0.433187429 | 0.179281652 | $1.15 \mathrm{E}-06$ | 6.996696796 |
| 117 | 1.488388515 | 2.371474685 | 1.289387018 | $4.73 \mathrm{E}-06$ | 0.432836854 | 0.178292721 | $1.01 \mathrm{E}-06$ | 7.004299078 |
| 118 | 1.487682468 | 2.369211367 | 1.289067651 | 4.19E-06 | 0.43248721 | 0.177334622 | 8.88E-07 | 7.011856682 |
| 119 | 1.486976603 | 2.366962192 | 1.288719565 | $3.71 \mathrm{E}-06$ | 0.432138504 | 0.176406213 | $7.82 \mathrm{E}-07$ | 7.019369735 |
| 120 | 1.486271222 | 2.364727462 | 1.288343928 | $3.29 \mathrm{E}-06$ | 0.431790749 | 0.175506398 | $6.88 \mathrm{E}-07$ | 7.026838372 |
| 121 | 1.485566617 | 2.362507448 | 1.287941874 | $2.92 \mathrm{E}-06$ | 0.431443965 | 0.17463412 | $6.05 \mathrm{E}-07$ | 7.034262731 |
| 122 | 1.484863066 | 2.360302391 | 1.2875145 | 2.59E-06 | 0.431098174 | 0.173788365 | 5.33E-07 | 7.041642954 |
| 123 | 1.484160838 | 2.358112507 | 1.287062866 | $2.29 \mathrm{E}-06$ | 0.430753404 | 0.172968158 | $4.69 \mathrm{E}-07$ | 7.048979191 |
| 124 | 1.48346019 | 2.355937983 | 1.286588002 | $2.03 \mathrm{E}-06$ | 0.430409686 | 0.172172558 | $4.13 \mathrm{E}-07$ | 7.056271593 |
| 125 | 1.482761366 | 2.353778986 | 1.286090902 | $1.80 \mathrm{E}-06$ | 0.430067052 | 0.171400663 | $3.63 \mathrm{E}-07$ | 7.063520317 |
| 126 | 1.482064599 | 2.351635657 | 1.28557253 | $1.59 \mathrm{E}-06$ | 0.429725538 | 0.170651604 | $3.20 \mathrm{E}-07$ | 7.070725521 |
| 127 | 1.481370112 | 2.349508116 | 1.28503382 | $1.41 \mathrm{E}-06$ | 0.42938518 | 0.169924546 | $2.81 \mathrm{E}-07$ | 7.077887371 |
| 128 | 1.480678115 | 2.347396463 | 1.284475673 | $1.25 \mathrm{E}-06$ | 0.429046017 | 0.169218686 | $2.47 \mathrm{E}-07$ | 7.085006031 |
| 129 | 1.479988808 | 2.345300778 | 1.283898964 | $1.11 \mathrm{E}-06$ | 0.428708088 | 0.16853325 | $2.18 \mathrm{E}-07$ | 7.092081672 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 130 | 1.479302379 | 2.343221124 | 1.283304538 | 9.82E-07 | 0.428371432 | 0.167867495 | $1.92 \mathrm{E}-07$ | 7.099114465 |
| 131 | 1.478619005 | 2.341157548 | 1.282693213 | 8.70E-07 | 0.428036088 | 0.167220705 | $1.69 \mathrm{E}-07$ | 7.106104585 |
| 132 | 1.477938854 | 2.339110079 | 1.282065781 | $7.71 \mathrm{E}-07$ | 0.427702097 | 0.166592192 | $1.48 \mathrm{E}-07$ | 7.11305221 |
| 133 | 1.477262084 | 2.337078734 | 1.281423008 | $6.83 \mathrm{E}-07$ | 0.427369497 | 0.165981295 | $1.31 \mathrm{E}-07$ | 7.119957519 |
| 134 | 1.47658884 | 2.335063512 | 1.280765633 | $6.05 \mathrm{E}-07$ | 0.427038328 | 0.165387376 | $1.15 \mathrm{E}-07$ | 7.126820693 |
| 135 | 1.475919261 | 2.333064404 | 1.280094373 | $5.35 \mathrm{E}-07$ | 0.426708627 | 0.164809822 | $1.01 \mathrm{E}-07$ | 7.133641914 |
| 136 | 1.475253473 | 2.331081385 | 1.279409922 | $4.74 \mathrm{E}-07$ | 0.426380432 | 0.164248045 | $8.90 \mathrm{E}-08$ | 7.14042137 |
| 137 | 1.474591596 | 2.329114422 | 1.278712948 | $4.20 \mathrm{E}-07$ | 0.42605378 | 0.163701477 | 7.83E-08 | 7.147159244 |
| 138 | 1.47393374 | 2.32716347 | 1.278004098 | $3.72 \mathrm{E}-07$ | 0.425728704 | 0.163169572 | $6.89 \mathrm{E}-08$ | 7.153855727 |
| 139 | 1.473280005 | 2.325228473 | 1.277283999 | $3.29 \mathrm{E}-07$ | 0.42540524 | 0.162651805 | $6.06 \mathrm{E}-08$ | 7.160511007 |
| 140 | 1.472630484 | 2.323309369 | 1.276553255 | $2.92 \mathrm{E}-07$ | 0.425083419 | 0.162147671 | $5.34 \mathrm{E}-08$ | 7.167125274 |
| 141 | 1.471985264 | 2.321406086 | 1.27581245 | $2.58 \mathrm{E}-07$ | 0.424763273 | 0.161656685 | $4.70 \mathrm{E}-08$ | 7.173698721 |
| 142 | 1.47134442 | 2.319518546 | 1.275062149 | $2.29 \mathrm{E}-07$ | 0.424444832 | 0.161178377 | $4.13 \mathrm{E}-08$ | 7.18023154 |
| 143 | 1.470708024 | 2.317646661 | 1.274302898 | $2.02 \mathrm{E}-07$ | 0.424128124 | 0.1607123 | $3.64 \mathrm{E}-08$ | 7.186723925 |
| 144 | 1.470076137 | 2.315790339 | 1.273535222 | $1.79 \mathrm{E}-07$ | 0.423813175 | 0.160258018 | $3.20 \mathrm{E}-08$ | 7.19317607 |
| 145 | 1.469448817 | 2.313949483 | 1.27275963 | $1.59 \mathrm{E}-07$ | 0.423500012 | 0.159815117 | $2.82 \mathrm{E}-08$ | 7.199588171 |
| 146 | 1.468826112 | 2.312123988 | 1.271976614 | $1.41 \mathrm{E}-07$ | 0.423188657 | 0.159383195 | $2.48 \mathrm{E}-08$ | 7.205960423 |
| 147 | 1.468208067 | 2.310313746 | 1.271186648 | $1.24 \mathrm{E}-07$ | 0.422879133 | 0.158961866 | $2.18 \mathrm{E}-08$ | 7.212293023 |
| 148 | 1.46759472 | 2.308518644 | 1.270390188 | $1.10 \mathrm{E}-07$ | 0.42257146 | 0.158550759 | $1.92 \mathrm{E}-08$ | 7.218586168 |
| 149 | 1.466986102 | 2.306738566 | 1.269587676 | $9.75 \mathrm{E}-08$ | 0.422265659 | 0.158149517 | $1.69 \mathrm{E}-08$ | 7.224840056 |
| 150 | 1.46638224 | 2.304973391 | 1.268779539 | 8.63E-08 | 0.421961745 | 0.157757796 | $1.49 \mathrm{E}-08$ | 7.231054884 |
| 151 | 1.465783157 | 2.303222996 | 1.267966186 | $7.64 \mathrm{E}-08$ | 0.421659735 | 0.157375265 | $1.31 \mathrm{E}-08$ | 7.237230851 |
| 152 | 1.465188868 | 2.301487254 | 1.267148014 | $6.76 \mathrm{E}-08$ | 0.421359644 | 0.157001607 | $1.15 \mathrm{E}-08$ | 7.243368155 |
| 153 | 1.464599386 | 2.299766038 | 1.266325405 | $5.98 \mathrm{E}-08$ | 0.421061484 | 0.156636514 | $1.01 \mathrm{E}-08$ | 7.249466995 |
| 154 | 1.464014719 | 2.298059216 | 1.265498728 | $5.30 \mathrm{E}-08$ | 0.420765268 | 0.156279693 | 8.91E-09 | 7.255527571 |
| 155 | 1.463434871 | 2.296366656 | 1.264668337 | $4.69 \mathrm{E}-08$ | 0.420471005 | 0.155930859 | 7.84E-09 | 7.26155008 |
| 156 | 1.462859843 | 2.294688225 | 1.263834573 | $4.15 \mathrm{E}-08$ | 0.420178705 | 0.155589739 | $6.90 \mathrm{E}-09$ | 7.267534723 |
| 157 | 1.46228963 | 2.293023786 | 1.262997767 | $3.67 \mathrm{E}-08$ | 0.419888375 | 0.155256071 | $6.07 \mathrm{E}-09$ | 7.273481699 |
| 158 | 1.461724225 | 2.291373204 | 1.262158236 | $3.25 \mathrm{E}-08$ | 0.419600021 | 0.154929603 | $5.34 \mathrm{E}-09$ | 7.279391207 |
| 159 | 1.461163619 | 2.289736342 | 1.261316285 | $2.88 \mathrm{E}-08$ | 0.419313649 | 0.154610089 | $4.70 \mathrm{E}-09$ | 7.285263446 |
| 160 | 1.460607799 | 2.288113062 | 1.260472208 | $2.54 \mathrm{E}-08$ | 0.419029262 | 0.154297297 | $4.14 \mathrm{E}-09$ | 7.291098616 |
| 161 | 1.460056747 | 2.286503226 | 1.259626288 | $2.25 \mathrm{E}-08$ | 0.418746863 | 0.153991001 | $3.64 \mathrm{E}-09$ | 7.296896916 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 162 | 1.459510447 | 2.284906697 | 1.258778799 | $1.99 \mathrm{E}-08$ | 0.418466454 | 0.153690985 | 3.21E-09 | 7.302658544 |
| 163 | 1.458968876 | 2.283323336 | 1.25793 | $1.76 \mathrm{E}-08$ | 0.418188034 | 0.153397038 | 2.82E-09 | 7.308383699 |
| 164 | 1.458432012 | 2.281753005 | 1.257080146 | $1.56 \mathrm{E}-08$ | 0.417911605 | 0.153108961 | $2.48 \mathrm{E}-09$ | 7.314072581 |
| 165 | 1.457899828 | 2.280195567 | 1.256229477 | $1.38 \mathrm{E}-08$ | 0.417637164 | 0.15282656 | $2.18 \mathrm{E}-09$ | 7.319725388 |
| 166 | 1.457372298 | 2.278650885 | 1.255378226 | $1.22 \mathrm{E}-08$ | 0.417364708 | 0.152549649 | $1.92 \mathrm{E}-09$ | 7.325342317 |
| 167 | 1.456849393 | 2.277118822 | 1.254526618 | $1.08 \mathrm{E}-08$ | 0.417094236 | 0.152278049 | $1.69 \mathrm{E}-09$ | 7.330923568 |
| 168 | 1.456331081 | 2.275599242 | 1.253674867 | 9.56E-09 | 0.416825741 | 0.152011587 | $1.49 \mathrm{E}-09$ | 7.336469337 |
| 169 | 1.45581733 | 2.27409201 | 1.252823179 | $8.45 \mathrm{E}-09$ | 0.416559221 | 0.151750097 | $1.31 \mathrm{E}-09$ | 7.341979822 |
| 170 | 1.455308106 | 2.272596992 | 1.251971752 | $7.48 \mathrm{E}-09$ | 0.416294668 | 0.15149342 | $1.15 \mathrm{E}-09$ | 7.347455219 |
| 171 | 1.454803375 | 2.271114054 | 1.251120777 | $6.62 \mathrm{E}-09$ | 0.416032077 | 0.151241401 | $1.01 \mathrm{E}-09$ | 7.352895727 |
| 172 | 1.4543031 | 2.269643065 | 1.250270436 | 5.85E-09 | 0.41577144 | 0.150993893 | 8.93E-10 | 7.35830154 |
| 173 | 1.453807244 | 2.268183894 | 1.249420903 | 5.18E-09 | 0.415512751 | 0.150750753 | 7.86E-10 | 7.363672855 |
| 174 | 1.453315769 | 2.26673641 | 1.248572346 | 4.58E-09 | 0.415255999 | 0.150511844 | $6.91 \mathrm{E}-10$ | 7.369009867 |
| 175 | 1.452828635 | 2.265300485 | 1.247724926 | $4.05 \mathrm{E}-09$ | 0.415001178 | 0.150277033 | $6.08 \mathrm{E}-10$ | 7.374312771 |
| 176 | 1.452345804 | 2.263875992 | 1.246878797 | 3.58E-09 | 0.414748276 | 0.150046195 | 5.35E-10 | 7.379581763 |
| 177 | 1.451867235 | 2.262462805 | 1.246034105 | 3.17E-09 | 0.414497285 | 0.149819205 | $4.71 \mathrm{E}-10$ | 7.384817035 |
| 178 | 1.451392886 | 2.261060799 | 1.245190992 | $2.80 \mathrm{E}-09$ | 0.414248193 | 0.149595947 | $4.15 \mathrm{E}-10$ | 7.390018782 |
| 179 | 1.450922717 | 2.259669851 | 1.244349593 | $2.48 \mathrm{E}-09$ | 0.414000991 | 0.149376306 | $3.65 \mathrm{E}-10$ | 7.395187197 |
| 180 | 1.450456685 | 2.258289841 | 1.243510036 | 2.19E-09 | 0.413755667 | 0.149160174 | $3.21 \mathrm{E}-10$ | 7.400322472 |
| 181 | 1.449994749 | 2.256920646 | 1.242672445 | $1.94 \mathrm{E}-09$ | 0.413512209 | 0.148947445 | $2.83 \mathrm{E}-10$ | 7.4054248 |
| 182 | 1.449536866 | 2.25556215 | 1.241836937 | $1.71 \mathrm{E}-09$ | 0.413270605 | 0.148738018 | $2.49 \mathrm{E}-10$ | 7.410494371 |
| 183 | 1.449082994 | 2.254214234 | 1.241003626 | $1.52 \mathrm{E}-09$ | 0.413030844 | 0.148531795 | $2.19 \mathrm{E}-10$ | 7.415531378 |
| 184 | 1.44863309 | 2.252876783 | 1.240172617 | $1.34 \mathrm{E}-09$ | 0.412792913 | 0.148328683 | $1.93 \mathrm{E}-10$ | 7.42053601 |
| 185 | 1.448187111 | 2.251549684 | 1.239344013 | $1.19 \mathrm{E}-09$ | 0.412556798 | 0.148128591 | $1.69 \mathrm{E}-10$ | 7.425508457 |
| 186 | 1.447745014 | 2.250232824 | 1.238517913 | $1.05 \mathrm{E}-09$ | 0.412322488 | 0.147931431 | $1.49 \mathrm{E}-10$ | 7.430448909 |
| 187 | 1.447306757 | 2.248926091 | 1.237694408 | $9.27 \mathrm{E}-10$ | 0.412089968 | 0.14773712 | $1.31 \mathrm{E}-10$ | 7.435357554 |
| 188 | 1.446872297 | 2.247629377 | 1.236873587 | 8.20E-10 | 0.411859226 | 0.147545577 | $1.15 \mathrm{E}-10$ | 7.44023458 |
| 189 | 1.446441591 | 2.246342574 | 1.236055534 | 7.25E-10 | 0.411630248 | 0.147356723 | $1.02 \mathrm{E}-10$ | 7.445080175 |
| 190 | 1.446014596 | 2.245065575 | 1.235240329 | $6.41 \mathrm{E}-10$ | 0.41140302 | 0.147170485 | $8.94 \mathrm{E}-11$ | 7.449894525 |
| 191 | 1.445591272 | 2.243798277 | 1.234428048 | $5.67 \mathrm{E}-10$ | 0.411177528 | 0.14698679 | 7.87E-11 | 7.454677816 |
| 192 | 1.445171574 | 2.242540576 | 1.233618763 | 5.01E-10 | 0.410953759 | 0.146805567 | $6.92 \mathrm{E}-11$ | 7.459430233 |
| 193 | 1.444755463 | 2.24129237 | 1.232812543 | $4.43 \mathrm{E}-10$ | 0.410731699 | 0.146626751 | $6.09 \mathrm{E}-11$ | 7.464151962 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 194 | 1.444342895 | 2.24005356 | 1.232009451 | $3.92 \mathrm{E}-10$ | 0.410511332 | 0.146450275 | 5.36E-11 | 7.468843187 |
| 195 | 1.443933831 | 2.238824048 | 1.231209549 | $3.46 \mathrm{E}-10$ | 0.410292646 | 0.146276079 | $4.72 \mathrm{E}-11$ | 7.47350409 |
| 196 | 1.443528229 | 2.237603735 | 1.230412896 | $3.06 \mathrm{E}-10$ | 0.410075626 | 0.146104101 | $4.15 \mathrm{E}-11$ | 7.478134855 |
| 197 | 1.443126048 | 2.236392527 | 1.229619545 | $2.71 \mathrm{E}-10$ | 0.409860258 | 0.145934285 | $3.65 \mathrm{E}-11$ | 7.482735663 |
| 198 | 1.442727249 | 2.235190331 | 1.228829548 | $2.39 \mathrm{E}-10$ | 0.409646527 | 0.145766574 | $3.22 \mathrm{E}-11$ | 7.487306696 |
| 199 | 1.442331791 | 2.233997052 | 1.228042954 | $2.12 \mathrm{E}-10$ | 0.40943442 | 0.145600914 | 2.83E-11 | 7.491848134 |
| 200 | 1.441939636 | 2.232812601 | 1.227259808 | $1.87 \mathrm{E}-10$ | 0.409223922 | 0.145437255 | $2.49 \mathrm{E}-11$ | 7.496360157 |
| 201 | 1.441550744 | 2.231636888 | 1.226480154 | $1.65 \mathrm{E}-10$ | 0.409015019 | 0.145275544 | 2.19E-11 | 7.500842944 |
| 202 | 1.441165077 | 2.230469824 | 1.225704031 | $1.46 \mathrm{E}-10$ | 0.408807696 | 0.145115736 | $1.93 \mathrm{E}-11$ | 7.505296674 |
| 203 | 1.440782597 | 2.229311323 | 1.224931478 | $1.29 \mathrm{E}-10$ | 0.40860194 | 0.144957782 | $1.70 \mathrm{E}-11$ | 7.509721523 |
| 204 | 1.440403266 | 2.2281613 | 1.224162529 | $1.14 \mathrm{E}-10$ | 0.408397737 | 0.144801639 | $1.49 \mathrm{E}-11$ | 7.514117669 |
| 205 | 1.440027047 | 2.22701967 | 1.223397217 | $1.01 \mathrm{E}-10$ | 0.408195072 | 0.144647263 | $1.31 \mathrm{E}-11$ | 7.518485288 |
| 206 | 1.439653904 | 2.22588635 | 1.222635573 | 8.92E-11 | 0.407993932 | 0.144494612 | $1.16 \mathrm{E}-11$ | 7.522824554 |
| 207 | 1.4392838 | 2.224761259 | 1.221877625 | 7.89E-11 | 0.407794303 | 0.144343647 | $1.02 \mathrm{E}-11$ | 7.527135643 |
| 208 | 1.438916699 | 2.223644318 | 1.221123399 | 6.97E-11 | 0.40759617 | 0.144194328 | 8.95E-12 | 7.531418729 |
| 209 | 1.438552567 | 2.222535446 | 1.22037292 | 6.16E-11 | 0.407399521 | 0.144046618 | 7.88E-12 | 7.535673983 |
| 210 | 1.438191369 | 2.221434567 | 1.219626208 | $5.45 \mathrm{E}-11$ | 0.407204341 | 0.14390048 | $6.93 \mathrm{E}-12$ | 7.539901579 |
| 211 | 1.43783307 | 2.220341604 | 1.218883286 | $4.81 \mathrm{E}-11$ | 0.407010617 | 0.143755881 | $6.10 \mathrm{E}-12$ | 7.544101687 |
| 212 | 1.437477637 | 2.219256482 | 1.218144171 | $4.25 \mathrm{E}-11$ | 0.406818336 | 0.143612786 | 5.37E-12 | 7.548274478 |
| 213 | 1.437125037 | 2.218179126 | 1.21740888 | $3.76 \mathrm{E}-11$ | 0.406627484 | 0.143471163 | $4.73 \mathrm{E}-12$ | 7.552420123 |
| 214 | 1.436775236 | 2.217109464 | 1.216677428 | $3.32 \mathrm{E}-11$ | 0.406438048 | 0.14333098 | $4.16 \mathrm{E}-12$ | 7.556538789 |
| 215 | 1.436428203 | 2.216047425 | 1.215949828 | $2.94 \mathrm{E}-11$ | 0.406250015 | 0.143192208 | $3.66 \mathrm{E}-12$ | 7.560630645 |
| 216 | 1.436083906 | 2.214992937 | 1.215226093 | $2.59 \mathrm{E}-11$ | 0.406063372 | 0.143054816 | $3.22 \mathrm{E}-12$ | 7.564695858 |
| 217 | 1.435742313 | 2.213945931 | 1.214506233 | $2.29 \mathrm{E}-11$ | 0.405878106 | 0.142918777 | 2.83E-12 | 7.568734595 |
| 218 | 1.435403394 | 2.212906338 | 1.213790256 | 2.03E-11 | 0.405694205 | 0.142784063 | $2.49 \mathrm{E}-12$ | 7.572747022 |
| 219 | 1.435067119 | 2.211874092 | 1.213078171 | $1.79 \mathrm{E}-11$ | 0.405511655 | 0.142650649 | $2.19 \mathrm{E}-12$ | 7.576733303 |
| 220 | 1.434733457 | 2.210849125 | 1.212369984 | $1.58 \mathrm{E}-11$ | 0.405330444 | 0.142518507 | $1.93 \mathrm{E}-12$ | 7.580693602 |
| 221 | 1.43440238 | 2.209831372 | 1.211665701 | $1.40 \mathrm{E}-11$ | 0.405150561 | 0.142387615 | $1.70 \mathrm{E}-12$ | 7.584628083 |
| 222 | 1.434073858 | 2.208820769 | 1.210965324 | $1.24 \mathrm{E}-11$ | 0.404971992 | 0.142257948 | $1.50 \mathrm{E}-12$ | 7.588536908 |
| 223 | 1.433747864 | 2.207817253 | 1.210268856 | $1.09 \mathrm{E}-11$ | 0.404794726 | 0.142129482 | $1.32 \mathrm{E}-12$ | 7.592420238 |
| 224 | 1.433424369 | 2.206820761 | 1.209576301 | $9.65 \mathrm{E}-12$ | 0.40461875 | 0.142002196 | $1.16 \mathrm{E}-12$ | 7.596278235 |
| 225 | 1.433103345 | 2.20583123 | 1.208887657 | 8.52E-12 | 0.404444053 | 0.141876068 | $1.02 \mathrm{E}-12$ | 7.600111058 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | Val] of turtle 7 |
| 226 | 1.432784767 | 2.204848602 | 1.208202924 | $7.53 \mathrm{E}-12$ | 0.404270623 | 0.141751078 | 8.97E-13 | 7.603918866 |
| 227 | 1.432468606 | 2.203872815 | 1.207522102 | 6.65E-12 | 0.404098449 | 0.141627204 | $7.89 \mathrm{E}-13$ | 7.607701818 |
| 228 | 1.432154838 | 2.202903812 | 1.206845188 | $5.88 \mathrm{E}-12$ | 0.403927519 | 0.141504428 | $6.95 \mathrm{E}-13$ | 7.611460071 |
| 229 | 1.431843436 | 2.201941533 | 1.206172178 | $5.20 \mathrm{E}-12$ | 0.403757821 | 0.141382731 | $6.11 \mathrm{E}-13$ | 7.615193781 |
| 230 | 1.431534376 | 2.200985922 | 1.205503069 | $4.59 \mathrm{E}-12$ | 0.403589345 | 0.141262093 | $5.38 \mathrm{E}-13$ | 7.618903105 |
| 231 | 1.431227632 | 2.200036922 | 1.204837856 | $4.06 \mathrm{E}-12$ | 0.40342208 | 0.141142499 | $4.73 \mathrm{E}-13$ | 7.622588196 |
| 232 | 1.430923179 | 2.199094478 | 1.204176533 | $3.58 \mathrm{E}-12$ | 0.403256014 | 0.14102393 | $4.17 \mathrm{E}-13$ | 7.62624921 |
| 233 | 1.430620995 | 2.198158535 | 1.203519094 | $3.17 \mathrm{E}-12$ | 0.403091137 | 0.140906369 | 3.67E-13 | 7.629886299 |
| 234 | 1.430321055 | 2.197229038 | 1.202865532 | $2.80 \mathrm{E}-12$ | 0.402927438 | 0.140789801 | $3.23 \mathrm{E}-13$ | 7.633499616 |
| 235 | 1.430023336 | 2.196305935 | 1.202215839 | $2.47 \mathrm{E}-12$ | 0.402764907 | 0.14067421 | 2.84E-13 | 7.637089313 |
| 236 | 1.429727815 | 2.195389172 | 1.201570007 | $2.18 \mathrm{E}-12$ | 0.402603534 | 0.14055958 | $2.50 \mathrm{E}-13$ | 7.64065554 |
| 237 | 1.42943447 | 2.194478698 | 1.200928027 | $1.93 \mathrm{E}-12$ | 0.402443307 | 0.140445898 | $2.20 \mathrm{E}-13$ | 7.644198446 |
| 238 | 1.429143279 | 2.193574462 | 1.200289889 | $1.70 \mathrm{E}-12$ | 0.402284217 | 0.140333149 | $1.93 \mathrm{E}-13$ | 7.647718182 |
| 239 | 1.42885422 | 2.192676412 | 1.199655583 | $1.50 \mathrm{E}-12$ | 0.402126255 | 0.140221318 | $1.70 \mathrm{E}-13$ | 7.651214895 |
| 240 | 1.428567272 | 2.1917845 | 1.199025099 | $1.33 \mathrm{E}-12$ | 0.401969409 | 0.140110393 | $1.50 \mathrm{E}-13$ | 7.654688732 |
| 241 | 1.428282413 | 2.190898676 | 1.198398425 | $1.17 \mathrm{E}-12$ | 0.401813671 | 0.14000036 | $1.32 \mathrm{E}-13$ | 7.658139841 |
| 242 | 1.427999624 | 2.19001889 | 1.19777555 | 1.04E-12 | 0.40165903 | 0.139891207 | $1.16 \mathrm{E}-13$ | 7.661568366 |
| 243 | 1.427718883 | 2.189145097 | 1.197156462 | $9.16 \mathrm{E}-13$ | 0.401505478 | 0.139782922 | $1.02 \mathrm{E}-13$ | 7.664974453 |
| 244 | 1.427440172 | 2.188277247 | 1.196541148 | $8.10 \mathrm{E}-13$ | 0.401353004 | 0.139675492 | $8.98 \mathrm{E}-14$ | 7.668358246 |
| 245 | 1.427163469 | 2.187415295 | 1.195929595 | $7.15 \mathrm{E}-13$ | 0.4012016 | 0.139568906 | $7.91 \mathrm{E}-14$ | 7.671719888 |
| 246 | 1.426888756 | 2.186559193 | 1.195321791 | $6.32 \mathrm{E}-13$ | 0.401051256 | 0.139463152 | $6.96 \mathrm{E}-14$ | 7.675059522 |
| 247 | 1.426616015 | 2.185708897 | 1.194717721 | $5.58 \mathrm{E}-13$ | 0.400901964 | 0.13935822 | $6.12 \mathrm{E}-14$ | 7.678377288 |
| 248 | 1.426345225 | 2.184864362 | 1.194117372 | $4.93 \mathrm{E}-13$ | 0.400753713 | 0.139254099 | 5.39E-14 | 7.681673329 |
| 249 | 1.426076369 | 2.184025542 | 1.193520729 | $4.35 \mathrm{E}-13$ | 0.400606497 | 0.139150778 | $4.74 \mathrm{E}-14$ | 7.684947783 |
| 250 | 1.425809429 | 2.183192395 | 1.192927777 | $3.84 \mathrm{E}-13$ | 0.400460305 | 0.139048248 | 4.17E-14 | 7.68820079 |
| 251 | 1.425544387 | 2.182364875 | 1.192338503 | $3.40 \mathrm{E}-13$ | 0.40031513 | 0.138946498 | 3.67E-14 | 7.691432488 |
| 252 | 1.425281225 | 2.181542942 | 1.19175289 | $3.00 \mathrm{E}-13$ | 0.400170962 | 0.138845519 | $3.23 \mathrm{E}-14$ | 7.694643014 |
| 253 | 1.425019926 | 2.180726551 | 1.191170922 | $2.65 \mathrm{E}-13$ | 0.400027794 | 0.138745302 | $2.84 \mathrm{E}-14$ | 7.697832506 |
| 254 | 1.424760474 | 2.179915662 | 1.190592586 | $2.34 \mathrm{E}-13$ | 0.399885617 | 0.138645837 | $2.50 \mathrm{E}-14$ | 7.7010011 |
| 255 | 1.424502851 | 2.179110232 | 1.190017864 | $2.07 \mathrm{E}-13$ | 0.399744423 | 0.138547115 | $2.20 \mathrm{E}-14$ | 7.704148929 |
| 256 | 1.42424704 | 2.178310221 | 1.18944674 | $1.83 \mathrm{E}-13$ | 0.399604203 | 0.138449129 | $1.94 \mathrm{E}-14$ | 7.707276129 |
| 257 | 1.423993027 | 2.177515588 | 1.188879198 | $1.61 \mathrm{E}-13$ | 0.399464951 | 0.138351868 | 1.70E-14 | 7.710382833 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 258 | 1.423740794 | 2.176726293 | 1.188315222 | $1.42 \mathrm{E}-13$ | 0.399326658 | 0.138255326 | $1.50 \mathrm{E}-14$ | 7.713469173 |
| 259 | 1.423490326 | 2.175942296 | 1.187754794 | $1.26 \mathrm{E}-13$ | 0.399189316 | 0.138159494 | $1.32 \mathrm{E}-14$ | 7.716535282 |
| 260 | 1.423241608 | 2.175163559 | 1.187197899 | $1.11 \mathrm{E}-13$ | 0.399052917 | 0.138064364 | $1.16 \mathrm{E}-14$ | 7.71958129 |
| 261 | 1.422994624 | 2.174390042 | 1.186644518 | $9.81 \mathrm{E}-14$ | 0.398917455 | 0.137969929 | $1.02 \mathrm{E}-14$ | 7.722607328 |
| 262 | 1.422749359 | 2.173621706 | 1.186094636 | 8.66E-14 | 0.398782921 | 0.137876181 | 9.00E-15 | 7.725613525 |
| 263 | 1.422505799 | 2.172858515 | 1.185548234 | 7.65E-14 | 0.398649308 | 0.137783113 | 7.92E-15 | 7.728600011 |
| 264 | 1.422263929 | 2.172100431 | 1.185005295 | $6.75 \mathrm{E}-14$ | 0.398516608 | 0.137690717 | $6.97 \mathrm{E}-15$ | 7.731566912 |
| 265 | 1.422023734 | 2.171347415 | 1.184465802 | $5.96 \mathrm{E}-14$ | 0.398384816 | 0.137598987 | 6.13E-15 | 7.734514355 |
| 266 | 1.4217852 | 2.170599432 | 1.183929738 | 5.27E-14 | 0.398253922 | 0.137507916 | $5.40 \mathrm{E}-15$ | 7.737442469 |
| 267 | 1.421548314 | 2.169856445 | 1.183397083 | $4.65 \mathrm{E}-14$ | 0.398123921 | 0.137417497 | $4.75 \mathrm{E}-15$ | 7.740351377 |
| 268 | 1.421313061 | 2.169118418 | 1.182867822 | $4.11 \mathrm{E}-14$ | 0.397994805 | 0.137327723 | 4.18E-15 | 7.743241205 |
| 269 | 1.421079429 | 2.168385315 | 1.182341935 | $3.63 \mathrm{E}-14$ | 0.397866568 | 0.137238589 | 3.68E-15 | 7.746112076 |
| 270 | 1.420847403 | 2.167657101 | 1.181819406 | $3.20 \mathrm{E}-14$ | 0.397739202 | 0.137150087 | $3.24 \mathrm{E}-15$ | 7.748964115 |
| 271 | 1.42061697 | 2.16693374 | 1.181300215 | $2.83 \mathrm{E}-14$ | 0.397612701 | 0.137062212 | $2.85 \mathrm{E}-15$ | 7.751797443 |
| 272 | 1.420388117 | 2.166215199 | 1.180784346 | $2.50 \mathrm{E}-14$ | 0.397487059 | 0.136974958 | 2.51E-15 | 7.754612182 |
| 273 | 1.420160832 | 2.165501443 | 1.180271779 | $2.21 \mathrm{E}-14$ | 0.397362267 | 0.136888318 | 2.21E-15 | 7.757408454 |
| 274 | 1.419935102 | 2.164792438 | 1.179762498 | $1.95 \mathrm{E}-14$ | 0.397238321 | 0.136802287 | $1.94 \mathrm{E}-15$ | 7.760186378 |
| 275 | 1.419710914 | 2.16408815 | 1.179256483 | $1.72 \mathrm{E}-14$ | 0.397115214 | 0.13671686 | $1.71 \mathrm{E}-15$ | 7.762946074 |
| 276 | 1.419488255 | 2.163388546 | 1.178753717 | $1.52 \mathrm{E}-14$ | 0.396992938 | 0.13663203 | $1.50 \mathrm{E}-15$ | 7.76568766 |
| 277 | 1.419267115 | 2.162693592 | 1.178254182 | $1.34 \mathrm{E}-14$ | 0.396871489 | 0.136547793 | $1.32 \mathrm{E}-15$ | 7.768411256 |
| 278 | 1.41904748 | 2.162003257 | 1.177757859 | $1.18 \mathrm{E}-14$ | 0.396750859 | 0.136464142 | $1.16 \mathrm{E}-15$ | 7.771116977 |
| 279 | 1.418829339 | 2.161317507 | 1.17726473 | $1.04 \mathrm{E}-14$ | 0.396631043 | 0.136381073 | $1.02 \mathrm{E}-15$ | 7.773804941 |
| 280 | 1.418612679 | 2.160636311 | 1.176774778 | $9.23 \mathrm{E}-15$ | 0.396512034 | 0.13629858 | 9.01E-16 | 7.776475264 |
| 281 | 1.418397491 | 2.159959636 | 1.176287983 | $8.15 \mathrm{E}-15$ | 0.396393827 | 0.136216658 | 7.93E-16 | 7.779128059 |
| 282 | 1.418183761 | 2.159287452 | 1.175804328 | 7.19E-15 | 0.396276415 | 0.136135303 | $6.98 \mathrm{E}-16$ | 7.781763443 |
| 283 | 1.417971479 | 2.158619726 | 1.175323794 | $6.35 \mathrm{E}-15$ | 0.396159792 | 0.136054509 | $6.14 \mathrm{E}-16$ | 7.784381528 |
| 284 | 1.417760633 | 2.157956428 | 1.174846364 | $5.61 \mathrm{E}-15$ | 0.396043954 | 0.135974272 | $5.40 \mathrm{E}-16$ | 7.786982428 |
| 285 | 1.417551213 | 2.157297527 | 1.17437202 | $4.95 \mathrm{E}-15$ | 0.395928893 | 0.135894586 | $4.76 \mathrm{E}-16$ | 7.789566253 |
| 286 | 1.417343207 | 2.156642992 | 1.173900742 | 4.37E-15 | 0.395814604 | 0.135815448 | $4.19 \mathrm{E}-16$ | 7.792133117 |
| 287 | 1.417136605 | 2.155992794 | 1.173432514 | $3.86 \mathrm{E}-15$ | 0.395701082 | 0.135736852 | $3.68 \mathrm{E}-16$ | 7.79468313 |
| 288 | 1.416931396 | 2.155346902 | 1.172967317 | $3.41 \mathrm{E}-15$ | 0.39558832 | 0.135658794 | $3.24 \mathrm{E}-16$ | 7.797216402 |
| 289 | 1.41672757 | 2.154705287 | 1.172505133 | 3.01E-15 | 0.395476314 | 0.13558127 | $2.85 \mathrm{E}-16$ | 7.799733042 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | of turtle 6 | [val] of turtle 7 |
| 290 | 1.416525115 | 2.154067919 | 1.172045944 | $2.66 \mathrm{E}-15$ | 0.395365058 | 0.135504275 | $2.51 \mathrm{E}-16$ | 7.802233159 |
| 291 | 1.416324023 | 2.153434769 | 1.171589733 | $2.34 \mathrm{E}-15$ | 0.395254546 | 0.135427804 | 2.21E-16 | 7.804716861 |
| 292 | 1.416124282 | 2.152805808 | 1.171136481 | $2.07 \mathrm{E}-15$ | 0.395144773 | 0.135351855 | $1.94 \mathrm{E}-16$ | 7.807184256 |
| 293 | 1.415925883 | 2.152181008 | 1.170686171 | $1.83 \mathrm{E}-15$ | 0.395035734 | 0.135276421 | $1.71 \mathrm{E}-16$ | 7.809635449 |
| 294 | 1.415728816 | 2.151560339 | 1.170238785 | $1.61 \mathrm{E}-15$ | 0.394927423 | 0.1352015 | $1.51 \mathrm{E}-16$ | 7.812070548 |
| 295 | 1.41553307 | 2.150943775 | 1.169794305 | $1.42 \mathrm{E}-15$ | 0.394819835 | 0.135127087 | 1.32E-16 | 7.814489656 |
| 296 | 1.415338637 | 2.150331285 | 1.169352713 | $1.26 \mathrm{E}-15$ | 0.394712965 | 0.135053178 | $1.17 \mathrm{E}-16$ | 7.81689288 |
| 297 | 1.415145505 | 2.149722844 | 1.168913992 | $1.11 \mathrm{E}-15$ | 0.394606808 | 0.13497977 | 1.03E-16 | 7.819280322 |
| 298 | 1.414953667 | 2.149118423 | 1.168478125 | $9.80 \mathrm{E}-16$ | 0.394501359 | 0.134906857 | $9.03 \mathrm{E}-17$ | 7.821652086 |
| 299 | 1.414763112 | 2.148517995 | 1.168045093 | $8.65 \mathrm{E}-16$ | 0.394396612 | 0.134834438 | 7.94E-17 | 7.824008275 |
| 300 | 1.414573831 | 2.147921532 | 1.16761488 | $7.63 \mathrm{E}-16$ | 0.394292563 | 0.134762506 | 6.99E-17 | 7.82634899 |
| 301 | 1.414385816 | 2.147329009 | 1.167187468 | 6.74E-16 | 0.394189207 | 0.13469106 | 6.15E-17 | 7.828674333 |
| 302 | 1.414199055 | 2.146740397 | 1.16676284 | $5.95 \mathrm{E}-16$ | 0.394086539 | 0.134620094 | $5.41 \mathrm{E}-17$ | 7.830984405 |
| 303 | 1.414013542 | 2.146155672 | 1.166340978 | $5.25 \mathrm{E}-16$ | 0.393984554 | 0.134549607 | $4.76 \mathrm{E}-17$ | 7.833279305 |
| 304 | 1.413829266 | 2.145574806 | 1.165921865 | $4.63 \mathrm{E}-16$ | 0.393883247 | 0.134479593 | $4.19 \mathrm{E}-17$ | 7.835559133 |
| 305 | 1.413646219 | 2.144997773 | 1.165505485 | $4.09 \mathrm{E}-16$ | 0.393782613 | 0.134410049 | 3.69E-17 | 7.837823987 |
| 306 | 1.413464392 | 2.144424547 | 1.16509182 | 3.61E-16 | 0.393682648 | 0.134340972 | $3.25 \mathrm{E}-17$ | 7.840073966 |
| 307 | 1.413283776 | 2.143855104 | 1.164680853 | $3.19 \mathrm{E}-16$ | 0.393583347 | 0.134272358 | 2.86E-17 | 7.842309168 |
| 308 | 1.413104363 | 2.143289417 | 1.164272568 | $2.81 \mathrm{E}-16$ | 0.393484706 | 0.134204204 | $2.51 \mathrm{E}-17$ | 7.844529688 |
| 309 | 1.412926145 | 2.14272746 | 1.163866947 | $2.48 \mathrm{E}-16$ | 0.393386719 | 0.134136507 | $2.21 \mathrm{E}-17$ | 7.846735623 |
| 310 | 1.412749111 | 2.14216921 | 1.163463974 | $2.19 \mathrm{E}-16$ | 0.393289383 | 0.134069263 | $1.95 \mathrm{E}-17$ | 7.848927069 |
| 311 | 1.412573255 | 2.14161464 | 1.163063632 | $1.93 \mathrm{E}-16$ | 0.393192692 | 0.134002468 | $1.71 \mathrm{E}-17$ | 7.851104121 |
| 312 | 1.412398569 | 2.141063727 | 1.162665905 | $1.71 \mathrm{E}-16$ | 0.393096642 | 0.13393612 | $1.51 \mathrm{E}-17$ | 7.853266873 |
| 313 | 1.412225043 | 2.140516446 | 1.162270777 | $1.51 \mathrm{E}-16$ | 0.39300123 | 0.133870215 | $1.33 \mathrm{E}-17$ | 7.855415418 |
| 314 | 1.412052669 | 2.139972772 | 1.16187823 | $1.33 \mathrm{E}-16$ | 0.392906449 | 0.13380475 | $1.17 \mathrm{E}-17$ | 7.85754985 |
| 315 | 1.41188144 | 2.139432681 | 1.161488248 | $1.17 \mathrm{E}-16$ | 0.392812297 | 0.133739721 | 1.03E-17 | 7.859670262 |
| 316 | 1.411711348 | 2.138896149 | 1.161100816 | 1.04E-16 | 0.392718768 | 0.133675126 | $9.04 \mathrm{E}-18$ | 7.861776745 |
| 317 | 1.411542384 | 2.138363153 | 1.160715916 | $9.15 \mathrm{E}-17$ | 0.392625859 | 0.133610962 | 7.96E-18 | 7.86386939 |
| 318 | 1.411374541 | 2.137833668 | 1.160333534 | 8.07E-17 | 0.392533565 | 0.133547225 | 7.00E-18 | 7.865948289 |
| 319 | 1.411207811 | 2.137307672 | 1.159953652 | $7.13 \mathrm{E}-17$ | 0.392441881 | 0.133483913 | 6.16E-18 | 7.868013532 |
| 320 | 1.411042186 | 2.13678514 | 1.159576256 | $6.29 \mathrm{E}-17$ | 0.392350805 | 0.133421021 | $5.42 \mathrm{E}-18$ | 7.870065207 |
| 321 | 1.410877659 | 2.13626605 | 1.159201328 | 5.55E-17 | 0.392260331 | 0.133358548 | $4.77 \mathrm{E}-18$ | 7.872103404 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 322 | 1.410714222 | 2.13575038 | 1.158828854 | $4.90 \mathrm{E}-17$ | 0.392170455 | 0.133296491 | $4.20 \mathrm{E}-18$ | 7.874128212 |
| 323 | 1.410551867 | 2.135238105 | 1.158458818 | $4.32 \mathrm{E}-17$ | 0.392081174 | 0.133234845 | 3.69E-18 | 7.876139719 |
| 324 | 1.410390587 | 2.134729203 | 1.158091203 | $3.82 \mathrm{E}-17$ | 0.391992483 | 0.13317361 | $3.25 \mathrm{E}-18$ | 7.87813801 |
| 325 | 1.410230375 | 2.134223653 | 1.157725996 | 3.37E-17 | 0.391904378 | 0.133112781 | $2.86 \mathrm{E}-18$ | 7.880123174 |
| 326 | 1.410071223 | 2.133721431 | 1.157363179 | 2.97E-17 | 0.391816856 | 0.133052355 | $2.52 \mathrm{E}-18$ | 7.882095297 |
| 327 | 1.409913125 | 2.133222516 | 1.157002738 | 2.62E-17 | 0.391729912 | 0.132992331 | 2.22E-18 | 7.884054463 |
| 328 | 1.409756071 | 2.132726885 | 1.156644658 | $2.32 \mathrm{E}-17$ | 0.391643542 | 0.132932705 | $1.95 \mathrm{E}-18$ | 7.886000758 |
| 329 | 1.409600057 | 2.132234516 | 1.156288924 | 2.04E-17 | 0.391557743 | 0.132873474 | $1.72 \mathrm{E}-18$ | 7.887934267 |
| 330 | 1.409445074 | 2.131745389 | 1.155935519 | $1.80 \mathrm{E}-17$ | 0.39147251 | 0.132814635 | $1.51 \mathrm{E}-18$ | 7.889855073 |
| 331 | 1.409291115 | 2.131259481 | 1.15558443 | $1.59 \mathrm{E}-17$ | 0.39138784 | 0.132756187 | $1.33 \mathrm{E}-18$ | 7.891763259 |
| 332 | 1.409138175 | 2.130776771 | 1.155235642 | $1.40 \mathrm{E}-17$ | 0.39130373 | 0.132698125 | $1.17 \mathrm{E}-18$ | 7.893658909 |
| 333 | 1.408986244 | 2.130297237 | 1.154889139 | $1.24 \mathrm{E}-17$ | 0.391220174 | 0.132640449 | $1.03 \mathrm{E}-18$ | 7.895542105 |
| 334 | 1.408835317 | 2.12982086 | 1.154544907 | $1.09 \mathrm{E}-17$ | 0.39113717 | 0.132583154 | $9.05 \mathrm{E}-19$ | 7.897412928 |
| 335 | 1.408685388 | 2.129347617 | 1.154202931 | 9.65E-18 | 0.391054713 | 0.132526238 | 7.97E-19 | 7.89927146 |
| 336 | 1.408536448 | 2.128877488 | 1.153863196 | 8.52E-18 | 0.390972801 | 0.132469699 | 7.01E-19 | 7.901117782 |
| 337 | 1.408388491 | 2.128410453 | 1.153525689 | 7.52E-18 | 0.390891429 | 0.132413533 | 6.17E-19 | 7.902951973 |
| 338 | 1.408241512 | 2.12794649 | 1.153190395 | $6.63 \mathrm{E}-18$ | 0.390810594 | 0.13235774 | 5.43E-19 | 7.904774113 |
| 339 | 1.408095502 | 2.12748558 | 1.152857299 | $5.85 \mathrm{E}-18$ | 0.390730291 | 0.132302315 | $4.78 \mathrm{E}-19$ | 7.906584281 |
| 340 | 1.407950457 | 2.127027702 | 1.152526387 | 5.17E-18 | 0.390650519 | 0.132247256 | $4.20 \mathrm{E}-19$ | 7.908382556 |
| 341 | 1.407806368 | 2.126572836 | 1.152197645 | $4.56 \mathrm{E}-18$ | 0.390571272 | 0.132192562 | $3.70 \mathrm{E}-19$ | 7.910169016 |
| 342 | 1.40766323 | 2.126120962 | 1.151871059 | 4.02E-18 | 0.390492548 | 0.132138228 | 3.26E-19 | 7.911943739 |
| 343 | 1.407521036 | 2.125672061 | 1.151546615 | $3.55 \mathrm{E}-18$ | 0.390414343 | 0.132084254 | 2.87E-19 | 7.913706801 |
| 344 | 1.40737978 | 2.125226112 | 1.151224299 | $3.13 \mathrm{E}-18$ | 0.390336653 | 0.132030636 | 2.52E-19 | 7.915458279 |
| 345 | 1.407239455 | 2.124783097 | 1.150904098 | $2.76 \mathrm{E}-18$ | 0.390259475 | 0.131977372 | 2.22E-19 | 7.91719825 |
| 346 | 1.407100056 | 2.124342995 | 1.150585997 | $2.44 \mathrm{E}-18$ | 0.390182806 | 0.13192446 | $1.95 \mathrm{E}-19$ | 7.918926788 |
| 347 | 1.406961575 | 2.123905789 | 1.150269983 | $2.15 \mathrm{E}-18$ | 0.390106642 | 0.131871898 | $1.72 \mathrm{E}-19$ | 7.920643969 |
| 348 | 1.406824008 | 2.123471457 | 1.149956042 | 1.90E-18 | 0.39003098 | 0.131819682 | $1.51 \mathrm{E}-19$ | 7.922349867 |
| 349 | 1.406687348 | 2.123039982 | 1.149644161 | $1.68 \mathrm{E}-18$ | 0.389955816 | 0.13176781 | $1.33 \mathrm{E}-19$ | 7.924044557 |
| 350 | 1.406551588 | 2.122611344 | 1.149334326 | $1.48 \mathrm{E}-18$ | 0.389881148 | 0.131716281 | $1.17 \mathrm{E}-19$ | 7.925728112 |
| 351 | 1.406416723 | 2.122185526 | 1.149026525 | $1.30 \mathrm{E}-18$ | 0.389806971 | 0.131665092 | $1.03 \mathrm{E}-19$ | 7.927400605 |
| 352 | 1.406282746 | 2.121762507 | 1.148720743 | $1.15 \mathrm{E}-18$ | 0.389733283 | 0.131614241 | 9.07E-20 | 7.929062109 |
| 353 | 1.406149653 | 2.12134227 | 1.148416969 | $1.02 \mathrm{E}-18$ | 0.38966008 | 0.131563724 | $7.98 \mathrm{E}-20$ | 7.930712697 |


|  | A | B | C | D | E | F | G | H |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 0 | [val] of turtle 1 | [val] of turtle 2 | [val] of turtle 3 | [val] of turtle 4 | [val] of turtle 5 | [val] of turtle 6 | [val] of turtle 7 |
| 354 | 1.406017436 | 2.120924797 | 1.148115188 | 8.96E-19 | 0.389587359 | 0.131513541 | $7.02 \mathrm{E}-20$ | 7.932352438 |
| 355 | 1.40588609 | 2.120510068 | 1.147815387 | 7.91E-19 | 0.389515117 | 0.131463689 | 6.18E-20 | 7.933981406 |
| 356 | 1.405755609 | 2.120098067 | 1.147517554 | $6.98 \mathrm{E}-19$ | 0.389443351 | 0.131414166 | $5.44 \mathrm{E}-20$ | 7.93559967 |
| 357 | 1.405625988 | 2.119688774 | 1.147221677 | $6.16 \mathrm{E}-19$ | 0.389372057 | 0.131364969 | $4.79 \mathrm{E}-20$ | 7.937207302 |
| 358 | 1.40549722 | 2.119282173 | 1.146927741 | $5.43 \mathrm{E}-19$ | 0.389301233 | 0.131316096 | $4.21 \mathrm{E}-20$ | 7.93880437 |
| 359 | 1.4053693 | 2.118878245 | 1.146635735 | $4.79 \mathrm{E}-19$ | 0.389230874 | 0.131267545 | $3.71 \mathrm{E}-20$ | 7.940390944 |
| 360 | 1.405242223 | 2.118476972 | 1.146345646 | $4.23 \mathrm{E}-19$ | 0.389160979 | 0.131219314 | $3.26 \mathrm{E}-20$ | 7.941967094 |
| 361 | 1.405115982 | 2.118078338 | 1.146057461 | $3.73 \mathrm{E}-19$ | 0.389091544 | 0.131171401 | 2.87E-20 | 7.943532887 |
| 362 | 1.404990573 | 2.117682325 | 1.145771168 | $3.29 \mathrm{E}-19$ | 0.389022566 | 0.131123804 | 2.53E-20 | 7.945088391 |
| 363 | 1.404865989 | 2.117288915 | 1.145486755 | $2.90 \mathrm{E}-19$ | 0.388954042 | 0.13107652 | $2.22 \mathrm{E}-20$ | 7.946633675 |
| 364 | 1.404742225 | 2.116898091 | 1.145204209 | $2.56 \mathrm{E}-19$ | 0.388885969 | 0.131029548 | $1.96 \mathrm{E}-20$ | 7.948168805 |
| 365 | 1.404619276 | 2.116509837 | 1.144923518 | $2.26 \mathrm{E}-19$ | 0.388818344 | 0.130982885 | $1.72 \mathrm{E}-20$ | 7.949693849 |
| 366 | 1.404497136 | 2.116124135 | 1.14464467 | $1.99 \mathrm{E}-19$ | 0.388751164 | 0.130936529 | $1.51 \mathrm{E}-20$ | 7.951208871 |
| 367 | 1.4043758 | 2.115740969 | 1.144367654 | $1.76 \mathrm{E}-19$ | 0.388684426 | 0.130890478 | $1.33 \mathrm{E}-20$ | 7.952713939 |
| 368 | 1.404255262 | 2.115360322 | 1.144092456 | $1.55 \mathrm{E}-19$ | 0.388618127 | 0.130844731 | $1.17 \mathrm{E}-20$ | 7.954209117 |
| 369 | 1.404135518 | 2.114982176 | 1.143819065 | $1.37 \mathrm{E}-19$ | 0.388552264 | 0.130799285 | $1.03 \mathrm{E}-20$ | 7.95569447 |
| 370 | 1.404016562 | 2.114606517 | 1.14354747 | $1.21 \mathrm{E}-19$ | 0.388486835 | 0.130754138 | $9.08 \mathrm{E}-21$ | 7.957170064 |
| 371 | 1.403898388 | 2.114233327 | 1.143277658 | $1.07 \mathrm{E}-19$ | 0.388421836 | 0.130709289 | 7.99E-21 | 7.958635962 |
| 372 | 1.403780992 | 2.11386259 | 1.143009618 | $9.41 \mathrm{E}-20$ | 0.388357264 | 0.130664734 | 7.03E-21 | 7.960092227 |
| 373 | 1.403664369 | 2.11349429 | 1.142743338 | 8.30E-20 | 0.388293118 | 0.130620473 | $6.19 \mathrm{E}-21$ | 7.961538924 |
| 374 | 1.403548513 | 2.113128411 | 1.142478807 | 7.32E-20 | 0.388229393 | 0.130576503 | 5.45E-21 | 7.962976114 |


|  | I | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 2 | 8.296323962 | 6.202609666 | 6.980004327 | 11.23294113 | 4.326796875 | 3.246512088 | 0.043653881 |
| 3 | 5.912071101 | 4.738555449 | 5.324340646 | 6 | 2 | 2.461056929 | 0.043653881 |
| 4 | 8.296323962 | 6.202609666 | 6.980004327 | 11.23294113 | 4.326796875 | 4 | 1 |
| 5 | 7.521475832 | 5.648900831 | 6.356092962 | 10.30160686 | 3.883981467 | 2.969859582 | 0.111183762 |
| 6 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| 7 |  |  |  |  |  |  |  |
| 8 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 9 | 6 | 5 | 6 | 6 | 2 | 4 | 1 |
| 10 | 5.962 | 4.944 | 5.86 | 6.45 | 2.136 | 3.766 | 0.98 |
| 11 | 5.936324 | 4.898308 | 5.74622 | 6.827988364 | 2.252752 | 3.562912 | 0.955457143 |
| 12 | 5.920658446 | 4.861185067 | 5.653970291 | 7.145717697 | 2.353546051 | 3.387202371 | 0.927645029 |
| 13 | 5.913097345 | 4.831188181 | 5.579401752 | 7.413039875 | 2.441093059 | 3.235666686 | 0.897590361 |
| 14 | 5.912071101 | 4.807120999 | 5.519356635 | 7.638210689 | 2.517624764 | 3.105413749 | 0.866115928 |
| 15 | 5.916287799 | 4.787992482 | 5.471245439 | 7.828146174 | 2.584977008 | 2.993846723 | 0.833876431 |
| 16 | 5.924684763 | 4.772982203 | 5.432945395 | 7.988638163 | 2.644658993 | 2.898642596 | 0.801388352 |
| 17 | 5.936388599 | 4.761411304 | 5.402716818 | 8.124535502 | 2.697910812 | 2.817730946 | 0.769054798 |
| 18 | 5.950682223 | 4.752718224 | 5.379134248 | 8.239896311 | 2.745751167 | 2.749272682 | 0.737186163 |
| 19 | 5.966977655 | 4.746438463 | 5.361029792 | 8.338115887 | 2.789016896 | 2.691639274 | 0.706017289 |
| 20 | 5.984793574 | 4.74218772 | 5.347446547 | 8.422034088 | 2.828395663 | 2.643392815 | 0.675721687 |
| 21 | 6.003736778 | 4.739647893 | 5.337600351 | 8.494025461 | 2.864452947 | 2.603267153 | 0.646423321 |
| 22 | 6.023486879 | 4.738555449 | 5.330848381 | 8.556074871 | 2.897654293 | 2.570150243 | 0.618206338 |
| 23 | 6.043783663 | 4.738691803 | 5.326663402 | 8.60984092 | 2.928383628 | 2.543067772 | 0.591123095 |
| 24 | 6.064416633 | 4.739875354 | 5.324612668 | 8.656709127 | 2.956958299 | 2.521168107 | 0.565200768 |
| 25 | 6.085216369 | 4.741954918 | 5.324340646 | 8.697836504 | 2.983641416 | 2.503708539 | 0.54044677 |
| 26 | 6.106047377 | 4.744804315 | 5.325554881 | 8.734188902 | 3.008651944 | 2.490042781 | 0.51685319 |
| 27 | 6.126802164 | 4.74831791 | 5.328014442 | 8.766572293 | 3.032172952 | 2.479609673 | 0.494400409 |
| 28 | 6.147396336 | 4.752406957 | 5.331520483 | 8.795658973 | 3.054358334 | 2.471923019 | 0.473060043 |
| 29 | 6.167764528 | 4.7569966 | 5.335908543 | 8.822009491 | 3.075338278 | 2.466562466 | 0.452797316 |
| 30 | 6.187857029 | 4.762023409 | 5.341042259 | 8.84609101 | 3.095223705 | 2.463165376 | 0.433572975 |
| 31 | 6.207636985 | 4.767433377 | 5.346808244 | 8.868292662 | 3.114109862 | 2.461419575 | 0.415344823 |
| 32 | 6.227078069 | 4.773180272 | 5.353111918 | 8.888938402 | 3.132079226 | 2.461056929 | 0.398068927 |
| 33 | 6.246162547 | 4.779224297 | 5.359874108 | 8.90829775 | 3.149203847 | 2.461847654 | 0.381700579 |


|  | I | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 34 | 6.264879677 | 4.785531001 | 5.367028283 | 8.926594782 | 3.165547229 | 2.463595295 | 0.366195035 |
| 35 | 6.283224364 | 4.792070379 | 5.374518304 | 8.944015637 | 3.181165843 | 2.4661323 | 0.351508092 |
| 36 | 6.301196059 | 4.798816156 | 5.382296594 | 8.960714799 | 3.196110336 | 2.469316141 | 0.33759651 |
| 37 | 6.318797825 | 4.805745185 | 5.390322647 | 8.976820343 | 3.210426503 | 2.473025906 | 0.324418337 |
| 38 | 6.336035581 | 4.812836971 | 5.398561816 | 8.992438318 | 3.224156052 | 2.477159318 | 0.311933128 |
| 39 | 6.352917453 | 4.82007327 | 5.406984325 | 9.00765641 | 3.237337228 | 2.481630138 | 0.300102101 |
| 40 | 6.369453258 | 4.827437771 | 5.415564464 | 9.022546998 | 3.2500053 | 2.486365895 | 0.28888823 |
| 41 | 6.385654056 | 4.834915827 | 5.42427993 | 9.037169712 | 3.262192954 | 2.491305916 | 0.278256292 |
| 42 | 6.401531797 | 4.842494237 | 5.43311129 | 9.051573564 | 3.273930605 | 2.496399616 | 0.268172883 |
| 43 | 6.41709902 | 4.850161064 | 5.442041542 | 9.065798724 | 3.285246649 | 2.501605016 | 0.258606398 |
| 44 | 6.43236861 | 4.857905489 | 5.45105575 | 9.079878012 | 3.296167667 | 2.506887455 | 0.249527003 |
| 45 | 6.447353602 | 4.865717678 | 5.460140748 | 9.093838137 | 3.306718585 | 2.512218491 | 0.240906578 |
| 46 | 6.462067016 | 4.87358868 | 5.46928489 | 9.107700728 | 3.316922811 | 2.517574941 | 0.232718657 |
| 47 | 6.476521729 | 4.881510332 | 5.478477848 | 9.1214832 | 3.326802346 | 2.522938061 | 0.22493836 |
| 48 | 6.490730375 | 4.889475188 | 5.487710435 | 9.135199475 | 3.336377881 | 2.528292844 | 0.21754232 |
| 49 | 6.504705261 | 4.897476446 | 5.496974469 | 9.14886058 | 3.34566887 | 2.533627415 | 0.210508604 |
| 50 | 6.518458306 | 4.90550789 | 5.506262642 | 9.16247515 | 3.354693611 | 2.538932514 | 0.203816638 |
| 51 | 6.532000995 | 4.913563839 | 5.515568424 | 9.176049843 | 3.363469299 | 2.544201055 | 0.197447127 |
| 52 | 6.545344346 | 4.921639101 | 5.524885969 | 9.189589692 | 3.372012087 | 2.549427754 | 0.191381985 |
| 53 | 6.558498887 | 4.929728932 | 5.534210041 | 9.203098389 | 3.380337139 | 2.554608807 | 0.185604257 |
| 54 | 6.571474642 | 4.937828997 | 5.543535949 | 9.216578532 | 3.388458677 | 2.559741625 | 0.18009805 |
| 55 | 6.584281123 | 4.945935336 | 5.552859484 | 9.230031822 | 3.396390026 | 2.5648246 | 0.174848467 |
| 56 | 6.596927334 | 4.954044336 | 5.562176876 | 9.243459231 | 3.40414366 | 2.569856917 | 0.16984154 |
| 57 | 6.609421773 | 4.962152698 | 5.571484741 | 9.256861143 | 3.411731245 | 2.574838392 | 0.165064173 |
| 58 | 6.621772439 | 4.970257416 | 5.580780048 | 9.270237468 | 3.419163676 | 2.579769337 | 0.160504078 |
| 59 | 6.633986846 | 4.978355747 | 5.590060078 | 9.283587737 | 3.42645112 | 2.584650446 | 0.156149728 |
| 60 | 6.646072038 | 4.986445195 | 5.599322398 | 9.296911186 | 3.433603052 | 2.589482704 | 0.151990302 |
| 61 | 6.658034603 | 4.994523484 | 5.608564825 | 9.310206813 | 3.440628293 | 2.594267311 | 0.14801564 |
| 62 | 6.669880691 | 5.002588544 | 5.617785407 | 9.323473444 | 3.447535046 | 2.599005614 | 0.144216196 |
| 63 | 6.681616032 | 5.010638492 | 5.626982397 | 9.336709768 | 3.454330931 | 2.603699059 | 0.140582999 |
| 64 | 6.693245956 | 5.018671613 | 5.63615423 | 9.34991438 | 3.461023016 | 2.608349149 | 0.13710761 |
| 65 | 6.704775413 | 5.026686349 | 5.645299509 | 9.363085811 | 3.467617854 | 2.612957411 | 0.133782093 |


|  | I | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 66 | 6.716208989 | 5.03468128 | 5.654416982 | 9.376222551 | 3.47412151 | 2.617525366 | 0.130598976 |
| 67 | 6.727550932 | 5.042655117 | 5.663505532 | 9.389323069 | 3.480539593 | 2.622054514 | 0.127551221 |
| 68 | 6.738805163 | 5.050606685 | 5.672564157 | 9.402385834 | 3.486877285 | 2.626546311 | 0.124632197 |
| 69 | 6.749975301 | 5.058534917 | 5.681591963 | 9.415409322 | 3.493139366 | 2.631002165 | 0.121835652 |
| 70 | 6.761064679 | 5.066438837 | 5.690588148 | 9.428392035 | 3.499330246 | 2.63542342 | 0.119155687 |
| 71 | 6.772076362 | 5.074317559 | 5.699551993 | 9.441332501 | 3.505453981 | 2.639811356 | 0.116586734 |
| 72 | 6.783013163 | 5.082170274 | 5.708482856 | 9.454229285 | 3.511514306 | 2.644167183 | 0.114123535 |
| 73 | 6.793877663 | 5.08999624 | 5.717380157 | 9.467080997 | 3.517514651 | 2.648492035 | 0.111761121 |
| 74 | 6.804672221 | 5.097794783 | 5.726243375 | 9.47988629 | 3.523458166 | 2.652786977 | 0.109494793 |
| 75 | 6.815398997 | 5.105565282 | 5.735072041 | 9.492643868 | 3.529347739 | 2.657053001 | 0.107320108 |
| 76 | 6.826059958 | 5.11330717 | 5.743865729 | 9.505352485 | 3.535186017 | 2.661291028 | 0.105232859 |
| 77 | 6.836656897 | 5.121019923 | 5.752624055 | 9.518010947 | 3.54097542 | 2.66550191 | 0.103229062 |
| 78 | 6.847191445 | 5.12870306 | 5.761346667 | 9.530618114 | 3.546718163 | 2.669686432 | 0.101304943 |
| 79 | 6.857665081 | 5.136356138 | 5.770033246 | 9.543172902 | 3.55241627 | 2.67384532 | 0.099456924 |
| 80 | 6.868079149 | 5.143978746 | 5.778683498 | 9.555674276 | 3.558071586 | 2.677979235 | 0.097681611 |
| 81 | 6.87843486 | 5.151570503 | 5.787297153 | 9.568121257 | 3.563685793 | 2.682088786 | 0.095975783 |
| 82 | 6.888733312 | 5.159131057 | 5.795873962 | 9.58051292 | 3.569260424 | 2.686174525 | 0.094336383 |
| 83 | 6.898975491 | 5.166660079 | 5.804413692 | 9.592848389 | 3.574796873 | 2.690236958 | 0.092760507 |
| 84 | 6.909162286 | 5.174157261 | 5.812916129 | 9.605126839 | 3.580296408 | 2.694276542 | 0.091245395 |
| 85 | 6.919294496 | 5.181622317 | 5.82138107 | 9.617347498 | 3.585760179 | 2.698293693 | 0.089788423 |
| 86 | 6.929372835 | 5.189054978 | 5.829808325 | 9.629509639 | 3.591189231 | 2.702288786 | 0.088387096 |
| 87 | 6.939397942 | 5.196454992 | 5.838197715 | 9.641612583 | 3.596584509 | 2.70626216 | 0.087039037 |
| 88 | 6.949370388 | 5.203822122 | 5.846549071 | 9.653655698 | 3.601946872 | 2.71021412 | 0.085741988 |
| 89 | 6.959290681 | 5.211156144 | 5.854862232 | 9.665638395 | 3.607277093 | 2.71414494 | 0.084493794 |
| 90 | 6.969159272 | 5.21845685 | 5.863137045 | 9.677560131 | 3.612575873 | 2.718054867 | 0.083292404 |
| 91 | 6.978976561 | 5.22572404 | 5.871373365 | 9.689420401 | 3.617843846 | 2.721944121 | 0.082135863 |
| 92 | 6.988742902 | 5.232957526 | 5.879571052 | 9.701218743 | 3.623081581 | 2.725812899 | 0.081022308 |
| 93 | 6.998458608 | 5.240157133 | 5.887729973 | 9.712954732 | 3.628289594 | 2.729661378 | 0.079949958 |
| 94 | 7.008123954 | 5.247322693 | 5.895850003 | 9.724627982 | 3.633468348 | 2.733489714 | 0.078917119 |
| 95 | 7.017739182 | 5.254454048 | 5.903931018 | 9.736238143 | 3.638618261 | 2.737298048 | 0.07792217 |
| 96 | 7.027304505 | 5.26155105 | 5.911972903 | 9.7477849 | 3.643739708 | 2.741086502 | 0.076963566 |
| 97 | 7.036820109 | 5.268613558 | 5.919975548 | 9.75926797 | 3.648833027 | 2.744855189 | 0.076039829 |


|  | I | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 98 | 7.046286157 | 5.27564144 | 5.927938846 | 9.770687104 | 3.653898521 | 2.748604207 | 0.075149548 |
| 99 | 7.055702793 | 5.282634572 | 5.935862698 | 9.782042082 | 3.658936463 | 2.752333642 | 0.074291374 |
| 100 | 7.065070142 | 5.289592837 | 5.943747008 | 9.793332717 | 3.663947099 | 2.756043573 | 0.073464019 |
| 101 | 7.074388314 | 5.296516126 | 5.951591686 | 9.804558846 | 3.668930649 | 2.759734069 | 0.072666249 |
| 102 | 7.083657407 | 5.303404339 | 5.959396649 | 9.815720336 | 3.673887311 | 2.763405193 | 0.071896885 |
| 103 | 7.092877506 | 5.31025738 | 5.967161815 | 9.826817081 | 3.678817264 | 2.767056999 | 0.071154798 |
| 104 | 7.102048688 | 5.317075163 | 5.974887112 | 9.837848999 | 3.68372067 | 2.770689537 | 0.070438909 |
| 105 | 7.111171023 | 5.323857608 | 5.982572472 | 9.84881603 | 3.688597672 | 2.774302853 | 0.069748184 |
| 106 | 7.120244573 | 5.330604642 | 5.99021783 | 9.859718141 | 3.693448403 | 2.777896989 | 0.069081633 |
| 107 | 7.129269396 | 5.337316199 | 5.99782313 | 9.870555317 | 3.698272982 | 2.781471982 | 0.068438308 |
| 108 | 7.138245548 | 5.343992219 | 6.00538832 | 9.881327566 | 3.703071518 | 2.785027867 | 0.0678173 |
| 109 | 7.14717308 | 5.35063265 | 6.012913355 | 9.892034916 | 3.707844109 | 2.788564677 | 0.06721774 |
| 110 | 7.156052044 | 5.357237446 | 6.020398194 | 9.902677414 | 3.712590847 | 2.792082444 | 0.066638794 |
| 111 | 7.164882488 | 5.363806569 | 6.027842804 | 9.913255125 | 3.717311816 | 2.795581198 | 0.066079662 |
| 112 | 7.173664463 | 5.370339985 | 6.035247157 | 9.92376813 | 3.722007093 | 2.799060967 | 0.065539578 |
| 113 | 7.18239802 | 5.376837669 | 6.042611231 | 9.934216529 | 3.726676753 | 2.80252178 | 0.065017807 |
| 114 | 7.191083211 | 5.383299601 | 6.049935009 | 9.944600436 | 3.731320863 | 2.805963666 | 0.064513645 |
| 115 | 7.199720091 | 5.389725769 | 6.057218482 | 9.95491998 | 3.735939488 | 2.809386653 | 0.064026416 |
| 116 | 7.208308717 | 5.396116165 | 6.064461647 | 9.965175305 | 3.740532691 | 2.812790769 | 0.06355547 |
| 117 | 7.216849148 | 5.402470789 | 6.071664505 | 9.975366568 | 3.745100531 | 2.816176043 | 0.063100186 |
| 118 | 7.225341449 | 5.408789646 | 6.078827065 | 9.985493939 | 3.749643067 | 2.819542506 | 0.062659967 |
| 119 | 7.233785684 | 5.415072749 | 6.085949341 | 9.995557599 | 3.754160354 | 2.822890187 | 0.06223424 |
| 120 | 7.242181925 | 5.421320115 | 6.093031355 | 10.00555774 | 3.758652449 | 2.826219118 | 0.061822454 |
| 121 | 7.250530247 | 5.427531768 | 6.100073133 | 10.01549457 | 3.763119407 | 2.829529332 | 0.061424081 |
| 122 | 7.258830728 | 5.433707737 | 6.107074707 | 10.02536831 | 3.767561283 | 2.832820862 | 0.061038615 |
| 123 | 7.267083451 | 5.439848058 | 6.114036115 | 10.03517916 | 3.771978132 | 2.836093742 | 0.060665567 |
| 124 | 7.275288503 | 5.445952771 | 6.120957402 | 10.04492738 | 3.776370009 | 2.839348011 | 0.060304471 |
| 125 | 7.283445978 | 5.452021922 | 6.127838618 | 10.0546132 | 3.780736971 | 2.842583704 | 0.059954878 |
| 126 | 7.291555971 | 5.458055564 | 6.134679819 | 10.06423687 | 3.785079073 | 2.845800862 | 0.059616355 |
| 127 | 7.299618584 | 5.464053753 | 6.141481066 | 10.07379865 | 3.789396375 | 2.848999524 | 0.059288488 |
| 128 | 7.307633922 | 5.470016551 | 6.148242425 | 10.0832988 | 3.793688934 | 2.852179732 | 0.05897088 |
| 129 | 7.315602098 | 5.475944026 | 6.154963969 | 10.09273759 | 3.79795681 | 2.855341531 | 0.058663147 |


|  | I | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 130 | 7.323523225 | 5.481836249 | 6.161645775 | 10.10211531 | 3.802200064 | 2.858484964 | 0.058364921 |
| 131 | 7.331397424 | 5.487693296 | 6.168287926 | 10.11143223 | 3.80641876 | 2.861610079 | 0.05807585 |
| 132 | 7.339224819 | 5.493515251 | 6.174890509 | 10.12068865 | 3.81061296 | 2.864716922 | 0.057795594 |
| 133 | 7.347005539 | 5.499302197 | 6.181453617 | 10.12988485 | 3.81478273 | 2.867805545 | 0.057523826 |
| 134 | 7.354739716 | 5.505054225 | 6.187977347 | 10.13902114 | 3.818928138 | 2.870875997 | 0.057260232 |
| 135 | 7.362427489 | 5.510771431 | 6.194461802 | 10.14809782 | 3.823049251 | 2.87392833 | 0.057004511 |
| 136 | 7.370068999 | 5.516453912 | 6.200907088 | 10.1571152 | 3.82714614 | 2.876962599 | 0.056756373 |
| 137 | 7.377664391 | 5.52210177 | 6.207313316 | 10.16607358 | 3.831218876 | 2.879978859 | 0.05651554 |
| 138 | 7.385213816 | 5.527715113 | 6.213680601 | 10.17497328 | 3.835267532 | 2.882977166 | 0.056281743 |
| 139 | 7.392717427 | 5.533294051 | 6.220009063 | 10.18381462 | 3.839292184 | 2.885957577 | 0.056054724 |
| 140 | 7.400175381 | 5.538838696 | 6.226298825 | 10.19259792 | 3.843292908 | 2.888920152 | 0.055834236 |
| 141 | 7.407587839 | 5.544349166 | 6.232550015 | 10.2013235 | 3.84726978 | 2.891864951 | 0.05562004 |
| 142 | 7.414954966 | 5.549825581 | 6.238762763 | 10.20999168 | 3.851222882 | 2.894792036 | 0.055411908 |
| 143 | 7.422276929 | 5.555268065 | 6.244937205 | 10.21860278 | 3.855152294 | 2.897701469 | 0.055209619 |
| 144 | 7.4295539 | 5.560676745 | 6.251073478 | 10.22715715 | 3.859058098 | 2.900593314 | 0.05501296 |
| 145 | 7.436786053 | 5.566051749 | 6.257171724 | 10.23565511 | 3.862940378 | 2.903467637 | 0.054821729 |
| 146 | 7.443973565 | 5.571393211 | 6.263232088 | 10.24409698 | 3.866799219 | 2.906324502 | 0.05463573 |
| 147 | 7.451116617 | 5.576701264 | 6.269254717 | 10.25248311 | 3.870634709 | 2.909163979 | 0.054454773 |
| 148 | 7.458215392 | 5.581976047 | 6.275239762 | 10.26081382 | 3.874446934 | 2.911986133 | 0.054278677 |
| 149 | 7.465270074 | 5.587217699 | 6.281187377 | 10.26908945 | 3.878235985 | 2.914791035 | 0.054107268 |
| 150 | 7.472280853 | 5.592426363 | 6.287097718 | 10.27731034 | 3.882001951 | 2.917578755 | 0.053940379 |
| 151 | 7.479247919 | 5.597602182 | 6.292970943 | 10.28547681 | 3.885744925 | 2.920349362 | 0.053777847 |
| 152 | 7.486171464 | 5.602745303 | 6.298807213 | 10.29358921 | 3.889464999 | 2.92310293 | 0.053619517 |
| 153 | 7.493051684 | 5.607855875 | 6.304606692 | 10.30164786 | 3.893162267 | 2.925839529 | 0.053465241 |
| 154 | 7.499888776 | 5.612934047 | 6.310369546 | 10.30965311 | 3.896836825 | 2.928559234 | 0.053314874 |
| 155 | 7.506682939 | 5.617979972 | 6.316095942 | 10.31760529 | 3.900488767 | 2.931262119 | 0.053168278 |
| 156 | 7.513434373 | 5.622993804 | 6.321786049 | 10.32550474 | 3.904118192 | 2.933948257 | 0.05302532 |
| 157 | 7.520143282 | 5.627975696 | 6.32744004 | 10.33335178 | 3.907725198 | 2.936617725 | 0.052885872 |
| 158 | 7.526809868 | 5.632925806 | 6.333058086 | 10.34114676 | 3.911309883 | 2.939270598 | 0.052749811 |
| 159 | 7.533434339 | 5.637844292 | 6.338640364 | 10.34889001 | 3.914872347 | 2.941906952 | 0.052617018 |
| 160 | 7.540016901 | 5.642731313 | 6.344187049 | 10.35658186 | 3.91841269 | 2.944526865 | 0.05248738 |
| 161 | 7.546557762 | 5.647587028 | 6.349698318 | 10.36422264 | 3.921931014 | 2.947130413 | 0.052360787 |


|  | I | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 162 | 7.553057133 | 5.6524116 | 6.355174352 | 10.37181269 | 3.925427421 | 2.949717676 | 0.052237133 |
| 163 | 7.559515223 | 5.65720519 | 6.360615329 | 10.37935232 | 3.928902014 | 2.952288731 | 0.052116317 |
| 164 | 7.565932244 | 5.661967963 | 6.366021431 | 10.38684188 | 3.932354896 | 2.954843658 | 0.051998241 |
| 165 | 7.57230841 | 5.666700081 | 6.371392841 | 10.3942817 | 3.93578617 | 2.957382535 | 0.051882811 |
| 166 | 7.578643932 | 5.671401709 | 6.376729741 | 10.40167209 | 3.939195942 | 2.959905442 | 0.051769936 |
| 167 | 7.584939027 | 5.676073013 | 6.382032315 | 10.40901338 | 3.942584317 | 2.962412459 | 0.05165953 |
| 168 | 7.591193908 | 5.680714159 | 6.387300749 | 10.4163059 | 3.9459514 | 2.964903666 | 0.051551508 |
| 169 | 7.597408791 | 5.685325313 | 6.392535228 | 10.42354998 | 3.949297296 | 2.967379144 | 0.051445791 |
| 170 | 7.603583893 | 5.689906643 | 6.397735938 | 10.43074592 | 3.952622113 | 2.969838974 | 0.0513423 |
| 171 | 7.609719429 | 5.694458315 | 6.402903065 | 10.43789406 | 3.955925957 | 2.972283235 | 0.051240961 |
| 172 | 7.615815617 | 5.698980497 | 6.408036796 | 10.4449947 | 3.959208935 | 2.974712011 | 0.051141702 |
| 173 | 7.621872673 | 5.703473357 | 6.41313732 | 10.45204818 | 3.962471155 | 2.977125381 | 0.051044454 |
| 174 | 7.627890816 | 5.707937064 | 6.418204823 | 10.4590548 | 3.965712725 | 2.979523428 | 0.050949149 |
| 175 | 7.633870263 | 5.712371784 | 6.423239494 | 10.46601487 | 3.968933751 | 2.981906233 | 0.050855725 |
| 176 | 7.63981123 | 5.716777688 | 6.42824152 | 10.47292872 | 3.972134343 | 2.984273878 | 0.05076412 |
| 177 | 7.645713938 | 5.721154942 | 6.433211091 | 10.47979664 | 3.975314609 | 2.986626445 | 0.050674273 |
| 178 | 7.651578602 | 5.725503715 | 6.438148394 | 10.48661895 | 3.978474657 | 2.988964015 | 0.050586129 |
| 179 | 7.657405441 | 5.729824176 | 6.443053618 | 10.49339596 | 3.981614596 | 2.99128667 | 0.050499631 |
| 180 | 7.663194673 | 5.734116493 | 6.447926951 | 10.50012796 | 3.984734535 | 2.993594493 | 0.050414728 |
| 181 | 7.668946515 | 5.738380833 | 6.452768581 | 10.50681527 | 3.987834582 | 2.995887565 | 0.050331367 |
| 182 | 7.674661184 | 5.742617365 | 6.457578697 | 10.51345818 | 3.990914846 | 2.998165969 | 0.050249501 |
| 183 | 7.680338897 | 5.746826256 | 6.462357486 | 10.520057 | 3.993975437 | 3.000429786 | 0.050169082 |
| 184 | 7.685979872 | 5.751007674 | 6.467105137 | 10.52661202 | 3.997016462 | 3.002679098 | 0.050090064 |
| 185 | 7.691584324 | 5.755161785 | 6.471821835 | 10.53312354 | 4.000038032 | 3.004913988 | 0.050012403 |
| 186 | 7.69715247 | 5.759288756 | 6.476507769 | 10.53959185 | 4.003040254 | 3.007134536 | 0.049936059 |
| 187 | 7.702684525 | 5.763388753 | 6.481163125 | 10.54601725 | 4.006023238 | 3.009340825 | 0.049860989 |
| 188 | 7.708180705 | 5.767461942 | 6.48578809 | 10.55240002 | 4.008987093 | 3.011532936 | 0.049787155 |
| 189 | 7.713641223 | 5.771508489 | 6.490382849 | 10.55874045 | 4.011931926 | 3.01371095 | 0.04971452 |
| 190 | 7.719066296 | 5.775528559 | 6.494947588 | 10.56503884 | 4.014857846 | 3.01587495 | 0.049643046 |
| 191 | 7.724456135 | 5.779522316 | 6.499482492 | 10.57129546 | 4.017764962 | 3.018025016 | 0.0495727 |
| 192 | 7.729810954 | 5.783489924 | 6.503987744 | 10.5775106 | 4.020653382 | 3.020161228 | 0.049503448 |
| 193 | 7.735130966 | 5.787431546 | 6.50846353 | 10.58368454 | 4.023523214 | 3.02228367 | 0.049435257 |


|  | 1 | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 194 | 7.740416383 | 5.791347346 | 6.512910031 | 10.58981755 | 4.026374565 | 3.024392419 | 0.049368096 |
| 195 | 7.745667415 | 5.795237485 | 6.517327432 | 10.59590993 | 4.029207544 | 3.026487559 | 0.049301935 |
| 196 | 7.750884272 | 5.799102126 | 6.521715913 | 10.60196193 | 4.032022257 | 3.028569168 | 0.049236746 |
| 197 | 7.756067166 | 5.802941428 | 6.526075657 | 10.60797384 | 4.034818812 | 3.030637327 | 0.049172501 |
| 198 | 7.761216304 | 5.806755554 | 6.530406843 | 10.61394592 | 4.037597316 | 3.032692115 | 0.049109172 |
| 199 | 7.766331896 | 5.810544662 | 6.534709653 | 10.61987845 | 4.040357874 | 3.034733614 | 0.049046734 |
| 200 | 7.771414147 | 5.814308911 | 6.538984264 | 10.6257717 | 4.043100595 | 3.036761901 | 0.048985163 |
| 201 | 7.776463266 | 5.81804846 | 6.543230856 | 10.63162592 | 4.045825583 | 3.038777056 | 0.048924434 |
| 202 | 7.781479458 | 5.821763467 | 6.547449606 | 10.63744139 | 4.048532944 | 3.040779158 | 0.048864523 |
| 203 | 7.786462928 | 5.825454088 | 6.551640691 | 10.64321837 | 4.051222784 | 3.042768286 | 0.04880541 |
| 204 | 7.79141388 | 5.829120479 | 6.555804288 | 10.64895711 | 4.053895208 | 3.044744519 | 0.048747072 |
| 205 | 7.796332517 | 5.832762797 | 6.559940572 | 10.65465788 | 4.056550321 | 3.046707934 | 0.048689489 |
| 206 | 7.801219042 | 5.836381195 | 6.564049717 | 10.66032092 | 4.059188227 | 3.048658609 | 0.048632641 |
| 207 | 7.806073657 | 5.839975828 | 6.568131897 | 10.66594651 | 4.061809031 | 3.050596622 | 0.048576508 |
| 208 | 7.810896562 | 5.843546848 | 6.572187285 | 10.67153489 | 4.064412835 | 3.052522051 | 0.048521073 |
| 209 | 7.815687956 | 5.847094409 | 6.576216054 | 10.67708631 | 4.066999744 | 3.054434972 | 0.048466318 |
| 210 | 7.820448039 | 5.850618662 | 6.580218373 | 10.68260102 | 4.06956986 | 3.056335462 | 0.048412224 |
| 211 | 7.825177008 | 5.854119757 | 6.584194414 | 10.68807927 | 4.072123286 | 3.058223597 | 0.048358777 |
| 212 | 7.82987506 | 5.857597845 | 6.588144347 | 10.6935213 | 4.074660124 | 3.060099454 | 0.048305959 |
| 213 | 7.834542392 | 5.861053074 | 6.592068339 | 10.69892736 | 4.077180477 | 3.061963109 | 0.048253755 |
| 214 | 7.839179198 | 5.864485594 | 6.595966558 | 10.7042977 | 4.079684444 | 3.063814636 | 0.048202151 |
| 215 | 7.843785671 | 5.867895551 | 6.599839171 | 10.70963255 | 4.082172128 | 3.065654111 | 0.048151132 |
| 216 | 7.848362006 | 5.871283093 | 6.603686344 | 10.71493215 | 4.084643629 | 3.067481609 | 0.048100684 |
| 217 | 7.852908394 | 5.874648365 | 6.607508241 | 10.72019675 | 4.087099046 | 3.069297205 | 0.048050795 |
| 218 | 7.857425026 | 5.877991512 | 6.611305028 | 10.72542656 | 4.089538481 | 3.071100972 | 0.048001451 |
| 219 | 7.861912093 | 5.881312679 | 6.615076867 | 10.73062184 | 4.091962031 | 3.072892985 | 0.047952639 |
| 220 | 7.866369782 | 5.884612009 | 6.61882392 | 10.73578281 | 4.094369796 | 3.074673316 | 0.047904348 |
| 221 | 7.870798283 | 5.887889644 | 6.622546348 | 10.7409097 | 4.096761875 | 3.076442039 | 0.047856567 |
| 222 | 7.875197782 | 5.891145727 | 6.626244312 | 10.74600274 | 4.099138364 | 3.078199227 | 0.047809283 |
| 223 | 7.879568466 | 5.894380398 | 6.629917971 | 10.75106216 | 4.101499362 | 3.079944953 | 0.047762487 |
| 224 | 7.883910519 | 5.897593798 | 6.633567484 | 10.75608819 | 4.103844965 | 3.081679287 | 0.047716168 |
| 225 | 7.888224125 | 5.900786065 | 6.637193009 | 10.76108105 | 4.106175271 | 3.083402303 | 0.047670316 |


|  | 1 | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | val] of turtle 14 |
| 226 | 7.892509467 | 5.903957338 | 6.640794701 | 10.76604095 | 4.108490375 | 3.085114071 | 0.047624921 |
| 227 | 7.896766728 | 5.907107754 | 6.644372717 | 10.77096813 | 4.110790373 | 3.086814662 | 0.047579973 |
| 228 | 7.900996087 | 5.91023745 | 6.647927212 | 10.77586281 | 4.11307536 | 3.088504148 | 0.047535465 |
| 229 | 7.905197726 | 5.913346563 | 6.651458338 | 10.78072519 | 4.11534543 | 3.090182598 | 0.047491386 |
| 230 | 7.909371822 | 5.916435227 | 6.65496625 | 10.7855555 | 4.117600679 | 3.091850082 | 0.047447729 |
| 231 | 7.913518554 | 5.919503576 | 6.658451099 | 10.79035395 | 4.119841199 | 3.093506671 | 0.047404485 |
| 232 | 7.917638098 | 5.922551743 | 6.661913036 | 10.79512075 | 4.122067084 | 3.095152432 | 0.047361647 |
| 233 | 7.921730631 | 5.925579862 | 6.665352211 | 10.79985612 | 4.124278426 | 3.096787436 | 0.047319206 |
| 234 | 7.925796327 | 5.928588064 | 6.668768774 | 10.80456027 | 4.126475319 | 3.09841175 | 0.047277156 |
| 235 | 7.929835359 | 5.931576479 | 6.672162873 | 10.8092334 | 4.128657853 | 3.100025442 | 0.04723549 |
| 236 | 7.933847901 | 5.934545239 | 6.675534654 | 10.81387573 | 4.130826121 | 3.101628582 | 0.047194199 |
| 237 | 7.937834124 | 5.937494471 | 6.678884266 | 10.81848745 | 4.132980212 | 3.103221234 | 0.047153279 |
| 238 | 7.941794199 | 5.940424305 | 6.682211852 | 10.82306878 | 4.135120218 | 3.104803468 | 0.047112721 |
| 239 | 7.945728296 | 5.943334868 | 6.685517558 | 10.82761991 | 4.137246227 | 3.106375349 | 0.047072521 |
| 240 | 7.949636583 | 5.946226287 | 6.688801527 | 10.83214105 | 4.139358331 | 3.107936944 | 0.047032671 |
| 241 | 7.953519227 | 5.949098688 | 6.692063902 | 10.83663239 | 4.141456616 | 3.109488318 | 0.046993166 |
| 242 | 7.957376396 | 5.951952195 | 6.695304825 | 10.84109414 | 4.143541173 | 3.111029537 | 0.046954001 |
| 243 | 7.961208255 | 5.954786935 | 6.698524438 | 10.8455265 | 4.145612088 | 3.112560667 | 0.046915169 |
| 244 | 7.965014969 | 5.957603029 | 6.701722879 | 10.84992965 | 4.147669449 | 3.114081772 | 0.046876665 |
| 245 | 7.968796701 | 5.9604006 | 6.704900288 | 10.8543038 | 4.149713343 | 3.115592917 | 0.046838485 |
| 246 | 7.972553613 | 5.963179772 | 6.708056804 | 10.85864913 | 4.151743857 | 3.117094165 | 0.046800623 |
| 247 | 7.976285869 | 5.965940664 | 6.711192563 | 10.86296585 | 4.153761076 | 3.11858558 | 0.046763075 |
| 248 | 7.979993627 | 5.968683397 | 6.714307703 | 10.86725413 | 4.155765086 | 3.120067226 | 0.046725834 |
| 249 | 7.983677048 | 5.971408092 | 6.717402359 | 10.87151417 | 4.157755971 | 3.121539166 | 0.046688898 |
| 250 | 7.987336291 | 5.974114866 | 6.720476666 | 10.87574615 | 4.159733817 | 3.123001462 | 0.046652262 |
| 251 | 7.990971513 | 5.976803837 | 6.723530757 | 10.87995027 | 4.161698708 | 3.124454177 | 0.04661592 |
| 252 | 7.99458287 | 5.979475124 | 6.726564766 | 10.88412671 | 4.163650726 | 3.125897371 | 0.04657987 |
| 253 | 7.998170519 | 5.982128842 | 6.729578824 | 10.88827565 | 4.165589955 | 3.127331108 | 0.046544106 |
| 254 | 8.001734614 | 5.984765108 | 6.732573064 | 10.89239727 | 4.167516477 | 3.128755448 | 0.046508625 |
| 255 | 8.005275309 | 5.987384035 | 6.735547615 | 10.89649176 | 4.169430375 | 3.130170451 | 0.046473424 |
| 256 | 8.008792756 | 5.98998574 | 6.738502607 | 10.90055929 | 4.17133173 | 3.131576179 | 0.046438498 |
| 257 | 8.012287109 | 5.992570334 | 6.741438169 | 10.90460005 | 4.173220623 | 3.132972691 | 0.046403843 |


|  | 1 | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 258 | 8.015758516 | 5.995137931 | 6.744354429 | 10.90861421 | 4.175097134 | 3.134360046 | 0.046369457 |
| 259 | 8.01920713 | 5.997688643 | 6.747251514 | 10.91260195 | 4.176961344 | 3.135738305 | 0.046335335 |
| 260 | 8.022633097 | 6.000222581 | 6.75012955 | 10.91656344 | 4.178813333 | 3.137107526 | 0.046301474 |
| 261 | 8.026036568 | 6.002739855 | 6.752988662 | 10.92049887 | 4.18065318 | 3.138467769 | 0.046267872 |
| 262 | 8.029417687 | 6.005240576 | 6.755828975 | 10.92440839 | 4.182480962 | 3.13981909 | 0.046234525 |
| 263 | 8.032776603 | 6.007724852 | 6.758650613 | 10.92829219 | 4.184296759 | 3.141161548 | 0.046201429 |
| 264 | 8.036113459 | 6.010192793 | 6.761453699 | 10.93215042 | 4.186100649 | 3.142495201 | 0.046168582 |
| 265 | 8.039428401 | 6.012644504 | 6.764238355 | 10.93598328 | 4.187892708 | 3.143820106 | 0.046135981 |
| 266 | 8.042721572 | 6.015080094 | 6.767004702 | 10.93979091 | 4.189673013 | 3.145136319 | 0.046103623 |
| 267 | 8.045993114 | 6.017499669 | 6.769752861 | 10.94357349 | 4.191441642 | 3.146443898 | 0.046071505 |
| 268 | 8.049243169 | 6.019903334 | 6.772482952 | 10.94733118 | 4.193198668 | 3.147742898 | 0.046039624 |
| 269 | 8.052471878 | 6.022291194 | 6.775195093 | 10.95106415 | 4.194944169 | 3.149033375 | 0.046007978 |
| 270 | 8.055679379 | 6.024663353 | 6.777889403 | 10.95477256 | 4.196678219 | 3.150315385 | 0.045976564 |
| 271 | 8.058865813 | 6.027019914 | 6.780565999 | 10.95845657 | 4.198400892 | 3.151588983 | 0.04594538 |
| 272 | 8.062031318 | 6.029360981 | 6.783224998 | 10.96211636 | 4.200112262 | 3.152854223 | 0.045914423 |
| 273 | 8.065176029 | 6.031686656 | 6.785866516 | 10.96575206 | 4.201812404 | 3.15411116 | 0.04588369 |
| 274 | 8.068300085 | 6.033997039 | 6.788490667 | 10.96936385 | 4.203501389 | 3.155359849 | 0.04585318 |
| 275 | 8.071403619 | 6.036292232 | 6.791097567 | 10.97295189 | 4.205179291 | 3.156600342 | 0.04582289 |
| 276 | 8.074486766 | 6.038572335 | 6.793687328 | 10.97651632 | 4.206846183 | 3.157832693 | 0.045792818 |
| 277 | 8.077549661 | 6.040837446 | 6.796260064 | 10.98005731 | 4.208502135 | 3.159056956 | 0.045762961 |
| 278 | 8.080592435 | 6.043087666 | 6.798815886 | 10.98357501 | 4.210147219 | 3.160273184 | 0.045733317 |
| 279 | 8.083615221 | 6.045323091 | 6.801354907 | 10.98706958 | 4.211781506 | 3.161481428 | 0.045703885 |
| 280 | 8.08661815 | 6.04754382 | 6.803877236 | 10.99054116 | 4.213405066 | 3.16268174 | 0.045674662 |
| 281 | 8.089601352 | 6.049749949 | 6.806382984 | 10.99398991 | 4.21501797 | 3.163874173 | 0.045645645 |
| 282 | 8.092564956 | 6.051941575 | 6.808872259 | 10.99741598 | 4.216620286 | 3.165058778 | 0.045616834 |
| 283 | 8.095509091 | 6.054118792 | 6.81134517 | 11.00081952 | 4.218212085 | 3.166235606 | 0.045588226 |
| 284 | 8.098433884 | 6.056281696 | 6.813801825 | 11.00420068 | 4.219793434 | 3.167404709 | 0.045559819 |
| 285 | 8.101339463 | 6.058430381 | 6.816242332 | 11.00755961 | 4.221364401 | 3.168566135 | 0.045531612 |
| 286 | 8.104225953 | 6.06056494 | 6.818666795 | 11.01089644 | 4.222925056 | 3.169719936 | 0.045503602 |
| 287 | 8.10709348 | 6.062685467 | 6.821075321 | 11.01421134 | 4.224475464 | 3.170866161 | 0.045475788 |
| 288 | 8.109942167 | 6.064792055 | 6.823468015 | 11.01750444 | 4.226015694 | 3.172004861 | 0.045448167 |
| 289 | 8.11277214 | 6.066884794 | 6.82584498 | 11.02077589 | 4.22754581 | 3.173136083 | 0.045420739 |


|  | 1 | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | val] of turtle 14 |
| 290 | 8.11558352 | 6.068963776 | 6.828206321 | 11.02402582 | 4.229065881 | 3.174259877 | 0.045393501 |
| 291 | 8.118376429 | 6.071029091 | 6.83055214 | 11.02725439 | 4.230575971 | 3.175376292 | 0.045366452 |
| 292 | 8.121150989 | 6.073080831 | 6.83288254 | 11.03046173 | 4.232076145 | 3.176485376 | 0.04533959 |
| 293 | 8.12390732 | 6.075119083 | 6.835197621 | 11.03364799 | 4.233566468 | 3.177587177 | 0.045312913 |
| 294 | 8.126645542 | 6.077143937 | 6.837497485 | 11.03681329 | 4.235047006 | 3.178681742 | 0.045286421 |
| 295 | 8.129365773 | 6.079155481 | 6.839782232 | 11.03995779 | 4.236517821 | 3.179769119 | 0.04526011 |
| 296 | 8.132068132 | 6.081153802 | 6.842051961 | 11.04308161 | 4.237978977 | 3.180849355 | 0.04523398 |
| 297 | 8.134752736 | 6.083138988 | 6.844306772 | 11.04618489 | 4.239430539 | 3.181922497 | 0.04520803 |
| 298 | 8.137419701 | 6.085111125 | 6.846546761 | 11.04926778 | 4.240872567 | 3.182988591 | 0.045182257 |
| 299 | 8.140069144 | 6.087070299 | 6.848772028 | 11.05233039 | 4.242305126 | 3.184047683 | 0.045156661 |
| 300 | 8.142701179 | 6.089016595 | 6.850982668 | 11.05537288 | 4.243728276 | 3.185099819 | 0.045131239 |
| 301 | 8.145315921 | 6.090950099 | 6.853178778 | 11.05839536 | 4.24514208 | 3.186145045 | 0.04510599 |
| 302 | 8.147913482 | 6.092870893 | 6.855360454 | 11.06139797 | 4.246546598 | 3.187183405 | 0.045080914 |
| 303 | 8.150493977 | 6.094779062 | 6.85752779 | 11.06438085 | 4.247941892 | 3.188214946 | 0.045056008 |
| 304 | 8.153057517 | 6.096674689 | 6.859680881 | 11.06734411 | 4.249328021 | 3.189239711 | 0.045031271 |
| 305 | 8.155604213 | 6.098557857 | 6.861819821 | 11.0702879 | 4.250705047 | 3.190257745 | 0.045006702 |
| 306 | 8.158134176 | 6.100428647 | 6.863944702 | 11.07321234 | 4.252073028 | 3.191269093 | 0.0449823 |
| 307 | 8.160647516 | 6.10228714 | 6.866055618 | 11.07611755 | 4.253432024 | 3.192273797 | 0.044958063 |
| 308 | 8.163144341 | 6.104133419 | 6.868152659 | 11.07900367 | 4.254782093 | 3.193271902 | 0.04493399 |
| 309 | 8.165624762 | 6.105967563 | 6.870235918 | 11.08187081 | 4.256123295 | 3.19426345 | 0.044910079 |
| 310 | 8.168088884 | 6.107789651 | 6.872305485 | 11.08471911 | 4.257455687 | 3.195248486 | 0.04488633 |
| 311 | 8.170536815 | 6.109599764 | 6.874361449 | 11.08754869 | 4.258779326 | 3.19622705 | 0.044862741 |
| 312 | 8.172968662 | 6.11139798 | 6.876403902 | 11.09035967 | 4.260094272 | 3.197199187 | 0.044839311 |
| 313 | 8.17538453 | 6.113184377 | 6.878432931 | 11.09315217 | 4.261400579 | 3.198164937 | 0.044816038 |
| 314 | 8.177784525 | 6.114959034 | 6.880448624 | 11.09592632 | 4.262698306 | 3.199124343 | 0.044792922 |
| 315 | 8.180168749 | 6.116722027 | 6.88245107 | 11.09868223 | 4.263987508 | 3.200077447 | 0.044769962 |
| 316 | 8.182537308 | 6.118473432 | 6.884440355 | 11.10142003 | 4.265268241 | 3.20102429 | 0.044747155 |
| 317 | 8.184890303 | 6.120213327 | 6.886416566 | 11.10413983 | 4.266540561 | 3.201964912 | 0.044724501 |
| 318 | 8.187227837 | 6.121941787 | 6.88837979 | 11.10684176 | 4.267804523 | 3.202899355 | 0.044702 |
| 319 | 8.189550012 | 6.123658887 | 6.890330111 | 11.10952593 | 4.269060182 | 3.20382766 | 0.044679649 |
| 320 | 8.191856928 | 6.125364702 | 6.892267614 | 11.11219246 | 4.270307591 | 3.204749866 | 0.044657447 |
| 321 | 8.194148687 | 6.127059307 | 6.894192384 | 11.11484146 | 4.271546806 | 3.205666013 | 0.044635395 |


|  | I | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 322 | 8.196425386 | 6.128742774 | 6.896104504 | 11.11747305 | 4.27277788 | 3.206576142 | 0.044613489 |
| 323 | 8.198687125 | 6.130415177 | 6.898004058 | 11.12008735 | 4.274000866 | 3.207480291 | 0.04459173 |
| 324 | 8.200934003 | 6.132076589 | 6.899891128 | 11.12268446 | 4.275215818 | 3.2083785 | 0.044570116 |
| 325 | 8.203166117 | 6.133727082 | 6.901765796 | 11.12526451 | 4.276422789 | 3.209270809 | 0.044548647 |
| 326 | 8.205383565 | 6.135366728 | 6.903628145 | 11.12782759 | 4.277621829 | 3.210157255 | 0.04452732 |
| 327 | 8.207586441 | 6.136995598 | 6.905478254 | 11.13037384 | 4.278812993 | 3.211037877 | 0.044506136 |
| 328 | 8.209774843 | 6.138613764 | 6.907316204 | 11.13290334 | 4.27999633 | 3.211912713 | 0.044485093 |
| 329 | 8.211948865 | 6.140221295 | 6.909142075 | 11.13541623 | 4.281171894 | 3.212781802 | 0.04446419 |
| 330 | 8.214108601 | 6.141818261 | 6.910955948 | 11.1379126 | 4.282339734 | 3.213645181 | 0.044443426 |
| 331 | 8.216254147 | 6.143404733 | 6.9127579 | 11.14039256 | 4.283499901 | 3.214502887 | 0.0444228 |
| 332 | 8.218385594 | 6.144980778 | 6.914548009 | 11.14285622 | 4.284652446 | 3.215354959 | 0.044402312 |
| 333 | 8.220503035 | 6.146546466 | 6.916326355 | 11.1453037 | 4.285797419 | 3.216201432 | 0.044381959 |
| 334 | 8.222606563 | 6.148101864 | 6.918093014 | 11.14773508 | 4.286934869 | 3.217042343 | 0.044361742 |
| 335 | 8.224696268 | 6.149647041 | 6.919848063 | 11.15015049 | 4.288064847 | 3.21787773 | 0.044341659 |
| 336 | 8.226772242 | 6.151182063 | 6.921591578 | 11.15255003 | 4.2891874 | 3.218707628 | 0.04432171 |
| 337 | 8.228834575 | 6.152706998 | 6.923323635 | 11.15493379 | 4.290302577 | 3.219532073 | 0.044301892 |
| 338 | 8.230883357 | 6.154221911 | 6.92504431 | 11.15730189 | 4.291410428 | 3.220351101 | 0.044282207 |
| 339 | 8.232918676 | 6.155726868 | 6.926753677 | 11.15965443 | 4.292511 | 3.221164748 | 0.044262652 |
| 340 | 8.234940621 | 6.157221935 | 6.928451811 | 11.16199151 | 4.293604341 | 3.22197305 | 0.044243226 |
| 341 | 8.236949279 | 6.158707178 | 6.930138785 | 11.16431323 | 4.294690498 | 3.22277604 | 0.044223929 |
| 342 | 8.238944739 | 6.160182659 | 6.931814673 | 11.16661969 | 4.295769519 | 3.223573754 | 0.04420476 |
| 343 | 8.240927087 | 6.161648445 | 6.933479548 | 11.16891099 | 4.29684145 | 3.224366227 | 0.044185718 |
| 344 | 8.242896408 | 6.163104598 | 6.935133482 | 11.17118723 | 4.297906339 | 3.225153493 | 0.044166802 |
| 345 | 8.244852789 | 6.164551181 | 6.936776548 | 11.17344852 | 4.29896423 | 3.225935587 | 0.044148011 |
| 346 | 8.246796315 | 6.165988259 | 6.938408815 | 11.17569495 | 4.300015171 | 3.226712541 | 0.044129345 |
| 347 | 8.24872707 | 6.167415892 | 6.940030357 | 11.17792661 | 4.301059207 | 3.227484391 | 0.044110802 |
| 348 | 8.250645137 | 6.168834144 | 6.941641242 | 11.18014361 | 4.302096382 | 3.228251169 | 0.044092381 |
| 349 | 8.252550601 | 6.170243075 | 6.943241541 | 11.18234603 | 4.303126743 | 3.229012909 | 0.044074083 |
| 350 | 8.254443545 | 6.171642748 | 6.944831324 | 11.18453399 | 4.304150334 | 3.229769643 | 0.044055905 |
| 351 | 8.256324049 | 6.173033222 | 6.94641066 | 11.18670756 | 4.3051672 | 3.230521406 | 0.044037848 |
| 352 | 8.258192197 | 6.17441456 | 6.947979617 | 11.18886686 | 4.306177384 | 3.231268229 | 0.04401991 |
| 353 | 8.260048069 | 6.175786819 | 6.949538263 | 11.19101196 | 4.30718093 | 3.232010145 | 0.04400209 |


|  | I | J | K | L | M | N | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 8 | [val] of turtle 9 | [val] of turtle 10 | [val] of turtle 11 | [val] of turtle 12 | [val] of turtle 13 | [val] of turtle 14 |
| 354 | 8.261891745 | 6.177150061 | 6.951086668 | 11.19314296 | 4.308177883 | 3.232747186 | 0.043984388 |
| 355 | 8.263723307 | 6.178504345 | 6.952624897 | 11.19525997 | 4.309168285 | 3.233479384 | 0.043966804 |
| 356 | 8.265542834 | 6.179849729 | 6.954153017 | 11.19736306 | 4.310152179 | 3.234206771 | 0.043949335 |
| 357 | 8.267350404 | 6.181186272 | 6.955671096 | 11.19945233 | 4.311129608 | 3.234929379 | 0.043931981 |
| 358 | 8.269146097 | 6.182514031 | 6.957179199 | 11.20152787 | 4.312100615 | 3.235647238 | 0.043914742 |
| 359 | 8.27092999 | 6.183833066 | 6.958677391 | 11.20358977 | 4.313065242 | 3.236360381 | 0.043897617 |
| 360 | 8.272702161 | 6.185143432 | 6.960165738 | 11.20563812 | 4.314023531 | 3.237068837 | 0.043880605 |
| 361 | 8.274462687 | 6.186445188 | 6.961644305 | 11.20767301 | 4.314975523 | 3.237772639 | 0.043863705 |
| 362 | 8.276211645 | 6.187738389 | 6.963113156 | 11.20969452 | 4.315921259 | 3.238471816 | 0.043846916 |
| 363 | 8.277949109 | 6.189023092 | 6.964572354 | 11.21170276 | 4.316860782 | 3.239166399 | 0.043830238 |
| 364 | 8.279675157 | 6.190299353 | 6.966021963 | 11.21369779 | 4.317794131 | 3.239856418 | 0.043813671 |
| 365 | 8.281389863 | 6.191567227 | 6.967462046 | 11.21567972 | 4.318721347 | 3.240541903 | 0.043797212 |
| 366 | 8.283093301 | 6.19282677 | 6.968892667 | 11.21764862 | 4.31964247 | 3.241222884 | 0.043780862 |
| 367 | 8.284785546 | 6.194078035 | 6.970313886 | 11.21960459 | 4.320557541 | 3.24189939 | 0.04376462 |
| 368 | 8.286466671 | 6.195321078 | 6.971725765 | 11.2215477 | 4.3214666 | 3.242571451 | 0.043748484 |
| 369 | 8.288136749 | 6.196555953 | 6.973128367 | 11.22347804 | 4.322369685 | 3.243239095 | 0.043732456 |
| 370 | 8.289795853 | 6.197782713 | 6.974521752 | 11.2253957 | 4.323266836 | 3.243902353 | 0.043716532 |
| 371 | 8.291444055 | 6.199001411 | 6.97590598 | 11.22730075 | 4.324158092 | 3.244561253 | 0.043700714 |
| 372 | 8.293081426 | 6.200212101 | 6.977281113 | 11.22919329 | 4.325043491 | 3.245215823 | 0.043685 |
| 373 | 8.294708038 | 6.201414835 | 6.978647209 | 11.23107339 | 4.325923073 | 3.245866092 | 0.043669389 |
| 374 | 8.296323962 | 6.202609666 | 6.980004327 | 11.23294113 | 4.326796875 | 3.246512088 | 0.043653881 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 2 | 0.258633544 | 0.388229393 | $5.45 \mathrm{E}-21$ | 3.080076218 | 0.076852031 | 0.043653881 | 3.845895814 |
| 3 | 0.258633544 | 0.388229393 | $5.45 \mathrm{E}-21$ | 2.980390656 | 0.076852031 | 0.043653881 | 1 |
| 4 | 1 | 1 | 1 | 3.300331812 | 2 | 1 | 4.285771642 |
| 5 | 0.304744697 | 0.444153469 | 0.02276867 | 3.053929602 | 0.229486411 | 0.106440289 | 3.945715888 |
| 6 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| 7 |  |  |  |  |  |  |  |
| 8 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [ val] of turtle 20 | val] of turtle 21 |
| 9 | 1 | 1 | 1 | 3 | 2 | 1 | 1 |
| 10 | 0.964545455 | 0.974545455 | 0.88 | 3.096545455 | 1.978 | 0.96 | 1.222 |
| 11 | 0.929330909 | 0.950712727 | 0.7744 | 3.168530494 | 1.947393143 | 0.919657143 | 1.426832156 |
| 12 | 0.894572292 | 0.928184801 | 0.681472 | 3.220744178 | 1.909949486 | 0.879597029 | 1.615683963 |
| 13 | 0.860461471 | 0.906723711 | 0.59969536 | 3.257107087 | 1.867165362 | 0.840284761 | 1.789740927 |
| 14 | 0.827164667 | 0.886153526 | 0.527731917 | 3.280826064 | 1.820302911 | 0.80205756 | 1.950160117 |
| 15 | 0.794822195 | 0.866346574 | 0.464404087 | 3.294521466 | 1.770423941 | 0.765151343 | 2.098052014 |
| 16 | 0.763549145 | 0.847212339 | 0.408675596 | 3.300331812 | 1.718418959 | 0.729722358 | 2.234468677 |
| 17 | 0.733436712 | 0.828688549 | 0.359634525 | 3.299999821 | 1.665032064 | 0.695864714 | 2.360396703 |
| 18 | 0.704553947 | 0.81073407 | 0.316478382 | 3.29494316 | 1.6108823 | 0.663624556 | 2.476753751 |
| 19 | 0.67694975 | 0.793323269 | 0.278500976 | 3.286312613 | 1.556481984 | 0.63301148 | 2.58438769 |
| 20 | 0.65065498 | 0.776441578 | 0.245080859 | 3.275039906 | 1.502252438 | 0.604007686 | 2.684077629 |
| 21 | 0.625684589 | 0.760082033 | 0.215671156 | 3.261877031 | 1.448537491 | 0.576575277 | 2.776536265 |
| 22 | 0.602039703 | 0.7442426 | 0.189790617 | 3.247428578 | 1.395615073 | 0.550662053 | 2.8624131 |
| 23 | 0.579709605 | 0.72892414 | 0.167015743 | 3.232178319 | 1.343707171 | 0.526206077 | 2.942298213 |
| 24 | 0.558673599 | 0.714128883 | 0.146973854 | 3.216511077 | 1.292988363 | 0.503139236 | 3.016726327 |
| 25 | 0.538902718 | 0.699859308 | 0.129336991 | 3.200730696 | 1.243593158 | 0.481390003 | 3.086180994 |
| 26 | 0.520361279 | 0.68611734 | 0.113816552 | 3.185074835 | 1.195622274 | 0.460885546 | 3.151098752 |
| 27 | 0.503008282 | 0.672903813 | 0.100158566 | 3.169727119 | 1.149148036 | 0.441553315 | 3.211873186 |
| 28 | 0.48679865 | 0.660218113 | 0.088139538 | 3.154827146 | 1.104218989 | 0.42332221 | 3.268858795 |
| 29 | 0.471684318 | 0.648057984 | 0.077562794 | 3.140478709 | 1.060863851 | 0.406123424 | 3.322374656 |
| 30 | 0.457615186 | 0.636419448 | 0.068255258 | 3.126756563 | 1.019094897 | 0.38989102 | 3.372707842 |
| 31 | 0.44453993 | 0.6252968 | 0.060064627 | 3.113711983 | 0.978910848 | 0.374562306 | 3.420116581 |
| 32 | 0.432406704 | 0.614682683 | 0.052856872 | 3.101377337 | 0.940299333 | 0.36007805 | 3.464833172 |
| 33 | 0.421163722 | 0.604568185 | 0.046514047 | 3.089769849 | 0.903238986 | 0.346382578 | 3.507066643 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 34 | 0.410759753 | 0.594942986 | 0.040932362 | 3.07889468 | 0.867701241 | 0.333423775 | 3.547005176 |
| 35 | 0.401144512 | 0.585795506 | 0.036020478 | 3.068747467 | 0.833651834 | 0.321153024 | 3.584818296 |
| 36 | 0.39226899 | 0.57711307 | 0.031698021 | 3.0593164 | 0.801052097 | 0.309525096 | 3.620658857 |
| 37 | 0.384085702 | 0.568882075 | 0.027894258 | 3.050583927 | 0.769860035 | 0.298498001 | 3.65466482 |
| 38 | 0.376548888 | 0.561088151 | 0.024546947 | 3.042528149 | 0.740031237 | 0.28803282 | 3.686960858 |
| 39 | 0.36961465 | 0.55371632 | 0.021601314 | 3.035123956 | 0.711519643 | 0.278093531 | 3.717659787 |
| 40 | 0.363241056 | 0.546751138 | 0.019009156 | 3.02834396 | 0.684278182 | 0.268646817 | 3.74686385 |
| 41 | 0.357388197 | 0.540176841 | 0.016728057 | 3.022159244 | 0.658259298 | 0.259661881 | 3.774665857 |
| 42 | 0.352018225 | 0.533977463 | 0.01472069 | 3.016539976 | 0.633415393 | 0.251110264 | 3.801150212 |
| 43 | 0.347095349 | 0.528136957 | 0.012954208 | 3.0114559 | 0.609699178 | 0.242965665 | 3.826393813 |
| 44 | 0.342585824 | 0.522639291 | 0.011399703 | 3.00687673 | 0.587063973 | 0.235203772 | 3.850466866 |
| 45 | 0.338457912 | 0.517468543 | 0.010031738 | 3.002772464 | 0.565463933 | 0.227802101 | 3.873433599 |
| 46 | 0.334681836 | 0.512608981 | 0.00882793 | 2.999113629 | 0.544854238 | 0.220739849 | 3.8953529 |
| 47 | 0.331229717 | 0.508045126 | 0.007768578 | 2.995871475 | 0.525191232 | 0.213997746 | 3.916278883 |
| 48 | 0.328075511 | 0.503761819 | 0.006836349 | 2.99301812 | 0.506432537 | 0.207557932 | 3.936261389 |
| 49 | 0.325194929 | 0.499744262 | 0.006015987 | 2.990526657 | 0.48853713 | 0.201403831 | 3.955346434 |
| 50 | 0.322565361 | 0.495978065 | 0.005294069 | 2.988371237 | 0.471465394 | 0.195520045 | 3.9735766 |
| 51 | 0.320165796 | 0.492449276 | 0.00465878 | 2.986527119 | 0.455179162 | 0.18989225 | 3.990991388 |
| 52 | 0.317976737 | 0.489144407 | 0.004099727 | 2.984970701 | 0.439641722 | 0.184507107 | 4.007627525 |
| 53 | 0.31598012 | 0.486050454 | 0.003607759 | 2.983679542 | 0.42481783 | 0.179352173 | 4.023519246 |
| 54 | 0.314159233 | 0.483154913 | 0.003174828 | 2.98263236 | 0.410673697 | 0.174415829 | 4.038698532 |
| 55 | 0.312498634 | 0.480445784 | 0.002793849 | 2.981809022 | 0.39717697 | 0.169687206 | 4.053195331 |
| 56 | 0.310984072 | 0.477911579 | 0.002458587 | 2.981190532 | 0.384296709 | 0.165156129 | 4.067037748 |
| 57 | 0.309602411 | 0.475541323 | 0.002163557 | 2.980759003 | 0.372003353 | 0.160813052 | 4.080252219 |
| 58 | 0.308341561 | 0.47332455 | 0.00190393 | 2.98049763 | 0.360268687 | 0.156649013 | 4.092863662 |
| 59 | 0.307190402 | 0.471251297 | 0.001675458 | 2.980390656 | 0.349065799 | 0.152655584 | 4.104895609 |
| 60 | 0.30613872 | 0.469312096 | 0.001474403 | 2.980423332 | 0.338369039 | 0.148824829 | 4.116370335 |
| 61 | 0.305177143 | 0.467497965 | 0.001297475 | 2.980581884 | 0.328153975 | 0.145149266 | 4.127308956 |
| 62 | 0.30429708 | 0.465800398 | 0.001141778 | 2.980853469 | 0.318397346 | 0.141621836 | 4.13773153 |
| 63 | 0.303490665 | 0.464211347 | 0.001004765 | 2.981226135 | 0.30907702 | 0.138235866 | 4.147657143 |
| 64 | 0.302750703 | 0.462723214 | 8.84E-04 | 2.98168878 | 0.300171945 | 0.134985045 | 4.157103982 |
| 65 | 0.302070616 | 0.461328829 | $7.78 \mathrm{E}-04$ | 2.98223111 | 0.291662102 | 0.131863394 | 4.166089407 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 66 | 0.301444404 | 0.460021442 | $6.85 \mathrm{E}-04$ | 2.982843597 | 0.283528464 | 0.12886525 | 4.17463001 |
| 67 | 0.300866591 | 0.4587947 | $6.03 \mathrm{E}-04$ | 2.983517441 | 0.275752948 | 0.125985238 | 4.182741669 |
| 68 | 0.30033219 | 0.457642637 | $5.30 \mathrm{E}-04$ | 2.984244528 | 0.268318374 | 0.123218253 | 4.190439602 |
| 69 | 0.299836662 | 0.456559653 | $4.67 \mathrm{E}-04$ | 2.985017393 | 0.261208421 | 0.120559446 | 4.197738406 |
| 70 | 0.299375879 | 0.4555405 | $4.11 \mathrm{E}-04$ | 2.985829183 | 0.254407587 | 0.118004205 | 4.2046521 |
| 71 | 0.298946096 | 0.454580263 | $3.61 \mathrm{E}-04$ | 2.986673616 | 0.247901151 | 0.115548139 | 4.211194161 |
| 72 | 0.298543912 | 0.453674349 | $3.18 \mathrm{E}-04$ | 2.987544953 | 0.241675131 | 0.113187069 | 4.217377556 |
| 73 | 0.298166246 | 0.452818465 | $2.80 \mathrm{E}-04$ | 2.988437959 | 0.235716251 | 0.110917012 | 4.223214772 |
| 74 | 0.297810311 | 0.452008608 | $2.46 \mathrm{E}-04$ | 2.989347874 | 0.230011903 | 0.10873417 | 4.228717842 |
| 75 | 0.297473588 | 0.451241045 | $2.17 \mathrm{E}-04$ | 2.990270378 | 0.224550115 | 0.106634922 | 4.233898372 |
| 76 | 0.297153801 | 0.450512305 | $1.91 \mathrm{E}-04$ | 2.991201568 | 0.219319519 | 0.104615809 | 4.238767559 |
| 77 | 0.296848901 | 0.449819155 | $1.68 \mathrm{E}-04$ | 2.992137924 | 0.214309318 | 0.102673533 | 4.243336216 |
| 78 | 0.296557042 | 0.449158598 | $1.48 \mathrm{E}-04$ | 2.993076282 | 0.209509259 | 0.100804941 | 4.247614787 |
| 79 | 0.296276566 | 0.448527849 | $1.30 \mathrm{E}-04$ | 2.994013816 | 0.204909601 | 0.099007021 | 4.251613367 |
| 80 | 0.296005984 | 0.447924329 | $1.14 \mathrm{E}-04$ | 2.994948004 | 0.200501095 | 0.097276895 | 4.255341716 |
| 81 | 0.295743966 | 0.447345651 | $1.01 \mathrm{E}-04$ | 2.995876613 | 0.196274951 | 0.09561181 | 4.258809273 |
| 82 | 0.295489319 | 0.446789609 | $8.86 \mathrm{E}-05$ | 2.996797674 | 0.192222819 | 0.094009134 | 4.262025172 |
| 83 | 0.295240983 | 0.446254166 | $7.79 \mathrm{E}-05$ | 2.997709461 | 0.188336764 | 0.092466349 | 4.264998252 |
| 84 | 0.294998011 | 0.445737441 | $6.86 \mathrm{E}-05$ | 2.998610474 | 0.184609245 | 0.090981045 | 4.26773707 |
| 85 | 0.294759565 | 0.445237704 | $6.04 \mathrm{E}-05$ | 2.99949942 | 0.181033093 | 0.089550917 | 4.270249911 |
| 86 | 0.294524904 | 0.444753364 | 5.31E-05 | 3.000375195 | 0.177601493 | 0.088173755 | 4.272544797 |
| 87 | 0.294293372 | 0.444282958 | $4.67 \mathrm{E}-05$ | 3.001236871 | 0.174307964 | 0.086847448 | 4.274629502 |
| 88 | 0.294064394 | 0.443825146 | $4.11 \mathrm{E}-05$ | 3.002083678 | 0.171146344 | 0.085569969 | 4.276511552 |
| 89 | 0.293837466 | 0.443378699 | $3.62 \mathrm{E}-05$ | 3.002914991 | 0.16811077 | 0.084339379 | 4.278198241 |
| 90 | 0.293612148 | 0.442942496 | $3.18 \mathrm{E}-05$ | 3.003730318 | 0.165195664 | 0.083153821 | 4.279696636 |
| 91 | 0.29338806 | 0.44251551 | $2.80 \mathrm{E}-05$ | 3.004529287 | 0.162395718 | 0.082011515 | 4.281013584 |
| 92 | 0.293164873 | 0.442096809 | $2.47 \mathrm{E}-05$ | 3.005311633 | 0.159705879 | 0.080910753 | 4.282155719 |
| 93 | 0.292942306 | 0.441685542 | $2.17 \mathrm{E}-05$ | 3.006077191 | 0.157121337 | 0.079849901 | 4.283129472 |
| 94 | 0.29272012 | 0.441280938 | $1.91 \mathrm{E}-05$ | 3.006825884 | 0.154637513 | 0.078827392 | 4.283941072 |
| 95 | 0.292498115 | 0.440882299 | $1.68 \mathrm{E}-05$ | 3.007557714 | 0.152250044 | 0.077841721 | 4.284596555 |
| 96 | 0.292276124 | 0.440488994 | $1.48 \mathrm{E}-05$ | 3.008272752 | 0.149954774 | 0.076891449 | 4.285101773 |
| 97 | 0.292054011 | 0.440100453 | $1.30 \mathrm{E}-05$ | 3.008971133 | 0.147747744 | 0.075975193 | 4.285462394 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 98 | 0.291831668 | 0.439716165 | $1.15 \mathrm{E}-05$ | 3.009653047 | 0.145625178 | 0.075091627 | 4.285683909 |
| 99 | 0.29160901 | 0.439335669 | $1.01 \mathrm{E}-05$ | 3.010318733 | 0.14358348 | 0.07423948 | 4.285771642 |
| 100 | 0.291385973 | 0.438958558 | 8.87E-06 | 3.010968473 | 0.141619219 | 0.073417532 | 4.285730746 |
| 101 | 0.291162513 | 0.438584464 | 7.81E-06 | 3.011602585 | 0.139729124 | 0.072624612 | 4.285566217 |
| 102 | 0.290938602 | 0.438213063 | 6.87E-06 | 3.012221417 | 0.137910072 | 0.071859599 | 4.285282894 |
| 103 | 0.290714228 | 0.43784407 | $6.04 \mathrm{E}-06$ | 3.012825347 | 0.136159086 | 0.071121414 | 4.28488546 |
| 104 | 0.290489389 | 0.437477232 | $5.32 \mathrm{E}-06$ | 3.013414772 | 0.134473324 | 0.070409023 | 4.284378457 |
| 105 | 0.290264098 | 0.437112329 | $4.68 \mathrm{E}-06$ | 3.01399011 | 0.132850073 | 0.069721433 | 4.283766277 |
| 106 | 0.290038374 | 0.43674917 | $4.12 \mathrm{E}-06$ | 3.014551792 | 0.131286743 | 0.069057692 | 4.283053178 |
| 107 | 0.289812246 | 0.43638759 | 3.62E-06 | 3.01510026 | 0.129780858 | 0.068416885 | 4.28224328 |
| 108 | 0.289585749 | 0.436027447 | 3.19E-06 | 3.015635966 | 0.128330057 | 0.067798133 | 4.281340571 |
| 109 | 0.289358927 | 0.435668623 | $2.81 \mathrm{E}-06$ | 3.016159366 | 0.126932082 | 0.067200594 | 4.280348912 |
| 110 | 0.289131824 | 0.435311017 | $2.47 \mathrm{E}-06$ | 3.016670918 | 0.125584774 | 0.066623458 | 4.27927204 |
| 111 | 0.288904492 | 0.434954548 | $2.17 \mathrm{E}-06$ | 3.017171083 | 0.124286072 | 0.066065947 | 4.278113573 |
| 112 | 0.288676984 | 0.434599151 | $1.91 \mathrm{E}-06$ | 3.01766032 | 0.123034004 | 0.065527314 | 4.276877007 |
| 113 | 0.288449357 | 0.434244773 | $1.68 \mathrm{E}-06$ | 3.018139084 | 0.121826685 | 0.065006842 | 4.275565729 |
| 114 | 0.28822167 | 0.433891376 | $1.48 \mathrm{E}-06$ | 3.018607827 | 0.120662311 | 0.064503843 | 4.274183014 |
| 115 | 0.287993982 | 0.433538934 | $1.30 \mathrm{E}-06$ | 3.019066994 | 0.119539158 | 0.064017654 | 4.272732027 |
| 116 | 0.287766353 | 0.433187429 | $1.15 \mathrm{E}-06$ | 3.019517022 | 0.118455574 | 0.06354764 | 4.271215831 |
| 117 | 0.287538845 | 0.432836854 | $1.01 \mathrm{E}-06$ | 3.019958343 | 0.117409982 | 0.063093189 | 4.269637389 |
| 118 | 0.287311518 | 0.43248721 | $8.88 \mathrm{E}-07$ | 3.020391375 | 0.116400869 | 0.062653715 | 4.267999562 |
| 119 | 0.287084433 | 0.432138504 | $7.82 \mathrm{E}-07$ | 3.02081653 | 0.115426788 | 0.062228654 | 4.266305117 |
| 120 | 0.28685765 | 0.431790749 | $6.88 \mathrm{E}-07$ | 3.021234208 | 0.114486353 | 0.061817464 | 4.264556728 |
| 121 | 0.286631228 | 0.431443965 | $6.05 \mathrm{E}-07$ | 3.021644796 | 0.113578237 | 0.061419624 | 4.26275698 |
| 122 | 0.286405226 | 0.431098174 | $5.33 \mathrm{E}-07$ | 3.022048673 | 0.11270117 | 0.061034634 | 4.260908369 |
| 123 | 0.286179699 | 0.430753404 | 4.69E-07 | 3.022446203 | 0.111853933 | 0.060662013 | 4.259013306 |
| 124 | 0.285954703 | 0.430409686 | $4.13 \mathrm{E}-07$ | 3.022837739 | 0.11103536 | 0.060301298 | 4.257074121 |
| 125 | 0.285730292 | 0.430067052 | $3.63 \mathrm{E}-07$ | 3.02322362 | 0.110244333 | 0.059952044 | 4.255093062 |
| 126 | 0.285506518 | 0.429725538 | $3.20 \mathrm{E}-07$ | 3.023604175 | 0.10947978 | 0.059613825 | 4.253072302 |
| 127 | 0.285283431 | 0.42938518 | $2.81 \mathrm{E}-07$ | 3.023979718 | 0.108740674 | 0.05928623 | 4.251013935 |
| 128 | 0.285061079 | 0.429046017 | $2.47 \mathrm{E}-07$ | 3.02435055 | 0.10802603 | 0.058968865 | 4.248919985 |
| 129 | 0.284839509 | 0.428708088 | $2.18 \mathrm{E}-07$ | 3.024716962 | 0.107334904 | 0.058661348 | 4.246792405 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 130 | 0.284618765 | 0.428371432 | $1.92 \mathrm{E}-07$ | 3.025079229 | 0.10666639 | 0.058363317 | 4.244633077 |
| 131 | 0.28439889 | 0.428036088 | $1.69 \mathrm{E}-07$ | 3.025437616 | 0.10601962 | 0.058074418 | 4.242443818 |
| 132 | 0.284179924 | 0.427702097 | $1.48 \mathrm{E}-07$ | 3.025792375 | 0.105393761 | 0.057794316 | 4.240226381 |
| 133 | 0.283961906 | 0.427369497 | $1.31 \mathrm{E}-07$ | 3.026143744 | 0.104788013 | 0.057522686 | 4.237982456 |
| 134 | 0.283744871 | 0.427038328 | $1.15 \mathrm{E}-07$ | 3.026491953 | 0.10420161 | 0.057259215 | 4.23571367 |
| 135 | 0.283528856 | 0.426708627 | $1.01 \mathrm{E}-07$ | 3.026837217 | 0.103633815 | 0.057003605 | 4.233421594 |
| 136 | 0.283313892 | 0.426380432 | $8.90 \mathrm{E}-08$ | 3.02717974 | 0.103083921 | 0.056755565 | 4.231107741 |
| 137 | 0.283100009 | 0.42605378 | $7.83 \mathrm{E}-08$ | 3.027519716 | 0.102551253 | 0.056514819 | 4.228773569 |
| 138 | 0.282887237 | 0.425728704 | $6.89 \mathrm{E}-08$ | 3.027857327 | 0.102035157 | 0.0562811 | 4.226420482 |
| 139 | 0.282675603 | 0.42540524 | $6.06 \mathrm{E}-08$ | 3.028192745 | 0.101535011 | 0.056054151 | 4.224049832 |
| 140 | 0.282465131 | 0.425083419 | $5.34 \mathrm{E}-08$ | 3.028526133 | 0.101050213 | 0.055833725 | 4.221662923 |
| 141 | 0.282255844 | 0.424763273 | $4.70 \mathrm{E}-08$ | 3.028857641 | 0.100580188 | 0.055619585 | 4.219261007 |
| 142 | 0.282047765 | 0.424444832 | $4.13 \mathrm{E}-08$ | 3.029187413 | 0.100124384 | 0.055411502 | 4.216845291 |
| 143 | 0.281840913 | 0.424128124 | $3.64 \mathrm{E}-08$ | 3.02951558 | 0.099682268 | 0.055209257 | 4.214416938 |
| 144 | 0.281635306 | 0.423813175 | $3.20 \mathrm{E}-08$ | 3.029842267 | 0.099253331 | 0.055012638 | 4.211977063 |
| 145 | 0.28143096 | 0.423500012 | $2.82 \mathrm{E}-08$ | 3.03016759 | 0.098837082 | 0.054821442 | 4.209526741 |
| 146 | 0.281227892 | 0.423188657 | $2.48 \mathrm{E}-08$ | 3.030491655 | 0.098433051 | 0.054635474 | 4.207067006 |
| 147 | 0.281026114 | 0.422879133 | $2.18 \mathrm{E}-08$ | 3.030814561 | 0.098040786 | 0.054454545 | 4.204598851 |
| 148 | 0.28082564 | 0.42257146 | $1.92 \mathrm{E}-08$ | 3.031136401 | 0.097659852 | 0.054278474 | 4.20212323 |
| 149 | 0.280626478 | 0.422265659 | $1.69 \mathrm{E}-08$ | 3.031457259 | 0.097289831 | 0.054107087 | 4.199641062 |
| 150 | 0.28042864 | 0.421961745 | $1.49 \mathrm{E}-08$ | 3.031777211 | 0.096930323 | 0.053940218 | 4.197153227 |
| 151 | 0.280232134 | 0.421659735 | $1.31 \mathrm{E}-08$ | 3.032096329 | 0.096580942 | 0.053777703 | 4.194660572 |
| 152 | 0.280036966 | 0.421359644 | $1.15 \mathrm{E}-08$ | 3.032414676 | 0.096241318 | 0.05361939 | 4.192163909 |
| 153 | 0.279843142 | 0.421061484 | $1.01 \mathrm{E}-08$ | 3.032732313 | 0.095911094 | 0.053465127 | 4.189664019 |
| 154 | 0.279650668 | 0.420765268 | 8.91E-09 | 3.03304929 | 0.095589928 | 0.053314772 | 4.187161651 |
| 155 | 0.279459547 | 0.420471005 | $7.84 \mathrm{E}-09$ | 3.033365655 | 0.095277491 | 0.053168187 | 4.184657521 |
| 156 | 0.279269782 | 0.420178705 | $6.90 \mathrm{E}-09$ | 3.033681451 | 0.094973468 | 0.053025239 | 4.18215232 |
| 157 | 0.279081374 | 0.419888375 | $6.07 \mathrm{E}-09$ | 3.033996714 | 0.094677553 | 0.0528858 | 4.179646707 |
| 158 | 0.278894326 | 0.419600021 | $5.34 \mathrm{E}-09$ | 3.034311476 | 0.094389455 | 0.052749747 | 4.177141314 |
| 159 | 0.278708636 | 0.419313649 | $4.70 \mathrm{E}-09$ | 3.034625767 | 0.094108893 | 0.052616961 | 4.174636749 |
| 160 | 0.278524305 | 0.419029262 | $4.14 \mathrm{E}-09$ | 3.03493961 | 0.093835597 | 0.05248733 | 4.172133593 |
| 161 | 0.278341331 | 0.418746863 | $3.64 \mathrm{E}-09$ | 3.035253025 | 0.093569306 | 0.052360742 | 4.1696324 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 162 | 0.278159711 | 0.418466454 | $3.21 \mathrm{E}-09$ | 3.03556603 | 0.093309772 | 0.052237093 | 4.167133703 |
| 163 | 0.277979443 | 0.418188034 | $2.82 \mathrm{E}-09$ | 3.035878636 | 0.093056754 | 0.052116281 | 4.164638011 |
| 164 | 0.277800523 | 0.417911605 | $2.48 \mathrm{E}-09$ | 3.036190854 | 0.092810021 | 0.051998209 | 4.162145812 |
| 165 | 0.277622947 | 0.417637164 | $2.18 \mathrm{E}-09$ | 3.036502692 | 0.09256935 | 0.051882782 | 4.15965757 |
| 166 | 0.277446711 | 0.417364708 | $1.92 \mathrm{E}-09$ | 3.036814152 | 0.09233453 | 0.051769911 | 4.15717373 |
| 167 | 0.27727181 | 0.417094236 | $1.69 \mathrm{E}-09$ | 3.037125238 | 0.092105353 | 0.051659508 | 4.154694717 |
| 168 | 0.277098238 | 0.416825741 | $1.49 \mathrm{E}-09$ | 3.037435948 | 0.091881622 | 0.051551489 | 4.152220936 |
| 169 | 0.276925988 | 0.416559221 | $1.31 \mathrm{E}-09$ | 3.037746279 | 0.091663148 | 0.051445773 | 4.149752775 |
| 170 | 0.276755054 | 0.416294668 | $1.15 \mathrm{E}-09$ | 3.038056226 | 0.091449748 | 0.051342284 | 4.147290603 |
| 171 | 0.27658543 | 0.416032077 | $1.01 \mathrm{E}-09$ | 3.038365783 | 0.091241245 | 0.051240947 | 4.144834771 |
| 172 | 0.276417108 | 0.41577144 | 8.93E-10 | 3.03867494 | 0.091037471 | 0.051141689 | 4.142385615 |
| 173 | 0.276250081 | 0.415512751 | $7.86 \mathrm{E}-10$ | 3.038983688 | 0.090838263 | 0.051044442 | 4.139943453 |
| 174 | 0.27608434 | 0.415255999 | $6.91 \mathrm{E}-10$ | 3.039292014 | 0.090643464 | 0.050949139 | 4.13750859 |
| 175 | 0.275919877 | 0.415001178 | $6.08 \mathrm{E}-10$ | 3.039599906 | 0.090452924 | 0.050855717 | 4.135081314 |
| 176 | 0.275756685 | 0.414748276 | $5.35 \mathrm{E}-10$ | 3.039907349 | 0.090266498 | 0.050764112 | 4.1326619 |
| 177 | 0.275594753 | 0.414497285 | $4.71 \mathrm{E}-10$ | 3.040214328 | 0.090084047 | 0.050674266 | 4.130250609 |
| 178 | 0.275434074 | 0.414248193 | $4.15 \mathrm{E}-10$ | 3.040520827 | 0.089905437 | 0.050586122 | 4.127847688 |
| 179 | 0.275274639 | 0.414000991 | $3.65 \mathrm{E}-10$ | 3.040826829 | 0.089730538 | 0.050499626 | 4.125453372 |
| 180 | 0.275116437 | 0.413755667 | $3.21 \mathrm{E}-10$ | 3.041132316 | 0.089559227 | 0.050414723 | 4.123067882 |
| 181 | 0.27495946 | 0.413512209 | $2.83 \mathrm{E}-10$ | 3.041437269 | 0.089391383 | 0.050331363 | 4.12069143 |
| 182 | 0.274803698 | 0.413270605 | $2.49 \mathrm{E}-10$ | 3.041741669 | 0.089226893 | 0.050249497 | 4.118324214 |
| 183 | 0.274649141 | 0.413030844 | $2.19 \mathrm{E}-10$ | 3.042045498 | 0.089065646 | 0.050169078 | 4.115966423 |
| 184 | 0.274495781 | 0.412792913 | $1.93 \mathrm{E}-10$ | 3.042348734 | 0.088907534 | 0.050090061 | 4.113618234 |
| 185 | 0.274343606 | 0.412556798 | $1.69 \mathrm{E}-10$ | 3.042651357 | 0.088752456 | 0.050012401 | 4.111279813 |
| 186 | 0.274192606 | 0.412322488 | $1.49 \mathrm{E}-10$ | 3.042953348 | 0.088600314 | 0.049936056 | 4.10895132 |
| 187 | 0.274042773 | 0.412089968 | $1.31 \mathrm{E}-10$ | 3.043254685 | 0.088451011 | 0.049860987 | 4.106632901 |
| 188 | 0.273894096 | 0.411859226 | $1.15 \mathrm{E}-10$ | 3.043555348 | 0.088304458 | 0.049787153 | 4.104324697 |
| 189 | 0.273746564 | 0.411630248 | $1.02 \mathrm{E}-10$ | 3.043855315 | 0.088160566 | 0.049714518 | 4.102026836 |
| 190 | 0.273600168 | 0.41140302 | $8.94 \mathrm{E}-11$ | 3.044154566 | 0.08801925 | 0.049643045 | 4.099739442 |
| 191 | 0.273454898 | 0.411177528 | 7.87E-11 | 3.04445308 | 0.08788043 | 0.049572699 | 4.097462629 |
| 192 | 0.273310743 | 0.410953759 | $6.92 \mathrm{E}-11$ | 3.044750835 | 0.087744026 | 0.049503446 | 4.095196502 |
| 193 | 0.273167694 | 0.410731699 | $6.09 \mathrm{E}-11$ | 3.045047812 | 0.087609964 | 0.049435256 | 4.09294116 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 194 | 0.27302574 | 0.410511332 | $5.36 \mathrm{E}-11$ | 3.04534399 | 0.087478171 | 0.049368095 | 4.090696696 |
| 195 | 0.272884872 | 0.410292646 | $4.72 \mathrm{E}-11$ | 3.045639349 | 0.087348577 | 0.049301935 | 4.088463194 |
| 196 | 0.272745079 | 0.410075626 | $4.15 \mathrm{E}-11$ | 3.045933868 | 0.087221114 | 0.049236746 | 4.086240732 |
| 197 | 0.272606351 | 0.409860258 | $3.65 \mathrm{E}-11$ | 3.046227528 | 0.087095718 | 0.0491725 | 4.084029383 |
| 198 | 0.272468679 | 0.409646527 | $3.22 \mathrm{E}-11$ | 3.046520309 | 0.086972326 | 0.049109172 | 4.081829213 |
| 199 | 0.272332053 | 0.40943442 | $2.83 \mathrm{E}-11$ | 3.046812193 | 0.086850879 | 0.049046734 | 4.079640282 |
| 200 | 0.272196462 | 0.409223922 | $2.49 \mathrm{E}-11$ | 3.047103159 | 0.086731318 | 0.048985162 | 4.077462645 |
| 201 | 0.272061897 | 0.409015019 | $2.19 \mathrm{E}-11$ | 3.047393191 | 0.086613589 | 0.048924433 | 4.07529635 |
| 202 | 0.271928348 | 0.408807696 | $1.93 \mathrm{E}-11$ | 3.047682269 | 0.086497636 | 0.048864523 | 4.073141443 |
| 203 | 0.271795806 | 0.40860194 | $1.70 \mathrm{E}-11$ | 3.047970376 | 0.086383409 | 0.04880541 | 4.070997962 |
| 204 | 0.271664262 | 0.408397737 | $1.49 \mathrm{E}-11$ | 3.048257495 | 0.086270858 | 0.048747072 | 4.068865943 |
| 205 | 0.271533704 | 0.408195072 | $1.31 \mathrm{E}-11$ | 3.048543609 | 0.086159935 | 0.048689489 | 4.066745414 |
| 206 | 0.271404126 | 0.407993932 | $1.16 \mathrm{E}-11$ | 3.048828701 | 0.086050593 | 0.048632641 | 4.064636403 |
| 207 | 0.271275516 | 0.407794303 | $1.02 \mathrm{E}-11$ | 3.049112756 | 0.085942789 | 0.048576508 | 4.062538931 |
| 208 | 0.271147865 | 0.40759617 | 8.95E-12 | 3.049395758 | 0.08583648 | 0.048521073 | 4.060453016 |
| 209 | 0.271021166 | 0.407399521 | $7.88 \mathrm{E}-12$ | 3.049677692 | 0.085731623 | 0.048466317 | 4.058378671 |
| 210 | 0.270895408 | 0.407204341 | $6.93 \mathrm{E}-12$ | 3.049958544 | 0.08562818 | 0.048412224 | 4.056315907 |
| 211 | 0.270770582 | 0.407010617 | $6.10 \mathrm{E}-12$ | 3.050238299 | 0.085526112 | 0.048358776 | 4.05426473 |
| 212 | 0.27064668 | 0.406818336 | $5.37 \mathrm{E}-12$ | 3.050516944 | 0.085425383 | 0.048305958 | 4.052225145 |
| 213 | 0.270523694 | 0.406627484 | $4.73 \mathrm{E}-12$ | 3.050794466 | 0.085325956 | 0.048253755 | 4.050197152 |
| 214 | 0.270401613 | 0.406438048 | $4.16 \mathrm{E}-12$ | 3.051070852 | 0.085227798 | 0.048202151 | 4.048180748 |
| 215 | 0.270280431 | 0.406250015 | $3.66 \mathrm{E}-12$ | 3.05134609 | 0.085130875 | 0.048151132 | 4.046175928 |
| 216 | 0.270160137 | 0.406063372 | $3.22 \mathrm{E}-12$ | 3.051620168 | 0.085035155 | 0.048100684 | 4.044182683 |
| 217 | 0.270040725 | 0.405878106 | $2.83 \mathrm{E}-12$ | 3.051893074 | 0.084940608 | 0.048050795 | 4.042201003 |
| 218 | 0.269922185 | 0.405694205 | $2.49 \mathrm{E}-12$ | 3.052164799 | 0.084847205 | 0.048001451 | 4.040230874 |
| 219 | 0.269804509 | 0.405511655 | 2.19E-12 | 3.052435332 | 0.084754916 | 0.047952639 | 4.038272279 |
| 220 | 0.26968769 | 0.405330444 | $1.93 \mathrm{E}-12$ | 3.052704664 | 0.084663715 | 0.047904348 | 4.036325202 |
| 221 | 0.269571719 | 0.405150561 | $1.70 \mathrm{E}-12$ | 3.052972784 | 0.084573574 | 0.047856567 | 4.034389622 |
| 222 | 0.269456589 | 0.404971992 | $1.50 \mathrm{E}-12$ | 3.053239684 | 0.084484468 | 0.047809283 | 4.032465517 |
| 223 | 0.269342291 | 0.404794726 | $1.32 \mathrm{E}-12$ | 3.053505355 | 0.084396373 | 0.047762487 | 4.030552861 |
| 224 | 0.269228819 | 0.40461875 | $1.16 \mathrm{E}-12$ | 3.05376979 | 0.084309264 | 0.047716168 | 4.028651629 |
| 225 | 0.269116163 | 0.404444053 | $1.02 \mathrm{E}-12$ | 3.054032981 | 0.084223119 | 0.047670316 | 4.026761794 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | val] of turtle 21 |
| 226 | 0.269004318 | 0.404270623 | 8.97E-13 | 3.05429492 | 0.084137915 | 0.047624921 | 4.024883324 |
| 227 | 0.268893276 | 0.404098449 | $7.89 \mathrm{E}-13$ | 3.054555602 | 0.084053631 | 0.047579973 | 4.023016189 |
| 228 | 0.268783028 | 0.403927519 | $6.95 \mathrm{E}-13$ | 3.05481502 | 0.083970247 | 0.047535465 | 4.021160356 |
| 229 | 0.268673569 | 0.403757821 | $6.11 \mathrm{E}-13$ | 3.055073168 | 0.083887742 | 0.047491386 | 4.019315791 |
| 230 | 0.26856489 | 0.403589345 | $5.38 \mathrm{E}-13$ | 3.055330041 | 0.083806097 | 0.047447729 | 4.017482457 |
| 231 | 0.268456986 | 0.40342208 | $4.73 \mathrm{E}-13$ | 3.055585633 | 0.083725294 | 0.047404485 | 4.015660319 |
| 232 | 0.268349848 | 0.403256014 | $4.17 \mathrm{E}-13$ | 3.05583994 | 0.083645315 | 0.047361647 | 4.013849337 |
| 233 | 0.26824347 | 0.403091137 | 3.67E-13 | 3.056092957 | 0.083566142 | 0.047319206 | 4.012049471 |
| 234 | 0.268137846 | 0.402927438 | $3.23 \mathrm{E}-13$ | 3.056344681 | 0.083487759 | 0.047277156 | 4.010260683 |
| 235 | 0.268032969 | 0.402764907 | $2.84 \mathrm{E}-13$ | 3.056595109 | 0.083410149 | 0.04723549 | 4.008482929 |
| 236 | 0.267928831 | 0.402603534 | $2.50 \mathrm{E}-13$ | 3.056844237 | 0.083333297 | 0.047194199 | 4.006716168 |
| 237 | 0.267825428 | 0.402443307 | $2.20 \mathrm{E}-13$ | 3.057092061 | 0.083257188 | 0.047153279 | 4.004960355 |
| 238 | 0.267722751 | 0.402284217 | $1.93 \mathrm{E}-13$ | 3.057338581 | 0.083181807 | 0.047112721 | 4.003215447 |
| 239 | 0.267620796 | 0.402126255 | $1.70 \mathrm{E}-13$ | 3.057583793 | 0.08310714 | 0.047072521 | 4.001481398 |
| 240 | 0.267519555 | 0.401969409 | $1.50 \mathrm{E}-13$ | 3.057827695 | 0.083033174 | 0.047032671 | 3.999758161 |
| 241 | 0.267419023 | 0.401813671 | $1.32 \mathrm{E}-13$ | 3.058070287 | 0.082959895 | 0.046993166 | 3.998045691 |
| 242 | 0.267319193 | 0.40165903 | $1.16 \mathrm{E}-13$ | 3.058311567 | 0.08288729 | 0.046954001 | 3.99634394 |
| 243 | 0.26722006 | 0.401505478 | $1.02 \mathrm{E}-13$ | 3.058551534 | 0.082815348 | 0.046915169 | 3.994652859 |
| 244 | 0.267121617 | 0.401353004 | $8.98 \mathrm{E}-14$ | 3.058790187 | 0.082744055 | 0.046876665 | 3.992972401 |
| 245 | 0.267023859 | 0.4012016 | $7.91 \mathrm{E}-14$ | 3.059027526 | 0.082673402 | 0.046838485 | 3.991302515 |
| 246 | 0.26692678 | 0.401051256 | $6.96 \mathrm{E}-14$ | 3.059263552 | 0.082603376 | 0.046800623 | 3.989643152 |
| 247 | 0.266830375 | 0.400901964 | $6.12 \mathrm{E}-14$ | 3.059498263 | 0.082533966 | 0.046763075 | 3.987994261 |
| 248 | 0.266734637 | 0.400753713 | $5.39 \mathrm{E}-14$ | 3.059731661 | 0.082465163 | 0.046725834 | 3.986355793 |
| 249 | 0.266639561 | 0.400606497 | $4.74 \mathrm{E}-14$ | 3.059963747 | 0.082396956 | 0.046688898 | 3.984727695 |
| 250 | 0.266545142 | 0.400460305 | 4.17E-14 | 3.06019452 | 0.082329335 | 0.046652262 | 3.983109917 |
| 251 | 0.266451374 | 0.40031513 | $3.67 \mathrm{E}-14$ | 3.060423983 | 0.08226229 | 0.04661592 | 3.981502407 |
| 252 | 0.266358252 | 0.400170962 | $3.23 \mathrm{E}-14$ | 3.060652137 | 0.082195813 | 0.04657987 | 3.979905111 |
| 253 | 0.26626577 | 0.400027794 | $2.84 \mathrm{E}-14$ | 3.060878984 | 0.082129895 | 0.046544106 | 3.978317979 |
| 254 | 0.266173924 | 0.399885617 | $2.50 \mathrm{E}-14$ | 3.061104524 | 0.082064526 | 0.046508625 | 3.976740956 |
| 255 | 0.266082708 | 0.399744423 | $2.20 \mathrm{E}-14$ | 3.061328761 | 0.081999698 | 0.046473424 | 3.975173991 |
| 256 | 0.265992118 | 0.399604203 | $1.94 \mathrm{E}-14$ | 3.061551697 | 0.081935404 | 0.046438498 | 3.97361703 |
| 257 | 0.265902148 | 0.399464951 | $1.70 \mathrm{E}-14$ | 3.061773333 | 0.081871634 | 0.046403843 | 3.972070019 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 258 | 0.265812793 | 0.399326658 | $1.50 \mathrm{E}-14$ | 3.061993673 | 0.081808383 | 0.046369457 | 3.970532906 |
| 259 | 0.265724048 | 0.399189316 | $1.32 \mathrm{E}-14$ | 3.06221272 | 0.081745641 | 0.046335335 | 3.969005636 |
| 260 | 0.265635909 | 0.399052917 | $1.16 \mathrm{E}-14$ | 3.062430475 | 0.081683402 | 0.046301474 | 3.967488156 |
| 261 | 0.265548371 | 0.398917455 | $1.02 \mathrm{E}-14$ | 3.062646943 | 0.081621659 | 0.046267872 | 3.965980411 |
| 262 | 0.265461429 | 0.398782921 | $9.00 \mathrm{E}-15$ | 3.062862127 | 0.081560404 | 0.046234525 | 3.964482349 |
| 263 | 0.265375078 | 0.398649308 | 7.92E-15 | 3.06307603 | 0.081499632 | 0.046201429 | 3.962993914 |
| 264 | 0.265289314 | 0.398516608 | $6.97 \mathrm{E}-15$ | 3.063288655 | 0.081439336 | 0.046168582 | 3.961515053 |
| 265 | 0.265204132 | 0.398384816 | $6.13 \mathrm{E}-15$ | 3.063500007 | 0.081379508 | 0.046135981 | 3.960045711 |
| 266 | 0.265119528 | 0.398253922 | $5.40 \mathrm{E}-15$ | 3.063710089 | 0.081320145 | 0.046103623 | 3.958585835 |
| 267 | 0.265035498 | 0.398123921 | $4.75 \mathrm{E}-15$ | 3.063918905 | 0.081261238 | 0.046071505 | 3.957135371 |
| 268 | 0.264952036 | 0.397994805 | $4.18 \mathrm{E}-15$ | 3.06412646 | 0.081202783 | 0.046039624 | 3.955694263 |
| 269 | 0.264869139 | 0.397866568 | $3.68 \mathrm{E}-15$ | 3.064332757 | 0.081144774 | 0.046007978 | 3.954262459 |
| 270 | 0.264786802 | 0.397739202 | $3.24 \mathrm{E}-15$ | 3.064537801 | 0.081087205 | 0.045976564 | 3.952839904 |
| 271 | 0.264705021 | 0.397612701 | $2.85 \mathrm{E}-15$ | 3.064741596 | 0.081030071 | 0.04594538 | 3.951426545 |
| 272 | 0.264623791 | 0.397487059 | $2.51 \mathrm{E}-15$ | 3.064944147 | 0.080973367 | 0.045914423 | 3.950022327 |
| 273 | 0.26454311 | 0.397362267 | $2.21 \mathrm{E}-15$ | 3.065145458 | 0.080917087 | 0.04588369 | 3.948627196 |
| 274 | 0.264462972 | 0.397238321 | $1.94 \mathrm{E}-15$ | 3.065345534 | 0.080861227 | 0.04585318 | 3.947241099 |
| 275 | 0.264383373 | 0.397115214 | $1.71 \mathrm{E}-15$ | 3.065544381 | 0.080805782 | 0.04582289 | 3.945863982 |
| 276 | 0.26430431 | 0.396992938 | 1.50E-15 | 3.065742002 | 0.080750748 | 0.045792818 | 3.944495791 |
| 277 | 0.264225779 | 0.396871489 | $1.32 \mathrm{E}-15$ | 3.065938403 | 0.080696118 | 0.045762961 | 3.943136474 |
| 278 | 0.264147775 | 0.396750859 | $1.16 \mathrm{E}-15$ | 3.066133589 | 0.08064189 | 0.045733317 | 3.941785977 |
| 279 | 0.264070294 | 0.396631043 | $1.02 \mathrm{E}-15$ | 3.066327564 | 0.080588058 | 0.045703885 | 3.940444247 |
| 280 | 0.263993334 | 0.396512034 | $9.01 \mathrm{E}-16$ | 3.066520335 | 0.080534619 | 0.045674662 | 3.93911123 |
| 281 | 0.263916889 | 0.396393827 | 7.93E-16 | 3.066711907 | 0.080481567 | 0.045645645 | 3.937786875 |
| 282 | 0.263840956 | 0.396276415 | $6.98 \mathrm{E}-16$ | 3.066902284 | 0.0804289 | 0.045616834 | 3.936471128 |
| 283 | 0.263765532 | 0.396159792 | $6.14 \mathrm{E}-16$ | 3.067091473 | 0.080376613 | 0.045588226 | 3.935163936 |
| 284 | 0.263690613 | 0.396043954 | $5.40 \mathrm{E}-16$ | 3.067279478 | 0.080324701 | 0.045559819 | 3.933865248 |
| 285 | 0.263616195 | 0.395928893 | $4.76 \mathrm{E}-16$ | 3.067466305 | 0.080273162 | 0.045531612 | 3.932575012 |
| 286 | 0.263542274 | 0.395814604 | $4.19 \mathrm{E}-16$ | 3.06765196 | 0.080221992 | 0.045503602 | 3.931293174 |
| 287 | 0.263468847 | 0.395701082 | $3.68 \mathrm{E}-16$ | 3.067836447 | 0.080171186 | 0.045475788 | 3.930019684 |
| 288 | 0.263395911 | 0.39558832 | $3.24 \mathrm{E}-16$ | 3.068019774 | 0.080120742 | 0.045448167 | 3.92875449 |
| 289 | 0.263323461 | 0.395476314 | $2.85 \mathrm{E}-16$ | 3.068201945 | 0.080070655 | 0.045420739 | 3.927497541 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 290 | 0.263251494 | 0.395365058 | 2.51E-16 | 3.068382966 | 0.080020922 | 0.045393501 | 3.926248785 |
| 291 | 0.263180008 | 0.395254546 | 2.21E-16 | 3.068562843 | 0.07997154 | 0.045366452 | 3.925008171 |
| 292 | 0.263108998 | 0.395144773 | $1.94 \mathrm{E}-16$ | 3.068741582 | 0.079922506 | 0.04533959 | 3.923775649 |
| 293 | 0.26303846 | 0.395035734 | $1.71 \mathrm{E}-16$ | 3.068919188 | 0.079873816 | 0.045312913 | 3.922551168 |
| 294 | 0.262968393 | 0.394927423 | $1.51 \mathrm{E}-16$ | 3.069095667 | 0.079825467 | 0.045286421 | 3.921334678 |
| 295 | 0.262898792 | 0.394819835 | $1.32 \mathrm{E}-16$ | 3.069271026 | 0.079777456 | 0.04526011 | 3.920126129 |
| 296 | 0.262829654 | 0.394712965 | 1.17E-16 | 3.069445269 | 0.07972978 | 0.04523398 | 3.91892547 |
| 297 | 0.262760976 | 0.394606808 | $1.03 \mathrm{E}-16$ | 3.069618403 | 0.079682435 | 0.04520803 | 3.917732652 |
| 298 | 0.262692754 | 0.394501359 | $9.03 \mathrm{E}-17$ | 3.069790433 | 0.07963542 | 0.045182257 | 3.916547626 |
| 299 | 0.262624986 | 0.394396612 | 7.94E-17 | 3.069961366 | 0.07958873 | 0.045156661 | 3.915370343 |
| 300 | 0.262557667 | 0.394292563 | 6.99E-17 | 3.070131207 | 0.079542364 | 0.045131239 | 3.914200753 |
| 301 | 0.262490796 | 0.394189207 | 6.15E-17 | 3.070299963 | 0.079496317 | 0.04510599 | 3.913038808 |
| 302 | 0.262424369 | 0.394086539 | 5.41E-17 | 3.070467639 | 0.079450589 | 0.045080914 | 3.911884459 |
| 303 | 0.262358383 | 0.393984554 | $4.76 \mathrm{E}-17$ | 3.070634241 | 0.079405175 | 0.045056008 | 3.910737658 |
| 304 | 0.262292834 | 0.393883247 | $4.19 \mathrm{E}-17$ | 3.070799775 | 0.079360073 | 0.045031271 | 3.909598358 |
| 305 | 0.26222772 | 0.393782613 | 3.69E-17 | 3.070964248 | 0.07931528 | 0.045006702 | 3.90846651 |
| 306 | 0.262163038 | 0.393682648 | 3.25E-17 | 3.071127664 | 0.079270795 | 0.0449823 | 3.907342067 |
| 307 | 0.262098784 | 0.393583347 | 2.86E-17 | 3.071290031 | 0.079226614 | 0.044958063 | 3.906224982 |
| 308 | 0.262034956 | 0.393484706 | $2.51 \mathrm{E}-17$ | 3.071451353 | 0.079182734 | 0.04493399 | 3.905115207 |
| 309 | 0.261971551 | 0.393386719 | $2.21 \mathrm{E}-17$ | 3.071611637 | 0.079139154 | 0.044910079 | 3.904012697 |
| 310 | 0.261908566 | 0.393289383 | $1.95 \mathrm{E}-17$ | 3.071770889 | 0.079095871 | 0.04488633 | 3.902917404 |
| 311 | 0.261845998 | 0.393192692 | $1.71 \mathrm{E}-17$ | 3.071929115 | 0.079052883 | 0.044862741 | 3.901829282 |
| 312 | 0.261783844 | 0.393096642 | $1.51 \mathrm{E}-17$ | 3.072086321 | 0.079010186 | 0.044839311 | 3.900748285 |
| 313 | 0.261722102 | 0.39300123 | $1.33 \mathrm{E}-17$ | 3.072242512 | 0.07896778 | 0.044816038 | 3.899674368 |
| 314 | 0.261660767 | 0.392906449 | 1.17E-17 | 3.072397694 | 0.07892566 | 0.044792922 | 3.898607485 |
| 315 | 0.261599839 | 0.392812297 | $1.03 \mathrm{E}-17$ | 3.072551874 | 0.078883827 | 0.044769962 | 3.897547591 |
| 316 | 0.261539313 | 0.392718768 | $9.04 \mathrm{E}-18$ | 3.072705057 | 0.078842276 | 0.044747155 | 3.896494641 |
| 317 | 0.261479188 | 0.392625859 | 7.96E-18 | 3.07285725 | 0.078801006 | 0.044724501 | 3.895448589 |
| 318 | 0.26141946 | 0.392533565 | $7.00 \mathrm{E}-18$ | 3.073008457 | 0.078760014 | 0.044702 | 3.894409393 |
| 319 | 0.261360127 | 0.392441881 | 6.16E-18 | 3.073158686 | 0.078719299 | 0.044679649 | 3.893377007 |
| 320 | 0.261301185 | 0.392350805 | $5.42 \mathrm{E}-18$ | 3.073307941 | 0.078678859 | 0.044657447 | 3.892351387 |
| 321 | 0.261242633 | 0.392260331 | $4.77 \mathrm{E}-18$ | 3.073456229 | 0.07863869 | 0.044635395 | 3.891332491 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 322 | 0.261184468 | 0.392170455 | $4.20 \mathrm{E}-18$ | 3.073603555 | 0.078598792 | 0.044613489 | 3.890320273 |
| 323 | 0.261126687 | 0.392081174 | $3.69 \mathrm{E}-18$ | 3.073749925 | 0.078559162 | 0.04459173 | 3.889314692 |
| 324 | 0.261069288 | 0.391992483 | $3.25 \mathrm{E}-18$ | 3.073895346 | 0.078519798 | 0.044570116 | 3.888315704 |
| 325 | 0.261012267 | 0.391904378 | $2.86 \mathrm{E}-18$ | 3.074039822 | 0.078480698 | 0.044548647 | 3.887323267 |
| 326 | 0.260955623 | 0.391816856 | $2.52 \mathrm{E}-18$ | 3.074183359 | 0.078441861 | 0.04452732 | 3.886337338 |
| 327 | 0.260899353 | 0.391729912 | $2.22 \mathrm{E}-18$ | 3.074325964 | 0.078403283 | 0.044506136 | 3.885357874 |
| 328 | 0.260843454 | 0.391643542 | $1.95 \mathrm{E}-18$ | 3.074467642 | 0.078364964 | 0.044485093 | 3.884384835 |
| 329 | 0.260787923 | 0.391557743 | $1.72 \mathrm{E}-18$ | 3.074608398 | 0.078326901 | 0.04446419 | 3.883418178 |
| 330 | 0.260732759 | 0.39147251 | $1.51 \mathrm{E}-18$ | 3.074748238 | 0.078289093 | 0.044443426 | 3.882457862 |
| 331 | 0.260677959 | 0.39138784 | $1.33 \mathrm{E}-18$ | 3.074887168 | 0.078251538 | 0.0444228 | 3.881503846 |
| 332 | 0.26062352 | 0.39130373 | $1.17 \mathrm{E}-18$ | 3.075025194 | 0.078214233 | 0.044402312 | 3.880556088 |
| 333 | 0.260569441 | 0.391220174 | $1.03 \mathrm{E}-18$ | 3.075162321 | 0.078177177 | 0.044381959 | 3.879614548 |
| 334 | 0.260515718 | 0.39113717 | $9.05 \mathrm{E}-19$ | 3.075298555 | 0.078140368 | 0.044361742 | 3.878679187 |
| 335 | 0.260462349 | 0.391054713 | 7.97E-19 | 3.0754339 | 0.078103805 | 0.044341659 | 3.877749962 |
| 336 | 0.260409331 | 0.390972801 | $7.01 \mathrm{E}-19$ | 3.075568364 | 0.078067486 | 0.04432171 | 3.876826836 |
| 337 | 0.260356664 | 0.390891429 | $6.17 \mathrm{E}-19$ | 3.07570195 | 0.078031408 | 0.044301892 | 3.875909767 |
| 338 | 0.260304343 | 0.390810594 | $5.43 \mathrm{E}-19$ | 3.075834666 | 0.07799557 | 0.044282207 | 3.874998716 |
| 339 | 0.260252367 | 0.390730291 | $4.78 \mathrm{E}-19$ | 3.075966515 | 0.077959971 | 0.044262652 | 3.874093645 |
| 340 | 0.260200734 | 0.390650519 | $4.20 \mathrm{E}-19$ | 3.076097504 | 0.077924609 | 0.044243226 | 3.873194514 |
| 341 | 0.260149441 | 0.390571272 | $3.70 \mathrm{E}-19$ | 3.076227638 | 0.077889482 | 0.044223929 | 3.872301285 |
| 342 | 0.260098485 | 0.390492548 | $3.26 \mathrm{E}-19$ | 3.076356923 | 0.077854588 | 0.04420476 | 3.871413918 |
| 343 | 0.260047866 | 0.390414343 | 2.87E-19 | 3.076485363 | 0.077819926 | 0.044185718 | 3.870532376 |
| 344 | 0.259997579 | 0.390336653 | $2.52 \mathrm{E}-19$ | 3.076612964 | 0.077785494 | 0.044166802 | 3.869656622 |
| 345 | 0.259947624 | 0.390259475 | $2.22 \mathrm{E}-19$ | 3.076739732 | 0.07775129 | 0.044148011 | 3.868786616 |
| 346 | 0.259897998 | 0.390182806 | $1.95 \mathrm{E}-19$ | 3.076865671 | 0.077717314 | 0.044129345 | 3.867922321 |
| 347 | 0.259848699 | 0.390106642 | $1.72 \mathrm{E}-19$ | 3.076990787 | 0.077683563 | 0.044110802 | 3.867063701 |
| 348 | 0.259799724 | 0.39003098 | $1.51 \mathrm{E}-19$ | 3.077115085 | 0.077650035 | 0.044092381 | 3.866210718 |
| 349 | 0.259751072 | 0.389955816 | $1.33 \mathrm{E}-19$ | 3.077238571 | 0.07761673 | 0.044074083 | 3.865363336 |
| 350 | 0.25970274 | 0.389881148 | $1.17 \mathrm{E}-19$ | 3.077361249 | 0.077583646 | 0.044055905 | 3.864521517 |
| 351 | 0.259654726 | 0.389806971 | $1.03 \mathrm{E}-19$ | 3.077483124 | 0.07755078 | 0.044037848 | 3.863685225 |
| 352 | 0.259607029 | 0.389733283 | 9.07E-20 | 3.077604203 | 0.077518133 | 0.04401991 | 3.862854425 |
| 353 | 0.259559645 | 0.38966008 | 7.98E-20 | 3.077724489 | 0.077485701 | 0.04400209 | 3.86202908 |


|  | P | Q | R | S | T | U | V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 15 | [val] of turtle 16 | [val] of turtle 17 | [val] of turtle 18 | [val] of turtle 19 | [val] of turtle 20 | [val] of turtle 21 |
| 354 | 0.259512573 | 0.389587359 | $7.02 \mathrm{E}-20$ | 3.077843988 | 0.077453484 | 0.043984388 | 3.861209155 |
| 355 | 0.259465811 | 0.389515117 | $6.18 \mathrm{E}-20$ | 3.077962704 | 0.07742148 | 0.043966804 | 3.860394614 |
| 356 | 0.259419357 | 0.389443351 | $5.44 \mathrm{E}-20$ | 3.078080644 | 0.077389688 | 0.043949335 | 3.859585422 |
| 357 | 0.259373208 | 0.389372057 | $4.79 \mathrm{E}-20$ | 3.078197812 | 0.077358106 | 0.043931981 | 3.858781544 |
| 358 | 0.259327364 | 0.389301233 | $4.21 \mathrm{E}-20$ | 3.078314212 | 0.077326733 | 0.043914742 | 3.857982945 |
| 359 | 0.25928182 | 0.389230874 | $3.71 \mathrm{E}-20$ | 3.07842985 | 0.077295567 | 0.043897617 | 3.857189591 |
| 360 | 0.259236577 | 0.389160979 | $3.26 \mathrm{E}-20$ | 3.078544731 | 0.077264608 | 0.043880605 | 3.856401448 |
| 361 | 0.259191631 | 0.389091544 | 2.87E-20 | 3.07865886 | 0.077233852 | 0.043863705 | 3.85561848 |
| 362 | 0.259146981 | 0.389022566 | $2.53 \mathrm{E}-20$ | 3.07877224 | 0.0772033 | 0.043846916 | 3.854840655 |
| 363 | 0.259102624 | 0.388954042 | $2.22 \mathrm{E}-20$ | 3.078884878 | 0.07717295 | 0.043830238 | 3.854067939 |
| 364 | 0.25905856 | 0.388885969 | $1.96 \mathrm{E}-20$ | 3.078996778 | 0.0771428 | 0.043813671 | 3.853300298 |
| 365 | 0.259014785 | 0.388818344 | $1.72 \mathrm{E}-20$ | 3.079107945 | 0.077112849 | 0.043797212 | 3.852537698 |
| 366 | 0.258971298 | 0.388751164 | $1.51 \mathrm{E}-20$ | 3.079218383 | 0.077083096 | 0.043780862 | 3.851780108 |
| 367 | 0.258928097 | 0.388684426 | $1.33 \mathrm{E}-20$ | 3.079328097 | 0.07705354 | 0.04376462 | 3.851027494 |
| 368 | 0.258885181 | 0.388618127 | $1.17 \mathrm{E}-20$ | 3.079437092 | 0.077024178 | 0.043748484 | 3.850279823 |
| 369 | 0.258842546 | 0.388552264 | $1.03 \mathrm{E}-20$ | 3.079545373 | 0.07699501 | 0.043732456 | 3.849537064 |
| 370 | 0.258800193 | 0.388486835 | $9.08 \mathrm{E}-21$ | 3.079652943 | 0.076966034 | 0.043716532 | 3.848799183 |
| 371 | 0.258758117 | 0.388421836 | $7.99 \mathrm{E}-21$ | 3.079759809 | 0.07693725 | 0.043700714 | 3.84806615 |
| 372 | 0.258716319 | 0.388357264 | $7.03 \mathrm{E}-21$ | 3.079865973 | 0.076908655 | 0.043685 | 3.847337932 |
| 373 | 0.258674795 | 0.388293118 | $6.19 \mathrm{E}-21$ | 3.079971442 | 0.076880249 | 0.043669389 | 3.846614497 |
| 374 | 0.258633544 | 0.388229393 | $5.45 \mathrm{E}-21$ | 3.080076218 | 0.076852031 | 0.043653881 | 3.845895814 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 2 | 0.1218727 | 2.841212541 | 1.947250925 | 2.224137024 | 0.049054265 | 1.129616572 | 0.493045205 |
| 3 | 0.1218727 | 2.841212541 | 1 | 1.99 | 0.049054265 | 0.982631915 | 0.493045205 |
| 4 | 3 | 5 | 2.440492031 | 2.77304867 | 1.134082766 | 1.325446716 | 2 |
| 5 | 0.256818615 | 3.10388835 | 2.126511597 | 2.432687072 | 0.161240448 | 1.210077646 | 0.670182561 |
| 6 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| 7 |  |  |  |  |  |  |  |
| 8 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 9 | 3 | 5 | 1 | 2 | 1 | 1 | 2 |
| 10 | 2.704 | 4.962 | 1.144545455 | 1.99 | 1.044 | 0.991428571 | 1.979428571 |
| 11 | 2.448617143 | 4.906833455 | 1.271552727 | 1.992162857 | 1.07828 | 0.985862338 | 1.95507574 |
| 12 | 2.227746629 | 4.839421956 | 1.383566094 | 2.003851167 | 1.103616183 | 0.98302424 | 1.928087222 |
| 13 | 2.036222016 | 4.76370692 | 1.482731994 | 2.022881878 | 1.12081971 | 0.982631915 | 1.899318946 |
| 14 | 1.869670041 | 4.682821947 | 1.570862038 | 2.047454677 | 1.130707848 | 0.98440561 | 1.869405368 |
| 15 | 1.724388024 | 4.599236626 | 1.649486081 | 2.076091062 | 1.134082766 | 0.988074066 | 1.838812813 |
| 16 | 1.597240331 | 4.514876369 | 1.719896894 | 2.107582577 | 1.131716398 | 0.993378745 | 1.807880925 |
| 17 | 1.485570893 | 4.431222108 | 1.783187787 | 2.140946903 | 1.124340068 | 1.000076718 | 1.776854711 |
| 18 | 1.387129282 | 4.349393113 | 1.840284263 | 2.175390657 | 1.112637821 | 1.007942491 | 1.745909153 |
| 19 | 1.300008223 | 4.270215673 | 1.891970667 | 2.210277938 | 1.097242604 | 1.016768982 | 1.715167995 |
| 20 | 1.22259076 | 4.194279939 | 1.938912595 | 2.245103751 | 1.078734628 | 1.026367855 | 1.68471796 |
| 21 | 1.153505591 | 4.121986868 | 1.98167576 | 2.279471612 | 1.057641346 | 1.036569349 | 1.654619424 |
| 22 | 1.09158928 | 4.053586914 | 2.020741844 | 2.313074691 | 1.034438629 | 1.047221742 | 1.624914325 |
| 23 | 1.035854306 | 3.989211824 | 2.056521837 | 2.345679967 | 1.009552786 | 1.05819055 | 1.595631974 |
| 24 | 0.985462024 | 3.928900691 | 2.089367247 | 2.377114944 | 0.983363164 | 1.069357544 | 1.566793234 |
| 25 | 0.939699798 | 3.872621242 | 2.119579518 | 2.407256524 | 0.95620511 | 1.080619646 | 1.538413487 |
| 26 | 0.897961647 | 3.820287158 | 2.14741795 | 2.436021721 | 0.928373143 | 1.091887774 | 1.510504675 |
| 27 | 0.859731877 | 3.771772106 | 2.173106344 | 2.463359911 | 0.900124206 | 1.103085658 | 1.483076667 |
| 28 | 0.824571225 | 3.726921058 | 2.196838589 | 2.4892464 | 0.871680909 | 1.11414866 | 1.456138129 |
| 29 | 0.792105139 | 3.685559359 | 2.218783345 | 2.51367708 | 0.843234692 | 1.125022639 | 1.429697034 |
| 30 | 0.762013859 | 3.647499953 | 2.239087984 | 2.53666402 | 0.814948868 | 1.135662852 | 1.403760931 |
| 31 | 0.734024027 | 3.61254908 | 2.257881881 | 2.558231822 | 0.7869615 | 1.146032925 | 1.378337036 |
| 32 | 0.707901588 | 3.580510736 | 2.27527919 | 2.578414637 | 0.759388104 | 1.156103882 | 1.353432227 |
| 33 | 0.683445783 | 3.551190113 | 2.291381161 | 2.597253721 | 0.732324165 | 1.165853252 | 1.329052961 |


|  | W | X | Y | Z | AA | $A B$ | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 34 | 0.660484069 | 3.524396205 | 2.306278086 | 2.614795444 | 0.705847449 | 1.175264246 | 1.305205166 |
| 35 | 0.638867824 | 3.499943755 | 2.320050932 | 2.63108968 | 0.680020135 | 1.184325006 | 1.281894122 |
| 36 | 0.618468709 | 3.477654648 | 2.332772703 | 2.64618851 | 0.654890743 | 1.193027928 | 1.259124336 |
| 37 | 0.599175595 | 3.457358884 | 2.344509589 | 2.660145186 | 0.630495892 | 1.201369045 | 1.236899446 |
| 38 | 0.580891968 | 3.438895188 | 2.355321922 | 2.673013309 | 0.606861884 | 1.209347478 | 1.215222127 |
| 39 | 0.563533724 | 3.422111365 | 2.365264978 | 2.684846187 | 0.584006119 | 1.216964953 | 1.194094027 |
| 40 | 0.547027318 | 3.406864426 | 2.374389655 | 2.695696337 | 0.561938371 | 1.224225363 | 1.173515727 |
| 41 | 0.531308189 | 3.39302056 | 2.382743031 | 2.705615108 | 0.540661914 | 1.231134387 | 1.153486715 |
| 42 | 0.516319433 | 3.380454971 | 2.390368841 | 2.714652399 | 0.52017453 | 1.237699155 | 1.134005384 |
| 43 | 0.502010682 | 3.369051629 | 2.39730787 | 2.722856459 | 0.500469393 | 1.243927955 | 1.115069051 |
| 44 | 0.48833715 | 3.358702949 | 2.403598292 | 2.730273744 | 0.481535851 | 1.249829981 | 1.096673984 |
| 45 | 0.475258836 | 3.349309419 | 2.409275946 | 2.736948837 | 0.463360111 | 1.255415111 | 1.078815446 |
| 46 | 0.462739844 | 3.340779208 | 2.414374573 | 2.742924395 | 0.445925837 | 1.260693719 | 1.06148775 |
| 47 | 0.450747807 | 3.333027743 | 2.418926017 | 2.748241138 | 0.429214672 | 1.265676514 | 1.044684319 |
| 48 | 0.439253402 | 3.325977289 | 2.422960396 | 2.752937857 | 0.413206689 | 1.270374405 | 1.028397758 |
| 49 | 0.428229941 | 3.319556525 | 2.426506243 | 2.757051441 | 0.397880783 | 1.274798381 | 1.012619918 |
| 50 | 0.41765302 | 3.313700126 | 2.429590628 | 2.760616925 | 0.383215002 | 1.278959424 | 0.997341978 |
| 51 | 0.407500227 | 3.308348355 | 2.43223927 | 2.763667543 | 0.369186839 | 1.282868418 | 0.982554516 |
| 52 | 0.39775089 | 3.303446675 | 2.434476623 | 2.766234784 | 0.35577347 | 1.286536093 | 0.968247584 |
| 53 | 0.388385863 | 3.298945369 | 2.436325957 | 2.768348466 | 0.342951964 | 1.289972969 | 0.95441078 |
| 54 | 0.37938735 | 3.294799185 | 2.437809426 | 2.770036799 | 0.330699452 | 1.293189314 | 0.941033321 |
| 55 | 0.370738747 | 3.290966997 | 2.438948133 | 2.771326461 | 0.318993273 | 1.296195113 | 0.928104109 |
| 56 | 0.362424513 | 3.287411486 | 2.439762184 | 2.772242666 | 0.307811093 | 1.29900004 | 0.915611796 |
| 57 | 0.354430059 | 3.284098836 | 2.440270732 | 2.772809236 | 0.297130997 | 1.301613446 | 0.903544847 |
| 58 | 0.346741649 | 3.280998461 | 2.440492031 | 2.77304867 | 0.28693157 | 1.304044343 | 0.891891592 |
| 59 | 0.33934632 | 3.278082733 | 2.440443467 | 2.77298221 | 0.277191956 | 1.306301399 | 0.880640282 |
| 60 | 0.33223181 | 3.275326748 | 2.440141603 | 2.77262991 | 0.267891903 | 1.308392933 | 0.869779137 |
| 61 | 0.325386498 | 3.272708088 | 2.439602212 | 2.772010696 | 0.259011802 | 1.310326919 | 0.859296389 |
| 62 | 0.31879935 | 3.270206619 | 2.438840306 | 2.771142426 | 0.250532703 | 1.312110984 | 0.849180323 |
| 63 | 0.312459873 | 3.267804292 | 2.437870173 | 2.770041949 | 0.24243634 | 1.313752418 | 0.839419311 |
| 64 | 0.306358072 | 3.265484964 | 2.436705403 | 2.768725158 | 0.23470513 | 1.315258178 | 0.830001846 |
| 65 | 0.300484421 | 3.26323423 | 2.435358916 | 2.767207044 | 0.227322178 | 1.316634898 | 0.82091657 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 66 | 0.294829824 | 3.261039271 | 2.433842989 | 2.765501744 | 0.220271277 | 1.317888901 | 0.812152299 |
| 67 | 0.289385591 | 3.258888709 | 2.432169284 | 2.763622588 | 0.213536892 | 1.319026201 | 0.803698041 |
| 68 | 0.284143414 | 3.256772483 | 2.430348868 | 2.761582144 | 0.207104157 | 1.320052526 | 0.795543021 |
| 69 | 0.279095342 | 3.254681723 | 2.428392243 | 2.759392258 | 0.200958854 | 1.320973318 | 0.78767669 |
| 70 | 0.274233764 | 3.252608644 | 2.426309363 | 2.757064094 | 0.195087403 | 1.321793751 | 0.780088743 |
| 71 | 0.269551387 | 3.250546442 | 2.424109663 | 2.754608175 | 0.189476837 | 1.322518743 | 0.772769127 |
| 72 | 0.265041221 | 3.248489205 | 2.421802074 | 2.752034412 | 0.184114789 | 1.323152962 | 0.765708047 |
| 73 | 0.260696568 | 3.246431824 | 2.419395051 | 2.749352142 | 0.17898947 | 1.323700844 | 0.758895978 |
| 74 | 0.256510999 | 3.244369917 | 2.416896585 | 2.746570155 | 0.174089644 | 1.324166599 | 0.752323665 |
| 75 | 0.252478349 | 3.24229976 | 2.414314233 | 2.743696731 | 0.169404613 | 1.324554225 | 0.745982126 |
| 76 | 0.248592701 | 3.240218218 | 2.411655128 | 2.740739659 | 0.164924192 | 1.324867516 | 0.739862656 |
| 77 | 0.244848377 | 3.238122687 | 2.408926005 | 2.73770627 | 0.160638688 | 1.325110075 | 0.733956825 |
| 78 | 0.241239924 | 3.23601104 | 2.406133212 | 2.734603458 | 0.156538882 | 1.325285324 | 0.728256477 |
| 79 | 0.237762108 | 3.233881578 | 2.403282734 | 2.731437707 | 0.152616004 | 1.32539651 | 0.722753728 |
| 80 | 0.234409902 | 3.231732981 | 2.400380206 | 2.728215111 | 0.148861714 | 1.325446716 | 0.717440963 |
| 81 | 0.231178479 | 3.229564273 | 2.39743093 | 2.724941394 | 0.145268086 | 1.325438872 | 0.712310833 |
| 82 | 0.228063201 | 3.227374776 | 2.394439893 | 2.721621934 | 0.141827581 | 1.325375761 | 0.70735625 |
| 83 | 0.225059614 | 3.225164085 | 2.39141178 | 2.718261778 | 0.138533038 | 1.325260024 | 0.702570381 |
| 84 | 0.22216344 | 3.222932027 | 2.388350986 | 2.714865661 | 0.135377647 | 1.325094175 | 0.697946643 |
| 85 | 0.219370567 | 3.22067864 | 2.385261638 | 2.711438023 | 0.132354939 | 1.324880602 | 0.693478701 |
| 86 | 0.216677046 | 3.218404145 | 2.382147601 | 2.707983028 | 0.129458763 | 1.324621575 | 0.689160456 |
| 87 | 0.214079082 | 3.216108922 | 2.379012496 | 2.704504571 | 0.126683275 | 1.324319254 | 0.684986041 |
| 88 | 0.211573028 | 3.213793487 | 2.375859707 | 2.701006303 | 0.124022921 | 1.323975695 | 0.680949815 |
| 89 | 0.20915538 | 3.211458478 | 2.372692402 | 2.697491637 | 0.121472421 | 1.323592853 | 0.677046358 |
| 90 | 0.206822771 | 3.20910463 | 2.369513535 | 2.693963763 | 0.119026756 | 1.323172592 | 0.673270461 |
| 91 | 0.204571965 | 3.206732769 | 2.366325863 | 2.690425661 | 0.116681156 | 1.322716684 | 0.66961712 |
| 92 | 0.202399852 | 3.204343787 | 2.363131956 | 2.686880113 | 0.114431084 | 1.322226821 | 0.666081531 |
| 93 | 0.200303442 | 3.201938639 | 2.359934205 | 2.683329712 | 0.112272229 | 1.321704613 | 0.662659081 |
| 94 | 0.198279863 | 3.199518323 | 2.356734834 | 2.679776874 | 0.110200488 | 1.321151598 | 0.659345344 |
| 95 | 0.196326354 | 3.197083877 | 2.353535908 | 2.676223848 | 0.108211961 | 1.320569241 | 0.656136071 |
| 96 | 0.194440261 | 3.194636365 | 2.350339341 | 2.672672725 | 0.106302937 | 1.319958941 | 0.653027186 |
| 97 | 0.192619032 | 3.192176872 | 2.347146909 | 2.669125446 | 0.104469886 | 1.319322034 | 0.65001478 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 98 | 0.190860217 | 3.189706491 | 2.343960251 | 2.665583814 | 0.102709449 | 1.318659797 | 0.647095104 |
| 99 | 0.189161457 | 3.187226325 | 2.340780883 | 2.662049496 | 0.101018427 | 1.317973447 | 0.644264559 |
| 100 | 0.187520486 | 3.184737474 | 2.337610202 | 2.658524037 | 0.099393778 | 1.317264152 | 0.641519698 |
| 101 | 0.185935126 | 3.182241032 | 2.334449495 | 2.655008863 | 0.097832602 | 1.316533025 | 0.638857213 |
| 102 | 0.184403283 | 3.179738084 | 2.331299943 | 2.651505289 | 0.096332141 | 1.315781133 | 0.636273933 |
| 103 | 0.182922944 | 3.177229702 | 2.328162629 | 2.648014527 | 0.094889766 | 1.315009497 | 0.63376682 |
| 104 | 0.181492173 | 3.174716939 | 2.325038545 | 2.64453769 | 0.093502972 | 1.314219095 | 0.631332957 |
| 105 | 0.180109108 | 3.172200827 | 2.321928595 | 2.6410758 | 0.092169372 | 1.313410863 | 0.628969552 |
| 106 | 0.178771961 | 3.169682377 | 2.318833604 | 2.63762979 | 0.090886692 | 1.312585698 | 0.626673924 |
| 107 | 0.17747901 | 3.167162574 | 2.31575432 | 2.634200514 | 0.089652763 | 1.31174446 | 0.624443507 |
| 108 | 0.176228603 | 3.164642377 | 2.312691417 | 2.630788748 | 0.088465518 | 1.310887975 | 0.622275837 |
| 109 | 0.175019147 | 3.162122715 | 2.309645508 | 2.627395198 | 0.087322985 | 1.310017034 | 0.620168555 |
| 110 | 0.173849113 | 3.159604489 | 2.306617139 | 2.624020501 | 0.086223281 | 1.309132397 | 0.618119396 |
| 111 | 0.17271703 | 3.157088569 | 2.3036068 | 2.620665231 | 0.085164613 | 1.308234792 | 0.616126192 |
| 112 | 0.171621485 | 3.154575794 | 2.300614928 | 2.617329905 | 0.084145266 | 1.307324921 | 0.61418686 |
| 113 | 0.170561115 | 3.15206697 | 2.297641906 | 2.614014984 | 0.083163606 | 1.306403456 | 0.612299407 |
| 114 | 0.169534615 | 3.149562874 | 2.294688072 | 2.610720876 | 0.08221807 | 1.305471043 | 0.610461918 |
| 115 | 0.168540724 | 3.147064247 | 2.291753722 | 2.607447941 | 0.081307168 | 1.304528304 | 0.608672558 |
| 116 | 0.167578234 | 3.144571802 | 2.288839107 | 2.604196496 | 0.080429474 | 1.303575838 | 0.606929568 |
| 117 | 0.16664598 | 3.142086216 | 2.285944443 | 2.600966815 | 0.079583629 | 1.302614218 | 0.605231259 |
| 118 | 0.165742843 | 3.139608136 | 2.28306991 | 2.597759132 | 0.078768332 | 1.301643997 | 0.603576012 |
| 119 | 0.164867748 | 3.137138177 | 2.280215657 | 2.594573644 | 0.077982338 | 1.300665709 | 0.601962272 |
| 120 | 0.164019657 | 3.134676924 | 2.277381799 | 2.591410517 | 0.077224461 | 1.299679864 | 0.60038855 |
| 121 | 0.163197576 | 3.132224931 | 2.274568427 | 2.588269883 | 0.076493563 | 1.298686956 | 0.598853413 |
| 122 | 0.162400547 | 3.129782721 | 2.271775605 | 2.585151845 | 0.075788557 | 1.29768746 | 0.597355491 |
| 123 | 0.161627647 | 3.127350787 | 2.269003372 | 2.582056479 | 0.075108405 | 1.296681833 | 0.595893464 |
| 124 | 0.160877991 | 3.124929596 | 2.266251747 | 2.578983837 | 0.07445211 | 1.295670515 | 0.594466069 |
| 125 | 0.160150726 | 3.122519585 | 2.263520728 | 2.575933947 | 0.073818722 | 1.29465393 | 0.593072091 |
| 126 | 0.159445032 | 3.120121164 | 2.260810293 | 2.572906814 | 0.073207329 | 1.293632489 | 0.591710365 |
| 127 | 0.158760119 | 3.117734715 | 2.258120406 | 2.569902426 | 0.072617058 | 1.292606583 | 0.59037977 |
| 128 | 0.15809523 | 3.115360598 | 2.255451014 | 2.56692075 | 0.072047076 | 1.291576594 | 0.589079233 |
| 129 | 0.157449632 | 3.112999145 | 2.252802049 | 2.563961739 | 0.071496581 | 1.290542886 | 0.58780772 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 130 | 0.156822625 | 3.110650665 | 2.250173433 | 2.561025328 | 0.070964808 | 1.289505813 | 0.586564241 |
| 131 | 0.156213531 | 3.108315443 | 2.247565073 | 2.55811144 | 0.070451022 | 1.288465715 | 0.585347842 |
| 132 | 0.155621702 | 3.105993742 | 2.244976867 | 2.555219984 | 0.069954522 | 1.287422918 | 0.584157608 |
| 133 | 0.155046511 | 3.103685804 | 2.242408703 | 2.552350857 | 0.069474632 | 1.28637774 | 0.58299266 |
| 134 | 0.154487357 | 3.101391848 | 2.239860462 | 2.549503946 | 0.069010708 | 1.285330485 | 0.581852152 |
| 135 | 0.15394366 | 3.099112077 | 2.237332015 | 2.546679128 | 0.06856213 | 1.284281445 | 0.580735273 |
| 136 | 0.153414864 | 3.09684667 | 2.234823227 | 2.543876272 | 0.068128305 | 1.283230905 | 0.57964124 |
| 137 | 0.152900432 | 3.094595792 | 2.232333959 | 2.541095238 | 0.067708663 | 1.282179137 | 0.578569303 |
| 138 | 0.152399849 | 3.092359587 | 2.229864062 | 2.53833588 | 0.067302659 | 1.281126404 | 0.57751874 |
| 139 | 0.151912619 | 3.090138185 | 2.227413387 | 2.535598045 | 0.06690977 | 1.280072959 | 0.576488857 |
| 140 | 0.151438265 | 3.087931698 | 2.224981779 | 2.532881574 | 0.066529493 | 1.279019047 | 0.575478987 |
| 141 | 0.150976326 | 3.085740223 | 2.222569078 | 2.530186305 | 0.066161347 | 1.277964902 | 0.574488487 |
| 142 | 0.150526361 | 3.083563843 | 2.220175123 | 2.527512069 | 0.06580487 | 1.276910752 | 0.573516739 |
| 143 | 0.150087945 | 3.081402627 | 2.217799751 | 2.524858695 | 0.065459618 | 1.275856816 | 0.57256315 |
| 144 | 0.149660668 | 3.079256631 | 2.215442794 | 2.522226008 | 0.065125165 | 1.274803303 | 0.571627146 |
| 145 | 0.149244137 | 3.077125898 | 2.213104086 | 2.519613832 | 0.064801104 | 1.273750416 | 0.570708179 |
| 146 | 0.148837973 | 3.075010459 | 2.210783456 | 2.517021987 | 0.064487042 | 1.27269835 | 0.569805718 |
| 147 | 0.148441811 | 3.072910335 | 2.208480735 | 2.514450291 | 0.064182602 | 1.271647294 | 0.568919253 |
| 148 | 0.1480553 | 3.070825536 | 2.206195753 | 2.511898561 | 0.063887424 | 1.270597428 | 0.568048293 |
| 149 | 0.147678104 | 3.06875606 | 2.203928339 | 2.509366613 | 0.06360116 | 1.269548927 | 0.567192367 |
| 150 | 0.147309896 | 3.066701898 | 2.201678321 | 2.506854263 | 0.063323477 | 1.268501956 | 0.566351019 |
| 151 | 0.146950364 | 3.064663031 | 2.199445529 | 2.504361325 | 0.063054054 | 1.267456679 | 0.565523811 |
| 152 | 0.146599208 | 3.062639433 | 2.197229792 | 2.501887614 | 0.062792586 | 1.266413249 | 0.56471032 |
| 153 | 0.146256138 | 3.060631067 | 2.195030942 | 2.499432944 | 0.062538776 | 1.265371815 | 0.563910141 |
| 154 | 0.145920876 | 3.058637893 | 2.192848808 | 2.49699713 | 0.06229234 | 1.264332521 | 0.563122882 |
| 155 | 0.145593153 | 3.05665986 | 2.190683224 | 2.494579988 | 0.062053007 | 1.263295503 | 0.562348165 |
| 156 | 0.145272711 | 3.054696914 | 2.188534022 | 2.492181334 | 0.061820514 | 1.262260894 | 0.561585627 |
| 157 | 0.144959302 | 3.052748992 | 2.186401038 | 2.489800985 | 0.061594611 | 1.261228821 | 0.560834918 |
| 158 | 0.144652687 | 3.050816028 | 2.184284106 | 2.487438759 | 0.061375054 | 1.260199404 | 0.560095701 |
| 159 | 0.144352637 | 3.04889795 | 2.182183064 | 2.485094475 | 0.061161613 | 1.259172761 | 0.559367648 |
| 160 | 0.144058929 | 3.046994679 | 2.180097752 | 2.482767954 | 0.060954064 | 1.258149003 | 0.558650448 |
| 161 | 0.143771351 | 3.045106135 | 2.17802801 | 2.480459017 | 0.060752191 | 1.257128237 | 0.557943797 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 162 | 0.143489698 | 3.043232232 | 2.17597368 | 2.478167489 | 0.06055579 | 1.256110566 | 0.557247404 |
| 163 | 0.143213772 | 3.04137288 | 2.173934606 | 2.475893194 | 0.060364662 | 1.255096087 | 0.556560988 |
| 164 | 0.142943384 | 3.039527988 | 2.171910635 | 2.47363596 | 0.060178617 | 1.254084896 | 0.555884277 |
| 165 | 0.142678351 | 3.037697459 | 2.169901613 | 2.471395615 | 0.059997471 | 1.253077081 | 0.55521701 |
| 166 | 0.142418497 | 3.035881194 | 2.167907392 | 2.46917199 | 0.059821048 | 1.252072728 | 0.554558935 |
| 167 | 0.142163653 | 3.034079092 | 2.165927822 | 2.466964917 | 0.059649179 | 1.25107192 | 0.553909808 |
| 168 | 0.141913655 | 3.032291049 | 2.163962758 | 2.46477423 | 0.059481701 | 1.250074734 | 0.553269394 |
| 169 | 0.141668347 | 3.03051696 | 2.162012054 | 2.462599767 | 0.059318458 | 1.249081245 | 0.552637467 |
| 170 | 0.141427578 | 3.028756717 | 2.16007557 | 2.460441365 | 0.059159299 | 1.248091524 | 0.552013808 |
| 171 | 0.141191202 | 3.027010211 | 2.158153163 | 2.458298865 | 0.05900408 | 1.247105638 | 0.551398206 |
| 172 | 0.14095908 | 3.025277331 | 2.156244697 | 2.456172109 | 0.058852662 | 1.246123652 | 0.550790457 |
| 173 | 0.140731076 | 3.023557966 | 2.154350035 | 2.454060942 | 0.05870491 | 1.245145627 | 0.550190364 |
| 174 | 0.140507062 | 3.021852002 | 2.152469041 | 2.451965211 | 0.058560696 | 1.24417162 | 0.549597738 |
| 175 | 0.140286913 | 3.020159326 | 2.150601585 | 2.449884764 | 0.058419897 | 1.243201687 | 0.549012395 |
| 176 | 0.140070507 | 3.018479824 | 2.148747536 | 2.447819453 | 0.058282392 | 1.24223588 | 0.548434158 |
| 177 | 0.13985773 | 3.016813381 | 2.146906765 | 2.44576913 | 0.058148069 | 1.241274247 | 0.547862856 |
| 178 | 0.13964847 | 3.01515988 | 2.145079145 | 2.443733651 | 0.058016816 | 1.240316836 | 0.547298324 |
| 179 | 0.139442619 | 3.013519207 | 2.143264554 | 2.441712872 | 0.057888527 | 1.23936369 | 0.546740402 |
| 180 | 0.139240076 | 3.011891246 | 2.141462866 | 2.439706653 | 0.057763102 | 1.23841485 | 0.546188936 |
| 181 | 0.139040739 | 3.01027588 | 2.139673963 | 2.437714854 | 0.057640441 | 1.237470356 | 0.545643777 |
| 182 | 0.138844514 | 3.008672995 | 2.137897725 | 2.43573734 | 0.057520451 | 1.236530244 | 0.54510478 |
| 183 | 0.138651308 | 3.007082475 | 2.136134035 | 2.433773976 | 0.057403041 | 1.235594547 | 0.544571808 |
| 184 | 0.138461033 | 3.005504203 | 2.134382777 | 2.431824628 | 0.057288123 | 1.234663298 | 0.544044725 |
| 185 | 0.138273602 | 3.003938067 | 2.132643839 | 2.429889166 | 0.057175614 | 1.233736526 | 0.543523401 |
| 186 | 0.138088934 | 3.00238395 | 2.130917109 | 2.427967461 | 0.057065432 | 1.232814259 | 0.543007711 |
| 187 | 0.137906949 | 3.00084174 | 2.129202475 | 2.426059386 | 0.0569575 | 1.231896522 | 0.542497532 |
| 188 | 0.137727571 | 2.999311322 | 2.127499831 | 2.424164817 | 0.056851744 | 1.230983339 | 0.541992748 |
| 189 | 0.137550726 | 2.997792584 | 2.12580907 | 2.422283629 | 0.056748091 | 1.230074732 | 0.541493244 |
| 190 | 0.137376343 | 2.996285415 | 2.124130085 | 2.420415702 | 0.056646472 | 1.229170721 | 0.540998911 |
| 191 | 0.137204355 | 2.994789703 | 2.122462775 | 2.418560916 | 0.05654682 | 1.228271323 | 0.540509641 |
| 192 | 0.137034695 | 2.993305338 | 2.120807036 | 2.416719154 | 0.056449072 | 1.227376555 | 0.540025332 |
| 193 | 0.136867299 | 2.99183221 | 2.119162769 | 2.414890298 | 0.056353165 | 1.226486432 | 0.539545885 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 194 | 0.136702108 | 2.99037021 | 2.117529874 | 2.413074236 | 0.05625904 | 1.225600968 | 0.539071202 |
| 195 | 0.136539061 | 2.988919232 | 2.115908255 | 2.411270853 | 0.05616664 | 1.224720172 | 0.53860119 |
| 196 | 0.136378102 | 2.987479169 | 2.114297815 | 2.40948004 | 0.05607591 | 1.223844057 | 0.538135759 |
| 197 | 0.136219178 | 2.986049914 | 2.11269846 | 2.407701687 | 0.055986797 | 1.22297263 | 0.537674821 |
| 198 | 0.136062233 | 2.984631364 | 2.111110096 | 2.405935686 | 0.05589925 | 1.222105899 | 0.537218291 |
| 199 | 0.135907219 | 2.983223415 | 2.109532631 | 2.404181931 | 0.05581322 | 1.221243869 | 0.536766087 |
| 200 | 0.135754087 | 2.981825965 | 2.107965976 | 2.402440317 | 0.05572866 | 1.220386547 | 0.536318129 |
| 201 | 0.135602788 | 2.980438912 | 2.10641004 | 2.400710741 | 0.055645524 | 1.219533934 | 0.53587434 |
| 202 | 0.135453277 | 2.979062155 | 2.104864737 | 2.398993101 | 0.055563768 | 1.218686034 | 0.535434646 |
| 203 | 0.135305511 | 2.977695597 | 2.103329978 | 2.397287297 | 0.055483351 | 1.217842847 | 0.534998973 |
| 204 | 0.135159447 | 2.976339139 | 2.101805678 | 2.39559323 | 0.055404232 | 1.217004374 | 0.534567252 |
| 205 | 0.135015045 | 2.974992684 | 2.100291754 | 2.393910803 | 0.055326371 | 1.216170613 | 0.534139414 |
| 206 | 0.134872264 | 2.973656136 | 2.098788122 | 2.392239919 | 0.055249731 | 1.215341563 | 0.533715393 |
| 207 | 0.134731068 | 2.972329402 | 2.097294699 | 2.390580483 | 0.055174276 | 1.214517221 | 0.533295125 |
| 208 | 0.134591419 | 2.971012387 | 2.095811404 | 2.388932403 | 0.055099971 | 1.213697583 | 0.532878547 |
| 209 | 0.134453282 | 2.969705 | 2.094338159 | 2.387295585 | 0.055026782 | 1.212882643 | 0.5324656 |
| 210 | 0.134316623 | 2.968407149 | 2.092874883 | 2.385669939 | 0.054954678 | 1.212072397 | 0.532056225 |
| 211 | 0.13418141 | 2.967118745 | 2.091421499 | 2.384055374 | 0.054883626 | 1.211266837 | 0.531650364 |
| 212 | 0.134047609 | 2.965839699 | 2.089977931 | 2.382451803 | 0.054813597 | 1.210465957 | 0.531247963 |
| 213 | 0.133915191 | 2.964569923 | 2.088544101 | 2.380859137 | 0.054744562 | 1.209669748 | 0.530848968 |
| 214 | 0.133784126 | 2.96330933 | 2.087119936 | 2.379277291 | 0.054676493 | 1.208878201 | 0.530453327 |
| 215 | 0.133654386 | 2.962057836 | 2.08570536 | 2.377706178 | 0.054609364 | 1.208091307 | 0.530060988 |
| 216 | 0.133525942 | 2.960815356 | 2.084300302 | 2.376145716 | 0.054543147 | 1.207309056 | 0.529671904 |
| 217 | 0.133398768 | 2.959581808 | 2.082904688 | 2.37459582 | 0.05447782 | 1.206531436 | 0.529286025 |
| 218 | 0.133272838 | 2.958357108 | 2.081518448 | 2.373056408 | 0.054413357 | 1.205758436 | 0.528903306 |
| 219 | 0.133148128 | 2.957141176 | 2.08014151 | 2.3715274 | 0.054349735 | 1.204990045 | 0.528523701 |
| 220 | 0.133024614 | 2.955933933 | 2.078773806 | 2.370008715 | 0.054286932 | 1.204226249 | 0.528147167 |
| 221 | 0.132902271 | 2.954735299 | 2.077415266 | 2.368500275 | 0.054224927 | 1.203467035 | 0.52777366 |
| 222 | 0.132781078 | 2.953545197 | 2.076065823 | 2.367002001 | 0.054163699 | 1.20271239 | 0.527403138 |
| 223 | 0.132661012 | 2.95236355 | 2.074725408 | 2.365513816 | 0.054103228 | 1.201962299 | 0.527035562 |
| 224 | 0.132542054 | 2.951190282 | 2.073393956 | 2.364035643 | 0.054043495 | 1.201216747 | 0.526670892 |
| 225 | 0.132424181 | 2.950025319 | 2.0720714 | 2.362567408 | 0.053984481 | 1.20047572 | 0.526309089 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | val] of turtle 28 |
| 226 | 0.132307376 | 2.948868588 | 2.070757675 | 2.361109035 | 0.053926168 | 1.199739202 | 0.525950116 |
| 227 | 0.132191618 | 2.947720015 | 2.069452718 | 2.359660451 | 0.053868539 | 1.199007177 | 0.525593936 |
| 228 | 0.13207689 | 2.946579528 | 2.068156464 | 2.358221583 | 0.053811578 | 1.198279628 | 0.525240514 |
| 229 | 0.131963173 | 2.945447058 | 2.06686885 | 2.356792359 | 0.053755268 | 1.19755654 | 0.524889816 |
| 230 | 0.13185045 | 2.944322535 | 2.065589814 | 2.355372708 | 0.053699595 | 1.196837893 | 0.524541807 |
| 231 | 0.131738705 | 2.943205889 | 2.064319295 | 2.353962559 | 0.053644542 | 1.196123673 | 0.524196454 |
| 232 | 0.131627921 | 2.942097053 | 2.063057231 | 2.352561842 | 0.053590096 | 1.195413859 | 0.523853726 |
| 233 | 0.131518082 | 2.940995959 | 2.061803561 | 2.351170488 | 0.053536242 | 1.194708435 | 0.523513591 |
| 234 | 0.131409174 | 2.939902542 | 2.060558226 | 2.34978843 | 0.053482968 | 1.194007383 | 0.523176019 |
| 235 | 0.131301181 | 2.938816736 | 2.059321167 | 2.348415599 | 0.05343026 | 1.193310683 | 0.522840979 |
| 236 | 0.131194089 | 2.937738478 | 2.058092325 | 2.347051929 | 0.053378106 | 1.192618316 | 0.522508443 |
| 237 | 0.131087885 | 2.936667703 | 2.056871642 | 2.345697354 | 0.053326494 | 1.191930265 | 0.522178381 |
| 238 | 0.130982555 | 2.935604348 | 2.055659061 | 2.344351808 | 0.053275412 | 1.191246509 | 0.521850767 |
| 239 | 0.130878086 | 2.934548352 | 2.054454523 | 2.343015227 | 0.053224849 | 1.190567029 | 0.521525573 |
| 240 | 0.130774465 | 2.933499655 | 2.053257974 | 2.341687545 | 0.053174794 | 1.189891805 | 0.521202772 |
| 241 | 0.13067168 | 2.932458194 | 2.052069357 | 2.3403687 | 0.053125237 | 1.189220817 | 0.520882339 |
| 242 | 0.130569718 | 2.931423912 | 2.050888616 | 2.339058629 | 0.053076167 | 1.188554046 | 0.520564247 |
| 243 | 0.13046857 | 2.930396748 | 2.049715697 | 2.33775727 | 0.053027574 | 1.187891471 | 0.520248473 |
| 244 | 0.130368222 | 2.929376646 | 2.048550546 | 2.33646456 | 0.05297945 | 1.187233071 | 0.519934991 |
| 245 | 0.130268664 | 2.928363548 | 2.047393108 | 2.335180439 | 0.052931785 | 1.186578827 | 0.519623779 |
| 246 | 0.130169886 | 2.927357397 | 2.04624333 | 2.333904847 | 0.05288457 | 1.185928717 | 0.519314812 |
| 247 | 0.130071877 | 2.926358137 | 2.045101159 | 2.332637722 | 0.052837796 | 1.185282722 | 0.519008068 |
| 248 | 0.129974628 | 2.925365714 | 2.043966544 | 2.331379007 | 0.052791456 | 1.184640819 | 0.518703525 |
| 249 | 0.129878127 | 2.924380072 | 2.04283943 | 2.330128641 | 0.052745541 | 1.184002989 | 0.51840116 |
| 250 | 0.129782366 | 2.923401158 | 2.041719768 | 2.328886567 | 0.052700044 | 1.183369209 | 0.518100953 |
| 251 | 0.129687336 | 2.922428919 | 2.040607507 | 2.327652727 | 0.052654957 | 1.18273946 | 0.517802881 |
| 252 | 0.129593027 | 2.921463302 | 2.039502594 | 2.326427063 | 0.052610273 | 1.182113719 | 0.517506926 |
| 253 | 0.129499431 | 2.920504255 | 2.03840498 | 2.32520952 | 0.052565984 | 1.181491966 | 0.517213065 |
| 254 | 0.129406539 | 2.919551728 | 2.037314616 | 2.32400004 | 0.052522085 | 1.180874179 | 0.51692128 |
| 255 | 0.129314342 | 2.918605668 | 2.036231452 | 2.322798568 | 0.052478568 | 1.180260337 | 0.51663155 |
| 256 | 0.129222833 | 2.917666027 | 2.035155438 | 2.321605048 | 0.052435426 | 1.179650419 | 0.516343858 |
| 257 | 0.129132004 | 2.916732755 | 2.034086527 | 2.320419426 | 0.052392655 | 1.179044403 | 0.516058183 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 258 | 0.129041846 | 2.915805802 | 2.03302467 | 2.319241648 | 0.052350248 | 1.178442268 | 0.515774508 |
| 259 | 0.128952353 | 2.91488512 | 2.031969819 | 2.318071659 | 0.052308199 | 1.177843991 | 0.515492814 |
| 260 | 0.128863516 | 2.913970663 | 2.030921926 | 2.316909407 | 0.052266502 | 1.177249553 | 0.515213085 |
| 261 | 0.128775329 | 2.913062381 | 2.029880945 | 2.315754837 | 0.052225152 | 1.176658931 | 0.514935301 |
| 262 | 0.128687785 | 2.912160229 | 2.02884683 | 2.314607898 | 0.052184144 | 1.176072103 | 0.514659446 |
| 263 | 0.128600877 | 2.91126416 | 2.027819532 | 2.313468538 | 0.052143473 | 1.175489049 | 0.514385504 |
| 264 | 0.128514597 | 2.910374128 | 2.026799008 | 2.312336704 | 0.052103133 | 1.174909747 | 0.514113457 |
| 265 | 0.12842894 | 2.909490089 | 2.025785211 | 2.311212346 | 0.052063119 | 1.174334175 | 0.513843289 |
| 266 | 0.128343899 | 2.908611998 | 2.024778095 | 2.310095413 | 0.052023428 | 1.173762312 | 0.513574984 |
| 267 | 0.128259468 | 2.907739809 | 2.023777616 | 2.308985854 | 0.051984054 | 1.173194137 | 0.513308526 |
| 268 | 0.12817564 | 2.906873481 | 2.02278373 | 2.30788362 | 0.051944994 | 1.172629628 | 0.5130439 |
| 269 | 0.12809241 | 2.906012968 | 2.021796392 | 2.30678866 | 0.051906242 | 1.172068763 | 0.512781091 |
| 270 | 0.128009771 | 2.905158228 | 2.020815558 | 2.305700926 | 0.051867794 | 1.171511522 | 0.512520082 |
| 271 | 0.127927719 | 2.90430922 | 2.019841185 | 2.304620368 | 0.051829647 | 1.170957883 | 0.51226086 |
| 272 | 0.127846246 | 2.9034659 | 2.018873229 | 2.303546938 | 0.051791797 | 1.170407824 | 0.51200341 |
| 273 | 0.127765348 | 2.902628228 | 2.017911647 | 2.302480589 | 0.051754239 | 1.169861325 | 0.511747717 |
| 274 | 0.127685019 | 2.901796161 | 2.016956398 | 2.301421271 | 0.05171697 | 1.169318365 | 0.511493766 |
| 275 | 0.127605254 | 2.90096966 | 2.016007438 | 2.300368939 | 0.051679986 | 1.168778922 | 0.511241545 |
| 276 | 0.127526048 | 2.900148685 | 2.015064726 | 2.299323544 | 0.051643284 | 1.168242975 | 0.510991039 |
| 277 | 0.127447395 | 2.899333194 | 2.01412822 | 2.298285041 | 0.05160686 | 1.167710504 | 0.510742234 |
| 278 | 0.12736929 | 2.89852315 | 2.013197878 | 2.297253383 | 0.051570711 | 1.167181487 | 0.510495118 |
| 279 | 0.127291729 | 2.897718511 | 2.01227366 | 2.296228524 | 0.051534834 | 1.166655903 | 0.510249676 |
| 280 | 0.127214707 | 2.896919241 | 2.011355525 | 2.295210418 | 0.051499225 | 1.166133732 | 0.510005895 |
| 281 | 0.127138219 | 2.8961253 | 2.010443432 | 2.294199021 | 0.051463881 | 1.165614953 | 0.509763764 |
| 282 | 0.127062259 | 2.89533665 | 2.009537341 | 2.293194287 | 0.051428799 | 1.165099545 | 0.509523268 |
| 283 | 0.126986825 | 2.894553254 | 2.008637213 | 2.292196172 | 0.051393977 | 1.164587488 | 0.509284395 |
| 284 | 0.12691191 | 2.893775075 | 2.007743007 | 2.291204631 | 0.05135941 | 1.16407876 | 0.509047134 |
| 285 | 0.126837511 | 2.893002075 | 2.006854685 | 2.290219621 | 0.051325098 | 1.163573343 | 0.508811471 |
| 286 | 0.126763623 | 2.892234218 | 2.005972207 | 2.289241098 | 0.051291036 | 1.163071214 | 0.508577394 |
| 287 | 0.126690242 | 2.891471468 | 2.005095534 | 2.288269019 | 0.051257222 | 1.162572355 | 0.508344892 |
| 288 | 0.126617363 | 2.890713788 | 2.004224628 | 2.28730334 | 0.051223653 | 1.162076744 | 0.508113952 |
| 289 | 0.126544983 | 2.889961143 | 2.003359452 | 2.286344019 | 0.051190327 | 1.161584362 | 0.507884564 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 290 | 0.126473098 | 2.889213498 | 2.002499966 | 2.285391014 | 0.051157241 | 1.161095188 | 0.507656714 |
| 291 | 0.126401702 | 2.888470818 | 2.001646133 | 2.284444283 | 0.051124393 | 1.160609203 | 0.507430393 |
| 292 | 0.126330793 | 2.887733068 | 2.000797916 | 2.283503783 | 0.05109178 | 1.160126386 | 0.507205588 |
| 293 | 0.126260367 | 2.887000214 | 1.999955277 | 2.282569474 | 0.051059401 | 1.159646719 | 0.506982288 |
| 294 | 0.126190419 | 2.886272221 | 1.99911818 | 2.281641315 | 0.051027252 | 1.15917018 | 0.506760482 |
| 295 | 0.126120945 | 2.885549056 | 1.998286588 | 2.280719263 | 0.050995331 | 1.158696751 | 0.50654016 |
| 296 | 0.126051943 | 2.884830686 | 1.997460465 | 2.27980328 | 0.050963637 | 1.158226412 | 0.506321311 |
| 297 | 0.125983408 | 2.884117076 | 1.996639774 | 2.278893324 | 0.050932166 | 1.157759144 | 0.506103923 |
| 298 | 0.125915336 | 2.883408195 | 1.995824479 | 2.277989355 | 0.050900918 | 1.157294927 | 0.505887986 |
| 299 | 0.125847724 | 2.88270401 | 1.995014546 | 2.277091334 | 0.050869889 | 1.156833742 | 0.505673491 |
| 300 | 0.125780569 | 2.882004488 | 1.994209938 | 2.276199222 | 0.050839078 | 1.15637557 | 0.505460425 |
| 301 | 0.125713866 | 2.881309597 | 1.99341062 | 2.275312979 | 0.050808482 | 1.155920391 | 0.50524878 |
| 302 | 0.125647613 | 2.880619306 | 1.992616557 | 2.274432566 | 0.0507781 | 1.155468188 | 0.505038544 |
| 303 | 0.125581806 | 2.879933582 | 1.991827715 | 2.273557945 | 0.05074793 | 1.15501894 | 0.504829708 |
| 304 | 0.125516441 | 2.879252395 | 1.991044059 | 2.272689077 | 0.05071797 | 1.154572629 | 0.504622262 |
| 305 | 0.125451516 | 2.878575714 | 1.990265556 | 2.271825925 | 0.050688218 | 1.154129237 | 0.504416197 |
| 306 | 0.125387026 | 2.877903507 | 1.98949217 | 2.27096845 | 0.050658672 | 1.153688745 | 0.504211501 |
| 307 | 0.125322969 | 2.877235744 | 1.988723868 | 2.270116614 | 0.05062933 | 1.153251135 | 0.504008166 |
| 308 | 0.125259342 | 2.876572396 | 1.987960617 | 2.269270381 | 0.050600191 | 1.152816387 | 0.503806182 |
| 309 | 0.125196141 | 2.875913431 | 1.987202384 | 2.268429714 | 0.050571253 | 1.152384484 | 0.503605539 |
| 310 | 0.125133363 | 2.87525882 | 1.986449134 | 2.267594575 | 0.050542514 | 1.151955408 | 0.503406228 |
| 311 | 0.125071005 | 2.874608533 | 1.985700837 | 2.266764929 | 0.050513972 | 1.15152914 | 0.50320824 |
| 312 | 0.125009063 | 2.873962541 | 1.984957458 | 2.265940738 | 0.050485626 | 1.151105663 | 0.503011566 |
| 313 | 0.124947536 | 2.873320816 | 1.984218965 | 2.265121967 | 0.050457474 | 1.150684958 | 0.502816195 |
| 314 | 0.124886419 | 2.872683327 | 1.983485327 | 2.26430858 | 0.050429515 | 1.150267008 | 0.50262212 |
| 315 | 0.124825711 | 2.872050047 | 1.982756511 | 2.263500542 | 0.050401747 | 1.149851795 | 0.502429332 |
| 316 | 0.124765407 | 2.871420947 | 1.982032485 | 2.262697817 | 0.050374168 | 1.149439302 | 0.50223782 |
| 317 | 0.124705505 | 2.870795998 | 1.981313218 | 2.261900369 | 0.050346777 | 1.14902951 | 0.502047577 |
| 318 | 0.124646002 | 2.870175173 | 1.980598679 | 2.261108165 | 0.050319572 | 1.148622404 | 0.501858594 |
| 319 | 0.124586896 | 2.869558444 | 1.979888836 | 2.26032117 | 0.050292552 | 1.148217964 | 0.501670862 |
| 320 | 0.124528183 | 2.868945784 | 1.979183659 | 2.259539348 | 0.050265715 | 1.147816175 | 0.501484372 |
| 321 | 0.12446986 | 2.868337164 | 1.978483117 | 2.258762667 | 0.05023906 | 1.147417019 | 0.501299116 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 322 | 0.124411926 | 2.867732558 | 1.977787179 | 2.257991092 | 0.050212586 | 1.147020479 | 0.501115086 |
| 323 | 0.124354376 | 2.867131938 | 1.977095814 | 2.25722459 | 0.05018629 | 1.146626538 | 0.500932273 |
| 324 | 0.124297209 | 2.866535279 | 1.976408994 | 2.256463126 | 0.050160173 | 1.146235179 | 0.500750668 |
| 325 | 0.124240421 | 2.865942553 | 1.975726688 | 2.255706669 | 0.050134231 | 1.145846387 | 0.500570264 |
| 326 | 0.124184011 | 2.865353735 | 1.975048865 | 2.254955184 | 0.050108465 | 1.145460143 | 0.500391052 |
| 327 | 0.124127975 | 2.864768797 | 1.974375498 | 2.25420864 | 0.050082872 | 1.145076431 | 0.500213024 |
| 328 | 0.12407231 | 2.864187714 | 1.973706556 | 2.253467003 | 0.050057452 | 1.144695236 | 0.500036172 |
| 329 | 0.124017015 | 2.86361046 | 1.97304201 | 2.252730241 | 0.050032202 | 1.144316541 | 0.499860489 |
| 330 | 0.123962086 | 2.863037009 | 1.972381832 | 2.251998322 | 0.050007122 | 1.143940329 | 0.499685965 |
| 331 | 0.123907522 | 2.862467337 | 1.971725993 | 2.251271215 | 0.04998221 | 1.143566584 | 0.499512594 |
| 332 | 0.123853318 | 2.861901417 | 1.971074463 | 2.250548887 | 0.049957466 | 1.143195292 | 0.499340367 |
| 333 | 0.123799474 | 2.861339226 | 1.970427215 | 2.249831306 | 0.049932887 | 1.142826434 | 0.499169277 |
| 334 | 0.123745986 | 2.860780737 | 1.969784221 | 2.249118443 | 0.049908473 | 1.142459997 | 0.498999316 |
| 335 | 0.123692853 | 2.860225926 | 1.969145453 | 2.248410265 | 0.049884223 | 1.142095963 | 0.498830477 |
| 336 | 0.123640071 | 2.859674769 | 1.968510882 | 2.247706742 | 0.049860134 | 1.141734318 | 0.498662751 |
| 337 | 0.123587638 | 2.859127241 | 1.967880482 | 2.247007843 | 0.049836207 | 1.141375046 | 0.498496132 |
| 338 | 0.123535552 | 2.858583319 | 1.967254224 | 2.246313538 | 0.04981244 | 1.141018131 | 0.498330611 |
| 339 | 0.12348381 | 2.858042978 | 1.966632082 | 2.245623797 | 0.049788831 | 1.140663558 | 0.498166182 |
| 340 | 0.12343241 | 2.857506194 | 1.966014028 | 2.244938589 | 0.04976538 | 1.140311312 | 0.498002838 |
| 341 | 0.12338135 | 2.856972943 | 1.965400036 | 2.244257884 | 0.049742085 | 1.139961378 | 0.49784057 |
| 342 | 0.123330628 | 2.856443203 | 1.964790079 | 2.243581653 | 0.049718946 | 1.13961374 | 0.497679372 |
| 343 | 0.123280241 | 2.85591695 | 1.96418413 | 2.242909867 | 0.04969596 | 1.139268384 | 0.497519236 |
| 344 | 0.123230186 | 2.85539416 | 1.963582164 | 2.242242496 | 0.049673128 | 1.138925295 | 0.497360156 |
| 345 | 0.123180462 | 2.854874812 | 1.962984153 | 2.241579511 | 0.049650448 | 1.138584457 | 0.497202124 |
| 346 | 0.123131066 | 2.854358881 | 1.962390072 | 2.240920884 | 0.049627918 | 1.138245857 | 0.497045133 |
| 347 | 0.123081997 | 2.853846345 | 1.961799894 | 2.240266585 | 0.049605539 | 1.13790948 | 0.496889177 |
| 348 | 0.123033251 | 2.853337182 | 1.961213596 | 2.239616587 | 0.049583308 | 1.137575311 | 0.496734248 |
| 349 | 0.122984827 | 2.852831369 | 1.96063115 | 2.23897086 | 0.049561225 | 1.137243335 | 0.496580339 |
| 350 | 0.122936723 | 2.852328884 | 1.960052531 | 2.238329377 | 0.049539288 | 1.136913539 | 0.496427445 |
| 351 | 0.122888936 | 2.851829706 | 1.959477715 | 2.23769211 | 0.049517498 | 1.136585908 | 0.496275557 |
| 352 | 0.122841464 | 2.851333811 | 1.958906676 | 2.237059031 | 0.049495851 | 1.136260429 | 0.496124669 |
| 353 | 0.122794305 | 2.850841179 | 1.95833939 | 2.236430113 | 0.049474349 | 1.135937086 | 0.495974776 |


|  | W | X | Y | Z | AA | AB | AC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 22 | [val] of turtle 23 | [val] of turtle 24 | [val] of turtle 25 | [val] of turtle 26 | [val] of turtle 27 | [val] of turtle 28 |
| 354 | 0.122747457 | 2.850351788 | 1.957775831 | 2.235805328 | 0.049452989 | 1.135615866 | 0.495825869 |
| 355 | 0.122700918 | 2.849865616 | 1.957215976 | 2.235184649 | 0.04943177 | 1.135296756 | 0.495677942 |
| 356 | 0.122654686 | 2.849382642 | 1.9566598 | 2.234568049 | 0.049410692 | 1.134979741 | 0.495530989 |
| 357 | 0.122608759 | 2.848902845 | 1.956107279 | 2.233955501 | 0.049389754 | 1.134664807 | 0.495385004 |
| 358 | 0.122563135 | 2.848426204 | 1.955558388 | 2.233346979 | 0.049368955 | 1.134351942 | 0.49523998 |
| 359 | 0.122517811 | 2.847952698 | 1.955013104 | 2.232742456 | 0.049348293 | 1.134041131 | 0.49509591 |
| 360 | 0.122472785 | 2.847482306 | 1.954471404 | 2.232141906 | 0.049327768 | 1.133732361 | 0.494952789 |
| 361 | 0.122428057 | 2.847015008 | 1.953933263 | 2.231545302 | 0.049307379 | 1.133425619 | 0.494810609 |
| 362 | 0.122383623 | 2.846550783 | 1.953398659 | 2.230952619 | 0.049287125 | 1.133120891 | 0.494669365 |
| 363 | 0.122339482 | 2.846089611 | 1.952867567 | 2.230363831 | 0.049267004 | 1.132818165 | 0.494529051 |
| 364 | 0.122295632 | 2.845631471 | 1.952339966 | 2.229778913 | 0.049247017 | 1.132517427 | 0.49438966 |
| 365 | 0.12225207 | 2.845176345 | 1.951815831 | 2.229197838 | 0.049227162 | 1.132218664 | 0.494251186 |
| 366 | 0.122208795 | 2.844724211 | 1.951295141 | 2.228620582 | 0.049207438 | 1.131921863 | 0.494113623 |
| 367 | 0.122165806 | 2.844275051 | 1.950777872 | 2.228047119 | 0.049187845 | 1.131627011 | 0.493976966 |
| 368 | 0.122123099 | 2.843828844 | 1.950264002 | 2.227477425 | 0.04916838 | 1.131334097 | 0.493841207 |
| 369 | 0.122080674 | 2.84338557 | 1.94975351 | 2.226911475 | 0.049149045 | 1.131043106 | 0.493706341 |
| 370 | 0.122038528 | 2.842945212 | 1.949246371 | 2.226349243 | 0.049129837 | 1.130754026 | 0.493572363 |
| 371 | 0.121996659 | 2.842507749 | 1.948742565 | 2.225790707 | 0.049110756 | 1.130466845 | 0.493439266 |
| 372 | 0.121955066 | 2.842073162 | 1.94824207 | 2.225235841 | 0.049091801 | 1.130181551 | 0.493307045 |
| 373 | 0.121913747 | 2.841641432 | 1.947744864 | 2.224684621 | 0.049072971 | 1.12989813 | 0.493175693 |
| 374 | 0.1218727 | 2.841212541 | 1.947250925 | 2.224137024 | 0.049054265 | 1.129616572 | 0.493045205 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 2 | 3.429118298 | 2.17760508 | 3.429118298 | 6.659251651 | 1.177968498 | 0.35752198 | 0.394988798 |
| 3 | 3 | 1.965220681 | 3 | 3 | 1.177968498 | 0.35752198 | 0.394988798 |
| 4 | 4.505756307 | 2.646314758 | 4.505756307 | 7.751365331 | 3 | 1 | 1 |
| 5 | 3.821266135 | 2.365987819 | 3.821266135 | 7.058004607 | 1.485239914 | 0.41035264 | 0.45420513 |
| 6 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| 7 |  |  |  |  |  |  |  |
| 8 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 9 | 3 | 2 | 3 | 3 | 3 | 1 | 1 |
| 10 | 3.108 | 1.981428571 | 3.108 | 3.352545455 | 2.965428571 | 0.964545455 | 0.988545455 |
| 11 | 3.210761714 | 1.970130909 | 3.210761714 | 3.674454442 | 2.936645714 | 0.932587273 | 0.976136364 |
| 12 | 3.308367948 | 1.965220681 | 3.308367948 | 3.969032074 | 2.911932232 | 0.903489983 | 0.962791114 |
| 13 | 3.40091679 | 1.965876306 | 3.40091679 | 4.23914308 | 2.889975618 | 0.876748613 | 0.948570803 |
| 14 | 3.488518497 | 1.971340816 | 3.488518497 | 4.487282145 | 2.86978375 | 0.851963615 | 0.933565829 |
| 15 | 3.571293062 | 1.980920715 | 3.571293062 | 4.715631462 | 2.850615981 | 0.828820286 | 0.917885327 |
| 16 | 3.649368291 | 1.993984069 | 3.649368291 | 4.926107999 | 2.831928232 | 0.807071902 | 0.901648931 |
| 17 | 3.722878245 | 2.009958027 | 3.722878245 | 5.120402464 | 2.813329329 | 0.786525939 | 0.884980456 |
| 18 | 3.791961961 | 2.028325924 | 3.791961961 | 5.300011552 | 2.794546363 | 0.767032845 | 0.86800313 |
| 19 | 3.856762355 | 2.048624112 | 3.856762355 | 5.466264777 | 2.775397284 | 0.748476922 | 0.850836086 |
| 20 | 3.91742529 | 2.07043862 | 3.91742529 | 5.620346882 | 2.755769271 | 0.730768945 | 0.833591865 |
| 21 | 3.974098735 | 2.093401738 | 3.974098735 | 5.763316675 | 2.735601724 | 0.713840209 | 0.816374727 |
| 22 | 4.026932025 | 2.117188593 | 4.026932025 | 5.89612292 | 2.714872931 | 0.697637755 | 0.799279591 |
| 23 | 4.076075174 | 2.141513775 | 4.076075174 | 6.01961784 | 2.693589665 | 0.68212056 | 0.782391486 |
| 24 | 4.121678256 | 2.166128047 | 4.121678256 | 6.13456863 | 2.671779101 | 0.667256512 | 0.765785364 |
| 25 | 4.163890833 | 2.190815188 | 4.163890833 | 6.241667342 | 2.649482567 | 0.653020026 | 0.749526219 |
| 26 | 4.202861425 | 2.215388969 | 4.202861425 | 6.341539408 | 2.626750759 | 0.639390187 | 0.733669412 |
| 27 | 4.238737029 | 2.239690308 | 4.238737029 | 6.43475102 | 2.603640081 | 0.626349307 | 0.718261145 |
| 28 | 4.271662676 | 2.263584576 | 4.271662676 | 6.521815566 | 2.580209899 | 0.613881829 | 0.703339045 |
| 29 | 4.30178103 | 2.286959098 | 4.30178103 | 6.603199248 | 2.556520486 | 0.601973502 | 0.688932803 |
| 30 | 4.329232032 | 2.30972082 | 4.329232032 | 6.679326018 | 2.532631515 | 0.590610768 | 0.675064863 |
| 31 | 4.354152573 | 2.331794155 | 4.354152573 | 6.750581932 | 2.508600976 | 0.57978033 | 0.661751102 |
| 32 | 4.37667622 | 2.353119 | 4.37667622 | 6.817318987 | 2.484484424 | 0.56946885 | 0.649001522 |
| 33 | 4.396932966 | 2.37364892 | 4.396932966 | 6.879858537 | 2.460334467 | 0.55966275 | 0.63682091 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 34 | 4.41504903 | 2.393349487 | 4.41504903 | 6.938494317 | 2.436200455 | 0.550348103 | 0.625209474 |
| 35 | 4.431146682 | 2.412196775 | 4.431146682 | 6.993495146 | 2.412128307 | 0.541510574 | 0.614163443 |
| 36 | 4.445344105 | 2.430175985 | 4.445344105 | 7.045107338 | 2.388160442 | 0.533135413 | 0.603675623 |
| 37 | 4.457755295 | 2.447280216 | 4.457755295 | 7.093556852 | 2.364335799 | 0.525207483 | 0.593735919 |
| 38 | 4.468489978 | 2.463509349 | 4.468489978 | 7.139051227 | 2.340689899 | 0.517711305 | 0.584331802 |
| 39 | 4.477653567 | 2.478869048 | 4.477653567 | 7.181781309 | 2.317254961 | 0.510631122 | 0.575448744 |
| 40 | 4.485347136 | 2.493369873 | 4.485347136 | 7.221922808 | 2.294060037 | 0.503950974 | 0.567070605 |
| 41 | 4.491667427 | 2.507026477 | 4.491667427 | 7.259637691 | 2.271131165 | 0.497654769 | 0.559179981 |
| 42 | 4.496706863 | 2.519856904 | 4.496706863 | 7.295075438 | 2.248491536 | 0.491726366 | 0.551758513 |
| 43 | 4.500553596 | 2.531881964 | 4.500553596 | 7.328374175 | 2.226161658 | 0.486149648 | 0.544787162 |
| 44 | 4.503291563 | 2.543124676 | 4.503291563 | 7.359661689 | 2.204159532 | 0.480908596 | 0.538246445 |
| 45 | 4.505000555 | 2.553609789 | 4.505000555 | 7.389056345 | 2.182500813 | 0.475987353 | 0.532116648 |
| 46 | 4.505756307 | 2.563363355 | 4.505756307 | 7.416667919 | 2.161198976 | 0.471370291 | 0.526378005 |
| 47 | 4.505630592 | 2.572412357 | 4.505630592 | 7.442598336 | 2.140265472 | 0.467042061 | 0.521010851 |
| 48 | 4.504691329 | 2.580784394 | 4.504691329 | 7.466942353 | 2.119709877 | 0.462987641 | 0.515995752 |
| 49 | 4.503002691 | 2.5885074 | 4.503002691 | 7.489788163 | 2.099540041 | 0.459192386 | 0.511313619 |
| 50 | 4.500625229 | 2.595609409 | 4.500625229 | 7.511217945 | 2.079762214 | 0.455642052 | 0.506945794 |
| 51 | 4.497615997 | 2.60211835 | 4.497615997 | 7.531308368 | 2.060381186 | 0.452322835 | 0.502874125 |
| 52 | 4.494028676 | 2.608061882 | 4.494028676 | 7.550131036 | 2.041400397 | 0.449221392 | 0.499081025 |
| 53 | 4.489913705 | 2.613467245 | 4.489913705 | 7.567752902 | 2.022822059 | 0.446324856 | 0.495549517 |
| 54 | 4.485318415 | 2.618361148 | 4.485318415 | 7.584236635 | 2.004647258 | 0.443620853 | 0.49226327 |
| 55 | 4.480287161 | 2.622769665 | 4.480287161 | 7.599640957 | 1.986876056 | 0.441097513 | 0.489206619 |
| 56 | 4.474861449 | 2.626718163 | 4.474861449 | 7.614020951 | 1.969507585 | 0.438743468 | 0.486364582 |
| 57 | 4.469080074 | 2.630231238 | 4.469080074 | 7.627428336 | 1.952540131 | 0.43654786 | 0.483722869 |
| 58 | 4.462979243 | 2.633332671 | 4.462979243 | 7.639911724 | 1.935971219 | 0.434500336 | 0.481267878 |
| 59 | 4.456592705 | 2.636045392 | 4.456592705 | 7.651516844 | 1.919797688 | 0.432591042 | 0.478986698 |
| 60 | 4.449951876 | 2.638391456 | 4.449951876 | 7.662286758 | 1.904015761 | 0.430810621 | 0.476867094 |
| 61 | 4.443085958 | 2.640392034 | 4.443085958 | 7.672262051 | 1.888621112 | 0.429150196 | 0.474897497 |
| 62 | 4.436022059 | 2.642067402 | 4.436022059 | 7.681481006 | 1.873608924 | 0.427601368 | 0.473066986 |
| 63 | 4.428785308 | 2.643436947 | 4.428785308 | 7.689979764 | 1.858973952 | 0.426156194 | 0.471365274 |
| 64 | 4.421398964 | 2.644519172 | 4.421398964 | 7.697792473 | 1.844710569 | 0.424807183 | 0.469782684 |
| 65 | 4.413884524 | 2.645331706 | 4.413884524 | 7.704951422 | 1.830812818 | 0.423547274 | 0.468310128 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 66 | 4.406261825 | 2.645891325 | 4.406261825 | 7.711487166 | 1.817274456 | 0.422369824 | 0.466939084 |
| 67 | 4.398549147 | 2.646213967 | 4.398549147 | 7.717428636 | 1.804088999 | 0.421268592 | 0.465661576 |
| 68 | 4.390763303 | 2.646314758 | 4.390763303 | 7.722803251 | 1.791249754 | 0.420237721 | 0.464470144 |
| 69 | 4.38291973 | 2.646208032 | 4.38291973 | 7.727637009 | 1.778749859 | 0.419271726 | 0.463357825 |
| 70 | 4.375032579 | 2.645907358 | 4.375032579 | 7.73195458 | 1.766582316 | 0.418365472 | 0.462318126 |
| 71 | 4.367114796 | 2.645425569 | 4.367114796 | 7.735779385 | 1.754740017 | 0.417514163 | 0.461345002 |
| 72 | 4.3591782 | 2.644774788 | 4.3591782 | 7.739133676 | 1.743215776 | 0.41671332 | 0.460432831 |
| 73 | 4.351233556 | 2.643966456 | 4.351233556 | 7.742038607 | 1.732002348 | 0.415958771 | 0.459576392 |
| 74 | 4.34329065 | 2.643011361 | 4.34329065 | 7.744514297 | 1.72109246 | 0.41524663 | 0.458770843 |
| 75 | 4.335358355 | 2.641919667 | 4.335358355 | 7.746579892 | 1.710478824 | 0.414573286 | 0.458011697 |
| 76 | 4.327444691 | 2.64070094 | 4.327444691 | 7.748253622 | 1.70015416 | 0.413935385 | 0.457294802 |
| 77 | 4.31955689 | 2.63936418 | 4.31955689 | 7.749552857 | 1.690111211 | 0.413329818 | 0.456616325 |
| 78 | 4.31170145 | 2.637917844 | 4.31170145 | 7.75049415 | 1.680342761 | 0.412753705 | 0.455972723 |
| 79 | 4.303884186 | 2.636369878 | 4.303884186 | 7.751093288 | 1.670841647 | 0.41220438 | 0.455360735 |
| 80 | 4.296110288 | 2.634727736 | 4.296110288 | 7.751365331 | 1.66160077 | 0.411679385 | 0.454777357 |
| 81 | 4.288384361 | 2.632998412 | 4.288384361 | 7.751324656 | 1.652613109 | 0.411176448 | 0.454219828 |
| 82 | 4.280710471 | 2.631188464 | 4.280710471 | 7.750984991 | 1.643871731 | 0.41069348 | 0.453685612 |
| 83 | 4.273092189 | 2.629304032 | 4.273092189 | 7.750359453 | 1.635369795 | 0.410228555 | 0.453172387 |
| 84 | 4.265532631 | 2.627350868 | 4.265532631 | 7.749460577 | 1.627100565 | 0.409779908 | 0.452678023 |
| 85 | 4.258034488 | 2.625334354 | 4.258034488 | 7.74830035 | 1.619057414 | 0.409345919 | 0.452200577 |
| 86 | 4.250600068 | 2.623259524 | 4.250600068 | 7.746890238 | 1.611233829 | 0.408925102 | 0.451738273 |
| 87 | 4.243231325 | 2.621131083 | 4.243231325 | 7.745241213 | 1.603623419 | 0.408516101 | 0.451289493 |
| 88 | 4.235929888 | 2.618953429 | 4.235929888 | 7.74336378 | 1.596219914 | 0.408117678 | 0.450852766 |
| 89 | 4.228697089 | 2.61673067 | 4.228697089 | 7.741267999 | 1.589017175 | 0.407728705 | 0.450426756 |
| 90 | 4.221533991 | 2.61446664 | 4.221533991 | 7.738963507 | 1.58200919 | 0.407348156 | 0.45001025 |
| 91 | 4.214441412 | 2.612164918 | 4.214441412 | 7.736459542 | 1.575190082 | 0.406975099 | 0.449602155 |
| 92 | 4.207419943 | 2.609828843 | 4.207419943 | 7.733764959 | 1.568554104 | 0.406608691 | 0.44920148 |
| 93 | 4.200469977 | 2.607461527 | 4.200469977 | 7.730888252 | 1.562095647 | 0.40624817 | 0.448807335 |
| 94 | 4.193591719 | 2.605065874 | 4.193591719 | 7.727837567 | 1.555809238 | 0.405892849 | 0.448418919 |
| 95 | 4.186785214 | 2.602644587 | 4.186785214 | 7.724620724 | 1.549689537 | 0.405542111 | 0.448035517 |
| 96 | 4.180050354 | 2.600200187 | 4.180050354 | 7.721245231 | 1.543731343 | 0.405195402 | 0.447656488 |
| 97 | 4.173386901 | 2.59773502 | 4.173386901 | 7.717718295 | 1.537929587 | 0.404852227 | 0.447281261 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 98 | 4.166794497 | 2.595251272 | 4.166794497 | 7.714046839 | 1.532279337 | 0.404512145 | 0.446909331 |
| 99 | 4.160272678 | 2.592750977 | 4.160272678 | 7.710237516 | 1.526775792 | 0.404174766 | 0.446540251 |
| 100 | 4.153820888 | 2.590236027 | 4.153820888 | 7.70629672 | 1.521414287 | 0.403839743 | 0.446173628 |
| 101 | 4.147438488 | 2.587708185 | 4.147438488 | 7.702230596 | 1.516190283 | 0.403506773 | 0.445809116 |
| 102 | 4.141124766 | 2.585169089 | 4.141124766 | 7.698045054 | 1.511099374 | 0.403175591 | 0.445446417 |
| 103 | 4.134878948 | 2.582620264 | 4.134878948 | 7.693745778 | 1.506137279 | 0.402845964 | 0.445085271 |
| 104 | 4.128700208 | 2.580063128 | 4.128700208 | 7.689338236 | 1.501299842 | 0.402517694 | 0.444725456 |
| 105 | 4.12258767 | 2.577499 | 4.12258767 | 7.684827688 | 1.496583033 | 0.40219061 | 0.444366783 |
| 106 | 4.116540424 | 2.574929106 | 4.116540424 | 7.680219199 | 1.491982939 | 0.401864568 | 0.444009094 |
| 107 | 4.110557523 | 2.572354586 | 4.110557523 | 7.675517643 | 1.487495768 | 0.401539446 | 0.443652257 |
| 108 | 4.104637998 | 2.569776501 | 4.104637998 | 7.67072771 | 1.483117845 | 0.401215144 | 0.443296164 |
| 109 | 4.098780856 | 2.567195836 | 4.098780856 | 7.665853921 | 1.478845607 | 0.400891583 | 0.442940732 |
| 110 | 4.092985092 | 2.564613509 | 4.092985092 | 7.660900626 | 1.474675604 | 0.400568699 | 0.442585894 |
| 111 | 4.087249686 | 2.562030371 | 4.087249686 | 7.655872017 | 1.470604493 | 0.400246445 | 0.442231603 |
| 112 | 4.081573613 | 2.559447217 | 4.081573613 | 7.650772132 | 1.46662904 | 0.399924786 | 0.441877826 |
| 113 | 4.075955845 | 2.556864783 | 4.075955845 | 7.645604861 | 1.462746113 | 0.3996037 | 0.441524546 |
| 114 | 4.070395351 | 2.554283756 | 4.070395351 | 7.640373952 | 1.458952681 | 0.399283178 | 0.441171755 |
| 115 | 4.064891107 | 2.551704773 | 4.064891107 | 7.635083019 | 1.455245813 | 0.398963217 | 0.440819458 |
| 116 | 4.059442091 | 2.549128429 | 4.059442091 | 7.629735541 | 1.451622674 | 0.398643825 | 0.44046767 |
| 117 | 4.054047289 | 2.546555278 | 4.054047289 | 7.624334875 | 1.448080521 | 0.398325015 | 0.440116412 |
| 118 | 4.0487057 | 2.543985833 | 4.0487057 | 7.618884255 | 1.444616704 | 0.39800681 | 0.439765712 |
| 119 | 4.04341633 | 2.541420575 | 4.04341633 | 7.613386799 | 1.441228661 | 0.397689235 | 0.439415606 |
| 120 | 4.038178202 | 2.538859951 | 4.038178202 | 7.607845512 | 1.437913916 | 0.39737232 | 0.439066134 |
| 121 | 4.032990352 | 2.536304376 | 4.032990352 | 7.602263291 | 1.434670076 | 0.397056101 | 0.438717338 |
| 122 | 4.027851831 | 2.533754239 | 4.027851831 | 7.596642929 | 1.431494829 | 0.396740616 | 0.438369268 |
| 123 | 4.022761708 | 2.531209902 | 4.022761708 | 7.590987118 | 1.428385944 | 0.396425904 | 0.438021971 |
| 124 | 4.01771907 | 2.528671704 | 4.01771907 | 7.585298455 | 1.425341265 | 0.396112009 | 0.437675501 |
| 125 | 4.01272302 | 2.526139959 | 4.01272302 | 7.579579441 | 1.422358709 | 0.395798974 | 0.437329912 |
| 126 | 4.007772684 | 2.523614963 | 4.007772684 | 7.573832489 | 1.419436267 | 0.395486844 | 0.436985256 |
| 127 | 4.002867203 | 2.521096991 | 4.002867203 | 7.568059925 | 1.416571999 | 0.395175666 | 0.436641591 |
| 128 | 3.998005741 | 2.518586301 | 3.998005741 | 7.562263988 | 1.413764032 | 0.394865485 | 0.43629897 |
| 129 | 3.99318748 | 2.516083132 | 3.99318748 | 7.55644684 | 1.411010559 | 0.394556348 | 0.43595745 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 130 | 3.988411622 | 2.513587712 | 3.988411622 | 7.550610562 | 1.408309836 | 0.394248301 | 0.435617084 |
| 131 | 3.983677392 | 2.51110025 | 3.983677392 | 7.544757162 | 1.40566018 | 0.393941388 | 0.435277927 |
| 132 | 3.978984031 | 2.508620946 | 3.978984031 | 7.538888573 | 1.403059969 | 0.393635655 | 0.434940032 |
| 133 | 3.974330803 | 2.506149984 | 3.974330803 | 7.533006657 | 1.400507635 | 0.393331145 | 0.434603449 |
| 134 | 3.969716993 | 2.503687538 | 3.969716993 | 7.527113209 | 1.39800167 | 0.393027902 | 0.434268231 |
| 135 | 3.965141901 | 2.501233772 | 3.965141901 | 7.521209958 | 1.395540615 | 0.392725966 | 0.433934424 |
| 136 | 3.960604853 | 2.498788838 | 3.960604853 | 7.51529857 | 1.393123067 | 0.392425378 | 0.433602078 |
| 137 | 3.956105189 | 2.496352882 | 3.956105189 | 7.509380648 | 1.39074767 | 0.392126177 | 0.433271236 |
| 138 | 3.951642272 | 2.493926038 | 3.951642272 | 7.503457736 | 1.388413119 | 0.3918284 | 0.432941943 |
| 139 | 3.94721548 | 2.491508433 | 3.94721548 | 7.49753132 | 1.386118153 | 0.391532082 | 0.43261424 |
| 140 | 3.942824213 | 2.489100187 | 3.942824213 | 7.491602831 | 1.383861558 | 0.391237258 | 0.432288168 |
| 141 | 3.938467887 | 2.486701413 | 3.938467887 | 7.485673645 | 1.381642164 | 0.39094396 | 0.431963764 |
| 142 | 3.934145937 | 2.484312217 | 3.934145937 | 7.479745087 | 1.379458842 | 0.390652218 | 0.431641063 |
| 143 | 3.929857813 | 2.481932698 | 3.929857813 | 7.473818431 | 1.377310504 | 0.390362062 | 0.4313201 |
| 144 | 3.925602984 | 2.479562949 | 3.925602984 | 7.467894902 | 1.375196101 | 0.390073519 | 0.431000906 |
| 145 | 3.921380935 | 2.477203061 | 3.921380935 | 7.461975678 | 1.373114623 | 0.389786614 | 0.430683512 |
| 146 | 3.917191166 | 2.474853114 | 3.917191166 | 7.456061891 | 1.371065096 | 0.389501372 | 0.430367944 |
| 147 | 3.913033194 | 2.472513188 | 3.913033194 | 7.450154628 | 1.36904658 | 0.389217814 | 0.430054229 |
| 148 | 3.90890655 | 2.470183357 | 3.90890655 | 7.444254936 | 1.367058171 | 0.388935962 | 0.429742391 |
| 149 | 3.90481078 | 2.467863689 | 3.90481078 | 7.438363817 | 1.365098996 | 0.388655833 | 0.429432451 |
| 150 | 3.900745445 | 2.465554249 | 3.900745445 | 7.432482235 | 1.363168215 | 0.388377445 | 0.42912443 |
| 151 | 3.896710118 | 2.463255099 | 3.896710118 | 7.426611114 | 1.361265017 | 0.388100815 | 0.428818346 |
| 152 | 3.892704387 | 2.460966295 | 3.892704387 | 7.420751341 | 1.359388621 | 0.387825955 | 0.428514216 |
| 153 | 3.888727852 | 2.458687893 | 3.888727852 | 7.414903767 | 1.357538276 | 0.387552879 | 0.428212054 |
| 154 | 3.884780126 | 2.456419941 | 3.884780126 | 7.409069208 | 1.355713256 | 0.387281597 | 0.427911873 |
| 155 | 3.880860835 | 2.454162487 | 3.880860835 | 7.403248443 | 1.353912862 | 0.387012121 | 0.427613686 |
| 156 | 3.876969613 | 2.451915575 | 3.876969613 | 7.397442222 | 1.35213642 | 0.386744457 | 0.427317501 |
| 157 | 3.873106111 | 2.449679246 | 3.873106111 | 7.39165126 | 1.350383282 | 0.386478614 | 0.427023328 |
| 158 | 3.869269985 | 2.447453538 | 3.869269985 | 7.385876244 | 1.348652821 | 0.386214596 | 0.426731173 |
| 159 | 3.865460905 | 2.445238486 | 3.865460905 | 7.380117829 | 1.346944435 | 0.385952409 | 0.426441041 |
| 160 | 3.86167855 | 2.443034124 | 3.86167855 | 7.37437664 | 1.345257542 | 0.385692056 | 0.426152938 |
| 161 | 3.857922609 | 2.44084048 | 3.857922609 | 7.368653278 | 1.343591581 | 0.38543354 | 0.425866866 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | val] of turtle 35 |
| 162 | 3.854192781 | 2.438657582 | 3.854192781 | 7.362948313 | 1.341946014 | 0.38517686 | 0.425582827 |
| 163 | 3.850488772 | 2.436485457 | 3.850488772 | 7.35726229 | 1.340320319 | 0.384922019 | 0.42530082 |
| 164 | 3.846810298 | 2.434324126 | 3.846810298 | 7.35159573 | 1.338713994 | 0.384669015 | 0.425020847 |
| 165 | 3.843157082 | 2.43217361 | 3.843157082 | 7.345949128 | 1.337126555 | 0.384417845 | 0.424742905 |
| 166 | 3.839528858 | 2.430033928 | 3.839528858 | 7.340322956 | 1.335557537 | 0.384168509 | 0.42446699 |
| 167 | 3.835925365 | 2.427905096 | 3.835925365 | 7.334717663 | 1.334006488 | 0.383921001 | 0.424193101 |
| 168 | 3.832346349 | 2.425787129 | 3.832346349 | 7.329133675 | 1.332472976 | 0.383675319 | 0.423921232 |
| 169 | 3.828791564 | 2.423680037 | 3.828791564 | 7.323571397 | 1.330956581 | 0.383431456 | 0.423651378 |
| 170 | 3.825260772 | 2.421583833 | 3.825260772 | 7.318031215 | 1.329456901 | 0.383189408 | 0.423383532 |
| 171 | 3.821753739 | 2.419498524 | 3.821753739 | 7.312513493 | 1.327973547 | 0.382949167 | 0.423117688 |
| 172 | 3.818270238 | 2.417424116 | 3.818270238 | 7.307018575 | 1.326506143 | 0.382710727 | 0.422853838 |
| 173 | 3.81481005 | 2.415360615 | 3.81481005 | 7.30154679 | 1.325054327 | 0.382474081 | 0.422591973 |
| 174 | 3.811372959 | 2.413308024 | 3.811372959 | 7.296098443 | 1.32361775 | 0.382239219 | 0.422332086 |
| 175 | 3.807958754 | 2.411266344 | 3.807958754 | 7.290673828 | 1.322196074 | 0.382006133 | 0.422074165 |
| 176 | 3.804567233 | 2.409235574 | 3.804567233 | 7.285273218 | 1.320788975 | 0.381774815 | 0.421818201 |
| 177 | 3.801198196 | 2.407215713 | 3.801198196 | 7.279896872 | 1.319396138 | 0.381545254 | 0.421564184 |
| 178 | 3.797851447 | 2.405206756 | 3.797851447 | 7.27454503 | 1.318017261 | 0.381317441 | 0.421312102 |
| 179 | 3.794526797 | 2.4032087 | 3.794526797 | 7.26921792 | 1.316652051 | 0.381091364 | 0.421061944 |
| 180 | 3.791224061 | 2.401221537 | 3.791224061 | 7.263915755 | 1.315300226 | 0.380867014 | 0.420813698 |
| 181 | 3.787943056 | 2.399245259 | 3.787943056 | 7.258638733 | 1.313961513 | 0.380644378 | 0.420567351 |
| 182 | 3.784683605 | 2.397279857 | 3.784683605 | 7.253387038 | 1.312635648 | 0.380423447 | 0.420322891 |
| 183 | 3.781445535 | 2.39532532 | 3.781445535 | 7.248160842 | 1.311322377 | 0.380204207 | 0.420080305 |
| 184 | 3.778228675 | 2.393381635 | 3.778228675 | 7.242960303 | 1.310021454 | 0.379986647 | 0.419839579 |
| 185 | 3.775032859 | 2.391448789 | 3.775032859 | 7.237785569 | 1.308732642 | 0.379770756 | 0.419600701 |
| 186 | 3.771857923 | 2.389526766 | 3.771857923 | 7.232636774 | 1.307455712 | 0.379556519 | 0.419363657 |
| 187 | 3.768703708 | 2.387615551 | 3.768703708 | 7.22751404 | 1.306190441 | 0.379343926 | 0.419128432 |
| 188 | 3.765570056 | 2.385715127 | 3.765570056 | 7.222417482 | 1.304936615 | 0.379132963 | 0.418895013 |
| 189 | 3.762456814 | 2.383825474 | 3.762456814 | 7.217347199 | 1.303694027 | 0.378923618 | 0.418663385 |
| 190 | 3.75936383 | 2.381946572 | 3.75936383 | 7.212303285 | 1.302462475 | 0.378715877 | 0.418433535 |
| 191 | 3.756290955 | 2.380078402 | 3.756290955 | 7.207285821 | 1.301241767 | 0.378509728 | 0.418205447 |
| 192 | 3.753238044 | 2.37822094 | 3.753238044 | 7.202294879 | 1.300031715 | 0.378305157 | 0.417979107 |
| 193 | 3.750204953 | 2.376374163 | 3.750204953 | 7.197330523 | 1.298832136 | 0.378102152 | 0.4177545 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 194 | 3.74719154 | 2.374538048 | 3.74719154 | 7.192392808 | 1.297642854 | 0.377900698 | 0.417531612 |
| 195 | 3.744197666 | 2.372712569 | 3.744197666 | 7.187481779 | 1.296463701 | 0.377700783 | 0.417310428 |
| 196 | 3.741223195 | 2.370897699 | 3.741223195 | 7.182597474 | 1.29529451 | 0.377502394 | 0.417090933 |
| 197 | 3.738267991 | 2.369093412 | 3.738267991 | 7.177739925 | 1.294135123 | 0.377305516 | 0.416873113 |
| 198 | 3.735331921 | 2.367299679 | 3.735331921 | 7.172909153 | 1.292985384 | 0.377110138 | 0.416656952 |
| 199 | 3.732414855 | 2.365516472 | 3.732414855 | 7.168105175 | 1.291845143 | 0.376916245 | 0.416442437 |
| 200 | 3.729516663 | 2.36374376 | 3.729516663 | 7.163327999 | 1.290714256 | 0.376723824 | 0.416229551 |
| 201 | 3.726637217 | 2.361981512 | 3.726637217 | 7.158577627 | 1.289592581 | 0.376532862 | 0.416018281 |
| 202 | 3.723776391 | 2.360229698 | 3.723776391 | 7.153854056 | 1.288479982 | 0.376343346 | 0.415808612 |
| 203 | 3.720934062 | 2.358488284 | 3.720934062 | 7.149157274 | 1.287376326 | 0.376155263 | 0.415600529 |
| 204 | 3.718110105 | 2.356757237 | 3.718110105 | 7.144487265 | 1.286281485 | 0.375968599 | 0.415394018 |
| 205 | 3.715304401 | 2.355036524 | 3.715304401 | 7.139844008 | 1.285195333 | 0.375783342 | 0.415189064 |
| 206 | 3.712516828 | 2.353326109 | 3.712516828 | 7.135227475 | 1.28411775 | 0.375599478 | 0.414985654 |
| 207 | 3.709747267 | 2.351625957 | 3.709747267 | 7.130637634 | 1.283048617 | 0.375416996 | 0.414783772 |
| 208 | 3.706995603 | 2.349936033 | 3.706995603 | 7.126074447 | 1.281987821 | 0.375235881 | 0.414583404 |
| 209 | 3.704261717 | 2.348256299 | 3.704261717 | 7.121537873 | 1.28093525 | 0.375056122 | 0.414384537 |
| 210 | 3.701545496 | 2.346586719 | 3.701545496 | 7.117027863 | 1.279890797 | 0.374877705 | 0.414187156 |
| 211 | 3.698846826 | 2.344927253 | 3.698846826 | 7.112544369 | 1.278854356 | 0.374700619 | 0.413991248 |
| 212 | 3.696165593 | 2.343277864 | 3.696165593 | 7.108087333 | 1.277825825 | 0.37452485 | 0.413796799 |
| 213 | 3.693501686 | 2.341638513 | 3.693501686 | 7.103656697 | 1.276805105 | 0.374350387 | 0.413603795 |
| 214 | 3.690854994 | 2.34000916 | 3.690854994 | 7.099252398 | 1.275792099 | 0.374177217 | 0.413412222 |
| 215 | 3.688225408 | 2.338389765 | 3.688225408 | 7.094874368 | 1.274786713 | 0.374005328 | 0.413222068 |
| 216 | 3.685612819 | 2.336780287 | 3.685612819 | 7.090522539 | 1.273788855 | 0.373834709 | 0.413033319 |
| 217 | 3.683017119 | 2.335180685 | 3.683017119 | 7.086196837 | 1.272798435 | 0.373665348 | 0.412845962 |
| 218 | 3.680438201 | 2.333590918 | 3.680438201 | 7.081897184 | 1.271815368 | 0.373497232 | 0.412659983 |
| 219 | 3.67787596 | 2.332010943 | 3.67787596 | 7.077623501 | 1.270839568 | 0.37333035 | 0.412475371 |
| 220 | 3.675330289 | 2.330440719 | 3.675330289 | 7.073375706 | 1.269870952 | 0.373164691 | 0.412292112 |
| 221 | 3.672801085 | 2.328880203 | 3.672801085 | 7.069153714 | 1.26890944 | 0.373000244 | 0.412110194 |
| 222 | 3.670288244 | 2.327329351 | 3.670288244 | 7.064957437 | 1.267954953 | 0.372836996 | 0.411929604 |
| 223 | 3.667791664 | 2.325788119 | 3.667791664 | 7.060786783 | 1.267007414 | 0.372674938 | 0.41175033 |
| 224 | 3.665311241 | 2.324256465 | 3.665311241 | 7.056641662 | 1.266066748 | 0.372514057 | 0.41157236 |
| 225 | 3.662846876 | 2.322734344 | 3.662846876 | 7.052521977 | 1.265132881 | 0.372354344 | 0.411395682 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 226 | 3.660398466 | 2.321221712 | 3.660398466 | 7.048427632 | 1.264205743 | 0.372195788 | 0.411220284 |
| 227 | 3.657965913 | 2.319718524 | 3.657965913 | 7.044358528 | 1.263285263 | 0.372038377 | 0.411046154 |
| 228 | 3.655549118 | 2.318224734 | 3.655549118 | 7.040314564 | 1.262371373 | 0.371882102 | 0.41087328 |
| 229 | 3.65314798 | 2.316740299 | 3.65314798 | 7.036295638 | 1.261464006 | 0.371726952 | 0.410701652 |
| 230 | 3.650762404 | 2.315265172 | 3.650762404 | 7.032301644 | 1.260563097 | 0.371572917 | 0.410531257 |
| 231 | 3.64839229 | 2.313799308 | 3.64839229 | 7.028332478 | 1.259668581 | 0.371419987 | 0.410362085 |
| 232 | 3.646037544 | 2.31234266 | 3.646037544 | 7.024388032 | 1.258780395 | 0.371268152 | 0.410194125 |
| 233 | 3.643698068 | 2.310895184 | 3.643698068 | 7.020468196 | 1.25789848 | 0.371117402 | 0.410027365 |
| 234 | 3.641373767 | 2.309456832 | 3.641373767 | 7.016572861 | 1.257022773 | 0.370967727 | 0.409861795 |
| 235 | 3.639064547 | 2.308027559 | 3.639064547 | 7.012701915 | 1.256153217 | 0.370819117 | 0.409697405 |
| 236 | 3.636770313 | 2.306607317 | 3.636770313 | 7.008855246 | 1.255289754 | 0.370671564 | 0.409534183 |
| 237 | 3.634490971 | 2.305196062 | 3.634490971 | 7.00503274 | 1.254432327 | 0.370525058 | 0.40937212 |
| 238 | 3.632226429 | 2.303793744 | 3.632226429 | 7.001234283 | 1.25358088 | 0.37037959 | 0.409211205 |
| 239 | 3.629976593 | 2.302400319 | 3.629976593 | 6.997459759 | 1.252735359 | 0.37023515 | 0.409051427 |
| 240 | 3.627741372 | 2.301015738 | 3.627741372 | 6.993709051 | 1.251895711 | 0.37009173 | 0.408892778 |
| 241 | 3.625520674 | 2.299639956 | 3.625520674 | 6.989982042 | 1.251061883 | 0.36994932 | 0.408735248 |
| 242 | 3.623314408 | 2.298272925 | 3.623314408 | 6.986278614 | 1.250233824 | 0.369807912 | 0.408578825 |
| 243 | 3.621122484 | 2.296914597 | 3.621122484 | 6.982598649 | 1.249411483 | 0.369667497 | 0.408423502 |
| 244 | 3.618944812 | 2.295564926 | 3.618944812 | 6.978942027 | 1.24859481 | 0.369528067 | 0.408269268 |
| 245 | 3.616781302 | 2.294223865 | 3.616781302 | 6.975308628 | 1.247783756 | 0.369389613 | 0.408116114 |
| 246 | 3.614631866 | 2.292891367 | 3.614631866 | 6.971698332 | 1.246978274 | 0.369252127 | 0.407964031 |
| 247 | 3.612496415 | 2.291567384 | 3.612496415 | 6.968111018 | 1.246178315 | 0.369115601 | 0.40781301 |
| 248 | 3.610374862 | 2.290251868 | 3.610374862 | 6.964546565 | 1.245383835 | 0.368980026 | 0.407663041 |
| 249 | 3.608267118 | 2.288944774 | 3.608267118 | 6.961004851 | 1.244594786 | 0.368845395 | 0.407514116 |
| 250 | 3.606173098 | 2.287646054 | 3.606173098 | 6.957485755 | 1.243811124 | 0.368711699 | 0.407366227 |
| 251 | 3.604092714 | 2.28635566 | 3.604092714 | 6.953989153 | 1.243032805 | 0.368578931 | 0.407219364 |
| 252 | 3.602025881 | 2.285073546 | 3.602025881 | 6.950514924 | 1.242259785 | 0.368447083 | 0.407073518 |
| 253 | 3.599972514 | 2.283799665 | 3.599972514 | 6.947062945 | 1.241492021 | 0.368316147 | 0.406928682 |
| 254 | 3.597932527 | 2.282533969 | 3.597932527 | 6.943633093 | 1.24072947 | 0.368186116 | 0.406784848 |
| 255 | 3.595905835 | 2.281276412 | 3.595905835 | 6.940225246 | 1.239972092 | 0.368056983 | 0.406642006 |
| 256 | 3.593892356 | 2.280026946 | 3.593892356 | 6.93683928 | 1.239219844 | 0.36792874 | 0.406500148 |
| 257 | 3.591892006 | 2.278785526 | 3.591892006 | 6.933475072 | 1.238472687 | 0.367801379 | 0.406359268 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | val] of turtle 35 |
| 258 | 3.589904701 | 2.277552104 | 3.589904701 | 6.930132499 | 1.23773058 | 0.367674895 | 0.406219356 |
| 259 | 3.587930358 | 2.276326634 | 3.587930358 | 6.926811439 | 1.236993484 | 0.367549279 | 0.406080405 |
| 260 | 3.585968896 | 2.275109069 | 3.585968896 | 6.923511768 | 1.23626136 | 0.367424524 | 0.405942407 |
| 261 | 3.584020234 | 2.273899363 | 3.584020234 | 6.920233364 | 1.23553417 | 0.367300624 | 0.405805355 |
| 262 | 3.582084289 | 2.272697469 | 3.582084289 | 6.916976103 | 1.234811876 | 0.367177572 | 0.405669241 |
| 263 | 3.580160981 | 2.271503342 | 3.580160981 | 6.913739863 | 1.234094441 | 0.367055362 | 0.405534057 |
| 264 | 3.57825023 | 2.270316935 | 3.57825023 | 6.910524522 | 1.233381827 | 0.366933985 | 0.405399797 |
| 265 | 3.576351956 | 2.269138203 | 3.576351956 | 6.907329957 | 1.232673998 | 0.366813437 | 0.405266452 |
| 266 | 3.57446608 | 2.267967099 | 3.57446608 | 6.904156046 | 1.231970919 | 0.36669371 | 0.405134016 |
| 267 | 3.572592522 | 2.266803577 | 3.572592522 | 6.901002667 | 1.231272553 | 0.366574798 | 0.405002482 |
| 268 | 3.570731204 | 2.265647594 | 3.570731204 | 6.897869699 | 1.230578865 | 0.366456695 | 0.404871842 |
| 269 | 3.568882048 | 2.264499102 | 3.568882048 | 6.89475702 | 1.229889822 | 0.366339394 | 0.40474209 |
| 270 | 3.567044977 | 2.263358056 | 3.567044977 | 6.891664509 | 1.229205388 | 0.366222889 | 0.404613218 |
| 271 | 3.565219914 | 2.262224413 | 3.565219914 | 6.888592046 | 1.22852553 | 0.366107174 | 0.404485221 |
| 272 | 3.56340678 | 2.261098126 | 3.56340678 | 6.88553951 | 1.227850213 | 0.365992243 | 0.40435809 |
| 273 | 3.561605502 | 2.259979151 | 3.561605502 | 6.882506781 | 1.227179406 | 0.36587809 | 0.404231821 |
| 274 | 3.559816001 | 2.258867443 | 3.559816001 | 6.879493739 | 1.226513074 | 0.365764709 | 0.404106405 |
| 275 | 3.558038204 | 2.257762958 | 3.558038204 | 6.876500264 | 1.225851187 | 0.365652094 | 0.403981836 |
| 276 | 3.556272035 | 2.256665652 | 3.556272035 | 6.873526238 | 1.225193711 | 0.36554024 | 0.403858109 |
| 277 | 3.55451742 | 2.25557548 | 3.55451742 | 6.870571543 | 1.224540614 | 0.36542914 | 0.403735217 |
| 278 | 3.552774284 | 2.254492398 | 3.552774284 | 6.867636059 | 1.223891866 | 0.365318789 | 0.403613153 |
| 279 | 3.551042554 | 2.253416363 | 3.551042554 | 6.864719669 | 1.223247436 | 0.365209181 | 0.403491911 |
| 280 | 3.549322157 | 2.252347332 | 3.549322157 | 6.861822256 | 1.222607292 | 0.365100312 | 0.403371486 |
| 281 | 3.547613019 | 2.25128526 | 3.547613019 | 6.858943703 | 1.221971404 | 0.364992174 | 0.40325187 |
| 282 | 3.545915069 | 2.250230105 | 3.545915069 | 6.856083894 | 1.221339741 | 0.364884764 | 0.403133059 |
| 283 | 3.544228234 | 2.249181823 | 3.544228234 | 6.853242711 | 1.220712275 | 0.364778074 | 0.403015046 |
| 284 | 3.542552443 | 2.248140372 | 3.542552443 | 6.850420041 | 1.220088975 | 0.364672101 | 0.402897825 |
| 285 | 3.540887625 | 2.24710571 | 3.540887625 | 6.847615767 | 1.219469812 | 0.364566839 | 0.40278139 |
| 286 | 3.539233709 | 2.246077793 | 3.539233709 | 6.844829775 | 1.218854758 | 0.364462283 | 0.402665736 |
| 287 | 3.537590625 | 2.245056579 | 3.537590625 | 6.842061952 | 1.218243782 | 0.364358427 | 0.402550856 |
| 288 | 3.535958303 | 2.244042027 | 3.535958303 | 6.839312183 | 1.217636858 | 0.364255267 | 0.402436746 |
| 289 | 3.534336673 | 2.243034095 | 3.534336673 | 6.836580355 | 1.217033955 | 0.364152797 | 0.4023234 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | val] of turtle 35 |
| 290 | 3.532725667 | 2.242032741 | 3.532725667 | 6.833866357 | 1.216435048 | 0.364051012 | 0.402210812 |
| 291 | 3.531125215 | 2.241037923 | 3.531125215 | 6.831170075 | 1.215840108 | 0.363949907 | 0.402098976 |
| 292 | 3.52953525 | 2.240049601 | 3.52953525 | 6.828491399 | 1.215249107 | 0.363849479 | 0.401987888 |
| 293 | 3.527955705 | 2.239067732 | 3.527955705 | 6.825830217 | 1.214662018 | 0.36374972 | 0.401877541 |
| 294 | 3.52638651 | 2.238092278 | 3.52638651 | 6.823186419 | 1.214078814 | 0.363650628 | 0.401767931 |
| 295 | 3.5248276 | 2.237123196 | 3.5248276 | 6.820559895 | 1.213499469 | 0.363552197 | 0.401659052 |
| 296 | 3.523278908 | 2.236160447 | 3.523278908 | 6.817950536 | 1.212923956 | 0.363454422 | 0.4015509 |
| 297 | 3.521740368 | 2.23520399 | 3.521740368 | 6.815358233 | 1.212352248 | 0.363357298 | 0.401443468 |
| 298 | 3.520211913 | 2.234253785 | 3.520211913 | 6.812782878 | 1.21178432 | 0.363260822 | 0.401336751 |
| 299 | 3.518693479 | 2.233309793 | 3.518693479 | 6.810224363 | 1.211220146 | 0.363164988 | 0.401230746 |
| 300 | 3.517185001 | 2.232371974 | 3.517185001 | 6.80768258 | 1.2106597 | 0.363069792 | 0.401125445 |
| 301 | 3.515686414 | 2.231440288 | 3.515686414 | 6.805157423 | 1.210102957 | 0.362975229 | 0.401020846 |
| 302 | 3.514197653 | 2.230514697 | 3.514197653 | 6.802648787 | 1.209549891 | 0.362881295 | 0.400916942 |
| 303 | 3.512718656 | 2.229595162 | 3.512718656 | 6.800156566 | 1.209000477 | 0.362787986 | 0.400813729 |
| 304 | 3.511249358 | 2.228681643 | 3.511249358 | 6.797680654 | 1.208454691 | 0.362695297 | 0.400711202 |
| 305 | 3.509789697 | 2.227774103 | 3.509789697 | 6.795220948 | 1.207912508 | 0.362603223 | 0.400609356 |
| 306 | 3.50833961 | 2.226872503 | 3.50833961 | 6.792777343 | 1.207373904 | 0.362511761 | 0.400508186 |
| 307 | 3.506899034 | 2.225976804 | 3.506899034 | 6.790349737 | 1.206838854 | 0.362420907 | 0.400407689 |
| 308 | 3.505467909 | 2.22508697 | 3.505467909 | 6.787938027 | 1.206307334 | 0.362330655 | 0.400307857 |
| 309 | 3.504046172 | 2.224202962 | 3.504046172 | 6.78554211 | 1.205779321 | 0.362241002 | 0.400208689 |
| 310 | 3.502633762 | 2.223324743 | 3.502633762 | 6.783161886 | 1.205254791 | 0.362151943 | 0.400110178 |
| 311 | 3.501230619 | 2.222452276 | 3.501230619 | 6.780797254 | 1.20473372 | 0.362063475 | 0.40001232 |
| 312 | 3.499836682 | 2.221585524 | 3.499836682 | 6.778448112 | 1.204216085 | 0.361975594 | 0.399915111 |
| 313 | 3.498451891 | 2.220724449 | 3.498451891 | 6.776114361 | 1.203701863 | 0.361888294 | 0.399818546 |
| 314 | 3.497076188 | 2.219869016 | 3.497076188 | 6.773795903 | 1.203191031 | 0.361801573 | 0.39972262 |
| 315 | 3.495709512 | 2.219019188 | 3.495709512 | 6.771492638 | 1.202683566 | 0.361715427 | 0.39962733 |
| 316 | 3.494351804 | 2.218174929 | 3.494351804 | 6.769204469 | 1.202179446 | 0.36162985 | 0.399532671 |
| 317 | 3.493003007 | 2.217336203 | 3.493003007 | 6.766931297 | 1.201678649 | 0.361544841 | 0.399438638 |
| 318 | 3.491663062 | 2.216502973 | 3.491663062 | 6.764673026 | 1.201181151 | 0.361460394 | 0.399345228 |
| 319 | 3.490331911 | 2.215675206 | 3.490331911 | 6.76242956 | 1.200686931 | 0.361376505 | 0.399252436 |
| 320 | 3.489009498 | 2.214852864 | 3.489009498 | 6.760200802 | 1.200195967 | 0.361293171 | 0.399160257 |
| 321 | 3.487695764 | 2.214035914 | 3.487695764 | 6.757986658 | 1.199708237 | 0.361210389 | 0.399068689 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 322 | 3.486390654 | 2.21322432 | 3.486390654 | 6.755787033 | 1.199223719 | 0.361128154 | 0.398977725 |
| 323 | 3.485094111 | 2.212418047 | 3.485094111 | 6.753601833 | 1.198742393 | 0.361046462 | 0.398887363 |
| 324 | 3.483806079 | 2.211617061 | 3.483806079 | 6.751430964 | 1.198264236 | 0.360965311 | 0.398797598 |
| 325 | 3.482526503 | 2.210821329 | 3.482526503 | 6.749274334 | 1.197789229 | 0.360884695 | 0.398708426 |
| 326 | 3.481255327 | 2.210030814 | 3.481255327 | 6.747131849 | 1.197317349 | 0.360804613 | 0.398619844 |
| 327 | 3.479992496 | 2.209245485 | 3.479992496 | 6.745003418 | 1.196848575 | 0.360725059 | 0.398531846 |
| 328 | 3.478737956 | 2.208465307 | 3.478737956 | 6.74288895 | 1.196382888 | 0.36064603 | 0.39844443 |
| 329 | 3.477491653 | 2.207690246 | 3.477491653 | 6.740788354 | 1.195920267 | 0.360567524 | 0.398357591 |
| 330 | 3.476253533 | 2.20692027 | 3.476253533 | 6.73870154 | 1.195460691 | 0.360489535 | 0.398271325 |
| 331 | 3.475023543 | 2.206155346 | 3.475023543 | 6.736628418 | 1.195004139 | 0.360412062 | 0.398185629 |
| 332 | 3.473801628 | 2.205395439 | 3.473801628 | 6.734568899 | 1.194550593 | 0.3603351 | 0.398100498 |
| 333 | 3.472587737 | 2.204640519 | 3.472587737 | 6.732522895 | 1.194100031 | 0.360258645 | 0.398015929 |
| 334 | 3.471381817 | 2.203890552 | 3.471381817 | 6.730490317 | 1.193652435 | 0.360182696 | 0.397931918 |
| 335 | 3.470183815 | 2.203145506 | 3.470183815 | 6.728471078 | 1.193207784 | 0.360107247 | 0.397848461 |
| 336 | 3.468993681 | 2.20240535 | 3.468993681 | 6.726465091 | 1.192766059 | 0.360032296 | 0.397765555 |
| 337 | 3.467811362 | 2.201670051 | 3.467811362 | 6.724472271 | 1.192327241 | 0.359957839 | 0.397683195 |
| 338 | 3.466636807 | 2.200939577 | 3.466636807 | 6.72249253 | 1.191891309 | 0.359883873 | 0.397601379 |
| 339 | 3.465469966 | 2.200213897 | 3.465469966 | 6.720525784 | 1.191458246 | 0.359810395 | 0.397520102 |
| 340 | 3.464310788 | 2.199492981 | 3.464310788 | 6.718571948 | 1.191028032 | 0.359737401 | 0.397439361 |
| 341 | 3.463159223 | 2.198776796 | 3.463159223 | 6.716630937 | 1.190600647 | 0.359664889 | 0.397359152 |
| 342 | 3.46201522 | 2.198065313 | 3.46201522 | 6.714702669 | 1.190176075 | 0.359592854 | 0.397279472 |
| 343 | 3.460878732 | 2.197358499 | 3.460878732 | 6.712787059 | 1.189754295 | 0.359521294 | 0.397200317 |
| 344 | 3.459749707 | 2.196656326 | 3.459749707 | 6.710884026 | 1.18933529 | 0.359450206 | 0.397121684 |
| 345 | 3.458628098 | 2.195958762 | 3.458628098 | 6.708993487 | 1.18891904 | 0.359379587 | 0.397043568 |
| 346 | 3.457513855 | 2.195265777 | 3.457513855 | 6.70711536 | 1.188505529 | 0.359309432 | 0.396965968 |
| 347 | 3.456406931 | 2.194577342 | 3.456406931 | 6.705249564 | 1.188094737 | 0.35923974 | 0.396888879 |
| 348 | 3.455307278 | 2.193893427 | 3.455307278 | 6.703396019 | 1.187686646 | 0.359170507 | 0.396812297 |
| 349 | 3.454214847 | 2.193214002 | 3.454214847 | 6.701554644 | 1.18728124 | 0.359101729 | 0.39673622 |
| 350 | 3.453129593 | 2.192539038 | 3.453129593 | 6.699725361 | 1.1868785 | 0.359033405 | 0.396660644 |
| 351 | 3.452051466 | 2.191868506 | 3.452051466 | 6.69790809 | 1.186478408 | 0.358965531 | 0.396585566 |
| 352 | 3.450980422 | 2.191202377 | 3.450980422 | 6.696102752 | 1.186080947 | 0.358898104 | 0.396510982 |
| 353 | 3.449916412 | 2.190540621 | 3.449916412 | 6.694309269 | 1.1856861 | 0.358831121 | 0.396436889 |


|  | AD | AE | AF | AG | AH | AI | AJ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 29 | [val] of turtle 30 | [val] of turtle 31 | [val] of turtle 32 | [val] of turtle 33 | [val] of turtle 34 | [val] of turtle 35 |
| 354 | 3.448859393 | 2.189883212 | 3.448859393 | 6.692527564 | 1.185293849 | 0.358764578 | 0.396363284 |
| 355 | 3.447809316 | 2.189230119 | 3.447809316 | 6.69075756 | 1.184904177 | 0.358698474 | 0.396290164 |
| 356 | 3.446766138 | 2.188581315 | 3.446766138 | 6.688999181 | 1.184517068 | 0.358632805 | 0.396217525 |
| 357 | 3.445729812 | 2.187936771 | 3.445729812 | 6.687252349 | 1.184132503 | 0.358567569 | 0.396145364 |
| 358 | 3.444700294 | 2.187296461 | 3.444700294 | 6.685516989 | 1.183750468 | 0.358502762 | 0.396073679 |
| 359 | 3.443677539 | 2.186660355 | 3.443677539 | 6.683793027 | 1.183370944 | 0.358438381 | 0.396002465 |
| 360 | 3.442661502 | 2.186028427 | 3.442661502 | 6.682080388 | 1.182993915 | 0.358374424 | 0.39593172 |
| 361 | 3.441652141 | 2.185400649 | 3.441652141 | 6.680378997 | 1.182619365 | 0.358310888 | 0.39586144 |
| 362 | 3.44064941 | 2.184776995 | 3.44064941 | 6.678688781 | 1.182247278 | 0.35824777 | 0.395791623 |
| 363 | 3.439653267 | 2.184157436 | 3.439653267 | 6.677009667 | 1.181877637 | 0.358185068 | 0.395722266 |
| 364 | 3.438663668 | 2.183541947 | 3.438663668 | 6.675341582 | 1.181510426 | 0.358122778 | 0.395653364 |
| 365 | 3.43768057 | 2.1829305 | 3.43768057 | 6.673684453 | 1.181145629 | 0.358060898 | 0.395584916 |
| 366 | 3.436703931 | 2.182323069 | 3.436703931 | 6.67203821 | 1.18078323 | 0.357999425 | 0.395516919 |
| 367 | 3.435733708 | 2.181719628 | 3.435733708 | 6.670402779 | 1.180423213 | 0.357938357 | 0.395449369 |
| 368 | 3.434769859 | 2.181120151 | 3.434769859 | 6.668778092 | 1.180065563 | 0.35787769 | 0.395382263 |
| 369 | 3.433812342 | 2.180524611 | 3.433812342 | 6.667164077 | 1.179710265 | 0.357817422 | 0.395315599 |
| 370 | 3.432861116 | 2.179932983 | 3.432861116 | 6.665560664 | 1.179357301 | 0.357757551 | 0.395249373 |
| 371 | 3.43191614 | 2.179345241 | 3.43191614 | 6.663967783 | 1.179006658 | 0.357698074 | 0.395183583 |
| 372 | 3.430977372 | 2.178761361 | 3.430977372 | 6.662385367 | 1.17865832 | 0.357638988 | 0.395118226 |
| 373 | 3.430044772 | 2.178181315 | 3.430044772 | 6.660813345 | 1.178312272 | 0.357580291 | 0.395053299 |
| 374 | 3.429118298 | 2.17760508 | 3.429118298 | 6.659251651 | 1.177968498 | 0.35752198 | 0.394988798 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 2 | $5.45 \mathrm{E}-21$ | 0.338406343 | 0.258633544 | 3.808077723 |
| 3 | $5.45 \mathrm{E}-21$ | 0.338406343 | 0.258633544 | 2.733078358 |
| 4 | 1 | 1.585186617 | 1 | 4.29140316 |
| 5 | 0.02276867 | 0.509995493 | 0.29905253 | 3.956925352 |
| 6 | 365 | 365 | 365 | 365 |
| 7 |  |  |  |  |
| 8 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 9 | 1 | 1 | 1 | 3 |
| 10 | 0.88 | 1.151428571 | 0.934545455 | 2.894545455 |
| 11 | 0.7744 | 1.272294286 | 0.876530909 | 2.820283636 |
| 12 | 0.681472 | 1.367366362 | 0.824876292 | 2.771620817 |
| 13 | 0.59969536 | 1.440695808 | 0.778684831 | 2.74386296 |
| 14 | 0.527731917 | 1.495725158 | 0.737210363 | 2.733078358 |
| 15 | 0.464404087 | 1.535380936 | 0.69983045 | 2.735980395 |
| 16 | 0.408675596 | 1.562151637 | 0.666024287 | 2.749827623 |
| 17 | 0.359634525 | 1.578153586 | 0.635354569 | 2.772338674 |
| 18 | 0.316478382 | 1.585186617 | 0.607452625 | 2.801619915 |
| 19 | 0.278500976 | 1.58478121 | 0.582006235 | 2.836103994 |
| 20 | 0.245080859 | 1.578238437 | 0.558749658 | 2.874497709 |
| 21 | 0.215671156 | 1.566663849 | 0.53745548 | 2.915737835 |
| 22 | 0.189790617 | 1.55099626 | 0.517927952 | 2.958953741 |
| 23 | 0.167015743 | 1.532032224 | 0.499997546 | 3.003435792 |
| 24 | 0.146973854 | 1.510446865 | 0.483516515 | 3.04860868 |
| 25 | 0.129336991 | 1.486811618 | 0.468355268 | 3.094008934 |
| 26 | 0.113816552 | 1.461609365 | 0.454399413 | 3.139265993 |
| 27 | 0.100158566 | 1.435247348 | 0.441547343 | 3.18408629 |
| 28 | 0.088139538 | 1.408068198 | 0.429708267 | 3.228239888 |
| 29 | 0.077562794 | 1.380359362 | 0.418800595 | 3.271549288 |
| 30 | 0.068255258 | 1.352361167 | 0.408750626 | 3.313880052 |
| 31 | 0.060064627 | 1.324273717 | 0.39949146 | 3.355132978 |
| 32 | 0.052856872 | 1.296262804 | 0.390962111 | 3.395237571 |
| 33 | 0.046514047 | 1.268464965 | 0.383106775 | 3.434146611 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 34 | 0.040932362 | 1.240991817 | 0.375874217 | 3.471831643 |
| 35 | 0.036020478 | 1.213933775 | 0.36921727 | 3.508279234 |
| 36 | 0.031698021 | 1.187363233 | 0.363092402 | 3.543487893 |
| 37 | 0.027894258 | 1.161337296 | 0.357459365 | 3.577465517 |
| 38 | 0.024546947 | 1.135900117 | 0.352280883 | 3.610227304 |
| 39 | 0.021601314 | 1.111084905 | 0.347522397 | 3.641794037 |
| 40 | 0.019009156 | 1.08691564 | 0.343151834 | 3.672190691 |
| 41 | 0.016728057 | 1.063408545 | 0.339139407 | 3.701445293 |
| 42 | 0.01472069 | 1.040573345 | 0.335457448 | 3.729588011 |
| 43 | 0.012954208 | 1.018414346 | 0.332080245 | 3.756650414 |
| 44 | 0.011399703 | 0.996931351 | 0.328983906 | 3.782664886 |
| 45 | 0.010031738 | 0.976120451 | 0.326146233 | 3.80766416 |
| 46 | 0.00882793 | 0.955974694 | 0.323546606 | 3.831680953 |
| 47 | 0.007768578 | 0.936484654 | 0.321165878 | 3.854747687 |
| 48 | 0.006836349 | 0.91763892 | 0.318986275 | 3.876896275 |
| 49 | 0.006015987 | 0.899424508 | 0.31699131 | 3.898157954 |
| 50 | 0.005294069 | 0.881827209 | 0.315165697 | 3.918563178 |
| 51 | 0.00465878 | 0.864831889 | 0.313495269 | 3.938141531 |
| 52 | 0.004099727 | 0.848422732 | 0.31196691 | 3.956921679 |
| 53 | 0.003607759 | 0.832583455 | 0.310568481 | 3.974931334 |
| 54 | 0.003174828 | 0.817297479 | 0.309288758 | 3.992197251 |
| 55 | 0.002793849 | 0.802548081 | 0.308117371 | 4.008745218 |
| 56 | 0.002458587 | 0.788318511 | 0.307044745 | 4.024600077 |
| 57 | 0.002163557 | 0.774592093 | 0.306062046 | 4.039785738 |
| 58 | 0.00190393 | 0.761352309 | 0.305161133 | 4.054325205 |
| 59 | 0.001675458 | 0.748582864 | 0.304334508 | 4.068240606 |
| 60 | 0.001474403 | 0.736267739 | 0.303575269 | 4.081553225 |
| 61 | 0.001297475 | 0.724391236 | 0.302877074 | 4.094283532 |
| 62 | 0.001141778 | 0.71293801 | 0.302234095 | 4.106451221 |
| 63 | 0.001004765 | 0.70189309 | 0.301640985 | 4.118075242 |
| 64 | $8.84 \mathrm{E}-04$ | 0.691241906 | 0.301092841 | 4.129173834 |
| 65 | 7.78E-04 | 0.680970291 | 0.300585173 | 4.13976456 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 66 | $6.85 \mathrm{E}-04$ | 0.6710645 | 0.300113871 | 4.149864339 |
| 67 | $6.03 \mathrm{E}-04$ | 0.661511204 | 0.29967518 | 4.159489472 |
| 68 | $5.30 \mathrm{E}-04$ | 0.652297499 | 0.299265672 | 4.168655679 |
| 69 | 4.67E-04 | 0.6434109 | 0.298882218 | 4.177378121 |
| 70 | $4.11 \mathrm{E}-04$ | 0.634839336 | 0.298521971 | 4.185671429 |
| 71 | $3.61 \mathrm{E}-04$ | 0.626571148 | 0.298182338 | 4.193549727 |
| 72 | $3.18 \mathrm{E}-04$ | 0.61859508 | 0.297860964 | 4.201026661 |
| 73 | $2.80 \mathrm{E}-04$ | 0.610900271 | 0.297555712 | 4.208115414 |
| 74 | $2.46 \mathrm{E}-04$ | 0.603476245 | 0.297264647 | 4.214828732 |
| 75 | $2.17 \mathrm{E}-04$ | 0.596312903 | 0.296986015 | 4.221178944 |
| 76 | $1.91 \mathrm{E}-04$ | 0.58940051 | 0.296718236 | 4.227177976 |
| 77 | $1.68 \mathrm{E}-04$ | 0.58272969 | 0.296459883 | 4.232837372 |
| 78 | $1.48 \mathrm{E}-04$ | 0.576291408 | 0.296209672 | 4.23816831 |
| 79 | $1.30 \mathrm{E}-04$ | 0.570076965 | 0.29596645 | 4.243181615 |
| 80 | $1.14 \mathrm{E}-04$ | 0.564077984 | 0.295729184 | 4.247887778 |
| 81 | $1.01 \mathrm{E}-04$ | 0.558286402 | 0.295496951 | 4.252296962 |
| 82 | 8.86E-05 | 0.552694457 | 0.295268927 | 4.25641902 |
| 83 | $7.79 \mathrm{E}-05$ | 0.547294678 | 0.295044381 | 4.260263508 |
| 84 | $6.86 \mathrm{E}-05$ | 0.542079874 | 0.294822663 | 4.26383969 |
| 85 | $6.04 \mathrm{E}-05$ | 0.537043128 | 0.294603202 | 4.267156555 |
| 86 | $5.31 \mathrm{E}-05$ | 0.532177782 | 0.294385494 | 4.27022282 |
| 87 | 4.67E-05 | 0.52747743 | 0.294169098 | 4.273046946 |
| 88 | $4.11 \mathrm{E}-05$ | 0.522935909 | 0.293953631 | 4.275637144 |
| 89 | $3.62 \mathrm{E}-05$ | 0.518547289 | 0.29373876 | 4.278001381 |
| 90 | $3.18 \mathrm{E}-05$ | 0.514305865 | 0.293524202 | 4.280147391 |
| 91 | $2.80 \mathrm{E}-05$ | 0.510206148 | 0.293309712 | 4.282082682 |
| 92 | $2.47 \mathrm{E}-05$ | 0.506242858 | 0.293095086 | 4.28381454 |
| 93 | $2.17 \mathrm{E}-05$ | 0.502410914 | 0.292880153 | 4.285350042 |
| 94 | $1.91 \mathrm{E}-05$ | 0.498705429 | 0.292664774 | 4.286696053 |
| 95 | $1.68 \mathrm{E}-05$ | 0.4951217 | 0.292448838 | 4.287859244 |
| 96 | $1.48 \mathrm{E}-05$ | 0.491655205 | 0.292232256 | 4.288846085 |
| 97 | $1.30 \mathrm{E}-05$ | 0.48830159 | 0.292014964 | 4.289662863 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 98 | $1.15 \mathrm{E}-05$ | 0.485056669 | 0.291796916 | 4.290315676 |
| 99 | $1.01 \mathrm{E}-05$ | 0.481916413 | 0.291578084 | 4.290810448 |
| 100 | 8.87E-06 | 0.478876947 | 0.291358456 | 4.291152927 |
| 101 | 7.81E-06 | 0.475934541 | 0.291138031 | 4.291348692 |
| 102 | 6.87E-06 | 0.473085609 | 0.290916824 | 4.29140316 |
| 103 | $6.04 \mathrm{E}-06$ | 0.470326698 | 0.290694857 | 4.291321587 |
| 104 | $5.32 \mathrm{E}-06$ | 0.467654488 | 0.290472162 | 4.291109073 |
| 105 | $4.68 \mathrm{E}-06$ | 0.465065782 | 0.290248778 | 4.290770568 |
| 106 | $4.12 \mathrm{E}-06$ | 0.462557507 | 0.290024752 | 4.290310873 |
| 107 | $3.62 \mathrm{E}-06$ | 0.460126705 | 0.289800135 | 4.289734649 |
| 108 | 3.19E-06 | 0.457770529 | 0.289574983 | 4.289046413 |
| 109 | $2.81 \mathrm{E}-06$ | 0.455486239 | 0.289349357 | 4.288250551 |
| 110 | $2.47 \mathrm{E}-06$ | 0.453271202 | 0.289123318 | 4.287351313 |
| 111 | 2.17E-06 | 0.451122881 | 0.288896933 | 4.286352821 |
| 112 | $1.91 \mathrm{E}-06$ | 0.449038836 | 0.288670267 | 4.285259073 |
| 113 | $1.68 \mathrm{E}-06$ | 0.44701672 | 0.288443389 | 4.284073944 |
| 114 | $1.48 \mathrm{E}-06$ | 0.445054273 | 0.288216367 | 4.28280119 |
| 115 | $1.30 \mathrm{E}-06$ | 0.443149321 | 0.287989271 | 4.281444451 |
| 116 | $1.15 \mathrm{E}-06$ | 0.441299772 | 0.287762168 | 4.280007255 |
| 117 | $1.01 \mathrm{E}-06$ | 0.439503613 | 0.287535128 | 4.27849302 |
| 118 | 8.88E-07 | 0.437758908 | 0.287308217 | 4.276905058 |
| 119 | $7.82 \mathrm{E}-07$ | 0.436063791 | 0.287081501 | 4.275246575 |
| 120 | 6.88E-07 | 0.434416469 | 0.286855047 | 4.273520677 |
| 121 | $6.05 \mathrm{E}-07$ | 0.432815217 | 0.286628917 | 4.271730372 |
| 122 | $5.33 \mathrm{E}-07$ | 0.431258372 | 0.286403173 | 4.269878572 |
| 123 | $4.69 \mathrm{E}-07$ | 0.429744336 | 0.286177877 | 4.267968096 |
| 124 | $4.13 \mathrm{E}-07$ | 0.428271571 | 0.285953085 | 4.26600167 |
| 125 | 3.63E-07 | 0.426838596 | 0.285728856 | 4.263981934 |
| 126 | 3.20E-07 | 0.425443987 | 0.285505244 | 4.261911443 |
| 127 | $2.81 \mathrm{E}-07$ | 0.424086373 | 0.2852823 | 4.259792666 |
| 128 | $2.47 \mathrm{E}-07$ | 0.422764433 | 0.285060075 | 4.257627992 |
| 129 | $2.18 \mathrm{E}-07$ | 0.4214769 | 0.284838618 | 4.255419731 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 130 | $1.92 \mathrm{E}-07$ | 0.42022255 | 0.284617975 | 4.253170117 |
| 131 | $1.69 \mathrm{E}-07$ | 0.419000208 | 0.284398189 | 4.250881309 |
| 132 | $1.48 \mathrm{E}-07$ | 0.417808742 | 0.284179302 | 4.248555392 |
| 133 | $1.31 \mathrm{E}-07$ | 0.416647063 | 0.283961354 | 4.246194382 |
| 134 | $1.15 \mathrm{E}-07$ | 0.415514123 | 0.283744382 | 4.243800228 |
| 135 | $1.01 \mathrm{E}-07$ | 0.414408913 | 0.283528422 | 4.241374809 |
| 136 | $8.90 \mathrm{E}-08$ | 0.413330462 | 0.283313506 | 4.238919942 |
| 137 | $7.83 \mathrm{E}-08$ | 0.412277837 | 0.283099667 | 4.236437381 |
| 138 | $6.89 \mathrm{E}-08$ | 0.411250138 | 0.282886934 | 4.233928818 |
| 139 | $6.06 \mathrm{E}-08$ | 0.410246499 | 0.282675334 | 4.231395888 |
| 140 | $5.34 \mathrm{E}-08$ | 0.409266089 | 0.282464892 | 4.228840165 |
| 141 | $4.70 \mathrm{E}-08$ | 0.408308106 | 0.282255633 | 4.226263172 |
| 142 | $4.13 \mathrm{E}-08$ | 0.407371778 | 0.282047577 | 4.223666374 |
| 143 | $3.64 \mathrm{E}-08$ | 0.406456363 | 0.281840746 | 4.221051186 |
| 144 | $3.20 \mathrm{E}-08$ | 0.405561146 | 0.281635158 | 4.218418971 |
| 145 | $2.82 \mathrm{E}-08$ | 0.404685441 | 0.28143083 | 4.215771042 |
| 146 | $2.48 \mathrm{E}-08$ | 0.403828585 | 0.281227776 | 4.213108667 |
| 147 | $2.18 \mathrm{E}-08$ | 0.402989941 | 0.281026012 | 4.210433065 |
| 148 | $1.92 \mathrm{E}-08$ | 0.402168897 | 0.280825549 | 4.20774541 |
| 149 | $1.69 \mathrm{E}-08$ | 0.401364862 | 0.280626398 | 4.205046834 |
| 150 | $1.49 \mathrm{E}-08$ | 0.400577269 | 0.280428569 | 4.202338426 |
| 151 | $1.31 \mathrm{E}-08$ | 0.399805571 | 0.28023207 | 4.199621235 |
| 152 | $1.15 \mathrm{E}-08$ | 0.399049242 | 0.28003691 | 4.196896268 |
| 153 | $1.01 \mathrm{E}-08$ | 0.398307775 | 0.279843092 | 4.194164495 |
| 154 | $8.91 \mathrm{E}-09$ | 0.397580684 | 0.279650624 | 4.19142685 |
| 155 | $7.84 \mathrm{E}-09$ | 0.396867498 | 0.279459508 | 4.18868423 |
| 156 | $6.90 \mathrm{E}-09$ | 0.396167768 | 0.279269747 | 4.185937497 |
| 157 | $6.07 \mathrm{E}-09$ | 0.395481057 | 0.279081344 | 4.183187478 |
| 158 | $5.34 \mathrm{E}-09$ | 0.394806949 | 0.278894299 | 4.18043497 |
| 159 | $4.70 \mathrm{E}-09$ | 0.394145039 | 0.278708612 | 4.177680737 |
| 160 | $4.14 \mathrm{E}-09$ | 0.39349494 | 0.278524284 | 4.174925513 |
| 161 | 3.64E-09 | 0.39285628 | 0.278341312 | 4.17217 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 162 | $3.21 \mathrm{E}-09$ | 0.392228698 | 0.278159694 | 4.169414875 |
| 163 | $2.82 \mathrm{E}-09$ | 0.39161185 | 0.277979428 | 4.166660786 |
| 164 | $2.48 \mathrm{E}-09$ | 0.391005401 | 0.27780051 | 4.163908353 |
| 165 | $2.18 \mathrm{E}-09$ | 0.390409032 | 0.277622936 | 4.161158171 |
| 166 | $1.92 \mathrm{E}-09$ | 0.389822434 | 0.277446701 | 4.158410811 |
| 167 | $1.69 \mathrm{E}-09$ | 0.389245309 | 0.277271801 | 4.155666817 |
| 168 | $1.49 \mathrm{E}-09$ | 0.388677372 | 0.277098229 | 4.152926714 |
| 169 | $1.31 \mathrm{E}-09$ | 0.388118348 | 0.276925981 | 4.150191001 |
| 170 | $1.15 \mathrm{E}-09$ | 0.38756797 | 0.276755048 | 4.147460157 |
| 171 | $1.01 \mathrm{E}-09$ | 0.387025983 | 0.276585425 | 4.144734638 |
| 172 | 8.93E-10 | 0.386492142 | 0.276417103 | 4.142014881 |
| 173 | $7.86 \mathrm{E}-10$ | 0.38596621 | 0.276250076 | 4.139301304 |
| 174 | $6.91 \mathrm{E}-10$ | 0.385447958 | 0.276084336 | 4.136594305 |
| 175 | 6.08E-10 | 0.384937166 | 0.275919874 | 4.133894265 |
| 176 | 5.35E-10 | 0.384433624 | 0.275756682 | 4.131201545 |
| 177 | $4.71 \mathrm{E}-10$ | 0.383937127 | 0.275594751 | 4.128516492 |
| 178 | $4.15 \mathrm{E}-10$ | 0.383447479 | 0.275434072 | 4.125839434 |
| 179 | 3.65E-10 | 0.382964491 | 0.275274637 | 4.123170685 |
| 180 | 3.21E-10 | 0.38248798 | 0.275116435 | 4.120510541 |
| 181 | $2.83 \mathrm{E}-10$ | 0.382017771 | 0.274959458 | 4.117859288 |
| 182 | $2.49 \mathrm{E}-10$ | 0.381553695 | 0.274803697 | 4.115217193 |
| 183 | 2.19E-10 | 0.381095588 | 0.27464914 | 4.112584513 |
| 184 | $1.93 \mathrm{E}-10$ | 0.380643294 | 0.274495779 | 4.109961488 |
| 185 | $1.69 \mathrm{E}-10$ | 0.380196662 | 0.274343605 | 4.107348349 |
| 186 | $1.49 \mathrm{E}-10$ | 0.379755545 | 0.274192605 | 4.104745314 |
| 187 | $1.31 \mathrm{E}-10$ | 0.379319802 | 0.274042772 | 4.102152586 |
| 188 | $1.15 \mathrm{E}-10$ | 0.378889299 | 0.273894095 | 4.099570361 |
| 189 | 1.02E-10 | 0.378463904 | 0.273746563 | 4.096998822 |
| 190 | $8.94 \mathrm{E}-11$ | 0.378043491 | 0.273600168 | 4.09443814 |
| 191 | 7.87E-11 | 0.377627939 | 0.273454897 | 4.09188848 |
| 192 | $6.92 \mathrm{E}-11$ | 0.377217132 | 0.273310743 | 4.089349992 |
| 193 | 6.09E-11 | 0.376810955 | 0.273167694 | 4.086822822 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 194 | 5.36E-11 | 0.376409299 | 0.27302574 | 4.084307103 |
| 195 | $4.72 \mathrm{E}-11$ | 0.37601206 | 0.272884872 | 4.08180296 |
| 196 | $4.15 \mathrm{E}-11$ | 0.375619137 | 0.272745079 | 4.079310511 |
| 197 | 3.65E-11 | 0.375230431 | 0.272606351 | 4.076829866 |
| 198 | 3.22E-11 | 0.374845847 | 0.272468679 | 4.074361126 |
| 199 | $2.83 \mathrm{E}-11$ | 0.374465296 | 0.272332052 | 4.071904384 |
| 200 | $2.49 \mathrm{E}-11$ | 0.374088688 | 0.272196462 | 4.069459729 |
| 201 | 2.19E-11 | 0.373715938 | 0.272061897 | 4.06702724 |
| 202 | $1.93 \mathrm{E}-11$ | 0.373346966 | 0.271928348 | 4.064606991 |
| 203 | $1.70 \mathrm{E}-11$ | 0.372981691 | 0.271795806 | 4.062199048 |
| 204 | $1.49 \mathrm{E}-11$ | 0.372620037 | 0.271664261 | 4.059803475 |
| 205 | $1.31 \mathrm{E}-11$ | 0.372261931 | 0.271533704 | 4.057420324 |
| 206 | 1.16E-11 | 0.3719073 | 0.271404125 | 4.055049648 |
| 207 | $1.02 \mathrm{E}-11$ | 0.371556076 | 0.271275516 | 4.052691489 |
| 208 | 8.95E-12 | 0.371208193 | 0.271147865 | 4.050345888 |
| 209 | $7.88 \mathrm{E}-12$ | 0.370863585 | 0.271021166 | 4.048012878 |
| 210 | $6.93 \mathrm{E}-12$ | 0.370522191 | 0.270895408 | 4.04569249 |
| 211 | 6.10E-12 | 0.37018395 | 0.270770582 | 4.043384748 |
| 212 | $5.37 \mathrm{E}-12$ | 0.369848803 | 0.27064668 | 4.041089674 |
| 213 | $4.73 \mathrm{E}-12$ | 0.369516696 | 0.270523694 | 4.038807283 |
| 214 | $4.16 \mathrm{E}-12$ | 0.369187573 | 0.270401613 | 4.03653759 |
| 215 | 3.66E-12 | 0.368861381 | 0.270280431 | 4.034280602 |
| 216 | $3.22 \mathrm{E}-12$ | 0.36853807 | 0.270160137 | 4.032036325 |
| 217 | $2.83 \mathrm{E}-12$ | 0.368217589 | 0.270040725 | 4.02980476 |
| 218 | $2.49 \mathrm{E}-12$ | 0.367899892 | 0.269922185 | 4.027585906 |
| 219 | 2.19E-12 | 0.367584932 | 0.269804509 | 4.025379759 |
| 220 | $1.93 \mathrm{E}-12$ | 0.367272663 | 0.26968769 | 4.023186309 |
| 221 | 1.70E-12 | 0.366963042 | 0.269571719 | 4.021005548 |
| 222 | $1.50 \mathrm{E}-12$ | 0.366656028 | 0.269456589 | 4.01883746 |
| 223 | $1.32 \mathrm{E}-12$ | 0.366351579 | 0.269342291 | 4.01668203 |
| 224 | $1.16 \mathrm{E}-12$ | 0.366049656 | 0.269228819 | 4.01453924 |
| 225 | $1.02 \mathrm{E}-12$ | 0.36575022 | 0.269116163 | 4.012409067 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 226 | 8.97E-13 | 0.365453233 | 0.269004318 | 4.010291489 |
| 227 | 7.89E-13 | 0.365158661 | 0.268893276 | 4.00818648 |
| 228 | $6.95 \mathrm{E}-13$ | 0.364866466 | 0.268783028 | 4.006094012 |
| 229 | 6.11E-13 | 0.364576617 | 0.268673569 | 4.004014055 |
| 230 | 5.38E-13 | 0.364289079 | 0.26856489 | 4.001946578 |
| 231 | $4.73 \mathrm{E}-13$ | 0.364003819 | 0.268456986 | 3.999891548 |
| 232 | $4.17 \mathrm{E}-13$ | 0.363720808 | 0.268349848 | 3.997848929 |
| 233 | 3.67E-13 | 0.363440014 | 0.26824347 | 3.995818684 |
| 234 | 3.23E-13 | 0.363161408 | 0.268137846 | 3.993800776 |
| 235 | $2.84 \mathrm{E}-13$ | 0.362884961 | 0.268032969 | 3.991795164 |
| 236 | $2.50 \mathrm{E}-13$ | 0.362610646 | 0.267928831 | 3.989801807 |
| 237 | $2.20 \mathrm{E}-13$ | 0.362338434 | 0.267825428 | 3.987820663 |
| 238 | $1.93 \mathrm{E}-13$ | 0.362068301 | 0.267722751 | 3.985851688 |
| 239 | $1.70 \mathrm{E}-13$ | 0.361800218 | 0.267620796 | 3.983894837 |
| 240 | $1.50 \mathrm{E}-13$ | 0.361534163 | 0.267519555 | 3.981950064 |
| 241 | $1.32 \mathrm{E}-13$ | 0.36127011 | 0.267419023 | 3.980017321 |
| 242 | $1.16 \mathrm{E}-13$ | 0.361008035 | 0.267319193 | 3.978096562 |
| 243 | $1.02 \mathrm{E}-13$ | 0.360747915 | 0.26722006 | 3.976187736 |
| 244 | 8.98E-14 | 0.360489728 | 0.267121617 | 3.974290795 |
| 245 | $7.91 \mathrm{E}-14$ | 0.360233451 | 0.267023859 | 3.972405686 |
| 246 | $6.96 \mathrm{E}-14$ | 0.359979062 | 0.26692678 | 3.970532359 |
| 247 | 6.12E-14 | 0.359726542 | 0.266830375 | 3.968670762 |
| 248 | $5.39 \mathrm{E}-14$ | 0.359475869 | 0.266734637 | 3.966820841 |
| 249 | $4.74 \mathrm{E}-14$ | 0.359227022 | 0.266639561 | 3.964982543 |
| 250 | $4.17 \mathrm{E}-14$ | 0.358979984 | 0.266545142 | 3.963155813 |
| 251 | 3.67E-14 | 0.358734733 | 0.266451374 | 3.961340598 |
| 252 | $3.23 \mathrm{E}-14$ | 0.358491253 | 0.266358252 | 3.959536842 |
| 253 | $2.84 \mathrm{E}-14$ | 0.358249523 | 0.26626577 | 3.957744489 |
| 254 | $2.50 \mathrm{E}-14$ | 0.358009527 | 0.266173924 | 3.955963483 |
| 255 | $2.20 \mathrm{E}-14$ | 0.357771247 | 0.266082708 | 3.954193767 |
| 256 | $1.94 \mathrm{E}-14$ | 0.357534665 | 0.265992118 | 3.952435286 |
| 257 | $1.70 \mathrm{E}-14$ | 0.357299765 | 0.265902148 | 3.950687981 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 258 | $1.50 \mathrm{E}-14$ | 0.357066531 | 0.265812793 | 3.948951794 |
| 259 | $1.32 \mathrm{E}-14$ | 0.356834946 | 0.265724048 | 3.947226669 |
| 260 | $1.16 \mathrm{E}-14$ | 0.356604994 | 0.265635909 | 3.945512547 |
| 261 | $1.02 \mathrm{E}-14$ | 0.356376661 | 0.265548371 | 3.943809369 |
| 262 | $9.00 \mathrm{E}-15$ | 0.35614993 | 0.265461429 | 3.942117078 |
| 263 | $7.92 \mathrm{E}-15$ | 0.355924787 | 0.265375078 | 3.940435615 |
| 264 | 6.97E-15 | 0.355701218 | 0.265289314 | 3.93876492 |
| 265 | 6.13E-15 | 0.355479207 | 0.265204132 | 3.937104935 |
| 266 | $5.40 \mathrm{E}-15$ | 0.355258742 | 0.265119528 | 3.935455602 |
| 267 | $4.75 \mathrm{E}-15$ | 0.355039807 | 0.265035498 | 3.93381686 |
| 268 | $4.18 \mathrm{E}-15$ | 0.35482239 | 0.264952036 | 3.93218865 |
| 269 | $3.68 \mathrm{E}-15$ | 0.354606477 | 0.264869139 | 3.930570914 |
| 270 | 3.24E-15 | 0.354392055 | 0.264786802 | 3.928963592 |
| 271 | $2.85 \mathrm{E}-15$ | 0.354179112 | 0.264705021 | 3.927366625 |
| 272 | $2.51 \mathrm{E}-15$ | 0.353967634 | 0.264623791 | 3.925779954 |
| 273 | $2.21 \mathrm{E}-15$ | 0.353757609 | 0.26454311 | 3.924203519 |
| 274 | $1.94 \mathrm{E}-15$ | 0.353549024 | 0.264462972 | 3.922637261 |
| 275 | $1.71 \mathrm{E}-15$ | 0.353341869 | 0.264383373 | 3.921081121 |
| 276 | $1.50 \mathrm{E}-15$ | 0.35313613 | 0.26430431 | 3.91953504 |
| 277 | $1.32 \mathrm{E}-15$ | 0.352931797 | 0.264225779 | 3.91799896 |
| 278 | $1.16 \mathrm{E}-15$ | 0.352728857 | 0.264147775 | 3.91647282 |
| 279 | $1.02 \mathrm{E}-15$ | 0.352527299 | 0.264070294 | 3.914956563 |
| 280 | $9.01 \mathrm{E}-16$ | 0.352327112 | 0.263993334 | 3.913450129 |
| 281 | $7.93 \mathrm{E}-16$ | 0.352128286 | 0.263916889 | 3.91195346 |
| 282 | $6.98 \mathrm{E}-16$ | 0.351930809 | 0.263840956 | 3.910466498 |
| 283 | $6.14 \mathrm{E}-16$ | 0.35173467 | 0.263765532 | 3.908989184 |
| 284 | 5.40E-16 | 0.351539859 | 0.263690613 | 3.907521461 |
| 285 | $4.76 \mathrm{E}-16$ | 0.351346366 | 0.263616195 | 3.906063269 |
| 286 | $4.19 \mathrm{E}-16$ | 0.351154181 | 0.263542274 | 3.904614552 |
| 287 | 3.68E-16 | 0.350963292 | 0.263468847 | 3.903175252 |
| 288 | 3.24E-16 | 0.350773691 | 0.263395911 | 3.90174531 |
| 289 | 2.85E-16 | 0.350585366 | 0.263323461 | 3.900324671 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 290 | $2.51 \mathrm{E}-16$ | 0.35039831 | 0.263251494 | 3.898913277 |
| 291 | 2.21E-16 | 0.350212511 | 0.263180008 | 3.897511071 |
| 292 | 1.94E-16 | 0.350027961 | 0.263108998 | 3.896117996 |
| 293 | $1.71 \mathrm{E}-16$ | 0.34984465 | 0.26303846 | 3.894733996 |
| 294 | $1.51 \mathrm{E}-16$ | 0.349662569 | 0.262968393 | 3.893359015 |
| 295 | $1.32 \mathrm{E}-16$ | 0.349481708 | 0.262898792 | 3.891992997 |
| 296 | $1.17 \mathrm{E}-16$ | 0.349302059 | 0.262829654 | 3.890635885 |
| 297 | $1.03 \mathrm{E}-16$ | 0.349123612 | 0.262760976 | 3.889287625 |
| 298 | $9.03 \mathrm{E}-17$ | 0.348946359 | 0.262692754 | 3.887948161 |
| 299 | $7.94 \mathrm{E}-17$ | 0.348770291 | 0.262624986 | 3.886617439 |
| 300 | 6.99E-17 | 0.348595399 | 0.262557667 | 3.885295402 |
| 301 | 6.15E-17 | 0.348421675 | 0.262490796 | 3.883981997 |
| 302 | $5.41 \mathrm{E}-17$ | 0.34824911 | 0.262424369 | 3.88267717 |
| 303 | $4.76 \mathrm{E}-17$ | 0.348077696 | 0.262358383 | 3.881380866 |
| 304 | 4.19E-17 | 0.347907425 | 0.262292834 | 3.880093031 |
| 305 | $3.69 \mathrm{E}-17$ | 0.347738288 | 0.26222772 | 3.878813613 |
| 306 | 3.25E-17 | 0.347570277 | 0.262163038 | 3.877542557 |
| 307 | $2.86 \mathrm{E}-17$ | 0.347403385 | 0.262098784 | 3.876279811 |
| 308 | 2.51E-17 | 0.347237603 | 0.262034956 | 3.875025321 |
| 309 | $2.21 \mathrm{E}-17$ | 0.347072923 | 0.261971551 | 3.873779036 |
| 310 | $1.95 \mathrm{E}-17$ | 0.346909337 | 0.261908566 | 3.872540904 |
| 311 | $1.71 \mathrm{E}-17$ | 0.346746839 | 0.261845998 | 3.871310871 |
| 312 | $1.51 \mathrm{E}-17$ | 0.346585419 | 0.261783844 | 3.870088888 |
| 313 | $1.33 \mathrm{E}-17$ | 0.346425072 | 0.261722102 | 3.868874901 |
| 314 | 1.17E-17 | 0.346265788 | 0.261660767 | 3.86766886 |
| 315 | $1.03 \mathrm{E}-17$ | 0.346107561 | 0.261599839 | 3.866470715 |
| 316 | $9.04 \mathrm{E}-18$ | 0.345950383 | 0.261539313 | 3.865280414 |
| 317 | $7.96 \mathrm{E}-18$ | 0.345794247 | 0.261479188 | 3.864097908 |
| 318 | 7.00E-18 | 0.345639146 | 0.26141946 | 3.862923146 |
| 319 | 6.16E-18 | 0.345485072 | 0.261360127 | 3.861756078 |
| 320 | $5.42 \mathrm{E}-18$ | 0.345332018 | 0.261301185 | 3.860596656 |
| 321 | $4.77 \mathrm{E}-18$ | 0.345179978 | 0.261242633 | 3.859444829 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 322 | $4.20 \mathrm{E}-18$ | 0.345028945 | 0.261184468 | 3.858300549 |
| 323 | $3.69 \mathrm{E}-18$ | 0.344878911 | 0.261126687 | 3.857163768 |
| 324 | $3.25 \mathrm{E}-18$ | 0.344729869 | 0.261069288 | 3.856034437 |
| 325 | $2.86 \mathrm{E}-18$ | 0.344581813 | 0.261012267 | 3.854912507 |
| 326 | $2.52 \mathrm{E}-18$ | 0.344434736 | 0.260955623 | 3.853797932 |
| 327 | $2.22 \mathrm{E}-18$ | 0.344288631 | 0.260899353 | 3.852690663 |
| 328 | $1.95 \mathrm{E}-18$ | 0.344143492 | 0.260843454 | 3.851590654 |
| 329 | $1.72 \mathrm{E}-18$ | 0.343999312 | 0.260787923 | 3.850497856 |
| 330 | $1.51 \mathrm{E}-18$ | 0.343856085 | 0.260732759 | 3.849412225 |
| 331 | $1.33 \mathrm{E}-18$ | 0.343713803 | 0.260677959 | 3.848333713 |
| 332 | 1.17E-18 | 0.343572462 | 0.26062352 | 3.847262273 |
| 333 | $1.03 \mathrm{E}-18$ | 0.343432053 | 0.260569441 | 3.846197861 |
| 334 | $9.05 \mathrm{E}-19$ | 0.343292571 | 0.260515718 | 3.845140431 |
| 335 | 7.97E-19 | 0.34315401 | 0.260462349 | 3.844089937 |
| 336 | $7.01 \mathrm{E}-19$ | 0.343016364 | 0.260409331 | 3.843046334 |
| 337 | 6.17E-19 | 0.342879625 | 0.260356664 | 3.842009578 |
| 338 | 5.43E-19 | 0.342743789 | 0.260304343 | 3.840979624 |
| 339 | $4.78 \mathrm{E}-19$ | 0.342608849 | 0.260252367 | 3.839956427 |
| 340 | $4.20 \mathrm{E}-19$ | 0.342474799 | 0.260200734 | 3.838939945 |
| 341 | 3.70E-19 | 0.342341632 | 0.260149441 | 3.837930132 |
| 342 | 3.26E-19 | 0.342209344 | 0.260098485 | 3.836926946 |
| 343 | $2.87 \mathrm{E}-19$ | 0.342077928 | 0.260047866 | 3.835930344 |
| 344 | 2.52E-19 | 0.341947378 | 0.259997579 | 3.834940283 |
| 345 | $2.22 \mathrm{E}-19$ | 0.341817688 | 0.259947624 | 3.833956719 |
| 346 | $1.95 \mathrm{E}-19$ | 0.341688854 | 0.259897998 | 3.832979611 |
| 347 | $1.72 \mathrm{E}-19$ | 0.341560868 | 0.259848699 | 3.832008917 |
| 348 | $1.51 \mathrm{E}-19$ | 0.341433725 | 0.259799724 | 3.831044595 |
| 349 | $1.33 \mathrm{E}-19$ | 0.341307421 | 0.259751072 | 3.830086602 |
| 350 | 1.17E-19 | 0.341181948 | 0.25970274 | 3.829134899 |
| 351 | $1.03 \mathrm{E}-19$ | 0.341057302 | 0.259654726 | 3.828189443 |
| 352 | $9.07 \mathrm{E}-20$ | 0.340933476 | 0.259607029 | 3.827250195 |
| 353 | 7.98E-20 | 0.340810467 | 0.259559645 | 3.826317113 |


|  | AK | AL | AM | AN |
| :---: | :---: | :---: | :---: | :---: |
| 1 | [val] of turtle 36 | [val] of turtle 37 | [val] of turtle 38 | [val] of turtle 39 |
| 354 | $7.02 \mathrm{E}-20$ | 0.340688267 | 0.259512573 | 3.825390157 |
| 355 | 6.18E-20 | 0.340566872 | 0.259465811 | 3.824469287 |
| 356 | $5.44 \mathrm{E}-20$ | 0.340446276 | 0.259419357 | 3.823554464 |
| 357 | $4.79 \mathrm{E}-20$ | 0.340326474 | 0.259373208 | 3.822645648 |
| 358 | $4.21 \mathrm{E}-20$ | 0.340207461 | 0.259327364 | 3.821742799 |
| 359 | 3.71E-20 | 0.340089231 | 0.25928182 | 3.820845879 |
| 360 | 3.26E-20 | 0.33997178 | 0.259236577 | 3.819954849 |
| 361 | $2.87 \mathrm{E}-20$ | 0.339855102 | 0.259191631 | 3.81906967 |
| 362 | $2.53 \mathrm{E}-20$ | 0.339739191 | 0.259146981 | 3.818190304 |
| 363 | 2.22E-20 | 0.339624044 | 0.259102624 | 3.817316713 |
| 364 | $1.96 \mathrm{E}-20$ | 0.339509654 | 0.25905856 | 3.81644886 |
| 365 | $1.72 \mathrm{E}-20$ | 0.339396017 | 0.259014785 | 3.815586705 |
| 366 | $1.51 \mathrm{E}-20$ | 0.339283127 | 0.258971298 | 3.814730214 |
| 367 | $1.33 \mathrm{E}-20$ | 0.339170981 | 0.258928097 | 3.813879347 |
| 368 | $1.17 \mathrm{E}-20$ | 0.339059572 | 0.258885181 | 3.813034069 |
| 369 | $1.03 \mathrm{E}-20$ | 0.338948896 | 0.258842546 | 3.812194343 |
| 370 | 9.08E-21 | 0.338838948 | 0.258800193 | 3.811360132 |
| 371 | 7.99E-21 | 0.338729724 | 0.258758117 | 3.8105314 |
| 372 | 7.03E-21 | 0.338621218 | 0.258716319 | 3.809708112 |
| 373 | $6.19 \mathrm{E}-21$ | 0.338513426 | 0.258674795 | 3.808890232 |
| 374 | $5.45 \mathrm{E}-21$ | 0.338406343 | 0.258633544 | 3.808077723 |

Appendix E
Piñon Canyon Network Identification

| POSITION | STAKEHOLDER | IDENTIFED AS |  | TYPE | $\begin{aligned} & \text { COLOR } \\ & \text { and } \\ & \text { vALUE } \end{aligned}$ | LINKED TO | SHARE | VERIFIED BY |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | La Junta Chamber of Commerce | chess pawn |  | NGA | 1 | 18,21, 25, 40, | 18,25 | Secondary Source |
| 2 | Trinidad School District | house two story |  | DG | 1 | 21,32,39 | 39 | Secondary Source |
| 3 | Colorado State Parks | squirrel |  | SG | 1 | 5,11, 14, 19, 26, 37, | none | Interview |
| 4 | City of Walsenburg | Orbit 4 |  | LG | 1 | 16,23,32 | 16,23 | Secondary Source |
| 5 | Colorado Division of Wildlife | hawk |  | SG | 2 | 14, 19, 20, | none | Interview |
| 6 | Colorado Department of Transportation | wheel |  | SG | 1 | 0,8,13,23 | none | Secondary Source |
| 7 | Colorado Springs Chamber of Commerce | chess king | 35 | NGA | 3 | 8,11, 12, 13, 18, | 8,11,12,18 | Interview |
| 8 | City of Colorado Springs | orbit 1 |  | LG | 6 | 7,9,11,12,13, | 8,11, 12, 13 | Secondary Source |
| 9 | Deputy Under Secretary of Defense for Installations and Environment | pentagon |  | FG | 5 | 10,11 | 11 | Interview |
| 10 | Assistant Secretary of the Army for Installations and Environment | tank |  | FG | 6 | 7,8,9,11 | 9,11 | Interview |
| 11 | Commanding General Fort Carson | star |  | FG | 6 | 7, 8, 9, 10, | 7,8,9,10 | Interview |
| 12 | City of Fountain | Orbit2 |  | LG | 2 | 7,8,10,11 | 7,8 | Secondary Source |
| 13 | El Paso County | die 1 |  | CG | 4 | 8,11,12 | 8 | Secondary Source |
| 14 | USDOI Fish and Wildlife Service | fish |  | SG | 1 | 19, 26, 33 | none | Secondary Source |
| 15 | Advisory Council on Historic Preservation | chess king |  | FG | 1 | 7,21,32,35 | none | Secondary Source |
| 16 | Huerfano County | die 4 |  | CG | 1 | 4,32,39, | 4 | Secondary Source |
| 17 | Environmental Protection Agency | tile water |  | FG | 1 | 9,10,11 | none | Secondary Source |
| 18 | Pueblo Chamber of Commerce | chess bishop | 24 | NGA | 3 | 0, 1, 7, 21, 23, | 0,1,7,23 | Interview |
| 19 | San Isabel National Forest and Comanche National Grassland | tree pine |  | FG | 2 | 11,26,37 | 26 | Interview |
| 20 | USDOI Bureau of Land Management | tile stones |  | FG | 1 | 11, 19, 22, 26, 33 | none | Secondary Source |
| 21 | Las Animas County Chamber of Commerce | chess knight | 18 | NGA | 1 | 32,39 | 32,39 | Secondary Source |
| 22 | Colorado State Land Board | cactus |  | SG | 3 | 2, 5, 27,28,30,33,37 | 37 | Interview |
| 23 | Pueblo County | die 2 |  | CG | 5 | 0, 4, 16, 15, 18, 24, 32, 34, 35,38,39, | 0, 4, 18, 24, | Interview |
| 24 | City of LaJunta | orbit5 |  | LG | 1 | 1,25,23 | 1,25 | Interview |
| 25 | Otero County | die 3 |  | CG | 2 | 1,23,24 | 1,23,24 | Secondary Source |
| 26 | USDA Natural Resources Conservation Service | flower |  | FG | 1 | 19, $28,29,31,32$, | 19 | Interview |
| 27 | Hoehne School District | house efficiency |  | DG | 1 | 2, 21, 29, 30, 31, 32 | 32 | Secondary Source |
| 28 | Colorado Cattlemen's Association | cow |  | NGA | 2 | 29,31,33 | none | Interview |
| 29 | Piñon Canyon Expansion Opposition Coalition | tree |  | NGA | 3 | 30,31,32,33 | 30,31,32, 33 | Interview |
| 30 | Branson School District | house ranch |  | DG | 2 | 29,31,32 | 29,32 | Interview |
| 31 | Not One More Acre | bird |  | NGA | 3 | 24,25,29,32 | 29,32 | Interview |
| 32 | Las Animas County | die 5 |  | NGA |  | 21,27, 29, 30.31,39 | 21, 27, 29, 30, 31, 32 | Interview |
| 33 | Colorado Department of Agriculture | person farmer |  | SG |  | 28,29,31,37 | 28,29, 37 | Secondary Source |
| 34 | City of Springfield | circle |  | LG | 1 | 28, 29, $31,32,35$ | 35 | Secondary Source |
| 35 | Office Of Baca County Commission | die 6 |  | CG | 1 | 25,28,32,34 | 34 | Secondary Source |
| 36 | Colorado State Historic Preservation | acorn |  | SG | 1 | 3,15, 19, 37 | none | Secondary Source |
| 37 | Colorado Department of Natural Resources | butterfly | 15 | SG | 1 | 5,22,33 | 22,33 | Interview |
| 38 | City of Rocky Ford | orbit 6 |  | LG | 1 | 1,25,24 | none | Secondary Source |
| 39 | City of Trinidad | circle 2 |  | LG | 3 | 2,11, 21, 32 | 2,21,32 | Interview |
| 40 | City of Pueblo | orbit 3 |  | LG | 5 | 18,23 | 18,23 | Interview |

## Assignment of Power

| SMALL GOV'T | MUNICIPAL | COUNTY | STATE | NGA | FEDERAL | LARGE GOV'T | ACTIVE | PASSIVE | COLLABORATIVE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 3 | $1--3$ | 4 | 5 | 1 | -1 | $+/-1$ |


| POSITION | STAKEHOLDER | IDENTIFIED AS | INITIAL POWER | ACTIVE/PASSIVE | FINAL POWER |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | La Junta Chamber of Commerce | chess pawn | 1 |  | 1 |
| 2 | Trinidad School District | house two story | 1 |  | 1 |
| 3 | Colorado State Parks | squirrel | 3 | -2 | 1 |
| 4 | City of Walsenburg | orbit 4 | 1 |  | 1 |
| 5 | Colorado Division of Wildlife | hawk | 3 | -1 | 2 |
| 6 | Colorado Department of Transportation | wheel | 3 | -2 | 1 |
| 7 | Colorado Springs Chamber of Commerce | chess king | 3 |  | 3 |
| 8 | City of Colorado Springs | orbit 1 | 5 | +1 | 6 |
| 9 | Deputy Under Secretary of Defense for Installations and Environment | pentagon | 4 | -1 | 3 |
| 10 | Assistant Secretary of the Army for Installations and Environment | tank | 4 | +2 | 6 |
| 11 | Commanding General Fort Carson | star | 4 | +1 | 5 |
| 12 | City of Fountain | orbit 2 | 2 |  | 2 |
| 13 | El Paso County | die 1 | 3 | +2 | 5 |
| 14 | USDOI Fish and Wildlife Service | fish | 4 |  | 3 |
| 15 | Advisory Council on Historic Preservation | chess king | 4 |  | 4 |
| 16 | Huerfano County | die 4 | 3 | -2 | 1 |
| 17 | Environmental Protection Agency | tile water | 4 |  | 3 |
| 18 | Pueblo Chamber of Commerce | chess bishop | 3 |  | 3 |
| 19 | San Isabel National Forest and Comanche National Grassland | tree pine | 4 | -2 | 2 |
| 20 | USDOI Bureau of Land Management | tile stones | 4 | -2 | 2 |
| 21 | Las Animas County Chamber of Commerce | chess knight | 1 | +1 | 2 |
| 22 | Colorado State Land Board | cactus | 3 | +1 | 4 |
| 23 | Pueblo County | die 2 | 5 |  | 5 |
| 24 | City of LaJunta | orbit 5 | 2 |  | 2 |
| 25 | Otero County | die 3 | 3 |  | 3 |
| 26 | USDA Natural Resources Conservation Service | flower | 4 |  | 4 |
| 27 | Hoehne School District | house efficiency | 1 |  | 1 |
| 28 | Colorado Cattlemen's Association | cow | 2 | +1 | 3 |
| 29 | Piñon Canyon Expansion Opposition Coalition | tree | 1 | +2 | 3 |
| 30 | Branson School District | house ranch | 1 | +1 | 2 |
| 31 | Not One More Acre | bird | 1 | +1 | 3 |
| 32 | Las Animas County | die 5 | 3 | +1 | 4 |
| 33 | Colorado Department of Agriculture | person farmer | 3 | +1 | 4 |
| 34 | City of Springfield | circle | 2 | -1 | 1 |
| 35 | Office Of Baca County Commission | die 6 | 3 | -1 | 2 |
| 36 | Colorado State Historic Preservation | acorn | 3 | -2 | 1 |
| 37 | Colorado Department of Natural Resources | butterfly | 3 | -2 | 1 |
| 38 | City of Rocky Ford | orbit 6 | 2 | -1 | 1 |
| 39 | City of Trinidad | circle 2 | 2 | +1 | 3 |
| 40 | City of Pueblo | orbit 3 | 5 |  | 5 |

APPENDIX F
NetLogo Setup Commands

```
directed-link-breed [active-links active-link]
directed-link-breed [inactive-links inactive-link]
turtles-own [ val new-val ] ; a node's past and current quantity,
represented as size
links-own [ current-flow ] ; the amount of quantity that has passed
through a link
    ; in a given step
globals [
    total-val ; total quantity in the system
    max-val ; maximum quantity held by a single node
in the system
    max-flow ; maximum quantity that has passed through
a link in the system
    mean-flow
; average quantity that is passing through
an arbitrary
; link in the system
```

]
;;;;;;;;;;;;;,;;;;;;;
;;; Setup Procedures ;;;
;;;;;;;;;;;;;;;;;;;;

```
to setup
    clear-all
    set-default-shape turtles "cow"
    set-default-shape links "small-arrow-link"
    layout-circle turtles (world-width / 2 - 2)
    crt number-of-nodes
    ask patches with [abs pxcor < (grid-size / 1) and abs pycor < (grid-
size / 1)]
        [ sprout 1 [ set color blue ] ]
    ; create a directed network such that each node has a LINK-CHANCE
percent chance of
    ; having a link established from a given node to one of its
neighbors
    ask turtles [
        set val 1
        let neighbor-nodes turtle-set [turtles-here] of neighbors4
        create-active-links-to neighbor-nodes
        [
            set current-flow 0
            if random-float 100 > link-chance
            [
            set breed inactive-links
                        hide-link
            ]
```

```
        ]
    ]
    ; spread the nodes out
    ask turtles [
    layout-circle turtles (world-width / 2 - 2)
    ]
    update-globals
    update-visuals
    update-histogram
end
;;;;;;;;;;;;;;;;;;;;;
;;; Main Procedure ;;;
;;;;;;;;;;;;;;;;;;;;;
to go
    ask turtles [ set new-val 0 ]
    ask turtles [
        let recipients out-active-link-neighbors
        ifelse any? recipients [
            let val-to-keep val * (1 - diffusion-rate / 100)
            ; we keep some amount of our value from one turn to the next
            set new-val new-val + val-to-keep
            ; What we don't keep for ourselves, we divide evenly among our
out-link-neighbors.
            let val-increment ((val - val-to-keep) / count recipients)
            ask recipients [
                    set new-val new-val + val-increment
                    ask in-active-link-from myself [ set current-flow val-
increment ]
            ]
        ] [
            set new-val new-val + val
        ]
    ]
    ask turtles [ set val new-val ]
    update-globals
    update-visuals
    tick
    update-histogram
    update-plots
end
to rewire-a-link
    if any? active-links [
        ask one-of active-links [
            set breed inactive-links
            hide-link
        ]
        ask one-of inactive-links [
            set breed active-links
            show-link
```

```
    ]
    ]
end
to set-shape
ask turtle 1
    [set val 1]
ask turtle 2
    [set val 1]
ask turtle 3
    [set val 1]
ask turtle 4
    [set val 1]
ask turtle 5
    [set val 2]
ask turtle 6
    [set val 1]
ask turtle 7
    [set val 3]
ask turtle 8
    [set val 6]
ask turtle 9
    [set val 3]
ask turtle 10
    [set val 6]
ask turtle 11
    [set val 5]
ask turtle 12
    [set val 2]
ask turtle 13
    [set val 4]
ask turtle 14
    [set val 4]
ask turtle 15
    [set val 4]
ask turtle 16
    [set val 1]
ask turtle 17
    [set val 3]
ask turtle 18
    [set val 3]
ask turtle 19
    [set val 2]
ask turtle 20
    [set val 2]
ask turtle 21
    [set val 2]
ask turtle 22
    [set val 4]
ask turtle 23
    [set val 5]
ask turtle 24
```

[set val 2]
ask turtle 25
[set val 3]
ask turtle 26
[set val 4]
ask turtle 27
[set val 1]
ask turtle 28
[set val 3]
ask turtle 29
[set val 3]
ask turtle 30
[set val 2]
ask turtle 31
[set val 3]
ask turtle 32
[set val 4]
ask turtle 33
[set val 4]
ask turtle 34
[set val 1]
ask turtle 35
[set val 2]
ask turtle 36
[set val 1]
ask turtle 37
[set val 1]
ask turtle 38
[set val 1]
ask turtle 39
[set val 3]
ask turtle 0
[set val 5]
end
; ; ;i;i;i;i;i;i;i;i;i;i
;i; Updates i;;
; ; ; ; ; ; ; ; ; ; ; ; ; ; ;
to update-globals
set total-val sum [ val ] of turtles
set max-val max [ val ] of turtles
if any? active-links [ set max-flow max [current-flow] of active-links set mean-flow mean [current-flow] of active-links
]
end
to update-visuals
ask turtles [ update-node-appearance ] ask active-links [ update-link-appearance ]

```
end
to update-node-appearance ; node procedure
    ; scale the size to be between 0.1 and 5.0
    set size 0.1 + 5 * sqrt (val / total-val)
end
to update-link-appearance ; link procedure
    ; scale color to be brighter when more value is flowing through it
    set color scale-color gray (current-flow / (2 * mean-flow +
0.00001)) -0.4 1
end
;;,;i,i,i,i,i,i,i,i;;
;;;update-histogram ;;;
;;;,;i;i;;;,;,i,i;i;;
to update-histogram
    set-current-plot "Histogram"
    set-plot-x-range 0 ceiling (max-val + 0.5)
    set-histogram-num-bars ceiling (sqrt (count turtles))
    histogram [val] of turtles
end
;;;;;;;;;;;;;;
;;; Plotting ;;;
;;;;;;;;;;;;;;;
to update-plots
    set-current-plot "Power Military"
ask Turtle 9
    [plot [val] of turtle 9]
ask Turtle 10
    [plot [val] of turtle 10]
ask Turtle 11
    [plot [val] of turtle 11]
    set-current-plot "Power Agriculture"
ask turtle 29
    [plot [val] of turtle 29]
ask Turtle 30
    [plot [val] of turtle 30]
ask Turtle 31
    [plot [val] of turtle 31]
end
```

```
Network Links Commands
ask turtle 1 [ create-active-link-to turtle 18]
ask turtle 1 [ create-active-link-to turtle 21]
ask turtle 1 [ create-active-link-to turtle 25]
ask turtle 1 [ create-active-link-to turtle 0]
ask turtle 2 [ create-active-link-to turtle 39]
ask turtle 2 [ create-active-link-to turtle 32]
ask turtle 2 [ create-active-link-to turtle 21]
ask turtle 3 [ create-active-link-to turtle 5]
ask turtle 3 [ create-active-link-to turtle 11]
ask turtle 3 [ create-active-link-to turtle 14]
ask turtle 3 [ create-active-link-to turtle 19]
ask turtle 3 [ create-active-link-to turtle 26]
ask turtle 3 [ create-active-link-to turtle 37]
ask turtle 4 [ create-active-link-to turtle 16]
ask turtle 4 [ create-active-link-to turtle 23]
ask turtle 4 [ create-active-link-to turtle 32]
ask turtle 5 [ create-active-link-to turtle 14]
ask turtle 5 [ create-active-link-to turtle 20]
ask turtle 5 [ create-active-link-to turtle 19]
ask turtle 6 [ create-active-link-to turtle 8]
ask turtle 6 [ create-active-link-to turtle 0]
ask turtle 6 [ create-active-link-to turtle 23]
ask turtle 6 [ create-active-link-to turtle 13]
ask turtle 7 [ create-active-link-to turtle 8]
ask turtle 7 [ create-active-link-to turtle 11]
ask turtle 7 [ create-active-link-to turtle 12]
ask turtle 7 [ create-active-link-to turtle 13]
ask turtle 7 [ create-active-link-to turtle 18]
ask turtle 8 [ create-active-link-to turtle 7]
ask turtle 8 [ create-active-link-to turtle 9]
ask turtle 8 [ create-active-link-to turtle 11]
ask turtle 8 [ create-active-link-to turtle 12]
ask turtle 8 [ create-active-link-to turtle 13]
ask turtle 9 [ create-active-link-to turtle 10]
ask turtle 9 [ create-active-link-to turtle 11]
ask turtle 10 [ create-active-link-to turtle 9]
ask turtle 10 [ create-active-link-to turtle 11]
ask turtle 10 [ create-active-link-to turtle 8]
ask turtle 10 [ create-active-link-to turtle 7]
```

ask turtle 11 [ create-active-link-to turtle 10]
ask turtle 11 [ create-active-link-to turtle 9]
ask turtle 11 [ create-active-link-to turtle 8]
ask turtle 11 [ create-active-link-to turtle 7]
ask turtle 12 [ create-active-link-to turtle 10]
ask turtle 12 [ create-active-link-to turtle 11]
ask turtle 12 [ create-active-link-to turtle 7]
ask turtle 12 [ create-active-link-to turtle 8]
ask turtle 13 [ create-active-link-to turtle 8]
ask turtle 13 [ create-active-link-to turtle 11]
ask turtle 13 [ create-active-link-to turtle 12]
ask turtle 14 [ create-active-link-to turtle 33]
ask turtle 14 [ create-active-link-to turtle 19]
ask turtle 14 [ create-active-link-to turtle 26]
ask turtle 15 [ create-active-link-to turtle 7]
ask turtle 15 [ create-active-link-to turtle 21]
ask turtle 15 [ create-active-link-to turtle 32]
ask turtle 15 [ create-active-link-to turtle 35]
ask turtle 16 [ create-active-link-to turtle 39]
ask turtle 16 [ create-active-link-to turtle 32]
ask turtle 16 [ create-active-link-to turtle 4]
ask turtle 17 [ create-active-link-to turtle 9]
ask turtle 17 [ create-active-link-to turtle 10]
ask turtle 17 [ create-active-link-to turtle 11]
ask turtle 18 [ create-active-link-to turtle 0]
ask turtle 18 [ create-active-link-to turtle 1]
ask turtle 18 [ create-active-link-to turtle 7]
ask turtle 18 [ create-active-link-to turtle 21]
ask turtle 18 [ create-active-link-to turtle 23]
ask turtle 19 [ create-active-link-to turtle 26]
ask turtle 19 [ create-active-link-to turtle 37]
ask turtle 19 [ create-active-link-to turtle 11]
ask turtle 20 [ create-active-link-to turtle 11]
ask turtle 20 [ create-active-link-to turtle 19]
ask turtle 20 [ create-active-link-to turtle 22]
ask turtle 20 [ create-active-link-to turtle 26]
ask turtle 20 [ create-active-link-to turtle 33]
ask turtle 21 [ create-active-link-to turtle 32]
ask turtle 21 [ create-active-link-to turtle 39]
ask turtle 22 [ create-active-link-to turtle 2]
ask turtle 22 [ create-active-link-to turtle 5]
ask turtle 22 [ create-active-link-to turtle 27]
ask turtle 22 [ create-active-link-to turtle 28]
ask turtle 22 [ create-active-link-to turtle 30]
ask turtle 22 [ create-active-link-to turtle 33]
ask turtle 22 [ create-active-link-to turtle 37]
ask turtle 23 [ create-active-link-to turtle 0]
ask turtle 23 [ create-active-link-to turtle 4]
ask turtle 23 [ create-active-link-to turtle 15]
ask turtle 23 [ create-active-link-to turtle 16]
ask turtle 23 [ create-active-link-to turtle 18]
ask turtle 23 [ create-active-link-to turtle 24]
ask turtle 23 [ create-active-link-to turtle 32]
ask turtle 23 [ create-active-link-to turtle 34]
ask turtle 23 [ create-active-link-to turtle 35]
ask turtle 23 [ create-active-link-to turtle 38]
ask turtle 23 [ create-active-link-to turtle 39]
ask turtle 24 [ create-active-link-to turtle 25]
ask turtle 24 [ create-active-link-to turtle 23]
ask turtle 24 [ create-active-link-to turtle 1]
ask turtle 25 [ create-active-link-to turtle 24]
ask turtle 25 [ create-active-link-to turtle 1]
ask turtle 25 [ create-active-link-to turtle 23]
ask turtle 26 [ create-active-link-to turtle 19]
ask turtle 26 [ create-active-link-to turtle 28]
ask turtle 26 [ create-active-link-to turtle 29]
ask turtle 26 [ create-active-link-to turtle 31]
ask turtle 26 [ create-active-link-to turtle 32]
ask turtle 27 [ create-active-link-to turtle 2]
ask turtle 27 [ create-active-link-to turtle 21]
ask turtle 27 [ create-active-link-to turtle 29]
ask turtle 27 [ create-active-link-to turtle 30]
ask turtle 27 [ create-active-link-to turtle 31]
ask turtle 27 [ create-active-link-to turtle 32]
ask turtle 28 [ create-active-link-to turtle 29]
ask turtle 28 [ create-active-link-to turtle 31]
ask turtle 28 [ create-active-link-to turtle 33]
ask turtle 29 [ create-active-link-to turtle 30]
ask turtle 29 [ create-active-link-to turtle 31]
ask turtle 29 [ create-active-link-to turtle 32]
ask turtle 29 [ create-active-link-to turtle 33]
ask turtle 30 [ create-active-link-to turtle 32]
ask turtle 30 [ create-active-link-to turtle 29]
ask turtle 30 [ create-active-link-to turtle 31]
ask turtle 31 [ create-active-link-to turtle 29]
ask turtle 31 [ create-active-link-to turtle 24]
ask turtle 31 [ create-active-link-to turtle 25]
ask turtle 31 [ create-active-link-to turtle 32]
ask turtle 32 [ create-active-link-to turtle 21]
ask turtle 32 [ create-active-link-to turtle 27]
ask turtle 32 [ create-active-link-to turtle 29]
ask turtle 32 [ create-active-link-to turtle 30]
ask turtle 32 [ create-active-link-to turtle 31]
ask turtle 32 [ create-active-link-to turtle 39]
ask turtle 33 [ create-active-link-to turtle 29]
ask turtle 33 [ create-active-link-to turtle 31]
ask turtle 33 [ create-active-link-to turtle 28]
ask turtle 33 [ create-active-link-to turtle 37]
ask turtle 34 [ create-active-link-to turtle 28]
ask turtle 34 [ create-active-link-to turtle 29]
ask turtle 34 [ create-active-link-to turtle 31]
ask turtle 34 [ create-active-link-to turtle 35]
ask turtle 34 [ create-active-link-to turtle 32]
ask turtle 35 [ create-active-link-to turtle 34]
ask turtle 35 [ create-active-link-to turtle 32]
ask turtle 35 [ create-active-link-to turtle 28]
ask turtle 35 [ create-active-link-to turtle 25]
ask turtle 36 [ create-active-link-to turtle 3]
ask turtle 36 [ create-active-link-to turtle 37]
ask turtle 36 [ create-active-link-to turtle 15]
ask turtle 36 [ create-active-link-to turtle 19]
ask turtle 37 [ create-active-link-to turtle 22]
ask turtle 37 [ create-active-link-to turtle 5]
ask turtle 37 [ create-active-link-to turtle 33]
ask turtle 38 [ create-active-link-to turtle 25]
ask turtle 38 [ create-active-link-to turtle 1]
ask turtle 38 [ create-active-link-to turtle 24]
ask turtle 39 [ create-active-link-to turtle 32]
ask turtle 39 [ create-active-link-to turtle 11]
ask turtle 39 [ create-active-link-to turtle 21]
ask turtle 39 [ create-active-link-to turtle 2]
ask turtle 0 [ create-active-link-to turtle 23]
ask turtle 0 [ create-active-link-to turtle 18]

Set Shape Command
ask turtle 30
[ set color 25 set shape "book" set val 2]
ask turtle 29
[ set color 9.9 set shape "tree" set val 3]
ask turtle 31
[ set color 9.9 set shape "bird" set val 3]
ask turtle 28
[ set color 9.9 set shape "cow" set val 3]
ask turtle 32
[ set color 45 set shape "die 5" set val 4]
ask turtle 27
[ set color 25 set shape "house efficiency" set val 1]
ask turtle 33
[ set color 65 set shape "person farmer" set val 4]
ask turtle 26
[ set color 95 set shape "flower" set val 4]
ask turtle 34
[ set color 15 set shape "circle" set val 1]
ask turtle 25
[ set color 45 set shape "die 3" set val 3]
ask turtle 35
[ set color 45 set shape "die 6" set val 2]
ask turtle 24
[ set color 15 set shape "orbit 5" set val 2]
ask turtle 36

```
    [ set color 65
        set shape "acorn"
        set val 1]
ask turtle 23
    [ set color 45
        set shape "die 2"
        set val 5]
ask turtle 37
    [ set color 65
        set shape "butterfly"
        set val 1]
ask turtle 22
    [ set color 65
        set shape "cactus"
        set val 4]
ask turtle 38
    [ set color 15
        set shape "orbit 6"
        set val 1]
ask turtle 21
    [ set color 9.9
        set shape "chess knight"
        set val 2]
    ask turtle 39
    [ set color 15
        set shape "circle 2"
        set val 3]
    ask turtle 20
    [ set color 95
        set shape "tile stones"
        set val 2]
    ask turtle 0
    [ set color 15
        set shape "orbit 3"
        set val 5]
    ask turtle 19
    [ set color 95
        set shape "tree pine"
        set val 2]
    ask turtle 1
    [ set color 9.9
        set shape "chess pawn"
        set val 1]
    ask turtle 18
    [ set color 9.9
        set shape "chess bishop"
        set val 3]
    ask turtle 2
    [ set color 25
        set shape "house two story"
        set val 1]
    ask turtle 17
```

```
    [ set color 95
        set shape "tile water"
        set val 3]
ask turtle 3
    [ set color 65
        set shape "squirrel"
        set val 1]
ask turtle 16
    [ set color 45
        set shape "die 4"
        set val 1]
ask turtle 4
    [ set color 15
        set shape "orbit 4"
        set val 1]
ask turtle 15
    [ set color 95
        set shape "chess king"
        set val 4]
ask turtle 5
    [ set color 65
        set shape "hawk"
        set val 2]
    ask turtle 14
    [ set color 65
        set shape "fish"
        set val 4]
    ask turtle 6
    [ set color 65
        set shape "wheel"
        set val 1]
    ask turtle 13
    [ set color 45
        set shape "die 1"
        set val 4]
    ask turtle 7
    [ set color 9.9
        set shape "chess king"
        set val 3]
    ask turtle 12
    [ set color 15
        set shape "orbit 2"
        set val 2]
    ask turtle 8
    [ set color 15
        set shape "orbit 1"
        set val 6]
    ask turtle 11
    [ set color 95
        set shape "star"
        set val 5]
    ask turtle 9
```

```
    [ set color 95
        set shape "pentagon"
        set val 3]
ask turtle 10
    [ set color 95
        set shape "tank"
        set val 6]
```

Behavior Space Test Variables
["link-chance" 0]
["diffusion-rate" 12]
["number-of-nodes" 15]
["grid-size" 3]

```
BENZ Position Command
ask turtle 0 [move-to patch -1 10]
ask turtle 1 [move-to patch 1 10]
ask turtle 2 [move-to patch 2 9]
ask turtle 3 [move-to patch 3 8]
ask turtle 4 [move-to patch 4 7]
ask turtle 5 [move-to patch 5 6]
ask turtle 6 [move-to patch 6 5]
ask turtle 7 [move-to patch 7 4]
ask turtle 8 [move-to patch 7 3]
ask turtle 9 [move-to patch 7 2]
ask turtle 10 [move-to patch 7 1]
ask turtle 11 [move-to patch 7 -1]
ask turtle 12 [move-to patch 7 -2]
ask turtle 13 [move-to patch 7 -3]
ask turtle 14 [move-to patch 7 -4]
ask turtle 15 [move-to patch 6 -5]
ask turtle 16 [move-to patch 5 -6]
ask turtle 17 [move-to patch 4 -7]
ask turtle 18 [move-to patch 3-8]
ask turtle 19 [move-to patch 2 -9]
ask turtle 20 [move-to patch 1 -10]
ask turtle 21 [move-to patch -1 -10]
ask turtle 22 [move-to patch -2 -9]
```

```
ask turtle 23 [move-to patch -3 -8]
ask turtle 24 [move-to patch -4 -7]
ask turtle 25 [move-to patch -5 -6]
ask turtle 26 [move-to patch -6 -5]
ask turtle 27 [move-to patch -7 -4]
ask turtle 28 [move-to patch -7 -3]
ask turtle 29 [move-to patch -7 -2]
ask turtle 30 [move-to patch -7 -1]
ask turtle 31 [move-to patch -7 1]
ask turtle 32 [move-to patch -7 2]
ask turtle 33 [move-to patch -7 3]
ask turtle 34 [move-to patch -7 4]
ask turtle 35 [move-to patch -6 5]
ask turtle 36 [move-to patch -5 6]
ask turtle 37 [move-to patch -4 7]
ask turtle 38 [move-to patch -3 8]
ask turtle 39 [move-to patch -2 9]
```

APPENDIX G

Link Justification Matrix

| AGENT | STAKEHOLDER LINK | $\frac{\begin{array}{l} \text { AGENT \# } \\ \text { LINKED } \end{array}}{\text { TO }}$ | Source/Justification |
| :---: | :---: | :---: | :---: |
| 1 | La Junta Chamber of Commerce |  |  |
|  | Pueblo Chamber of Commerce | 18 | Not One More Acre Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  | Las Animas County Chamber of Commerce | 21 | Not One More Acre Interview |
|  |  |  | http://www.lajuntatribunedemocrat.com/homepage/x10908221273/Chamber-of-Commerce-banquet |
|  | City of LaJunta | 24 | Not One More Acre Interview |
|  |  |  | http://www.lajuntachamber.com/ |
|  | Otero County | 25 | Not One More Acre Interview |
|  |  |  | http://www.lajuntachamber.com/ |
|  | City of Pueblo | 40 | City of Pueblo Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  |  |  | La Junta Chamber is tied to Pueblo and the Pueblo Chamber as the closest economic hub. It ties to Otero County and the City of La Junta are central to its mission. These Links focus on primarily on economic and second to social connections. |
| 2 | Trinidad School District |  |  |
|  | Las Animas County Chamber of Commerce | 21 | http://www.trinidadchamber.com/community_resource_guide.html |
|  |  |  | http://www.tsd1.org/Resources/Community-Resources.html |
|  | Las Animas County | 32 | City of Trinidad Interview |
|  |  |  | http://www.tsd1.org/index.php?option=com_k2\&view=item\&task=download\&id=46 |
|  | City of Trinidad | 39 | City of Trinidad Interview |
|  |  |  | http://www.tsd1.or//Administration/Board-of-Education/Belief-Statements.html |
|  |  |  | The Trinidad School District is tied to the Chamber of Commerce as a relationship dependent on the base education of local citizens into the community. The School District as the largest in Las Animas County is tied to the county government for services and regulatory processes. The School District is the primary public education provider to the City of Trinidad. |
| 3 | Colorado State Parks |  |  |
|  | Colorado Division of Wildlife | 5 | http://dn.state.co.us/ |
|  |  |  | http://www.koaa.com/news/state-parks-wildifife-agencies-to-merge-july-1/ |
|  | Commanding General Fort Carson | 11 | Doe Interview |
|  |  |  | hhtp://www.ppacg.org/files/Military_Impact/Fort_Carson_Growth/Project_Materials/Growth_Plan/Phase_I_Vol_2_Sections/FCRGP_2008_TechRep_Compatibility.pdf |
|  | USDOI Fish and Wildifif Service | 14 | Doe Interview |
|  |  |  | http://www.dtic.mi//cgi-bin/GetTRDoc?AD=ADA482607 |
|  | San Isabel National Forest and Comanche National Grassland | 19 | http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA482607 |
|  |  |  | USDA-USFS Interview |
|  | USDA Natural Resources Conservation Service | 26 | http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA482607 |
|  |  |  | http://www.coloradoopenlands.org/sit//ourWork/landProtection/peakToPrairie/index.php |
|  | Colorado Department of Natural Resources | 37 | http://dmr.state.co.us/ |
|  |  |  | http://www.koaa.com/news/state-parks-wildifife-agencies-to-merge-july-1/ |
|  |  |  | The network of natural resource agencies in Colorado is complex and compounded by the consolidation of Colorado State Parks and Colorado Division of Wildlife in 2011. Colorado State Parks and Wildlife are merging offices and responsibilities. The links for Colorado State Parks is based on interviews and existing partnerships. |
| 4 | Citv of Walsenburg |  |  |
|  | Huerfano County | 16 | http://www.cityofwalsenburg.com/ |
|  |  |  | http://www.carson.army.mil/FortCarson2010/text/pinon/research_report.pdf |
|  | Pueblo County | 23 | City of Pueblo Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  | Las Animas County | 32 | Piñon Canyon Expansion Opposition Coalition Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  |  |  | The city of Walsenburg sits halfway between Pueblo and Trinidad and has commerce ties to both through a long history of coa lmining and agriculture. The city has stronger ties to the surrounding rural county communities with several family ties well as serving as a smaller economic hub alternative to Pueblo and Trinidad. |
| 5 | Colorado Division of Wildlife |  |  |
|  | USDOI Fish and Wildlife Service | 14 | Colorado Division of Wildlife Interview |
|  |  |  | USDA-USFS Interview |
|  | San Isabel National Forest and Comanche National Grassland | 19 | Colorado Division of Wildlife Interview |
|  |  |  | USDA-USFS Interview |
|  | USDOI Bureau of Land Management | 20 | http:/wildlifif.state.co.us/SiteCollectionDocuments/DOW/WildlifeSpecies/Grasslands/wholeplan.pdf |
|  |  |  | http://www.coloradoopenlands.org/_pdfs/our\%20work/peak\%200to\%20prairie\%20conservation\%20document.pdf |
|  |  |  | The network of natural resource agencies in Colorado is complex and compounded by the consolidation of Colorado State Parks and Colorado Division of Wildlife in 2011. Colorado Division of Wildlife tended to have strong ties with federal partners on several issues ranging from hazardous fuels to wildlife protection. |
| 6 | Colorado Department of Transportation |  |  |
|  | City of Pueblo | 0 | City of Pueblo Interview |
|  |  |  | http://www.lajuntatribunedemocrat.com/homepage/x1157491302/The-Department-of:Local-Affairs-mets-with-council?zc_p=1 |
|  | City of Colorado Springs | 8 | http://www.coloradodot.info/programs/statewide-planning/documents/2035PPlanAmendmentMay2011_Final_full.pdf |
|  |  |  | http://www.coloradospringschamber.org/military/pdf/Fort\%20Carson\%\%20Reg\%20Growth\%20Plan_draft_voll_0508.pdf |
|  | El Paso County | 13 | http://ppacg.org/committees/ransportation/ransportation-advisory-committe-tac |
|  |  |  |  |
|  | Pueblo County | 23 | http://www.coloradodot.info/programs/statewide-planning/documents/2035PlanAmendmentMay2011_Final_full.pdf |
|  |  |  | http://www.lajuntatribunedemocrat.com/homepage/x 1157491302/The-Department-of-Local-Affairs-meets-with-council?zc_p=1 |
|  |  |  | The Colorado Department of Transportation regional priorities and coordination activities focus on population centers and where the need is greatest. Within the group of stakeholders the Counties of EI Paso and Pueblo are the centers of population. |


| AGENT | STAKEHOLDER LINK | $\frac{\begin{array}{l} \text { AGENT \# } \\ \text { LINKED } \end{array}}{\text { TO }}$ | Source/Justification |
| :---: | :---: | :---: | :---: |
| 7 | Colorado Springs Chamber of Commerce |  |  |
|  | City of Colorado Springs | 8 | http://www.coloradospringschamber.org/military/pdffFort\%20Carson\%20Reg\%20Growth\%20Plan_drati_voll_0508.pdf |
|  |  |  | http://www.leg.state.co.us/Clics/Clics2007A/commsumm.nsf/b4a3962433652fa787256e5ff00670a71/f0699631246d1c7b872572b8006a5c97?OpenDocument |
|  | Commanding General Fort Carson | 11 | http://www.coloradospringschamber.org/military/pdf/Fort\%20Carson\%\%20Reg\%20Growth\%20Plan_drati_voll _ 0508. pdf |
|  |  |  | http://www.carson.army.mil/FortCarson2010/text/pinon/research_report.pdf |
|  | City of Fountain | 12 | http://www.coloradospringschamber.org/military/pdf/Fort\%20Carson\%20Reg\%20Growth\%20Plan_draft_voll_0508.pdf |
|  |  |  | http://www.coloradospringschamber.org/chamber/partners.asp |
|  | El Paso County | 13 | http://www.coloradospringschamber.ory/military/pdff/rort\%20Carson\%20Reg\%20Growth\%20Plan_draft_voll_0508.pdf |
|  |  |  | http://www.leg.state.co.us/Clics/Clics2007A/commsumm..nsf/b4a39624336522fa787256esf00670a71/ff0699631246d1c7b87257268006a5c97?OpenDocument |
|  | Pueblo Chamber of Commerce | 18 | http://www.coloradospringschamber.org/military/pdf/Fort\%20Carson\%20Reg\%20Growh\%/20Plan_draft_voll_0508.pdf |
|  |  |  | http://southerncoloradobusinesspartnership.com/Partners. html |
|  |  |  | While the focus of the Colorado Springs chamber is on Colorado Springs and El Paso County, the importance of Pueblo as a southern neighbor has grown as the two counties become increasingly networked. |
| 8 | Ciity of Colorado Springs |  |  |
|  | Colorado Springs Chamber of Commerce | 7 | http://www.leg.state.co.us/Clics/Clics2007A/commsumm.nsf/b4a3962433652fa787256esf00670a71/f0699631246d1c76872572b8006a5cc97?OpenDocument |
|  |  |  | http://www.coloradospringschamber.org/chamber/partners.asp |
|  | Deputy Under Secretary of Defense for Installations and Environment | 9 | http://www.defensecommunities.org/headlines/conservation-programs-provide-ft-carson-ample-buffer-from-community/\# |
|  |  |  | http://www.defensecommunities.org/headlines/army-taps-carson-lewis-mcchord-wainwright-for-new-units/\# |
|  | Commanding General Fort Carson | 11 | http://www.coloradospringschamber.ory/military/pdffFort\%20Carson\%20Reg\%20Growth\%20Plan_draft_voll_0508.pdf |
|  |  |  | http://www.springsgov.com/links.aspx?sectionid=23 |
|  | City of Fountain | 12 | http://www.coloradospringschamber.ory/military/pdf/Fort\%20Carson\%20Reg\%20Growth\%20Plan_draft_voll_0508.pdf |
|  |  |  | http://www.springsgov.com/files/annexplan06.pdf |
|  | El Paso County | 13 | http://www.coloradospringschamber.ory/military/pdffFort\%20Carson\%20Reg\%\%20Growth\%20Plan_draft_voll_0508.pdf |
|  |  |  | The City of Colorado Springs is tied via economics, social, and political links to Fort Carson. The city is a strong supporter of the local chamber, and the Department of Defense system that supports it. |
| 9 | Deputy Under Secretary of Defense for Installations and Environment |  |  |
|  | Assistant Secretary of the Army for Installations, Energy and Environment | 10 | Department of the Army Interview |
|  |  |  | http://www.gao.gov/assets/290/284826.pdf |
|  |  |  | http://leeds.colorado.edu/asse/frrd/coloradoeconomicoppportunities.pdf |
|  | Commanding General Fort Carson | 11 | http://www.gpo.gov//dsys/pkg/CHRG-11 lhhrg52667/htm//CHRG-111 hhrg52667.htm |
|  |  |  | http://www.defense.gov/pubs/BSR_2008_Baseline.pdf |
|  |  |  | Fort Carson's most valuable assets are its training ranges that the Department of Defense hopes to expand. |
| 10 | Assistant Secretary of the Army for Installations, Energy and Environment |  |  |
|  | Colorado Springs Chamber of Commerce | 7 | Department of the Army Interview |
|  |  |  | htt://www.asaie.army.mi/Public/IE/doc/BG_Aycock_Energy_Security_Panel_Brief_V12_W-O_NOTES.pdf |
|  | City of Colorado Springs | 8 | Department of the Army Interview |
|  |  |  | http://www.asaie.army.mil/Public/IE/doc/BG_Aycock_Energy_Security_Panel_Brief_V12_W-O_NOTES.pdf |
|  | Deputy Under Secretary of Defense for Installations and Environmen | 9 | Department of the Army Interview |
|  |  |  | http://www.gpo.gov//dsys//pkg/CHRG-11 1hhrg49449/hm//CHRG-11 lhhrg $49449 . \mathrm{htm}$ |
|  | Commanding General Fort Carson | 11 | http://www.gpo.gov//dsys/pkg/CHRG-111 hhrg52667/htm//CHRG-11 lhhrg 52667.htm |
|  |  |  | http://www.army.mi//article/18402/ |
|  |  |  | Fort Carson's most valuable assets are it training ranges that the Department of the Army hopes to expand. |
| 11 | Commanding General Fort Carson |  |  |
|  | Colorado Springs Chamber of Commerce | 7 | Department of the Army Interview |
|  |  |  | http:/www.carson.army.mil/FortCarson2010/text/pinon/research_report.pdf |
|  | City of Colorado Springs | 8 | Department of the Army Interview |
|  |  |  | http://www.carson.army.mil/FortCarson2010/tex//pinon/research_report.pdf |
|  | Deputy Under Secretary of Defense for Installations and Environmen | 9 | Department of the Army Interview |
|  |  |  | http://www.gpo.gov//dsys//pkg/CHRG-1 1 hhrr94949/htm//CHRG-11 1 hhrs $49449 . \mathrm{htm}$ |
|  | Assistant Secretary of the Army for Installations, Energy and Environment | 10 | Department of the Army Interview |
|  |  |  | http://edocket.access.gpo.gov/2007/pdf/07-3912.pdf |
|  |  |  | Fort Carson enjoys a strong relationship with the local community and is dependent upon the Department of the Army and Department of Defense |
| 12 | City of Fountain |  |  |
|  | Colorado Springs Chamber of Commerce | 7 | http://www.coloradospringschamber.ory/chamber/partners.asp |
|  |  |  | http://www.coloradospringschamber.org/military/pdff/rort\%20Carson\%\%20Reg\%20Growth\%20Plan_drati_voll_0508.pdf |
|  | City of Colorado Springs | 8 | http://www.springsgov.com/files/annexplan06.pdf |
|  |  |  | http://www.coloradospringschamber.org/military/pdffFort\%20Carson\%20Reg\%20Growth\%20Plan_drat_ voll _0508.pdf |
|  | Assistant Secretary of the Army for Installations, Energy and Environment | 10 | Department of the Army Interview |
|  |  |  | http://www.carson.army.mil/FortCarson2010/text/pinon/research_report.pdf |
|  | Commanding General Fort Carson | 11 | http://www.fountaincolorado.org/egov/docs/1306189609_602447.pdf |
|  |  |  | http://www.fountaincolorado.org/egov/docs/1176765928_661743.pdf |
|  |  |  | As a bedroom community south of Colorado Springs, the City of Fountain shares a school district with Fort Carson. The base and community are tightly linked though it's economy is diversified outside of the military. |
| 13 | El Paso County |  |  |
|  | City of Colorado Springs | 8 | http://www.coloradospringschamber.org/military/pdf/Fort\%20Carson\%20Reg\%20Growth\%20Plan_drat_ voll_0508.pdf |
|  |  |  | http://www.elpasoco.com/About_elpaso_county.asp |
|  | Commanding General Fort Carson | 11 | http:/www.carson.army.mil/FortCarson2010/text/pinon/research_report.pdf |
|  |  |  | Department of the Army Interview |
|  | City of Fountain | 12 | http://www.coloradospringschamber.ory/military/pdf/Fort\%20Carson\%20Reg\%20Growth\%20Plan_draft_voll_0508.pdf |
|  |  |  | http://www.elpasoco.com/About_elpaso_county.asp |
|  |  |  | El Paso County has its strongest links to its two largest communities of Colorado Springs and Fountain. As the largest employer in El Paso County, Fort Carson is one of the largest stakeholders. |


| AGENT | STAKEHOLDER LINK | $\begin{array}{\|c} \frac{\text { AGENT \# }}{\text { LINKED }} \\ \hline \text { TO } \\ \hline \end{array}$ | Source/Justification |
| :---: | :---: | :---: | :---: |
| 14 | USDOI Fish and Wildlife Service |  |  |
|  | Huerfano County | 16 | http://projects.propublica.org/recovery/l/cale/colorado/huerfano |
|  |  |  | http://www.huerfanjojurral.com/node/2286 |
|  | San Isabel National Forest and Comanche National Grassland | 19 | http://www.fs.fed.us/outernet/r2/psicic/publications/amendments/amend_24_picketwire_canyon.pdf |
|  |  |  | http://www.crhp.colostate.edu/download/documents/2006/CSP_FFinal_Report_2006.pdf |
|  | Colorado Department of Agriculture | 33 | Colorado Department of Agriculture Interview |
|  |  |  | htp://www.nasda.org/nasda/nasda/foundation/state/Colorado.pdf |
|  |  |  | http://wildlife.state.co.us/SiteCollectionDocuments/DOW/WildlifeSpecies/Grassland/wholeplan.pdf |
|  |  |  | The U.S. Fish and Wildlife Service, while tied to a number of partners across varying initiatives, is tied to Huerfano County as a major source of funding. The Cooperative Conservation Partnership Initiative Citizens for Huerfano County are active in their own right similar to PCEOC. The partnerships with the USFS and Colorado Department of Agriculture reflect not only ties via Pinon Canyon but to larger state issues as well. |
| 15 | Advisory Council on Historic Preservation |  |  |
|  | Colorado Springs Chamber of Commerce | 7 | http://www.preserveamerica.gov/06-23-08PAcommunity-coloradospringsCO.html |
|  |  |  | http://visitcos.com/news/tag/historic-destinations/ |
|  | USDOI Bureau of Land Management | 21 | http//www.achp.gov/blm.html |
|  |  |  | http://www.achp.gov/docs/Section3\%20Report2-24-09FINAL.pdf |
|  | Not One More Acre | 32 | http///issuu.com/coloradopreservation/docs/ranching-survey-report |
|  |  |  | http://www.csindy.com/colorado/making-an-impression/Content?oid=2005522 |
|  | City of Springfield | 35 | htpp//coloradopreservation.org/risurvey/rural/baca/index.html |
|  |  |  | http://www.preserveamerica.gov/cobaca.html |
|  |  |  | ACHP supports communities based on preservation need. While it does not side with groups over issues, it does develop strong partnerships. ACHP's support of the Comanche National Grasslands are more critical to Springfield and Baca County as they provide a historic resources that forms ecological and cultural tourism. |
| 16 | Huerfano County |  |  |
|  | City of Walsenburg | 4 | htp://www.huerfano.us/Home_Page.html |
|  |  |  | http://www.cityofwalsenburg.com/ |
|  | Las Animas County | 32 | City of Trinidad Interview |
|  |  |  | http:/sccog.net/AboutUs. html |
|  | City of Trinidad | 39 | City of Trinidad Interview |
|  |  |  | http://scoog.net/AboutUs.html |
|  |  |  | Huerfano County is offen thought as an outlier to the Piñon Canyon issue. The county, it's economy, social and family ties are very close to its southerrn neighbor. |
| 17 | Environmental Protection Agency |  |  |
|  | Deputy Under Secretary of Defense for Installations and Environment | 9 | http://www.epa.gov/ORD/memo_of_understanding.pdf |
|  |  |  | Department of the Army Interview |
|  | Assistant Secretary of the Army for Installations, Energy and Environment | 10 | http://www.army.mi/article/70009/ |
|  |  |  | Department of the Army Interview |
|  | Commanding General Fort Carson | 11 | http://www.epa.gov/greenpower/documents/top 10federal_2009.pdf |
|  |  |  | Department of the Army Interview |
|  |  |  | The Environmental Protection Agency's responsibility of maintaining and enforcing national standards at all levels of government especially environmental protection as part of U.S. policies concerning natural resources, human health, economic growth, energy, transportation, agriculture, industry are tied at this level with the Defense Department and Army. |
| 18 | Pueblo Chamber of Commerce |  |  |
|  | City of Pueblo | 0 | http://www.pueblochamber.ory/chamber-info |
|  |  |  | http://www.pedco.org/content/our-partners |
|  | La Junta Chamber of Commerce | 1 | Not One More Acre Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  | Colorado Springs Chamber of Commerce | 7 | http://www.coloradospringschamber.org/military/pdf/Fort\%20Carson\%20Reg\%20Growth\%20Plan_draft_voll_0508.pdf |
|  |  |  | http://www.defensecommunities.orghheadlines/ft-carson-looks-to-pueblo-depot-to-help-accommodate-new-brigade/t |
|  |  |  | http://www.landsofkansas.com/resources/articles.cfim/News/Colorado/Pueblo-chamber-backs-Army-studies-of-Pinon-Canyon/ |
|  | Las Animas County Chamber of Commerce | 21 | http://southerncoloradobusinesspartnership.com/Partners. html |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  | Pueblo County | 23 | http://www.pueblochamber.org/chamber-info |
|  |  |  | http://www.pedco.org/content/our-partners |
| 19 | San Isabel National Forest and Comanche National Grassland |  |  |
|  | Commanding General Fort Carson | 11 | USDA-USFS Interview |
|  |  |  | http://www.fs..usda.gov/Internet/FSE_DOCUMENTS/stelprib5209204.pdf |
|  | USDA Natural Resources Conservation Service | 26 | USDA-USFS Interview |
|  |  |  | http://www.rurdev.usda.gov/co/FY09EngineerResources/08\%20Important\%20Rangelands\%20\&\%20National\%20Grasslands.pdf |
|  | Colorado Department of Natural Resources | 37 | USDA-USFS Interview |
|  |  |  | http://www.ff. .usda.gov/Internet/FSE_DOCUMENTS/stelprib5209204.pdf |
|  |  |  | The Comanche National Grassland along with its USDA partner NRCS, ties both to the Army and to the ranchers via NRCS. The link to CDNR is through the umbrella of sub bureaucracies to the agency. |


| AGENT | STAKEHOLDER LINK | $\begin{array}{\|c} \frac{\text { AGENT } \#}{\text { LINKED }} \\ \text { TO } \\ \hline \end{array}$ | Source/Justification |
| :---: | :---: | :---: | :---: |
| 20 | USDOI Bureau of Land Management |  |  |
|  | Commanding General Fort Carson | 11 | http://www.blm.gov/co/st/en//BLM_Information/newsroom/2011/september/fort_carson_and_pinon.html |
|  |  |  | Department of the Army Interview |
|  | San Isabel National Forest and Comanche National Grassland | 19 | http://www.blm.gov//pgdata/etc/medialib/blm/co/resources/resource_advisory/front_range_ rac.Par.5555.File.dat/racminmarch-07a.pdf |
|  |  |  | http://www.blm.gov/pgdata/et/medialib/blm/co/resources/resource_advisory/front_range__rac.Par.82500.File.dat/racminmay-07.pdf |
|  | Colorado State Land Board | 22 | Colorado Board of Land Commissioners Interview |
|  |  |  | http://trustlands.state.co.us/SSctions/FieldOperations/Pages/FAQs.aspx |
|  | USDA Natural Resources Conservation Service | 26 | http://www.blm.gov/nstc/library/pdf/1734-6rev05.pdf |
|  |  |  | USDA-USFS Interview |
|  | Colorado Department of Agriculture | 33 | Colorado Department of Agriculture Interview |
|  |  |  | http://www.gpo.gov//dsys//pkg/CHRG-11 1 shrg48311/htm/CHRG-11 1 shrg483111.htm |
|  |  |  | Secretary of the Interior Salazar has a complicated problem with Piñon Canyon while being strong on the environmental concerns with Pinon Canyon The BLM also counts on the Army to prevent any adverse entry under mining laws and provide a consistant uninterupped use of lands. The obvious link with Agriculture on the land management side is also tightened with the relationship between the Secretary of the Interior and Commissioner of Agriculture who are brothers. |
| 21 | Las Animas County Chamber of Commerce |  |  |
|  | Las Animas County | 32 | http://www.chieftain.com/news/local/rinidad-chamber-opposes-pinon-expansion/article_c6cbb5e6-4d29-11e0-8eaa-001cc4c03286.html |
|  |  |  | http://www.chieftain.com/n/ews/local/pinon-expansion-foes-oppose-army-covenant/article_c76cbld6-13df-11e0-9680-001cc44002e0.html? |
|  | City of Trinidad | 39 | http://www.trinidadchamber.com/about_ the_chamber.html |
|  |  |  | http://www.tlac.net/about_us.html |
|  |  |  | The Chamber of Commerce walks a fine line between supporting the ranchers in the county and supporting any business the community can receive from the Army. The Chamber views both economic development and economic protection as its mission. |
| 22 | Colorado State Land Board |  |  |
|  | Trinidad School District | 2 | http://www.trustlands.state.co.us/Documents/10-2010_board_packet.pdf |
|  |  |  | Colorado Board of Land Commissioners Interview |
|  | Colorado Division of Wildlife | 5 | http://dr.s.state.co.us/ |
|  |  |  | http:///sfs.colostate.edu/pages/csf.programs.html |
|  | Hoehne School District | 27 | Colorado Board of Land Commissioners Interview |
|  |  |  | http://www.trustlands.state.co.us/Documents/10-2010_board_packet.pdf |
|  | Colorado Cattlemen's Association | 28 | Colorado Board of Land Commissioners Interview |
|  |  |  | htp://trustlands.state.co.us/Documents/December\%202010\%20Board\%20Packet.pdf |
|  | Branson School District | 30 | Colorado Board of Land Commissioners Interview |
|  |  |  | http://www.trustlands.state.co.us/Documents/10-2010_board_packet.pdf |
|  | Colorado Department of Agriculture | 33 | Colorado Department of Agriculture Interview |
|  |  |  | http://trustlands.state.co.us/Documents/FY\%202009-10\%20Annual\%20Report.pdf |
|  | Colorado Department of Natural Resources | 37 | http://dnr.state.co.us/ |
|  |  |  | Colorado Board of Land Commissioners Interview |
|  |  |  | In addition to the interview point to the large amount of State Trust Lands in the County and the impact on the local economy. Trinidad, Branson and Hoehne's income from the state in addition to its proximity to Chancellor Ranch and its evolving status in relation to the land board are also considered and noted by the Commission. The relationship with other state agencies is well documented. |
| 23 | Pueblo County |  |  |
|  | City of Pueblo | 0 | City of Pueblo Interview |
|  |  |  | http://www.pedco.org/content/our-partners |
|  | City of Walsenburg | 4 | City of Pueblo Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  | Advisory Council on Historic Preservation | 15 | http://county.pueblo.org/history/museums-landmarks |
|  |  |  | http://www.preserveamerica.gov/PAcommunity-puebloCO.html |
|  | Huerfano County | 16 | City of Pueblo Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  | Pueblo Chamber of Commerce | 18 | City of Pueblo Interview |
|  |  |  | http://www.pedco.org/content/our-parters |
|  | City of LaJunta | 24 | City of Pueblo Interview |
|  |  |  | http://www.scedd.com/about_us.htm |
|  | Las Animas County | 32 | City of Pueblo Interview |
|  |  |  | http://www.scedd.com/about_us.htm |
|  | City of Springfield | 34 | City of Pueblo Interview |
|  |  |  | http://www.scedd.com/about_us.htm |
|  | Baca County | 35 | City of Pueblo Interview |
|  |  |  | http://www.scedd.com/about_us.htm |
|  | City of Rocky Ford | 38 | City of Pueblo Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  | City of Trinidad | 39 | City of Pueblo Interview |
|  |  |  | Pueblo County and the City of Pueblo are tied together by two very strong government systems. While Colorado tends to have strong counties, the relationship between the city and county is most likely the strongest in the State after Colorado Springs/El Paso. The county government serves as a both an outward network to the smaller surrounding counties and a form of insulation to the city. |


| AGENT | STAKEHOLDER LINK | $\begin{array}{\|c} \hline \frac{\text { AGENT } \#}{\text { LINKED }} \\ \hline \text { TO } \\ \hline \end{array}$ | Source/Justification |
| :---: | :---: | :---: | :---: |
| 24 | City of LaJumta |  |  |
|  | La Junta Chamber of Commerce | 1 | Not One More Acre Interview |
|  |  |  | http://www.lajuntachamber.com/htm/about_us.html |
|  | Pueblo County | 23 | Not One More Acre Interview |
|  |  |  | http://www.scedd.com/about_us.htm |
|  | Otero County | 25 | Not One More Acre Interview |
|  |  |  | http://www.scedd.com/about_us.htm |
| 25 | Otero County |  | The City of La Junta is the first major sattelite community east of Pueblo. The ties to Pueblo can be found in the commerce that flows to the west as much as the water does to the east. La Junta situated east of Pueb;o's major Industrial Park provides a rural option for living less than 40 minutes away. |
|  | La Junta Chamber of Commerce | 1 | Not One More Acre Interview |
|  |  |  | http://www.lajuntachamber.com/htm/about_us.html |
|  | Pueblo County | 23 | Not One More Acre Interview |
|  |  |  | http://www.scedd.com/about_us.htm |
|  | City of LaJunta | 24 | Not One More Acre Interview |
|  |  |  | http://www.lajuntatribunedemocrat.com/news/x/1203794012/Otero-County-doesnt-agree-with-no-adverse-fffect-finding-at-Pinon-Canyon-site |
|  |  |  | The Otero County, like it's county seat La Junta iprovides a number of rural sattelite communities east of Pueblo. The ties to Pueblo can be found in the commerce, jobs, and education opportunites that are west in Pueblo County. Otero County and its proximity to the Pueblo Industrial Park and Pueblo Depot Activity make it a rura/bedroom location for Pueblo. |
| 26 | USDA Natural Resources Conservation Service |  |  |
|  | San Isabel National Forest and Comanche National Grassland | 19 | USDA Natural Resources Conservation Service Interview |
|  |  |  | http://www.rurdev.usda.gov/co/FY09EngineerResources/08\%20Important\%20Rangelands\%20\&\%20National\%20Grasslands.pdf |
|  | Colorado Cattlemen's Association | 28 | USDA Natural Resources Conservation Service Interview |
|  |  |  | http://www.coloradocattle.org/crmicontact.aspx |
|  | Piñon Canyon Expansion Opposition Coalition | 29 | USDA Natural Resources Conservation Service Interview |
|  |  |  | http://www.fws.gov/mountain-prairie/pfw/colorado/co35.htm |
|  | Not One More Acre | 31 | USDA Natural Resources Conservation Service Interview |
|  |  |  | http://www.fws.gov/mountain-prairie/pfw/colorado/co35.htm |
|  | Las Animas County | 32 | USDA Natural Resources Conservation Service Interview |
|  |  |  | http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1178305637691 |
|  |  |  | The NRCS mission of ensuring private lands are conserved and restored with priority work directed toward landowners naturally aligns the agency with the ranchers and cattlemen. The agency's sister bureaucracy, the forest service also ties them together. |
| 27 | Hoehne School District |  |  |
|  | Trinidad School District | 2 | City of Trinidad Interview |
|  |  |  | http://sc-boces.org/ |
|  | Las Animas County Chamber of Commerce | 21 | www.carson.army.mil/FortCarson2010/text/pinon/research_report.pdf |
|  |  |  | http://trinidadcf.org/ |
|  | Piñon Canyon Expansion Opposition Coalition | 29 | Piñon Canyon Expansion Opposition Coalition Interview |
|  |  |  | http://www.carson.army.mi//FortCarson2010/text/pinon/research_report.pdf |
|  | Branson School District | 30 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Not One More Acre | 31 | Not One More Acre Interview |
|  |  |  | http://www.carson.army.mi//FortCarson2010/tex/pinon/research_report.pdf |
|  | Las Animas County | 32 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  |  |  | Of all the bureaucracies in peril, none are more so than the Hoehne School District. The initial 400,000 acre proposal would take the community off the map. This fact has tied the school district very closely to the ranchers and their supporters. |
| 28 | Colorado Cattlemen's Association |  |  |
|  | Piñon Canyon Expansion Opposition Coalition | 29 | http://www.coloradocattle.org/news.aspx?NewsiD=159 |
|  |  |  | http://www.carson.army.mil/FortCarson2010/tex/p/inon/research_report.pdf |
|  | Not One More Acre | 31 | Not One More Acre Interview |
|  |  |  | http://www.springieldcolorado.com/expand2.html |
|  | Colorado Department of Agriculture | 33 | Colorado Department of Agriculure Interview |
|  |  |  | htpp:/coloradocatle.org/affiliations.aspx |
|  |  |  | The Colorado Cattlemen's Association has, usually opposed any government acquisition of land that impacts the industry. The support of the ranchers against the Army represents the first "industry bureaucracy" joining the side of the ranchers. |
| 29 | Pinion Canyon Expansion Opposition Coalition |  |  |
|  | Branson School District | 30 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Not One More Acre | 31 | Not One More Acre Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Las Animas County | 32 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Colorado Department of Agriculture | 33 | Colorado Department of Agriculture Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  |  |  | The Piñon Canyon Expansion Opposition Coalition is the primary non-governmental bureaucracy support for the ranchers. |
| 30 | Branson School District |  |  |
|  | Piñon Canyon Expansion Opposition Coalition | 29 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Not One More Acre | 31 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Las Animas County | 32 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  |  |  | The Branson School District's activist stance against the Army represents an education bureaucracy representing a constituency almost exclusively of members representing the Army's opposition. This bureaucracy has been more effective in tactical opposition than any other agency or government. |


| AGENT | STAKEHOLDER LINK | $\begin{array}{\|c\|} \hline \frac{\text { AGENT } \#}{\text { LINKED }} \\ \hline \text { TO } \\ \hline \end{array}$ | Source/Justification |
| :---: | :---: | :---: | :---: |
| 31 | Not One More Acre |  |  |
|  | City of LaJunta | 24 | Not One More Acre Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Otero County | 25 | Not One More Acre Interview |
|  |  |  | http://www.secoloradoheritage.com/about-our-heritage/media/local-officials-want-army-to-comply-with-historic-preservation-rules |
|  | Piñon Canyon Expansion Opposition Coalition | 29 | Not One More Acre Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Las Animas County | 32 | Not One More Acre Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  |  |  | Not One More Acre Opposition has taken the harder line of opposing ANY continued use or expansion of PCMS. The organization has taken root in both Otero and Las Animas Counties and while based in Trinidad has actually been more active from La Junta and its efforts to pull support closer to the larger population centers of Pueblo County, El Paso County and the Colorado eastern plains. |
| 32 | Las Animas County |  |  |
|  | Las Animas County Chamber of Commerce | 21 | City of Trinidad Interview |
|  |  |  | http://www.trinidadchamber.con/ |
|  | Hoehne School District | 27 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Piñon Canyon Expansion Opposition Coalition | 29 | Not One More Acre Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Branson School District | 30 | Branson School District Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Not One More Acre | 31 | Not One More Acre Interview |
|  |  |  | City of Trinidad Interview |
|  | City of Trinidad | 39 | City of Trinidad Interview |
|  |  |  | Branson School District Interview |
|  |  |  | Las Animas County has the benefit of being a very powerful county though the population ratio between Trinidad and the County is nearly 2:1. Links to the schools and ranchers is highlighted by members being active in the Anti-expansion movement. |
| 33 | Colorado Department of Agriculture |  |  |
|  | Colorado Cattlemen's Association | 28 | Colorado Department of Agriculture Interview |
|  |  |  | Not One More Acre Interview |
|  | Piñon Canyon Expansion Opposition Coalition | 29 | Colorado Department of Agricultur Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Not One More Acre | 31 | Colorado Department of Agriculture Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Colorado Department of Natural Resources | 37 | Colorado Department of Agriculture Interview |
|  |  |  | Colorado Division of Wildlife Interview |
|  |  |  | The Colorado Department of Agriculture has become more active on behalf of the ranchers with John Salazar. The former congressman has drawn upon his network to draw a line against the Army on |
| 34 | Citv of Springfield |  | behalf of the Ranchers. As a former Army veteran he has also been able to provide a technical and user counter several of the military's arguments for expansion. |
|  | Colorado Cattlemen's Association | 28 | http://www.springfieldcolorado.com/expand2.html |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Piñon Canyon Expansion Opposition Coalition | 29 | Not One More Acre Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Not One More Acre | 31 | Not One More Acre Interview |
|  |  |  | Piñon Canyon Expansion Opposition Coalition Interview |
|  | Las Animas County | 32 | Piñon Canyon Expansion Opposition Coalition Interview |
|  |  |  | http://www.action22.org/directories/DIRMembership.pdf |
|  | Baca County | 35 | http://www.springfieldcolorado.con/bacacountygov.html |
|  |  |  | http://www.bacacountyedc.com/ |
|  |  |  | The City of Springfield is tied to the agriculture community as its primary industry. The push by the Army to take over the entire southeastern part of the state could make the community even more isolated and a possible deathblow. |
| 35 | Baca County |  |  |
|  | Otero County | 25 | http://www.action22.ory/directories/DIRMembership.pdf |
|  |  |  | http://www.scedd.com/about_us.htm |
|  | Colorado Cattlemen's Association | 28 | http://www.springfieldcolorado.com/expand2.html |
|  |  |  | http://www.coloradocattle.org/bpannualbanquet.aspx |
|  | Las Animas County | 32 | http://www.action22.org/directories/DIRMembership.pdf |
|  |  |  | http://www.scedd.com/about_us.htm |
|  | City of Springfield | 34 | http://www.c-spanvideo.org/appearance/595458243 |
|  |  |  | http://www.bacacountyedc.com/ |
|  |  |  | Baca County is home to the American Agriculture Movement that organized tractor protest rallies in Washington D.C. during the late 1970 's. The county, like Spingfield has a great deal at stake if the Army expands. The area already isolated may be even more isolated depending on the reach of the military |
| 36 | Colorado State Historic Preservation |  |  |
|  | Colorado State Parks | 3 | http://www.historycolorado.or/s/ites/defaullffiles/files/OAHP/Programs/StatePlan.pdf |
|  |  |  | http://www.fs.usda.gov/Internet/FSE_DOCUMENTS//stelprdb5209204.pdf |
|  | Advisory Council on Historic Preservation | 15 | http://www.historycolorado.or/g/ites/defaullffiles/files/OAHP/Programs/StatePlan.pdf |
|  |  |  | http://www.fs.usda.gov/Internet/FSE_DOCUMENTS//stelprdb5209204.pdf |
|  | San Isabel National Forest and Comanche National Grassland | 19 | http://www.historycolorado.or/g/sites/defaullffiles/files/OAHP/Programs/StatePlan.pdf |
|  |  |  | http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stslprrdb5209204.pdf |
|  | Colorado Department of Natural Resources | 37 | http://www.ff.usda.gov/Internet/FSE_DOCUMENTS//stelprdb5209204.pdf |
|  |  |  | http://www.fs.fed.us/outernet/r2/psic/publications/amendments/amend_24_picketwire_canyon.pdf |
|  |  |  | Colorado State Historic Preservation (History Colorado) is tied to the both State and Federal Stakeholders interested in preserving both the ancient and modern history of the area. |


| AGENT | STAKEHOLDER LINK | $\begin{array}{\|c\|} \hline \frac{\text { AGENT } \#}{\text { LINKED }} \\ \hline \text { TO } \\ \hline \end{array}$ | Source/Justification |
| :---: | :---: | :---: | :---: |
| 37 | Colorado Department of Natural Resources |  |  |
|  | Colorado Division of Wildlife | 5 | http://dnr.state.co.us/ |
|  |  |  | Colorado Division of Wildlife Interview |
|  | Colorado State Land Board | 22 | http://dn.state.co.us/ |
|  |  |  | Colorado Board of Land Commissioners Interview |
|  | Colorado Department of Agriculture | 33 | Colorado Department of Agriculture Interview |
|  |  |  | Colorado Division of Wildlife Interview |
|  |  |  | The Colorado Department of Natural Resources, while not active in the controversy, has tied itself closer to more active state bureacracies in a policy of watchful waiting. |
| 38 | City of Rocky Ford |  |  |
|  | La Junta Chamber of Commerce | 1 | http://www.action22.org/directories/DIRMembership.pdf |
|  |  |  | http://www.lajuntachamber.com/htm//alphabetical_ list.html |
|  | City of LaJunta | 24 | http://www.action22.org/directories/DIRMembership.pdf |
|  |  |  | http://www.lajuntaeconomicdevelopment.netteam.htm |
|  | Otero County | 25 | http://www.oterogov.com/ |
|  |  |  | http://rockyfordcolo.com//s=pinon |
|  |  |  | Rocky Ford, like Walsenburg is a nearly forgotten stakeholder. Though it is close to Pueblo, family, culture, and economic ties link it close to the county and larger sister city of LaJunta. |
| 39 | City of Trinidad |  |  |
|  | Trinidad School District | 2 | City of Trinidad Interview |
|  |  |  | http://www.tlac.net/ |
|  | Commanding General Fort Carson | 11 | City of Trinidad Interview |
|  |  |  | http://www.chieftain.com/news/local/business-owners-seek-jobs-at-pinon-canyon/article_c68226e2-4715-11el-af73--0018771e3ce6c.html |
|  | Las Animas County Chamber of Commerce | 21 | City of Trinidad Interview |
|  |  |  | http://www.tlac.net/ |
|  | Las Animas County | 32 | City of Trinidad Interview |
|  |  |  | htp:///asanimascounty.org/ |
|  |  |  | Trinidad, like Pueblo is the one city that is torn. Still attempting to reap the benefits that never came with Piñon Canyon's inception, it is counting on the Army to make good on promised that the expansion will provide a positive economic outlook. |
| 40 | City of Pueblo |  |  |
|  | Pueblo Chamber of Commerce | 18 | City of Pueblo Interview |
|  |  |  | http://www.pedco.org/content/our-partners |
|  | Pueblo County | 23 | City of Pueblo Interview |
|  |  |  | http://www.pedco.org/content/our-partners |
|  |  |  | Pueblo is stuck in the middle. What was once Colorado's Second City is now thought of as the southern edge of the front range metro-plex that runs north to Fort Collins. The community of Pueblo, consisting of countless business interests, seeks to capture the power, independence, and influence it lost to closing mills and the onset of the Military Industrial Complex in Colorado Springs some $40-$ 50 years ago. The ties between the County and City are probably the strongest in the State. |

APPENDIX H

Branson/Fort Carson Correspondence

## BRANSON SCHOOL DISTRICT RE-82

Home of the Bearcats
101 Saddle Rock Drive
(719) 946-5531 voice

PO Box 128
Branson, CO 81027
(719) 946-5619 fax
www.bransonschootonline.com

February 24, 2011
Public Affairs Office
Attn: Robert McLaughlin
Garrison Commander - Fort Carson
Suite 200
Building 1118
Fort Carson, CO 80913

Enclosed is a copy of the Resolution of the Branson School District RE-82 in Las Animas County, Colorado calling on all federal agencies including the United States Army to coordinate with the District regarding plans, policies and actions.

The Resolution sets forth at length the statutes, regulations and Executive Orders that require agencies including the Army to coordinate with local governments such as the Branson District.

Pursuant to these laws, including the Army's own regulations as to NEPA processes found in Title 32 of the Code of Federal Regulations, we request that you meet with the Branson School Board on March 28, 2011 or April 4, 2011 to commence coordination with regard to the proposed expansion of the Pinon Canyon Maneuver Site.

Please contact Branson School at 719-946-5531 by March 14, 2011 to arrange meeting details. If it is impossible for you to meet on one of these dates, we expect that you will be able to agree to a mutually convenient date at the time of contact.

The meeting we request will be a govemment to govemment meeting with discussion participation only by the Board and staff and the Army and staff. The meeting will be open, but there will be no public participation. This format, consistent with the laws requiring coordination with local govemment, will allow us as government officials to focus on the facts.

We know, as do you, that mere public informational meetings or public input meetings do not satisfy the lawful requirements regarding your relationship with the District as a unit of local government. Had you engaged in coordination with the District and other local governments in the area during your prior NEPA activities, perhaps you would have fared better in court.

In preparation for our first coordination meeting, we request that you provide for our review plans, studies and activity documents relating to the proposed expansion of the Maneuver Site.

Further, it appears to the Board that enhancement of check dams and construction of new structures in the cantonment area constitute violations of Judge Matsch's order that invalidated the Transformation ROD and FEIS for Pinon Canyon Maneuver Site expansion. The status of that construction as it relates to the Court Order will be on our agenda.

We request that you provide for our review documents related to training of a Combat Aviation Brigade unit at the Maneuver Site. We are of the opinion that the construction activities on the Site are directly related to training of an additional CAB unit at the Site. We are interested in how that comports with Judge Matsch's order.

We will point out how we believe that the 2010 EA is not a new study at all, but simply a justification for the prior EIS that was set aside by the Court. We will be prepared to demonstrate our position in writing at the meeting; we also will be prepared to demonstrate why we believe that the law requires an EIS, not an EA.

When a meeting date is set, we will provide you with an agenda containing the subjects we wish to discuss, and will invite you to add subjects. A final agenda will be provided at least ten days prior to the meeting.

The meeting we request is consistent with your own regulations. Pursuant to 32 CFR section 651.14, you should have already established with us a "continuing relationship. . to promote cooperation and resolution of mutual land use and environment-related problems" in order to "promote" "general cooperative problem solving." (651.14 (g))

Coordinated engagement with our local government is called for by subsection g entitled "Relations with local, state, regional and tribal agencies"; the subsection requires you to "establish a continuing relationship" with "adjacent local, state, regional and tribal governments and agencies." Our District is such adjacent local government.

With regard to the proposed expansion of Pinon Canyon Maneuver Site, you have not fulfilled your legal obligations to coordinate with us. You did not do so during the development of the EIS that was set aside by the Court, and you have not done so as you move forward with an EA. We expect that you will honor your lawful obligations now that we have formally requested that coordination talks begin.

Congress has mandated that federal agencies coordinate with local governments, even in the highly sensitive area of Homeland Security as pointed out in the enclosed Resolution. The President of the United States has ordered closer working relationships, as did former Presidents Reagan and Clinton. The Council on Environmental Quality has directed coordination through its regulations setting the standards by which the NEPA process is to be applied. And, the United States Army has itself set forth regulations calling for the type of coordination talks we now request. (See 32 CFR 651.14, and the Army's website setting forth its position on NEPA processes: United States Army Environmental Command NEPA site)

The USAEC website contains a narrative "NEPA \& The Army" that includes the following sentence: "NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made." To that end, 32 CFR 651.14 sets forth the provisions that lead us to expect that you will meet with our local government to coordinate with us in an attempt to resolve inconsistencies in policy and land and environmental problems.

We trust that the Army will adhere to the law and its own regulations and agree to begin coordination meetings with the District. If not, please be assured that we will pursue every legal means to require that you follow the law.

We look forward to the first meeting at which we hope to begin a mutually beneficial coordination process. We hope that the meeting will be arranged voluntarily in order to avoid expensive judicial and political procedures to require compliance with the law.

Jerry Winford - Board President

Nick Lingus - Board Member

Dick Louden - Board Member

Beverly Shelden - Board Member

Allen Winford - Board Member
cc: Ashton B. Carter - Under Secretary of Defense for Acquisition, Technology \& Logistics
John McHugh - Secretary of Army
Eric Holder, Jr. - Attorney General
Robert Gates - Secretary of Defense
United States District Court - Colorado

DEPARTAENT OF THE ARMY
OFMCE OF THE ASSBTAMT SECRITMRY OF THE ARMY
INSTALLATIONS ENERGY MMD ENVRONMGNT 110 ARUY PMENTABON WASHINCTON, DC 20310-0190

Mr. Jerry Winford, Board President
Branson School District RE-82
101 Saddle Rock Drive
PO Box 128
Branson, CO 81027
Dear Mr. Winford:
I have been asked to respond on bebalf of Secretary of Defense Robert M. Gates to your February 24, 2011 letter concerning the Pinon Canyon Maneuver Site (PCMS). PCMS serves as an important training site in preparing our Soldiers to combat terrorism at home and abroad. Comprised of 235,000 acres, it provides critical mancuver lands for Soldiers from Fort Carson.

There continues to be discussion in local meetings and news media about potential Army land ecquisition and expansion for PCMS. Please be assured the Army has no plans to expand PCMS boundariea and, accordingly has not requested any funds be programmed in the Department of Amy budget (FY12-16) for the acquisition of land at PCMS over the next five years. Soldiers and units assigned to Fort Carson will be using PCMS within its current boundaries as they train and prepare for the dangerous assignments for which they have been tasked by this nation.

I trust this clarifies the Army's position and intentions concerning PCMS. The Army will continue to work with the Colorado Congressional delegation and local commonities concenning the accomplishment of its mission at Fort Carson.


# BRANSON SCHOOL DISTRICT RE-82 

Home of the Bearcats
101 Saddle Rock Drive
(719) 946-5531 volce
(719) 946-5619 fax
www.bransonschoolonline.com

May 18, 2011
To: Robert McLaughlin, Fort Carson Garrison Commander,

In response to our request for a coordination meeting with you, our School received a telephone call during which you agreed to meet with us--but at your office. You did this after canceling the May 12, 2011 coordination meeting with the School Board which you agreed to attend. Please understand that we do not write this letter from the standpoint of turf status, but from the standpoint of the good of our Board and our constituents.

If our Board travels to your office for a meeting, each will be giving up at least a day of work on their revenue based business. None of our constituents would be able to attend the meeting to observe our discussions.

Our meetings have to be open meetings, each with an agenda prepared in advance and posted with notice of the meeting. Coordination meetings are government to government meetings. So the public is not allowed to make comments or statements during the meetings. But members of the community can attend and listen. Then they are given a chance to make comments AT THE NEXT REGULARLY SCHEDULED REGULAR, NON-COORDINATION, BUSINESS MEETING. This precaution is taken to assure the representatives of both governments that the discussions will be relevant government to government discussions.

The process just outlined has to be followed under the Colorado open meeting law. Could we hold a coordination meeting at your office? Of course. Could we hold such meeting at your office and be in compliance with the spirit of the open meeting law? Of course not. The constituents who may want to attend a meeting of our Board are entitled to have that meeting scheduled locally so that they don't have to undertake the expense and loss of time connected with a trip to your office. They have the right to reasonably expect that our open meetings will be held locally, within the community.

We know that you will understand this. It is based on the same concept of coordination with local government that you express and demonstrate in Full Battle Rattle. There you point out how important it was for you and your command officers to visit with the local officials in Iraq on their home base, their home site. You point out how important it is that you show the interest in going to meet with them, and how important it is to show the whole local community your willingness to work with locally elected officials.

The concept you represent as being very effective in Iraq encompasses our reasons for suggesting that you meet with our Board in our community, instead of at your office. Your attendance at a meeting in this community will demonstrate your intent to work with local citizens and their elected officials.

We will not reiterate the reasons you must coordinate with us. We simply now request that you apply to our situation what you display in Full Battle Rattle to be a successful method of working with local elected officials in a meaningful way.

We would appreciate it if you would meet with us in our meeting room on June 2, 2011 or June 3, 2011 . Please call the Branson School at (719)946-5531 by Monday May 23, 2011 to confirm one of these dates.

Sincerely,

Jerry Winford
Branson School Board President

Cc:
Secretary of Defense, Robert Gates
Undersecretary of Defense and Acquisition, Technology and Logistics, Ashton B. Carter
Secretary of Army, John McHugh

# BRANSON SCHOOL DISTRICT RE-82 

Home of the Bearcats
101 Saddle Rock Drive
PO Box 128

(719) 946-5531 voice (719) 946-5619 fax www.bransonschoolonline.com
Branson, CO 81027

August 8, 2011
To:
Colonel Robert F. McLaughlin
Garrison Commander
1626 Ellis Street
Suite 200
Fort Carson, Colorado 80913
Letters dated February 24, 2011, March 28, 2011 and May 18, 2011 requested a government to government meeting regarding the proposed expansion of the Pinon Canyon Maneuver Site. They are enclosed with this letter for reference.
The Branson School District RE-82 in Las Animas County, Colorado invoked their authority to coordinate with all federal agencies including the United States Army regarding plans, policies and actions. A copy of the Resolution is included again.
The Army's own regulations as to NEPA process found in Title 32 of the Code of Federal Regulations and in the Department Of Defense Regulations 5030.54 \& 4165.57 , both clearly outline the requirement of coordinating with Local Governments to reach consistency in policy and Land Use Plans. Finally in your BRAC document Section. 2905 (D) \& (E) states "the Secretary of Defense shall consult with the Governor of the State and the heads of the local governments concerned for the purpose of considering any plan for the use of such property by the local community concerned."
This is now our $4^{\text {th }}$ and final letter requesting to meet as government to government and discuss the Pinon Canyon Maneuver Site prior to any information released to the public. This letter along with our prior correspondences will be sent to the appropriate agencies including the Department of Justice.
After receiving no responses from our last letter dated May 18, 2011 it is clear that you have intentionally violated the Executive Order 13575-Section 4 (a), (b), (c) \& (d).

Today's letter will serve notice to you and the Federal departments listed, we are prepared to take necessary action to insure the Federal Statues outlining our authority to coordinate will not be ignored.
As with all of our letters we are offering your choice of two meeting dates to be conducted in our meeting room. We request a meeting in our facility to accommodate the number of local elected officials who will be attending. The meeting dates are August 26, 2011 or September 2, 2011. Please call the Bronson School at (719)946-5531 by August 16, 2011 to confirm one of these dates or to recommend another date. An agenda is attached, please be prepared with your decision makers to discuss these issues. If there is anything you would like to add, please let me know 10 days prior to the meeting.

Sincerely,


Jerry Winforg-Branson School Board President
Nick Lingus Board Member


Dick Louden -Board Member


Cc:
Department of Justice, Christopher H. Schroeder
Secretary of Defense, Leon E. Panetta
Undersecretary of Defense and Acquisition, Technology and Logistics, Ashton B. Carter
Secretary of Army, John McHugh
Attorney General, Eric Holder, Jr
U.S. Army, Deputy Garrison Commander, Steven J. McCoy

United States District Court- Colorado

Agenda for Government to Government Coordination Meeting between Branson School District RE-82 and Department of Army

August 26, 2011 or September 2, 2011 6:30 PM
I. Pledge of Allegiance
II. Welcome
III. Introduction of School Board Members and Agency Personnel
IV. Army Documents Related to Combat Aviation Brigade and Proposed Expansion
V. Environmental Assessment
VI. Status of Construction in Pinon Canyon Maneuver Site Cantonment Area
VII. Status of Proposed Pinon Canyon Maneuver Site Expansion
VIII. Discussion Points for Next Meeting
IX. Colonel McLaughlin's Response Time
X. Set next meeting date
XI. Adjourn Meeting

APPENDIX I

Selected 1983 Piñon Canyon Acquisition Data

## Pinon Canyon Acquisition Data

| OWNER | ACQUISITION TRACT NUMBER | $\begin{gathered} \text { ACRES } \\ \text { ACQUIRED } \end{gathered}$ | PRICE |  | Dollars per Acre \$145 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 Bailey | 416 | 82.88 | \$ | 12,000.00 |  |
|  | 101, 110, 118 \& |  |  |  |  |
| 2 Baldwin | 119 | 39,245.00 | \$ | 4,493,552.50 | \$115 |
| 3 Bartell | 303 | 390.36 | \$ | 52,000.00 | \$133 |
|  | 307, 310, 500 \& |  |  |  |  |
| 4 Biernacki | 502 | 18,685.73 | \$ | 2,130,167.00 | \$114 |
|  | 417, 422, 708, 710 |  |  |  |  |
| 5 Big Canyon Grazing | \& 807 | 29,151.32 | \$ | 4,080,000.00 | \$140 |
| 6 Bowdie (estate) - [Reed] | 409 | 320.00 | \$ | 32,000.00 | \$100 |
| 7 Brownewell, Mattie - [S] | 212 | 419.86 | \$ | 48,090.00 | \$115 |
| 8 Brownewell, Wm. I | 203 | 420.00 | \$ | 48,090.00 | \$115 |
| 9 Burgener | 505 | 400.00 | \$ | 80,000.00 | \$200 |
| 10 Cha | 412 | 162.86 | \$ | 23,411.00 | \$144 |
| 11 Chancellor | 707-1, 2 | 13.74 | \$ | 2,000.00 | \$146 |
| 12 Cheyenne Mining | 305, 306 \& 309 | 7,313.70 | \$ | 1,067,552.00 | \$146 |
| 13 Cheyenne Mining | incl above | incl above |  | incl above |  |
| 14 Crowder | 805 | 2,399.69 | \$ | 275,964.35 | \$115 |
| 15 Crowder | 702, 703 \& 801 | 5,705.96 | \$ | 656,185.65 | \$115 |
| 16 Ervin | 302 | 463.33 | \$ | 73,000.00 | \$158 |
| 17 Faris | 200 | 19,353.03 | \$ | 2,499,833.00 | \$129 |
| 18 Faris [+ Ranches J] | 401, 511 \& 514 | 484.43 |  | incl above |  |
| 19 Gilmore | 201 | 80.89 | \$ | 12,000.00 | \$148 |
| 20 Gutierrez | 803 | 8,143.37 | \$ | 1,066,000.00 | \$131 |
| 21 Gyurman [Land \& Cattle] | 408 | 4,578.95 | \$ | 858,587.22 | \$188 |
| 22 Gyurman | 408-2, 3 | 494.61 |  | incl above |  |
| 23 Herschberger | 304 | 608.63 | \$ | 82,000.00 | \$135 |
| 24 Hill | 404 \& 406 | 4,652.86 | \$ | 735,000.00 | \$158 |
| 25 Hohnbaum | 204 | 160.00 | \$ | 23,000.00 | \$144 |
|  | incl line 17 or 18 | incl line 17 or |  |  |  |
| 26 Faris | above | 18 above |  | line 17 above |  |
| 27 Long | 211 | 640.29 | \$ | 73,600.00 | \$115 |
| 28 Mincic | 512 | 4,442.52 | \$ | 533,100.00 | \$120 |
| 29 McIntyre | 410 | 325.72 | \$ | 37,653.00 | \$116 |
| 30 Moffett | 402 | 2,867.46 | \$ | 244,315.36 | \$85 |
| 31 Morris | 403 \& 421 | 649.92 | \$ | 65,000.00 | \$100 |
| 32 Morris et al | 407 | 1,139.14 | \$ | 113,900.00 | \$100 |
| 33 Novey | 420 | 111.86 | \$ | 26,450.00 | \$236 |
| 34 Oberg | 202 | 13,979.34 | \$ | 1,708,245.00 | \$122 |
| 35 Oxley | 902 | 1,391.03 | \$ | 200,000.00 | \$144 |
| 36 Schlesinger | 311 | 423.71 | \$ | 86,000.00 | \$203 |
| 37 Sharp | 509 \& 605 | 9,516.98 | \$ | 1,733,596.00 | \$182 |
| Sunbird Environmental <br> 38 [Cheyenne Mining] | incl line 12 above | incl line 12 above |  | line 12 above |  |
| 39 Sundu | 400 | 400.00 | \$ | 84,000.00 | \$210 |
| 40 Thomas [ P et al] | 419 | 111.86 | \$ | 16,000.00 | \$143 |
| 41 Thompson | 312 | 423.14 | \$ | 86,000.00 | \$203 |
| 42 Van Vleet | 414 \& 900 | 292.00 | \$ | 41,975.00 | \$144 |
| 43 White | 504 | 400.00 | \$ | 79,000.00 | \$198 |
| 44 Wilson | 411 | 26,917.98 | \$ | 2,960,980.00 | \$110 |
| 45 Wilson | incl above | incl above |  | incl above |  |
| 46 Winkelman | 503 | 400.00 | \$ | 86,000.79 | \$215 |
| 47 Zinsser | 706 | 6.54 | \$ | 820.00 | \$125 |
|  |  | 208,170.69 | \$ | 6,527,067.87 | \$127 |



Office of superintiendent

Hoctine $\mathscr{P}$ ublic School District $\mathscr{R}-3$
Hochnne, Colorads
11046

Mr. Peter P. Pollreis
Chief, Real Estate Division
Department of the Army
Omaha District, Corps of Engineers
6014 U.S. Post Office and Court House
Omaha, Nebraska 68102

## Dear Sir:

Enclosed is the necessary information requested concerning the Pinon Canon Site. We were able to gain the information on personal property as listed. This was the complete record of personal property because not every tax parcel had personal property.

Secondly, enclosed is the correct certification for 1981. There were errors in the first assessed evaluation and an audit was completed at the request of the county commissioners.

Sincerely,


Dennis Trump
Superintendent

DT: jm

OWNER

1. Bailey, Alice C.
2. Baldwin, Owen $\frac{G}{}$ Doris T.
3. Bartell, Henry L. \& Bernadette H.
4. Biernacki, LeRoy F. \& Adna
5. Big Canyon Grazing Association
6. Brodie, Marie Rose, Estate
7. Brownewell, Mattie
8. Brownewell, Win. I,
9. Burgener, Lowell F. \& Lois M.
10. Cha, John
11. Chancellor, James \& Paula D.
12. Cheyenne Mining \& Land Company, Inc.
13. Cheyenne Mining $\&$ Land Company, Inc.
14. Crowder, Jack \& Margaret
15. Crowder, Jack \& Margaret
16. Ervin, Jerry $N \&$ Sally A.
17. Faris, Joe E., et al
18. Paris, Joe E. \& Sons Ranches
19. Gilmore, Gloria June
20. Gutierrez, Ben
21. Gyurman, Charles Land \& Cattle Co., Inc.
22. Gyurman, John \& Josephine
23. Hershberger, James $W$.
24. Hill, Robert J. \& Joella J.
25. Hohnbaum, George C.

| OWNER | CODE NO FROM 1981 TAX SCHEDULE agricultural real property |  |
| :---: | :---: | :---: |
| 26. Kitch, James O. (Joe E. Faris) | 3-400-25202 | \$ 2,210 |
| 27. Long, Dalton | 3-400-26650 | 560 |
| 28. Mincic, Charles V. \& Mary Ann | 3-400-30675 | mana dhachas miderament |
| 29. McIntyre, Albert | 3-400-32420 | 770 |
| 30. Moffett, E. Claudette \& W. Royce | 3-400-30960 | 19,320 |
| 31. Morris; Margaret | 3-400-31860 | 2,000 |
| 32. Morris, Margaret, et al | 3-400-31865 | 2,740 |
| 33. Novey, Bert \& Ruby | 3-400-33052 | 900 |
| 34. Oberg, Michael L. et al | 3-400033122.2 | $\begin{gathered} 1982 \text { Only } \\ 5,260 \end{gathered}$ |
| 35. Oxley, Thomas, John C. \& Mary June | 3P-400-33760 | 66,840 |
| 36. Schleisinger, Robert A. \& Violet M. | 3-400-39197 | 960 |
| 37. Sharp Ranch, Inc, | 3-400-39910.1 | 25,060-82-400-9000.1-6940 |
| 38. Sunbird Envirommental Resources | 3-400-41512 | 10,650 |
| 39. Sundu, James C. | 3-400-41522 | 960 |
| 40. Thomas, Phillip \& Louise | 3-400-42076-1-T | 890 |
| 41. Thompson, Wallace \& Lovilean | 3-400-42147 | 890 |
| 42. Van Fleet, Estate | 3-400-43865 | 630 |
| 43. White, Clinton A. E Evelyn V. | 3-400-45432 | 960 |
| 44. Wilson, George Wr. | 3-400-45700 | $62,150 \rightarrow 3-700-11050-12,330$ |
| 45. Wilson, George W. | 3-400-45700.1 | 1,540 |
| 46. Winkelman, Wayne $\&$ Joan | 3-400-45797 | 960 |
| 47. Zinsser, Mrs. Elizabeth, et al | 3-400-46535 | 170 |
|  | Total 5179.800 |  |



## COUNTY ASSESSOR

Las animas county
TRINIDAD, COLORADO 81082
PHONE (303) 846 - 2881

November 1, 1982

```
Dr. Dennis Trump, Sup't
Secretary to School Board
School District R-3
Hoehne, Colo. }8104
Dear Sir:
This letter is to advise you that there were a few errors on Rudy Mazza's Tax Roll Book for the year 1981 payable in 1982.
We discovered the errors when Gary Waller was auditing Rudy Mazza's Tax Roll Book.
Your new valuation for 1981 should have been \(6,504,590\) therefore you lost 548,300 in valuation
I am very sorry for the errors that we made. If you have any questions that you would like to ask, please feel free. to call Rudy Mazza, Gary Waller, or myself.
```

Thank-You

kfr

Office of SUPERINTENDENT

September 27, 1983

Department of the Army
Omaha District Corps of Engineers
6014 U.S. Post Office and Courthouse
Omaha, Nebraska 68102

Dear Ms. Plourde:
This letter is in recognition of U.S. Treasurer's Check No. 240,967 in the amount of $\$ 114,157.47$ which Hoehne School District has received.

I am returning the enclosed receipt unsigned for the following reason. The wording of the receipt is "the United States of America is hereby relieved of any and all further obligation or liability arising from said reduction of the school district's tax base due to sald land acquisition." This wording could affect federal funding that we are currently receiving (Chapter 2 of the Education Consolidation and Improvement Act of 1981) and any revenue that we may be eligible for in the future (Public Law 81-874).

The variance comes from the different interpretations of the word, government. Our interpretation was the action of Congress and the Military Construction Appropriations Committee of 1982 and the acquisition process by the Army Coprs of Engineers. The current wording of the receipt must be interpreted as the government and all bureaucratic divisions, i.e. Department of Education.

The specific intent and purpose of the military appropriation was to provide relief for the bonded indebtedness of the school district which is within the bond redemption fund. No mention was made of the general fund. The present wording of the receipt could limit or eliminate certain types of federal funding for the general fund which has no relationship with the bond redemption fund.

Twice in telephone conversations with the Army Corps of Engineers Office in Omaha, I asked about future revenue for the general fund under Public Law $81-874$ and was told that it would not be affected. I accepted those answers, but the receipt as currently written, would sign the possibility of that revenue away.

The Hoehne Board of Education approved the amount of $\$ 114,157.47$ in the regular meeting June 23,1983 as the enclosed minutes display.

I an not trying to be difficult in this matter, however, we as a school district can not affort to sign away the possibility of receiving federal funds for our general fund.

If the receipt is amended so that the final paragraph were to read "The undersigned....land acquisition", except liability to make payment under Public Law 81-874 and any other funds payable under any public law. This addition would remove the question of the signing away revenue provided as a right under public law.

Thank you.

Sincerely,


Dennis Trump Ed.D. Superintendent

DT: jm

BOARD OF EDUCATION



Office of SUPERINTENDENT

Mr. Gary D. Blair
Chief, Real Estate Division
Department of the Army
Omaha District Corps of Engineers
6014 U.S. Post Office and Courthouse
Omaha, Nebraska 68102

Dear Mr. Blair:
This letter is to formally notify you that the Hoehne R-3 Board of Education voted to accept your proposal concerning the Pinon Canyon Maneuver Site. This action was taken in its regular meeting June 23, 1983,

The money received will be placed in a separate account and used only towards the retirement of the bonds. This account will be audited annually until it is expended for its designated purpose.

The Board recognizes that the payment of $\$ 114,157.47$ wil1 relieve the Government of any further obligation or liability arising from the reduction of the tax base in connection with the Pinon Canyon Maneuver Site land acquisition.

Sincerely,
Semistrumges
Dennis Trump, Ed.D.
Superintendent

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15 \cdot 3-03
$$

DT: jm

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6: 7
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Hr. Dennis Trump
Superintendnent, School District R-3
P.O. Boz 91

Hoehn, Colorado 81046
Dear Dr. Trump:
As you know, the authorization from our higher headquarters to acquire the real eatate for the Pinon Canyon Maneuver Site contained the following language:
"Funds are included in this project for retirement of outstanding achool bonds relating to land to be acquixed. The amount to be paid is based on total Indebtness (sic) of the school district as of 1 January 1982 and shall be computed on the basis of the percentage by which the school district's tax base will be ditmiaished (sic) as a result of this action."

Attached is a tabulation showing by ownership the amount we feel the tax base of School District $R-3$ is reduced as a result of the Pinon Canyon Maneuver Site land acquisition. The list includes all ownerships of record within the project boundary and School District R-3 during 1981, which is the nearest full year to the January 1,1982 authorization for which couplete tax records were available. For your additional information, the 1982 assessments on the affected ownerships were partially complete at the time of our research, and In all caseg, they remalned the same as for 1981. We would assume that the same would hold true for the remainder of the school district; therefore, there would not be a proportionate change in 1982 from 1981. The County Assessor's office has advised that the county school diatrict's tax basia consists of taxes on real property, personal property and mineral interests.

The tabulation consists of seven (7) colums briefly explained below:
a. Tax Schedule No. - This number identifies the ownerships within the project by number, as they appear on the Las Animas County Assessors Tax Schedule - Agricultural Real Property. The tax schedule is the county's assesaed value of land and improvements by ownership. No Federal or State land is included because it is tax exempt.
-7re
b. Owner - The names under this columan are the names of owners of record for the 1981 tax year. It should be noted that due to land aales between the 1981 assessment and our acquisition, namas on this list may not coincide with the owners of racord at the time of our acquisition, We feel the owners names or configuration of the ownership is immaterial since the intent is to determine the assessed value of the land and inprovements within the project and school diatrict as it relates to the entire achool district.
c. Acres in Ownership-This columa depicts the total aasessed acres in each ownership affected by the project within the school district as shown on the Tax Schedule. In over $75 \%$ of the cases we are acquiring the total ownership as shown on the Tax Schedule.
d. Acres in Project - this column represents the amount of acres within each ownership that are acquixed for the project. In cases where the total ownership as shown on the Tax Schedule is acquired, that acreage is used. On partial acquisition, the acreage we actually acquired is used. We are doing this because in calculating acraages, ours and the assessors may not agree. Therefore, on total acquisitions, the assessors acreages are used, since credit should only be given to what is assessed. On partial acquisitions, there 18 no way to determine what is actually assessed, so our acreages are used. The acreages in this column also include what we refer to as "uneconomic remants", or in other words, lands that we were legally obligated to purchase but are not a part of the project. These lands will be turned over the the General Services Administration for disposal and, depending on whether another Governmental body acquires them, they may or may not return to the tax rolls. Due to this uncertainty, they are included as a tax base reduction to give you the benefit of
e. Lend Vaiue in Project - This colum depacts the assessdd valuation of land and ixprovements within the project and school district, and includes the "uneconomic remants" mentionad above.
f. Meneral Acres and Valuation - This colunn represents the amount of privately-owned mineral acres and valuation within the boundary. Federal and State-owned minexals are not included in this total aince they are exempt from tazation. The County Assessor's office advised that private minerals are taxed at a rate of one dollar per acre; therefore, the numbers in this colum represent both acres and dollars.
8. Personal Property Values - This column represents the persansl property values by ownership as furnished to us by your letter dated December 14, 1982. The values apparently relate to the total ownership; therefore, we have used a proportionate amount as it relates to the percentage of an ownership we are acquiring.

According to a Letter dated November 1, 1982 from the Las Animas County Assessor to you, which was attached to your December 14, 1982 letter to this office, the total 1981 aspassed valuation of School District R-3 was $\$ 6,504,590$. Oux computations indicate that that valuation has been reduced by $\$ 594,182$ or . $091348 \%$ as a direct result of the Pinon Canyon Maneuver Site land acquisition

We belleve the toral outatanding dndebtedness of the bond as of January 1. 1982 to be as follows:

| Total Bond | $\frac{\text { Principal }}{\$ 1,200,000}$ | Interest |
| :--- | ---: | ---: |
| Retired Prior to Jamuary 1, 1982 | $\frac{80,000}{\$ 1,009,057,75}$ |  |
| Remaining | $\frac{24,655.25}{\$ 1,120,000}$ | $\frac{244,}{\$ 164,402.50}$ |

Total \$7, $120,000+\$ 764,402.50 \mathrm{~m} \$ 1,884,402.50$
Because the bonds cannot be prepaid until. on or after December 1. 1989 and then only in inverse numerical order and at your option, we believe it would be mutually beneficial to make a one time lump sum payment for our proportionate share of the bond.

Since the bonds mature ovar the next 17 years the lump sum payment will be discounted to the present worth of $\$ 1.00$ (what $\$ 1.00$ payable yearly is worth today) using a liberal $5 \%$ interest rate.

Although your annual payments are variable, for simplicity we have based the payment on what our annual proportionate share would be which is arifued at as
follows:

| Total Bond Indebtedness |  | \$1.,884,402.50 |
| :---: | :---: | :---: |
| ,Government Reduction by \% | $X$ | . 091348 |
| Govermpent Proportionate Share |  | \$ 172,136.40 |
| Years Rematning on Bond Payment |  | $\mathrm{l}^{17}$ |
| Government Avarage Annual Payment | $\pm$ \$ | \$ 10,125.67 |

The 5\% interest discount rate was extracted from the Compound Interest Tables (the Six Functions of $\$ 1.00$ and Annual Constants for Monthly Payment Loans) prepared by the Financial Publishing Company, 82 Brooki ine Avenue, Boston, Massachusetts, for the American Institute of Real Estate Appraisers of the National Association of Realtors.

The payment is calculated as follows:

| Government Average Anmual Payment |  |
| :--- | :--- |
| $\mathbf{5 \%}$ Interest Discount Rate |  |
| Government Proportionate Share (Lump Sum) | $=\$ 10,125.67$ |
|  | $=\$ 11.274066$ |
|  |  |

1503.03 Pinon CanyonManeuver Site, COLO - Hoehne School District

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                    D'Agosta/mt/4392 7olgt 
```

We suggest that you consult with your legal or bond counsel to review the above. If you are in agreement with the payment of $\$ 114,1.57 .47$, we will deliver a check and have the School Board or its authorized agent execute a document stipulating that the funds will be applied tovards retirement of the bonds and also that the Government is relieved of any further obligation or liability ariaing from the reduction of the tax base in connection with the Pinon Canyon Maneuver Site land acquisition.

If you have any questions regarding the above, please contact Mike D'Agosta of my staff at (402) 221-4392.

Sincerely,
$\square$
Caty D. Blair Chief, Real Estate Division

Enclogure

CF:
MRDRE
Troia


## BIOGRAPHICAL SKETCH

Richard Mestas currently serves as a Program Manager at the National Intelligence University in Washington D.C. In this capacity, he coordinates Contracts, Campus Engineering, Space, Facilities, Mission Assurance and New Construction. He also previously served as NIU's Assistant Admissions Officer.

From 2009-11, Mr. Mestas took leave from the federal government to serve as Associate Dean, University of Nebraska College of Technical Agriculture. As Associate Dean, Mr. Mestas oversaw Student Services, Library, Information Technology, Residence Life and Facilities for the campus located in Curtis, Neb. He was also instrumental in the creation of the college's "Combat Boots to Cowboy Boots" program, which seeks to match returning war veterans with opportunities in agriculture.

Additionally, his work in the field of higher education has included assignments with the U.S. Navy Recruiting Command, the United States Merchant Marine Academy, Colorado State University-Pueblo, Lamar Community College, and the Defense Intelligence Agency.

He is an Army veteran of the first Gulf War, where he served as a munitions and light equipment maintenance officer with VII Corps in Southwest Asia.

Mr. Mestas received his Bachelor of Arts Degree from Colorado State University-Pueblo and Master of Arts Degree from the United States Naval War College. At present, he is a candidate for Doctor of Public Administration at the University of Baltimore. He is a native of Southern Colorado and resides in Southern Maryland.

